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BANKING IN THE THEORY OF FINANCE

Eugene F. FAMA*

University of Chicago, Chicago, IL 60637, USA

Banks are financial intermediaries that issue deposits and use the proceeds to purchase securities. This paper argues that when banking is competitive, these portfolio management activities in principle fall under the Modigliani–Miller theorem on the irrelevance of pure financing decisions. It follows that there is no need to control the deposit creation or security purchasing activities of banks to obtain a stable general equilibrium with respect to prices and real activit In practice, however, banks are forcibly involved in the process by which a pure nominal commodity or unit of account is made to play the role of numeraire in a monetary system. The paper examines the nature of such a nominal commodity and how, through reserve requirements, banks get involved in making it a real economic good.

1. Introduction

This paper studies commercial banking from the viewpoint of the theory of finance. We take the main function of banks in the transactions industry to be the maintenance of a system of accounts in which transfers of wealth are carried out with bookkeeping entries. Banks also provide the service of exchanging deposits and other forms of wealth for currency, but in modern banking this is less important than the accounting system of exchange. Moreover, although both can be used to carry out transactions, one of our main points is that currency and an accounting system are entirely different methods for exchanging wealth. Currency is a physical medium which can be characterized as money. An accounting system works through bookkeeping entries, debits and credits, which do not require any physical medium or the concept of money.

In principle, providing an accounting system of exchange does not require that banks hold the wealth being exchanged. In practice, the costs of operating the system – replenishment costs for depositors and costs to banks and transactors of determining when transactions are feasible – are probably smaller when this is the case. Thus, banks assume a second major function,

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portfolio management. They issue deposits and use the proceeds to purchase securities. A basic point of this paper is that when banking is competitive, the portfolio management activities of banks are the type of pure financing decisions covered by the Modigliani–Miller (1958) theorem. From this result we can infer that there is no need to control either the deposit creation or the security purchasing activities of banks for the purpose of obtaining a stable general equilibrium with respect to prices and real activity.

In examining the nature of banking, it is helpful to start with the assumption that banks are unregulated. This case provides the clearest view of the characteristics of an accounting system of exchange and of the fact that the concept of money plays no essential role in such a system. The unregulated case also provides the clearest application of the Modigliani–Miller theorem to the deposit creation and asset management decisions of banks. Having analyzed unregulated banking, we then study the effects of two main forms of bank regulation, reserve requirements and the limitation of direct interest payments on deposits.

Finally, much of the analysis centers on the argument that in principle the banking industry has no special role in the determination of prices. In practice, however, banks are forcibly involved in the process by which a pure nominal commodity or unit of account is made to play the role of numeraire in a real world monetary system. Our last task is to examine the nature of such a pure nominal commodity and how banks get involved in making it a real economic good.

2. An unregulated banking system

To get an understanding of the microeconomic structure of an unregulated banking industry, let us, for the moment, take the economy's pricing process as given. For concreteness, let us assume there is a numeraire, some real good, in terms of which prices are stated, leaving the issues connected with the pricing process for later. Finally, to focus on the issues of immediate interest, let us also assume, temporarily, that currency does not exist.

With unregulated banking, we might expect to observe a competitive banking system like that described by Johnson (1968) or Black (1970). In brief, banks pay competitive returns on deposits, that is, they pay the returns that would be earned by depositors on securities or portfolios that have risk equivalent to that of the deposits, less a competitively determined management fee; and banks charge for the transactions services they provide, again according to the competitively determined prices of these services. It is fruitful, however, to examine more closely both the transactions mechanism and the likely nature of unregulated deposits.

2.1. Bank deposits as portfolio assets

In the unregulated environment described by Black and Johnson, there is nothing special about bank deposits as portfolio assets since deposits pay the same returns as other managed portfolios with the same risk. Although Black and Johnson presume that bank deposits would be low risk portfolio assets, Tobin's (1963) conjecture seems more valid; that is, in an unregulated environment there is unlikely to be a clear distinction between banks and other portfolio managers. Although banks may be more interested in supplying transactions services, competition will induce them to provide different types of portfolios against which their depositors can hold claims. Although other financial institutions, like mutual funds, may be more interested in managing portfolios, competition will induce them to provide the transactions services normally associated with banks. In the end, one will observe financial institutions, all of which can be called banks, that provide accounts with different degrees of risk and allow individuals to carry out exchanges of wealth through their accounts.

In cases where individuals choose to hold deposits against risky portfolios, the value of an account fluctuates because of withdrawals and deposits and because of fluctuations in the market values of the portfolio assets on which the account has claim. For example, some banks may offer deposits which are nothing more than claims against an open end mutual fund. Such funds now issue and redeem shares on demand at the current market value of the portfolio. In a more open environment, they would allow the same thing to be done by check or any other mechanism coincident with the tastes of 'depositors' and whose costs the depositors are willing to bear.

