Real-time Gross Settlement in Australia

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The introduction of real-time gross settlement (RTGS) in Australia in 1998 was a major reform to reduce risk in the Australian payments system. Since its introduction, the value of RTGS payments has grown by nearly 70 per cent and the number of these payments has more than doubled. The infrastructure is critical in facilitating the orderly settlement of payment obligations in Australia and it functioned smoothly during the recent global financial crisis.

Introduction

Under RTGS, payments between banks are made individually in real time out of credit funds in the paying bank's Exchange Settlement Account (ESA) with the Reserve Bank. RTGS payments are final and cannot be revoked by the paying bank or otherwise unwound. In Australia, RTGS commenced on 22 June 1998, using the Reserve Bank Information and Transfer System (RITS), Australia's interbank settlement system. This article looks back over the twelve years of RTGS operations, discussing important characteristics of the system, reviewing its performance, and highlighting key developments.

Background

The move to RTGS was the culmination of several years of effort by the Reserve Bank, financial institutions and industry bodies to significantly reduce domestic interbank settlement risk.

Prior to the introduction of RTGS in June 1998, banks settled most of their transactions and those of their customers at 9.00 am (Sydney time) on the day after these transactions were made. Settlement was achieved by means of a single net transfer across their ESA at the Reserve Bank. This meant that in the intervening period banks could accumulate very large payment obligations to each other. If these failed to settle for any reason the payment system could have been seriously disrupted due to the large values and numbers of transactions involved. Other banks could have faced liquidity and even solvency pressures as a result. RTGS addressed this systemic risk by requiring the settlement of high-value payments to take place irrevocably, in real time, out of credit funds in banks' ESAs, thereby preventing the build-up in large values of unsettled obligations. The RTGS system is protected by an approval made by the Reserve Bank under the *Payment Systems and Netting Act 1998* which ensures that payments cannot be unwound if a participant were to fail after having made payments earlier in the day. Today, around 90 per cent of interbank payments by value are settled on an RTGS basis. Work is also currently under way to provide for more timely settlement of some payments from low-value systems, such as direct entry, that still settle in RITS on a next-day deferred basis.

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Types of Payments Settled

RITS settles payment obligations of banks and other institutions (other types of authorised deposit-taking institutions, clearing houses and other special-purpose institutions) authorised by the Reserve Bank to operate an ESA. At present, 55 banks and 14 other institutions (referred to collectively as 'banks' for the purposes of this article) hold ESAs.

There are three main categories of payment obligations settled on an RTGS basis in RITS:

- Wholesale debt securities and money market transactions undertaken in the Austraclear securities settlement system. A link between this system and RITS ensures that for securities settlements, delivery of securities occurs at the same time as the payment for these securities. This eliminates the risk of loss of principal (securities or cash) that can occur if delivery and payment do not occur simultaneously.
- The Australian dollar leg of foreign exchange transactions, correspondent banking flows and other customer payments. These are made using the SWIFT Payment Delivery System (PDS), administered by the Australian Payments Clearing Association.
- Interbank borrowing and lending, and special purpose interbank transactions entered directly into RITS as 'cash transfers'. Prior to February 2002, RITS provided an electronic depository and settlement system for Commonwealth Government Securities (CGS).

In addition to RTGS, RITS still settles batches of net interbank obligations. At 9.00 am each day a batch of multilateral net obligations is settled that includes those arising from the clearing of low-value payments (cheques, debit and credit card transactions, and direct entry) exchanged on the previous business day.

Share market transactions are also settled in RITS after being processed through the ASX Limited's Clearing House Electronic Subregister System (CHESS). The ASX Limited inputs netted settlement obligations into RITS for simultaneous settlement in the CHESS batch at around midday each day.

In addition, since May 2008, settlement of some property transactions has been able to take place directly in RITS as an alternative to using bank cheques. The settlement obligations arising from real estate transactions processed via an electronic registration system are entered into RITS by Austraclear Limited for settlement in the Electronic Property Settlement batch.

