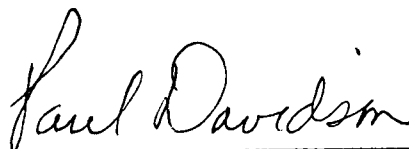


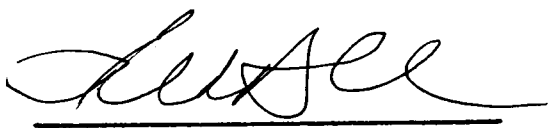
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**Concepts of Exogenous and Endogenous Money.
Theoretical Background and Institutional Evidence**

A Thesis
Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville

Sven-Olaf Vathje
August 1992

Abstract

This thesis provides an overview over different approaches to the theory of the supply of money. With respect to the determinants of the money supply, the orthodox view of largely exogenous money is opposed to more recent concepts that emphasize the quantity of money in an economy as endogenously determined. The concepts of exogeneity and endogeneity are defined in terms of interest elasticity and stability of the money supply curve in order to allow a clear distinction between the opposing views on the basis of a formal framework. The monetarist, accommodationist and structuralist approaches to the money supply process are represented in terms of these criteria and compared with respect to their basic properties. Institutional and legal arrangements in the United States and Germany are considered in order to supply evidence which of the presented approaches is best supported in the real world.

It is concluded that, for theoretical and institutional reasons, a view of the money supply emphasizing both exogenous and endogenous forces best appropriates the situation in real world economies. The structuralist position is supported by the arguments developed and preferred over either a simple exogenous or endogenous approach.

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Chapter 1

Introduction

The role of money in an economy has been the issue of lasting controversy in economic theory during the last decades. Attention, however, mainly focused on the demand side, leading to elaborate analyzes of economic agents' motives for holding money and to the development of money demand functions incorporating a variety of variables as determinants. The supply of money was not regarded as much of a problem since it seemed that the determination of the quantity of money in an economy is at the disposal of the monetary authority. Therefore, economists of both the neoclassical and the Keynesian tradition largely neglected money supply issues by treating the stock of money as fixed and exogenous in their models.

Only recently, it has been more widely recognized that the money supply process is worth analyzing, especially (but not exclusively) amongst economists pursuing a *Post Keynesian* research agenda. Source for the creation of money is not only the central bank, but also the banking system as a whole due to its ability to issue liabilities that are accepted as an alternative to money in an economy.

The following analysis starts with a definition of what money is. Its major

functions are described and brought into relation with different notions of the working of an economy. Emanating from the (abstract) role of money in an economy, the logical emergence of state-issued money almost without any physical value is explained. Furthermore, the evolution of financial intermediaries, and especially depository institutions, is shown to be the result of forces inherent in modern monetary economies in which production processes require finance and time. The emergence of this second group of creators of money leads to the need to classify bank created substitutes for money in order to have a reference aggregate when discussing the money supply process.

The orthodox view of the money supply is presented with the help of a monetarist framework. Money is regarded as an exogenous variable in the economy that causes changes in nominal variables while leaving the real sphere unaffected. The concept of the money multiplier, linking a given quantity of state-issued money to the volume of bank created money, is developed and the monetarist conclusions as to the determinants of the money supply are derived.

Before endogenous, Post Keynesian views of the money supply process are presented, the terms 'exogenous' and 'endogenous', that have often been used to describe the orthodox and the Post Keynesian positions on the supply of money, are defined. It is shown that a technical (statistical) use of the terms is inappropriate to distinguish the alternative positions, but that it is more expedient to focus on the issue of who is assumed to control the supply of money. In order to derive an answer to this question, a representative supply function is developed for the alternative approaches and regarded with respect to its interest rate elasticity and its in(ter)dependence on variables determined within the private economy. Two views of money supply endogeneity, namely an accommodationist

and a structuralist approach, are presented and analyzed with the help of these instruments. The exogenous (monetarist) view is compared to the former on a formal level.

Finally, the appropriateness of the different approaches for real world economies is regarded in the light of the institutional and regulatory background on which depository institutions operate. The respective environments in the United States and in Germany serve as an example. Reserve requirements are emphasized as the basic restriction to money creation in the banking system, and the channels through which banks can obtain reserves are distinguished and viewed with respect to the question of control of the flow of funds. On a theoretical basis, it is then analyzed which approach to the money supply process is best institutionally supported in both countries.

Chapter 2

Money and Credit

2.1 A definition of money

“Money is what money does”¹, is a frequently used tautology when it comes to first defining money in economics textbooks. Although basic in its role in modern entrepreneurial production economies, it is difficult to give an exact definition of what constitutes money. The most commonly used approach is to describe money by its functions, abstracting from its different actual shapes.

Usually, three different functions of money are distinguished: money serves as a unit of account, a store of value and a medium of exchange. However, depending on the theoretical origin from which the existence of money is explained, individual functions are assigned different weights and importance.

2.1.1 Money as a unit of account

The abstract function of a *unit of account* is a basic characteristic of money. Basically an asset can fulfill the unit of account function independently of the other two functions of money. In particular, there is no necessary coincidence of the unit of money and the unit of account. Any commodity or abstract measure

¹Sir John Hicks (1967), *Critical Essays in Monetary Theory*, Oxford: Clarendon Press, p. 1

can fulfill this function. With the help of the chosen standard the system of relative prices between tradable commodities and services can be transformed into a list of absolute prices in terms of the unit commodity.

The function of money as a standard, if it is no more than a standard, is to make it possible to form a price-list, in which the values of a number of commodities are reduced to a common measure.²

The existence of an abstract unit of account can even be assumed in a barter, i.e., moneyless economy where goods exchange for goods. The "correct" exchange relation between two commodities A and B can then be determined with reference to an accounting standard C , where $\frac{A}{C}$ and $\frac{B}{C}$ are the respective absolute prices resulting out of relative price relation $\frac{A}{B}$. However, in a barter economy there is a direct exchange between commodities A and B taking place, since the unit of account is a standard only existing in the minds of market participants, not as a commodity through which the transaction actually occurs.

From the perspective of neoclassical economists, using a Walrasian equilibrium framework of a monetary economy, money is sufficiently defined as a commodity representing the unit of account, i.e., the *numéraire*.³ Its functions as a medium of exchange and a store of value are of secondary importance. The impact of money on real variables in an economy is restricted to that of a veil, determining the nominal level of absolute prices but leaving the real sphere and the structure of relative prices unaffected.

