



RESERVE BANK OF AUSTRALIA

**FOREIGN EXCHANGE SETTLEMENT
PRACTICES IN AUSTRALIA**

December 1997

The research for this report was undertaken by Bernie Egan, Jeff Grow, Nathan Hale and Karen Cole from the Bank's Financial System Department.

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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. One of the largest risks facing foreign exchange dealers is settlement risk. This is a credit risk, whereby a party to a foreign exchange deal may deliver funds in the currency that was sold, but not receive the corresponding funds in the currency that was purchased.

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 by the Bank for International Settlements and others have revealed that foreign exchange settlement risk is more than just an intra-day phenomenon. The exposure lasts from the time that a payment instruction for the currency sold can no longer be cancelled unilaterally until the time that the currency purchased is confirmed as having been received with finality.

This report presents the results of an investigation by the Reserve Bank of Australia (RBA) into the settlement practices of the Australian foreign exchange market. It reveals that dealers in Australia are exposing themselves to large potential risks as a result of the settlement process for foreign exchange transactions. Based on the survey results presented in this report, the settlement exposure of the Australian industry, at any point in time, represents a multiple of its capital base.

While the values at risk are a natural consequence of trading in the world's ninth largest foreign exchange market, it is the length of time that Australian dealers are exposed to risk that is of particular concern. Exposures lasting in excess of 24 hours are the norm; for many currency pairs, the period of exposure lasts for over three business days and can extend out to a month for some of the more thinly traded currencies. The reconciliation practices adopted by many of the dealers surveyed fall far short of meeting international best practice.

Recognising the importance of the Australian dollar on global foreign exchange markets, the report specifically examines the settlement risk profile for transactions that involve an Australian dollar leg. In addition, it also examines the techniques applied by Australian dealers to limit or manage their exposures. Most dealers set limits on their accumulated counterparty exposures, although none measures its exposure in accordance with the methodology proposed by the Bank for International Settlements and adopted in this report.

The results of this survey are of some concern, as were the results of the overseas studies. Overall, though, Australian practice does not appear to vary significantly from that reported for the G10 banks in 1995. While several of the institutions surveyed in Australia are acutely aware of their exposure to foreign exchange settlement risk and are seeking ways of reducing and better managing it, many more

are still struggling with the issue. There is a general sense that Australian institutions are not addressing foreign exchange settlement risk with the same urgency as some of their G10 counterparts. The RBA will be looking for a demonstrable improvement when it undertakes a further study of the Australian foreign exchange market in 1998.

1. INTRODUCTION

1.1 Background

In 1995, the central banks of the Group of Ten (G10) countries¹ surveyed approximately eighty major banks in their respective local markets in order to document the practices used for settling foreign exchange transactions and to identify the associated risks. The G10 surveys were collated by the Committee on Payment and Settlement Systems (CPSS) of the Bank for International Settlements (BIS) and the findings were published in a report issued by the CPSS in March 1996.

That report, *Settlement Risk in Foreign Exchange Transactions*, did much to improve understanding of the problem and highlighted its scale. It showed that foreign exchange settlement risk is more than just an intra-day phenomenon: existing settlement practices create interbank exposures which can last anywhere from one to three or more business days. The CPSS also found that a bank's maximum foreign exchange settlement exposure could equal or even surpass the amount receivable for three days' worth of foreign exchange trades. With global turnover in excess of US\$1.2 trillion each day, the accumulated amount at risk at any point in time, to even a single counterparty, could easily exceed a bank's total capital resources.

In addition to revealing the size of the problem, the CPSS also showed how banks could take measures to reduce their exposures to foreign exchange settlement risk. These measures include improving back office processes, revisiting correspondent banking arrangements, examining the scope for bilateral or multilateral netting of foreign exchange settlements and the use of other risk management techniques.

The CPSS favoured a private sector solution, with inducements given to individual banks and industry groups. However, the G10 central banks, through the CPSS, also undertook to closely monitor progress over the ensuing two-year period to mid 1998 and to assess the need for further action at that time.

1.2 The Australian foreign exchange market

As noted above, the CPSS study covered the G10 countries and currencies and therefore did not include Australia or the Australian dollar (AUD). According to the last BIS survey of activity in global foreign exchange markets, which was conducted in April 1995, the Australian market ranked ninth in terms of global turnover, while the AUD was the eighth most actively traded currency. Given this relative importance, apart from the prudential issues, it is also critical to the competitive

¹ The Group of Ten countries are Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.

position of both the Australian foreign exchange market and the AUD that Australian settlement and risk management practices are not out of line with world best practice.

1.3 Objectives of a study by the Reserve Bank of Australia

Both the AUD and the Australian market play an important role in the global foreign exchange market place; this is reflected by their respective turnover volumes. Furthermore, the Australian market is the first major world market to open each day and has a 14 to 16 hour time zone difference with that of the United States, whose currency is the one against which most foreign exchange transactions are conducted. Time zone differences are one major factor that determine exposure to foreign exchange settlement risk.

However, as noted above, neither the AUD nor the Australian market have been included in any of the major studies of foreign exchange settlement risk to date. Accordingly, the Reserve Bank of Australia (RBA) undertook its own study, based on the work of the CPSS.

The RBA study aimed to address the following issues:

- whether there are any special features of the Australian market which would invalidate any of the general findings or methodology of the March 1996 CPSS report;
- whether participants in the Australian market are operating at world best practice in managing their exposures to foreign exchange settlement risk;
- what are the implications of settlement practices in Australia for domestic and offshore traders of the AUD; and
- how best to ensure that the AUD and the Australian market are part of any global solution to foreign exchange settlement risk.

1.4 Outline

This report has six main chapters:

- This first chapter describes the background and objectives of the RBA survey.
- Chapter 2 outlines the methodology of the study and provides information on the definitions used and the measurements applied.
- Chapter 3 presents the major findings of the study, including the duration and magnitude of foreign exchange settlement exposure.

- Chapter 4 provides analysis of the settlement risk profile for foreign exchange transactions that involve the AUD.
- Chapter 5 examines qualitative aspects of the study, with an emphasis on the techniques that are being applied to manage foreign exchange settlement risk.
- Chapter 6 discusses the next steps and conclusions.

There are five annexes, which provide supplementary information.

2. METHODOLOGY

2.1 Scope

While the RBA's basic intention was to replicate the work of the CPSS in an Australian context, the coverage of its survey was more comprehensive and ambitious than those of the G10 central banks in 1995. In large part, that reflected a desire by the RBA to incorporate, in one survey, what the G10 had addressed in both initial and follow-up surveys.

As discussed above in Section 1.3, an objective of the Australian study was to ascertain whether there were any special features of the Australian foreign exchange market which would invalidate any of the general findings or the methodology of the March 1996 CPSS report. This aspect of the study was to ensure completeness only - there was no expectation that there would be any special features of the Australian market which would invalidate the general findings of the CPSS report.

2.2 Definitions and measurement

To ensure consistency of the Australian study with the G10 surveys, the RBA adopted the same definition of foreign exchange settlement exposure as the CPSS. The following explains the definitions and measurements used by the RBA, drawing heavily on sections of the CPSS report.

2.2.1 Defining foreign exchange settlement exposure

“A bank's actual exposure - the amount at risk - when settling a foreign exchange trade equals the full amount of the 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.”²

It is important to note that this definition is designed to address the *size* and *duration* of the credit exposure that can arise during the foreign exchange settlement process. It says nothing about the *probability* of an actual loss.

2.2.2 Measuring foreign exchange settlement exposure

The definition also does not specifically address the *ability* of a foreign exchange dealer to measure and control its settlement exposure at a particular moment. To develop a practical methodology for measuring current and future settlement exposures in a manner consistent with the above definition, a foreign exchange dealer

² BIS (1996), *Settlement Risk in Foreign Exchange Transactions*, p.8.

would need to recognise the changing status - and, hence, the changing potential settlement exposure - of each of its trades during the settlement process.

Although settling a trade involves numerous steps, from a settlement risk perspective a trade's status can be classified according to five broad categories:

Status R: *Revocable.* The payment instruction for the sold currency either has not been issued or may be unilaterally cancelled without the consent of the counterparty or any other intermediary. No settlement exposure exists for this trade.

Status I: *Irrevocable.* The payment instruction for the sold currency can no longer be cancelled unilaterally either because it has been finally processed by the relevant payments system or because some other factor (eg internal procedures, correspondent banking arrangements, local payments system rules, laws) 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.

Status U: *Uncertain.* The payment instruction for the sold currency can no longer be cancelled unilaterally; receipt of the bought currency is due, but the dealer does not yet know whether it has received these funds with finality. In normal circumstances, it expects to have received the funds on time. However, since it is possible that the bought currency was not received when due (eg 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.

Status F: *Fail.* The dealer has established that it did not receive the bought currency from its counterparty. In this case the bought amount is overdue and remains clearly at risk.

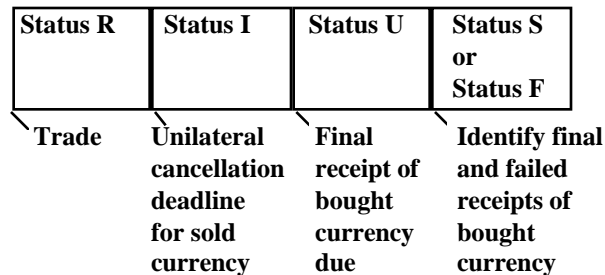
Status S: *Settled.* The dealer knows that it has received the bought currency with finality. From a settlement risk perspective, the trade is considered settled and the bought amount is no longer at risk.

Diagram 1 illustrates this simplified description of the foreign exchange settlement process. To classify trades according to the categories indicated, foreign exchange dealers need to know the following three critical times for each currency that they trade:

(i) the unilateral payment cancellation deadline;

- (ii) when the currency purchased is due to be received with finality; and
- (iii) when final and failed receipts are identified.

Diagram 1
The changing status of a transaction



These times depend on the characteristics of the relevant payments systems as well as on individual dealers' internal settlement practices and correspondent banking arrangements. Nevertheless, once these times are determined and the status of each trade appropriately classified, it is a relatively straightforward calculation to measure foreign exchange settlement exposure, even in the absence of real-time information.

Dealers that always identify their final and failed receipts of bought currencies as soon as they are due can determine their exposures exactly. For these institutions, current exposure equals the sum of their *Status I* and *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 have or have not actually settled (ie they do not know the amount of bought currencies that should - but might not - have been received on time).

Faced with this uncertainty, dealers should be aware of both their minimum and maximum foreign exchange settlement exposures. The following general guidelines can be used to measure these two extremes.

Minimum exposure: **Sum of *Status I* and *F* trades.** This is the value of the trades for which a dealer can no longer unilaterally stop payment of the sold currency but has not yet received the bought currency.

Maximum exposure: **Sum of *Status I*, *F* and *U* trades.** This equals the minimum exposure plus the amount of bought currencies that should - but might not - have been received.

In compiling this report, the RBA has assessed the industry's risk profile by using maximum exposure as the benchmark. The industry's actual exposure will usually fall

well short of this amount, but it is instructive for participants to know the magnitude of a potential ‘worst-case scenario’.³

2.3 Sample selection

In March 1997, the RBA wrote to the chief executive officers of 24 authorised foreign exchange dealers, inviting their institutions to participate in the survey. The institutions surveyed accounted for over 90 per cent of local market turnover and included both banks and non-banks. A complete list of respondents can be found in *Annex A* of this report.

The top fifteen dealers, by reported turnover, were included in the sample as a matter of course. Other dealers with lower turnover volumes were selected because of their unique characteristics, such as currency trading patterns, ownership and physical location.

2.4 Data collection

Prior to writing to the chief executives, the RBA prepared a draft questionnaire and circulated this to several prospective respondents, inviting their comments. Quantitative and qualitative aspects were covered in a single survey and in this sense, as noted above, it was a more comprehensive exercise than that undertaken by the G10 central banks in 1995. The institutions consulted all offered constructive comments on the design of the survey and their assistance was very much appreciated. A copy of the final questionnaire forms *Annex B* of this report.

Despite this preparation, many respondents - including those that had been consulted about the design of the questionnaire - experienced considerable difficulties in completing the survey. The RBA held follow-up discussions with most respondents in order to correct obvious errors or omissions and to clarify some responses. That process, which had not been anticipated, delayed the study and the release of this report.

2.5 Industry composites

Once the obvious errors were corrected and the RBA was substantially satisfied with the quality of the data overall, it aggregated the individual responses to construct an industry composite of the risk profile of the Australian foreign exchange market. As noted above, this was done using the ‘maximum exposure’ benchmark.

³ The amounts at risk presented later in this report explicitly assume 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 measure the sum of *Status I* and *U* transactions.

In order to ensure consistency of the Australian results with those of the CPSS study, reliance was placed on weighted average measurements when compiling much of the quantitative data. For the qualitative data, however, the RBA looked for commonality in the individual responses, seeking to discern if respondents took similar approaches towards particular issues.

2.6 Caveat

Despite its best efforts, and those of the respondents, the RBA remains sceptical about certain elements of the data supplied by some institutions. However, it believes that the information detailed in this report is a fairly accurate representation, in aggregate, of the settlement practices of the broader Australian market.

