THE CASH MARKET IN AUSTRALIA

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ABSTRACT

The cash market is the market for overnight loans between financial institutions. This market is central to the operation of Australia's financial system: it is there that banks seek to borrow or lend in response to short-term fluctuations in their liquidity, and where the Reserve Bank conducts the domestic market operations through which it controls monetary conditions and implements monetary policy changes.

This paper outlines a model of the cash market in Australia, which incorporates recent changes in the operating procedures followed by the Reserve Bank. The paper shows how the dynamics of the cash market depend on the presence of both same-day and next-day settlement in the cash market, and how the various interest rates on overnight loans ("cash rates") are determined.

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1. INTRODUCTION

This note outlines a model of the Australian cash market. This is the market where overnight interest rates are determined and where the Reserve Bank conducts its market operations. An understanding of the structure and operation of this market is helpful in analysis of the Reserve Bank's implementation of Australian monetary policy.

The paper explains the structure of the market and the determination of overnight interest rates (or "cash rates"). The analysis in the paper is based on the Reserve Bank's present approach to monetary policy in which it announces a target cash rate and operates to maintain rates close to the announced target rate; however, the model itself is equally useful in analysing the workings of the cash market prior to the adoption of this approach in January 1990.[1]

There are two parts to the cash market:

- the market for exchange settlement (ES) funds - those funds that can be transferred for same-day value between accounts at the Reserve Bank and used by banks to meet their daily ES obligations. Participation in this market is restricted to the Reserve Bank and those institutions with "same-day" accounts at the Reserve Bank: the banks (which have exchange settlement accounts) and the authorised short-term money market dealers (which have clearing accounts). Institutions in both groups must keep their Reserve Bank accounts in credit at the end of each day — there are no overdrafts permitted — and the Reserve Bank does not pay interest on credit balances.

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[1] Earlier papers have examined the workings of the cash market at different stages of its development: see Macfarlane (1984) and Dotsey (1991). A less technical introduction to the cash market can be found in Battellino (1990) or Reserve Bank of Australia (1990) .

The mainstay of this market is therefore the lending by banks of their surplus ES funds to authorised dealers. Like all loans to authorised dealers, these must be secured (if secured with Commonwealth Government securities (CGS), the loans can be counted as PAR assets). Banks also borrow and lend ES funds between themselves on an unsecured basis in the interbank market at a rate of interest which tends to be slightly higher than that on bank-dealer loans, reflecting the lack of collateral.

Both banks and authorised dealers also transact in non-ES funds, both with each other and with other non-bank institutions;

- the market for non-ES funds (often called "next-day" or "bank-cheque" funds). This part of the market deals in funds transferred by cheques paid into an account at a commercial bank. These funds are cleared overnight and give rise to ES obligations for banks on the next day. Banks, authorised dealers and other non-bank institutions participate in this market.

The interest rate paid by the authorised dealers on overnight ES loans from banks is called the interest rate on ES funds. The interest rate paid by the dealers on overnight loans in non-ES funds is the secured non-ES funds rate. The weighted average of these two rates is called the official cash rate.

The interest rate on unsecured overnight loans of non-ES funds is called the unofficial cash rate — this is generally higher than either of the two components of the official cash rate, reflecting the lack of collateral.

Of the two markets, that in non-ES funds is the larger — there are no statistics collected, but there could be $15 billion or more outstanding at any time. The market in ES funds typically has about 2\frac{1}{2}$ billion outstanding.

The two markets are closely linked. Banks expecting to receive inflows (respectively pay outflows) of ES funds tomorrow can either wait until tomorrow and lend (respectively borrow) in the ES market then or they can

lend (respectively borrow)[2] in the non-ES market today to offset tomorrow's expected flows. In the latter case, the banks are using what is called "float" — the amount which spills into the ES market tomorrow as a result of transactions today. Banks' choice between the two options will be based on a number of factors. One is a comparison of the non-ES rate today and the expected ES rate tomorrow. More important is the level of ES balances that each bank has — if high, the bank is likely to lend non-ES funds today so as to avoid building ES balances up further; if low, the bank is likely to wait so as to build up its ES balances and lend them in the ES market tomorrow. Indeed, in the latter case, the bank may even seek to borrow non-ES funds today to add to its ES surplus tomorrow.[3]

Authorised dealers facing a surplus (respectively deficit) today can meet this by repaying loans (respectively borrowing) in either the ES or non-ES markets today. In both cases they will balance their clearing accounts at the Reserve Bank, but each will have a different implication for flows of ES cash tomorrow. The decision will be based on comparing ES and non-ES interest rates today.

