
Foreign exchange settlement risk survey

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The world's central banks have been working for several years to promote awareness of the risks associated with the settlement of foreign exchange transactions. In September 2000, the Reserve Bank surveyed the major participants in the New Zealand foreign exchange market to focus attention on settlement practices and the potential risks. This article summarises the findings of that survey.

1 Introduction

International trade and investment require the buying and selling of different currencies in the foreign exchange markets. The amounts involved are very large. The April 2001 Bank for International Settlements survey of foreign exchange and derivatives market activity estimated daily global foreign exchange turnover of USD1,210 billion. Turnover in the New Zealand market was estimated to be on average about USD4 billion each day.¹

Foreign exchange settlement risk is the risk that a participant in the foreign exchange market will lose the full principal amount of a foreign exchange transaction. Such a loss would typically occur when the sold currency has been irrevocably paid away, but due to the failure of the counterparty, the bought currency is not received. Foreign exchange settlement risk is of particular concern to central banks given the large values involved in settling foreign exchange transactions and the resulting potential for the failure of one institution to impact on the rest of the financial system.

The potential systemic consequences were demonstrated by events in 1974, when a small German bank, Bankhaus Herstatt, failed. At the point that the bank failed, several of its counterparties had irrevocably paid Deutschmarks to Herstatt against anticipated receipt of US dollars later the same day in New York. On the announcement of Herstatt's closure (at 10.30 am New York time), Herstatt's New York correspondent bank suspended payments from its account and the counterparties were left exposed for the value of the Deutschmarks that they had delivered. Hence, foreign

exchange settlement risk is commonly referred to as Herstatt risk.

In June 1995, the Committee on Payment and Settlement Systems (CPSS) of G10 central banks conducted a survey of the foreign exchange settlement practices of about 80 major banks, with a view to assessing the extent of the risk facing banks.² The results of the survey were published in order to draw to the banks' attention the fact that they were facing some very large exposures.³ In 1996, the CPSS adopted a strategy aimed at reducing foreign exchange settlement risk. As part of this strategy, the CPSS encouraged central banks to promote action by commercial banks to manage and reduce their foreign exchange settlement risks.

The CPSS subsequently conducted a follow-up survey to monitor progress in implementing improvements in practices. The results of that survey were published in July 1998.⁴ The CPSS also released in January 2000 a " toolkit " to assist other central banks to understand and tackle foreign exchange settlement risk.

In order to address concerns about foreign exchange settlement risk in the Asia-Pacific region, the Executives' Meeting of East Asia-Pacific Central Banks and Monetary Authorities (EMEAP) agreed in 1999 that member countries should each conduct their own survey on foreign exchange settlement risk, modelled on the G10 survey. It was intended

¹ Lauren Rosborough discusses the results of the survey in the accompanying article, "Trends in Foreign Exchange Trading".

² CPSS members monitor and analyse developments in domestic and cross-border payments and settlements systems. The Committee also co-ordinates central bank efforts to oversee payments systems. The Committee's secretariat is based at the Bank for International Settlements.

³ *Settlement Risk in Foreign Exchange Transactions*, March 1996 (the Allsopp Report).

⁴ *Reducing Foreign Exchange Settlement Risk: A Progress Report*, July 1998.

that the EMEAP survey would promote awareness of the risk in the region and encourage improvements in foreign exchange settlement practices. The EMEAP Working Group on Payment and Settlement Systems was delegated the responsibility of co-ordinating the conduct of the surveys and publishing the results. The survey form to be used was based on that developed by the CPSS and included in their toolkit. Two EMEAP members – the Reserve Bank of Australia (RBA) and the Bank of Japan – had previously conducted their own surveys.⁵

As part of the EMEAP initiative, the Reserve Bank conducted a survey of participants in the New Zealand foreign exchange market in September last year. This article describes the Bank's survey and summarises the key findings. The survey represented a continuation of our efforts to raise awareness on the credit risks that banks face as a result of the settlement of foreign exchange transactions. These efforts included the publication, in September 1997, of a Bulletin article on foreign exchange settlement risk, drawing heavily on the initial CPSS report.⁶

2 Survey methodology

Definition

The CPSS definition of foreign exchange settlement risk is:

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.

It should be noted that the definition addresses only 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.

