



DP2001/05

Central banking: back to the future

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September 2001

JEL classification: N27, E58, E52

Discussion Paper Series

DP2001/05

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Abstract¹

Most textbook models explain the operation of monetary policy in terms of how the central bank influences the market rate of interest by managing the supply of its liabilities relative to the demand for them. Yet some central banks no longer operate that way and, instead, set an interest rate for their own liabilities. This raises the question of how under that modus of operation the central bank's rate is transmitted to the financial markets. Another question concerns whether advances in information technology may erode the demand for central bank money and hence threaten the ability of central banks to implement monetary policy. There are, however, some simple answers to these conundrums. In an open and efficient financial system, the central bank can determine the market rate of interest by standing in the market at its own rate, and rely on interest rate arbitrage to transmit that rate to the market. It follows that even if advances in information technology result in a diminished use of, and thus reduced demand for, a stock of central bank money, that

¹ The ideas in this paper owe much to discussions over a number of years with my colleague Michael Reddell, and with Michael Woodford while he was Professorial Fellow in Monetary Economics at Victoria University of Wellington and the Reserve Bank of New Zealand in June 2000. I am also grateful to them both for comments on previous versions of this paper, as I am for comments from David Archer, Jo Archibald, Nils Bjorksten, Anne-Marie Brook, Geof Mortlock, Steven Burnell, Paul Dalziel, Benjamin Friedman, Charles Goodhart, Arthur Grimes, Dean Minot, Weshah Razzak, and Christie Smith. The usual disclaimers apply: any remaining errors in the analysis are mine, and the conclusions do not necessarily represent the position of the Reserve Bank of New Zealand.

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need not undermine a central bank's capacity to implement monetary policy.

1 Introduction

In recent years there has been increasing interest in the question: what is at the heart of a central bank's ability to dictate monetary policy? Why is it that if the central bank says the cash interest rate will be "x", it is "x", while if a commercial bank were to say it will be "y", it would remain "x"? What is it about a central bank, at a fundamental level, that gives it an ability to drive the whole financial market, and ultimately to determine the price level? And why do other banks not have the same ability?

These might seem odd questions. After all, there is little doubt that central banks can and do dictate monetary policy. But when people ask how and why it works, many central bankers find providing a simple, intuitive, explanation a challenging task.

Two developments have added to the challenge. First, whereas most textbook models of how monetary policy is transmitted from the central bank to the financial markets centre on the role of the central bank in managing the supply of its liabilities, some central banks no longer operate that way. Instead they set an interest rate directly for their own liabilities. How under that *modus* of operation is the central bank's interest rate transmitted to the financial markets?

Second, monetary economists are becoming increasingly interested in whether innovations in information technology may result in the demise of central banking.² Benjamin Friedman, for example, has suggested that "several trends already visible in the financial markets of many countries today threaten to weaken or even undermine the relevance of [the central bank's] role as a monopolist over the supply of bank reserves". He sees these trends as including "the erosion of demand for bank-issued money, the proliferation of non-bank credit, and aspects of the operation of bank clearing mechanisms". In asking what to make of these "threats", he wonders whether

² See, for example, Friedman (1999), King (1999), Posen (2000), and Woodford (1997).

“potentially aggressive regulatory measures [may be] required in an effort to forestall them” (Friedman (1999)).

This paper seeks to respond to these challenges to our understanding of how monetary policy works. It comprises three further sections. Section 2 summarises the standard textbook model. It casts back to the underlying foundations of that model, and examines how they relate or, as the case may be, do not relate to a modern, deregulated, monetary system. Section 3 shows how, by modifying a key assumption in the textbook model, we arrive at a quite different understanding of how monetary policy can be transmitted from the central bank to the financial markets. It also explains how those central banks that set an interest rate for their own liabilities can transmit that rate to the financial markets without undertaking operations in those liabilities. Section 4 draws the analysis in the preceding sections to a conclusion, and then offers some thoughts on how that analysis provides a platform for exploring a wider range of contemporary central banking issues.

2 The textbook model of monetary policy transmission

The central idea in most textbook models of how monetary policy is transmitted from the central bank to the economy is that there exists a stable demand for a stock of money, the supply of which is under the control of the central bank. By undertaking market operations to alter the money supply, the central bank causes a gap to open up between how much money people and firms want to hold, and how much is available. This sets in train adjustments in the financial markets and in the wider economy which re-establish a balance between the central bank-determined supply of, and the demand for, money. (We consider a little more closely what we mean by “money” in a moment.)

To elaborate, consider the situation where the central bank reduces the money supply. Faced with the resulting diminished supply of money, some people and firms may be unable to transact and will therefore compete more strongly for the money balances that are available. They do this by offering to borrow money from those holding it, or, equivalently, by offering to sell other assets. For

example, bonds might be sold in exchange for money. To induce holders of money to lend (or exchange their money for other assets), the interest rate (or asset yield) is bid up. The resulting increase in interest rates discourages spending.³

Through these channels, higher interest rates cause aggregate spending, and its accounting counterpart, aggregate income, to adjust to a lower level. Consequently, if, as is postulated by the model, the demand for money is a (positive) function of income and expenditure, the demand for money also falls.⁴ This adjustment process continues until equilibrium between the demand for money and the (reduced) supply of money is re-established. The end result is that a tightening of monetary policy, in the form of a central bank-orchestrated contraction of the money supply, results in reduced spending and income, broadly in line with the reduction in the money stock.

That, in the broadest of terms, is how textbooks generally explain how monetary policy works. (The same account applies to how a central bank brings about an easing of monetary policy, except that the signs are reversed.) There are two key elements to the model: the determination of the interest rate in the “money market” as the rate that reconciles the supply of and demand for money; and the effect of that interest rate on spending.

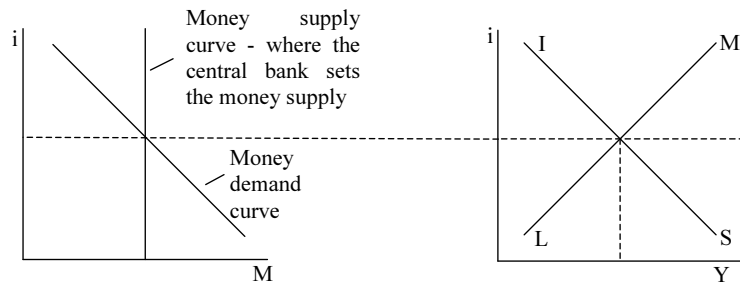
The so-called IS-LM model, which is illustrated in figure 1, is perhaps the classical representation of these relationships. I and S represent investment and saving respectively, and the so-called IS curve represents the locus of interest rates (i) which equilibrate saving with investment in the goods market at different levels of income (Y). The LM curve similarly represents the locus of interest rates that equilibrate the demand for money, or in other words

³ In an open economy, the higher interest rate also attracts capital from abroad and raises the exchange rate, which reduces spending by foreigners, and thus price pressures, on domestically produced goods and services, as well as reduces the price of imports directly.

⁴ There is a large literature on the demand for money, prominent among which is Laidler (1985). See Siklos (1995) for more recent analysis of the demand for money in New Zealand, and Sriram (1999) for a comprehensive survey of international evidence.

liquidity preferences (L), with the supply of money (M), at different levels of income. The intersection of these two curves gives the interest rate that is consistent with equilibrium within, and between, the money market and the goods market.⁵

Figure 1
The IS-LM model
The money market



2.1 The demand for money

Given the centrality of the demand for money to the model, it is worth considering more closely what we mean by “the demand for money”. To begin with, we need to be clear on what we mean by money.

Money is generally defined as something that serves as a unit of account, store of value, and means of exchange.

The liabilities of a central bank, comprising the notes and coin they issue and the deposit liabilities held at the central bank by the commercial banks, fulfil all three functions, and are often referred to as base money. Notes and coin are used as a means of exchange by the public, and central bank deposit liabilities are used as a means of exchange amongst commercial banks (something we discuss further

⁵ A more complete exposition of the IS-LM model can be found in any good undergraduate macroeconomic textbook. For example, see chapter nine of Mankiw (1992).

on). Notes and coin and commercial banks’ deposits at the central bank are obviously stores of value, in that they represent claims that can be used to effect future purchases. Moreover, these Reserve Bank liabilities are denominated in units that serve as the ubiquitous unit of account. Within most economies, virtually all contracts for value are expressed in terms of units of the liabilities issued by the central bank: in the case of New Zealand, prices are generally expressed in (Reserve Bank of) New Zealand dollars.