Overall, the linkages between the two parts of the cash market create a dynamic (or intertemporal) effect which is the key to understanding the operation of the cash market as a whole.

2. DAILY EQUILIBRIUM

Although it is the smaller part, it is the ES funds market which is central to an understanding of the operation of the overall market. It is here that the

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[2] In this context, "lend" should be taken to include buying securities and "borrow" should be taken to include selling securities (either outright or under repurchase agreements).

[3] When a bank (say, Bank A) lends non-ES funds today to a party which is, or banks with, another bank (say, Bank B), it must pay Bank B the "float" interest rate on this amount overnight — as it does on all uncleared payments. This normally does not affect the decision to lend, however, since Bank A will receive the float rate on the same amount when the loan is repaid. The float rate is set each week as the average of the official cash rate during that week. Banks settle for their net float payments each month in arrears — as this example suggests, the netted payments tend to be quite small given the large flows of funds that occur through the overnight clearings.

Reserve Bank operates, setting the parameters for the cash market as a whole.

Daily equilibrium in the ES funds market requires that the demand for and supply of ES funds to banks and authorised dealers are equated.

Supply of ES funds to banks comes from:

- an opening surplus of the banking system — i.e. the net amount owed by the Reserve Bank to other banks on account of the previous day's transactions in non-ES funds involving the Reserve Bank and its banking customers;[4]

- sales of currency to the Reserve Bank (these are usually small, the exceptions being immediately after Christmas and Easter holidays);

- recall by banks of ES loans made in the past to authorised dealers;

- rediscounts by banks of CGS at the Reserve Bank.

It should be noted that, while interbank loans of same-day funds do exist, they can only redistribute the supply between banks and cannot alter the supply to banks as a group.

Sources of ES funds to authorised dealers are:

- sales of CGS to the Reserve Bank in its daily operations at about 10:30;

- loans from banks transferred in ES funds;

- sales of CGS to the Reserve Bank under late repurchase arrangements after 14:30.

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4 This also includes some transactions in ES funds which were pre-arranged — e.g. sales of foreign exchange to the Reserve Bank (which would have been arranged two days in advance).

Demand by banks stems from:

- an opening deficit of the system;

- purchases of currency from the Reserve Bank (these are usually small, the exceptions being immediately before Christmas and Easter holidays);

- take-up of CGS won at tenders but not yet settled;

- placement of new loans with authorised dealers;

- leaving cash in exchange settlement accounts at the Reserve Bank.

Demand by authorised dealers stems from:

- purchases of CGS from the Reserve Bank in its daily operations at 10:30;

- take-up of CGS won at tenders but not yet settled;

- recall by banks of past ES loans;[5]

- leaving cash in clearing accounts at the Reserve Bank.

Also relevant are dealers' sales and purchases of securities, or loan transactions in non-ES funds, with banks and non-banks.[6] These sources all provide or use non-ES funds, but are relevant to the ES market as the Reserve Bank gives authorised dealers same-day value in their clearing accounts for these transactions. Hence, the authorised dealers can offset a potential surplus (respective shortage) of ES funds by creating a matching shortage (respective surplus) in their transactions in non-ES funds.

Of all the uses of ES funds listed above, the options of leaving positive balances in accounts at the Reserve Bank are rarely used in any significant

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[5] Authorised dealers are not permitted to make loans to other parties.
[6] Banks do not lend non-ES funds to dealers directly, but can sell or buy securities with them for non-ES payment, including under repurchase agreements.

degree, as the Reserve Bank pays zero interest on balances in these accounts.[7] All other uses pay a market return to the owner of the cash.