3. SETTLEMENT PRACTICES IN THE AUSTRALIAN FOREIGN EXCHANGE MARKET

3.1 Currencies

During April 1997, dealers participating in the survey reported foreign exchange settlements in 51 currencies. A complete list of currencies, together with the number of traders per currency, can be found in *Annex C* of this report. All respondents indicated that they had settled transactions in AUD, USD, JPY and NZD, while only one or two respondents had not settled transactions in DEM, GBP, CHF or CAD. Other currencies settled by many respondents included the FRF, ITL, HKD and SGD.

When measured in terms of value, USD and AUD settlements dominated, accounting for roughly three quarters of all foreign exchange activity in Australia.⁴ The USD represented almost half of total payments and receipts, indicating that it is on one side of virtually all foreign exchange transactions in the Australian market. When settlements in DEM, JPY, NZD and GBP are added to those in AUD and USD, these six currencies accounted for approximately 95 per cent of the value of all foreign exchange transactions for the month.

The average daily values of transactions in all other currencies were much smaller than those recorded for the six most actively traded currencies. However, the value of an individual transaction in one of these currencies, on any given day, could be large, and it should not be assumed that foreign exchange settlement risk is only an issue for the six most actively traded currencies.

3.2 Settlement methods

For most currencies, foreign exchange payments and receipts were made principally through the use of a nostro account held with another (correspondent) bank. As shown in Annex C to this report, the use of an unrelated correspondent bank was the most common method of settling foreign exchange transactions in most of the major currencies. The GBP and AUD were the two exceptions to this rule. Settlements in GBP were made almost equally by: unrelated correspondent banks; related corporate entities (ie parent banks or subsidiaries); or through branches in the United Kingdom. In contrast, the majority of survey respondents were directly responsible for the settlement of AUD transactions. However, the use of local correspondent

⁴ The survey asked for all foreign exchange settlements to be reported in terms of the original contracted currency. In order to aggregate these amounts, they were converted into a base currency, the AUD, at the average exchange rate prevailing for the month of April. Strictly, such conversions should have been made at the exchange rate applying at the time each individual transaction was entered into, but that would have been a very onerous task for the respondents. Given the relative stability of most currencies during the survey period, the RBA does not believe that the methodology used would lead to a material difference in the analysis.

banking services, by both bank and non-bank dealers, was also evident. Interestingly, not all institutions using a domestic correspondent for settling AUD transactions used a correspondent that was itself a direct clearer; that is, the correspondent in turn sometimes used a correspondent to settle on its behalf.

Not surprisingly, the choice of a correspondent often appears related to ownership. When the use of a related correspondent bank (ie parent or subsidiary) was combined with direct participation in the relevant payments systems, the relative use of 'external' agents to make and receive foreign exchange payments declined appreciably. For most of the major traded currencies, there was a near-equal split in the proportion of foreign exchange business being settled 'internally' (ie either directly or by related corporate entities) and that which was handled 'externally' (ie by a correspondent that did not have a common ownership). The principal exceptions were the NZD, CHF, FRF and MYR, where the use of an unrelated correspondent bank far exceeded 'internal' settlements. One reason for this may be the relatively high levels of banking sector concentration - and therefore correspondent banking facilities - in these countries.

3.3 Duration of exposures

As noted above, the USD is on one side of most foreign exchange transactions in the Australian market; the only other currency pairings of note involve trading against the AUD and DEM. The duration of foreign exchange settlement risk for all currencies against the USD is presented in the tables forming *Annex D* of this report.

The times presented in Annex D represent 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). The weights applied were derived from the value of payments and receipts supplied by survey respondents for each currency. As will be discussed later in this report, there were some very large deviations from these averages; the duration of foreign exchange settlement risk varied greatly between the institutions surveyed.

The results for the more significant currency pairs traded in the Australian market are reproduced in Table 1. This shows that there are significant variations in the duration of foreign exchange settlement risk, depending on whether a dealer is on the bid (buy) or offer (sell) side of the transaction.

Table 1
Industry weighted average exposure
(hours)

Currency pair	USD bought	USD sold
AUD/USD	33	12
USD/DEM	31	22
USD/JPY	37	17
NZD/USD	37	18
GBP/USD	29	24
USD/CHF	32	30
USD/FRF	32	20
USD/MYR	35	27
USD/SGD	36	24
USD/HKD	35	18

The length of foreign exchange settlement risk is generally shorter for transactions where the USD was sold, rather than where the USD was bought. The differences in the time at risk can be substantial - for example, on an AUD/USD transaction, it was over 21 hours. The weighted average exposures generated by each of the five major pairs traded in the Australian market are illustrated below in Diagrams 2 and 3.

Diagram 2
Settlement risk on USD purchases

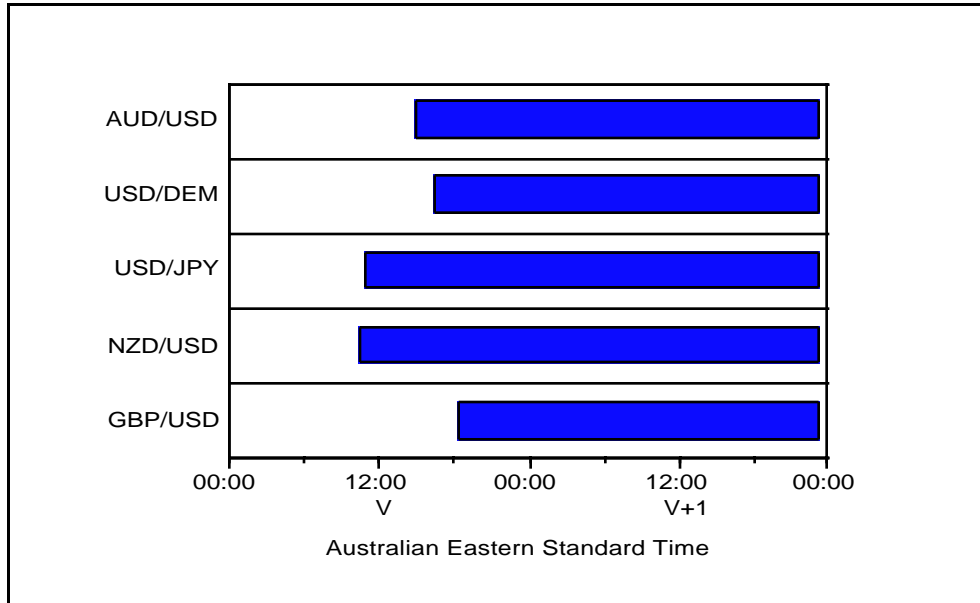
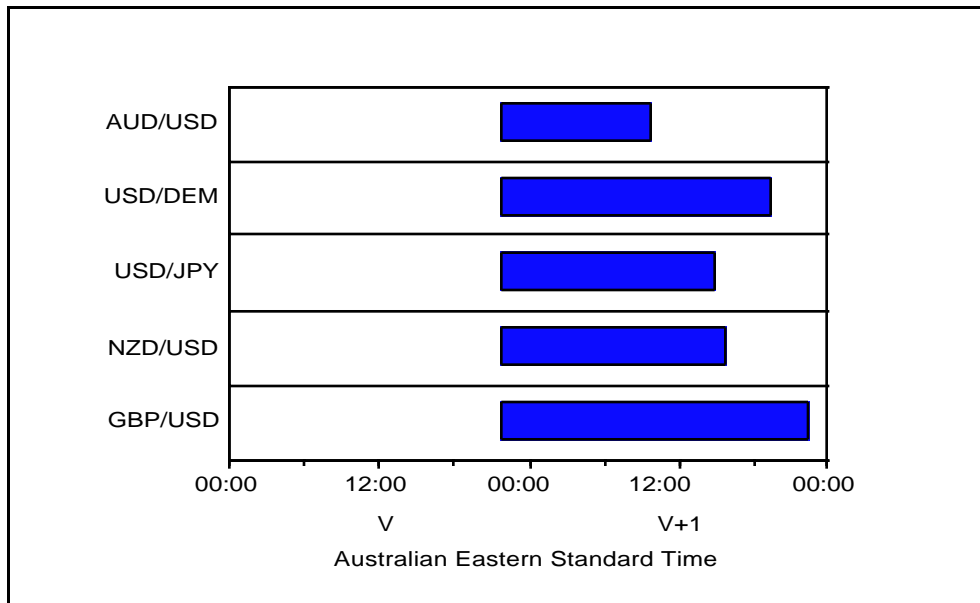


Diagram 3
Settlement risk on USD sales



Time zone differences play a major part in explaining these differences. Where currencies have been sold for USD, payment is generally required before the US payments system opens for the corresponding receipts. Where USD have been sold, the payment instruction can generally be cancelled later in the Australian day than can those for Asian or European currencies. Conversely, receipts in most currencies can generally be confirmed earlier than those in USD.

For some currencies with deferred net settlement arrangements - most notably the AUD and NZD - many respondents indicated that they reconcile receipts *before* interbank settlement has been completed across the accounts of the respective central banks. While early reconciliation assists in the detection of payments that have definitely not been received (ie those with *Status F*), it under-estimates the length of time that a dealer has an exposure to foreign exchange settlement risk.

Dealers are exposed to the risk of not receiving final value from a payment instruction until settlement occurs at the central bank. In the absence of a real-time gross settlement (RTGS) system, that may be many hours, or even days, after the settling bank has issued the payment. All such payments have a *Status U*. Without RTGS, a failure to settle by any direct member of a clearing system, regardless of whether they were involved in the settlement of the transaction in question, could precipitate an unwinding of the clearings and jeopardise the final receipt of the currency bought, leading to the risk of a full loss of principal on the transaction (ie the amount already delivered).

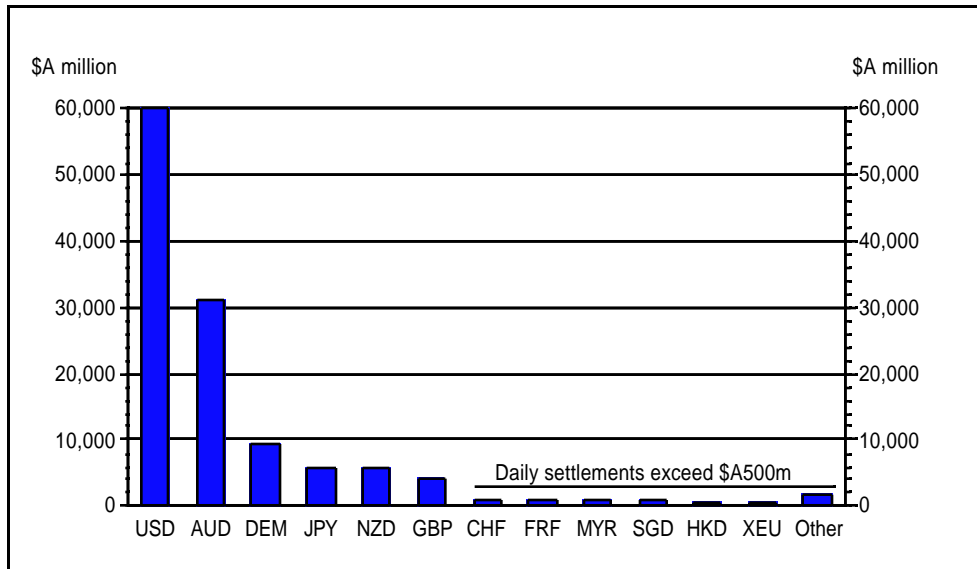
3.4 Magnitude of exposures

During the month of April, the 24 survey respondents collectively made foreign exchange payments for their own account worth, on average, \$A122 billion each day. This figure represents the sum total of *one side* of all foreign exchange transactions; consequently, the respondents also received, on average, approximately \$A122 billion per day from the settlement of foreign exchange related transactions.

It should be noted that the survey sought information on gross, not netted, amounts. As discussed later in Section 5.3.2 of this report, most respondents indicated that they engage in some form of netting for foreign exchange settlements, despite the current legal uncertainty surrounding this practice. While the recording of gross amounts may overstate the amount at risk, this would not invalidate the broad magnitudes, particularly in the absence of legal certainty for netting.

As noted previously, the bulk of foreign exchange settlements in the Australian market is concentrated in just six currencies; this is shown clearly by Diagram 4.

Diagram 4
Average daily settlements per currency



The USD is by far the major currency traded in the Australian market, accounting for \$A60 billion in foreign exchange payments each day and another \$A60 billion in receipts. As noted earlier, this represents roughly half of total reported settlements, implying that no significant cross-rate trading occurs in the Australian market.

The AUD ranked second, accounting for one quarter of total foreign exchange payments, or approximately \$A31 billion per day. This amount represents foreign exchange settlements from AUD trading by the survey respondents for their own account; it does not include any settlement activity originating from vostro accounts operated by Australian banks for their offshore correspondents.⁵ To include AUD vostro payments in this analysis is not appropriate because Australian banks do not face foreign exchange settlement risk on these transactions - they are only acting as an agent for their customers in making and receiving payments in AUD. Generally, they have no commercial interest in the final settlement of the foreign currency leg.

Of the four other most actively traded currencies, average payments per day were \$A9.5 billion for DEM, \$A5.7 billion for JPY, \$A5.6 billion for NZD and \$A4.2 billion for GBP. In addition, there were a further six currencies where average daily settlements in each currency ranged from \$A500 million to just under \$A1 billion.

⁵ Vostro account activity is discussed later in Section 4.4 of this report. The daily vostro account settlements from offshore trading were of a similar magnitude to the values settled by Australian banks for their own account.