One might also expect to observe banks that provide personalized portfolios of assets for the deposits of individual investors. The 'general accounts' maintained by New York Stock Exchange brokers for their customers could easily be transformed into such personalized bank accounts. As currently operated, an investor can borrow on demand, usually with a phone call to the broker, against a general account. When the broker's check is received, it can be endorsed over to an arbitrary third party. It is a short step from this to allowing investors to write checks against their accounts, with the checks covered, according to the choice of the investor, either with an automatic loan against the account or by the sale of specified assets from the account. There are similar simple mechanisms whereby the recipient of the check can instruct his broker-banker to use the addition to his account either to purchase new portfolio assets or draw down existing loans.

There will also be riskless deposits, that is, deposits not subject to capital gains or losses, where the value of the deposit varies only because of transactions executed and the accumulation of interest. Such riskless deposits might be direct claims against a portfolio of short-term riskless securities, in

effect, a riskless mutual fund. Or a bank may issue both riskfree and risky deposits against a given portfolio of assets, with any capital gains or losses in the portfolio absorbed by those holding the risky deposits. The latter scenario would look more familiar if we assumed instead that the risk in the portfolio is borne by stockholders. However, our risky deposits are common stock with the additional benefits provided by access to the bank's transactions services.

2.2. *An accounting system of exchange*

Consider a transaction in which wealth is to be transferred from one economic unit to another. In a complicated world where there are many types of portfolio assets and a spectrum of consumption goods and services, the form of wealth one economic unit chooses to give up in a transaction does not generally correspond to the form of wealth that the other eventually chooses to hold. Thus, one transaction generally gives rise to a set of transactions involving transfers of portfolio assets or consumption goods among many economic units. In a currency type system, each transaction in this resettling of wealth involves the intervention of a physical medium of exchange which serves as a temporary abode of purchasing power, but which is soon given up for consumption goods or new holdings of portfolio assets. In contrast, in a pure accounting system of exchange, the notion of a physical medium or temporary abode of purchasing power disappears. Its role in the transactions sequence is replaced by bookkeeping entries, that is, debits and credits to the deposits of the economic units involved.

Thus, when one economic unit wishes to transfer a given amount of wealth to another, he signals his broker–banker with a check or some more modern way of accessing the bank's bookkeeping system. The broker–banker debits the sending account and the same or another broker–banker credits the receiving account for the amount of the transaction. The debit to the sending account generates a sale of securities from the portfolio against which the sending depositor has claim while the credit to the receiving account generates a purchase of securities for the portfolio against which the receiving depositor has claim. All prices, including prices of securities, are stated in terms of a numeraire, which we have assumed is one of the economy's real goods, but the numeraire never appears physically in the process of exchange described above. The essence of an accounting system of exchange is that it operates through debits and credits, which do not require any physical medium.

Of course, the existing checking system is not as free as the unregulated one we have described. There are regulations concerning what types of securities can be held in the bank portfolios against which deposits represent

claims; there are regulations limiting the returns that can be paid on deposits; and for banks in the Federal Reserve system, there are regulations concerning how the bookkeeping entries generated by transactions move through the accounts that individual banks must keep with Federal Reserve banks. Nevertheless, the checking mechanism still operates through debits and credits that generate sales and purchases of securities from the portfolios against which the deposits involved have claims. Both in our unrestricted environment and in the real world's regulated environment, the accounting system of exchange provided by banks operates without the intervention of a physical medium of exchange or temporary abode of purchasing power.

2.3. *Deposits, prices, and real activity*

Although an accounting system of exchange involves no physical medium, like any system of exchange its efficiency is improved when all prices are stated in units of a common numeraire. For the purposes of a pure accounting system, the numeraire need not be portable or storable. It could well be tons of fresh cut beef or barrels of crude oil. However, in the type of unregulated banking system we have described, there is no meaningful way in which deposits can be the numeraire since deposits can be tailored to have the characteristics of any form of marketable wealth. Unregulated banks provide an accounting system in which organized markets and bookkeeping entries are used to allow economic units to exchange one form of wealth for another. But the deposits of the system are not a homogeneous good in which prices of all goods and securities might be stated.