Equilibrium

Ignoring the options of leaving cash uninvested — i.e. in exchange settlement accounts at zero interest — the equilibrium condition for the official market can be represented algebraically for day t by:

$$S_t + O_t + R_t - T^b_t - T^d_t + L^n_t + B^n_t = 0 \qquad (1)$$

where S_t = net opening surplus of the market (negative if deficit)

O_t = net purchases of CGS by the Reserve Bank in its open market operations and late repurchases (excludes unwinding repurchases, which are included in S_t)[8]

R_t = rediscounts of CGS by banks

T^b_t = take-up of newly-issued CGS by banks

T^d_t = take-up of newly-issued CGS by authorised dealers

L^n_t = net new loans to authorised dealers from non-banks

B^n_t = net sales of securities by authorised dealers to banks and non-banks

The net opening surplus of the market itself reflects a number of factors:

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[7] The Reserve Bank can at its discretion accept interest-bearing deposits from banks, but these are rarely used.

[8] If the Reserve Bank conducts foreign exchange swap transactions in ES funds, they would also be included in this term as their effect on the cash market is identical to that of conducting transactions in repurchase agreements using CGS.

$$S_t = G_{t-1} + M^n_{t-1} + M^b_t + M^d_t + Z_{t-2} + N_t + U^d_t - (L^n_{t-1} + B^n_{t-1}) \qquad (2)$$

where G_{t-1} = net Government deficit on day t-1 arising from budget transactions

M^n_{t-1} = maturities of and interest due on CGS paid to non-banks on day t-1

M^b_t = maturities of and interest due on CGS paid to banks

M^d_t = maturities of and interest due on CGS paid to authorised dealers

Z_{t-2} = net sales of foreign exchange to the Reserve Bank on day t-2

N_t = net sales of Australian currency to the Reserve Bank

U^d_t = net repurchases of CGS by the Reserve Bank as a result of past sales under repurchase agreements (negative if resales)

L^n_{t-1} = net new loans in non-ES funds to authorised dealers from banks and non-banks on day t-1

B^n_{t-1} = net sales of securities by authorised dealers to banks and non-banks on day t-1

Those items which appear dated t-1 are paid on day t-1 in non-ES funds and affect ES on day t after being cleared overnight. Z is dated t-2 because foreign exchange transactions are normally arranged two days before settlement, with that settlement being effected in ES funds.

Substituting (2) into (1) yields:

$$G_{t-1} + M^n_{t-1} + (M^b_t + M^d_t) + U^d_t + Z_{t-2} + N_t + O_t + R_t - (T^b_t + T^d_t) + (L^n_t + B^n_t) - (L^n_{t-1} + B^n_{t-1}) = 0 \qquad (3)$$

The dynamics of daily equilibrium arise because of the presence of the term $L^n_{t-1} + B^n_{t-1}$ in equation (3). This represents the net flow of non-ES cash obtained by authorised dealers from banks and non-banks on day t-1, either in the form of new loans or sales of securities. This net flow helped to balance the sources and uses of cash on day t-1, but also spills over to affect the equilibrium of the cash market on day t.

Of the terms in equation (3), G_{t-1}, M^n_{t-1}, $(M^b_t + M^d_t)$, U^d_t, Z_{t-2}, N_t and $(L^n_{t-1} + B^n_{t-1})$ are all predetermined, so the equation can be written:

$$O_t + R_t - (T^b_t + T^d_t) + (L^n_t + B^n_t) = X_t \qquad (4)$$

where $X_t = G_{t-1} + Z_{t-2} + N_t + M^n_{t-1} + (M^b_t + M^d_t) + U^d_t - (L^n_{t-1} + B^n_{t-1})$

The intertemporal workings of equation (4) can best be illustrated with a simple example. Assume that on day 1 X_1, R_1, and $T^b_1 + T^d_1$ are all zero — i.e. the system starts off in balance, there are no rediscounts and there is no take-up. Assume now that the Reserve Bank sells $100 million worth of securities to the authorised dealers in its daily operations — i.e. $O_1 = -100$. As there are no additional ES funds available, authorised dealers will need to choose one of two options in response:

- raise $100 million in non-ES funds to finance the purchase of the securities from the Reserve Bank, either by raising new loans of $100 million or selling securities worth $100 million to banks or non-banks. In either case, $L^n_1 + B^n_1 = 100$ and the cash market is in equilibrium.