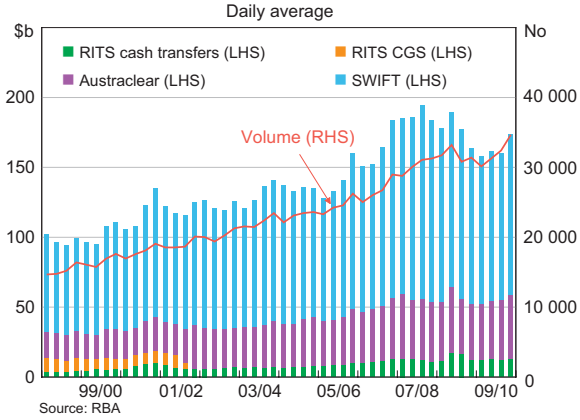
Payment Activity in RITS

Composition

In 2009/10, RITS settled, on average, about 32 000 transactions per day worth around $168 billion. To place this in context, on an average day in 2009/10, RTGS payment values equated to around 13 per cent of Australia's annual gross domestic product.

Considerable growth in payment activity has occurred since the start of RTGS (Graph 1). Growth in the number of transactions during the first decade of RTGS was relatively constant, averaging about 7 per cent per annum. In contrast, growth in the value of settlements has been more volatile, reflecting fluctuations in general economic and financial activity. During 2008/09 there was a noticeable downturn in both settlement values and volumes in RITS associated with reduced turnover in a range

Graph 1
RTGS Settlement
Daily average



Source: RBA

of financial markets as a result of the global financial problems.[1] Since then, there has been a strong recovery in the number of transactions settled in the system culminating in a record day of 52 120 transactions on 15 June 2010. In contrast, values settled in RTGS have been slower to recover and despite a strong pick up in the June quarter, values settled in 2009/10 were, on average, 14 per cent below those in 2007/08.

The major contribution to both the level and growth of RTGS payments has come from the SWIFT PDS (Table 1). Of these, it is 'interbank' SWIFT payments (i.e. payments between banks, largely associated with foreign exchange settlements and correspondent banking transactions) that have dominated RTGS values and have contributed most to the growth in RTGS values over time. By contrast, customer SWIFT payments (i.e. payments that arise from transactions of banks' customers) have been the largest contributor to the growth in RTGS numbers. These tend to be small-value payments (of less than $100 000) and have accounted for nearly 70 per cent of the increase in RTGS volumes since the inception of RTGS but only about 10 per cent of the increase in RTGS values.

Settlements of securities transactions in Austraclear account for less than 10 per cent of the total number of RTGS transactions but make up over 25 per cent of the total value of transactions; the average Austraclear transaction size is $16 million. The share of Austraclear payments increased significantly as a result of the movement of Commonwealth Government Securities from RITS to Austraclear in February 2002. This consolidation was the result of a consultative process which demonstrated a market preference for a single settlement system for both Commonwealth Government and other debt securities.

Over time there have been notable changes in the size distribution of RTGS payments (Graph 2). Although the number of large payments (of over $100 million) has changed little as a proportion of the total number of payments, their share of the total value of RTGS payments has risen to about 60 per cent, from about 40 per cent around ten years ago. Over the same period, the proportion of small RTGS payments (those less than $100 000) has grown to about 65 per cent of the total number of RTGS transactions. The total value of these payments has, however, remained very low as a share of total payments.

The values settled through the 9.00 am batch for low-value clearings have grown steadily since

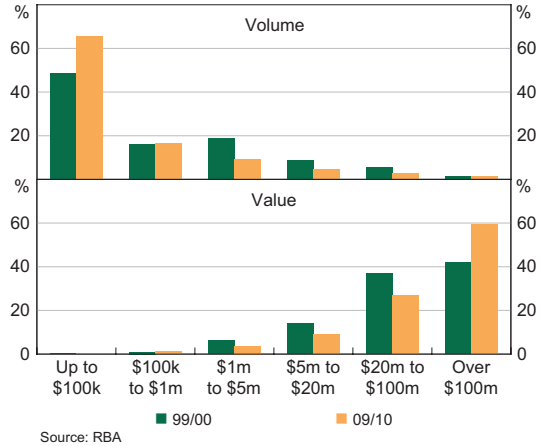
Table 1: RTGS Settlement by Source
Per cent of total