Additionally, however, the liabilities issued by commercial banks also serve as a store of value and means of exchange, indeed, to an overwhelmingly greater extent than do the central bank’s liabilities. (The deposit liabilities of the commercial banks in New Zealand at June 2001 amounted to NZ\$123 billion,⁶ compared with less than NZ\$3 billion of Reserve Bank currency and deposit liabilities on issue.)

However, commercial bank liabilities, of themselves, do not serve as an independent unit of account. Rather, they are generally denominated in terms of the liabilities of the central bank. In other words, commercial bank deposit liabilities derive their monetary character from being convertible at a fixed parity into the liabilities of the central bank. For this reason, only the central bank’s liabilities encapsulate all the qualities of money. To use an analogy from the pharmaceutical industry, commercial bank-issued money can be thought of as a “generic” product, whereas central bank money is the genuine “branded” product. But, as with pharmaceuticals, the generic product is generally used as if it were equivalent to the branded product.⁷

⁶ While only NZ\$15 billion of these commercial bank deposit liabilities were capable of being used directly as a means of exchange, that is were capable of being transferred directly from one party to another through the payments system, the balance was mostly issued on terms that enabled reasonably ready transfer to accounts on which payments facilities could be operated.

⁷ This analogy is not strictly correct, to the extent that generic products in the pharmaceutical industry can be an exact chemical replica of the branded product (even though they do not have the “name guarantee” implicit in a brand). Commercial bank liabilities, by contrast, are not an exact replica of central bank liabilities, as their convertibility at a fixed parity into the central bank’s liabilities is not 100 per cent assured. But the monetary system works on the basis that convertibility is assured – and does not work when that is not the case.

Moreover, as already mentioned, it is only those monetary liabilities that are under the control of the central bank that fit the definition of money implicit in the model we have described. In days gone by, when central banks had regulatory powers over the lending of commercial banks, the money supply under the control of the central bank could perhaps have been taken as including the broader, commercial-bank-deposit-inclusive, monetary aggregates. However, this is clearly not the case in today's deregulated world. Accordingly, in this paper we take the money supply as being limited to the central bank's own liabilities.⁸

Now that we have defined money, we also need to consider further what is meant by a stable demand for money.

If control over the money supply is to be effective as a means to implement monetary policy, at least in the sense that a given movement in the money stock will result in a broadly proportionate movement in nominal income, two conditions need to be met:

- The demand for money needs to be a stable function of a few variables. The key explanatory variables are generally considered to be nominal income and the interest rate for alternative financial assets.⁹
- There must be no close substitutes for the money stock that the central bank is seeking to control. As we shall see, this means

⁸ This is not to say that the broader commercial-bank-deposit-inclusive measures of the money supply are not relevant at all. While they are not under the direct control of the central bank, they do convey information about how the central bank's policy actions are being transmitted into the banking system. For example, rapid expansion in banks' lending, and hence in banks' deposits, provides *prima facie* evidence of a monetary expansion taking place. It is mainly in this "indicator" or "intermediate target" context that the broader measures of money have featured in monetary analysis.

⁹ Where the interest rate is assumed to be zero. Where interest is paid on money, for example, where interest is paid on the deposits commercial banks hold with the central bank, it is the margin between that rate and that for competing financial assets that is the relevant variable.

that the demand for money must be relatively inelastic with respect to the interest rate.

When these two conditions hold, the demand for money can be expressed as:

$$M^D = \alpha Y - \beta i$$

where β has a low value;

and both α and β have stable values over different sample periods.

That the α and β coefficients in equation need to be operationally stable in order for central banks to use it as the fulcrum for implementing monetary policy. In the absence of stable parameters, the consequences of a central bank-orchestrated adjustment to the money supply would be unpredictable. Such a fulcrum would not provide a reliable foundation for effective monetary policy.

But is a stable demand for money function alone, that is, stability in the parameter estimates, sufficient? Above we have suggested not, and that the parameter values also matter; in particular that an absence of close substitutes for money is indicated by way of a low interest elasticity of demand.

The intuition here is that if there are close substitutes, then a central bank-orchestrated contraction or expansion of the money stock would be counteracted by an offsetting expansion or contraction of the supply of the substitute. If the central bank were to, say, contract the supply of its own monetary liabilities with a view to creating a shortage to raise interest rates and curtail spending, but those wishing to spend could just as well use alternative forms of money (say, the deposit liabilities issued by commercial banks) then the effect on interest rates and spending would be minimal. In that case, any movement in the interest rate for the substitute, say, brought about by central bank market operations would result mostly, and directly, in a large change in the demand for money. In other words, equilibrium in the money market would be re-established mostly by demand adjusting to the changed supply, without much affect being transmitted to the wider economy.

Conversely, when the degree of substitutability is low, because money has important qualities not encapsulated in potential substitutes, the interest rate elasticity of the demand for money will be low. In that case, operations by the central bank to change the money supply have little effect on the demand for money, interest rates are forced to adjust, and equilibrium (between the supply of and demand for money) is re-established through the effect of interest rates working on spending (and its accounting counterpart nominal income).

Figure 2 illustrates these points. It shows how it matters for monetary policy implementation whether the interest elasticity of the demand for money is high or low. Figure 2(a) depicts an interest inelastic demand for money curve. It shows the amount of money that people and firms want to hold as being relatively insensitive to the interest rate across a wide range of interest rate levels. In this case, we can see that an adjustment by the central bank to the amount of money it supplies would move the market interest rate appreciably.

Figure 2(b) depicts the alternative case, where the demand for money is interest rate sensitive. In this case, where the amount of money that people and firms wish to hold is strongly related to the interest rate on competing financial instruments a change to the money supply would result in little sustained change in market interest rates. Any initial upward pressure on interest rates caused by contracting the money supply would feed back directly, and strongly, into a lower demand for money. The end result would be a change in the money stock but, because there would be little sustained change in interest rates, there would be little change in nominal income. Rather, there would be a change in the velocity of circulation of that stock of money.¹⁰ Or alternatively, to bring about the sorts of interest rate adjustments required in order for monetary policy to be effective in stabilising nominal income, very large scale movements in the money supply might be required. In that case, much of the appeal of money stock targeting as a policy implementation regime – which depends on policy-makers being

¹⁰ Where velocity of circulation is defined as the ratio of nominal income to the money stock.

able to rely on a change in the money stock resulting in a broadly proportionate change in nominal income – would no longer be present.

Figure 2(a)
Interest insensitive
demand for money

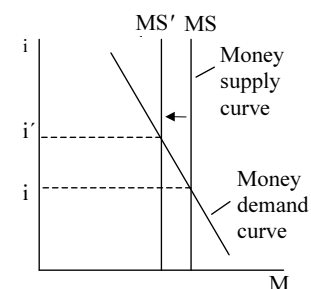
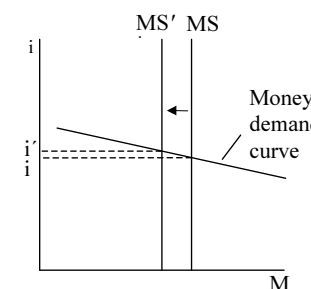


Figure 2(b)
Interest sensitive
demand for money



* Insofar as the shift in the money supply results in a sustained change in interest rates, which causes a change in nominal income, the demand for money curve would also shift to the left. This movement is not shown in the interests of maintaining simplicity.

That central bank money encapsulates unique qualities not capable of being replicated in potential substitutes, and hence that the demand for central bank money is relatively inelastic with respect to market interest rates, historically, has been a relatively uncontroversial proposition. But in today's world where financial markets are deregulated, where commercial bank liabilities are the predominant means of payment, and where advances in information technology are resulting in a proliferation of the means by which those liabilities can be so used, it is germane to ask whether that remains the case today.

Indeed, one might ask whether, because of these developments, central banks need to control interest rates directly, rather than indirectly via management of the money supply. But, as observed by Benjamin Friedman, this “only pushes the anomaly to be explained into a different arena”, as it leaves the question: “How, exactly, does the central bank affect interest rates?” (Friedman

(1999) page 5). We address this question in section 3. But before doing that, it is useful to examine the proposition that in today's deregulated banking system, there exist substitutes for central bank money and, hence, that an interest inelastic demand for central bank money may no longer be capable of being relied on to provide an effective fulcrum for the implementation of monetary policy. We examine this question by considering, in turn, the availability of substitutes for central bank currency (the central bank money used by the general public), and the availability of substitutes for central bank deposit liabilities (the central bank money used by commercial banks).