  Assume for the moment that this is what the authorised dealers do. On day 2, the spillover term from day 1 is $(L^n_1 + B^n_1) = 100$ and, if all other terms in X_2, R_2, and $T^b_2 + T^d_2$ are again assumed to be zero, banks will have to pay the Reserve Bank $100 million in ES funds to settle their overnight clearances and will call back this amount from authorised dealers, in turn causing dealers to have to raise another $100 million from

non-banks. If the Reserve Bank does not purchase securities from the dealers to offset this, $L^n_2 + B^n_2$ will be equal to \$100m, and the banks will be short \$100m on day 3. The process would repeat on the third day, and so on.

While the process continues, the level of banks' loans to authorised dealers will decline by \$100 million each day. This is offset by a combination of rises in the level of dealers' borrowings in non-ES funds and rises in the holdings of securities by banks or non-banks as dealers seek \$100 million from non-banks each day. The result would be upward pressure on interest rates and security yields, which would persist and even intensify as the process went on from day to day;

- sell CGS worth \$100 million to the Reserve Bank under the late repurchase facility. In this case, the value of O_t is reset to zero and the ES market is in equilibrium.

When the late repurchase agreement expires (which could be next day), O_t will have a value of -100 if the Reserve Bank does not do any other dealing. Authorised dealers will then have to raise another \$100 million from non-banks on that day, and the opening situation on day t is replicated.

Hence, use of the late repurchase facility merely postpones the need for other adjustments of the type outlined in the first option.

Of course, in practice the Reserve Bank would not allow the adjustment process to continue until banks' ES loans to authorised dealers became too low. During this process, interest rates on cash and securities will change as demand by and supply from the authorised dealers and banks change from day to day (the ways in which this occurs are discussed in some detail in Section 3 below). But the Reserve Bank has announced targets for cash rates — in order to keep to that target rate, the Reserve Bank would remove the imbalance by stepping in to inject cash through its market operations if no injection occurred from exogenous sources (e.g. from a Government deficit) or from rediscounts by banks (if cash rates rose to the point where rediscounts were cost-effective). Nevertheless, what this market structure does provide is a high degree of leverage by the Reserve Bank over the

market and hence it ensures that the Bank has the power to move the cash market quickly backward or forward, as the case may be, should there be some disturbance to cash rates caused by one of the exogenous factors in equation (4).

3. DETERMINATION OF CASH RATES

In practice, the official and unofficial cash rates are determined simultaneously by a complex interplay of demand and supply for the different categories of cash. Further, as both ES and non-ES loans are used by market participants to fund holdings of securities, typically of fairly short maturities, changes in demand for or supply of cash will affect the demand/supply balance in markets for these securities. Yields on these securities will be determined simultaneously with cash rates and will, in general, reflect expectations about the levels of cash rates over the term of the securities.

In this section, however, the determination of cash rates is presented using a partial equilibrium approach which brings out the key linkages between the different parts of the market. It first outlines the workings of the unofficial cash market and the determination of the unofficial cash rate. It then shows how the official cash rate is determined, taking the unofficial rate as given.

The Unofficial Cash Rate

As indicated by the model in Section 2, it is movements in non-ES loans to authorised dealers and the broader market for securities which play the pivotal role in the adjustment of the market in ES funds to changes in ES cash flows. When the level of non-ES loans to authorised dealers changes, it adds to or subtracts from the availability of non-ES funds in the wider unofficial market.

Under its present operating procedures, the Reserve Bank announces a target level for cash rates. In practice, it is the unofficial cash rate which is targeted by the Bank (though, as explained later, the unofficial and official cash rates are about equal). The unofficial cash rate fluctuates from day to day but the Bank acts to keep it fairly close to the announced target. Market

participants will expect the unofficial cash rate to equal the target rate on average in the future until a new target is announced.

