MONETARY TRANSMISSION IN A DEREGULATED FINANCIAL SYSTEM

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ABSTRACT

Financial deregulation is undermining the traditional role for what academic economists have defined as "money". The textbook IS/LM models, that rely so heavily on a monetary transmission mechanism running from "money" to activity and prices, may no longer be the most appropriate theoretical models for analysing monetary policy in a deregulated world. Despite this breakdown in the traditional monetary transmission mechanism, it is argued in this paper that monetary policy will continue to be effective in a deregulated environment. Worries that there will be price-level indeterminacy, no yard-stick to measure the stance of policy, and no rules to make monetary policy accountable in a fully deregulated world are not justified. A reaction function which ties the nominal short-term interest rate to a nominal anchor should ensure a stable steady state outcome. There are a number of alternative nominal anchors from which to chose, including: nominal financial prices - the exchange rate or a long-term nominal interest rate; or more direct targets such as inflation or nominal GDP growth. Implementing such policy strategies in the short-run, however, will remain as difficult as ever and optimal strategies may vary across countries. It is nevertheless important that policy reaction functions be clearly stated and adhered to , both to ensure credibility and allow full accountability.

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1. Introduction

Traditional textbook theories of monetary policy rely heavily on the Hicksian IS/LM model in which the monetary authorities control an exogenous "money" stock in implementing monetary policy. Changes in the money stock are used to control nominal income, with the transmission mechanism running through interest rates, exchange rates and/or via real balance and credit rationing effects. The simplicity of this approach was one of the primary attractions for many central banks in their decisions to target monetary aggregates in the 1970's and early 1980's.

Unfortunately, monetary targeting has not been as simple to implement as it was to model. The primary problem has been that the concept of money used in the textbook models - a liquid (in the sense of ease of making transactions) asset paying a controlled (normally zero) rate of interest - has become obsolete. With rapid financial innovation, deregulation, improved transactions based technology and the growing financial sophistication of households, firms and intermediaries, many transactions no longer require the use of that sort of money. The only pure money that remains in the traditional academic sense is currency and bank reserves at the central bank. Both are largely demand-determined in the short-run. More importantly, this concept of money no longer reflects the overall liquidity of the private sector or its ability to undertake transactions. As a result, many central banks now look more at the broader aggregates to gain an indication of monetary conditions, even though such broad aggregates are not under their direct control.

The aim of this paper is to set out a simple explanation of the transmission mechanism that does not depend on the central bank's ability to manipulate directly a transactions based monetary aggregate. It does so by looking ahead, to a world in which all transactions are non-money based.[1]   Will the monetary

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1 Where money is defined as a perfectly liquid asset, used for transactions purposes, paying a regulated rate of return.

authorities still be able to conduct monetary policy? If so, how will monetary policy be implemented and how will it be transmitted to private sector behaviour? These questions are not new, but have been raised by many of the early writers such as Wicksell (1936). It is only recently, however, with the growth of "new monetary economics" (see Cowen and Kroszner: 1987), that the issues have again been addressed by economists. These questions are also no longer only of interest to academic crystal ball gazers, but are becoming more and more relevant to current policy implementation. Indeed, it is argued in this paper that many countries may already be closer to such a "brave new world" than to the old textbook model of the transmission mechanism. The extreme assumptions of zero reserve requirements and no currency based transactions are used to focus attention on the key aspects of the transmission mechanism: aspects which are not altered by relaxing those assumptions. The objective is two-fold. First, it restricts the discussion to a particular range of theoretical propositions. Second, and more importantly, it simplifies the analytical framework substantially, without altering the fundamental features of the transmission process as it already operates in Australia and many industrial countries.

The following section starts by outlining the conceptual issues that are crucial to deciding whether monetary policy will continue to have a role in a fully deregulated financial system. In section 3, the traditional IS/LM model is reviewed and shown to be inadequate when it comes to looking at a world without 'money' as defined above. A modified theoretical framework is presented in section 4 which highlights the key role of financial prices (interest and exchange rates) in transmitting policy changes in a world without 'money'. Asset stocks (including banking aggregates that are now labeled money) may still respond to policy changes. However, they will not play the crucial causal role as in traditional theoretical models. Section 5 provides some general conclusions.

2. Conceptual Framework

Before looking at the implications of the trend towards a fully deregulated financial system, it is useful to define how the structure of such a system would look. The first point is that in such a futuristic financial system currency would be likely to play a decreasing role as a means of making transactions. It is therefore assumed below that all transactions will eventually be carried out using plastic cards (either debit or credit). The model conclusions do not depend on this assumption. The crucial condition is that there exists close substitutes for currency across a large share of transactions.

Secondly, it is assumed that all bank deposit rates (and lending rates) are set by market forces, ensuring that the central bank can no longer influence the differential rate of return on bank deposits and other assets in the economy. As discussed by Fama (1983), banks will merely provide a variety of portfolio management services and relative rates of return will reflect only the differing risk characteristics of the financial instruments marketed by banks and the relative costs of offering alternative banking functions. There will, in fact, be no distinguishable difference between banks and non-banks; unless the central bank wishes to maintain the distinction via prudential requirements.

With the (non-bank) private sector no longer holding outside money and, with so-called 'inside money' now earning market rates of interest, the central bank will clearly have less influence over an aggregate that reflects the private sector's transactions balances. This is an important point and it is worth further explanation. By allowing banks to set deposit and lending rates (an inevitable result of non-bank financial innovation), central banks have encouraged financial institutions to move towards liability management and away from a situation in which the authorities have a direct influence over their liabilities (the textbook definition of money) via the money/bond interest differential. This has already happened to a large extent in a number of countries and was largely completed in Australia by 1980. It is for this reason that the paper tries to avoid labeling intermediated financial assets as money.