The point is more than semantic. For example, after an insightful analysis of the social optimality of an unregulated banking system, Johnson (1968, p. 976) concludes that such a system would produce an upward spiralling price level:

> 'The analysis thus far has been concerned with the efficiency of the banking system, considered as an industry like any other industry. The banking system cannot, however, in strict logic, be so treated, because of the special characteristics that distinguish its product – money, the means of payment – from the products of other private enterprises – real goods and services . . . Less abstractly, a competitive banking system would be under constant incentive to expand the nominal money supply and thereby initiate price inflation.
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> Stability in the trend of prices (a special case of which is price stability) and in the trend of expectations about the future course of prices – which are generally agreed to be important to the social welfare – requires social control over the total quantity of money supplied by the banking system.'

Johnson is bothered by the fact that the deposits of an unregulated banking system involve no opportunity cost. There is no reason for investors to limit their holdings of deposits, and the supply of deposits is limited only by the economy's total invested wealth. However, the appropriate conclusion is not that prices measured in units of deposits will tend upward without limit, but rather that it makes no sense to try to force deposits to be numeraire in a system where 'deposits' is a rubric for all the different forms of portfolio wealth that have access to the accounting system of exchange provided by banks. Moreover, in a system where deposits can take on the characteristics of any form of invested wealth, deposits are a means of payment only in the sense that all forms of wealth are a means of payment, and the banking system is best understood without the mischief introduced by the concept of money.

The point in quoting from Johnson (1968) is not to single him out for special criticism. Other treatments of unregulated banking agree that determination of the price level is a special problem in such systems. Like Johnson, Pesek and Saving (1967) conclude that with unregulated banking, the price level will tend to spiral upward, while Gurley and Shaw (1960) and Patinkin (1961) argue that the price level is indeterminate. In all of these analyses, the problem of price level determinacy arises from treating unregulated deposits as 'money' and then trying to force this money to be the numeraire.

Since the economy in which we have embedded our competitive unregulated banking system is basically non-monetary, with some real good serving as numeraire, price level determinacy reduces to a standard problem concerning the existence of a stable general equilibrium in a non-monetary system. We examine now the role of banks in a general equilibrium, that is, in the determination of prices, real activity and the way that activity is financed.

In the world we are examining, banks have two functions. They provide transactions services, allowing depositors to carry out exchanges of wealth through their accounts, and they provide portfolio management services. The transactions services of banks allow economic units to exchange wealth more efficiently than if such services were not available, and in this way they are a real factor in a general equilibrium. However, there is no reason to suppose that these services are subject to special supply and demand conditions which would make them troublesome to price. Rather, the concern with banks in macroeconomics centers on their role as portfolio managers, whereby they purchase securities from individuals and firms (and a loan is, after all, just a purchase of securities) which they then offer as portfolio holdings (deposits) to other individuals and firms. Thus, banks are in the center of the process by which the economy chooses its real activities and the way those activities are financed.

In spite of their apparently strategic position, from the viewpoint of the theory of finance the portfolio management decisions of banks are the type of pure financing decisions that can be subject to the Modigliani–Miller (1958) theorem. The theorem has a strong form and a weak form, and we consider below how each can be applied to the portfolio management activities of banks. But the common message in both forms of the theorem is that as portfolio managers, banks are financial intermediaries with no special control over the details of a general equilibrium.[1]

Suppose that in purchasing securities from investors or firms and in issuing portfolios that represent claims against these securities, banks have no special privileges or comparative advantages vis à vis investors, firms or other financial intermediaries. Given such equal access to the capital market on the part of all economic units, the standard proof of the Modigliani–Miller theorem implies that the portfolios offered to depositors by banks can be refinanced by the depositors or their intermediaries so as to allow the depositors to achieve portfolio holdings that conform best to their tastes. In short, in an equal access market, a strong form of the Modigliani–Miller theorem holds. The basic constraints on portfolio opportunities are defined by the real production–investment decisions of firms. The way firms finance these decisions, or the way they are refinanced by intermediaries, including banks, neither expands nor contracts the set of portfolio opportunities available to investors. In this world, banks hold portfolios on behalf of their depositors because this probably allows them to provide transactions services (the accounting system of exchange) more efficiently, but the portfolio management activities of banks affect nothing, including prices and real activity.

Under the equal access assumption, the portfolio management decisions of the entire banking sector are of no consequence. However, the equal access assumption is stronger than is necessary for the weaker conclusions that each and every bank is subject to the Modigliani–Miller theorem (its portfolio decisions are of no consequence to investors) and that the banking sector is at most a passive force in the determination of prices and real activity. Thus, suppose access to the capital market for individuals is more limited than for banks, but among banks access to the market is competitive in the sense that an individual bank cannot offer to purchase securities and provide deposits which cannot also be purchased and offered by other banks. In other words, there are always actual or potential perfect substitutes for the portfolio management activities of any bank. As pointed out by Tobin (1963), if a bank is to survive, it must attract depositors, which means providing portfolios against which depositors are willing to hold claims. Moreover, competitive banks

[1]A discussion of the Modigliani–Miller theorem, covering both the 'equal access' and 'perfect substitutes' approaches used in what follows, is in Fama (1978).

simply turn over the returns on their portfolios to their depositors, less a competitively determined management fee. Banks are concerned with the fees they earn rather than with the types of portfolios they provide, so in a competitive equilibrium they provide, in aggregate, portfolios to the point where each different type produces management fees at the same rate.