3.5 Benchmarking exposures

For most respondents, and certainly on an industry basis, the values flowing from foreign exchange settlements are extremely large. Accordingly, some comparison, or benchmark, was sought in order to put the amounts into perspective. The benchmark chosen was capital.

Regulatory capital is not required to be held against foreign exchange settlement exposures; nor will it be under the market risk capital requirements (although capital will be required to be held against exchange rate risk, from the time that the transaction is entered into until settlement). Nevertheless, it is capital that must ultimately absorb losses arising out of the failure of a counterparty to pay.

Many of the institutions surveyed are part of multinational organisations that operate globally, with global capital. In those cases, it has been necessary to create a proxy for Australian capital for the purpose of these calculations. The capital used in this study to benchmark the collective exposure of the 24 respondents was \$A43 billion.

3.6 Industry risk profiles

The following section presents an analysis of the risk profile for the Australian foreign exchange market, based upon the trading patterns of respondents, the values settled and the reconciliation practices employed. Two aspects should be noted: first, it must be stressed that the times quoted below are industry *weighted averages* and do not necessarily correspond with any actual time reported by individual respondents. The use of weighted average measurements is consistent with the CPSS methodology. Second, the settlement amounts reported are those supplied by respondents. There are reservations about the accuracy of some of these values but, in aggregate, they appear to be ‘in the ball park’.

It should also be noted that the methodology used in this report differs from that used to report foreign exchange turnover for the RBA’s monthly *Bulletin*. The latter does not require the second leg of foreign exchange swaps to be reported. Both legs of a foreign exchange swap are generally settled and are therefore subject to settlement risk, in much the same way as are outright spot or forward transactions. This report takes account of the reciprocal leg of foreign exchange swaps that were settled during April 1997.

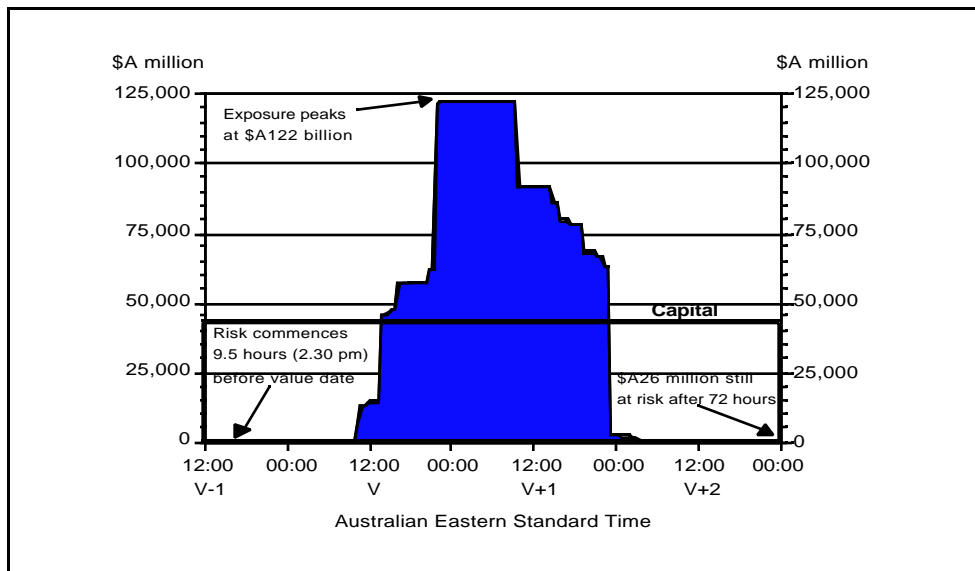
3.6.1 The one-day industry profile

Excluding the ‘exotic’ currencies, the weighted average exposure for a single day’s foreign exchange transactions was around 84 hours (or 3 1/2 business days). This is consistent with the broad findings of the CPSS for the G10 banks in 1995. The maximum weighted average period of risk for the six most actively traded currencies

in Australia is 37 hours (or 1 1/2 business days). The 37 hour period corresponds to the time that a dealer is at risk when selling either NZD or JPY for USD (refer to Table 1 and Diagram 2 above); the other actively traded currency pairs fall within this period. It should be noted, however, that Australian foreign exchange dealers can be exposed to settlement risk on a single day's transactions for a maximum of 746 hours (or 31 business days) due to receipts in some of the exotic currencies being reconciled only once per month. Settlements in these currencies are not generally of a significant value.

The accumulation of foreign exchange settlement risk beyond a 24 hour period has some important implications. Diagram 5 illustrates the pattern of risk accumulation, and subsequent reduction, for a single day's foreign exchange transactions, based on data collected from the survey. The capital benchmark, discussed in Section 3.5 above, is also shown.

Diagram 5
Settlement risk: one-day profile



As shown above, settlement risk on some foreign exchange transactions - in this instance, on sales of IDR - commences some 9 1/2 hours before the actual value date. Thus, from 2.30 pm on the day before value date (denoted 'V-1'), Australian dealers are exposed to \$A350 million of foreign exchange settlement risk on an average day. The accumulated exposure increases incrementally during the early morning as instructions to pay in other currencies become irrevocable, but the total values at risk do not become noticeable until mid-morning on value date, when over \$A11 billion worth of payment instructions in NZD and JPY can no longer be cancelled. Instructions to pay in many of the Asian currencies become irrevocable around midday, Sydney time, by which stage the aggregate value of foreign exchange settlement exposure has reached approximately \$A14 billion.

The risk profile increases dramatically in the early afternoon, when AUD payment instructions become irrevocable - the total values at risk by this time are around \$A45 billion. By the close of the Australian banking day at 5.00 pm, instructions to pay in many European currencies, including the DEM, can no longer be cancelled; total foreign exchange settlement risk at this point is \$A57 billion. By 7.00 pm, payments in most of the remaining currencies, including the GBP, can no longer be stopped and total settlement risk stands at \$A61 billion.

By the close of business in Sydney, it should be possible to make some reductions, albeit small, to the \$A61 billion at risk by reconciling receipt of those currencies in the Asia-Pacific time zone that have already settled with finality. For example, the FEYCS payments system for JPY settles at the Bank of Japan at 4.00 pm AEST, allowing a potential reduction in foreign exchange settlement risk of some \$A5.7 billion on an average day. Total settlement risk could be reduced further if some of the Asian currencies which are settled on a real-time basis, such as the HKD, were reconciled by the local close of business in Sydney.⁶ Not one of the respondents to the survey reconciled these payments before the Australian market re-opened next morning.

Instructions to make payments in North American currencies do not become irrevocable until late in the Australian evening (9.00 pm for CAD and 10.00 pm for USD). The last currency where payment instructions become irrevocable is the ECU. By 10.30 pm AEST, foreign exchange settlement risk on a single day's transactions reaches its maximum of \$A122 billion; this represents the gross total for the payment leg of all foreign exchange deals to be settled that day.

Using the weighted average reconciliation times, the total principal amount on all foreign exchange transactions then continues at risk for a period of 11 1/2 hours, from 10.30 pm until 10.00 am on the following morning, when the AUD receipts are confirmed as having been received with finality. Settlement risk on the previous day's transactions falls progressively during the business day, as foreign currency receipts are confirmed as having been received with finality. However, by the close of business on the day *after* value date (denoted 'V+1'), the total amount from the previous day's transactions that is still at risk equals \$A78 billion, with final receipts in several major currencies - including the USD, DEM and GBP - still unconfirmed.

It should be reiterated that this industry profile refers to the *weighted average* times for reconciling receipts - some respondents do actually reconcile payments in the major currencies on day V+1. Nevertheless, the weighted average time for confirming

⁶ As noted earlier, despite some indications to the contrary from survey respondents, until the introduction of RTGS, receipts in AUD and NZD *cannot* be received with finality on value date because interbank settlement is not until the following business day. End-of-day reconciliation of AUD and NZD payments will assist dealers in identifying failed (*Status F*) payments - possibly averting the classic 'Herstatt' scenario - but it cannot bring forward the time when payment instructions which have already been received (*Status U* payments) are settled and thus become final and irrevocable.

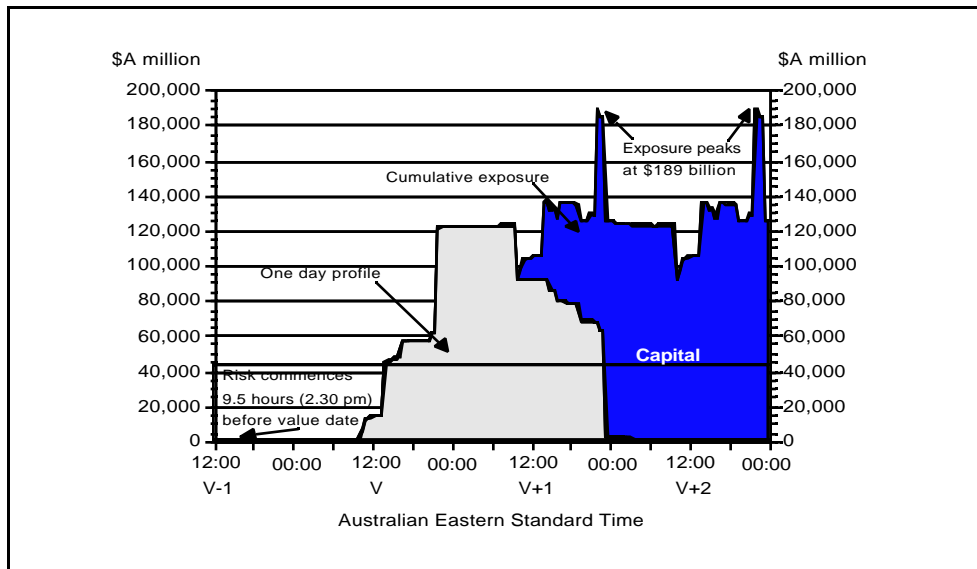
that the \$A60 billion of USD receipts is no longer at risk is 11.30 pm on day V+1; the outstanding settlement risk at this time is \$A2.6 billion. The total value at risk does not drop below \$A1 billion until CHF receipts are confirmed at 3.30 am on day V+2. By the local opening of business on day V+2, around \$A200 million of transactions *due two days earlier* are still at risk; this figure is substantially the same by the close of business at 5.00 pm. By 6.00 pm on day V+2, foreign exchange settlement exposure drops to \$A26 million. The remaining receipts still at risk are in minor currencies, which can take anywhere from 3 to 31 business days after value date to confirm with finality.

3.6.2 The inter-day industry profile

The accumulation of settlement risk over the periods discussed above means that foreign exchange payments in some currencies on one day will become irrevocable before it is confirmed whether settlements due the previous day have, in fact, been received with finality. Thus, at any point in time, it is possible for foreign exchange transactions due up to three (or even more) business days previously to still be at risk of failure.

Diagram 6 illustrates the inter-day accumulation of risk for an average day's foreign exchange settlements, again with the capital benchmark shown.

Diagram 6
Settlement risk: inter-day profile



As with Diagram 5, foreign exchange settlement risk on a single day's transactions begins on day V-1 with the sale of IDR and plateaus at \$A122 billion after instructions to pay ECU become irrevocable late on day V. However, due to the reconciliation times described above, settlement risk on the next day's foreign

exchange transactions begins to accumulate *before* the risk on the previous day's deals has been extinguished. Thus, at any point in time, the value of more than one day's foreign exchange transactions is at risk of failure.

After foreign exchange settlement risk has accumulated on the first day's transactions, at no point in time thereafter does the total value at risk for the industry drop below \$A92 billion. This is a significant on-going credit risk, representing a sum equivalent to the total daily value exchanged by Australian banks through the domestic payments system. And this is the *minimum* value at risk existing at any point in time.

The *maximum* amount of foreign exchange settlement risk, for an average day's transactions, is \$A189 billion, which occurs late on day V+1 (and subsequently at the same time on day V+2, etc), lasting for 1 1/2 hours.⁷ During this period, the second day's USD payments become irrevocable before the USD receipts due the preceding day are confirmed with finality. The peak amount of foreign exchange settlement risk represents over four times the capital benchmark discussed in Section 3.5 above.

The accumulation of risk does have important implications at the individual counterparty level, as well as at the more macro level discussed above. In setting and then monitoring settlement limits on individual counterparties, financial institutions must understand and be able to measure the duration of settlement risk. (Chapter 5 of this report reviews the questionnaire responses on risk management practices, including those relating to the setting and monitoring of limits.)

3.7 Industry benchmarks

The information presented above represents the collective exposure of survey respondents, on a weighted average basis, to foreign exchange settlement risk. However, individual practices did vary, often substantially, from this general industry profile. While no individual profiles are included in this report, the RBA has shown and discussed these results with most of the survey respondents.

The following section presents a composite of the 'best' and 'worst' industry settlement practices using the same values for an average day, but different cancellation and reconciliation times. It is worth noting that no single respondent exhibited the best (or worst) characteristics for all currencies surveyed.

⁷ Technically, the aggregate amount at risk will continue to grow until all settlements due on day V have been confirmed with finality. As shown in Annex D, this is not until day V+31 for some currencies. While, for the purpose of this analysis, the average amounts beyond the peak on day V+1 are not material, it should be stressed that they could be if there was a relatively large settlement involving a minor currency.