In the Walrasian equilibrium analysis the fact that real world economies are set into continuous time and a generally uncertain economic environment is not

²Sir John Hicks (1989), *A Market Theory of Money*, Oxford: Clarendon Press, p. 44

³Léon Walras conceived of his *numéraire* as an actual commodity and not merely an abstract unit of account. Cf. Emil-Maria Claassen (1980), *Grundlagen der Geldtheorie*, second Edition, Berlin etc.: Springer-Verlag, p. 35, footnote 1

taken account of. Nominal impacts are largely blended out of the analysis in real terms. All transactions, payments and receipts are assumed to occur simultaneously and instantaneously so that there cannot be any autonomous impact of monetary on real variables. "[M]oney is *inessential* in the sense that no monetary variable need enter into the description, or determination, of that economy's equilibrium"⁴, and it is *neutral* in that "the set of equilibria of an economy is independent of the quantity of money."⁵ The money found in the real world, though physical in its appearance, is deprived of its concreteness by the assumption that transactions take place at the instant, reducing money back into its abstract unit of account function and making its physical property unimportant. Markets are treated as trading goods and services on the spot, historical time is irrelevant to the analysis.⁶

An alternative approach to analyzing the function of money departs from explicitly taking account of the role it plays in the real world. Regarded from this point of view, money becomes essentially more than a mere unit of account. Any "real" production economy is set in historical time. Production processes take time, and products are not only sold on the spot, but also on a forward basis. From the fact that production, sale and payment do not coincide, as it is implied in the neoclassical Walrasian equilibrium approach, there is some degree of uncertainty involved in any real world production decision. It is for that reason that contracts come into existence. A contract consists of a promise to deliver and a promise to pay and can be viewed as the first part of any transaction.⁷ In a spot market transaction, actual delivery – both of the good or service and

⁴Frank Hahn (1984), *Equilibrium and Macroeconomics*, Oxford: Basil Blackwell, p.158

⁵*ibid.*

⁶Cf. e.g. Paul Davidson (1982), *International Money and the Real World*, London: MacMillan Press, p. 41; Sir John Hicks (1989), *loc. cit.*, p. 41

⁷Cf. Sir John Hicks (1989), *loc. cit.*, p. 42

the payment – would occur simultaneously with conclusion of the contract. In a forward transaction, actual delivery takes place at a later point in time, with the real (delivery of the commodity or service) and the economical (payment in money form) parts of the transaction usually not coinciding.

On this background, the function of money as a unit of account must be extended in its scope. Not only does money serve to translate relative prices into absolute terms, but also is it needed as a standard in which debts can be expressed. The indispensibility of such a standard follows directly from the fact that whenever delivery and payment in a forward transaction do not take place simultaneously, this represents some kind of credit.⁸⁹ At the same time, the fixation of the terms of contract, especially the agreement on a price, before future actual delivery involves an element of speculation, requiring a standard measure as well. Not only spot prices are therefore expressed in terms of the monetary commodity as a unit of account, but also forward prices that represent a contractual commitment and thereby a debt and an asset, respectively, to one of the parties of the contract.

In a world in which time-spanning contracts are at the basis of economic activity, money functions both as a unit of account, making it possible to reduce the values of a number of commodities to a common measure, and as a “standard of deferred payments”¹⁰. This distinction has already been recognized by Keynes who said that “[a] money-of-account comes into existence along with debts, which are contracts for deferred payment, and price lists, which are offers of contracts

⁸Cf. Hans-Michael Trautwein (1990), *Money-Matters in Post-Keynesian Theories and New Monetary Economics*, Arbeitsbericht Nr. 77, Lüneburg: Universität Lüneburg, p. 5

⁹If payment occurs before the delivery of the commodity or the service, the buyer gives the seller a credit in real terms. If delivery takes place before payment, the seller gives the buyer a credit in nominal terms.

¹⁰John Hicks (1989), *loc. cit.*, p. 42

for sale and purchase.”¹¹ Hicks replaces the unit-of-account function with the *standard of value* function, with the latter defined to comprise the former, thus integrating into the definition the function of money in debt contracts.

Money serves as a “subtle device for linking the present to the future”¹², as Keynes noted. It can only fulfill this function if it is also a store of value.¹³ In order to preserve its value in terms of purchasing power over commodities and services the asset serving as money need not necessarily be of any material value itself.¹⁴

As Trautwein explains, “the ‘value of money’ is defined by its *power to appropriate* value, to buy goods.”¹⁵ Only if it possesses this power, money will be accepted in its third function, namely as a medium of exchange. Market participants will only be willing to sell real goods for money if they are convinced that it does not lose its value before they re-use it.

2.1.2 Money as a medium of exchange

The function of money as a medium of exchange needs some further elaboration. It has been stated that any commodity could serve as *standard* of value, and it is obvious that there exists a broad spectrum of non-perishable goods that could be a *store* of value. For a commodity to be used as the medium of exchange in an economy it is necessary that it comply with another restriction: it must be

¹¹John M. Keynes (1971a), *A Treatise on Money*, Volume 1, London: Macmillan Press, p. 3

¹²John M. Keynes (1936), *The General Theory of Money, Interest and Employment*, New York: Harcourt Brace Jovanovich, p. 294

¹³Hicks notes correctly that money is not unique in its function as a store of value, so this function is not distinguishing it from other assets. But, still, it is an indispensable quality for an asset serving as money.

¹⁴It is even preferable if the money matter is of little material value like the fiat paper money prevailing in economies today. Not only does the transition from commodity to fiat money go along with a saving in real resources, but also does it avoid the problems associated with manipulations of the commodities representing money (like the shirking of gold coins etc.)

¹⁵Hans-Michael Trautwein, *loc. cit.*, p. 6

scarce with respect to demand for it. Keynes regarded as the essential properties of money its inelasticities of production and of substitution.¹⁶ Its relative stability of value is seen as due to its scarcity in supply.

Given this further restriction, one answer to the question which commodity specifically will become an economy's money departs from its store of value function and determines that commodity that is most suitable in this respect as the medium of exchange.¹⁷ The fact that gold and silver coins have served as commodity money for a long time, and that the elasticities of production of gold and silver were very low so that its value was relatively stable, may be regarded as evidence that above line of reasoning is valid. A money made from a precious metal indeed carries a value as imprinted on it, where stability over time is guaranteed by the money unit's material value.