2.2 The demand for currency

Suppose a central bank acted to control the money supply by rationing currency, ie, notes and coin. In this case, if the central bank wished to tighten monetary policy it would supply less currency than demanded by commercial banks, so that commercial banks could not, in turn, meet the demand for currency from their customers. In practical terms, ATMs, for example, would regularly run out of bank notes, and banks, from time to time, would be unable to meet firms' till cash requirements.

According to the model outlined above, in these circumstances, there would be an unmet demand for currency and a market for currency would emerge. People and firms short of currency would offer a higher interest rate than that prevailing, so as to induce those holding currency surplus to their immediate payment and liquidity needs to lend it.

However, we can say with some confidence that this would probably not happen in today's world. It is much more likely that if people and firms were to find themselves short of central bank currency, they would simply use alternatives. Curtailing the availability of central bank currency to the public would more likely see people and firms switching to alternative means of payment in the small change transactions where physical currency tends to be the favoured means of payment. While the alternative means of payment, such as cheques and EFTPOS, may not be perfect substitutes for central bank currency in these transactions, there seems little doubt that the

inconvenience and transactions costs arising from having to use alternatives would be less than the cost involved in setting up a market for trading physical currency, or the potentially much greater cost of forgoing the ability to transact at all.¹¹ To be sure, people might be irritated as the result of not having available a reliable supply of notes and coin, but it is difficult to envisage that that shortage would drive an adjustment to the overall level of interest rates, nor a discernible effect on the level of spending in the economy.

If this is the case, then the condition that for monetary policy to be effective there must be no close substitutes for central bank issued money does not hold, at least not in respect of the note and coin component of the central bank's monetary liabilities. This is well-recognised amongst central banks, as evidenced by the fact that no central bank, at least no central bank in an economy with a modern financial system, has sought to implement its monetary policy by controlling the amount of notes and coin it issues.¹²

2.3 The demand for central bank deposit liabilities

If the note and coin liabilities issued to the public by the central bank do not provide an effective fulcrum for monetary policy implementation, might the deposit liabilities issued by the central bank to commercial banks fulfil this role? Can central banks influence market interest rates by increasing or decreasing the supply of those liabilities in a way that they cannot by increasing or decreasing the supply of notes and coin?

¹¹ Of course, if commercial banks could issue notes and coin of their own, then an obvious response to a shortage of central bank-issued currency would be for commercial banks to issue their own liabilities in this form. However, in most countries, there is a legal prohibition against anyone other than the central bank issuing physical currency. In New Zealand, this prohibition is contained in section 25 of the Reserve Bank of New Zealand Act 1989.

¹² For a period in the 1980s the Bank of England did have a M0 (note and coin) target. However, this served as an indicator of nominal economic activity, and as such was of the nature of an intermediate target, not something that the Bank of England sought to control by rationing the amount of bank notes and coin on issue.

Central banks traditionally have used reserve requirements to establish a stable demand for central bank deposit balances. This mechanism also features in many textbook models of monetary policy implementation. By prescribing reserve requirements, the central bank enforces a demand from commercial banks for its deposit liabilities.

Reserve requirements typically also have been structured so as to establish a stable demand for central bank deposit balances. On the one hand, banks subject to reserve requirements cannot allow their holdings of reserve balances to fall below the prescribed level without incurring financial penalties, thus creating a floor to the demand for such balances. On the other hand, by either not remunerating reserve deposit balances, or remunerating them at a below-market interest rate, there tends also to be a ceiling on the demand for such balances.

With a stable demand for central bank deposits established in this way, actions by the central bank to increase or reduce the supply of such deposit balances translate reasonably directly, and predictably, into the extent of shortage or surplus of reserve balances in the commercial banking system. Hence, reserve requirements can be used by the central bank as a reasonably direct lever to influence commercial banks' lending propensities, that is, the rate at which commercial banks issue their own liabilities. When financial markets, or at least interest rates, are deregulated, the transmission of monetary policy is mainly indirect, via interest rate effects. The effect on interest rates arises from banks competing more (or less) for the funds required to meet their reserve requirements, and the consequential flow-through to the interest rates banks charge on their lending. When interest rates are not free to adjust, the transmission tends to be more direct as banks are forced to manage the growth of their balance sheets by rationing lending directly.

In countries with modern financial systems, reserve requirements are being de-emphasised, and in some cases phased out. In Canada and New Zealand, reserve requirements have already been completely eliminated, since 1985 in the case of New Zealand. In other countries, reserve requirements have been lowered to levels that make the reserve requirement a non-binding constraint. Some

countries have also increased the remuneration on reserve balances such that most or all banks voluntarily hold central bank deposit balances at levels above those officially prescribed.¹³

In these countries, the demand for central bank deposit balances is nowadays seen as being underpinned not by reserve requirements, but by banks' needs to make payments, in much the same way as the public's demand for currency is thought to be transactions-demand based.¹⁴ Banks, too, face a need to make payments in the course of conducting their business. For example, when a customer of one bank uses a deposit balance as the payment instrument in a transaction with a customer of another bank, the "transfer" of the payer's deposit liability to the payee's account at the other bank needs to be matched by a corresponding transfer of value, or a "settlement", between the two banks. Similarly, when a commercial bank buys, say, government securities from another participant in the securities market, it needs to pay for those securities. So banks need money – a means of payment – like everyone else.

Central bank deposits feature importantly in many analyses of the inter-bank payment (or settlement) process, because they provide a means by which banks can "settle among themselves the net flows from payments that take place in the economy every day" with "...no risk of default and no delay in obtaining value" (Thiessen, (1996), page 6). The absence of risk attributes in central bank money has been seen as distinguishing it from possible alternative means of settlement in the inter-bank system, and in respects that are important for banks, given the centrality of the inter-bank settlement for the operation of, and for the maintenance of public confidence in, the banking system. To the extent that this is the case, it may be

¹³ The principal reason for central banks having moved away from reserve requirements is because, to the extent they involve the banks that are subject to them having to hold reserve balances involuntarily, they impose costs that other financial institutions are not subject to, and thus result in an uneven competitive "playing field". The result is that the institutions not covered by the requirements compete business away from those that are and, over time, even if the instrument was initially effective in creating a stable demand for reserves, it tends to become increasingly less effective.

¹⁴ See Friedman (1999), Henckel et al (1999), Sellon and Weiner (1996), and Thiessen (1996).

reasonable to view central bank deposit liabilities as being a means of settlement in the inter-bank settlement system for which there do not exist close substitutes. If that is so, it follows that commercial banks' demand for central bank deposit liabilities can be viewed as providing a fulcrum on which the central bank can achieve monetary policy leverage, by increasing or decreasing the supply of those deposit liabilities relative to the demand for them.

2.4 The New Zealand experience

During the period 1985 to 1999, monetary policy in New Zealand operated within a framework based on an inter-bank-settlement-driven demand by commercial banks for central bank deposit balances.¹⁵ The Reserve Bank's operating framework was centred on managing the supply of the Bank's deposit liabilities, as the means by which it sought to influence the inter-bank rate of interest.

This regime was based on the notion that commercial banks needed to hold a minimum level of settlement balances at the Reserve Bank for use in making inter-bank settlements, including those arising from the need to settle customers' transactions. By reducing the supply of those balances, and/or by increasing the cost of borrowing from the Reserve Bank in the event that banks had insufficient settlement balances, the Reserve Bank could put pressure on market interest rates.¹⁶

Conversely, because the deposit balances that banks held with the Reserve Bank were remunerated at a below-market rate of interest, the Reserve Bank could put downward pressure on interest rates and foster an expansion of bank lending by increasing the supply of those balances above the level required for effecting inter-bank settlements: holding "excess" reserves was unattractive relative to being "fully lent".¹⁷

¹⁵ Prior to 1985, commercial banks in New Zealand were subject to reserve requirements.

¹⁶ For a fuller discussion of how monetary policy was implemented under the regime in effect from 1985 until 1999, see Huxford and Reddell (1996).