One suggested response to this situation is that the central bank could extend its reserve requirement net to include all financial institutions that offer transactions facilities. As Tobin (1987) points out, this also requires that reserve

requirements capture the ability of individuals to make transactions using credit cards. The central bank would, therefore, need "to set reserve requirements as a function of the bank's net transactions account balances plus aggregate credit lines". (Tobin: 1987, p. 154)

Such a proposal, while possible, seems highly unlikely as it would almost certainly lead to financial innovations which avoided reserve requirements. It seems more likely, given current trends, that reserve ratios will not be widened to include the broader spectrum of financial institutions. Indeed, given the microeconomic misallocation of resources generated by reserve requirements, it seems more likely that they will become of less importance in the OECD countries in the future.

A third implication of the current trend towards financial deregulation is the tendency for banks to pass on interest rate risk to end-users by offering more floating rate facilities on both deposits and lending instruments. This is a world wide trend well documented by the Bank for International Settlements (1984). The implications of this trend are not fully understood, but one important effect is that changes in short-term rates may now impact on the IS curve more quickly and to a larger extent, if the private sector faces short-run liquidity constraints.

In such a fully deregulated environment, would there be a need for a central bank? The world did, of course, get by without central banks for centuries and many, including Greenfield and Yeager (1983), King (1983) and Harper (1984), have argued that a return to private commodity or fiduciary monetary system is a realistic alternative. It seems most likely, however, that there will remain a demand for perfectly liquid risk-free central bank reserves both to provide a stable numeraire and as a means of interbank settlement. A return to a private commodity or fiduciary-based monetary system seems unlikely largely because of the reasons that led to the decline of such systems. In particular, the need for a perfectly liquid risk-free lender of last resort is crucial to maintaining confidence in a modern financial system based on a vast network of credit. As discussed in Havrilesky (1987), banking systems have generally relied on the supply of an outside asset to settle interbank accounts and to draw on in times of crisis. Given that such an outside asset can be viewed as a public good, it makes sense that it be supplied by a public authority. If this is the case, (and it is assumed so in the rest

of the paper) then monetary policy would continue to operate in much the same way as it does today.

3. Deregulation in Existing IS/LM Models

Having outlined the directions in which financial innovation and deregulation are taking the economy, the paper now reviews how one can incorporate such changes within standard macroeconomic models.

The open economy IS/LM model (in logs) can be described by the following equations:

(1) $\quad y = \delta e - \sigma r + \varepsilon_1$

(2) $\quad m\text{-}p = \emptyset y - \lambda r + \varepsilon_2$

(3) $\quad e = \bar{e} + 1/\ \theta(r^*\text{-}r) + \varepsilon_3$

where y is real output, r is the interest rate and m the nominal money stock. The exchange rate (e) is measured as the domestic price of foreign currency (i.e. a rise represents a depreciation). A dot over a variable is a time derivative, a star represents foreign variables and a bar signifies long-run steady state values.

Equations (1) and (2) are the IS and LM equations with standard assumptions concerning parameter signs. Equation (3) is a version of the interest parity condition.[2] The open economy extensions are not necessary for the discussion that follows, but do make the model resemble the Australian case more closely. Prices are held fixed at this stage, so the analysis should be thought of as short-run.

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[2] Using the Dornbusch (1976) definition of exchange rate expectations; that is $E\,\dot{e} = q(\bar{e}\text{-}e)$.

A monetary policy expansion in such a framework is illustrated in Figure 1. The exact solution (in a deterministic world) is given by;

$$\frac{dy}{dm} = \frac{(\sigma\theta + \delta)}{\lambda\theta + \emptyset(\sigma\theta + \delta)} > 0.$$

An increase in the money supply directly shifts right the LM curve and lowers the interest rate. Lower interest rates stimulate the interest sensitive component of domestic demand, bringing forth a rise in output. The lower domestic interest rate also depreciates the exchange rate (which shifts out the IS curve) and reinforces the rise in income. If rational expectations are imposed on the model (with the exchange rate allowed to overshoot), then income may rise even further on impact, putting upward pressure on interest rates. As shown in Dornbusch (1976), it is possible that all of the transmission process goes through the exchange rate, and the interest rate may actually rise following a monetary expansion. However, this result requires perfect capital mobility and a very large short-run response from the trade balance to exchange rate movements; assumptions that are not supported by empirical work.[3] It is generally accepted that the short-run response to a monetary expansion is a fall in the interest rate and a depreciation of the domestic currency. Both of these, in turn, act to raise domestic income, by stimulating interest sensitive domestic spending and providing a competitive boost to net exports.

While this IS/LM result has been criticized in a number of areas, the fundamental transmission mechanism it embodies remains the standard

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[3] While a rising interest rate is not likely following a monetary expansion, it is also true that the exchange rate should be playing an increasing role in the transmission process. A recent IMF report concludes: "In comparison with earlier periods, the growing responsiveness of capital flows and exchange rates to domestic policy actions implies that ... (monetary policy).. actions tend to be felt relatively less on domestic activity and more on external variables (e.g. exchange rate and current and capital account flows). Within the domestic economy, it is, therefore, possible that the incidence of monetary policy has tended to shift principally from such sectors as housing and fixed investment (typically with an important share of non-traded goods) more toward the export- and import-competing (tradable goods) industries". (Watson, et. al., 1988, p. 46.)

workhorse in most textbooks and policy debates.[4]   Indeed, the attraction of monetary targeting derives largely from the above framework, under the assumption that shocks to the LM curve are smaller (or more predictable) than those affecting the IS curve, and that the LM curve is not flat.[5]