	Value		Volume	
	1999/00	2009/10	1999/00	2009/10
RITS cash transfers	5	8	1	0.5
RITS CGS	8	na	2	na
Austraclear	19	26	13	8
SWIFT	68	66	83	91
of which:				
– Customer	5	7	41	54
– Bank	63	59	42	37
Total RTGS	**100**	**100**	**100**	**100**

Source: RBA

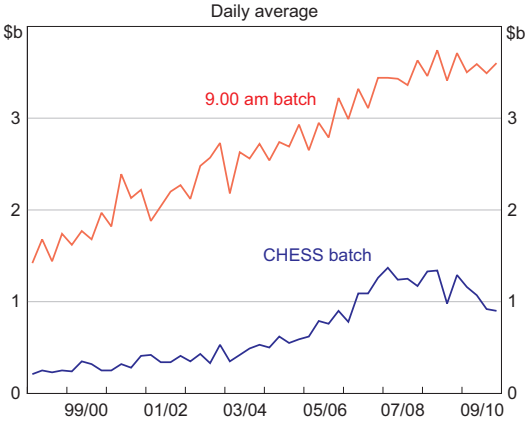
1 For a fuller discussion of Australian markets during this period, see Black, Brassil and Hack (2010) and Ossolinski and Zurawski (2010).

Graph 2
RTGS Settlement
By value-band, per cent of total



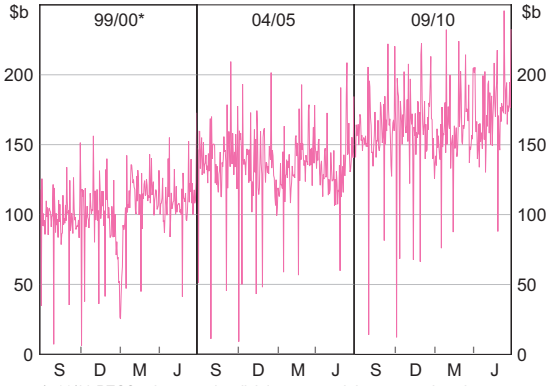
Source: RBA

Graph 3
Batch Settlement
Daily average



Source: RBA

Graph 4
RTGS Settlement
Daily value



* 99/00 RTGS values may be slightly overstated due to some intraday repos being classified as standard Austraclear trades.
Source: RBA

the introduction of RTGS (Graph 3). CHESS batch settlement values also grew quite rapidly for a number of years prior to the onset of the global financial crisis. The recent downturn in CHESS batch value reflects a fall in turnover (by value) on the Australian share market and is also influenced by trends in other equity related transactions such as capital raisings.

Volatility

There is significant volatility in day-to-day RTGS payment activity. On a peak day, values can be 50 per cent higher than on a normal day, while on low-activity days values settled are often 85 per cent below average (Graph 4). Similar patterns are evident for RTGS daily volumes but declines from the yearly average are less pronounced.

Day-to-day volatility is influenced significantly by foreign exchange settlements and correspondent banking flows. Troughs in RTGS activity occur on US holidays and the days when Melbourne is open for business but Sydney is not. Although RITS is open for settlement on all business days in either Sydney or Melbourne or both, by market convention there are no AUD foreign exchange settlements on non-business days in Sydney. On these days, foreign exchange settlement and many settlements of domestic origin do not occur. As a result, peak days normally occur surrounding these days and Australia-wide holidays.

Peaks also occur at the end of the financial year, quarter and month ends and at the expiry of some financial market contracts. The largest peak day on record occurred on the final business day of September 2007 with RTGS payments of $312 billion.