In important respects this approach to implementing monetary policy was very effective. For example, for an extended period during the mid-1990s, interest rates were sustained at levels well above "world rates" and inflation remained consistently within a band of about 1 ½ to 2 ½ per cent.

Prima facie, therefore, it would seem that, even in the absence of reserve requirements, demand by commercial banks for central bank deposit liabilities can provide a robust base from which the central bank can implement monetary policy, by managing the supply of those liabilities.

However, we are still left with some questions. For example, if a range of close substitutes for central bank notes and coin is available as a means of payment, are there also substitutes that commercial banks could use to settle inter-bank obligations? One might imagine that, insofar as a monetary policy implementation regime relies for its effectiveness on penalties for holding settlement balances that are too large or too small, the commercial banks would adapt their behaviour in ways that would avoid, or at least minimise, exposure to those penalties.¹⁸ We can also ask whether such an implementation regime is necessary for monetary policy to be effective, or whether there might exist alternative – but equally effective and potentially more efficient – operating techniques.

Closer examination of New Zealand's experience in the 1990s suggests that the operating regime then in place may not have been as robust as the *prima facie* evidence suggests. It reveals that the underpinning of that regime – a stable transactions-based demand by commercial banks for central bank deposit balances – was in fact being gradually eroded. In the early 1990s a stock of Reserve Bank deposit balances on issue of around NZ\$20 million was thought to

¹⁷ In practice, policy came to be implemented more by way of public statements that indicated the likelihood of the quantity of deposit balances on issue being adjusted than by actual adjustments. This evolution, to what was known colloquially as "open-mouth operations", is described in Reserve Bank of New Zealand (2000).

¹⁸ Or that such penalties would promote disintermediation, in much the same way as the penalties inherent in ratio requirements were thought to promote disintermediation.

represent a “neutral” policy position for the banking system, that is, a supply that about matched demand and hence resulted in an inter-bank interest rate in line with a “neutral rate”, in terms of its effect on spending, income and inflation. But as time passed, the commercial banks found ways to economise on their holdings of such balances. By the mid- to late-1990s, it was found that Reserve Bank balances needed to be reduced to about zero, or even possibly to a negative level, to create a shortage and impart upward pressure on interest rates.

How is it, then, that commercial banks can settle their inter-bank obligations with a minimum of, and in the limit no, central bank money being used as the means of settlement? The main way by which this can be achieved is by banks netting intra-day settlements. Given that for every payment involving bank deposit liabilities there is a payer and payee bank, by netting the two-way stream of settlement obligations banks can reduce their need to hold settlement balances with the central bank to no more than required to effect the end-of-day net settlement.¹⁹

Moreover, to the extent that, even with effective payments netting arrangements in place, net settlements remain to be made, those net settlements can be made by the commercial banks accepting claims against each other.²⁰ That is, like the public, commercial banks are able to make payments by using commercial bank money in place of central bank money. Indeed, that is how in New Zealand inter-bank settlements have generally been mostly effected. During each

¹⁹ It might seem that with the advent of real-time-gross settlement in central bank funds, this is no longer the case. Certainly, real-time-gross settlement has introduced an additional layer into the process by which transactions are settled within the banking system, and this generates an intra-day demand for central bank liabilities. However, it does nothing to buttress the effectiveness of monetary policy because those intra-day liabilities are supplied on a perfectly elastic basis (like currency is supplied on a perfectly elastic basis) and, indeed, at a zero interest rate. (See White (1998) for a description of New Zealand’s real-time-gross settlement arrangements.)

²⁰ See Zodgekar (1996) for an outline of recent changes to the law in New Zealand that were enacted to facilitate, and more clearly establish the legal enforceability of, multilateral netting contracts. This legislation was enacted with a view, amongst other things, to facilitating the multilateral netting of inter-bank settlement obligations.

banking day the commercial banks engage in quite large-scale borrowing and lending directly amongst themselves, leaving only residual end-of-day-balances to be settled by way of a net drawing on, or addition to, the balance in their respective Reserve Bank accounts (and, if required to fund a shortfall, by raising funds from the Reserve Bank).

Of course, for commercial banks to agree to settle by accepting claims on each other, they need to be willing to accept each others’ liabilities as constituting good value. In other words, they need to have confidence in the solvency of the banks on whom they are willing to accept a claim as constituting payment, just as any individual who accepts a cheque drawn on a commercial bank implicitly accepts the liabilities of that bank as constituting good value. When economic agents are confident that commercial bank liabilities are readily convertible into central bank liabilities, commercial bank liabilities will be regarded as close substitutes for central bank liabilities. And when this is the case, we should not be surprised to find that commercial banks, if faced with a shortage of central bank liabilities relative to their settlement requirements, and penalties on borrowing from the central bank, would turn to using substitutes, just as would the public if faced with a shortage of central bank-issued notes and coin.

Having said that, commercial bank and central bank liabilities are not perfect substitutes. Commercial banks are subject to some insolvency risk, whereas central banks are bankruptcy proof.²¹ Hence, whilst commercial banks may generally be comfortable with accepting claims on each other to settle their inter-bank obligations, there are some limits that apply to this. Prudent banking practice is for all risks, even low risks, to be subject to limits. Hence, where inter-bank settlement obligations are particularly large, as may arise, for example, when customers of one bank make especially large payments to customers of another, the degree of substitutability between commercial bank and central bank liabilities as a means of

²¹ A central bank is bankruptcy proof if, as is invariably the case, its liabilities are legal tender. This means that a central bank can discharge its liabilities – at least those denominated in its own currency – by tendering its own liabilities. We discuss the meaning and significance of legal tender in more detail later in this article.

inter-bank settlement diminishes. So, are we left with some irreducible level of demand for central bank liabilities, after all?

Not necessarily. It is not difficult to envisage ways in which commercial banks can manage down the risks involved in effecting inter-bank settlements in commercial bank funds. One way is for commercial banks to “collateralise” the exposures that arise when taking claims on each other. Indeed, this already happens to some extent, in that inter-bank borrowing and lending beyond certain limits tends to be structured as repurchase agreements. (A repurchase agreement is an innovative arrangement by which a securities transaction is structured in a way to resemble a collateralised loan).²²

In the light of these possibilities for doing without central bank liabilities as a means of inter-bank settlement, one might ask whether structural or regulatory interventions are needed to maintain a demand within the banking system for a minimum level of central bank balances, to provide the underpinning required for the operation of monetary policy.

One view is that to underwrite a minimum demand for central bank deposit balances, the central bank needs to have a regular operational interface with the commercial banking system. In this way, the central bank can generate and control the terms applying to the settlement of, transactions between itself and the commercial banks. One of those conditions can be that the settlements must be effected in the central bank’s own liabilities, so as to generate a demand for those liabilities.²³

Perhaps the most obvious and natural roles that a central bank might seek as a means of generating that demand for its own liabilities, and

²² See Lumpkin (1998) for a good description of repurchase agreements.

²³ The central bank’s ability to insist on inter-bank settlements due to itself being paid in its own liabilities can be thought of as being founded on the central bank, like any other payee, having the right to insist on being paid in legal tender. (More on legal tender later.)

those that have featured in New Zealand thinking,²⁴ are for the central bank to:

- Act as banker to the government. Where the central bank acts as banker to the government, inter-bank settlements arise from payment transactions between the government and the public. For example, when members of the public (who bank with commercial banks) make tax payments to the government (which banks with the central bank), an inter-bank settlement obligation arises between the commercial bank and the central bank. The central bank’s ability to insist that these inter-bank settlements be made in central bank funds means that the central bank can create a demand from commercial banks for its deposit liabilities.²⁵
- Act as the monopoly supplier of notes and coin. The reasoning here is that commercial banks, in the absence of being able to issue their own notes and coin, have to source from the central bank the physical currency they need to meet customer requirements. This, too, sets up inter-bank settlement payments between the commercial banks and the central bank, on account of the commercial banks having to pay for the currency they buy from the central bank. It again enables the central bank to insist on transactions being settled by way of a transfer of value in its own funds, and on its own terms.

An alternative school of thought, which advocates “free banking”, is that structural rigidities or interventions such as these have no place in an otherwise deregulated financial system. Proponents of this view see no reason why commercial banks should be prevented from

²⁴ See Huxford and Reddell (1996) and Archer, Brookes and Reddell (1999).