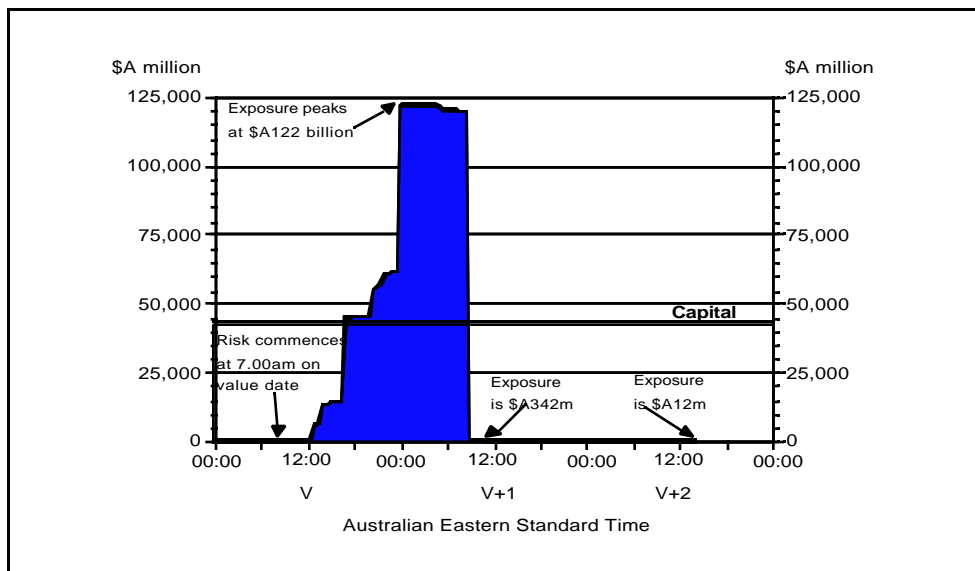
3.7.1 Current best practice

‘Best practice’ refers to the combination of responses which produced the latest possible unilateral cancellation deadline, and earliest possible reconciliation deadline, for each currency.

An important caveat needs to be noted: for the purpose of this analysis, all responses which indicated that foreign exchange receipts were reconciled *before* the time of finality in each currency have been disregarded and the time of interbank settlement in the relevant currency has been substituted. As noted in Section 3.3, this was necessary to avoid under-estimating the duration of exposure to foreign exchange settlement risk. Thus, ‘best practice’ refers to what is actually being achieved (or has been assumed), not to what is theoretically possible.

If all survey respondents employed the current best practices in each currency, then the industry’s collective exposure to foreign exchange settlement risk would look like Diagram 7.

Diagram 7
Current best practice: one-day profile



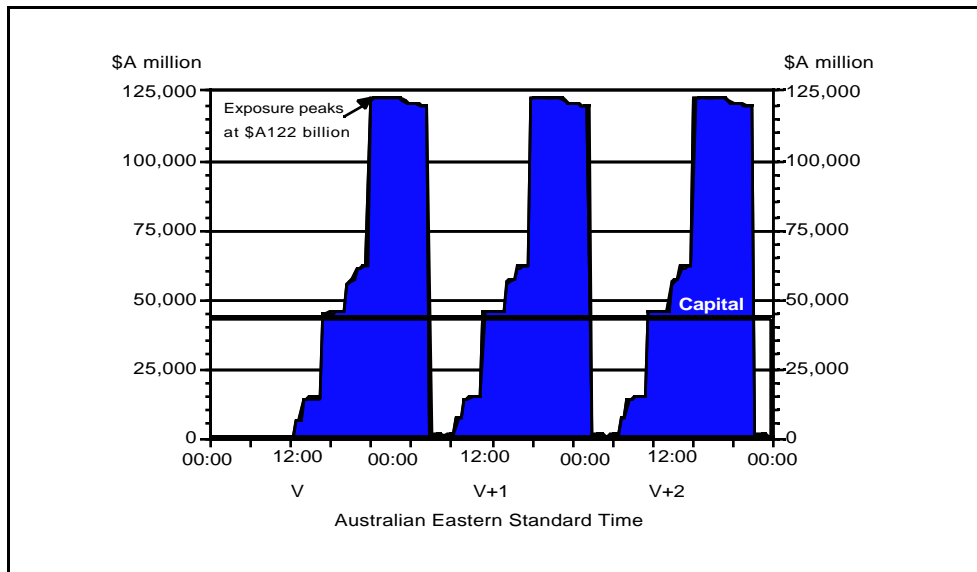
In common with Diagram 5 earlier, the maximum foreign exchange settlement exposure is equivalent to the day’s total payments. However, unlike the weighted average case, the best practice case quarantines foreign exchange settlement risk on most currencies to a period of 40 hours - just over 1 1/2 business days. Furthermore, the risk does not start accumulating until the value date itself.

For the five most actively traded currency pairs in Australia, the maximum exposure is only 20 hours. This corresponds to the time that a dealer is at risk when selling NZD and buying USD. When current best practices are employed for some other major

currency pairings, foreign exchange settlement exposure can be reduced to 12 hours (or even less).

Current best practices do not allow significant settlement exposures to accumulate across days. This is shown by Diagram 8.

Diagram 8
Current best practice: inter-day profile



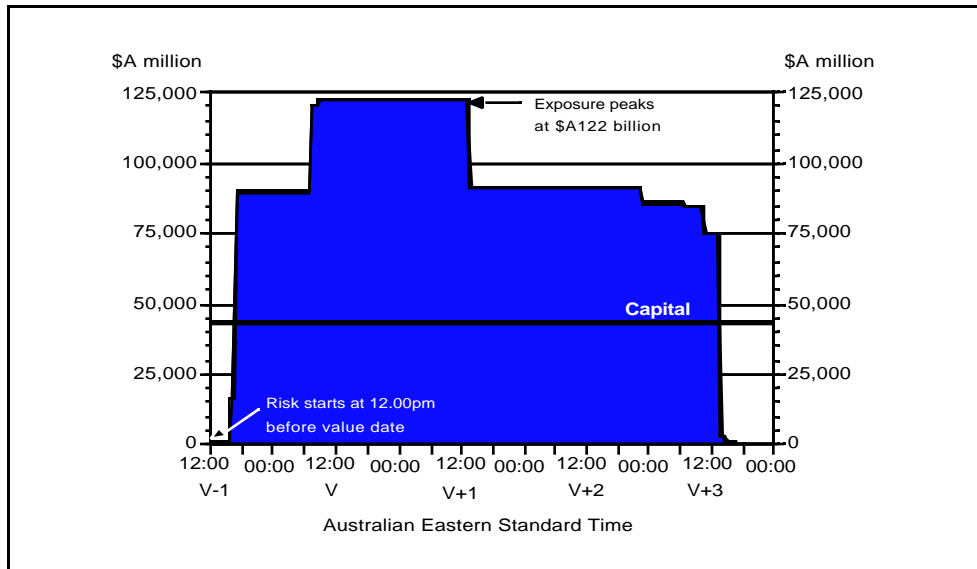
Even though current best practice does not allow settlement risk from one day's transactions to accumulate with that of the following day, it still falls short of what could be achieved. The maximum risk exhibited above in Diagram 8 is still the gross sum of all foreign exchange payments - the full principal amount settled each day. As noted in Section 3.6.1 above, there is no reconciliation on value date of currency receipts in Australia's time zone, such as the JPY and HKD, whose payments systems have settled. Over \$A6 billion of risk, on these two currencies alone, could be removed if statements were reconciled at the end of the local day, rather than at a later date.

3.7.2 Current worst practice

'Worst practice' refers to the combination of responses which produced the earliest unilateral cancellation deadline, and latest reconciliation deadline, for each currency. For some currencies, receipts were reconciled only on a monthly basis; however, this was generally confined to the thinly traded exotic currencies. For some of the less exotic currencies, it was not uncommon for respondents to indicate that they were on a weekly statement cycle and therefore did not reconcile foreign exchange receipts for up to seven business days after value date.

Diagram 9 illustrates the exposure of the industry to foreign exchange settlement risk if the worst settlement practices observed were employed for payments and receipts in each currency.

Diagram 9
Current worst practice: one-day profile

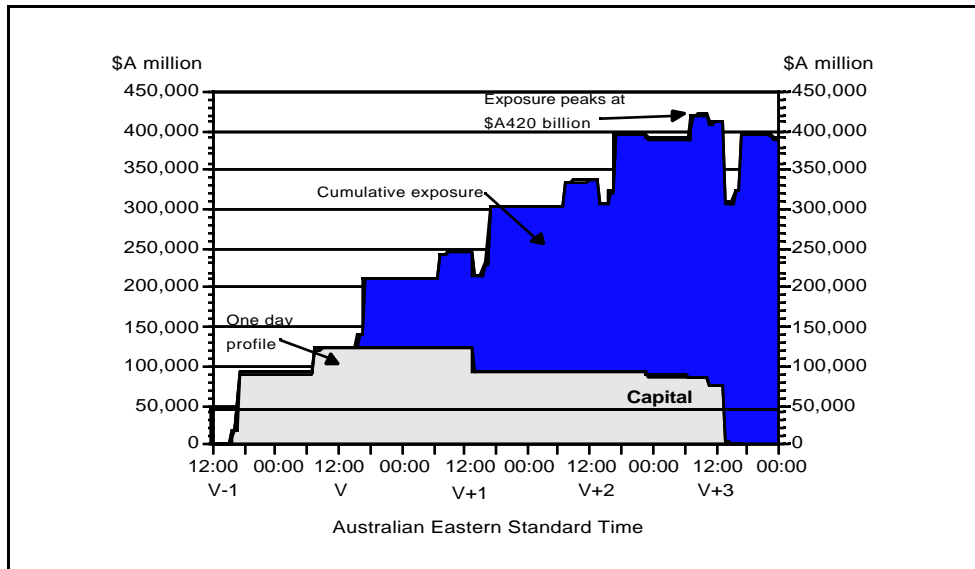


As shown above, if existing worst practices were the industry norm, then a substantial settlement exposure would have accumulated on the day *before* value date. By the start of the local business day in Sydney, less than \$A20 million of the \$A122 billion in foreign exchange payments due to be settled that day could be cancelled.

The length of time that the value of the entire day's settlements is at risk - some 29 hours - is also much longer than the weighted average case of 11 1/2 hours. The first noticeable drop in the aggregate value at risk does not occur until 2.00 pm on day V+1. This represents the latest time when AUD receipts are reconciled. However, after this, over \$A90 billion of settlement exposure persists for another 33 hours before NZD receipts are confirmed. Total settlement risk remains in excess of \$A80 billion for a further 12 hours before most of the major currencies are reconciled, and by the close of business on day V+3, just over \$A300 million worth of payments in minor currencies are still at risk. It can take anywhere from 7 to 31 business days to confirm final receipts in these currencies.

The continuation of foreign exchange settlement exposure over three business days means that, at any one point in time, the total value at risk will be a multiple of a single day's foreign exchange transactions. Diagram 10 illustrates the inter-day accumulation of settlement risk if the current worst industry practices were employed for each currency.

Diagram 10
Current worst practice: inter-day profile



As shown above, the accumulation of foreign exchange settlement exposure is substantial. For the first 48-hour period, the total value at risk continues to increase without respite. By the close of business on day V+1, total settlement exposure equals \$A245 billion - two days worth of foreign exchange payments. The late reconciliation time for the major traded currencies allows settlement risk to accumulate on additional days' transactions - by the close of business on day V+2, \$A300 billion is at risk; by the close of day V+3, the value at risk is nearly \$A400 billion. Total settlement risk peaks at just under \$A420 billion, early in the morning of day V+3, and thereafter remains between \$A300 billion and \$A420 billion.

While such figures represent an extremity - an amalgamation of the worst possible settlement practices currently exhibited in the Australian market - it must be remembered that such practices do, in fact, exist and are based on responses from the dealers that were surveyed.

3.8 Analysis and discussion

3.8.1 Australian results

The results of the investigation into foreign exchange settlement risk in Australia are a concern. While several respondents are clearly aware of the issue and actively implementing strategies to reduce their exposures, many more are still obviously struggling to comprehend the spectrum of risks to which they are exposed when settling foreign exchange transactions.

The considerable difficulty that many respondents had in completing the questionnaire was quite surprising, yet also instructive. In subsequent discussions

between the RBA and individual respondents, it was evident that many institutions simply did not have a good feel for the magnitudes of settlement risk to which they were exposed across their entire book. These exposures are significant - at the industry level, the on-going accumulated exposure ranges between \$A92 billion and \$A189 billion, well in excess of the capital available to absorb such losses.

Aggregating settlement risk across the entire book would appear, on the basis of this survey, to require financial institutions in Australia to broaden their focus on this risk. Saying that does not in any way diminish the advances of recent years as a growing number of financial institutions are now measuring, monitoring, setting and enforcing limits against settlement risk. The RBA, of course, supports and encourages that trend. But to date, at least in Australia, it has been done on a counterparty basis. What must be understood, though, is that foreign exchange settlement risk entails much more than risk to a single counterparty; in times of instability, it can rapidly escalate into systemic risk.

The RBA recognises the imponderables in attempting to anticipate or deal with a major systemic problem in the global banking system. Nevertheless, a crucial element in dealing with any banking problem, potential or real, is being able to quantify it, or at least being able to define its extremities. Accordingly, the RBA is of the view that Australian financial institutions should be able to measure and monitor their foreign exchange settlement exposures in aggregate.