However, there seems to be a better explanation for the use of a commodity as monetary medium of exchange. It simply relies on the *general acceptance* of a commodity as medium of exchange. In the case of commodity money this acceptance is certainly expedited by the physical money units's value. Users of money have learnt that holding the commodity money is a good means of transferring general purchasing power over time, they have experienced money to be "a one-way (present to future) time vehicle or time machine."¹⁸

The general acceptance of commodity money in trade is due to the fact that it is "circulating currency whose value is determined by an objective measure."¹⁹ It is normally some quantitative measure (like weight) of the material used for

¹⁶Cf. John M. Keynes (1936), *loc. cit.*, pp. 230f.

¹⁷Cf. Wulf F. Rohland (1983), *Gelddefinition und Geldschöpfung*, Europäische Hochschulschriften Reihe 5: Volks- und Betriebswirtschaft, Band 445, Frankfurt a.M., New York: Lang, p. 35f.

¹⁸Paul Davidson (1982), *loc. cit.*, p.31

¹⁹L. Randall Wray, (1990), *Money and credit in capitalist economies*, Hants: Edward Elgar, p. 27

the commodity money that determines its value. Modern moneys, however, do not derive their value from physical attributes anymore. The dominance of forms of paper money in modern economies gives a hint that there must be another way in which money can keep its value over time. The value assigned to paper money notes is far above its material value²⁰, and even metal coins carry a value unrelated to their cost of production, namely generally less than what the material they are made from is worth.

In the transitionary phase from pure commodity to pure paper money economies²¹ the latter was often still losely tied to an underlying commodity that served as a guarantee of its value. These so called asset-backed monies guaranteed convertibility at a fixed exchange rate into the value-safe underlying commodity (mostly gold).²²

Although it seems that again money is the generally accepted medium of exchange because of its direct tie to a value- stable commodity, there is one decisive feature distinguishing it from a pure commodity money: While the possession of the latter *automatically* means possession of the valuable asset, commodity-backed money has the character of only an IOU of the issuer, i.e., his *promise* to stand ready to fulfill the obligation of providing the holder of a note with a pre-determined quantity of the backing asset upon demand. The important point of this construction (that basically makes money a debt instrument) is that the acceptance of money in exchange is more a reflection of public trust into the issuer's

²⁰In the Federal Republic of Germany, the cost of production of a newly printed 100 DM note, e.g., is only 27 Pfennige, which is only about one quarter of a percent of its face value.

²¹In a pure paper money economy there are still some metal coins in circulation which carry a face value above costs of production. The attribute 'pure' thus does not mean *exclusively* paper money but refers to the fact that money is no longer valued according to an underlying commodity.

²²Until the breakdown of the *Bretton-Woods* system in 1973 the US- dollar was such an asset(gold)-backed money.

ability to fulfill his obligations than that it is directly related to the underlying commodity standard. This explains why it is usually the state who is the issuer of commodity-backed money due to its generally highest creditworthiness.

But there is an even more important circumstance that makes money attain its outstanding role as a medium of exchange in modern monetary economies. It can be found in the fact that the state makes use of its monopoly of force in declaring the money it issues the *obligatory* means of payment in the economy. State money becomes "legal tender for all debts, private and public"²³. As the function of money as a medium of exchange is inextricably intertwined with that of a means of payment²⁴, money becomes the official medium of exchange. It is the state who takes over the task of providing the economy with a monetary system that is stable over time, so that a commodity-backing of state money can be dispensed with. As a result, modern monetary production economies run on the basis of *fiat money* that can be defined as

something the intrinsic value of the material substance of which is divorced from its monetary face value [...], which is created and issued by the state, but is not convertible by law into anything other than itself, and has no fixed value in terms of an objective standard.²⁵

Fiat money thus is "currency issued by the state whose value is purely nominal"²⁶, it is a claim on the government without being a title to any particular asset. Its acceptance as means of payment both in spot and forward

²³As can be verified on every US-dollar.

²⁴It is not possible to describe the exchange of units of money for goods without implying that the monetary part of the transaction represents the payment, i.e., the settlement of the debt incurred in the real part of the transaction. Cf. Wulf J. Rohland (1983), *loc. cit.*, pp. 21-22

²⁵John M. Keynes (1971a), *loc. cit.*, p. 7

²⁶L. Randall Wray (1990), *loc. cit.*, p. 27

transactions ensues from the "existence of institutions, normally operating under the aegis of the state",²⁷ which provide "assurances of the continuity between the present and the future"²⁸. The prime instrument these institutions work with is given by the civil law of contracts that makes money contracts enforceable in terms of the money unit of account. The promise of legal support by the state for each contracting party in case the other party fails to perform on the contract provides for the necessary confidence into the obligatory money on the part of its users.²⁹ The civil law of contracts is therefore the essence of money in a modern production economy.

As in the case of commodity money, the essential properties of money, namely (close to) zero elasticities of production and substitution are still fulfilled for fiat money. Scarcity of the money matter is no longer given by a low elasticity of production of the money commodity itself, but artificially created by the choice of the quantity of state money supplied by the responsible state authority (i.e., the central bank) in its power as monopoly supplier. *Ceteris paribus*³⁰, a zero elasticity of production results. In so far as money is demanded for its function as a means of payment, it can neither be substituted by other commodities in its role as the ultimate means of settling contractual obligations.³¹

²⁷Paul Davidson (1978), *Money and the Real World*, second edition, Houndsmill etc.: Macmillan Press, p. 147

²⁸*ibid.*

²⁹Cf. Paul Davidson (1991), *Controversies in Post Keynesian Economics*, Hants: Edward Elgar, p. 59

³⁰The *ceteris paribus*-clause here refers to the supply-side and mainly implies no policy variations.

³¹In its function as a store of value, money is in direct competition with all other assets. If substitution is likely, however, is a question of asset liquidity. For the concept of 'liquidity' cf. below (p. 23)

2.2 The role of credit

Money has so far been defined in a narrow sense: What has been analyzed is “outside” money³², i.e., money “that on net is an asset to the private economy.”³³ It represents a claim for the private sector without at the same time being its liability. Outside money has been shown to be accepted in trade as a standard of value and as a medium of exchange not for its intrinsic, “natural” value (not even if the state money is partly or completely asset-backed), but moreover because of general confidence into the state’s ability to enforce contracts undergone in accordance with the civil law of contracts.³⁴ Outside money is legal tender, i.e., official means of payment.