Liquidity

The settlement of $168 billion in payments on average each day is facilitated by a pool of about $15 billion in system liquidity, which is exchanged multiple times between banks during the course of the day. The availability of sufficient liquidity is vital to ensure that settlement of RTGS transactions can continue uninterrupted. In RITS, the level of intraday

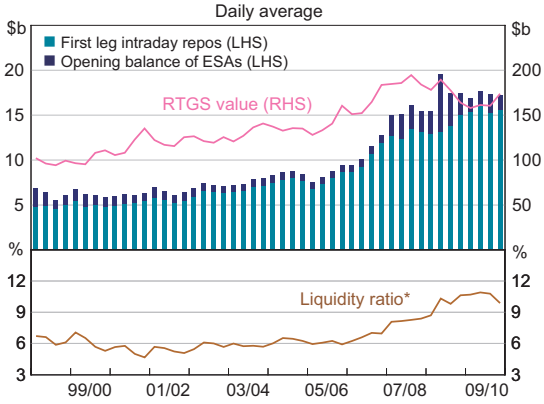
liquidity available for settlement can be measured by the total of ESA balances held overnight plus intraday repurchase transactions undertaken with the Reserve Bank (often referred to as RBA Repos).

The overall level of ESA balances is ultimately determined by the Reserve Bank's open market operations, aimed at maintaining the overnight cash rate at its target. In this task, the Reserve Bank seeks to provide sufficient ESA funds to meet demand by banks, rather than seeking to provide any specific level of funds.

Banks may, at their discretion, enter into intraday repos with the Reserve Bank to obtain intraday liquidity for the settlement of their payment obligations. An intraday repo involves a bank selling eligible securities to the Reserve Bank in exchange for ESA funds and agreeing to reverse this transaction by the end of the day. These repos are the major source of liquidity to facilitate payments. The range of eligible securities for intraday repos, and the Reserve Bank's open market operations, has been broadened considerably since the start of RTGS as the Reserve Bank has sought to ensure there are sufficient volumes of securities available for these purposes.

Demand for intraday liquidity was reasonably constant over the first half of the decade as banks became familiar with the regular pattern of funding and settlements (Graph 5). Changes to the Reserve Bank's dealing arrangements in 2004 made intraday repos in private securities more attractive for use in intraday funding of payments. With supply of these assets plentiful, banks were able to readily accommodate strong growth in settlement values. The onset of the financial market turbulence in mid 2007 saw some banks become less willing to lend their excess funds in the cash market, preferring instead to hold risk-free liquid assets with the Reserve Bank. The resulting higher opening balances of ESAs meant that for a given amount of intraday repos, system liquidity was higher. Overall, the increased use of intraday repos, and to a small extent higher opening ESA balances, saw intraday liquidity

Graph 5
Observable System Liquidity
Daily average



* Measured as intraday liquidity over RTGS value as a percentage
Source: RBA

double between 2005/06 and 2009/10, while the value of RTGS settlements only increased by around 15 per cent. The increase in observable liquidity, in concert with a reduction in settlement values since 2007/08, has resulted in a marked rise in the liquidity ratio (observable liquidity as a percentage of settlement value).

System Liquidity-saving Features

Given that there is an opportunity cost to banks from holding overnight ESA balances and other highly liquid assets, which could otherwise be invested in higher earning assets, an RTGS payment system aims to use liquidity efficiently. RITS does so by using a liquidity-efficient queue-testing method, and including features such as Targeted Bilateral Offset and Auto-Offset, to assist in the rapid redistribution of liquidity as payments are settled (see 'Box A: The Settlement Process'). The Auto-Offset algorithm can be highly effective in mitigating the effect of low liquidity by reducing the total liquidity needed to settle two offsetting payments to the net difference between the two.

Intraday settlement profiles show how participants manage their payments throughout the day, including the use of priority payments status and Auto-Offset (Graph 6). The use of Auto-Offset has become an increasingly important means of settling

Box A
The Settlement Process

All payment instructions submitted to RITS are placed on the system queue, where they are tested to ensure the paying bank is ready to make the payment and has sufficient funds in its ESA. RITS tests payment instructions in order of receipt and each payment only settles if all queue tests are passed. If a payment fails one of the queue tests, then the queue processor leaves the payment on the queue and attempts to settle the next payment. The process continues until the end of the queue is reached, after which it restarts testing from the start of the queue (Figure A1). This means that while the queue processor tests transactions in the order received, transactions may not settle in that order. RITS is able to test around 25 000 payments per minute and the queue is traversed multiple times per minute depending on the queue size.