²⁵ Alternatively, where the commercial banks do not already hold the central bank funds required for making the settlement, the central bank can dictate the terms (interest rate) on which they are borrowed from the central bank. The text-book model of how monetary policy works usually is constructed in terms of it being the liability side of the central bank balance sheet that matters, but there is no conceptual reason why the analysis cannot equally validly be constructed in terms of the counterpart amount of central bank credit extended, and the terms on which it is extended. What matters for the central bank to be able to implement monetary policy is that it can require the commercial banks to transact with it, and on such terms and conditions as the central bank dictates (Reddell 1999).

issuing transferable liabilities that take the form of notes and coin when, after all, commercial banks already issue very large amounts of transferable deposit liabilities, albeit in an electronic form. They ask why the issuance of transferable liabilities in a physical form should be the preserve of the central bank alone?²⁶ They might also ask: why should the government be forced to obtain financial services from the central bank, when there are no such stipulations on from where the government buys other services?²⁷ Implicit in these questions is a view that if structural interventions are really necessary for a central bank-administered monetary policy to be effective, then a centralised monetary policy is probably an unwarranted and unnecessary intervention in the economy.

A different possibility, however, is that the existence of a stable demand for a stock of central bank liabilities, and thus the need for structural rigidities designed to generate transactions in, and thus a demand for, those liabilities, is not the critical pillar that is required in order for a centralised monetary policy to work. There is a growing literature that suggests that such rigidities, and the inefficiencies they potentially create, could be dispensed with without undermining the ability of the central bank to give effect to its monetary policy. Woodford (1997), for example, considers whether “unchecked financial innovation and deregulation are... likely to result in macroeconomic instability, or a loss of control [by the central bank] over aggregate spending, and hence inflation”. He concludes that “there would seem to be no reason to impede progress toward the state of greater efficiency in financial intermediation for the sake of macroeconomic stability” (pages 6-7).

²⁶ See Dowd (1989) and Selgin (1988) for a more comprehensive discussion of the case for “free banking.”

²⁷ In New Zealand, the restriction on from where the Government buys banking services is already a narrow one. The processing of the government’s banking transactions has been contracted to a commercial bank, and the Reserve Bank’s operational role as banker to the Government is minimal. It amounts to no more than the government maintaining an account with the Reserve Bank that the Treasury uses to fund/receive each day’s net payments/receipts that have been processed by its commercial bank provider of transaction processing services. The main reason for retaining a residual role for the Reserve Bank in the government’s banking has been to generate a daily settlement between the Reserve Bank and the commercial banks.

In the next section we develop some of the ideas that emerge from this new literature.²⁸

3 An alternative paradigm

The challenge we set ourselves in this section is to explain how a central bank can transmit its monetary policy to the financial markets without recourse to a framework built around managing the supply of a stock of central bank money relative to an interest inelastic demand for that money. One way we can pose the question is: does monetary policy still work where there are close substitutes for central bank money?

An obvious starting point is to consider how the Reserve Bank nowadays actually implements monetary policy. It does this by setting the interest rate at which it lends²⁹ and borrows, that is, the interest rate at which it issues and at which it remunerates holders of its own liabilities. This is the Official Cash Rate regime, which was introduced in March 1999 (for details, see Reserve Bank of New Zealand (1999)). Note that under this regime the implementation of monetary policy involves no operations to increase or decrease the supply of the Reserve Bank’s liabilities: the Bank passively stands ready to issue its liabilities in whatever amounts the commercial banks choose, however large or small, including possibly not at all.³⁰

²⁸ See also Dalziel (2000) for a more general review of the literature on the evolution of money and the implications of that evolution for monetary policy practice. He suggests that theoretical developments are moving away from a quantity theory of money based on the role of money as a means of exchange.

²⁹ In practice, the Bank’s lending takes the form of repurchase agreements in high quality financial securities.

³⁰ Although the Reserve Bank still undertakes daily open market operations, these are calibrated merely to neutralise the effect of the daily settlement between the commercial banks and the Reserve Bank that arises from the government banking with the Reserve Bank and banks’ net purchases of currency from the Reserve Bank. If the government did not bank with the central bank, and if commercial banks issued their own currency, then, from a monetary policy standpoint, there would be no need for these operations. This is not to say that the government should not bank with the central bank, but rather that it need not for monetary

So how, then, is the central bank's interest rate transmitted to the financial markets? To revert to our opening question, why is it that if the central bank says the cash rate will be x , it is x , whereas if a commercial bank were to say it will be y , it would remain x ? What is it that is special about a central bank over a commercial bank, such that it is the central bank that anchors the market?

At this point it helps if we get a little bit practical.

Consider the following stylised situation. We have two banks, which we will label ABC bank and XYZ bank. We assume that ABC bank is committed to maintaining a fixed parity for, and free convertibility of, its liabilities relative to those of XYZ bank.

Now suppose that if ABC bank lowers the interest rate at which it takes deposits and lends. The customers of both banks would then have an incentive to borrow from ABC bank (at its lower interest rate) and to deposit with XYZ bank (at its higher interest rate).

Next, assume that XYZ bank can insist on the settlement obligation of ABC bank that arises being paid in XYZ bank's own liabilities (which, as we will see, is tantamount to saying that XYZ bank's liabilities are "legal tender" and thus that XYZ bank is the central bank.) In this situation, if ABC bank is committed to maintaining convertibility of its liabilities for those of XYZ bank at a fixed parity, it would need to either draw from reserves of XYZ bank liabilities it already holds, or obtain them by borrowing in that other bank's "currency". But this would result in ABC bank incurring a loss; it would be borrowing at XYZ bank's higher rate and lending at its own, lower rate. ABC bank may be willing and able to bear that loss for a period, but not indefinitely. At some point it would face a choice between abandoning maintenance of convertibility at a fixed parity, or raising its interest rate to match that of XYZ bank.

policy reasons. It is the view of the author that the government's principal bank account should be held with the central bank but for the different reason that it is desirable that the government should avoid the conflict of interest that would arise if it banked with a private bank that were to fail.

What will be evident from this stylised scenario is that it is the bank whose liabilities represent the standard of value that other banks commit to maintain parity with, and that are the accepted means of payment, that dictates the rate of interest for the whole banking system.

3.1 Central banks and commercial banks: a case of a fixed exchange rate

Many readers will be familiar with this account of how the interest rate of one "currency" is transmitted to other "currencies", in the context of exchange rate theory. In that context, it is well established that if a central bank maintains a fixed exchange rate with the currency issued by another, and there is an open capital account (ie free convertibility), that central bank cannot also sustain an independent monetary policy. Rather, the interest rate for the liabilities, or "currency", it issues is necessarily tied to the interest rate of the central bank that issues the currency to which it pegs.

In the account just given, we could replace ABC bank and XYZ bank with, for example, the Hong Kong Monetary Authority and the US Federal Reserve, and we would have an account of how and why it is – given Hong Kong's strong (currency board) commitment to maintaining a fixed exchange rate for the Hong Kong dollar relative to the US dollar – that the interest rate on Hong Kong dollars (the liabilities issued by the Hong Kong Monetary Authority) is tied to that for the US dollar (the liabilities issued by the US Federal Reserve).³¹ In exactly the same way, if a local commercial bank maintains a fixed exchange rate for its liabilities relative to another local bank, which we will call the central bank, then the commercial bank will "import" the central bank's interest rate.

³¹ This is not to say that the interest rates for two different currencies linked by a fixed exchange rate will always be identical. At times when it is thought that the rate might depreciate, there will be a premium in the interest rate for the pegged currency. This premium can be thought of as being equivalent to the credit risk premium in commercial bank interest rates relative to the central bank risk-free rate. That premium, too, reflects the risk that convertibility at par will not be maintained.

It will also be evident that, in our HKMA/Federal Reserve example, it is the interest rate of the Federal Reserve, as the issuer of what we might call the “base” money, that prevails. This reflects the fact that it is the Hong Kong Monetary Authority that commits to maintaining parity for the Hong Kong dollar with the US dollar, not the other way around.

If it was the other way around, and the US Federal Reserve maintained a fixed exchange rate for its liabilities against the Hong Kong dollar, then it would be the Federal Reserve that would need to stand ready to exchange US dollars for Hong Kong dollars, and absorb the arbitrage that would result from any interest rate differential between the two currencies.³² And similarly, not even the Federal Reserve could sustain an interest rate differential and a fixed exchange rate indefinitely. Sooner or later it would find that it could not maintain an interest rate different from that for the currency to which it had pegged its liabilities.