Figure 1
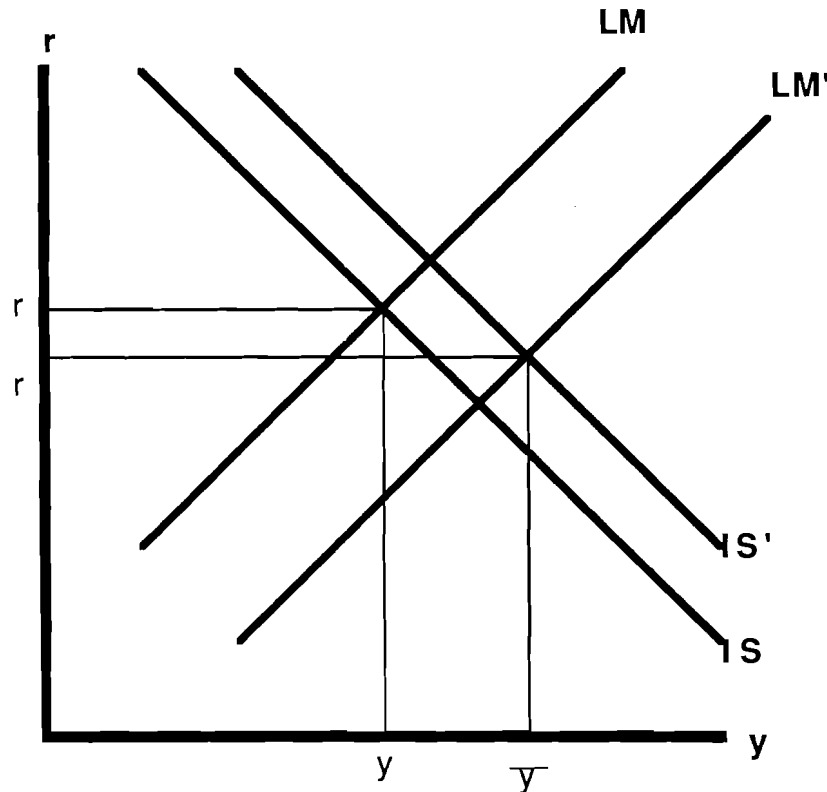
How does financial market deregulation complicate the standard IS/LM result? Recent work by Tobin (1987) summarizes the standard response.[6]   As he pointed

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[4]   There are at least two further transmission channels that have been seen as important in traditional models. The first is a real balance effect. This allows real money to directly enter the IS curve via its effects on private spending, i.e., an increase in the real money stock raises private sector real wealth and, therefore, private consumption. Laidler (1984) reviews the origins and underpinnings of this approach to the transmission mechanism. A second effect is credit rationing. In a world in which banking interest rates are controlled, those sectors that rely heavily on credit are largely at the mercy of the central bank in regards to the quantity of funds available. Up until recently, the credit rationing mechanism was seen to be of crucial importance to the implementation of monetary policy in many countries (Bank for International Settlements: 1984). Both of these mechanisms reinforce the interest rate and exchange rate channels discussed above, but are likely to be of little relevance in a deregulated financial system (Morris, 1988).

[5] See, for example, Poole (1970).

[6] See, also less formal discussion of these issues in Moses (1983) and Akhtar (1983) and Akhtar and Harris (1987).

out, the major effect of deregulation has been the payment of market-related interest rates on almost all forms of transactions balances. This renders the usual definitions of "money" insensitive to changes in interest rates. In the extreme, the interest rate drops out of the LM curve ($\lambda=0$), which becomes vertical. The "money" supply side is fixed by reserve requirements and the demand for "money" depends only on income. The classical quantity theory is reinstated and the case for monetary targeting would appear to be even stronger. The solution for a monetary expansion is now very simple;

$$\frac{dy}{dm} = \frac{1}{\varnothing} > 0 .$$

FIGURE 2
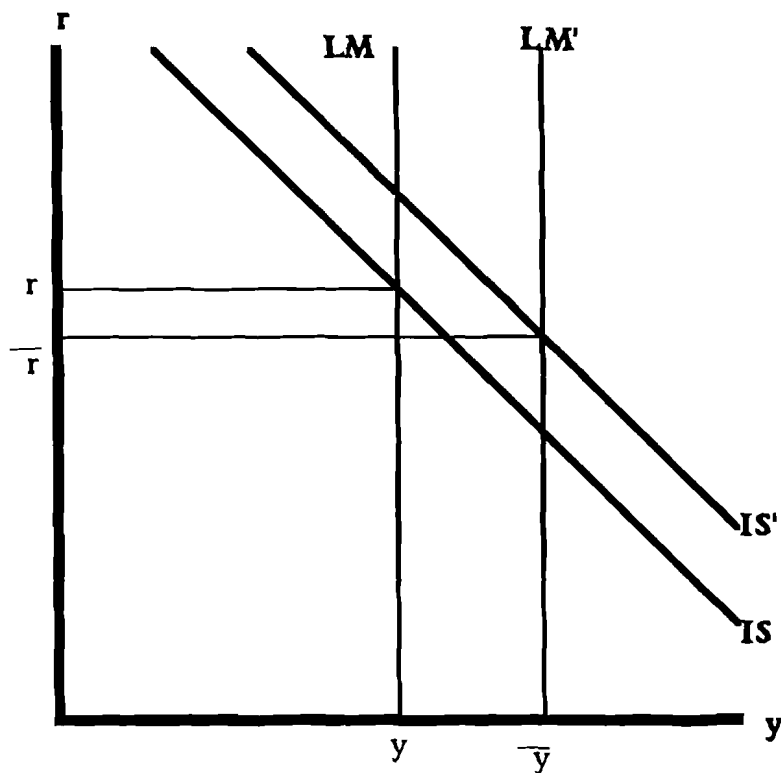
As shown in Figure 2, a monetary expansion again shifts the LM schedule to the right and now directly raises income in proportion to the rise in "M". There are

no longer problems of allowing for unwanted shifts in velocity because the fall in interest rates does not feed back onto the demand for money. According to this model, the monetarist's quantity theories should be strengthened via the process of deregulation, yet all around the world central banks are giving up the strict reliance on monetary targeting as an operating procedure. Where is the explanation?

