

Monetary policy and liquidity management after the introduction of Real Time Gross Settlement

John Tait, Financial Markets Department

In 1996 the Bank will introduce the ESAS system to provide banks with real time access to their settlement accounts at the Reserve Bank. In this article monetary policy and bank liquidity implications of this development are discussed. The article is fairly technical and readers will need to have a reasonable understanding of payment system reform and the current monetary policy regime. Three previous Reserve Bank Bulletin articles listed in the footnote¹ below provide a good source of information for a reader new to this area.

I Introduction

The Reserve Bank and the banking industry have decided to build systems that will enable settlement of payment transactions in real time. This will increase the stability of the banking system by decreasing payment system exposures and provide banks with improved ability to provide fully assured payment services.

For its part the Bank will build a system called the Exchange Settlement Account System (ESAS) which will link settlement accounts electronically to bank treasuries and to other payment systems.² The payment systems will deliver electronic payment instructions to paying banks for clearing, and to the ESAS system at the Reserve Bank for settlement. ESAS will act on the payment instructions to settle transactions by electronically debiting the settlement account of the paying bank and crediting the settlement account of the receiving bank. This electronic funds transfer between the two banks' accounts will be final and irrevocable. Most large value payments and perhaps some smaller value payments are expected to be settled this way.

Real Time Gross Settlement (RTGS) is planned for large value payments and RTGS requires that transactions be individually posted to settlement accounts intra-day. Smaller payments may be batched and settled at regular intervals. In contrast to current practice, banks will not be able to offset receipts against payments before settlement, and as a result they will need to maintain reasonably large intra-day settlement account balances. Intra-day liquidity management arrangements will be introduced by the Bank to help meet the increase in liquidity required.

1 The following *Bulletin* articles may aid understanding of this article. They are 'The operation of monetary policy' Vol. 54, No 1, 1991; 'Reform of the New Zealand payment system' Vol. 56, No 2, 1993; and 'Real Time Gross Settlement and the development of the Exchange Settlement Account System (ESAS)' Vol. 58, No 2, 1995. The last article is particularly useful.

2 In this article exchange settlement account holders are all assumed to be banks, although it is possible that non-banks will be eligible to join ESAS and obtain settlement accounts in future.

II Monetary policy and intra-day liquidity increases

The Bank currently uses a cash target and other monetary policy instruments to influence the demand for, supply of, and cost to banks of settlement balances. At present there is no intra-day settlement, as the settlement accounts are only updated once a day at end-of-day, which occurs on the morning of the next banking day. This leaves the banks and payment systems all night to batch up payments for the full banking day, and to work out the amount each bank needs to pay or to receive to settle all the day's payments. The banks then instruct the Reserve Bank to debit or credit their settlement account with the amount required to settle the net inter-bank positions generated by all netted transactions.

In contrast, after RTGS is introduced, each major transaction (and many minor transactions) will be treated separately for settlement. Bank customers or banks will generate transactions in various payment systems and, if the payment is valid, notification of the transaction will be sent electronically to the paying bank. The paying bank will place the transaction on an electronic settlement queue (outside ESAS). The paying bank will hold the transaction until an appropriate time and when ready will instruct payment systems to release the settlement part of the payment to the Reserve Bank's ESAS system for settlement. If the payment passes the validation checks and other requirements of the ESAS system, and if there are also sufficient funds in the paying bank's settlement account, ESAS will transfer settlement cash from the paying to the receiving bank as final settlement of the payment. After settlement the payment transaction between the payer (paying customer) and the payee (receiving customer) will be "interchanged" (ie, sent to the receiving bank). The receiving bank can then provide funds to the receiving customer without incurring risk against the paying bank.

On most days there are a number of payments larger than \$100 million and so many banks will need large settlement balances to settle. Sometimes a few large payments

may need to be settled together and, as a result, there will also be occasions when banks may need balances in their settlement accounts to the value of several hundred million dollars.