2.2.1 Contracts and the need for finance

Time-spanning production processes, lying at the heart of modern production economies, not only entail the existence of forward transactions as a means of circumventing the uncertainty of initiating the production of a real commodity today but depending on sales revenues obtained in selling it on the spot at a later point of time. As opposed to some simple economic models where production is assumed timeless and the sale of products occurs on the spot, in existing economies time consuming production normally leads to the non-coincidence of revenues and expenditures associated with the entrepreneurial provision of a

³²The expressions “outside” and “inside” money have been introduced by John G. Gurley and Edward S. Shaw. Cf. John G. Gurley and Edward S. Shaw (1960), *Money in a Theory of Finance*, Washington D.C.: Brookings Institution, pp. 134ff.

³³Olivier Jean Blanchard and Stanley Fischer (1989), *Lectures on Macroeconomics*, Cambridge (MA): MIT Press, p. 193

³⁴A breakdown of this confidence is not likely to lead to a long-lasting reversion to a barter system due to its high costs of resources wasted, and the need for undergoing intertemporal production commitments. Cf. L. Randall Wray (1990), *loc. cit.*, p. 4 and Paul Davidson (1978), *loc. cit.*, p. 48

good. Factors of production must be paid for their services in advance, i.e., before the product can be sold. As a result, an entrepreneur can either use up an existing amount of money he is already holding and thus *internally* finance the costs of production, or he can commit himself in a debt contract, i.e., borrow means of payment from an external source.

In the case of external finance, there exists a number of different ways of obtaining funds of the money matter circulating in the private economy. Depending on the market power of a company and the payment habits in the respective industry, an entrepreneur could oblige the buyer of the final product to pay for it before the production process is initiated at all. The producer has thus incurred a debt, which Keynes defined as a *contract for deferred payment*³⁵, *in real terms*. Under this special type of forward contract, he has received the sales revenue before actual delivery of the product has taken place, which is the same as if he had borrowed a certain amount of state money from an agent in the private sector and promised to repay him in terms of units of a real commodity.

Although it seems as though a commodity other than the state money had taken over the function of a unit of account, this is not the case. It must be remembered that the underlying transaction is still a sales contract, determining the delivery of a commodity at a future point of time at a prearranged price. The description of this type of loan in analogy to a debt contract clarifies that repayment only seems to take place in terms of units of the commodity. In an economic sense, the act of delivery of the commodity has a firm monetary foundation. The repayment act can be separated into three logically distinct components, i.e., into implicit transactions that occur simultaneously: the payment of the product received in units of money on the part of the buyer, and the repayment of the

³⁵Cf. John M. Keynes (1971a), *loc. cit.*, p. 3

loan in units of money and the transfer of the real good to the buyer on the part of the entrepreneur.³⁶

While in this case the entrepreneur has obtained a real credit³⁷, he can alternatively externally finance the production process by raising a loan from his suppliers of productive factors through negotiating a term of payment after delivery of the respective service. In terms of a debt contract, the supplier allows a credit at delivery of the factor of production which the entrepreneur later repays in compliance with the agreed terms of payment.³⁸ In this case the entrepreneur has to repay the loan in units of money, having "borrowed" units of the factor of production.³⁹

Theoretically the representative entrepreneur could get along without any need for additional finance for the process of production of a particular good if he could obtain payment in advance from his customers and, at the same time, negotiate deferred payment to his suppliers so that these cash-inflows and -outflows would coincide, or even the former precede the latter. However, this is not a very realistic scenario. In particular, the production factor labor can not be expected to accept deferred payment on a larger scale. Workers are employed on a long-term basis and not in connection with a single order. While the existence of long-term labor hire-contracts protects the entrepreneur against unexpected wage-related increases in production costs, it, on the other hand, exposes him to the necessity of securing finance to bridge the temporal gap until sales proceeds

³⁶As the two monetary transactions cancel each other out, the unit of account seems to be derived out of the commodity, although it actually still is the state money.

³⁷Erich Kosiol talks of passive real duration of credit [passive reale Kreditdauer]. Cf. Erich Kosiol (1968), *Einführung in die Betriebswirtschaftslehre, Die Unternehmung als wirtschaftliches Aktionszentrum*, Wiesbaden: Gabler Verlag, pp. 142ff.

³⁸Erich Kosiol defines this situation as active real duration of credit [aktive reale Kreditdauer]. Cf. *ibid.*

³⁹Again, state money is the standard of value, as the act of borrowing can be divided into three logically different, economically connected parts. Cf. above (p. 14).

flow in.

Another important point that supports the assumption of a breakdown of the no-cash-required possibility of production in modern economies is the fact that goods are not always produced under a forward contract, but sometimes (at the entrepreneur's price risk) to market, so that at initiation of the production process there is not yet a customer in sight who could pay in advance of delivery. But even if there is, in practice payment is mostly received only at delivery. As a result, entrepreneurs are normally unable to shift the burden of securing an appropriate quantity of means of payment on their suppliers and customers as part of negotiated terms of contract. To the extent that cash- outflows can not be covered by previously accumulated cash balances, i.e., as far as they can not be financed internally, they must be borrowed from other economic units within the private economy.