The idea that the full amount of a transaction is at risk is perhaps intuitively obvious. What may be less obvious is how long that exposure might last. When a bank sells a foreign currency and uses another bank to make the payment, that correspondent bank will specify a deadline after which the selling bank can not unilaterally withdraw a payment instruction, even though actual payment is not scheduled to occur until much later. The exposure may therefore start well before funds are actually paid away. Similarly, the exposure may continue after the time that the purchased currency is scheduled to be received. Funds may not be received, for example, because of an operational or solvency problem at the counterparty to the transaction. A bank will not know whether settlement has been completed successfully until it has completed its internal reconciliation process to identify settled and failed transactions.

The prudent approach to measuring the exposure to a counterparty is to assume that the funds have not been received until it can be confirmed that they have been. The established international practice is thus to focus on measuring the maximum possible exposure duration, defined as lasting from the unilateral cancellation deadline for the sold currency until the reconciliation time for the bought currency.

Content

The survey questionnaire asked for details of:

- the currencies in which each bank settled foreign exchange transactions totalling more than USD1 million equivalent over the survey period;
- the time that payment instructions are normally sent for each currency for value on day V (the payment send time);
- the deadline for unilaterally cancelling with certainty a payment instruction for value on day V (the cancellation deadline);
- the time by which a bank's correspondent will credit funds to the bank's account with finality, assuming that the counterparty has successfully made the payment on time (due time for final receipts);

⁵ The RBA has published the results of its surveys in *Foreign Exchange Settlement Risk in Australia, 1997 and Reducing Foreign Exchange Settlement Risk in Australia: A Progress Report*, September 1999.

⁶ Harrison I, (1997) "Settlement risk in foreign exchange transactions", *Reserve Bank of New Zealand Bulletin*, vol 60 no 3.

- the time at which the bank routinely identifies final and failed payments for value on day V (the reconciliation time);
- whether cancellation deadlines and final receipt times are documented legally;
- amounts of each currency settled over the survey period;
- the use of bilateral netting to reduce exposures; and
- details of risk management practices.

Limitations

The Bank endeavoured to obtain accurate and consistent data from survey participants. However, given the complexity of the information requested, participants may have interpreted the questions differently. Consequently, the results presented in this article should be treated as indicative measures only.

Timing

The survey period was 18 – 29 September 2000, ie the last ten business days of that month. The initial review and follow-up of responses was completed in the December quarter and a more detailed analysis undertaken during the first quarter of 2001.

Coverage

The Bank sent the survey form to all New Zealand registered banks, asking the five largest participants in the New Zealand foreign exchange market to participate in the survey and giving the other (non-foreign exchange market making) banks the option to take part. Six banks, including the five largest foreign exchange market participants, participated fully.

We believe that the survey covered almost all activity in the New Zealand foreign exchange market, in spite of the small number of survey participants. There were 18 registered banks at the time of the survey. The six banks from which we received survey replies are the largest, together holding about 85 per cent of the total assets of the banking system. Another five banks told us that they did not undertake foreign exchange transactions. The remaining seven banks are all

relatively small – together they hold just over 6 per cent of total banking system assets – and are all much smaller than the smallest of the six banks in the survey.

3 Foreign exchange settlements

Total foreign exchange settlements reported by the six banks were spread over 20 currencies and averaged USD18.3 billion equivalent a day. While this total appears to be a lot larger than the total average turnover of USD 4 billion in the Bank for International Settlements survey, there are reasons why it would be expected that the two measures would be different. Foreign exchange transactions result in two amounts to be settled – the amount payable in the sold currency and the amount receivable in the bought currency. The settlement risk survey recorded both these amounts, whereas the turnover survey only records one side of transactions. The turnover survey also adjusts for the double counting that would result from inter-bank transactions in New Zealand. If both banks were to report a transaction, it would be recorded twice. However, the settlement risk survey did not make this adjustment. Each bank will still have an amount receivable in one currency and an amount payable in another currency and will, therefore, potentially be exposed to foreign exchange settlement risk.

The dominant currency was the US dollar (USD), with settlements in that currency making up 48 per cent of total settlements – see Table 1. (Because of the relative depth of

Table 1
Average daily settlements by currency

Currency	Average daily settlements (USD million equivalent)	Percentage of total
United States dollar	8,832	48.3
New Zealand dollar	5,685	31.1
Australian dollar	1,279	7.0
Euro	1,154	6.3
Japanese yen	481	2.6
British pound	420	2.3
Canadian dollar	331	1.8
Swiss franc	47	0.3
Hong Kong dollar	15	0.1
Other currencies	29	0.2
Total	18,274	100.0

the USD market, most transactions between the New Zealand dollar and other currencies occur through back-to-back transactions with the USD.) The next most important currencies were the New Zealand dollar, Euro, British pound, Australian dollar and Japanese yen, which together accounted for about 50 per cent of total settlements. Table 1 details average daily settlements by currency over the survey period.