Suppose now that, for whatever reason, one bank perturbs the equilibrium by arbitrarily providing more deposits of a given type and less of another. If other banks do not respond, deposits of different types no longer produce management fees at the same rate. Thus, other banks respond by exactly offsetting the changes in the portfolio management decisions of the perturbing bank and in this way restore the original general equilibrium. It follows that the portfolio management decisions of individual banks are of no consequence to investors, that is, no bank can by itself alter the portfolio opportunities available to investors, and individual banks are subject to the Modigliani–Miller theorem.

The essence of the story is that even when they have comparative advantages in the capital market vis à vis individual investors, competitive unregulated banks end up simply bringing together demanders and suppliers of portfolio assets and then acting as repositories for the securities that are thereby created. If all or most portfolio wealth is managed by banks, this means that banks succeed, under the impetus of competition, in eliciting securities from individuals and firms and in transforming these securities into portfolio holdings that conform to the opportunities and tastes of the ultimate suppliers and demanders of securities. Since banks just respond to the tastes and opportunities of demanders and suppliers of portfolio assets, banks are simple intermediaries, and the role of a competitive banking sector in a general equilibrium is passive. The controlling forces in the economic activity that takes place, the way that activity is financed, and the prices of securities and goods are the tastes and endowments of individual economic units and the state of the economy's technology.

Finally, a rigorous development of the Modigliani–Miller theorem [see, for example, Fama (1978)] would require, among other assumptions, that there are no transactions costs in purchasing and selling securities. In the strong form of the theorem, which is based on equal access to the capital market on the part of both individuals and firms, the optimizing portfolio rearrangements undertaken by individuals must be costless. In the weak form of the theorem, which in our analysis is based on the assumption that there are perfect substitutes among banks for the portfolio management activities of any individual bank, the offsetting portfolio rearrangements that take place among banks to return the system to a general equilibrium in response to a perturbation must be costless.

However, the rigorous application of perfect competition to any industry always involves a similar assumption about frictionless reallocations of

resources. The standard scientific hope is that the major conclusions drawn from simplified scenarios are robust in the face of real world complications. For our purposes, the complications introduced by transactions costs in trading securities are not likely to overturn the general conclusions that a competitive banking sector is largely a passive participant in the determination of a general equilibrium, with no special control over prices or real activity, which in turn means that there is nothing in the economics of this sector that makes it a special candidate for government control.

3. A regulated banking system

Understanding unregulated banking makes analysis of the major forms of bank regulation straightforward. We consider first a reserve requirement and then a limitation on direct payments of returns to deposits. For the moment, we maintain the assumption that the numeraire is one of the economy's real goods and that there is no currency. The role of banks in defining a pure nominal commodity or unit of account which serves as numeraire is taken up subsequently.

3.1. Reserve requirements

Suppose banks, that is, intermediaries that offer deposits that provide access to an accounting system of exchange, are required to keep a minimum fraction of their assets 'on reserve' at the government's central bank, with the return on these reserves passing to the central bank. Such a reserve requirement is a direct tax on deposit returns since it lowers the return on deposits by the fraction of deposits that must be held as reserves. Deposits now involve opportunity costs, that is, lower returns than non-deposit assets with the same risk. Investors and firms are induced to economize their holdings of deposits and so to incur replenishment and other costs that would be unnecessary in the absence of a reserve requirement. Moreover, the reserve requirement causes some intermediaries to choose not to provide access to the accounting system of exchange, so the reserve requirement has the effect of differentiating banks from other intermediaries.

However, there are important conclusions on which a reserve requirement has no effect. It is still true that the payments mechanism provided by banks is a pure accounting system of exchange wherein transfers of wealth take place via debits and credits that give rise to sales and purchases of securities in the portfolios against which the sending and receiving accounts have claim. The reserve requirement simply means that there must also be a resettling of the reserve accounts that the banks involved must keep with the central bank.

Moreover, aside from the fact that they are taxed, there is still nothing special about deposits as portfolio assets. In the absence of further restrictions, deposits can represent claims against any form of invested wealth. If banks are competitive, deposits pay returns just like comparable non-deposit portfolios, less, of course, the tax imposed by the reserve requirement. Thus, deposits are still not a homogeneous good and they are not an appropriate candidate for numeraire.