One explanation is that theoretical economists have tended to be somewhat vague in their definition of exactly what they mean by "money". In the strict textbook sense, money is a liquid asset that pays no nominal return. Its quantity can easily be controlled either by changing its supply relative to the bond stock, or moving the rate of interest on other assets. (Both actions are identical from an open market operations point of view). In fact, the sort of assets that are classed as "money" in the Tobin-type framework do not resemble at all the textbook definition. The vertical LM curve is built on a broad definition of "money", (intermediated assets that return market rates of interest) with reserve requirements constraining the supply side. In a deregulated world such aggregates would not be under the direct control of the central bank. Nor would they necessarily have a stable relationship with nominal income.[7]

Tobin argues that such a broad aggregate could be brought under the control of the central bank as long as reserve requirements are placed on all financial intermediaries. Even if this were possible (it was argued above that it is unlikely), the vertical LM schedule is still not the most appropriate framework for analysing the transmission mechanism in a deregulated financial system. The reason being that it is not the supply of required reserves that is the crucial variable under the control of the central bank that causes changes in money and then activity.[8]   Rather, in a deregulated system it is the price that banks pay for excess reserves (i.e. the interest rate) that is the variable being controlled by the central bank and the variable that 'causes' changes in activity (and, in turn, the

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[7] Tobin (1987) does recognise the likely instability in income velocity and does not recommend strict monetary targets.

[8] See Macfarlane (1984) for a full discussion of the role of reserve requirements in Australia and Battellino and Macfarlane (1987) for some overseas examples.

demand for some broad definition of money).[9]   Even those central banks that
have institutional arrangements more suited to base money targeting have been
quick to point out that interest rates are still the crucial control mechanism. To
quote the Bundesbank:

> "....... it is the nature of the complex process of money creation in which
> the central bank, credit institutions and non-banks are all involved that
> the Bundesbank can work only <u>indirectly</u> towards ensuring that the
> central bank money stock develops along the envisaged lines, by the
> appropriate fixing of interest rates and the other terms on which it
> constantly makes central bank balances available." (Bundesbank: 1982,
> p. 88)

4. Monetary Policy Without Money

If the central bank cannot be expected to closely control the quantity of
transactions balances in the economy, how will it implement monetary policy in
a fully deregulated financial system? The implementation of monetary policy
will depend crucially on the residual demand by financial institutions for
perfectly liquid reserves held at the central bank. In fact, demand for such 'excess
reserves' already exists in present systems, both in Australia and in many other
industrial countries[10] . There is a substantial literature on the theoretical
derivation of excess reserve demand functions from micro-foundations. These,
of course, will look different depending on the institutional setting that banks
operate in, but for the purpose of this paper a particularly simple form of demand
function will be used. As pointed out above, financial institutions are likely to
demand such funds, even in a system that has no legally required reserves. The
demand for such funds will be a function of their cost, (the short-term interest
rate) and some measure of volatility or risk in the financial system.[11]   The
demand function can be written as,

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[9] Rogers (1987) points out that there has always been an academic school of thought supporting the central
banker's arguments on monetary control. This goes back to Wicksell, but can be traced through the writings
of Keynes.

[10] Such perfectly liquid reserves would be the equivalent of "exchange settlement funds" in Australia which
are largely held as loans to dealers. In the U.S. they are equivalent to what is called "excess reserves".

[11] In the present Australian financial system, the demand for settlement funds is also a positive function of
the penalty rate charged on rediscount facilities (see Dotsey, 1987). The model abstracts from many such

(4) $LR-p = c + \alpha u - \beta r + \epsilon_4$

Where LR is the demand for liquid central bank reserves, c is a constant and u is a measure of uncertainty or instability. In practice, u would be a function of the size of the stochastic shocks hitting the economy; i.e., the expected variance of ϵ_1, ϵ_2 and ϵ_3. The demand for liquid reserves, like the demand for money in the old LM curve, is a negative function of the opportunity cost of holding reserves; the rate of interest. It is a positive function of the variability in the system because banks have to have a non-negative position vis-a-vis the central bank. Banks must, therefore, hold adequate liquid reserves to cover the largest possible withdrawals from the system. In practice, of course, there are lender-of-last-resort facilities which ensure banks do not need to hold reserves for the very large and unpredictable shocks to the economy.

The crucial point to notice in equation (4) is that income does not enter into the demand function. The important determinant of the demand for LR will be the deviations in income from its expected level. If banks expect a change in income, then they will rebalance the structure of their portfolios to ensure they can match expected changes in the maturity structure of their assets and liabilities. However, if they are uncertain about future deposit and credit flows then they will increase their demands for LR. In Australia, the bank's demands for "excess reserves" are highly insensitive to short-run to changes in r (i.e. β is likely to be small).[12] This means small changes in LR would lead to large changes in interest rates as financial institutions compete with each other for the reduced supply of liquid funds.[13] Notice LR is something quite different to current notions of money base. There would be no sense in using it as some form of intermediate target, as suggested by traditional monetarists. Fixing a target for LR would almost certainly lead to extreme volatility in interest rates and aggravate,

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institutional features of the current Australian financial system in order to be as abstract and general as possible.

[12] Excess reserves in Australia (loans to dealers) receive a market related rate of interest. This implies they are even more insensitive to interest rate changes than might be expected.

[13] This appears to be the case in Australia, where the stock loans to dealers can change by over 100 per cent on a daily basis.

rather than smooth cycles in income (Dotsey, 1987). This aspect is discussed more fully below.