2.2.2 Financial intermediaries and the creation of money

In modern monetary production economies the need for external finance can be satisfied through basically two different channels. An economic unit in need of immediate command over resources in terms of money, i.e., a deficit spending unit (*DSU*), can either borrow funds directly from another spending unit that would like to defer purchasing power to a later point of time, i.e., a surplus spending unit (*SSU*), or can make use of the services of an economic agent specialized in providing deficit spending units with finance collected from surplus spending units, i.e., financial intermediaries. The former type of finance is called *direct*, the latter *indirect* finance.⁴⁰

For the economy as a whole the second form of finance is of particular im-

⁴⁰Cf. John G. Gurley and Edward S. Shaw (1960), *loc. cit.*, pp. 199ff.

portance. A financial intermediary "secures funds from surplus spending units and transmits them to deficit spending units".⁴¹ Financial intermediaries are therefore firms that help agents in an economy realize their time preferences as towards the point of time of exchange of their means of payment into commodities and services. They are in the business of providing *DSUs* with cash under the terms of a private debt contract, (in which the financial intermediary assumes the position of a creditor), while raising the means of payment from *SSUs* under another debt contract (in which the financial intermediary assumes the debtor's position).⁴²

The incentive for the financial intermediary to engage in this type of activity results from the profit it can make from the difference between the fee it charges its borrowers for the provision of a loan and the compensation it pays its lenders for a temporary sacrifice of purchasing power, i.e., from the interest rate differential between the two types of loans. The interest rate charged on a money loan, i.e., the cost of a contract that trades cash-inflows today against the promise to repay the loan in its entirety and an interest surcharge in the future (in terms of units of money), can be explained with reference to the impact of uncertainty on the creditor's position: the interest rate incorporates both a premium for the risk that the debtor defaults (totally or partially) on the loan, which is a risk element attributable to the debtor, and a monetary compensation for the creditor's risk to be unable to meet an (unforeseen) need for means of payment during the term

⁴¹Michael A. Klein (1971), "A Theory of the Banking Firm", *Journal of Money, Credit and Banking* 3 (2), p. 206

⁴²The coincidence of two private debt contracts in financial intermediation has been recognized in the following definition:

The principal function of financial intermediaries is to purchase primary securities from ultimate borrowers and to issue indirect debt for the portfolios of ultimate lenders.

(John G. Gurley and Edward S. Shaw (1960), *loc. cit.*, p. 192)

of the loan.⁴³

Specialization in the process of intermediation alone results in a more efficient use of monetary resources in the economy. Some businesses and individuals find it different or even impossible to gain access to sources of direct external finance in the open market due to the inexperience of most economic agents and the informational difficulties involved in assessing a prospective borrower's creditworthiness. Also, to an individual lender the costs of translating a debt contract into a legally acceptable form, and of monitoring the debtor's performance on the loan repayment generally would be so high that this would raise the loan interest rate to prohibitively high levels.⁴⁴ The existence of financial intermediaries, who are experienced in lending, thus contributes to the finance of "consumption and investment expenditures that would otherwise not take place."⁴⁵

Classifying financial intermediaries with respect to their role for monetary theory allows a division of this group into two subgroups. The first group, which can be titled *nonmonetary financial intermediaries*⁴⁶, performs

only the intermediary role of purchasing primary securities and creating nonmonetary claims on themselves, which take the form of savings deposits, shares, equities, and other obligations.⁴⁷

In doing so, nonmonetary financial intermediaries contribute to the efficient allocation of idle cash balances to productive and consumptive purposes within an economy. They basically channel outside money from one agent to another and offset this flow of cash with an indirect debt contract between the two parties

⁴³Cf. Hans-Michael Trautwein (1990), *loc. cit.*, p. 7

⁴⁴Cf. Ben Bernanke (1988), "Monetary Policy Transmission: Through Money or Credit?", in: Federal Reserve Bank of Philadelphia (ed.), *Business Review*, Nov./Dec., p.5

⁴⁵*ibid.*

⁴⁶John G. Gurley and Edward S. Shaw (1960), *loc. cit.*, p. 141

⁴⁷*ibid.*, p. 193

in which the intermediary interposes himself as party to the contract to both agents⁴⁸ The quantity of outside money in the economy remains unchanged, only the stock of outstanding debt contracts has grown.

The second subgroup under the heading "financial intermediaries" is the *monetary system*⁴⁹, or what is also called the *private banking system*. It plays a crucial role in the supply of the economy with money. What differentiates this second group of intermediaries from the former is a specific type of liability it issues to its suppliers of funds, namely transaction accounts which are basically demand deposits.⁵⁰

Transaction accounts are a type of private debt, with the bank as the debtor. What makes them unique amongst bank liabilities is the circumstance that they represent acknowledgements of debt due "at sight".⁵¹ Transaction accounts can be regarded as debt contracts without a fixed maturity. The determination of the duration of the loan is solely at the disposal of the lender who can cancel the loan anytime.⁵² As debt contracts are written in terms of the money of account⁵³, the lender can demand the repayment of the loan at par⁵⁴ in state money. Holding

⁴⁸The resulting two debt contracts, though in an economic sense originally closely related, are technically and legally independent from one another. Neither is there necessarily a congruity of maturities, loan value (funds of several lenders can be combined into one loan, and *vice versa*), or interest rates (to the contrary, financial intermediaries operate on an interest rate differential), nor does it affect the other debt contract if the agent in one debt contract defaults.

⁴⁹John G. Gurley and Edward S. Shaw (1960), *loc. cit.*, p. 191

⁵⁰The distinction between non-monetary financial intermediaries and the monetary system is drawn strictly along the lines of the availability of transaction accounts on the institution's liability side, which is a prerequisite for the "monetization of assets" to be explained below. Cf. Dieter Duwendag et al. (1985), *Geldtheorie und Geldpolitik*, Köln: Bund-Verlag, pp. 116f.

⁵¹The German word for transaction accounts, *Sichtverbindlichkeiten*, directly expresses this fact.

⁵²Since the installation of automated teller machines (ATMs), the lender is not even restricted to the operating hours of the bank if he wants to cancel his loan.

⁵³One of the basic functions of money (and a reason for its existence) is to serve as a standard of value in debt contracts. Cf. above (p. 8)

⁵⁴There may be nominal costs of conversion (i.e., bank service charges), which are neglected here. In principle, exchange parity holds.

private bank debt in the form of transaction accounts as a creditor, therefore, is tantamount to having immediate access to state money upon demand.

Whereas the liabilities of nonmonetary financial intermediaries are financial assets to their holders, i.e., represent temporary sacrifices of command over real resources and do not represent any immediate purchasing power during the terms of the loan⁵⁵, transaction deposits are inferior to state money only in that they involve the risk of default of the issuer, and that – due to the non-physical character of units of money in a bank deposit – the mere existence of transaction accounts by itself does not make them a helpful instrument in exchange, in particular as a means of contractual settlement. Both of these potential deficiencies are cured in modern monetary production economies in which banks assume a key position for economic development.