Under the current system the total banking system's average holdings of settlement balances are around about \$5 million (the present cash target), so settlement balances will need to be increased intra-day when RTGS is introduced. The Bank considered how best to supply the increased need for settlement balances - for example, by allowing sufficient settlement balances to build up³. If this route were followed monetary policy would need to change in fundamental ways just to accommodate the changed payment system. Although such a change need not necessarily cause problems, the Bank decided that it would be more acceptable to both the Bank and the industry to maintain the essence of the current monetary policy framework and to design the payment system around that framework. However, minor changes to open market operations (OMOs) will occur, having the effect of increasing settlement balances intra-day but not at end-of-day.

OMOs offset the daily expected transfers of settlement balances to or from the Crown accounts (Government) and other accounts at the Reserve Bank. The Bank withdraws settlement balances by selling Treasury bills, or injects balances through repurchase transactions. This situation will continue under RTGS as the net injections or withdrawals will remain unchanged. However, although the overall injections and withdrawals are unchanged, the Bank can and will adjust timing to ensure that banks receive funds as soon as possible intra-day. This will be achieved in two ways. First, whereas at present the float tender provides injections to offset government receipts at end-of-day, under RTGS the Bank intends to provide an increasing proportion of the current float funds during the OMO in the morning⁴. Secondly, the Bank will enable settlement of OMOs and tenders (of Treasury bills and of Reserve Bank bills) as soon as possible following the end of the respective operations. This will allow banks to choose when to settle tenders and OMOs and lose or gain settlement balances as a result. We assume banks will delay settlement of security purchases to maximise available settlement balances.

The timing of the government injections and withdrawals also influences intra-day settlement balances. It is likely

3 For further information on the mechanism by which settlement balances vary in size, refer to the earlier *Bulletin* article 'The operation of monetary policy', by J. Tait and M. Reddell, Vol 54, No 1, 1991.

4 The OMO will withdraw less than now on days when government injects liquidity, and inject more than now on days when government withdraws liquidity.

that changes to the intra-day timing of some of the relevant transactions will be possible, such that available settlement balances are increased intra-day.