Most important, if banking is competitive, banks remain passive intermediaries, with no control over any of the details of a general equilibrium. With respect to these issues, the 'perfect substitutes' analysis of unregulated banking can be applied intact. In brief, because they are concerned with management fees and not with the types of portfolios they manage, in their portfolio management decisions, banks simply cater to the tastes and opportunities of suppliers of securities and demanders of deposits. Thus, the real activity that takes place, the way it is financed, and the prices of securities and goods are not controlled either by individual banks or by the banking sector.

3.2. Limitation of interest payments on deposits

Suppose that in addition to a reserve requirement, there is a complete restriction on the payment of explicit returns on deposits. The restriction is complete in the sense that capital gains and losses on deposits as well as interest payments are not allowed and the value of a deposit is fixed, at least in units of whatever the system uses as numeraire. Since deposits must now be riskfree, a bank either limits its asset portfolio to riskfree securities or it has stockholders that absorb any variation in the market value of its portfolio. In short, except for the units in which they are denominated, deposits now look much like those of real world commercial banks.

If banks remain competitive, the restriction of interest payments on deposits does not yield them monopoly profits. One thing that is likely to happen, and which we in fact observe, is that banks charge less than cost for the transactions services they provide. In general, banks will now compete in finding ways to pass back returns on portfolio assets in the form of services to depositors. This special task of transforming ordinary interest bearing securities into securities (deposits) that pay returns in kind further differentiates banks from other financial intermediaries. However, if banks are competitive, the services they provide to depositors use up returns equivalent to those on non-deposit riskfree portfolio assets.[2]

[2]If the limitation of interest payments on deposits does not generate either profits for competitive banks or taxes for the government, one can wonder why sufficient political pressure has not been generated to cause this restriction to be eliminated. One possibility is that the

Because they pay returns in kind, deposits are not perfect substitutes for non-deposit portfolio assets with the same risk. Thus, the size of the banking sector is limited on the demand side by the incentives of investors to restrict their holdings of deposits. On the supply side, there is nothing special about the actions of any individual bank in transforming returns earned on portfolio assets into returns paid to depositors as services, so that this activity is likely to be characterized by constant returns to scale, at least at the industry level. Thus, the 'perfect substitutes' approach to the Modigliani–Miller theorem again holds. Perturbations to the overall equilibrium of the banking sector by any individual bank are offset by other banks, making the activities of any individual bank of no consequence. The banking sector as a whole just passively responds to the demands of investors for its particular type of financial intermediation.

In short, the limitation of direct payment of returns on deposits differentiates the portfolio management activities of banks from those of other financial intermediaries. Banks get into the business of transforming ordinary securities into special securities, deposits, that pay returns in the form of services. Nevertheless, as in the earlier cases, competitive banks end up as passive intermediaries fully subject to the Modigliani–Miller theorem, which means that there is no need to control their activities for the purpose of obtaining a stable general equilibrium with respect to prices and real activity.

4. Banking when the numeraire is a pure nominal or unit of account

In large part, the analysis of banking presented above can be viewed as a development of Tobin's (1963) insight that banking is just another industry whose equilibrium is subject to standard economic analysis. Elaborating this point has been simplified by the fact that we have so far treated banking in a non-monetary economy, which also allows us to give content to Tobin's conjecture that the special characteristics of banks as financial intermediaries derive more from regulations, for example, restrictions on returns paid on deposits, than from any role played by banks with respect to money.

On the other hand, we have so carefully kept anything resembling money out of banking that our analysis so far has nothing to say about how banks get involved in the process by which a pure nominal commodity or unit of account is made to play the role of numeraire in a real world monetary

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limitation has tax advantages. For individuals, interest received from banks would be taxable but payments for transactions services, like other expenses involved in generating consumption, would not be tax deductible. Thus, when banks transform interest payments into 'free' transactions services, they are in effect allowing individuals to realize tax-free returns on their deposits. Note that this form of tax avoidance tends to offset the implicit taxes that the government collects from the banking sector through the imposition of a reserve requirement.

system. We turn now to this issue. First we consider the case where the unit of account is introduced through a fiat currency. We then consider how a reserve requirement can be used to force on deposits the problem of transforming a unit of account into a well-defined economic good.

4.1. Currency

Suppose that for some transactions a hand-to-hand medium of exchange is more efficient than an accounting system. Let us jump right to a system where the physical medium is a non-interest-bearing fiat currency produced monopolistically by the government. Assume also that the government chooses to supply currency to the private sector via banks; it supplies currency to banks in exchange for securities or deposits. Banks, in turn, inventory currency on behalf of their depositors; they provide the currency convertibility service, allowing depositors to 'turn in' deposits for currency and vice versa.