The risk of default of private banks is low due to their possibility of matching the maturities of assets and liabilities in advance as to prevent situations of being unable to meet payments on their liabilities. Temporary lacks in holdings of state money can usually be covered by borrowing from the issuer of outside money, i.e., the central bank⁵⁶. Private banks are normally required to hold part of the debt they issue in the form of deposits in an account at the central bank, the so-called reserves. Although these funds do not serve the purpose of being freely disposable in cases of unforeseen cash-outflows, they can be regarded as an insurance premium a depository institution must pay in order to be allowed access to borrowing facilities at the central bank. Even if a bank permanently

⁵⁵Hicks has constructed an example in which private debt contracts represent means of payment regardless of their maturity, namely when they are offsetting one another. This, however, is a special case valid only in bilateral relations and does not allow the general conclusion that financial assets can directly be used to settle contractual obligations. Cf. Sir John Hicks (1989), *loc. cit.*, p. 43

⁵⁶The central bank acts as a "lender of last resort".

fails to perform on its liabilities, in many economies its deposits are mandatorily ensured so that lenders feel that storing units of money in a bank deposit is a safe substitute for holding state money.

Bank debt in the form of bank deposits becomes an acceptable medium of exchange and means of contractual settlement through the existence of a clearing mechanism that allows the transfer of units of money from one deposit account to another.⁵⁷

As long as there is general confidence in the economy into the banks' ability to perform on their part of the debt contract, economic units will be indifferent as to whether to deliver, or accept delivery of actual money or the money substitute, i.e., the claim on delivery of money through a private bank.⁵⁸ It follows that "the transference of claims to money may be just as serviceable for the settlement of transaction as the transference of money itself."⁵⁹ This fact has also been recognized by states in that they accept bank deposits as a type of private liability in payment of debts (in particular taxes).⁶⁰

An economy's supply of money thus consists of state-issued "high-powered", outside money, which is legal tender and the asset of ultimate redemption, and of bank-issued monetary claims, which can be called *bank money*.⁶¹ As opposed to

⁵⁷Cf. Paul Davidson (1978), *loc.cit.*, pp.151f. It is necessary that the transfer of funds from one deposit to another is not only facilitated within one bank, but moreover between all banks that are members of the monetary system. In today's economies, this is usually provided under the supervision and assistance of the central bank.

⁵⁸This only relates to the comparison of the basic attributes of actual money and substitute money. Preferences are likely to exist regarding implicit services of the respective means of payment which are here neglected.

⁵⁹Cf. John M. Keynes (1971a), *loc. cit.*, p. 20

⁶⁰Cf. John M. Keynes (1971a), *loc. cit.*, pp.5f. and L. Randall Wray (1990), *loc. cit.*, pp. 27f.

⁶¹The expression 'bank money' has first been used by John M. Keynes. "Bank money is simply an acknowledgement of a private debt, expressed in the money of account, which is used by passing from one hand to another, alternatively with money proper, to settle a transaction." John M. Keynes (1971a), *loc. cit.*, p. 29

outside money, they can also be titled *inside money*⁶², which is “simultaneously an asset and a liability of the private sector.”⁶³

Bank money comes into existence whenever a bank accepts a deposit. It can do this in exchange for cash, or, more important, in the course of allowing a credit. Instead of handing out high-powered money to the borrower, the bank simply credits the amount of the loan to the borrower's transaction account. In this way the quantity of inside and outside money in circulation in the economy is in principle subject to decisions of the central bank with respect to outside money and of the banking system with respect to inside (or *credit*-)money.⁶⁵

2.3 Monetary aggregates

Money is the standard of value and the asset of ultimate redemption. A rigorous approach to the definition of a monetary aggregate would thus only count outside money as constituting the money stock in an economy. However, as the analysis of credit-money has shown, assets other than money (namely transaction accounts) can serve as money, too. The aggregation of assets with the goal of deriving an aggregate of somehow money-like assets must take into account which purpose an economic unit pursues in holding a specific type of asset, i.e., which specific service the asset is to provide for him. In addition, since it is a

⁶²Cf. John G. Gurley and Edward S. Shaw (1960), *loc. cit.*, pp. 72f.

⁶³Olivier Jean Blanchard and Stanley Fisher (1990), *loc. cit.*, p. 193

⁶⁴Keynes proposed to regard bank money as state money because it is accepted by the state in payments of debt. However, technically bank money is a liability of the banking system. Cf. John M. Keynes (1971a), *loc. cit.*, pp. 5f.

⁶⁵In the creation of deposits the banking system is subject to some regulatory constraints. In particular, banks must hold a fraction of the volume of their deposits as reserves in the form of high-powered money, so that there is, *ceteris paribus*, a theoretical upper limit to the quantity of transaction accounts that can be issued on the basis of a given stock of outside money. The determination of the quantity of money on the basis of reserve requirements is explained in *Chapter 3*.

monetary aggregate that shall be defined, assets taken into consideration must have a close relation to state-issued money as the money proper.

The latter requirement can be analyzed in terms of the *liquidity* of an asset. The concept of liquidity was first introduced by Keynes who called an asset 'liquid' if it is "realizable at short notice without loss."⁶⁶ The term 'realizable', as Hicks notes, means "convertible into cash, or money."⁶⁷ The second part of the definition implies that "the difference between the current market price of the asset and what it might fetch if it were to be disposed of at an unfavourable moment"⁶⁸ must be zero. It is therefore the nearness to the money of account, in which contractual obligations are due, that makes an asset liquid.⁶⁹

Only money itself (including inside and outside money) has the status of a fully liquid asset, as it is the asset of ultimate redemption and the standard against which all other assets are measured. The latter are more or less illiquid, in that a forced sale in the market would result in losses. While financial assets, representing claims on money, can usually be traded in orderly financial markets and are thus relatively liquid, there are often no orderly markets for real goods (like production or working capital goods) so that they possess a high degree of illiquidity.⁷⁰

A narrow definition of a monetary aggregate takes account of assets held primarily for the purpose of conducting *transactions*. In the United States, the monetary aggregate *M1* basically includes currency in the hands of the public

⁶⁶John M. Keynes (1971b), *A Treatise on Money*, Volume 2, London: Macmillan Press, p. 67

⁶⁷Sir John Hicks (1989), *loc. cit.*, p. 61

⁶⁸*ibid.*, p. 62

⁶⁹Liquidity as here defined is a *property* of an asset. The term 'liquidity' can also be used in a *subject-related* way describing a person's ability to meet all contractual obligations when they become due (cf. e.g. Paul Davidson (1991), *loc. cit.*, p. 57). Being liquid thus involves access to or possession of liquid assets. Cf. Emil-M. Claassen (1980), *loc. cit.*, pp. 45ff.