Equation (4) and a specification of the supply of liquid reserves, can now replace the obsolete LM curve in the examination of the transmission mechanism. The solution for a change in liquid reserves (again holding prices constant) is given by;

$$\frac{dy}{dLR} = \frac{(\sigma\theta + \delta)}{\theta\beta} > 0 .$$

Figure 3 depicts an expansionary monetary policy using the new framework. The right-hand side of Figure 3 is the conventional IS curve in the income interest rate space. The left-hand side, shows the determination of the short-term interest rate from the intersection of demand and supply schedules for liquid reserves. The supply of liquid reserves LR_S is shown on the graph as a positive function of the interest rate.

$$(5) \qquad LR_S = \overline{LR} + \omega r$$

As will be discussed below, ω is determined by policy-makers and could easily be set to zero. Notice first that the LR curve (which equates the demand and supply of liquid reserves) is horizontal, in contrast to the previous vertical LM curve. Its position is determined by open market operations which change the quantity of liquid reserves. In other words, the central bank influences a short-term interest rate which will not depend, in the short-run, on the interaction between money and output. Expansionary monetary policy will now involve shifting the LR curve down, lowering domestic short-term interest rates and, in turn, depreciating the domestic currency. The depreciation reinforces the expansionary effects on income by shifting to the right the trade balance component of the IS curve. The exact size of the response in income to a change in LR depends crucially on the size of the co-efficient β. If, as suggested above, β is very small, then the multiplier will be very large. In other words, it will take only a very

small change in open market operations to cause a large change in income. Monetary policy will remain potent, even in a world without money.

FIGURE 3
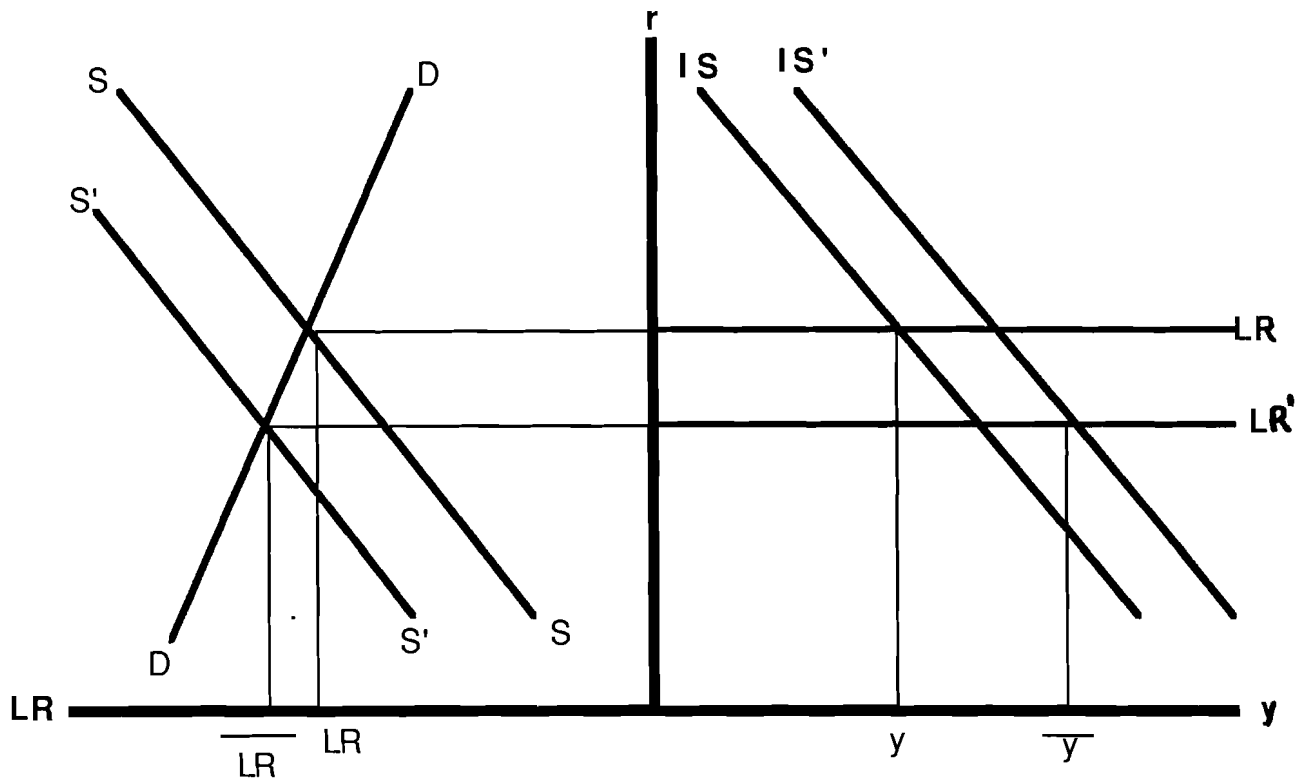
It should also be pointed out that the level of LR may be highly volatile if u and ε_4 have a high variance. This variation in LR would not imply an active monetary stance, but merely reflects the role of the central bank in supplying whatever short-term liquidity is needed in the financial system to ensure its stability. Policy changes may, in fact, imply very small changes in LR relative to normal random movements in demand, so that distinguishing regular relationships between monetary policy and the economy may not be possible by looking at the relationship between LR and Y.

To help explain this further, the above diagrams can be extended into a stochastic framework to evaluate alternative policy rules as was first done by Poole (1970). Figures 4 and 5 provide both the stochastic IS curve in the traditional income (y) and interest rate (r) space, along with demand and supply curves for liquid reserves (LR) under alternative supply rules. Figure 4 shows the highly elastic

supply curve (marked SS) normally associated with fairly close interest rate targeting. The demand curve for LR is marked as DD, with the parallel lines (marked D'D') representing the variances of the stochastic shocks hitting the demand for reserves. The optimality of this policy approach is evaluated by looking at the variance of income. With the interest rate held fixed in this policy setting the size of the variance in income is determined by the stochastic shocks hitting the goods market or IS curve.