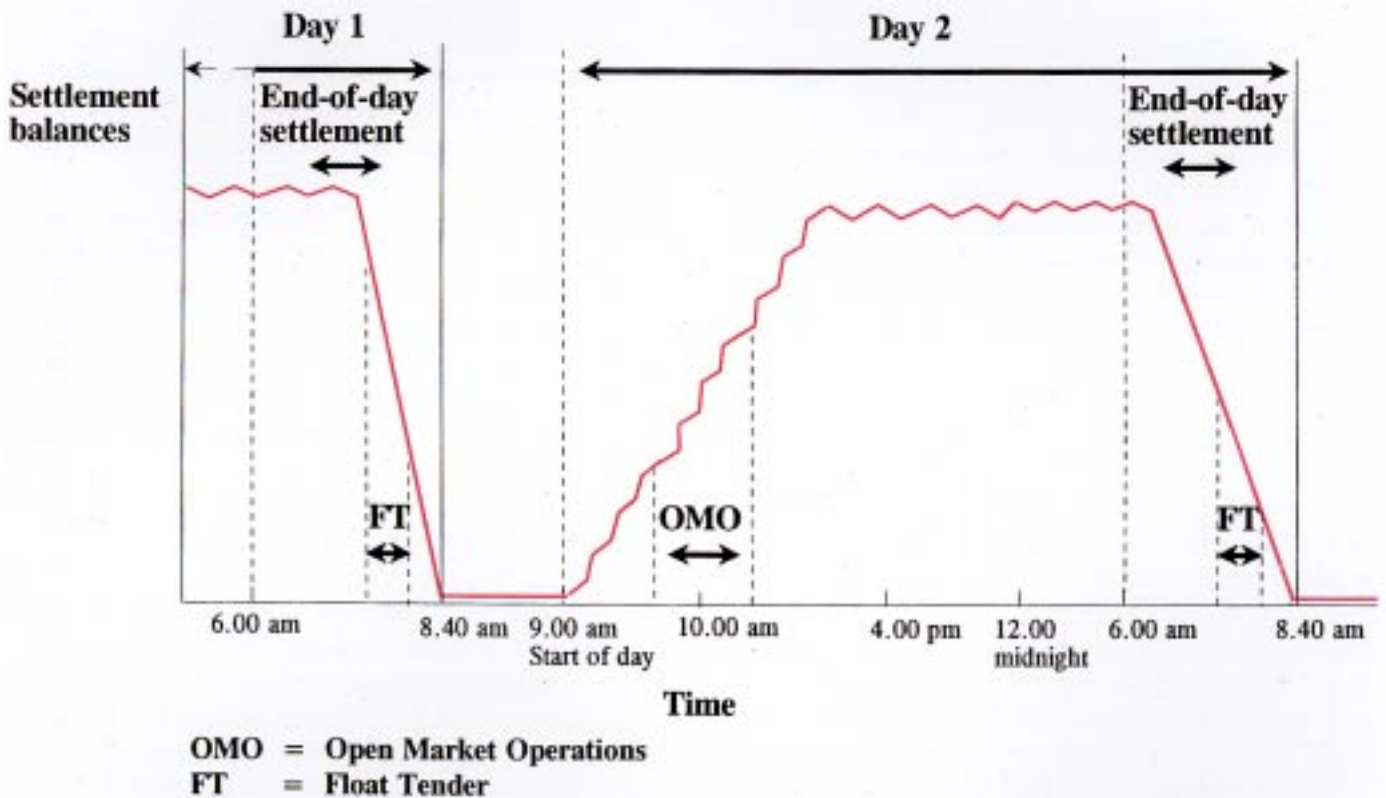
Intra-day repurchase agreement

As explained above banks will require large intra-day settlement balances to make large value payments, and changes to the timing of some operations will help maximise the availability of such balances. However, timing adjustments alone are unlikely to be sufficient. The Bank has decided to provide (inject) settlement cash intra-day by way of intra-day repurchase agreements. The settlement cash banks receive as a result of the repurchase transaction will be injected during the banking day and be withdrawn again on repurchase at or before the end-of-day. This arrangement will allow banks to resume ownership of the securities at end-of-day so that existing conventions in relation to interest charges and accounting practices will not need to be changed. Neither repurchase transactions nor the resultant settlement cash balances will bear interest intra-day (although this could be a possibility at some stage in the longer term, should intra-day markets emerge). The Bank intends, however, to recover the costs of providing the ESAS system by way of transaction fees. Current estimates point to costs of between 10 and 50 cents per transaction depending on the volumes processed.

An electronic link between the ESAS system and Austraclear⁵ will facilitate automatic intra-day repurchase transactions on those occasions when a bank needs intra-day settlement balances. Under this arrangement the ESAS system will allow banks to set parameters that will tell the ESAS system when to arrange automatic repurchase transactions. The repurchase security will then be sold to the Bank in return for an instant deposit to the settlement account of the selling bank. The trigger for an automatic repurchase transaction will be the value of unpaid transactions released to ESAS by the paying bank - a figure that will be set by the paying bank itself. Banks will enter a list of prioritised securities and, when the trigger amount is exceeded, ESAS will search for an asset for possible use in a repurchase transaction. ESAS will first consider the highest priority security, and check that the Bank is willing to buy that particular security (the Bank will purchase government securities, Reserve Bank bills and bank bills (within issuer limits)). If the Bank is willing, it will engage in the repurchase transaction for an

5 Austraclear features a securities depository, which can be used to transfer ownership on a DVP basis. For further information on Austraclear refer to the Reserve Bank *Bulletin* article 'The Austraclear New Zealand system' by S. Anderson, Vol 56, No 2, 1993.

Figure 1
ESAS day and settlement balances under RTGS



amount calculated from yields regularly updated in the ESAS system. When the repurchase transaction is complete, the ESAS system will transfer the settlement balances paid for the security to the settlement account of the selling bank. ESAS will then settle the selling bank's unpaid transactions and the injected funds will subsequently circulate amongst banks, speeding up settlement throughout the banking system.