⁷⁰Cf. e.g. Emil-M. Claassen (1980), *loc. cit.*, pp. 45ff.; Paul Davidson (1982), *loc. cit.*, pp. 33f.

and demand deposits held for transaction purposes.⁷¹ All of its components have in common that they are fully, or almost fully liquid assets.⁷²

Broader definitions include financial assets that can be generally described as "savings' balances".⁷³ The aggregate *M2* includes the assets of *M1* plus savings deposits, time deposits of less than 100.000 US-dollars, money market accounts⁷⁴, overnight repurchase agreements and certain overnight Eurodollar deposits. What all the net assets in *M2* – which are those not already included in *M1* – have in common is that they are both very liquid and are intended to be (in Milton Friedman's terms) a "temporary abode of purchasing power"⁷⁵. Although they can easily be converted into transaction balances (like savings deposits) or even be directly used in transactions (like money market accounts to a limited degree), these assets are not primarily held for transaction purposes, but for a short-term intertemporal transfer of value.⁷⁶

The monetary aggregate *M3* comprises the components of *M2* plus time deposits of at least 100.000 US-dollars, term repurchase agreements, institutional money market mutual fund shares, and term Eurodollar deposits. The transition from *M2* to *M3* adds assets to the broad monetary aggregate agents that are

⁷¹The latter include traditional demand deposits, traveler's checks, negotiable-order-of-withdrawal accounts (*NOW* and *Super-NOW*), automatic transfer services (*ATS*) and credit union share draft accounts. Cf. William L. Scott (1990), *Contemporary Financial Markets and Services*, St. Paul etc.: West Publishing Company, p. 211

⁷²Although it has been stated above that bank money essentially bears the same properties as state money (cf. p. 22), it is used in exchange in form of checks that are only exchangeable into high-powered money if the issuer is liquid. Only if a check written on a bank account is guaranteed to the accepting person (like it is the case with *eurocheques* in European countries up to a value of about 250 US-dollars), then bank deposits can be regarded as fully liquid assets (within the guaranteed range).

⁷³Brian Motley (1988), "Should *M2* be redefined ?", in: Federal Reserve Bank of San Francisco (ed.), *Economic Review (Winter 1988)*, p. 33

⁷⁴Included are money market deposit accounts at commercial banks and retail money market mutual fund shares.

⁷⁵Cf. Emil-M. Claassen (1980), *loc. cit.*, pp. 40f.

⁷⁶Cf. Board of Governors of the Federal Reserve System (1984), *The Federal Reserve System. Purposes and Functions*, Washington D.C., p. 22

primarily held by large (institutional) agents and depository institutions. The assets are rather liquid and variations in their volume mainly reflect changes in funding needs.⁷⁷

Finally, outside money alone can be regarded as the narrowest aggregate. The *monetary base* consists of currency in the hands of the public and the reserves held by the banking system against their deposits, either in accounts at the central bank or as vault cash. Its importance lies in the fact that, through the minimum reserve ratio requirement, the quantity of base money available determines the maximum quantity of the wider aggregates *M1* through *M3* that can be supported by it.

The distinction between the monetary aggregates as given by the definition of the *Mis* is not a strict one, but has an arbitrary element in it. Types of assets have been assigned to different monetary categories according to their *prevailing* use which, however, is not their exclusive one. Some of the deposits held for transaction purposes (like *NOW*-accounts) are interest-bearing assets and, therefore, also serve the purpose of transferring purchasing power in the short run. On the other hand, components of *M2* (like money market mutual fund shares) are to a limited degree checkable and thus can also serve transaction purposes. The distinction between *M1* and *M2* is blurred by these factors.

The difference between *M2* and *M3*, which both represent 'savings'-type aggregates, is small as well. It lies primarily in the volume of each single asset held, or in the separation of relatively small agents in *M2* and bigger ones in the financial assets that are net in *M3*.⁷⁸

⁷⁷*ibid.*, p. 23f.

⁷⁸Before the *Monetary Control Act* of 1980, that abolished interest rate ceilings from some of the financial assets included in *M2*, the aggregate *M3* was distinguished from the former in that it represented *managed liabilities* ("managed" in so far as interest rates could be adjusted to attain a desired quantity demanded) as opposed to (maximum) price and quantity-taking

For an analysis of issues concerning the supply of money it is necessary to keep in mind the different ways of defining a monetary aggregate. The decision for a definition is

a practical matter, a free and always somewhat arbitrary choice, based on the judgement of the investigator, of the aggregate most relevant to the problem he is attempting to answer.⁷⁹

The choice of a specific aggregate must depend on the nature of the problems to be analyzed. It may also be reasonable to modify existing definitions if the logic of an analysis deems it appropriate.⁸⁰ The following chapter develops the supply of money from its foundation in the monetary base. It describes what can be called the standard 'textbook' view of the money supply process in that it shows the monetary aggregate to be dependent on relatively few parameters that are assumed to be largely independently determined or influenced by the monetary authority.

behavior on the part of depository institutions in $M2$. Since the deregulation of price controls in $M2$, this is no longer a distinguishing characteristic.

⁷⁹Victoria Chick (1977), *The Theory of Monetary Policy*, Oxford: Basil Blackwell, p. 14

⁸⁰Cf., e.g., the suggestion of using nonterm $M3$ instead of $M2$ in response to the diminished importance of the distinction between traditional $M2$ and $M3$. By focusing rather on the asset when defining the "savings-type" aggregate, the criterion of distinction would change from size (small or large) to liquidity (more or less). Cf. Brian Motley (1988), *loc. cit.* pp. 33-48

Chapter 3

The Monetarist Approach to the Supply of Money

The monetarist approach to the role of money in an economy stands in the line of orthodox reasoning. Its development has been initiated and heavily influenced by Chicago economist Milton Friedman, based upon whose writings it is primarily presented here. At the heart of the following analysis lies the question of how money affects or interacts with the rest of the economy. After the description of the monetarist view of the transmission mechanism of monetary impulses, the implications for the money supply process are elucidated. In particular, the standard money multiplier mechanism is derived.