Demand for non-ES funds is likely to be highly elastic at the Reserve Bank's announced target interest rate. Above that rate, demand will fall steeply as the loan rate approaches the late repurchase rate (at which dealers can obtain cash from the Reserve Bank) or the rediscount rate — the late repurchase rate is normally the lower of the two and in practice is often equal to the announced target rate for unofficial cash. Below the announced target rate, demand will rise steeply as participants try to take advantage of what they expect to be a temporary low cost of funds.

Supply will be positively related to the unofficial cash rate, but it too is likely to be fairly elastic in the vicinity of the announced target rate. Because participants expect rates to remain close to the target rate, they will be willing to lend considerably more for a small rise in returns and, conversely, will curtail lending quickly if rates were to fall by a small amount.

Graphically, this can be represented by:

Figure 1: The Unofficial Cash Market
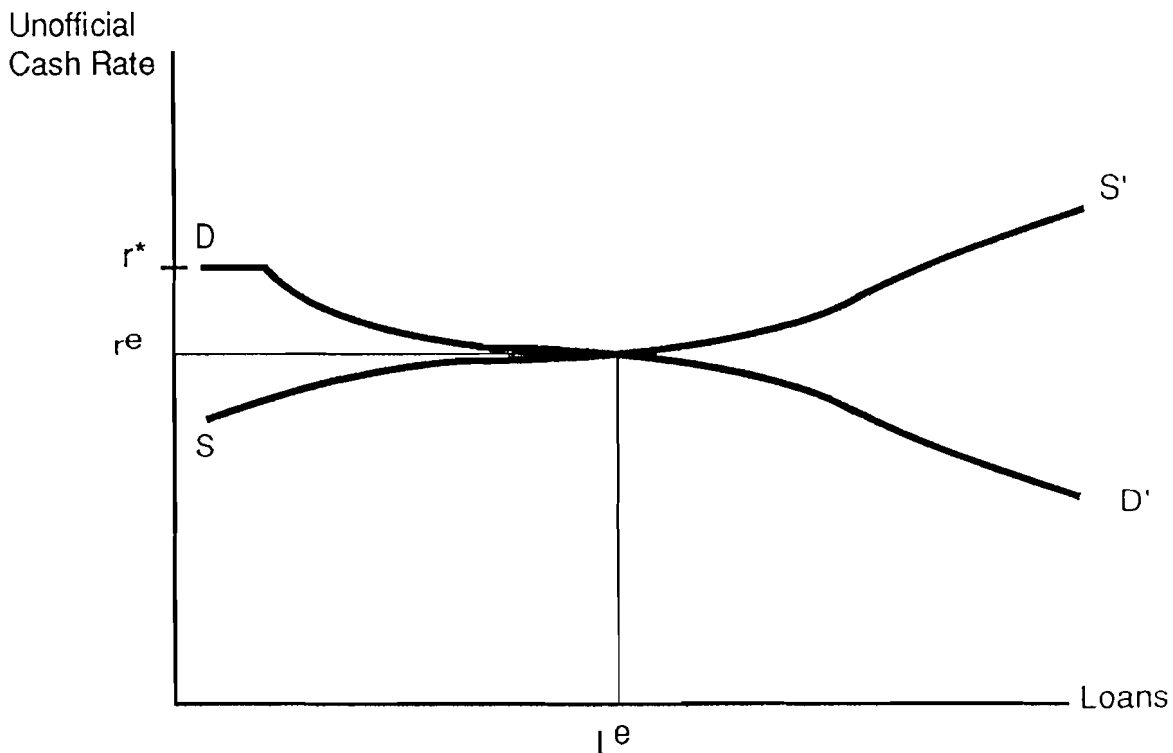
In Figure 1, DD' represents the demand for non-ES loans and SS' the supply of these loans. Both curves are relatively flat at around r^e, the announced target interest rate; r* is the late repurchase rate, at which dealers would cease to bid in the market for non-ES funds and instead would sell CGS to the Reserve Bank under repurchase arrangements to raise cash.

It should be emphasised that the shapes of the supply and demand curves depend on perceptions in the cash market that the Reserve Bank will take action to keep cash rates close to the announced target rate r^e and about where the Bank will choose to set the late repurchase rate.