From time to time banks may run out of suitable securities. When this happens, payments will tend to remain unpaid for longer than usual and payment system risks are likely to be somewhat higher than they would otherwise be. Accordingly, it is possible that intra-day cash markets, where banks lend money to each other, may develop. In addition, intra-day mechanisms for swapping and borrowing securities between banks may develop, which in turn would allow banks short of settlement balances to obtain cash through the automatic repurchase facility. If settlement is still not possible, transactions will simply wait in the electronic ESAS queue.

The FIFO queue

Most RTGS systems provide a queue for storing unpaid transactions. The ESAS system is no exception to this, and ESAS will have a First In First Out (FIFO) queuing convention, so that payments from each paying bank will be processed in the same order as they were authorised for settlement. The ESAS system will attempt to make the payment at the top of each bank's queue, and if this payment cannot be made no other payment for that bank will be paid. Instead, in a process that will cycle through all the banks, another bank's payment at the head of its queue will be paid if possible. On-going ESAS processing will help to redistribute cash to the banks unable to make payment, since receipts to the short bank will accumulate, and in time the stalled transaction is likely to proceed. This in turn will redistribute cash back to the rest of the banks allowing other payments to be made.

Simulations undertaken by the Bank suggest that the FIFO queue should work well in the New Zealand environment. If, however, the FIFO queue does not distribute funds with sufficient speed, the automatic repurchase system will cut in when a paying bank's queue is larger than the trigger amount, and provided adequate security is available, sufficient cash will be released to settle the queued payments.

Other liquidity saving arrangements

In table 1 we have hypothesised a situation where paying bank A needs to arrange for cash of \$100 million to settle, but only has \$50 million. The payment has come to the top of the FIFO queue and settlement of bank A's transactions has stalled. Unfortunately, settlement delays can inconvenience bank customers and in some circumstances are likely to result in rises in payment system risks. Settlement delays will therefore be unpopular. In order to overcome delays in settlement (often referred to as gridlocks) the ESAS system will have a multi-transaction facility attached. The multi-transaction facility called the Freeze Frame will allow many payments to be settled together. This will allow banks to offset payments against receipts so that the overall need for settlement balances is decreased. For example, paying banks A, B, C and D would only need \$30 million, \$10 million, zero and zero dollars if payments were settled together through the Freeze Frame. In contrast, without the Freeze Frame they would need \$100 million, \$10 million, zero and \$60 million. The multi-transaction facility would decrease required settlement balances to the lower levels mentioned above. It is worth noting, however, that the Freeze Frame will not always work. It could be the case that one or more of the paying banks might not have sufficient funds to meet even the reduced need for liquidity and the Freeze Frame would fail. If the Freeze Frame failed, banks would then need to arrange more liquidity (perhaps through the automatic repurchase facility) or wait to see whether the Freeze Frame worked when applied later.

Table 1

Settlement Accounts and use of Freeze Frame

	Bank			
	A	B	C	D
Cash at beginning	50	50	50	50
Transactions in queue	-100			+100
	+ 60			- 60
	+10	- 10	+ 10	- 10
Freeze Frame operation	- 30	- 10	+ 10	+ 30
Cash after Freeze Frame	20	40	60	80

III Responsibility for settlement, settlement account contracts and the use of liquidity saving facilities in ESAS

The settlement banks will be responsible for maintaining sufficient funds in their settlement accounts and will also take ultimate responsibility for ensuring that payments are settled. For its part, the Bank is responsible for ensuring that the channels for settlement are open (as central bank and provider of the settlement medium and system (ESAS)). Accordingly banks, payment systems and the Reserve Bank will all need to cooperate closely to reach their joint and separate objectives. This co-operation will be reflected formally in contracts for the provision of the Exchange Settlement Account System (ESAS) and the automatic intra-day repurchase facility.

IV End-of-day settlement

We expect that the ESAS system, new payment systems being built for RTGS and changes to existing payment systems will allow banks to settle nearly all large value payments during the banking day. It is likely that retail payments will be batched up and bilateral netted positions will be settled at regular intervals. However, it is possible that a number of these and other payments may be settled through ESAS the following banking morning (see figure 1, and table 2 items 2 and 3). ESAS will be available for settlement from 6:00 am. Banks will arrange to settle queued payments plus the repayment of any intra-day repurchase transactions during the next two hours and 40 minutes. Thus, the ESAS system will close at 8:40 am in time to allow it to open for the new ESAS day at 9:00 am.