Note that this account of how a central bank transmits its interest rate to the financial markets does not depend, as is sometimes argued, on the central bank having a capacity to absorb losses. Goodhart (2000), for example states that “unlike commercial entities.... the central bank – the government’s bank – can face a loss with equanimity, ...and that it is this that gives it the power in the last resort to fix [interest] rates” (page 205). But it is not as though the Federal Reserve is exposed to loss as the result of the HKMA fixing the value of the HKD to the USD. Hence the Fed does not need a capacity to absorb losses. On the contrary, as we have illustrated above, it would be the HKMA that would be exposed to loss, at least if it were to attempt simultaneously to maintain convertibility at par and adopt an independent monetary policy. Similarly, in the central bank-commercial bank context, it is the commercial bank that would be exposed to, and need a capacity to sustain, losses if it were to endeavour, simultaneously, to maintain a fixed parity with the central bank’s liabilities and adopt an independent monetary policy, ie, independently set its own interest rate.

³² That is, to intervene in the foreign exchange market.

The account we have given in this section of how monetary policy is transmitted from the central bank to the financial markets is obviously quite different from that outlined in section 2. Instead of relying on the absence of close substitutes for central bank money, it is the very substitutability, and hence the potential for interest rate arbitrage, between central bank and commercial bank liabilities that establishes the channel of transmission. Accordingly, there is no need for a demand from the public or commercial banks to hold a stock of central bank liabilities, let alone that the demand for those liabilities should be interest inelastic. It therefore also dispenses with the need for mechanisms or structural interventions to generate a demand for central bank liabilities, such as reserve requirements or, in the absence of reserve requirements, a requirement that the government bank at the central bank, or for the central bank to be a monopoly supplier of physical currency. And it dispenses with the need for mechanisms, such as open market operations, to enable the central bank to manage the quantity of its liabilities on issue in order to affect the price of those liabilities.

What this section suggests is required for a central bank to be able to transmit its monetary policy to the commercial banks and, through them, to the financial markets and economy more generally, is that (a) the central bank set the interest rate at which it stands ready to issue, and remunerate holders of, its own liabilities and (b) that the commercial banks maintain the convertibility of their deposit liabilities for the central bank’s liabilities at a fixed parity.³³ Interest rate arbitrage then ensures that the central bank’s interest rate is transmitted to the commercial banks.

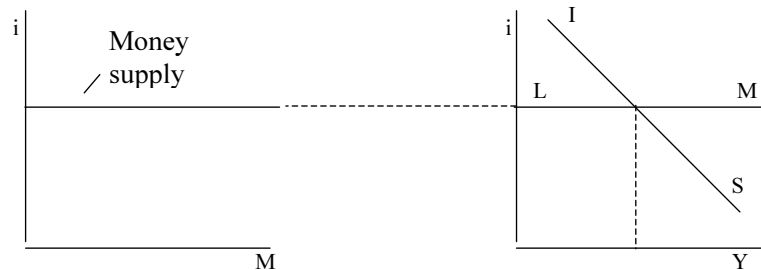
3.2 The current Reserve Bank operating regime

At the Reserve Bank of New Zealand, there has been a transition from a (money supply) quantity approach to an interest rate approach to implementing monetary policy. More specifically, the Reserve Bank has moved from controlling the supply of its liabilities to directly setting the interest rate for those liabilities. Figure 3

³³ Woodford (2000) makes this point in the more fundamental sense that it is inherent in the terms of the commercial bank deposit contract that the deposit is payable in central bank liabilities (page 257).

illustrates the framework within which monetary policy is now implemented in New Zealand, and in those other countries where the central bank sets an interest rate rather than manages the supply of its liabilities.

Figure 3
The current implementation regime



In figure 3 the central bank sets the interest rate at which commercial banks may – not must – transact with the central bank. In practice, inter-bank settlements are still mostly effected by commercial banks transacting amongst themselves, not with the Reserve Bank. This stems from the fact that the Reserve Bank’s applies a small spread to its lending rate over its deposit (borrowing) rate.³⁴ The spread between the Reserve Bank’s borrowing and lending rate makes it more cost effective for commercial banks to transact directly with each other, rather than to use the central bank as an intermediary. The rationale for this spread is not to force transactions between the central bank and the commercial banks – indeed, it has entirely the opposite effect – but to foster an inter-bank borrowing/lending market and to minimise the central bank’s lending exposure to the commercial banks.³⁵

³⁴ This means that the borrowing/lending transactions that are entered into by the central bank with the commercial banks, though generally small by value, are always profitable for the central bank.

³⁵ The margin on either side of the Reserve Bank’s central rate, known in New Zealand as the “Official Cash Rate”, at which the Bank borrows and lends could be shown in figure 3 as a channel centred on the Official Cash Rate. The determinants of where the inter-bank borrowing/lending rate settles within that

With the central bank determining the interest rate, and with that rate being transmitted to the commercial banking system by arbitrage, rather than by way of the central bank entering into actual transactions with the commercial banks, the position and shape of the demand for (central bank) money curve, and its counterpart LM curve, are of little consequence. Irrespective of where the demand for money curve might lie, how steep or flat (interest inelastic or elastic) it might be, and how stable or unstable it is, there is only a single equilibrium interest rate, that being the rate set by the central bank. (It is for this reason that a demand for money curve has been omitted from figure 3).

To be sure, some transactions do take place between the central bank and the commercial banks. Some of these arise from the fact that in New Zealand the government banks with the central bank and that the commercial banks need to source notes and coin from the Reserve Bank. Others arise as a matter of operational convenience. At the end of inter-bank trading each day there generally will remain some residual inter-bank positions to be settled. When, as is generally the case, these positions are small, and the central bank’s spread is narrow (currently 50 basis points), the convenience of being able to settle with the central bank using its standing facilities outweighs the small cost involved.

That is how things currently work. Although it remains the case that there are transactions between the Reserve Bank and the commercial banks, and in that sense there exists a demand by commercial banks for the Reserve Bank’s deposit liabilities, the preceding analysis has suggested that such transactions need not necessarily be undertaken for the Reserve Bank to be able to transmit monetary policy to the commercial banks. Indeed, it seems doubtful that a demand for the Reserve Bank’s liabilities the derives from the vagaries of daily net payments to and by the government, from commercial banks’ payments for note and coin purchases, or from the end-of-day inter-bank “wash-up”, will provide an effective fulcrum for the Bank’s monetary policy operations. This was found to be the case in the

channel are beyond the scope of this paper, but are discussed by Guthrie and Wright (2000) and also by Woodford (2001).

period leading up to the regime change in March 1999. One of the principal reasons for making that change, from a quantity framework for implementing monetary policy to setting an interest rate directly, was that it was proving impossible to calibrate the Bank's operations so as to achieve the desired interest rate outcome with any degree of precision.

To sum up, the Reserve Bank's monetary policy implementation regime now places no reliance on, nor makes any attempt to exploit, a day-to-day demand for its own liabilities. Rather it sets the interest rate at which it stands in the market, and relies on interest rate arbitrage to transmit that interest rate to the commercial banking system. As already explained, one can think of there being a demand for central bank money for everyday usage, but it does not feature in the transmission of monetary policy in any material way; the Reserve Bank now supplies its liabilities at an interest rate it has set directly – and in whatever quantity is demanded. The demand for central bank money that matters is not that evidenced by a stock of outstanding central bank liabilities, or actual transactions between the central bank and the commercial banks, but the latent demand that drives interest rate arbitrage.

3.3 What about currency substitution?

There is one further matter we need to consider. We tend to take it for granted that financial contracts between local residents are denominated in the currency of the local central bank. In New Zealand, as in most countries, that overwhelmingly is the case. But it bears thinking about why that is so. Are there institutional or legal reasons why it is the liabilities of the local central bank, rather than, say, those of another central bank, or of a large commercial bank, that are adopted as the “base” currency? In other words, is there a risk that even if the central bank can determine the interest rate for its liabilities, it could become de-coupled from the financial markets, and the economy more generally, as the result of people choosing simply not to use the central bank's currency as the “base” unit of account?³⁶

³⁶ Friedman (2000) discusses the possibility of the central bank becoming “de-coupled”. He indicates a range of ways by which this could occur, including the

In New Zealand there is nothing in law that makes it mandatory to denominate contracts in Reserve Bank of New Zealand dollars. This might seem surprising, in that it is commonly thought that, within New Zealand, Reserve Bank of New Zealand dollars constitute legal tender. That, of course, is true. But it does not follow that it is illegal to use alternative currencies as a unit of account in contracts, or as the means of payment in settling those contracts.