This model can be used to analyse the effect on the unofficial cash rate of a one-off sale of CGS by the Reserve Bank, as shown in Figure 2.

Figure 2: The Unofficial Cash Market
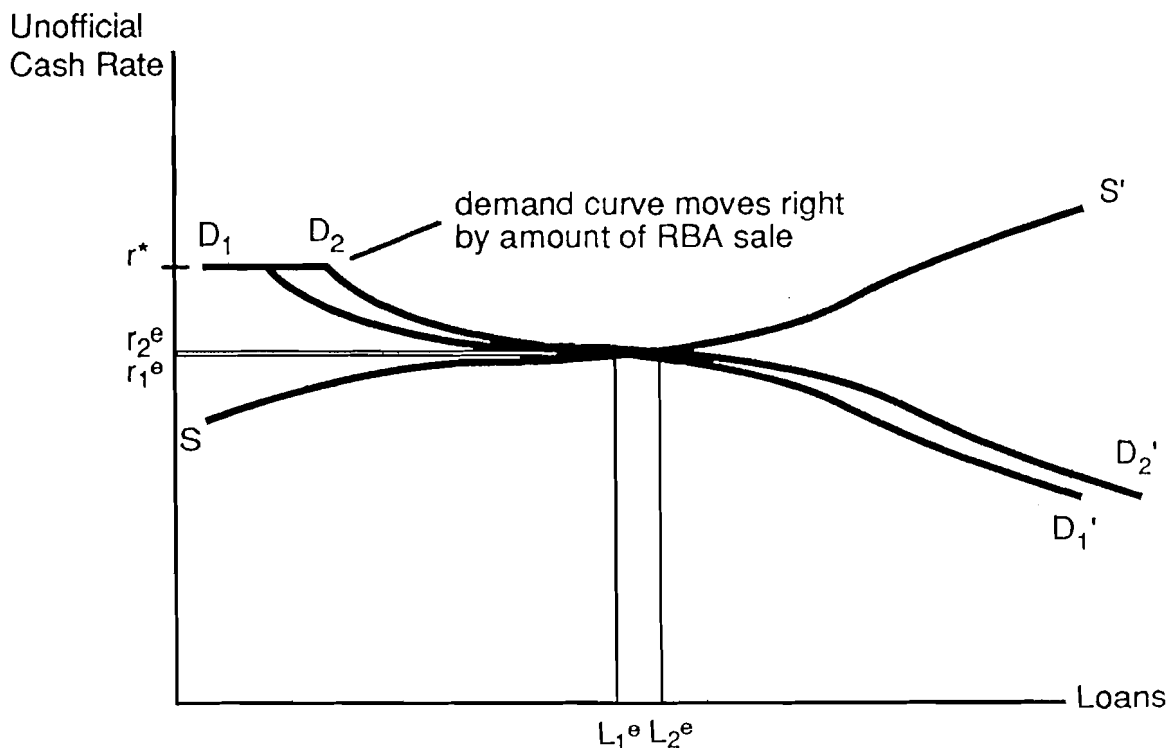
The sale of securities by the Reserve Bank causes a rightward shift in the demand curve for non-ES loans, from D_1D_1' to D_2D_2', as authorised dealers enter the market to fund the CGS they have bought from the Bank. The equilibrium level of loans rises from L_1^e to L_2^e and the equilibrium unofficial cash rate rises from r_1^e to r_2^e.

The next day, the spillover effect discussed in Section 2 would cause the demand curve to move right again by $L_2^e - L_1^e$. This process would continue from day to day while the authorised dealers were substituting non-ES funds for ES funds in their stock of loans.

It is clear from this analysis that the Reserve Bank would have to sell a large amount of CGS to cause a significant rise in the unofficial cash rate. Alternatively, it would have to sell a smaller amount and allow the effects to keep spilling over for several days, with the cash rate rising from day to day. However, this results from a set of demand and supply relationships which are based on the expectation that the Reserve Bank does not want to move the cash rate by a significant amount, but in fact wants to keep it within a narrow range. When the Bank does want the rate to move, it announces a new target which causes the curves to reshape, with their elastic segments at the new target rate, because the market knows that the Bank will seek to manage the flows of ES funds to clear the non-ES market at that rate. Indeed, having announced a new target, there may be very little need in practice for the Bank to buy or sell CGS to add pressure for the cash rate to move close to the new target.