In contrast, a move towards a reserve targeting policy, shown in Figure 5 as a steeper SS curve, introduces larger fluctuations in the interest rate and substantially raises the variance of income. The model stresses the importance of central bank policy in supplying short-run liquidity to the banking sector to ensure stability in both the financial and real sectors. This is in sharp contrast to conventional IS/LM models which give ambiguous answers on the relative merits of interest rate versus money stock control. In particular, the desirability of targeting money in the IS/LM model depended crucially on the the variance of the money demand shocks being smaller than goods market shocks (given model parameters). This ambiguity is not present in IS/LR framework which always calls for the short-run stabilization of interest rates in order to minimize the variance in income.

It is interesting to speculate on the likely demand for intermediated assets (what Tobin and others call 'inside money') in this perfectly deregulated system. If one continues to use the old LM equation to derive a demand for such assets, then the LM curve would shift passively to the right following a monetary expansion as financial institutions create more credit and deposits to accommodate increased transactions demand. However, it could also be argued that the LM equation is not a suitable approach to modelling the demand for intermediated assets. In a fully deregulated world, the private sector's demand for assets will reflect, more closely, their intertemporal savings decisions. For example, a policy-induced fall in interest rates makes it less attractive to save, and more attractive to spend, so there may in fact be a decline in the demand for intermediated assets following an easing of monetary policy, rather than an expansion. In any case, the stock of such assets outstanding will no longer be relevant for the implementation and transmission of monetary policy.
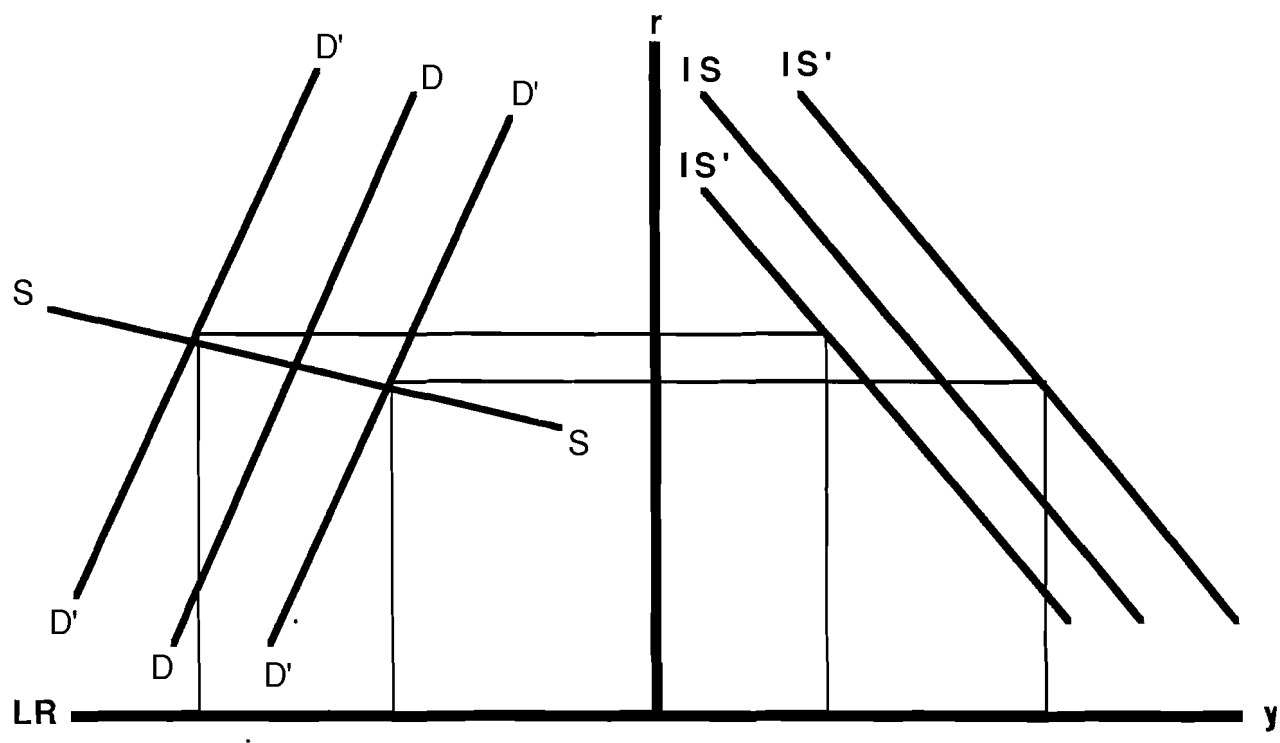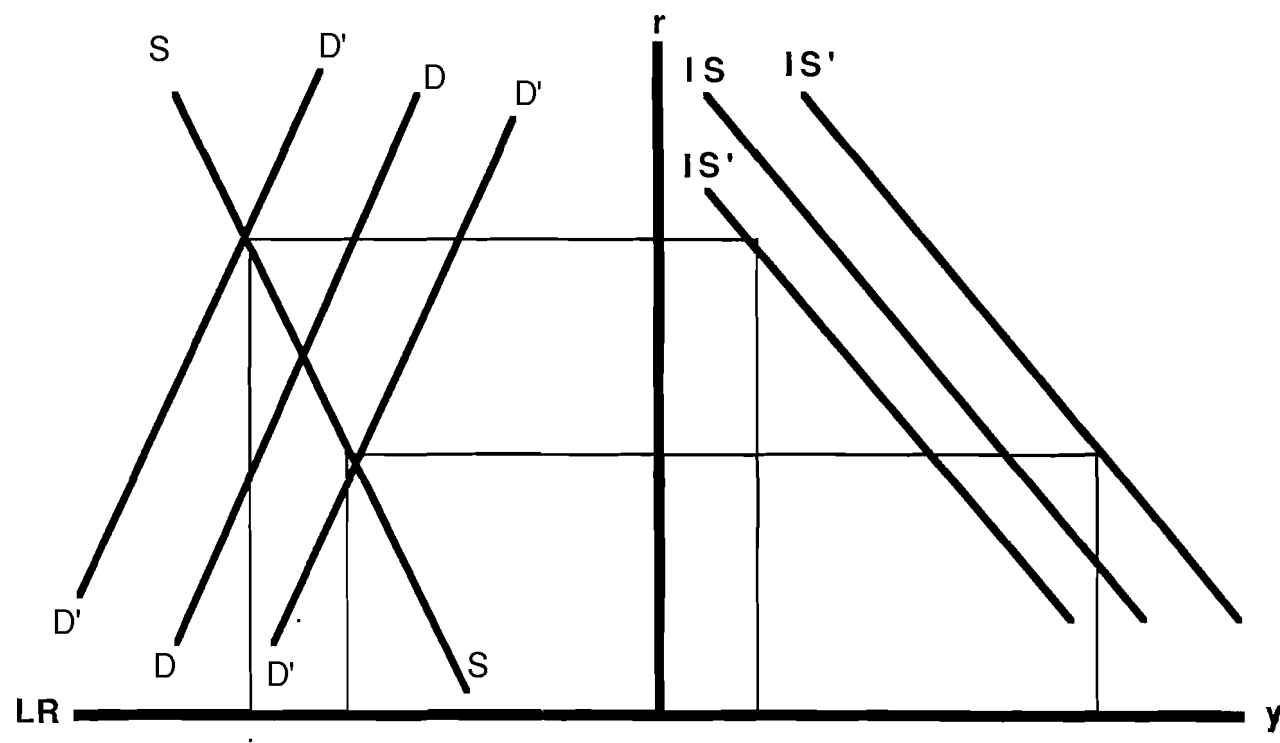
FIGURE 4