3.8.2 Observations

The main observation of this study is that Australian dealers are prolonging their exposure to foreign exchange settlement risk unnecessarily. This outcome is not due to the cancellation times that are imposed upon them by their correspondent banks; for most institutions surveyed, the times were very favourable, extending right up until the opening time of the local payments system for each currency (or even beyond this time in some cases).⁸

Rather, it is the reconciliation practices adopted by Australian foreign exchange dealers that extend the period of risk. Receipts in most of the major currencies traded in the Australian market are not confirmed until late on the business day following value date or even on the subsequent two days. For most currencies, waiting such a long time to reconcile final receipts should be unnecessary; payment and interbank settlement have generally been finalised before the new business day has begun in Australia. There was also some evidence of a 'no news is good news' policy. In the absence of any advice to the contrary, some respondents simply assumed that settlement had occurred and that the transaction was final. Best practice is achieved

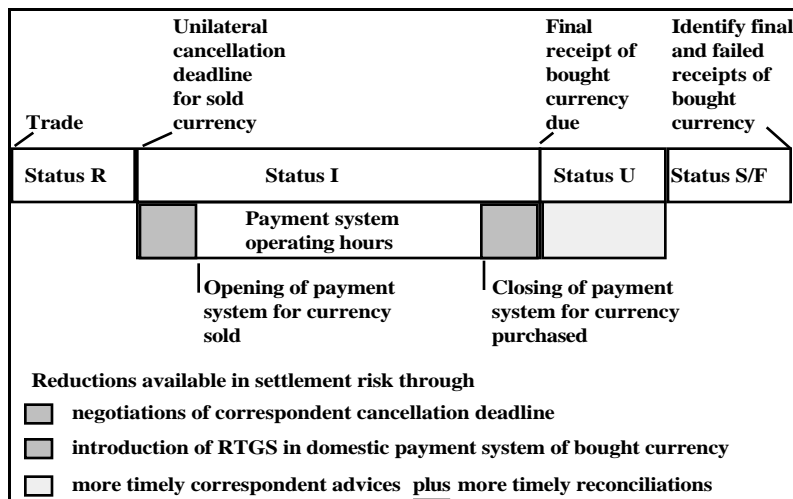
⁸ This is especially true of USD payments, where many of the larger dealers indicated that they could cancel or recall payments well into the New York day.

through prompt despatch of statements by offshore correspondents and prompt reconciliation by local dealers.

In some currencies, there is nothing that an Australian dealer can do to speed up the time when receipts become final. This must be accepted as a given and will set a minimum period of exposure that is as unavoidable as time zone differences. However, the introduction of RTGS in many of the more important payments systems means that, over time, the significance of this issue will diminish greatly. This will be especially true of currencies in Australia's time zone. Hong Kong, Korea and Thailand already have functioning RTGS systems, while New Zealand, Singapore and Malaysia are introducing such systems.⁹ RTGS will provide Australian dealers with the opportunity to reconcile final receipts in currencies in the Asian time zone on value date, thereby producing a noticeable drop in the magnitude of their overnight settlement exposure. (The implications of RTGS for AUD settlements are discussed in Section 4.5 below.)

Returning to the illustration of the changing status of a transaction shown earlier in Diagram 1, it is possible to illustrate the impact of best practice on the duration of settlement exposure. This is shown in Diagram 11.

**Diagram 11
Reducing settlement risk**



3.8.3 Comparison with the G10 results

Although foreign exchange settlement risk has long been recognised as a major issue, progress in addressing it has been slow. That, however, is starting to change.

⁹ Japan also has an RTGS system, but this is not currently used extensively for the settlement of foreign exchange transactions in JPY; most of these payments are processed via the FEYCS system.

Some individual institutions have recently made very significant advances in managing and reducing this risk.

It would therefore be unfair to attempt to make too direct a comparison between the results of the 1997 RBA study and that undertaken two years earlier by the G10 central banks. Also, the structures of the respective markets are very different. The G10 central banks did not include the AUD in their surveys and so no direct comparisons can be made for AUD/USD transactions, the most significant currency pair traded in the Australian market.¹⁰ Further, the time zone differences between Australia and the G10 countries work in Australia's favour when settling some currencies and against it when settling others.

That said, the variation between institutions in managing settlement exposures that was identified in the CPSS study applies equally to the participants in the RBA study. Overall, Australian practice does not appear to vary significantly from that of the G10 banks; but there is a sense that Australian institutions are not addressing foreign exchange settlement risk with the same urgency as some of their G10 counterparts.

¹⁰ The same also applies to NZD/USD transactions; a currency pair more actively traded in Australia than either GBP/USD or USD/CHF, but one which is not traded widely in most of the G10 countries.

4. SETTLEMENT RISK ON AUSTRALIAN DOLLAR TRANSACTIONS

4.1 Background

As noted earlier, previous studies of foreign exchange settlement risk have generally been limited to an examination of the G10 currencies. Nevertheless, the AUD is an actively traded currency in all of the major foreign exchange centres. The RBA is concerned to ensure that the level of settlement risk on AUD transactions is not out of line with those for other major traded currencies. It also wants to ensure that traders in AUD are not placed at a competitive disadvantage by solutions developed offshore which fail to make allowances for the Australian market.

All traders, whether based in Australia or offshore, face exposure to foreign exchange settlement risk on their AUD transactions. However, even though the AUD is traded in many countries, it is not widely quoted - and therefore settled - against any currency other than the USD. While Australia provides the largest market for direct cross-rate deals in AUD, even this market is relatively small, accounting for less than four per cent of domestic AUD turnover.

4.2 Domestic settlement arrangements

Settlement of AUD transactions for a dealer's own account is effected through many different means, both direct and indirect. This is illustrated below in Table 2, which represents an average day's settlement activity for the 24 survey respondents.

Table 2
Daily AUD settlements by system

Method	AUD Payments		AUD Receipts	
	\$A million	per cent	\$A million	per cent
BITS	6 870	22.3	6 713	21.9
Austraclear	7 726	25.1	7 687	25.1
RITS	129	0.4	131	0.4
Paper clearings	10 055	32.7	10 020	32.7
Domestic nostro accounts	4 032	13.1	4 123	13.4
Other*	1 983	6.4	1 993	6.5
Total	30 795	100.0	30 667	100.0

* 'Other' refers principally to settlements between a bank and its customers, where credits and debits are made internally by the bank without the need for a payment instrument to be issued.

Most of the banks surveyed pay and receive AUD as a principal in at least one local clearing system and have direct responsibility for the final settlement of these transactions on the following business day. While non-bank dealers may also be responsible for making and receiving their own AUD payments (eg if they have access to an Austraclear or SWIFT terminal), *settlement* of such payments is performed by their banker.

However, the survey revealed that not all banks settle directly for AUD foreign exchange payments. The use of extensive correspondent banking and agency arrangements by many banks for the domestic currency leg of foreign exchange transactions was evident from the survey responses. The most common arrangement was for paper clearing, where many foreign exchange dealers maintain their own accounting records (and may even collect and disburse warrants themselves), but use a large clearing bank for the settlement of these instruments. Use of a *nostro* account at a larger bank to make and receive payments was also a common method for settling foreign exchange transactions in AUD.

4.3 Issues for domestic dealers

4.3.1 Measurement problems

The use of different systems and payment instruments makes identification and measurement of foreign exchange settlement risk on AUD transactions more difficult than for many other currencies. For example, some means of settlement in Australia provide for ‘assured payments’ (ie those with agreed irrevocability); some alternatives are clearly conditional (eg cheques); and other methods, such as correspondent banking, vary from case to case.

This fragmentation is thought to be the reason for the high number of survey respondents under-estimating the duration of their exposure to foreign exchange settlement risk for AUD transactions. Many respondents regarded the time of ‘finality’ for AUD transactions as the local close of business, rather than at 9.00 am the next day. In addition, several respondents indicated that they reconcile their AUD settlement flows on value date, rather than waiting for interbank settlement to be completed (which, as discussed earlier, is the event that confirms finality).

Ordinarily, early reconciliation of receipts would constitute sound practice. Indeed, it allows Australian dealers to reduce their risk profiles by providing some scope to cancel the USD leg of a transaction if it is discovered the AUD side has definitely not been delivered (ie *Status F* transactions). However, if it is confirmed that the counterparty has delivered the AUD, this amount must still be considered at *risk* of failure (as opposed to actually having failed) until interbank settlement has been completed at 9.00 am the following business day. In the CPSS methodology, the transaction has entered the *Status U* phase. Depending on whether weekends intervene, this period can range anywhere from one to three calendar days after the

actual value date, or even longer with public holidays. By reconciling *expected* receipts (rather than *final* receipts) on value date, domestic dealers are under-estimating their true exposure by some 16 hours, on a standard day, implicitly discounting the possibility of a failure to settle the following morning.

4.3.2 Trading patterns

As noted earlier, the overwhelming majority of foreign exchange transactions in AUD involve the USD on the other side. However, some direct cross-rate trading does occur, albeit in low volumes, against other currencies. Table 3 shows the weighted average time, in hours, that foreign exchange transactions are at risk for the five most actively traded AUD pairs.

Table 3
Settlement risk on AUD transactions
(hours)

Currency pair	AUD bought	AUD sold
AUD/USD	12	33
AUD/JPY	23	25
AUD/DEM	17	30
AUD/NZD	24	26
AUD/GBP	16	32

Several points of interest arise from the information presented in Table 3. First, the exposure to foreign exchange settlement risk on AUD transactions is the most variable for deals that involve the USD on the other side. The difference in exposure between paying and receiving AUD for USD is around 21 hours. Reducing the period of risk where the AUD is sold against the USD is critical because AUD/USD deals are the most prevalent of all AUD transactions, both domestically and offshore.

Second, it is clear from Table 3 that foreign exchange settlement risk on AUD transactions is much more than a time zone problem. The superficial ‘pay early, receive later’ analysis of the original Bankhaus Herstatt incident in 1974 does not withstand close scrutiny. Deals involving the AUD against the JPY and NZD are at risk, on both sides of the transaction, for around 24 hours, despite the small time zone differences that exist between Sydney, Tokyo and Wellington.

Third, Australia’s next-day settlement arrangements do not assist in the reduction of foreign exchange settlement risk; in fact, they prolong the period of exposure. As noted earlier, receipts in AUD are not final until 9.00 am on the business day after value date and should not be reconciled with finality until this time. If same-day

settlement were in place, as it is generally elsewhere in the world, the period of risk where the AUD was purchased could be reduced by ten or more hours, and possibly eliminated. Such a reduction would be possible despite the fact that the length of exposure on such transactions is already less than that when the AUD is sold and foreign currency is purchased.

4.4 Issues for offshore traders

4.4.1 Settlement arrangements

Offshore traders in AUD face broadly similar risks to those of domestic dealers that trade in ‘third’ currencies (ie those without an AUD component). They need to establish arrangements to make and receive payments in the currency, and must negotiate appropriate cancellation and notification times with local correspondent banks. In addition, they need to be aware of the time when AUD receipts can be considered ‘final’, taking into consideration the different payment systems/instruments used and the deferred settlement arrangements that currently exist in Australia.

Thirteen of the 24 survey respondents indicated that they offered correspondent banking services to offshore traders of AUD. For some, this vostro account business is confined to servicing the AUD payment needs of their head office or branches, while for others, it represents an extensive and profitable line of business in its own right. Importantly, it needs to be recognised that this activity does *not* generate foreign exchange settlement risk for the Australian banks that offer the correspondent banking services. The domestic bank is merely acting on advice from its offshore correspondent and generally has no commercial interest in the settlement of the foreign currency leg of the underlying transaction (which will usually be USD).

This situation of Australian banks making or receiving ‘one-sided’ payments to settle foreign exchange deals done by offshore customers is to be contrasted with that where deals are settled for the bank’s own account: in the latter case, the local bank has an interest in the settlement of both currency legs, regardless of whether one currency happens to be the AUD.

4.4.2 Settlement flows

Of the 13 respondents who indicated that they did provide correspondent banking services, most could not isolate that portion of vostro account turnover which was related to foreign exchange activity on the part of offshore traders. Table 4 details the composition of total vostro account activity reported by those survey respondents that provide such services to offshore traders of AUD.

Table 4
Daily AUD vostro settlements by system

Method	Vostro Payments		Vostro Receipts	
	\$A million	per cent	\$A million	per cent
BITS	15 369	49.9	15 303	44.1
Austraclear	15	0.0	15	0.0
RITS	69	0.2	69	0.2
Paper clearings	8 289	26.9	12 108	34.9
Domestic nostro accounts	886	2.9	887	2.6
Other*	6 178	20.1	6 338	18.2
Total	30 806	100.0	34 720	100.0

* 'Other' refers principally to settlements between two offshore traders in AUD that hold vostro accounts with the same bank.

The level of daily settlements generated from vostro account activity is comparable to that reported by all 24 survey respondents when settling AUD transactions for their own account. While the figures presented in Table 4 are contaminated by non-foreign exchange payments (and therefore over-estimate the case), large AUD settlements originating from offshore are to be expected because the AUD is traded in all of the major foreign exchange centres. Overseas banks are important counterparties in the AUD market.

4.4.3 Cancellation deadlines

As most respondents were directly responsible for the settlement of transactions in the domestic currency, the cancellation times reported for 'own business' in AUD were the most favourable of all the currencies traded. This was to be expected. Essentially, the time of cancellation faced by domestic dealers is dependent upon the rules of the system which they use to send the payments.