The results of the survey are consistent with surveys conducted in other countries. USD settlements are typically the largest, followed by settlements in the domestic currency of the country concerned.

4 Foreign exchange settlement exposures

Duration of exposures

As explained previously, the maximum duration of the exposure will be determined by the unilateral cancellation deadline for the currency sold and the reconciliation time for the currency purchased. Table 2 summarises the cancellation deadlines and reconciliation times reported by the respondent banks for the six major currencies. All times are in New Zealand Standard Time and V denotes the settlement, or value, day.

The reported times suggest that settlement practices differ significantly between banks. Table 2 gives an indication of best, worst and "average" practice amongst the banks surveyed. Best practice would be to have the latest possible cancellation deadline (which according to the survey was 10.00 am on the day after the value day for USD payments) and the earliest reconciliation time (12.30 pm on the day after the value day for USD receipts). Weighted average times are calculated by weighting each bank's time by the share of that bank's settlements in total settlements.⁷

Caution should be exercised when comparing the times reported by the various banks. It appears that some banks

Table 2
Cancellation and reconciliation times – by currency

	US dollar		NZ dollar		Australian dollar	
	Cancellation	Reconciliation	Cancellation	Reconciliation	Cancellation	Reconciliation
Earliest	18:00 V-1	12:30 V+1	14:00 V-1	17:15 V	1:00 V	19:00 V
Latest	10:00 V+1	13:00 V+2	17:00 V	13:00 V+1	16:00 V	13:00 V+1
Mode	23:00 V	16:00 V+1	16:00 V	10:00 V+1	15:00 V	10:00 V+1
Median	23:00 V	16:00 V+1	16:00 V	10:00 V+1	14:00 V	10:00 V+1
Average	20:20 V	18:35 V+1	11:02 V	7:37 V+1	11:45 V	8:05 V+1
Weighted average	17:41 V	18:22 V+1	12:32 V	10:14 V+1	13:00 V	8:14 V+1
	Euro		British Pound		Japanese Yen	
	Cancellation	Reconciliation	Cancellation	Reconciliation	Cancellation	Reconciliation
Earliest	18:00 V-1	12:00 V+1	18:00 V-1	12:00 V+1	14:00 V-1	9:00 V+1
Latest	17:30 V	16:00 V+1	19:30 V	17:00 V+1	14:30 V	14:00 V+1
Mode	17:30 V	13:00 V+1	NA	NA	13:30 V	NA
Median	16:15 V	13:00 V+1	16:45 V	14:45 V+1	12:00 V	10:45 V+1
Average	12:15 V	13:25 V+1	12:55 V	14:35 V+1	8:40 V	11:15 V+1
Weighted average	22:50 V-1	12:36 V+1	12:10 V	13:23 V+1	8:20 V	10:33 V+1

⁷ In tables 2 and 3, weighted averages have been calculated using each bank's gross settlements – ie the amounts that would have been settled if there had been no netting of obligations. As discussed later in the

article, the survey found that little use was made of netting. Consequently, using net amounts to calculate the weighted averages makes very little difference to the results.

practices. The longest durations reported to the CPSS exceeded three days.

Legal documentation

To measure and manage their foreign exchange settlement exposures, banks need to be certain when their unilateral cancellation deadlines are for each currency. These deadlines depend on arrangements between the bank and its overseas correspondents. The legal documentation covering these arrangements should ideally include details of cancellation cut-off times.

The survey asked banks whether the cancellation deadlines and due times for final receipts were legally documented with the correspondents and counterparties concerned. The responses to this question suggested that banks have not documented these times to any great extent.

Magnitude of exposures

The other key component of the risk exposure is the size of the exposure. The survey asked respondents to provide information on both net and gross payments and receipts, since banks can and do, to a limited degree, use bilateral netting to reduce their total foreign exchange settlement risk – see below.