The Official Cash Rate

As noted in Section 2 above, there are few uses for ES cash in the hands of banks which are surplus to their needs for exchange settlement. Banks can use them to make deposits with the Reserve Bank (generally at low or zero interest), to purchase notes and coin, to purchase CGS previously won at tender but not yet taken up, or to make loans to authorised dealers. Only the last two offer a market return on the funds, and of those the former is not always available.

Banks are willing to lend their ES funds to authorised dealers at less than the unofficial cash rate, for two reasons:

- the presence of a captive market element, reflecting the relative lack of opportunities for banks to invest ES funds;

- banks' loans to authorised dealers are secured, either by CGS (attracting a concessional risk weighting for capital adequacy purposes and included in PAR) or other securities.

The official cash rate is the average rate paid by authorised dealers on all their loans. From an authorised dealer's point of view, ES loans from banks and loans of non-ES funds from banks or others are very close substitutes — both can be used to square the dealer's clearing account. As a result, dealers' demand for ES loans is highly interest-elastic.

The market for official cash can be represented graphically as follows:

Figure 3: The ES Cash Market
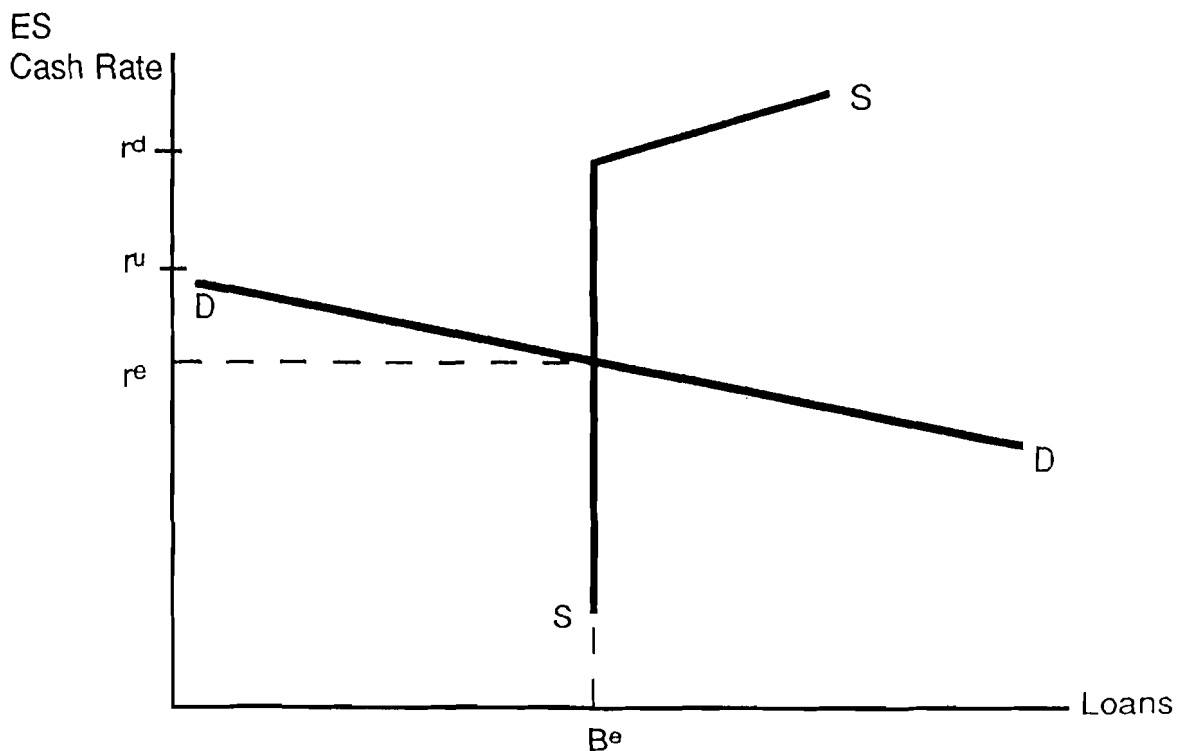
where r^u represents the unofficial cash rate
r^d represents the rediscount rate
B^e represents the surplus ES available to banks.