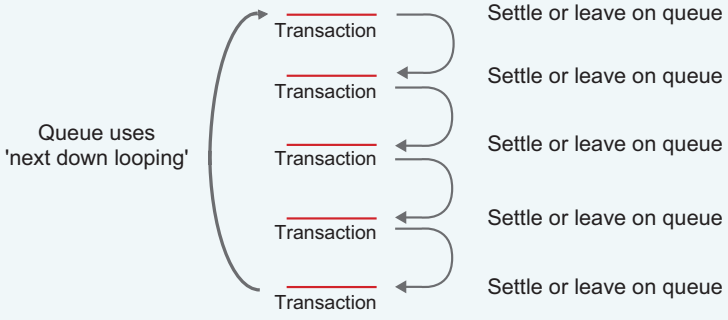
RITS tests the value of a payment against the sending bank's available ESA funds. Banks may apply different statuses to payments that affect this testing and may use a sub-limit to reserve ESA funds for critical payments.

Banks may manage their ESA and queued payments online using the RITS User Interface or by using the Automated Information Facility (AIF) over the SWIFT network. The AIF allows banks to perform automated credit and liquidity management, as well as make enquiries and receive various automated advices. RITS processes an average of about 15 000 AIF messages per day.

RITS also employs a number of liquidity-saving mechanisms that help avoid gridlock. Auto-Offset is a bilateral offsetting algorithm that automatically runs when a payment remains unsettled on the system queue for longer than one minute. Once a payment has triggered the Auto-Offset algorithm, the queue processor searches for queued payments from the receiving bank that will offset some or all of the value due to be paid by the paying bank of the trigger transaction. Where the simultaneous settlement of all of these transactions would not result in a negative balance on either ESA or breach any ESA sub-limit, then the trigger and offsetting transactions are settled simultaneously.

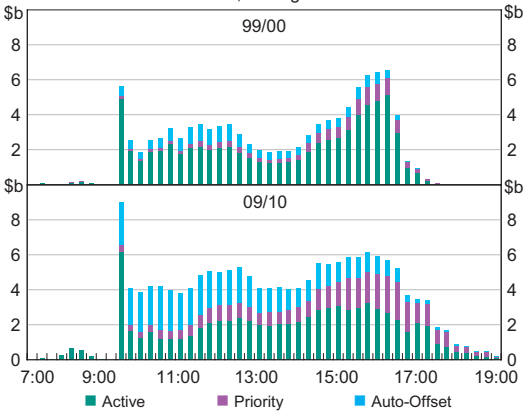
A new piece of functionality implemented in RITS in July 2009 is the Targeted Bilateral Offset facility. This functionality allows any two ESA holders to offset selected transactions against each other to improve the efficient use of system liquidity and to assist in client credit management.

Figure A1: Operation of the System Queue



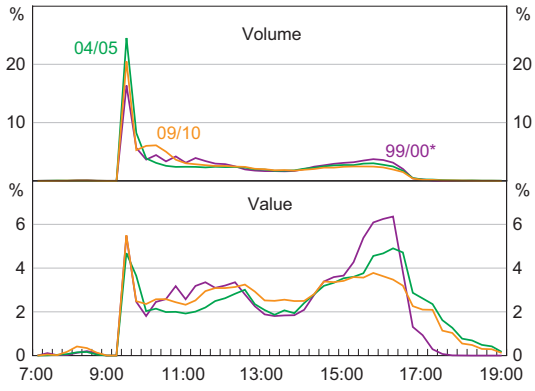
Source: RBA

Graph 6
RTGS Liquidity-saving Features
15 minute intervals, average settlement value