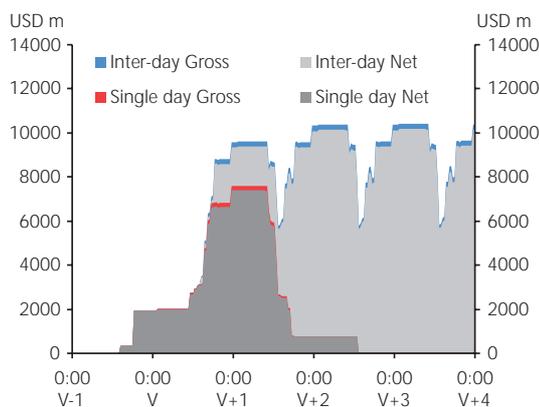
Foreign exchange settlement exposures are not necessarily an intra-day phenomenon. When receipts of purchased currencies are not confirmed until after the cancellation deadline for the next day's payments of sold currencies, there will be a period when the amount of both days' settlements will potentially be at risk. The survey results suggest that such an accumulation of exposures occurs in New Zealand. The single day profile in figure 1 shows how the total exposure builds up as the day progresses and the cancellation deadlines for different currencies are reached. Exposures should then progressively reduce as the various reconciliation times are reached. However, because the reconciliation times tend to be after the cancellation deadlines for the next day's payments, exposures continue to accumulate.

The inter-day accumulation of exposures means that the average total foreign exchange settlement exposure on an industry-wide basis lies between USD8 and 10 billion equivalent much of the time. Furthermore, the survey results

suggest that for individual banks, exposures are equal to, or in excess of, the total capital of those banks for periods of several hours each day.

Figure 1 also highlights the small role played by bilateral netting in the New Zealand foreign exchange market – see further discussion below.

Figure 1
Industry exposures
Single and inter-day profiles



5 Risk management

Given the importance of foreign exchange settlement risk, participants in the foreign exchange market should endeavour to accurately identify and manage their exposures. The CPSS has suggested that best practice with respect to managing foreign exchange settlement risk would be characterised by:

- the proper measurement of exposures;
- the application of an appropriate credit control process to exposures; and
- the reduction of excess exposures for a given level of trading.

As well as requesting quantitative information on the size and duration of foreign exchange settlement exposures, the survey asked participating banks to describe their current risk management practices with respect to settlement exposures and any plans to improve those practices.

Current practices

Some general themes emerged from the descriptions of current risk management policies and procedures:

- **Foreign exchange settlement risk recognised**

Respondents painted a picture of risk management arrangements that acknowledged the credit risk component associated with foreign exchange settlements. The reporting lines for staff responsible for managing foreign exchange settlement risk all appear to lead to senior management, in much the same way as for other forms of risk.

- **Settlement risk limits in place and monitored**

All the banks indicated that they had in place settlement risk limits that are monitored on an on-going basis. These limits were mostly part of a global system for the banking group concerned. Where breaches of limits occur, these are generally reported to the credit function. The credit function can also usually pre-approve limit breaches.

- **Limited recognition of the inter-day nature of foreign exchange settlement risk**

Most banks did not appear to explicitly recognise the inter-day nature of foreign exchange settlement exposures and indicated that they measured the exposure for only one day as the full value of transactions due to be settled on that day. Where the exposure was recorded as lasting for more than a day, system limitations meant that exposures could only be measured for full days. Thus, the full value of foreign exchange transactions on any day was assumed to be at risk on that day and on the next day. This approach is based on the conservative assumption that all sold currencies are paid out at the beginning of the value day and reconciliation of receipts is not completed until the end of the next day.

The various approaches to measuring exposures described seem to leave potential for the over or underestimation of settlement risk, depending on when cancellation deadlines are in relation to reconciliation times. For example, where reconciliation of a day's receipts does not occur until after the cancellation deadline for the next day's payments, exposures will be greater than a single day's settlements. Similarly, banks can overestimate their exposures when some receipts for a particular day are reconciled before the cancellation deadline for payments in other currencies due to be made that day.

- **Failed receipts reported to credit function and senior management**

Although all respondents confirmed that failed receipts are reported to the credit function and to senior management, not all banks appear to add the amount of a failed transaction back to the exposure recorded for the counterparty concerned.