In Figure 3, the SS curve is drawn as vertical at loan rates below r^d. This would be the case if there are no CGS previously won at tender by banks but not yet taken up. If banks have such CGS available to be taken up, they

might use some ES for this purpose if the loan rate falls sufficiently and the SS curve may kink to the left at some point.

To determine the official cash rate, it is necessary to know r^e, r^u and the proportions of loans to authorised dealers in ES and non-ES funds. Generally, the proportion in ES loans is large — 80 per cent is not unusual — so the official rate is dominated by the rate in the ES part of the market.

Loans of ES funds between banks on the interbank market are generally at a rate slightly higher than the rate on ES loans to dealers, because the interbank loans are unsecured.

In Figure 3, the rate on ES loans will be r^e, which is less than r^u as the demand curve for ES funds is always below that point. If ES funds are in plentiful supply, r^e may be considerably below the unofficial cash rate but typically the margin is around 10 basis points (0.1 percentage point). In such a state, however, banks which held high levels of ES loans to authorised dealers would be much more willing to lend non-ES funds in an attempt to run down their ES holdings — this would tend, in terms of Figure 1, to shift the demand curve for non-ES loans to the left and the supply curve to the right. In the absence of some offsetting withdrawal of ES funds from the market the plentiful supply of ES funds would flow through to lower unofficial cash rates and the normal margin between official and unofficial rates would tend to be restored. Of course, if the unofficial rate were to fall too far below the Reserve Bank's announced target rate, the Bank would step in to remove ES funds and reverse the process.

4. CONCLUSION

This paper has presented a simple model of the workings of the Australian cash market, illustrating the key features of the same-day/next-day nexus on which the dynamics of the market depend and the impact of changes in cash flows on cash rates.

The model presented here reflects the contemporary structure of the market — in particular, it embodies the Reserve Bank's post-January 1990 approach of announcing changes in monetary policy in the form of new target levels

for cash rates. Under this operating regime, cash rates have generally been within quite narrow bands around the announced target rates.

There are, of course, some shortcomings of a simple model like the one presented here. One important one is that the model makes it look too easy to keep cash rates at their target levels. In fact, there have been occasions when cash rates have risen sharply above the announced target levels for short periods. The model presented in this paper suggests that this would occur if there was a very large outflow of ES cash but even then the safety valves — the late repurchase facility for authorised dealers and the rediscount facility — should limit the scope for cash rates to rise.

These safety valves — indeed, the whole of the Reserve Bank's intervention in the market — depend on the ready availability of CGS to sell to the Bank. There are times when friction in the market, associated with the existence of credit and dealing limits between counterparties, makes it difficult to transfer holdings of securities — and hence access to cash — to the parties that need it. Of course, like all frictional effects, these tend to be short-lived and even then the resulting fluctuations in cash rates are of a smaller order of magnitude than occurred under past operating regimes.

Another reason why cash rates might move up sharply stems from each bank's desire to keep its level of ES balances above a minimum "comfort" level. If ES balances fall to this level, the bank will curtail its non-ES lending and begin to borrow non-ES funds in the unofficial market, with the aim of building up its ES levels the next day. If the overall level of ES balances is very low, many banks will be trying to do this simultaneously and, in terms of Figure 1, the supply curve for non-ES funds will move to the left and the demand curve will move to the right — a sizeable increase in the cash rate is likely. Of course, this cannot increase the overall level of ES balances available to banks — at most, it just changes the distribution between banks — but the resulting increase in the cash rate would be enough to induce the Reserve Bank to inject ES so as to return cash rates closer to their announced target level. Initially, this would depress the official cash rate but within a few days would also work through to the unofficial rate by reversing the shift in the demand and supply curves for non-ES funds.

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