The significance of legal tender is that it constitutes the means of payment that an obligee in a contract denominated in New Zealand dollars, in the absence of contractual terms to the contrary, is entitled to insist on receiving in payment.³⁷ That is, someone owed a debt that is denominated in New Zealand dollars is entitled to insist on receiving the genuine, “branded”, version of money rather than the “generic” (commercial bank-issued) version. Similarly, an obligor is able to discharge a New Zealand dollar obligation by supplying legal tender. But there is nothing to prevent contracting parties from agreeing, implicitly or explicitly, to payment being made in an alternative form. Indeed, as we have already noted, in the overwhelming majority of New Zealand dollar contracts (at least by value), payment is made using the liabilities of the commercial banks, not those of the central bank.

Does the prevalence of commercial bank liabilities as a means of payment pose a risk that a commercial bank, say the largest or perceived to be strongest commercial bank, could de-couple itself

possibility that “the interest rate that the central bank can set, on the exchange of its own liabilities for other claims, becomes less closely – in the limit, not at all – connected to the interest rate and other asset prices for ordinary economic transactions” (page 263).

³⁷ Legal tender, as defined in the Reserve Bank of New Zealand Act 1989, comprises bank notes issued by the Reserve Bank of New Zealand and also coin issued by the Reserve Bank, but in the case of coin, subject to maximum amounts depending on the denomination of the coin. It would appear that deposit liabilities issued by the Reserve Bank, strictly speaking, are not legal tender. However, given that they are as much a Reserve Bank liability as are notes and coin, and can be converted into notes and coin on demand, it seems reasonable to regard them as if they were legal tender. Other authors, for example, Goodhart (2000) and Grimes (1992) also take this view.

from the central bank and, in effect, become a competing central bank? And if it could de-couple itself, might such a bank actually be able to supplant the official central bank, and become a new monetary authority for the country?

Neither of these possibilities can be ruled out totally. However, we need to recognise that in order for these things actually to happen, the “competing” central bank would have to cease representing its liabilities as being convertible at a fixed parity into the liabilities of the “official” central bank. In practical terms, it would have to make clear that it was no longer taking Reserve Bank of New Zealand dollar deposits, but instead was taking, say, ABC bank dollar deposits. Whether that could ever be a viable strategy for any commercial bank is a moot point. One thing we can say is that it would be a viable strategy only if the deposit liabilities issued by ABC bank came generally to be accepted as an alternative unit of account, or standard of value, in their own right.

In effect, the liabilities of ABC bank would need to become a separate but parallel currency, with its own exchange rate relative to the currency issued by the official central bank. Only if that were to happen would the proprietors of ABC bank be able to operate an independent monetary policy. And if ABC bank’s currency were actually to supplant, rather than just circulate in parallel with, that issued by the official central bank, its liabilities would need to become the dominant unit of account and means of payment. Whether that could happen without the currency in question being officially recognised as legal tender is another moot point.

So how real might these possibilities for currency substitution be? In other words, how fragile or robust is the current role of (official) central bank liabilities as the generally accepted unit of account?

One guide to the vulnerability of a local central bank’s currency to competing currencies is the extent to which foreign central bank-issued currencies are already used in the local economy. After all, those foreign alternatives are already incumbents, in the sense that they already enjoy common acceptance, albeit in a different market. The experience in this regard has been that in most countries the local central bank-issued currency is very resilient in the face of

“competition” from foreign central bank alternatives. The few exceptions relate to cases where the local currency has been seriously mis-managed, generally in a way that has resulted in hyperinflation.

It is easy to understand why incumbent central bank currencies tend to enjoy such a solid market position. The *raison d'être* for weights and measures – and that is what money is, a measure of value – is to facilitate co-ordination; whether it be the co-ordination required to facilitate economic exchange, or in the case of physical weights and measures, the co-ordination that enables, for example, a construction team to work together. This being the case, weights and measures are useful only if they enjoy wide and consistent usage. And once established in wide usage, there tends to be strong resistance to adopting alternatives – since to do so would erode the co-ordination, or “network”, benefits that accrue from having standardised measures.

Thus, except when a currency ceases to be an effective standard of value, as in the case of hyper-inflation, transition from one currency to another tends to occur only when change is centrally mandated and thus the transition is itself co-ordinated and usually quite rapid. This is necessary so that any loss of co-ordination benefits during the transition is minimised, as with the conversion to decimal currency in New Zealand in 1967, the conversion to the euro more recently in Europe, or the Swedish conversion to driving on the right hand side of the road.³⁸ History suggests that, outside of these kinds of situation, an incumbent currency tends to be very difficult to supplant, owing to the difficulty any rival has in building acceptance

³⁸ Although note that the conversion to the euro has been implemented in a phased manner. On 1 January 1999, exchange rates amongst the national currencies of the initial 11 euro area member countries were irrevocably fixed, amongst each other, and to the deposit liabilities issued by the new European Central Bank. From that point, each of the national central banks forwent the ability to implement a national monetary policy. However, their individual currencies, for the meantime, remained a unit of account (and in circulation in the form of notes and coin). But given the permanently fixed exchange rates, those national currency units became, in effect, “non-decimal denominations” of the euro. From 1 January 2002, the European Central Bank will commence issuing euro notes and coin in “decimal denominations” and the individual national currencies will be withdrawn from circulation.

and usage levels to the point where it is of utility as a means of achieving co-ordination.

So what do we expect to happen in the future? Some suggest that in a world of rapidly developing information technology, we should not be quite so sanguine about the durability of central banking. What about the possibility of a de-coupling that comes about as the result of the central bank's own liabilities ceasing actively to be used as a means of payment for an extended period? For example, consider what would happen if, through disuse, the electronic systems for maintaining the connection between the central and commercial banks were not maintained, and if the "printing plates" for currency were thrown away. In this case, the ability to arbitrage between the liabilities issued by commercial banks and those issued by the central bank would be gone, and the central bank would no longer have any capacity to give effect to its monetary policy. In effect, the official central bank would be sidelined. In this situation, perhaps unwittingly, the community would have moved over to a new unit of account, possibly to the liabilities of the commercial bank that had assumed the role of banker to the banks or banker to the government.

Clearly this is a conceivable scenario, but it does not seem a remotely likely one, at least not for the foreseeable future. There are no indications yet of commercial banks being willing to forego the right to insist on payment in central bank rather than commercial bank liabilities, even if, as a matter of practice, the great bulk of daily inter-bank settlements are effected in commercial bank liabilities. Indeed, we can safely say that banks are comfortable about daily inter-bank settlements taking place mostly in commercial bank liabilities only because they are confident about the convertibility of those liabilities into the central bank's liabilities at a fixed parity. If the capacity to effect that convertibility was thought to be disappearing, a response would almost certainly be forthcoming.³⁹ It is implausible to think that commercial banks and central banks would stand blithely by.

³⁹ Moreover, if anything, recent developments have been going in the opposite direction. For example, to facilitate real-time-gross settlement for high value payments, new real-time electronic links between commercial banks and central banks have been built.

Another possibility, and one raised by Mervyn King, Deputy Governor of the Bank of England (King (1999)), is that at some future time, people might have palm held computers which enable prices to be denominated, and transactions settled, in a wide range of financial instruments for which there are market prices (and thus a whole array of readily knowable "exchange rates"). That world would be one in which many "currencies" – all those things used in settling exchange – would circulate within the local economy, in parallel. It would represent a step toward a world without money, that is, a world within which many things – in the limit, everything – could serve as money. In effect, information technology would be rolling back the information and coincidence-of-wants problems that currently make barter trade inefficient, and which lie behind our use of money today. But, as other authors have noted that too does not seem a near-term prospect (for example, Woodford (2001)).

4 Concluding observations and further issues

Section 1 of this paper sketched the traditional textbook model of how monetary policy is transmitted from the central bank to the financial system and wider economy. That model is founded on the notion that the central bank gives effect to monetary policy by adjusting the supply of its liabilities relative to the demand for them. However, for monetary policy to be effective in that model, there needs to exist a stable demand for an outstanding stock of those liabilities. We have suggested that in today's world, where there exist close substitutes for the central bank's liabilities, that condition probably is not well-satisfied.