Having described how currency gets into an economic system and how banks get involved in its distribution, the problem now is to give economic content to the pure nominal unit of account (say, a dollar) in which currency is measured, that is, to make this unit of account a good that can serve as numeraire. Applying the analysis of Patinkin (1961), the problem is to ensure that the nominal commodity, currency in the present case, is subject to sufficiently well-defined demand and supply functions to give the unit in which it is measured determinate prices in terms of other goods.[3]

Since currency produces real services in allowing some exchanges to be carried out with lower transactions costs, currency has a demand function. For example, one might hypothesize that there is an aggregate demand for real currency which depends on (i) the opportunity cost of currency, the interest rate on a short-term bond whose promised pay-off in the nominal unit (say dollars) in which currency is measured is certain, (ii) some measure of real transactions activity of the type in which currency has a comparative advantage, and (iii) the minimum real costs of executing these transactions through methods other than currency.

As the wording suggests, in most models the demand for currency is expressed in real terms, units of goods and services, rather than in the nominal unit of account in which currency is denominated. To get a well-defined equilibrium in the currency market, that is, a price for the unit of account in terms of goods and services, the supply function for currency

[3]Since our goal is just to examine how banks get involved in introducing a pure nominal unit of account into the economy, we mean to bypass the type of price level determinacy issue, discussed by Brock (1974) and others, which arises when currency is treated as an asset with an infinite life. Let us just assume that the currency in our model will be expropriated and destroyed at some distant future date.

must be stated in terms of the unit of account. One possibility is that the government fixes the supply of nominal currency in terms of units of account, and then lets the public's demand function for the services of real currency determine the price level or the real value of a unit of account.

When the currency market is used to transform the unit of account into a real economic good, there is no need for government control of banking. Thus, suppose the unit in which currency is measured is the economy's numeraire, and currency exists side-by-side with an accounting system of exchange. Suppose the government monopolizes the production of currency but the banking sector is uncontrolled and competitive in the sense of section 2: Banks pass the returns they earn on portfolio assets over to depositors, they charge depositors for portfolio management and transactions services according to competitively determined fees, they allow deposits to be claims against portfolios with any degree of risk desired by depositors, and they allow depositors to participate in two kinds of transactions services, the currency convertibility privilege and access to an accounting system of exchange.

Since the nominal unit (say, a dollar) in which currency is measured is assumed to be the numeraire, the value of deposits like the value of all securities and goods, is expressed in this same nominal unit. However, in the present scenario, transforming the unit of account into a real economic good takes place in the currency market, via well-specified demand and supply functions for currency. For deposits, the analysis of section 2 holds intact. The portfolio management decisions of banks, that is, their decisions to issue deposits and purchase securities, are subject to the Modigliani–Miller theorem, which means that there is no reason to control these financing decisions of competitive banks for the purpose of obtaining equilibrium with respect to prices and real activity.

4.2. A reserve requirement

Although currency alone could be used to define a nominal unit of account as a separate good in an economic system, this function can also be imposed on deposits. One possible device is a reserve requirement. When an abstract nominal unit (a dollar) is numeraire, a regulation which says that a minimum fraction of the portfolio against which deposits represent claims must be non-interest bearing reserves issued by a central bank in effect requires that a minimum fraction of the value of the portfolio must be held in pure nominal units of account 'issued' by the central bank.

As in the case of currency, if the unit of account is to be defined through reserves, reserves must have demand and supply functions. The demand for currency arises from the direct transactions services that it provides as a physical medium of exchange. In contrast, the demand for required reserves

arises because of the reserve requirement: By making non-interest bearing reserves a required part of an accounting system of exchange which yields valuable transactions services, the government creates a demand for non-interest bearing central bank reserves which would not exist in the absence of the reserve requirement.

The point bears emphasis. Even in a competitive unregulated system, there may be securities that can be exchanged among banks at lower transactions costs than other portfolio assets. Such securities might be convenient for resettling accounts within and among banks. As a consequence, depositors may generally choose to have some amount of such low transactions cost assets in the portfolios against which their deposits have claim in order to reduce the charges they must bear when transactions through deposits require purchases or sales of assets. Thus, such low transactions cost assets may come to play the role of 'reserves'. However, these 'reserves' of an unregulated competitive system would be interest bearing since they would be ordinary securities for which competitive trading involved low transactions costs.[4]

Currency and the accounting system of exchange maintained by banks are substitutes but not perfect substitutes as methods of executing transactions. Thus, currency and reserves have separate demand functions. It follows that by controlling the nominal supply of currency alone, the government could continue to use currency alone to render the real value of the unit of account (the price level) determinate. The government could follow a passive policy with respect to reserves, allowing banks to exchange securities (but not currency) for reserves on demand. In this situation, the earlier analysis of the reserve requirement would apply: The reserve requirement is simply a tax on deposit returns which does not imply a need to control the level of either reserves or deposits.