- **Bilateral netting currently not used widely**

Netting can be a useful tool for managing foreign exchange settlement exposures. A legally binding bilateral netting agreement can reduce the magnitude of the exposure by allowing receipts due from a counterparty to be offset against payments to that counterparty. Bilateral netting appears to currently play only a small role in the way that New Zealand banks approach managing their settlement risk. Five of the six survey respondents reported making use of bilateral netting. However, the use of netting by these banks appeared to be rather limited. The banks indicated that they had netting arrangements in place with only a few of their top counterparties, and with less than two per cent of all counterparties. Total gross daily settlements for all six banks were USD18,274 million and net settlements were USD17,758 million.

The overall picture of risk management practices and procedures suggested by the survey results is similar to that obtained by the CPSS. The only major difference is the relatively low level of netting by New Zealand banks. In the second CPSS survey, 77 per cent of banks used bilateral netting to some degree, such that bilateral netting reduced overall settlement flows by 15 per cent, compared with only a 3 per cent reduction reported by New Zealand banks.

Planned improvements

Banks individually and collectively are pursuing improvements to procedures for managing foreign exchange settlement risk. Survey responses pointed to steps being taken to improve the measurement of exposures and to reduce both the duration and magnitude of exposures.

Banks' risk management processes already tend to recognise that the full amount of foreign exchange transactions could be at risk. However, there would appear to be scope for

improving the duration of exposures. One survey respondent mentioned that it was planning to link its reconciliation and treasury systems so that exposures are recorded until such time as receipt of the bought currency is confirmed.

Changing procedures to achieve later cancellation deadlines or earlier reconciliation times would reduce the duration of exposures. Three banks mentioned that they were reviewing their settlement practices with a view to shortening the duration of exposures.

One way to reduce the magnitude of exposures would be to make greater use of netting. While New Zealand banks are making limited use of bilateral netting arrangements for foreign exchange settlements, banks are keen to extend their use of netting. Several of the banks indicated that they were looking either to request that foreign exchange counterparties sign a bilateral netting agreement or to join FX Net, an international system providing foreign exchange netting services. The Bank is keen to encourage banks to develop robust netting arrangements and we would welcome moves to use netting more widely. New Zealand has had legislation in place to ensure the enforceability of written netting agreements since April 1999. We would want to ensure that netting was subject to netting agreements that conformed to the requirements of that legislation and we will continue to encourage banks to enter into such agreements with counterparties.

Continuous linked settlement

Perhaps the most significant initiative aimed at reducing foreign exchange settlement currently under way is continuous linked settlement, or CLS. CLS is being developed by more than 60 major international commercial banks. The planned CLS Bank will act as an intermediary in the settlement of foreign exchange transactions and will provide a form of payment versus payment for netted foreign exchange transactions. Seven currencies (the Australian, Canadian and US dollars, the British pound, the Euro, the Swiss franc and the Japanese yen) will be included in the first stage of the arrangements. Other currencies will be added later and the Bank is working to ensure that the New Zealand dollar is a candidate for inclusion as soon as possible. We are also actively encouraging New Zealand banks to explore the use

that they can make of CLS.⁸

There was a high level of awareness of the CLS initiative among respondents. Five banks referred to CLS Bank as a way to reduce foreign exchange settlement risk. These banks noted that they intended to join CLS, install software that was compatible with CLS, or simply stated that future involvement with CLS Bank was a possibility under consideration

6 Conclusion

The Bank's survey of foreign exchange settlement practices in New Zealand indicated that foreign exchange settlement exposures are potentially very large and can last for a considerable period. Exposures for an individual bank can exceed that bank's total capital for several hours each day. These results are consistent with previous surveys conducted in other countries. While survey respondents appeared to recognise the significance and magnitude of foreign exchange settlement risk, they did not always seem to appreciate the potential duration of the exposure.

The survey also pointed to several improvements that banks were making or had planned to identify and manage their foreign exchange settlement risk better. The Bank intends to continue to encourage banks to improve their risk management processes. For that reason, we have provided survey participants with information on the survey results. That information included a summary of the response received from the bank concerned as well as industry weighted averages for the duration of exposures and a general description of risk management practices. Each bank is therefore now able to compare its own procedures with industry-wide practices and to identify possible areas for improvement.

The Bank is also working to facilitate the entry of the New Zealand dollar into the CLS arrangements. CLS Bank promises a substantial reduction in foreign exchange settlement risk and we are keen to see participants in the New Zealand foreign exchange market able to take advantage of these arrangements at the earliest opportunity.

⁸ For more information on CLS see the CLS website (www.cls-services.com).