Liquidity management and discounting

Soon after 7:00 am the Bank will tender government receipts not already injected through the previous day's OMO. Once the results of the float are known, the banks will be aware of their expected end-of-day positions, and over the next hour the inter-bank cash market will be available to banks (as it is during the rest of the day) should they need to increase their settlement cash positions. In most circumstances this will result in banks which expect to have more than sufficient end-of-day settlement cash making loans to banks that do not have sufficient cash. On those occasions when a bank is unable to borrow sufficient end-of-day funds it will need to resort to the Reserve Bank's discount facility to obtain settlement balances.

Table 2**End-of-Day Settlement Process**

Item	Description	Value (\$m)
1	Settlement cash balance at 7.00 am	\$100
2	Queued payments overnight	- \$120
3	New payments received	- \$120
4	Interim balance	- \$140
5	Intra-day repurchase transactions	- \$200
6	Funding required to settle end-of-day	- \$340
7	Inter-bank borrowing	+ \$300
8	Discounting	+ \$40
9	Freeze Frame potentially applied	0

Successful end-of-day at 8.40 am

Final close-off for the day

During the period leading up to the end-of-day the ESAS system will continue to try to settle any outstanding queued payments. The intra-day repurchase agreements will not need to be settled until immediately before the final end-of-day at 8:40 am and so settlement balances will probably still be high. At the same time, banks will be arranging sufficient end-of-day settlement cash (after repayment of intra-day repurchase agreements) to manage final end-of-day settlement. This process will be much the same as that which occurs now. We expect that end-of-day inter-bank cash markets and discounting will continue as now. If there are problems with settlement the Freeze Frame may also be used at end-of-day. If banks have arranged sufficient cash to settle all queued payments and complete the intra-day repurchase transactions it follows that, in principle, all of the transactions could be settled through the Freeze Frame. Having said that, however, the Bank hopes that the end-of-day settlement process will not automatically require the use of the Freeze Frame, but rather that the Freeze Frame will be a back stop facility that will be used only when necessary.

V Concluding comments

The Bank has designed the liquidity management arrangements for RTGS to ensure that there is minimal change to the current monetary policy regime. In particular, the end-of-day cash target will continue along with current liquidity management arrangements. Open market operations will continue to be based on *forecast* net injections and so will not fully match the total day's *actual* loss or gain in funds from the government and Reserve Bank. It follows that discounting will continue to be required occasionally to maintain positive end-of-day settlement cash balances. Accordingly, we do not expect that there will be any material influence on either the demand or supply of end-of-day settlement cash balances.

Banks will, however, need to increase their holdings of settlement balances intra-day and the Bank has agreed to inject settlement balances through intra-day repurchase agreements. These repurchase agreements will inject funds intra-day and will withdraw the funds at the end of the day so that the current monetary policy structure based on end-of-day cash targets will continue. The Bank will also inject OMO funds earlier than now to increase the intra-day settlement balances of the banks.

Should a bank run short of suitable repurchase assets and settlement balances, the inter-bank cash market may be available to redistribute cash. We also expect that markets will develop where repurchase assets will be swapped and borrowed on an intra-day basis. If banks still find problems obtaining sufficient liquidity the ESAS system will continue to hold payments in unsettled transaction queues. The queues will stop illiquid banks making payments, which should result in illiquid banks progressively becoming more liquid over time. The Freeze Frame facility may be used in the event that liquidity constraints cause the settlement process to stall and it is not clear whether or not settlement will begin again without outside intervention. This will allow banks to offset receipts and payments and may overcome the problem.

We believe that the automatic repurchase facility, other facilities in ESAS and the inter-bank cash market should be sufficient to liquify the banking system intra-day and maintain timely real time settlement. We are also confident that the proposed changes will not cause problems for monetary policy and liquidity management. Overall, we expect that the introduction of real time settlement will generate very real benefits - particularly in terms of improved assuredness of payments - for relatively small overall costs.