However, this is not the case for offshore traders in AUD. Like domestic dealers trading in third currencies, offshore traders must issue payment instructions to their Australian correspondent, who will set a deadline after which they cannot guarantee that the payment can be cancelled. The range of cancellation times reported by survey respondents for their offshore correspondents is presented in Table 5.

Table 5
Cancellation deadlines for AUD

Earliest	Mode	Median	Latest	Weighted Average
8.00 am (Day V)	9.00 am (Day V)	9.30 am (Day V)	4.30 pm (Day V)	11.30 am (Day V)

As can be seen above, most cancellation deadlines for offshore traders are before the Australian payments system opens or very early on value date. Of those survey respondents who set later cut-off times, most acknowledged that a request during the business day by an offshore correspondent to cancel an AUD payment could only be handled on a 'best endeavours' basis.

4.4.4 Notification of receipts

As with domestic dealers trading in foreign currencies, offshore traders in AUD must rely on advice from their Australian correspondents to verify the receipt of the AUD leg of their foreign exchange deals. The range of notification times reported by survey respondents for their offshore correspondents is presented below in Table 6.

Table 6
Notification times for AUD

Earliest	Mode	Median	Latest	Weighted Average
4.30 pm (Day V)	12.00 pm (Day V+1)	8.30 am (Day V+1)	4.00 pm (Day V+1)	7.00 am (Day V+1)

As with the reconciliation of their own transactions in AUD, many respondents which offered correspondent banking facilities regarded the time of finality for vostro account receipts as the close of business on value date, rather than at 9.00 am on the following business day. For most Australian banks, the time when vostro account statements are sent to customers offshore is determined by operational considerations.

While several respondents issued vostro account statements to their offshore correspondents before it was certain that interbank settlement in AUD would be completed, few had formal arrangements in place with their correspondents regarding the impact of a failure to settle on the following morning. Some respondents indicated that they issued statements on the proviso that all receipts were

conditional upon final settlement occurring; others were not sure whether they would (or could) reverse the credits to vostro accounts if the paying bank failed to settle subsequently. In many instances, the responses differed according to which payments system or instrument was used to make the transaction.

4.5 Real-time gross settlement in Australia

The introduction of RTGS will vastly improve certainty in the measurement of foreign exchange settlement risk on transactions involving the AUD. It will allow both domestic and offshore traders in AUD to confirm, on value date, that they have - or have not - received final AUD funds. While many dealers already reconcile their AUD receipts on value date, the current next-day settlement arrangements in Australia mean that such practices under-estimate the true risk profile by many hours.

Under RTGS, this will no longer be the case. Once a payment instruction has been forwarded onto the receiving bank, there can be no question about its status - it has been settled at the RBA and the proceeds are final, with cleared funds in the hands of the receiving bank (and its customers). For the sending bank, the latest cancellation time will be represented by the time of settlement at the RBA - if there are sufficient funds on account with the RBA when the payment instruction is sent, settlement is immediate and the payment cannot be revoked; if not, the payment may still be cancelled while it is queued, awaiting settlement.

The real-time settlement of all interbank foreign exchange transactions in AUD will put Australia at world best practice. Of the nine most actively traded currencies, the AUD will join only the GBP and CHF in being settled exclusively by RTGS. The world's three major traded currencies - the USD, DEM and JPY - are not settled principally by the RTGS system in each of their respective countries and there are no indications that this situation will change in the immediate future.

5. RISK MANAGEMENT PRACTICES

5.1 Introduction

Section III of the RBA questionnaire sought an open-ended discussion from respondents on the risk management practices that they employ when settling foreign exchange transactions. It canvassed views on how risks in individual institutions could be reduced and what respondents thought of overseas initiatives to minimise foreign exchange settlement risk. Naturally, there was a diverse range of experiences and opinions, but there were also some common themes arising from the responses.

5.2 Measurement issues

The CPSS proposed a methodology by which foreign exchange dealers could measure and track their exposure to settlement risk, both against individual counterparties and in aggregate. As noted earlier in Section 2.2, that methodology was used by the RBA in this report to analyse the collective exposure of the Australian market to foreign exchange settlement risk. To ensure that the industry was comfortable with the approach taken, comments were sought from survey respondents on the methodology proposed by the CPSS and its applicability to their own business operations.

Of those institutions that made comments on the CPSS report, all agreed the methodology adopted was valid and accurate. Many had not explicitly considered the changing status of a transaction - from 'revocable' to 'irrevocable' through to 'uncertain' and finally to 'settled' or 'failed' - but noted that the CPSS methodology provided a useful framework for analysing settlement risk on foreign exchange transactions.

However, while respondents agreed, in principle, with the methodology proposed, many expressed doubts as to whether it could be applied successfully within their own organisations. Several cited systems constraints, arguing that to apply such procedures for each counterparty, and the trading book as a whole, would be onerous. Many have made a conscious decision to fix their exposure periods in terms of days, not hours, and questioned whether the large amount of automation that would be required to constantly track the changing status of transactions could be justified.

5.3 Risk management techniques

Survey respondents were asked to describe the risk management techniques that they employ, or which they are considering, for the settlement of foreign exchange transactions. The RBA sought specific responses on the arrangements used to set counterparty limits and net foreign exchange settlements, but respondents were free

to discuss other risk management techniques as well. The following sections review the risk management techniques used in the Australian market.

5.3.1 Counterparty exposure limits

All respondents, with one exception, indicated that they set limits on the amount of settlement exposure to any individual counterparty. For the most part, counterparty exposure limits are applied to the global operations of the dealers surveyed; some of the respondents which are branches or subsidiaries of foreign banks indicated that they are allocated a specific portion of their parent bank's global limits.

Counterparty limits are set by the Credit or Treasury areas of the institutions surveyed, as part of a general credit assessment of dealing counterparties. Most respondents conducted regular balance sheet appraisals in order to determine the financial strength of their counterparties; changes in credit ratings were monitored closely by most dealers. Other important factors that influenced the size of limits were requests from the dealing room, the level of existing turnover and future business opportunities with the counterparty concerned.

In some instances, separate product limits are in force (eg for foreign exchange transactions), while for others, the counterparty limit applies to the totality of the bilateral trading relationship. In the absence of a legally binding netting agreement, counterparty exposure limits have been designed to measure the *gross value* of all transactions that are awaiting settlement. For operational reasons, this exposure is often denominated and measured in USD terms.

There was a large degree of variance in the ways that respondents actually *monitored* compliance with exposure limits. Some respondents operate real-time credit monitoring systems, allowing dealers to check their current exposures before agreeing any further transactions with the same counterparty; others rely on 'excess reports' which are produced at the end of each day, comparing current bilateral exposures against established limits. Many respondents did both, updating counterparty limit utilisation on a real-time basis and also producing excess reports at day's end. As noted earlier, no respondent had systems in place to measure or monitor settlement risk according to the methodology adopted by the CPSS, but several indicated that their internal procedures would produce a similar result.

5.3.2 Netting arrangements

A clear majority of respondents indicated that they engage in some form of bilateral netting arrangement with their foreign exchange counterparties. For the most part, this was done on an informal basis, possibly reflecting the current lack of legal

certainty for netting arrangements in Australia.¹¹ No Australian-based dealer has yet joined a multilateral foreign exchange netting scheme, although some respondents indicated that they are contemplating avenues such as ECHO.

Beyond the fact that most dealers net some foreign exchange settlements, their responses displayed little else in common. Many respondents indicated that they are prepared to net only with their non-bank or corporate customers, while others would only consider netting where the counterparty was another bank or large financial institution. Several respondents were prepared to net in all currencies; others preferred the major traded currencies; while one respondent was only prepared to net transactions in Australian dollars.

Interestingly, while most payments netting occurred on an informal basis, many respondents noted that they had signed formal master netting agreements (eg ISDA, IFEMA) with some of their counterparties. While some of these agreements provide for payments netting as an option, all have close-out netting provisions in the event of a default by one party. Under such provisions, after a default, all outstanding transactions, for both spot and forward-dated settlement, are marked-to-market in a base currency and netted against one another, with the net present value of all outstanding transactions then payable by one of the counterparties.

5.3.3 Other risk management techniques

In addition to the specific information requested, some respondents also volunteered specific measures that they are taking to unilaterally reduce their exposure to foreign exchange settlement risk. Many institutions are making enhancements to their back office systems in order to more accurately measure and monitor their counterparty exposures. All deals generally now require a matched confirmation and standard settlement instructions.

Several of the dealers surveyed indicated that they have begun to renegotiate long-standing arrangements with their correspondent banks. Most are requiring nostro account statements to be delivered on a daily basis, or at least when there has been a movement on the account. Some have gone even further, requesting SWIFT MT910 messages (ie confirmations of credit) for individual receipts.

5.4 International initiatives

The RBA sought comments from survey respondents on the risk reduction measures that are currently being pursued internationally. These include the general move

¹¹ The Government is expected to introduce legislation shortly to overcome these uncertainties. The RBA has long supported the introduction of legislation to validate netting arrangements in Australia.

towards RTGS in most countries and the emergence of multi-currency settlement systems.

5.4.1 Impact of RTGS

Over the past two years, around ten currencies traded in the Australian market, including the GBP and HKD, have converted from deferred net settlement to RTGS. Almost all respondents reported that the introduction of RTGS in other countries had had little or no impact on their own settlement practices. This is not surprising, given Australia's time zone location and the fact that the top five traded currencies (which accounted for over 90 per cent of aggregate flows) are still currently settled on a deferred net basis.

As more currencies in the Asia-Pacific time zone adopt RTGS, there could be a noticeable impact on the duration of foreign exchange settlement exposure for these currencies. Cancellation times faced by Australian-based dealers in these currencies may be wound back. However, it is to be hoped that the introduction of RTGS offshore will also provide Australian dealers with a corresponding opportunity to reduce the time taken to reconcile receipts in these currencies.

5.4.2 Multi-currency settlement systems

Regardless of their differing positions on the merits of gross versus net settlement, most respondents believed that there is a useful role to be played by multi-currency settlement systems. However, many remained mindful about the cost of joining bodies such as ECHO, Multinet International Bank or the proposed CLS Bank.

At the time of the survey in April, many institutions were reluctant to commit resources to any of these competing projects until their viability was more certain.¹² In October 1997, it was announced that ECHO, Multinet and CLS Services would merge to form a single industry utility, offering a suite of products to members, including bilateral netting, multilateral netting and continuous linked settlement. There was strong endorsement for such a merger from participants in the Australian market.

Ensuring that these emerging multi-currency settlement systems make adequate provision for the AUD will be one clear area where the RBA and local foreign exchange dealers will need to co-ordinate their efforts for communal benefit. While the AUD is already included in ECHO, it was not going to be amongst the first currencies settled by Multinet, and the G20 have yet to make provision for its

¹² Two major participants in the Australian foreign exchange market have since signalled their intention to join ECHO once the legal position with respect to netting has been clarified by the Australian Parliament.

inclusion in CLS. It is important that one of the world's most actively traded currencies not be excluded from these systems.

5.5 Areas for co-operation

In order to better understand where it can assist the industry reduce its exposure to settlement risk, the RBA encouraged respondents to identify areas where they saw scope for mutual co-operation. Some of the suggestions put forward by the industry are already being implemented, such as RTGS, while others will be considered by the RBA. The following section lists some of these suggestions as a basis for further discussion within the industry.

5.5.1 PVP solutions

Several respondents indicated that their preferred solution to foreign exchange settlement risk lay with linking national RTGS systems on a global basis, so as to achieve payment-versus-payment (PVP). This is already occurring in the European Union, as member states prepare for the introduction of TARGET.

However, the introduction of bilateral linkages between RTGS systems in Europe is being driven primarily by the demands of monetary union, not those of reducing foreign exchange settlement risk. Introduction of the euro will eliminate settlement risk for much of the current intra-European cross-rate trading, but transactions against the euro (eg EUR/USD) will be subject to foreign exchange settlement risk in much the same way as are transactions in USD/DEM, for example.

In terms of developing PVP solutions for the Australian market, the most important payments system offshore that needs to be considered is that of the United States. As revealed from the survey results, the USD is on one side of most foreign exchange transactions undertaken in Australia, including almost all of those involving the AUD. While Fedwire and CHIPS are now operating for 18 hours a day, the overlap with Australia remains small - no more than three hours, depending on daylight saving arrangements. Liquidity in both markets at that time is thin. To achieve a meaningful PVP overlap with the US will require that operating hours in Australia are lengthened. The RBA has canvassed this option previously with the banking industry. It has been agreed that the operating hours for the Australian RTGS system will not be extended until participants have had time to adapt to the new settlement arrangements.

5.5.2 Promoting regional dialogue

Several respondents saw benefits in the establishment of an Asia-Pacific forum to encourage, and possibly co-ordinate, action by foreign exchange dealers in the region. The EMEAP group of central banks, of which the RBA is a member, could be

one such vehicle to promote regional dialogue on the issue of foreign exchange settlement risk.

The RBA is promoting the issue with other central banks and monetary authorities in the region. However, it should be recognised that, as there is very little direct trading of EMEAP currencies against one another, any solution or action plan developed within the region will require the involvement of organisations that are based in the United States.

5.5.3 Foreign exchange hedge market

An interesting suggestion to arise from the survey was a call for the reintroduction of the 'hedge' market in Australia. This market existed prior to deregulation and operated on a non-deliverable basis. Traders in the hedge market would agree on a transaction but, unlike current practice, neither party would physically deliver funds on settlement date. Rather, an amount equivalent to the difference between the contracted rate and a reference rate was payable on settlement date by one party in order to crystallise the profit or loss on the transaction.