Alternatively, since currency and reserves have separate demand functions, the government could choose to define the unit of account through reserves alone, controlling the nominal quantity of reserves, but following a passive policy with respect to currency, that is, allowing banks to exchange currency for ordinary securities (but not reserves) on demand. Finally, the government could choose to follow a passive policy with respect to the mix of currency and reserves, allowing banks to exchange currency for reserves on demand. In this case, there is no separate supply function for either currency or reserves, but determinacy of the real value of the unit of account can be

[4]There would be no particular problem in the arrangement of competitive interest payments on reserves, even though they may be continuously shifting among banks. For example, the federal funds market now provides an efficient mechanism whereby banks can earn competitive interest on a day-to-day basis on any reserves they may happen to have in excess of the legal minimum. In earlier times, banks paid interest on the deposits kept with them by other banks to resettle accounts in response to transactions among their depositors.

obtained by controlling the sum of currency and reserves. This last possibility seems to correspond best to the stated policy of the central bank in the U.S.

4.3. *Patinkin and the price level*

The preceding draws heavily on the analysis of Patinkin (1961), who in turn builds on the work of Gurley and Shaw (1960, ch. 7). However, Patinkin and Gurley and Shaw always tie control of the supply of units of account to control of bank reserves or deposits, in which case determinacy of the price level implies controlled banking. It is clear from the analysis above that currency alone could be used to define the unit of account and so obtain a determinate price level. The government could leave reserves uncontrolled or the reserve requirement could be dropped; that is, the assets (if any) that banks choose to hold as reserves to resettle accounts in response to transactions executed through their accounting system of exchange could be left unregulated, and all other aspects of banking could also be left unregulated.

Patinkin, at least, does not seem to be misled on this matter. At the end of his review of the Gurley and Shaw (1960) book, he states (1961, p. 116):

> 'The general conclusion that we can draw from all this is that, in the absence of distribution effects, the necessary conditions for rendering a monetary system determinate are that there be an exogenous fixing of (1) some nominal quantity and (2) some rate of return. It follows that if we were to extend the argument to an economy with both inside and outside money (something G–S do not do) it would suffice to fix the quantity of outside money and its rate of return (say, at zero). In such an economy the price level would be determinate even if the central bank were to fix nothing, . . . subject to the restriction that the quantity of outside money is fixed.'

If the term 'outside money' is interpreted as currency, and 'inside money' is taken to mean unregulated deposits, then the contention of Patinkin's statement is exactly our conclusion that controlling the supply of currency alone is sufficient to render the price level (the real value of the unit of account) determinate.[5]

[5]We might note that when he applies his results to reserves, Patinkin's analysis is incomplete. He concludes that the real value of the unit of account becomes determinate when the government fixes the supply of reserves and the interest rate paid on them, leaving the fraction of deposits held as reserves to the discretion of the banks. In other words, he concludes that there is no need for a reserve requirement. However, since his analysis implies that the interest rate fixed for reserves must be below what a free market would pay, the optimal strategy for banks is to hold no central bank reserves. When reserves pay less than a competitive return banks must be forced

The fact that Patinkin may not be misled does not mean that the implications of his analysis about the feasibility of uncontrolled banking are clear. We saw in the earlier quote from Johnson (1968) that he felt that a determinate price level requires government control over the total quantity of money, including the fully interest-bearing deposits of competitive banks, and Johnson explicitly considered a system where non-interest bearing, government-produced currency exists side-by-side with the deposits issued by competitive banks. Moreover, in a later comment on the Pesek and Saving (1967) book, Johnson (1969) re-iterates his position and indicates that he sees it to be consistent with Patinkin's:

> 'This analysis shows that reduction of the alternative opportunity cost of holding money to zero and reduction of the purchasing power of money to zero are two extremely different things involving different policies. The confusion between them has probably been fostered by an ambiguity in the concept of 'competition' among banks as providers of the money supply. If deposits cost nothing to create and yet the assets held against them yield a positive return, banks subject to no restraint on the nominal quantity of money they can create in the aggregate will be under competitive pressure to expand the nominal money supply until its purchasing power is reduced to zero. At best the money supply so determined will be in neutral equilibrium.
>
> On the other hand, if banks are competitive but subject either to a quantitative restraint on the aggregate money supply they can create or to a policy of stabilization of the aggregate price level mediated through control of the aggregate money supply, competition among them will force them to pay interest to their depositors and so optimize the supply of real balances without reducing the real value of money to zero . . .
>
> In conclusion, it may be noted that Figure 4.4 can be used to establish in a simple way the proposition, which emerged from Patinkin's critique of Gurley and Shaw's work that the monetary authority needs to control both a nominal magnitude and an interest rate to control the price level.'