Source: RBA

Graph 7
RTGS Intraday Settlement Profile
15 minute intervals, per cent of daily settlement



* 99/00 was prior to the introduction of the Evening Settlement Session.
Source: RBA

payments earlier in the day. A larger proportion of small-value payments is submitted to the system queue for settlement testing before midday and this increases the probability that RITS is able to locate eligible offsetting payments. Towards the end of the Daily Settlement Session (discussed in 'Box B: The RTGS Operating Day'), the average size of transactions tends to be significantly larger. As a result, banks tend to manage their queued payments more actively by using sub-limits and priority statuses to prevent settlement delays that might otherwise arise due to liquidity constraints.

Intraday Payment Activity

In general, earlier settlement of payments is desirable as this assists in the redistribution of liquidity between banks and reduces the operational and liquidity risks that can manifest late in the settlement day. One set of funding payments which must, however, take place late in the RTGS day is for foreign exchange related transactions that use Continuous Linked Settlement (CLS), which has its operational timeframe concentrated in the European morning.

Banks queue a large number of payments in advance of, and around the opening of, the Daily Settlement Session at 9.15 am. A large proportion of these queued payments by number is then settled almost immediately (Graph 7). These payments are predominantly small-value SWIFT customer payments.

In contrast, settled payment values show two distinct peaks. The first occurs immediately after the 9.15 am opening of the Daily Settlement Session when large numbers of smaller payments are settled. The second peak occurs in the late afternoon as banks' treasuries become more active in managing the settlement of their larger payments and engage in interbank borrowing and lending to square their overnight positions. In the early years of RTGS this second peak tended to be the larger of the two. However, the afternoon peak has fallen over time, due in part to some netting efficiencies gained with the migration of foreign exchange related payments to CLS and the introduction of an Evening Settlement Session to settle some of these transactions, and more recently as greater intraday liquidity has facilitated the earlier settlement of large-value payments.

Despite the relatively large proportion of values and volumes settled early in the settlement day, the aggregate value of payments on the queue awaiting settlement testing tends to rise

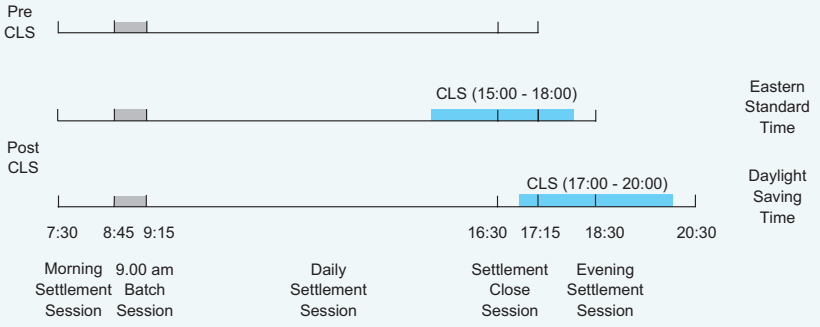
Box B
The RTGS Operating Day

The RTGS operating day is divided into a number of sessions (Figure B1). During the Morning Settlement Session, only RITS and interbank Austraclear payments can be settled. This enables banks to borrow funds or enter into intraday repurchase agreements with the Reserve Bank to fund debit positions in the 9.00 am batch and fund their subsequent daily RTGS payment obligations. Following this, RTGS settlement ceases temporarily at 8.45 am to allow the 9.00 am batch to be run.

At 9.15 am, RTGS settlement recommences with the start of the Daily Settlement Session. In this session, all RTGS payments are eligible for settlement. This session ends at 4.30 pm, at which point new customer payments are no longer accepted. This allows a brief period for banks to enter funding transactions to balance their ESA positions before 5.15 pm, which, until the commencement of Continuous Linked Settlement (CLS) in September 2002, marked the close of the settlement day. CLS is an international initiative that extinguishes settlement risk in foreign exchange transactions by providing for payment versus payment settlement in multiple currencies during a common international window of open hours for RTGS systems.