In today's market place, a 'hedge contract settlement' would deliver benefits analogous to those of bilateral netting. The amount at risk of failure under a non-deliverable contract is only the marked-to-market profit on each transaction, rather than the full principal amount traded. In some Asian and Eastern European currencies, 'non-delivery' settlement is the industry standard. However, it would not be appropriate for the more actively traded currencies if the gross proceeds from the foreign exchange transaction were needed to fund an outgoing payment to a third party or another liability. In these instances, physical delivery would still be required. The use of non-deliverable 'contracts for difference' is also being discussed overseas as a potential means to reduce exposure to foreign exchange settlement risk.

6. NEXT STEPS AND CONCLUSIONS

6.1 Action by the RBA

When the RBA resolved to undertake its April 1997 survey, it had an open mind about what, if any, action it would take subsequently. The results of the survey, however, have highlighted that foreign exchange settlement risk in the Australian market must be reduced. As was the conclusion of the 1996 CPSS report, it would be preferable for the private sector to develop a solution.

But there is a role for the RBA in ensuring that progress is made. Indeed, the recent Financial System Inquiry recommended that the RBA give high priority to promoting cost-effective control of international settlement risks. That recommendation has been accepted by the Australian Government.

6.1.1 Netting

Netting is a proven way of reducing settlement risk. The RBA has been actively supporting legislative proposals to give legal certainty to netting arrangements in Australia. Two Australian banks have already indicated a desire to join ECHO once the appropriate legislation has been passed by the Australian Parliament.

6.1.2 Liaison

The RBA has also been following the proposals by CLS Services to establish a vehicle to enable the simultaneous settlement of different currencies in real time. The RBA has stressed the importance of including the AUD, as one of the world's most actively traded currencies, in such a scheme. It has attended meetings with CLS Services to discuss the proposals and the issues involved in including the AUD. The RBA has also adopted the role of facilitating discussions between the proponents of possible private sector solutions and participants in the Australian market.

6.1.3 RTGS

A domestic RTGS system is an essential element for inclusion of any currency in the CLS proposal. As identified in this report, RTGS also provides a mechanism for reducing the times at which foreign exchange payments are at risk. By the middle of 1998, Australia will have a world-class RTGS system for all high-value interbank payments, including the AUD leg of foreign exchange settlements.

6.1.4 Follow-up survey

To monitor progress by the Australian market in reducing foreign exchange settlement risk, the RBA will conduct a follow-up survey during 1998. A decision on the month to be surveyed will be made early in 1998. There is some attraction in

selecting April. Apart from providing a consistent reporting period to this initial survey, it would also co-incide with the triennial BIS survey on foreign exchange turnover. However, on the other hand, Australia's RTGS system will be fully implemented during April 1998, so there is a strong case for conducting the survey a little later.

As part of its follow-up survey, the RBA will be requesting that respondents broadly reconcile the value of their foreign exchange settlements with the turnover figures that they supply on a monthly basis. While not all foreign exchange transactions contracted during a given month will be settled in that month, a better understanding of the relationships between foreign exchange turnover and settlements will help in managing settlement risk.

6.2 Action by participants

6.2.1 Re-engineering

This report has highlighted the scope for institutions to reduce substantially their exposure to foreign exchange settlement risk by renegotiating correspondent banking relationships and improving back office procedures. In this way, cancellation deadlines for payment instructions can be extended and confirmation of final payments can be received and reconciled much earlier. The 1996 CPSS report reached the same conclusion and several banks have already achieved substantial reductions in the time that foreign exchange payments are at risk by taking such actions.

6.2.2 Industry commitment

The reduction of foreign exchange settlement risk depends, in part, on the issue being fully understood by participants in the market place. The release of this report should assist greatly in that comprehension process. Once understood and properly quantified, individual institutions then need to make a serious commitment towards tackling the problem, in much the same manner as the banking industry has committed towards reducing risks and improving efficiency in the domestic payments system.

6.3 Conclusion

Foreign exchange settlement risk has long existed, but little real progress has been made towards properly managing it, let alone reducing it. However, that is now changing. In many markets, there is the will and, increasingly, the means to address this problem. The RBA's aim is to ensure that the Australian market and the AUD keep up with that process.

ANNEX A**LIST OF SURVEY RESPONDENTS**

ABN AMRO Australia Limited
Australia and New Zealand Banking Group Limited
Bankers Trust Australia Limited
BankWest
Banque Nationale de Paris
Chase Manhattan Bank
Citibank NA
Colonial State Bank
Commonwealth Bank of Australia
Deutsche Bank AG
IBJ Australia Bank Limited
JP Morgan
Macquarie Bank Limited
Midland Bank plc
National Australia Bank Limited
NatWest Markets Australia Limited
Rabobank Nederland
SBC (Sydney) Limited
Societe Generale Australia Limited
St George Bank Limited
Suncorp-Metway Limited
Toronto Dominion Australia Limited
UBS Australia Limited
Westpac Banking Corporation

ANNEX B

SAMPLE QUESTIONNAIRE



RESERVE BANK OF AUSTRALIA

CONFIDENTIAL

**SURVEY OF FOREIGN EXCHANGE SETTLEMENT
PRACTICES - APRIL 1997**

Institution

Contact name

Contact telephone no.

Please complete this survey (affixing additional sheets where there is insufficient space) for the calendar month of April 1997 and return it no later than 26 May 1997 to:

Payments Systems Section
Financial System Department
Reserve Bank of Australia
GPO Box 3947
SYDNEY NSW 2001

Any questions may be directed to either Bernie Egan on 95518705 or Jeff Grow on 95518776.

SECTION I: GENERAL SETTLEMENT PRACTICES

1. Please indicate the currencies in which your institution, on its Australian books, settled foreign exchange transactions (including transactions generated through OBUs and vostro accounts), on any day from 1 April to 30 April 1997.

<input type="checkbox"/>	Australian Dollar (AUD)	<input type="checkbox"/>	German Mark (DEM)
<input type="checkbox"/>	US Dollar (USD)	<input type="checkbox"/>	UK Pound Sterling (GBP)
<input type="checkbox"/>	Japanese Yen (JPY)	<input type="checkbox"/>	Swiss Franc (CHF)
<input type="checkbox"/>	New Zealand Dollar (NZD)	<input type="checkbox"/>	French Franc (FRF)
<input type="checkbox"/>	Canadian Dollar (CAD)	<input type="checkbox"/>	European Currency Unit (XEU)
<input type="checkbox"/>	Other Asian currencies. Please specify		
<input type="checkbox"/>	Other European currencies. Please specify		
<input type="checkbox"/>	Other currencies. Please specify		

2. For each of the currencies identified above, please indicate, using 'A', 'B' or 'C', the principal method of settlement. Where:

- **A** indicates that correspondent banking services in the currency were provided by a local clearing bank that is 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 (eg separately incorporated parent or subsidiary); and
- **C** indicates that your institution (include branches/head office, but not a separately incorporated parent or subsidiary) settled itself.

(For example, an Australian bank that uses its UK subsidiary to settle its GBP transactions should insert 'B' under 'GBP', whereas if it used its London branch it would insert 'C'. The Australian branch of a US bank, 'XYZ Bank Inc', settling its GBP transactions using the London branch of 'XYZ Bank Inc' would insert 'C' under GBP, whereas if it used the UK subsidiary of 'XYZ Bank Inc' it would insert 'B'.)

AUD	CAD	CHF	DEM	FRF	GBP	JPY	NZD	USD	XEU

Other currencies (specify)									

3. This question is seeking information on the duration of foreign exchange settlement exposures for the various currencies, using the contracted value date, 'V', as the measurement base.

Institutions may issue instructions to correspondents progressively during the day and correspondents, in turn, may have flexible arrangements for the settlement of transactions. Accordingly, if precise measurement is not possible this question may be answered on a best endeavours basis, but please identify where this is done and provide an explanation.

For each of the currencies identified in Question 1, please indicate (in the following table):

- a) the time and day (eg 1530 on V-2) when payment instructions are routinely issued by your institution;
- b) the time and day (eg 1700 on V-1) when these payment instructions can no longer be cancelled unilaterally - ie require the consent of your correspondent bank, or in terms of the local clearing house rules the beneficiary or its bank;
- c) the time and day (eg 1700 on V) when you routinely receive, with finality, payments due to you (including, where appropriate, book-entry transfers at correspondents); and,
- d) the time and day (eg 1200 on V+1) when you routinely identify final and failed payments due to you.

Please provide all answers in Australian Eastern Standard Time (AEST).

Briefly outline your institution's systems for identifying and then acting on delays to these routine times, where appropriate, expressing the various steps in terms of the "V" measurement base. Please provide details of any significant delays that occurred during April.

4. For each of the currencies identified in Question 1, please indicate the total gross value of foreign exchange settlement receipts and payments made by your institution from 1 April until 30 April 1997 (expressed in millions of the relevant currency). Where payments have been bilaterally or multilaterally netted prior to settlement, please estimate the initial underlying gross settlement obligation in each currency.

Currency	Total gross settlements during April		Peak day settlements			
	Value of Payments	Value of Receipts	Date of peak day	Value of Payments	Date of peak day	Value of Receipts
AUD: <i>own business</i>						
AUD: <i>vostro business</i>						
CAD						
CHF						
DEM						
FRF						
GBP						
JPY						
NZD						
USD						
XEU						
Other <i>Specify</i>						
Other <i>Specify</i>						

SECTION II: AUSTRALIAN DOLLAR SETTLEMENTS

5. Please indicate how your institution routinely settles foreign exchange related AUD transactions. Please estimate the proportion of the AUD amounts settled that were processed through each of the identified payment systems during April 1997.

System	Used for FX (✓ / X)	Proportion own FX business (%)	Proportion as correspondent (%)
<i>BITS payments</i>			
<i>Austraclear cash transfers</i>			
<i>RITS cash transfers</i>			
<i>Paper items, such as interbank warrants and bank Nostro accounts held at other institutions in Australia</i>			
<i>Other - specify</i>			

6. This question is seeking information on the duration of settlement exposures in AUD where Australian institutions settle on behalf of overseas institutions (ie the AUD business emanating from vostro accounts). Does your institution settle foreign exchange transactions in AUD for overseas correspondents (including related institutions, eg overseas parent or subsidiary)?

YES/NO If yes, please indicate:

- the time and day (eg 1530 on V-2) when payment instructions for AUD are routinely issued to you by offshore correspondents;
- the time and day (eg 1700 on V-1) when these payment instructions can no longer be cancelled unilaterally - ie require either your consent or that of the beneficiary or its bank;
- the time and day when your customers routinely receive, with finality, payments due in AUD (including, where appropriate, book-entry transfers across accounts held at your institution); and,
- the time and day (eg 1200 on V+1) and method (eg SWIFT, fax) when you routinely notify overseas correspondents of final and failed AUD payments due to them.

Please provide all answers in Australian Eastern Standard Time (AEST).

	AUD payment instructions sent to you	Deadline for cancellation of AUD payment instructions	AUD payments received with finality	Notification of final and failed AUD payments
Time/day				

SECTION III: SETTLEMENT RISK MANAGEMENT PRACTICES

This section seeks brief open-ended responses on the settlement risk practices currently employed by your institution and its views on how these risks can be reduced. Please provide written answers on a separate sheet.

Limit-setting

7. *Does your institution set limits on the amount of foreign exchange settlement exposure it is prepared to accept from an individual counterparty? YES/NO*

If so:

a) *are they global limits or is each branch/subsidiary of your institution delegated its own limit structure?*

b) *describe how limits, and any ensuing exposures, are:*

- *set;*
- *measured;*
- *monitored; and*
- *reported internally within your institution.*

Please include in your response the process and timeframe for notifying dealers of reductions in limits.