FIGURE 5

5 Empirical Implications

The model of the transmission mechanism outlined above has empirical implications which differ substantially from both the textbook model and from more institutional descriptions of the monetary transmission process. In particular, traditional models tend to view central bank control over a money or credit aggregate as being the important exogenous force driving activity and prices. In such models the aggregates should, therefore, lead movements in activity and prices. In the deregulated world, where central banks operate directly on the price of financial assets, it will be interest rates and exchange rates which lead activity, with money and credit moving with, or after, changes in activity and prices. The above work therefore provides a strong alternative hypothesis to the conventional notion that money leads the economic cycle.

This paper will not attempt to provide new evidence on the question of money/income causality: that question is addressed directly in a number of other papers in this series.[14]   It is, however, worth bringing together some of that evidence, as well as placing it within the context of the recent overseas work on the subject; particularly as the international evidence is starting to question the assumption that money and/or credit are leading indicators of activity.

A good summary of the US experience is provided in a series of papers by Benjamin Friedman (1988a and 1988b). He points out that the conventional wisdom of money leading output was established using data primarily from the pre-deregulation era.[15] As the deregulated data from the 1970s and 1980s began to be included in the data sets, it became increasingly difficult to make strong statements about the leading role of money and credit. The work of Stock and Watson (1987) was able to find, under certain restrictive specifications, that M1 still had some predictive power in explaining future industrial production with

[14] See, for example, Bullock, Stevens and Thorp (1988) and Bullock, Morris and Stevens (1988).

[15] The foundation work in this case was Friedman and Schwartz (1963). This was backed up by Sims(1972) in the US and by numerous other studies for the other major industrial countries.

data up to 1985. However, Friedman (1988a) claims this appears to be breaking down once data up to 1987 is added to the model. To quote:

> "As of 1979, the available evidence strongly supported the view that observed fluctuations of M1 in the United States did contain such information about future movements of U.S. income and prices. By contrast, the same experiments carried out with data for the most recent 18 years provide no support for the view that fluctuations in M1 carry information about future income and prices that is not already contained in fluctuations of income and prices themselves."

In other countries the evidence is not necessarily as strong, although this is to be expected given that many countries have not yet proceeded as far in allowing financial market deregulation. In Japan, for example, the conventional wisdom remains that the monetary aggregates are good leading indicators of activity and prices, although it is already recognized that further steps aimed at deregulating the financial system may change this relationship (Suzuki 1987). Similarly, the stability of the monetary aggregates in a number of European countries (and the continued use of monetary targets) appears to be related to the gradual pace of deregulation in those countries. In countries where deregulation has proceeded further (the United Kingdom, Canada and New Zealand) there has generally been a breakdown in the relationship between conventional monetary aggregates and nominal spending. It is interesting that both the U.K. and New Zealand are now concentrating more closely on a definition of money that is much closer to the old textbook definition; i.e. currency in the hands of the public plus liquid reserves at the central bank. In all countries there is agreement that the effectiveness of monetary policy is not necessarily being reduced by the process of deregulation. Rather, as the model above would predict, the transmission mechanism is running directly from interest and exchange rates to real demand, activity and prices. The most recent OECD survey of the empirical literature concluded:

> "The dismantling of administrative regulations and the adoption of market-orientated techniques of monetary control has resulted in financial market prices such as interest rates, and exchange rates, and in some cases equity prices, having to play a more

important role in the transmission process of monetary policy."(Chouraqui, Driscoll and Strauss-Kahn, 1988, p. 35)

These conclusions are also reinforced by the work of Ahktar (1983) at the Bank for International Settlements, by the Federal Reserve Bank of New York (1988) and by the International Monetary Fund (Watson, et al 1988).