So where to from there? One direction of thinking is that there is a need for the monetary system to be structured in a way so as to generate an irreducible demand for a stock of the central bank's liabilities to hold. Traditionally, reserve requirements have been seen as playing this role. But with reserve requirements being phased out in many countries, the focus in recent years has shifted to the roles central banks play in the payments system, as banker to the government, and as the issuer of physical currency, as sources of demand for the central bank's liabilities. These central bank roles have come to be seen as important elements of the underpinning for monetary policy, and threats to them have been seen by some as threats to central banks' capacity to implement monetary policy.

There is, however, an alternative view, which we developed in section 3. We observed that some central banks no longer implement monetary policy by controlling the amount of their own liabilities on issue, but instead stand in the market at an interest rate at which they issue and remunerate those liabilities. Transmission of policy to the financial system then occurs through interest rate arbitrage. Under such a regime, the money supply is endogenous.

We have also seen how one's choice of model – as between the traditional textbook money supply/money demand model, and what I will call the interest rate arbitrage model – hinges importantly on one's assumption concerning the substitutability of commercial bank liabilities for the central bank's liabilities. The textbook model relies on there being no close substitutes for the central bank's liabilities,

whereas the arbitrage model of transmission is based on there being a high degree of substitutability between the central bank's and commercial banks' liabilities.

We have also argued, however, that while under current operating procedures the transmission of monetary policy relies on central bank and commercial bank liabilities being close substitutes, there is little prospect of central banks' liabilities being substituted into extinction. To be sure, ongoing developments in information technology may result in central bank liabilities featuring even less as an actively used means of payment, but it is difficult to see how or why they should cease to constitute the standard of value in which contracts are denominated, and thus in which prices are expressed. For that to change some other standard of value, for example the liabilities of the largest or most sound commercial bank, would have to come to be generally accepted as the standard of value.

But that seems no more than a very remote possibility. For one thing, any competitor with a central bank will start from a position where its soundness is evaluated in terms of its ability to convert its liabilities at a fixed parity into the central bank's liabilities. As long as that is the case, it is difficult to see how a commercial bank could be perceived as being more sound than the central bank. This alone tends to secure the central bank's position as incumbent. Beyond that, the co-ordination problems in gravitating from one currency to another are considerable. They are similar in nature to those encountered in changing from one set of physical weights and measures to another, or from changing from driving on the right to driving on the left.

4.1 Some further issues

The analysis presented in this paper, besides providing a framework for understanding how central banks transmit their monetary policies into their respective financial markets, provides a platform for exploring a number of other contemporary issues in central banking.

For instance, there is the question – which we have not explored – of what it is that underpins the convertibility of commercial banks' liabilities for the central bank's liabilities, and hence the

substitutability of one for the other. That underpinning, of course, is prudential discipline. To see that connection, recall that the definition of solvency concerns one's ability to pay one's debts when they fall due, with it being implicit that "ability to pay" is the ability to pay in central bank money or its equivalent.⁴⁰

In this sense, underpinning the macro (interest rate) policy role of central banks are micro-prudential foundations. It follows that if macro-monetary policy is about providing the economy with a "nominal anchor" – that is, an appropriately "weighted" interest rate – then prudential policies can be thought of as the "chain" that keeps the anchor attached. During the last decade or so, the challenges facing central banks have, perhaps, been as much about these micro-foundations of monetary management as they have been about macro-monetary policy, that is, monetary policy. Certainly, the last decade or so has been notable for the prevalence of episodes of banking system instability in the wake of imprudent commercial bank lending expansions.⁴¹

Viewed from this vantage point, some interesting perspectives on a range of current central banking issues emerge. One such issue concerns the appropriate institutional arrangements for the conduct of macro-monetary policy and micro-prudential policy. The question here is whether the conduct of banking supervision and macro-monetary policy should be regarded as inextricably linked elements of an integrated whole, and thus be conducted by a single, integrated, central banking institution.⁴² Or might one take the view that, although macro-monetary policy and banking supervision are

⁴⁰ There is, of course, an accounting definition of insolvency, namely that the entity's liabilities exceed its assets, where those assets are valued in the unit of account in which the liabilities are payable. It will be evident, however, that this is not a different definition from being unable to pay one's debts, but rather a means of bringing some measurement specificity to that concept.

⁴¹ Including, for example, the financial bubble and subsequent banking collapses in Australia and New Zealand in the mid- to late-1980s, the savings and loan crisis in the United States in the early 1990s, the financial bubble (in the 1980s) and subsequent financial implosion (in the 1990s) in Japan, the bubble in and collapse of the financial systems of Scandinavia in the early 1990s, and the Asian crisis of 1997-98.

⁴² Corrigan (1990) provides a forceful exposition of this view.

two stands of an integrated whole, they involve quite different skills and that superior outcomes are more likely to be achieved by focussing two specialist institutions on the respective areas of responsibility. This has been a subject of debate in recent years, with the indications being that the latter view is winning out. In countries where central banks have traditionally performed both monetary policy and banking supervision, the recent trend has been for the two roles to be assigned to separate agencies, although within a framework that seeks to ensure continued liaison and co-operation.⁴³

A related, and equally topical, policy issue in central banking is asset price inflation. The integration of the macro- and micro-dimensions of monetary management suggested in this paper provides an umbrella framework within which questions about asset price inflations can be addressed. It makes evident that asset price inflation can be symptomatic of either an "anchor" that is too light, or a "chain" that is too weak, and that the appropriate policy response will vary according to which is thought to be the case.⁴⁴ If it is a case of weak micro foundations (weak prudential standards), a macro (interest rate) policy response may not be the appropriate response, and vice versa.

Another, perennial, debate in central banking circles, which we have touched on only briefly, concerns the relative merits of central banking versus so-called "free banking". Free banking can be thought of as the situation that would prevail if central banks were abolished, and indeed generally did prevail before central banking became the mainstream monetary arrangement. In such a world,

⁴³ British Commonwealth countries have been amongst those traditionally which have combined both roles within the central bank, following the Bank of England model. During the last few years, however, banking supervision has been transferred to specialist financial supervisory agencies in both the United Kingdom and Australia.

⁴⁴ An additional possibility, of course, is that an appreciation in asset prices, or in a category of asset prices (such as real estate, or equities) reflects expected increases in the real income generating capacity of the assets in question. In this case, it might be said that the rising asset prices are justified by "fundamentals" and do not constitute "inflation" (in the sense of inflation being a monetary phenomenon).

there would be multiple units of value, the most likely candidates being the liabilities of the individual commercial banks.

How would things work in such a world? Some suggest that they would work at least as well as under central banking arrangements. The contention is that, just as globally there are many currencies (issued by many central banks), there is no reason why, within a single country, there cannot be multiple units of currency issued by multiple issuers. According to this view, it should not be necessary to mandate a single unit of account, or single standard of value, because people and firms would gravitate to those that best meet their needs. The thinking is that competition in currencies would result in better outcomes than under the centralised – central banking – arrangements we have today. Indeed, some might argue that that is very much the global monetary order today. That is, globally, many independently issued currencies float against each other, and entities engaged in international trade can freely choose the unit of account in which to denominate and settle contracts. It might be argued that if that is a good arrangement for facilitating trade amongst countries, then there is no reason why it should not also be a good arrangement for facilitating trade within a country.

A contrary view, of course, is that it would be preferable if the world had fewer currencies, and that the trend will be in that direction. Possible evidence of tendencies in that direction include the dominance of a handful of currencies, especially of the US dollar, as the unit of account in international trade; the adoption of monetary union in much of Europe; and discussion, albeit at only an embryonic stage, about currency unions being established in other regions, such in North America and, closer to home, between New Zealand and Australia.

However, these issues – concerning prudential supervision, asset price inflation, free banking and currency unions – are all big subjects in their own rights. They are introduced here merely to illustrate how at the core of each are questions about the choice of a standard of value. Obviously a critically important element in making that choice concerns who would determine the value of the standard. The main purpose of this paper has been to illustrate how, and why, it is the issuer of whose liabilities are chosen as the

standard of value that determines the monetary policy for that “currency”.

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