Netting arrangements

8. *Does your institution engage in formal or informal payments netting arrangements for foreign exchange settlements? YES/NO*

If so:

a) *are they restricted to a class of counterparty, eg banks, other financial intermediaries or non-bank customers?*

b) *which currencies do such netting arrangements cover?*

c) *are they organised on a bilateral and/or multilateral basis?*

d) *do they involve the substitution/novation of credit exposure to a central counterparty? If so, to whom?*

e) *do these arrangements include close-out netting provisions in the event of default?*

Reducing foreign exchange settlement risks

9. *From the perspective of your business, would you like to make any comments on the BIS Report on Settlement Risk in Foreign Exchange Transactions that was released in March 1996? In particular do you have any comments on the methodology outlined on pages 33-35?*

10. *Outline any measures that your institution is taking to reduce settlement risk in foreign exchange transactions.*

11. *This question is seeking an indication of the likely effects, if any, of current and planned/proposed risk-reduction measures (domestically and internationally) on foreign exchange settlement processes.*

k) *What do you consider to be the likely impact of real-time gross settlement (RTGS) on AUD foreign exchange settlements? Has the introduction of RTGS elsewhere in the world affected your own settlement practices for particular currencies (eg. do correspondent banks now impose stricter unilateral cancellation deadlines)?*

l) *From the perspective of your business, do you think there is a useful role for multilateral bodies, such as ECHO, Multinet or the proposed Group of 20 CLS Bank? Do you consider that they will gain the critical mass to be able to influence international settlement practices? Please explain your reasons.*

1. *Are there issues on which your bank would like to see central banks and commercial banks co-operate to reduce settlement risk in foreign exchange transactions?*

ANNEX C

CURRENCY DATA

Currency	No. of dealers	Settlement method			Monthly settlements (AUD million)		Ranking by turnover
		A	B	C	Payments	Receipts	
AED	1	0	1	0	Nil	~	44
ATS	12	10	0	2	114	121	26
AUD*	24	8	1	16	646,695	644,033	2
AUD (vostro)	13	n.a.			646,922	729,093	n.a.
BDT	1	0	1	0	Nil	~	46
BEF	15	12	0	3	207	203	21
BHD	1	1	0	0	Nil	68	29
BND	1	0	1	0	~	~	49
CAD	23	16	4	3	6,736	6,771	14
CHF	23	17	4	2	19,920	19,735	7
CNY	2	2	0	0	Nil	1	43
CYP	2	2	0	0	Nil	7	40
DEM	23	10	8	5	200,110	200,167	3
DKK	14	14	0	0	171	178	24
ESP	17	14	0	3	1,098	1,110	18
FIM	11	11	0	0	180	175	23
FJD	6	4	0	2	19	21	32
FRF	20	14	1	5	19,239	19,354	8
GBP	23	8	7	8	88,244	87,810	6
GRD	6	4	1	1	9	10	35
HKD	18	8	3	7	12,837	13,092	11
IDR	10	5	2	3	7,381	7,379	13
IEP	6	6	0	0	38	44	28
INR	5	3	2	0	5	40	31
ITL	18	15	0	3	5,543	5,567	16
JPY	24	12	7	5	119,594	119,280	4
KES	1	1	0	0	Nil	~	47

Currency	No. of dealers	Settlement method			Monthly settlements (AUD million)		Ranking by turnover
		A	B	C	Payments	Receipts	
KWD	1	1	0	0	~	Nil	50
LKR	3	2	1	0	~	9	38
MTL	3	3	0	0	Nil	50	30
MUR	1	1	0	0	Nil	~	45
MYR	15	11	2	2	17,181	17,131	9
NLG	16	13	0	3	3,383	3,331	17
NOK	14	14	0	0	315	316	20
NZD	24	19	3	2	118,410	116,973	5
OMR	1	1	0	0	~	Nil	51
PGK	5	4	1	0	14	16	33
PHP	5	4	0	1	5	6	37
PKR	3	2	1	0	16	9	34
PTE	10	9	0	1	52	53	27
SAR	2	2	0	0	~	257	25
SBD	4	2	0	2	~	12	36
SEK	17	16	0	1	984	1,007	19
SGD	20	11	2	7	16,753	16,710	10
THB	10	6	1	3	6,282	5,075	15
TRL	1	1	0	0	~	Nil	48
USD	24	12	5	7	1,264,576	1,255,028	1
VUV	3	1	1	1	1	1	42
WST	2	1	1	0	Nil	4	41
XEU	17	8	4	5	12,466	12,324	12
XPF	3	2	0	1	4	4	39
ZAR	5	4	0	1	200	206	22

Where:

- A indicates use of an unassociated correspondent bank;
- B indicates use of a related corporate entity (eg parent/subsidiary); and
- C indicates direct responsibility for settlement.

~ Values round to zero when converted into AUD equivalents.

* One respondent had two principal methods for settling AUD transactions.

ANNEX D

HOURS AT RISK PER CURRENCY PAIRING

1. Major traded currencies

Buy	Sell								
	USD	AUD	DEM	JPY	NZD	GBP	CHF	FRF	CAD
USD		33	31	37	37	29	32	32	27
AUD	12		17	23	24	16	18	19	13
DEM	22	30		33	33	25	28	29	23
JPY	17	25	22		29	21	23	24	18
NZD	18	26	23	29		22	25	25	19
GBP	24	32	30	35	36		31	31	25
CHF	30	37	35	41	41	33		36	31
FRF	20	28	25	31	31	23	26		21
CAD	33	40	38	44	44	36	39	39	

2. European currencies

Buy	Sell								
	USD	DEM	XEU	ATS	BEF	DKK	ESP	FIM	GRD
USD		31	25	31	30	32	32	31	37
DEM	22		21	27	26	28	28	27	33
XEU	21	26		26	25	27	28	26	33
ATS	52	57	51						
BEF	36	41	35						
DKK	28	34	28						
ESP	29	34	29						
FIM	20	25	20						
GRD	38	43	37						

2. European currencies (continued)

Buy	Sell								
	USD	DEM	XEU	IEP	ITL	NLG	NOK	PTE	SEK
USD		31	25	32	31	30	33	32	32
DEM	22		21	28	27	26	29	28	28
XEU	21	26		27	26	26	29	27	27
IEP	42	47	41						
ITL	24	29	23						
NLG	44	49	44						
NOK	33	38	32						
PTE	21	26	20						
SEK	26	31	25						

3. Asian currencies

Buy	Sell								
	USD	JPY	CNY	HKD	IDR	MYR	PHP	SGD	THB
USD		37	36	35	57	35	37	36	40
JPY	17		27	27	48	26	29	27	32
CNY	60	71							
HKD	18	29							
IDR	20	31							
MYR	27	38							
PHP	348	359							
SGD	24	35							
THB	28	39							

6. Other currencies

Buy	Sell						
	USD	BDT	INR	LKR	MTL	MUR	PKR
USD		33	35	35	32	32	33
BDT	499						
INR	43						
LKR	178						
MTL	40						
MUR	67						
PKR	682						

ANNEX E**GLOSSARY**

AED	United Arab Emirates dirham
AEST	Australian Eastern Standard Time
ATS	Austrian schilling
AUD	Australian dollar
Austraclear	A private sector company that operates the main securities depository in Australia. Members may use the transfer system operated by Austraclear to make foreign exchange confirmations and deliver the AUD leg.
BDT	Bangladeshi taka
BEF	Belgian franc
BHD	Bahraini dinar
BIS	Bank for International Settlements
BITS	Bank Interchange and Transfer System. A large-value transfer system used frequently in Australia for settling foreign exchange payments in Australian dollars.
BND	Brunei dollar
CAD	Canadian dollar
CHF	Swiss franc
CHIPS	Clearing House Interbank Payment System. The large-value transfer system used in the United States principally for settlement of international USD payments, such as those arising from foreign exchange transactions.
Close-out netting	An arrangement to settle all contracted but not yet due liabilities to and claims on an institution by one single payment, immediately upon the occurrence of one of a list of defined events, such as the appointment of a liquidator to that institution (<i>see netting by novation and obligation netting</i>).

CLS	Continuous linked settlement - a process for simultaneous settlement of both legs of a foreign exchange transaction.
CLS Services	A UK company founded by the G20 banks to oversee the implementation of continuous linked settlement (<i>see CLS and G20</i>).
CNY	Chinese renminbi
CPSS	Committee on Payment and Settlement Systems of the BIS.
Credit risk/ exposure	The risk that a counterparty will not settle an obligation for full value, either when due or at any time thereafter. In exchange-for-value systems, the risk is generally defined to include replacement risk and principal risk.
CYP	Cypriot pound
DEM	Deutsche mark
DKK	Danish kroner
ECHO	Exchange Clearing House Limited, a UK-based company offering multilateral netting services for foreign exchange transactions in eligible currencies.
ECU	European currency unit
EMEAP	Executive Meeting of East Asian and Pacific central banks. The member countries are Australia, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand.
ESP	Spanish peseta
EUR	SWIFT code for the euro
Exchange rate risk	<i>See market risk.</i>
Fedwire	The real-time gross settlement system operating in the United States.
FEYCS	Foreign Exchange Yen Clearing System. The large-value transfer system used in Japan principally for settlement of international JPY payments, particularly those arising from foreign exchange transactions.

FIM	Finnish markka
Final (finality)	Irrevocable and unconditional.
FJD	Fiji dollar
Foreign exchange settlement exposure	The amount at risk when a foreign exchange transaction is settled. This equals the full amount of the currency purchased and lasts from the time that a payment instruction for the currency sold can no longer be cancelled unilaterally until the time the currency purchased is received with finality (<i>see credit risk/exposure and foreign exchange settlement risk</i>).
Foreign exchange settlement risk	The risk that one party to a foreign exchange transaction will pay the currency it sold but not receive the currency it bought. This is also called cross-currency settlement risk or principal risk; it is also referred to as Herstatt risk, although this is an inappropriate term given the differing circumstances in which this risk has materialised.
FRF	French franc
G10	The Group of Ten Countries: Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.
G20	The Group of Twenty; an association of twenty large commercial banks from Europe, North America and Asia.
GBP	Pound sterling
GRD	Greek drachma
HKD	Hong Kong dollar
IDR	Indonesian rupiah
IEP	Irish pound
INR	Indian rupee
ITL	Italian lira
JPY	Japanese yen

KES	Kenyan shilling
KWD	Kuwaiti dinar
Liquidity risk	The risk that a counterparty (or participant in a settlement system) will not settle an obligation for full value when due. Liquidity risk does not imply that a counterparty or participant is insolvent since it may be able to settle the required debit obligations at some time thereafter.
LKR	Sri Lankan rupee
Market risk	The risk that an institution or other trader will experience a loss on a trade owing to an unfavourable exchange rate movement (<i>see replacement cost risk</i>).
MTL	Maltese lira
MUR	Mauritian rupee
MYR	Malaysian ringgit
Netting	An agreed offsetting of positions or obligations by trading partners or participants. The netting reduces a large number of individual positions or obligations to a smaller number of positions or obligations. Netting may take several forms which have varying degrees of legal enforceability in the event of default of one of the parties (<i>see also close-out netting, netting by novation and obligation netting</i>).
Netting by novation (novation)	Satisfaction and discharge of existing contractual obligations by means of their replacement by new obligations (whose effect, for example, is to replace gross with net payment obligations). The parties to the new obligations may be the same as to the existing obligations or, in the context of some clearing house arrangements, there may additionally be substitution of parties (<i>see close-out netting, netting and obligation netting</i>).
NLG	Netherlands guilder
NOK	Norwegian krone
Nostro account	An account held by one bank with another bank, generally for the purpose of making and receiving payments. The account may be denominated in the domestic currency or,

more typically, in a foreign currency. Derived from the Latin for 'mine'.

NZD	New Zealand dollar
Obligation netting	The legally binding netting of amounts due in the same currency for settlement on the same day under two or more trades. Under an obligation netting agreement for foreign exchange transactions, counterparties are required to settle on the due date all of the trades included under the agreement by either making or receiving a single payment in each of the relevant currencies. Depending on the legal system, obligation netting can find a legal basis in constructions such as novation, set-off or the current account mechanism (<i>see close-out netting, netting and netting by novation</i>).
OMR	Omani rial
Operational risk	The risk of incurring interest charges or other penalties for misdirecting or otherwise failing to make settlement payments on time owing to an error or technical failure.
Payment versus payment (PVP)	A mechanism in a foreign exchange settlement system that ensures that a final transfer of one currency occurs if and only if a final transfer of the other currency or currencies takes place.
PGK	Papua New Guinea kina
PHP	Philippines peso
PKR	Pakistani rupee
Principal risk	<i>See foreign exchange settlement risk.</i>
PTE	Portugese escudo
PVP	<i>See payment versus payment.</i>
RBA	Reserve Bank of Australia
Replacement cost risk/ replacement risk	The risk that a counterparty to an outstanding transaction for completion at a future date will fail to perform on the settlement date. This failure may leave the solvent party with an unhedged or open market position or deny the solvent party unrealised gains on the position. The resulting

exposure is the cost of replacing, at current market prices, the original transaction (*see credit risk/exposure and market risk*).

RITS	Reserve Bank Information and Transfer System. A system operated by the RBA primarily for the settlement of transactions in government securities. All foreign exchange transactions with the RBA are settled using RITS.
RTGS	Real time gross settlement; the final and irrevocable settlement of transactions on an individual basis.
SAR	Saudi Arabian riyal
SBD	Solomon Islands dollar
SEK	Swedish krona
Settlement	An act that discharges obligations in respect of funds or securities transfers between two or more parties.
SGD	Singapore dollar
Simultaneous settlement	The settlement of payment obligations in different currencies at the same time. A simultaneous settlement system would not pay out any currencies to any participant before all relevant participants pay in all of the currencies they owe (<i>see payment versus payment and settlement</i>).
SWIFT	Society for Worldwide Interbank Financial Telecommunication
Systemic risk	The risk that the failure of one participant in a payments system, or in financial markets generally, to meet its required obligations when due will cause other participants or financial institutions to be unable to meet their obligations (including settlement obligations in a transfer system) when due. Such a failure may cause significant liquidity or credit problems and, as a result, might threaten the stability of financial markets.
TARGET	Trans-European Automated Real Time Gross Express Transfer system. A payments mechanism being developed in the European Union to process cross-border transactions in euro on a real-time gross settlement basis. TARGET is comprised of an RTGS system in each country and the

bilateral linkages between these systems.

THB	Thai baht
TRL	Turkish lira
USD	United States dollar
Vostro account	An account held by one bank for another bank, generally for the purpose of making and receiving payments. The account is typically denominated in the domestic currency of the bank providing the account. Derived from the Latin for 'yours'.
VUV	Vanuatu vatu
WST	Western Samoan tala
XEU	SWIFT code for the European currency unit (ECU)
XPF	Central Pacific franc
ZAR	South African rand