6 Policy Implications

Before discussing the policy implications of the theoretical model, it is important to point out the limitations of the static fixed price Hicksian framework modeled above. First, it is not possible to treat the interest rate as an exogenous variable, even although it is closely influenced by the central bank. When put into a stochastic world, the model does not imply that fixing the nominal interest rate is an optimal policy. Fixing the nominal interest rate would, as discussed initially by Wicksell (1936) and more recently by Sargent and Wallace (1975), lead to price level indeterminacy and/or instability as soon as one relaxes the assumption of fixed prices. As an example, imagine a one-off positive shock to the economy (e.g., an improvement in the terms of trade), this would lead to a rise in income and, starting from initial equilibrium, a rise in inflation. With the nominal interest rate fixed, and inflation rising, the real interest rate will fall. This leads, in turn, to a second-round rise in income and inflation and a further fall in the real interest rate and so on. Any deviation from steady-state induces explosive behaviour.

To avoid such instability, the nominal interest rate needs to be tied to a nominal variable. Until recently, most countries, including Australia, have used nominal "money" growth as a nominal policy anchor. In a world without money is there an alternative nominal anchor? The most obvious alternative anchor is nominal GDP growth which is, in any case, the ultimate objective in a monetary targeting framework. A rise in GDP would then be followed by a policy-induced rise in interest rates, cutting off any inflationary spiral before it could get underway. The stance of monetary policy could be evaluated by comparing nominal GDP growth with the nominal interest rate. If the nominal interest rate was below current nominal GDP growth (and expected to remain there), this allows investors

(including the government) to borrow at current interest rates, invest in the domestic economy and pay interest out of future growth. Such a monetary stance is clearly expansionary (and could not be maintained indefinitely without rising inflation). In contrast, if interest rates were allowed to move above the GDP growth rate, policy could be interpreted as contractionary.

Even more direct and simple policy regimes are available. One is fixing the nominal exchange rate, although this strategy is not available to every country (one country must tie down the world average price level). Another regime is to target directly a price level or the rate of inflation. This approach has been suggested by Hall (1983) and others in the New Monetary Economics school. A major problem with the pure price targets is that they largely remove the anti-cyclical or Keynesian role for monetary policy. Without going into the debate over discetionary monetary policy, it is clear that many central banks would be unwilling (or unable) to give up any role for real variables in setting interest and exchange rates. It is perhaps this factor that gives nominal GDP targets some advantage over pure price targets. It should also be stressed that none of the above alternative regimes are necessarily easy to implement. Because of lags in the collection of data and the impact of policy on targets, there will always be substantial discretion and uncertainty involved in the short-run operation of monetary policy.

Indeed, the crucial problem with many simple quantity or price level rules is that they require the authorities to forecast the future impact of current policies on private sector expectations. Such a task is certain to lead to frequent forecast errors and may aggravate rather than smooth economic cycles. Is there a monetary regime that can be neutral to the business cycle in a deregulated financial system, just as monetary targets were supposed to be neutral in a regulated system? This is clearly a neglected area requiring further research. A recent paper by Barro (1988) may provide a fertile starting point. He argues that monetary policy could be directed at stabilizing an interest rate. In the framework outlined above, such a policy is clearly not possible given that the interest rate is basically an operating instrument. However, if a long-term rate is introduced into the model, then targeting the long rate could be a feasible policy alternative. It has the major advantage that it removes the need for central banks to try and forecast their policy target and the effects of policy on the target: this would now be left entirely up to financial markets and would be instantly observable.

For some central banks this strategy would not provide adequate control over inflationary expectations because the long-term real interest rate is not observable and may vary through time. An extension of the Barro proposal would therefore be to target the difference between a nominal and an indexed long-term bond; i.e. the markets long-run inflationary expectations. Whenever the yield on nominal long bonds rose above the yield on indexed bonds policy would be tightened and the yield curve would invert; activity would slow and so expected inflation (and nominal long yields) would fall.

A number of technical and practical problems remain unresolved with many of the above policy proposals. Yet for many countries, including the US, the U.K., Canada, and Australia, where financial deregulation has undermined the simple monetary targeting option, regimes currently in operation are probably best described as some mixture (often ad hoc) of the above systems. Given this state of affairs, further research on alternative regimes is clearly required.

6. Conclusions

The paper has argued that monetary policy is likely to remain effective (and operate in a similar way as it does at present), even once financial deregulation and innovation have taken us to a world without currency or required reserves. When analysing monetary policy in a deregulated environment, it was shown that the textbook IS/LM model is no longer an adequate means of explaining the monetary transmission mechanism. A new approach, based on the demand for liquid reserves by financial institutions was presented that captures the essence of the modern transmission process in very simple terms. In this model, policy works by directly moving short-term real interest rates which, in turn, generates shifts in the exchange rate. Interest rate effects on domestic demand are reinforced by exchange rate effects on net exports. Monetary policy remains very powerful.

The theoretical model was presented in a futuristic framework of zero currency balances and complete deregulation to contrast it with current thinking on monetary transmission. In fact, since the deregulation of interest rates in many countries, the implementation and transmission of monetary policy has already moved very close to the IS/LR framework presented above. Many central banks take the monetary aggregates (including currency and required reserves) as demand determined and operate on the supply of excess liquid reserves to influence interest rates. The empirical evidence surveyed also suggests that there has been a major shift in the way monetary policy is transmitted to the economy, with the monetary aggregates no longer providing leading information on the economy.

Given these changes to the way policy is transmitted to the economy, the paper has called for the examination of alternative monetary regimes that may simplify the policy implementation process and make central banks more clearly accountable for their policy decisions.

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