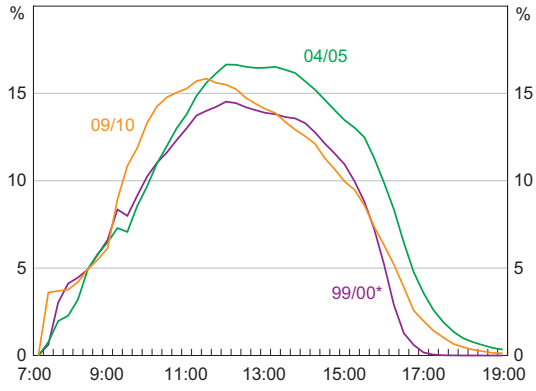
With the operation of CLS, RITS operating hours include an Evening Settlement Session that accommodates an overlap of Australian settlement hours with the European morning, when funding of CLS positions occurs. The length of the Evening Settlement Session varies depending upon the time of year and the consequent difference between European and Australian time. During this session participating banks unwind remaining intraday repos and undertake final funding transactions to square their positions.

Figure B1: The RTGS Operating Day



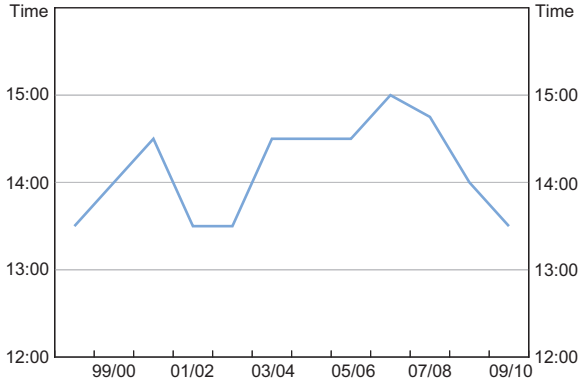
Source: RBA

Graph 8
RTGS Intraday Queue Profile
15 minute intervals, value queued as per cent of daily settlement



* 99/00 was prior to the introduction of the Evening Settlement Session.
Source: RBA

Graph 9
RTGS Throughput Time
Average time for settling 50 per cent of value



Source: RBA

throughout the morning as more large-value interbank payments are entered (Graph 8). Until recent years, the value of payments on the queue tended to plateau during the middle of the day. More recently, the peak in aggregate queued values has occurred significantly earlier in the day and the value of payments on the queue has fallen noticeably during the afternoon.

The average time of day when half of the day's total settlement value is complete has fluctuated since the start of RTGS (Graph 9). This is consistent with the changes in intraday settlement peaks over time. In the lead-up to the financial crisis in 2007, it was taking until as late as 3.00 pm to settle half of the day's payment values. With the increase in liquidity and the earlier settlement of larger payments, the half-way point is now significantly earlier.

Conclusion

The implementation of RTGS in RITS on 22 June 1998 was a milestone in the reduction of settlement risk, and in turn systemic risk, in the Australian financial system. The past twelve years have witnessed strong growth in the value and number of RTGS transactions settled by RITS. The RITS infrastructure functioned reliably and efficiently in providing final interbank settlement during the recent financial crisis, providing a solid foundation for the operation of the Australian financial system.

The Reserve Bank has made a significant public policy investment in RITS to ensure that it is stable and resilient and that it meets the settlement needs of participants, appropriate to its critical role in the financial system. Investments include the total upgrade of the technical architecture, with dual components at two sites, introduction of a modern browser-based user interface, internet access and enhanced security features.

The Reserve Bank is continuing to develop initiatives that will further strengthen the settlement infrastructure in Australia. In particular, work is currently underway to provide enhanced settlement functionality to facilitate a reduction in settlement lags for various payments currently settled on a deferred basis. This functionality will provide a platform for greater efficiency and product innovation in Australia's payment system, through faster access to funds and by reducing the risks associated with deferred settlement.

References

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Ossolinski C and A Zurawski (2010), 'Global Foreign Exchange Turnover', RBA *Bulletin*, March, pp 45–48.