The confusion in Johnson's interpretation of Patinkin probably arises in part from the fact that Patinkin, like everyone but Black (1970), treats unregulated competitively produced deposits as money. Even though he distinguishes between this 'inside money' and 'outside money', like currency, which is produced exogenously, and even though he is clear on the point that controlling only the quantity of outside money (and the interest paid on

to hold them. This is the function of a reserve requirement. Alternatively, a demand for reserves can be created by making central bank reserves the only eligible security for settling accounts among banks in response to transactions among customers. However, such a regulation would probably be more difficult to enforce than a reserve requirement.

it) can render the price level determinate, the temptation is there for others to treat all things called money alike, and, like Johnson, to conclude that price level determinacy requires that competitive banks are 'subject either to a quantitative restraint on the aggregate money supply they can create or to a policy of stabilization of the aggregate price level mediated through control of the aggregate money supply.

Perhaps a more important source of confusion is that Patinkin consistently uses phrases like 'the necessary conditions for *rendering a monetary system determinate* are that there be an exogenous fixing of (1) some nominal quantity and (2) some rate of return' [Patinkin (1961, p. 116), italics mine]. The precise problem is not rendering a monetary system determinate, but rather giving content to a pure nominal unit of account (a dollar) as a separate, well-defined economic good. It turns out, of course, that the unit of account is generally defined through parts of what is usually referred to as the monetary system, and, more specifically, through currency and the non-interest bearing reserves that member banks are required to hold with central banks. Nevertheless, when the price level determinacy problem is focused directly on the unit of account, one is less likely to fall into the error of concluding that price level determinacy requires control over all parts of the monetary system. One might even be tempted to conclude that the price level determinacy problem could be solved and the efficiency of the transactions and portfolio management industries could be improved if the government got out of the banking business, that is, if the activities of banks in managing portfolios (issuing deposits and purchasing securities) and in providing an accounting system of exchange were deregulated, and if the problem of defining a unit of account were focused solely on the currency end of the transactions industry.

5. A concluding parable

Finally, let us consider a scenario in which it is clear that, at least in principle, the problem of defining a nominal unit of account is not coincident with the problem of rendering a monetary system determinate. Suppose we have a completely unregulated banking system in the sense of section 2, and an advanced society in which it is economic to carry out all transactions through the accounting system of exchange provided by banks. The system finds no need for currency or other physical mediums of exchange, and its numeraire has long been a real good, say steel ingots. The society is so advanced that terms like money, medium of exchange, means of payment, and temporary abode of purchasing power have long ago fallen from its vocabulary, and all written accounts of the ancient 'monetary age' were long ago recycled as part of an ecology movement.

Suppose now that, for whatever reason, the government of this society decides that it would be more aesthetic to replace steel ingots as numeraire with a pure nominal commodity which will be called a 'unit' but which has no physical representation. Although monetary theory has long since passed away, value theory has strengthened with time, and the government's economists realize that the 'unit' cannot be established as numeraire by simple decree. It must be a well-defined economic good, that is, the 'unit' needs demand and supply functions which can determine its equilibrium value in terms of other goods.

Controlling the supply of 'units' is no problem, but creating a demand for them is another matter since they have no intrinsic usefulness. The solution hit upon by the authorities is to use a reserve requirement to forcibly join the holding of 'units' with something that does provide valuable services. In the monetary age the appropriate industry to burden with the reserve requirement would have been clear, but in the new more enlightened age it is evident that there are many potential candidates. In the end, the government imposes the reserve requirement on spaceship owners. Every spaceship owner has to keep a reserve of X 'units' with the central 'unit' authority. Since most citizens of the society desire the transportation services of private spaceships, the reserve requirement creates a real demand for 'units'. The government then renders the price of the 'unit' determinate by fixing the interest rate paid on 'units', perhaps at zero, and controlling the supply of 'unit' reserves.

The reserve requirement, of course, has a depressing effect on the spaceship industry. Because X 'units' must be purchased along with every spaceship, people economize more on their holdings of spaceships, existing spaceships are used more intensively, and alternative forms of transportation services are substituted to some extent for spaceships. On the other hand, sales of 'units' by the government can substitute for other forms of taxation. Indeed, most of the citizens of this enlightened society feel this new form of taxation is the major reason for the government's interest in replacing the ingot as numeraire with the 'unit'.

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