3.1 The revival of the quantity theory

What makes the monetarist approach to monetary theory basically an orthodox one is the circumstance that, at its very foundation, lies the quantity theory of money, that in its famous *exchange form* introduced by Irving Fisher (the ‘velocity approach’) states that

$$M \cdot V = p \cdot y \quad (3.1)$$

(where M is the quantity of money, V its velocity of circulation, p the price level and y real income as a measure of the volume of transactions), and in its *Cambridge* ('cash balances') form says that

$$M = k \cdot Y \quad (3.2)$$

(where k is the proportion of income that is held as money, and Y is aggregate nominal income). Basically, both equations are merely identities without any explanatory value for causal linkages between the variables included. However, the Fisher equation has mostly been interpreted under the assumption of constant velocity and real income, resulting in the assertion of a covariation of changes in the quantity of money with changes in the general price level.¹

Friedman deviates from the classical theory formulation essentially by introducing different time perspectives into his interpretation of the identity: it is distinguished between short run and long run effects. Formally this is emphasised in that Friedman drops the product of the general price level p and real income y from the Fisher equation and replaces it with nominal income Y . Friedman reformulates the (modern) quantity equation as²

$$M \cdot V = Y \quad (3.3)$$

Under the assumption of a constant velocity of circulation of money, a co-movement of changes in the money stock M and nominal income Y is the result. The latter can be the result of changes in prices and/or changes in real income.

In interpreting the asserted correlation between money and real income, Friedman sticks to the view of changes in money being primarily a cause, not an effect of changes in nominal income.

¹Cf. Dieter Duwendag et al. (1985), *loc. cit.*, pp. 73ff.

²Cf. Bernhard Ziese (1970), *Zur Neubegründung der Quantitätstheorie*, Kieler Studien Nr. 111, Tübingen: J.C.B. Mohr

Changes in the money stock are [...] a consequence as well as an independent source of changes in money income and prices [...], but with money rather clearly the senior partner in longer-run movements and in major cyclical movements, and more nearly an equal partner with money income and prices in shorter-run and milder movements.³

The *long-run* perspective implied in this conclusion is the same already interpreted into the Fisher equation. Money is neutral in long run equilibrium in that it only affects the price level but not any real variables, like real income. The correlation of the money stock M and nominal income Y is warranted by equiproportionate changes in the price level p after changes in M , at least in the long run. The classical dichotomy between the real and the nominal spheres of an economy holds. Money "is only a machine" allowing the economy "to do more efficiently what could be done without [it] at much greater cost in labor."⁴ It has no independent influence on the real economy, "nonmonetary forces are 'all the matter' for changes in real income over the decades."⁵

A rise in nominal income Y due to an increase in the money stock M will, in the *short run*, "take the form of an increase in output and employment rather than in prices."⁶ Different from the long run effects, changes in the quantity of money in an economy have real effects in the short run, to the extent that the former have not been anticipated.⁷ When money "gets out of order, it throws a

³Milton Friedman and Anna J. Schwartz (1963), *A Monetary History of the U.S.: 1867-1960*, Princeton: Princeton University Press, p. 695

⁴Milton Friedman (1968), *loc. cit.*, p. 12

⁵Milton Friedman (1974), "A Theoretical Framework for Monetary Analysis", in: Robert J. Gordon (ed.), *Milton Friedman's Monetary Framework: A Debate with his Critics*, Chicago: University of Chicago Press, p. 27

⁶Milton Friedman (1968), "The Role of Monetary Policy", *The American Economic Review* 58 (March), p. 9

⁷Friedman assumes a stable demand for money function according to which individuals desire to hold a certain real quantity of money. They determine the quantity of their desired cash

monkey wrench into the operation of all the other machines.”⁸ Thus money is regarded basically as a disturbance to the short run equilibrium position of an economy.

3.1.1 The monetarist transmission mechanism

The monetary transmission mechanism in a monetarist approach theory is supportive to the long run outcome predicted by the quantity theory.⁹ At the very heart of the assumed transmission process lies the perception of economic agents that money is only one asset amongst others, i.e., that holding money can be substituted by holding other (durable and semi-durable) assets.¹⁰

An economic unit's decision how to allocate wealth between the number of assets available as alternative (temporary) stores of value depends upon the prevailing structure of relative prices. An inflow of additional cash as the result of an increase in outside money, therefore, leads to an undesirably high position in money in the economic unit's portfolio. In an attempt to restore a balanced asset holding, excess nominal balances are moved into alternative stores of value, including reproducibles.¹¹

balances within an adaptive expectations framework, in which they calculate the adjustment of their nominal balances according to expected price movements associated with expected changes in the supply of money. An unexpected increase in money seems to represent excess purchasing power to an individual that he partly disposes of by spending it.

⁸Milton Friedman (1968), *loc. cit.*, p. 12

⁹Monetarists have often been accused of having a “black box” as to the transmission mechanism they assume between monetary impulses and their impact on key variables in an economy. The brief description given here represents the basis upon which monetarists build their reasoning. For a short description of the transmission mechanism cf. Milton Friedman (1991), *Monetarist Economics*, Oxford: Basil Blackwell, pp. 16f., and for an elaborate one cf. Dieter Duwendag et al. (1985), *loc. cit.*, pp. 176ff.

¹⁰This is contrary to the Keynesian tradition which is based upon Keynes' *liquidity preference* theory. Here, the choice how to “dispose” of excess cash balances is between money and bonds, i.e., it is confined to the class of financial assets. “The difference between us [i.e., the monetarists] and the Keynesians is less in the nature of the process than in the range of assets considered.” Milton Friedman (1974), *loc. cit.*, p. 28

¹¹Again, it is necessary that the increase in the supply of money is in excess of what is expected

Production is stimulated through an increase in aggregate demand.¹² Under the assumption of flexible prices, relative price adjustments are the result: The spill-over from money into alternative stores of value leads to price increases for all other assets so that both the yield on financial assets (e.g. bonds) and the implicit “yields” on non-financial assets (like “houses, automobiles, let alone furniture, household appliances, clothes and so on”¹³ fall after an expansion of the economic’s money stock.

A new equilibrium is the result, after all the other prices in the economy (like wages and those of assets not considered as alternatives to money in its store of value function) have adjusted.¹⁴ The long run quantity theory determines the final price level reached as a result of the increase in M .¹⁵

The monetarist conclusion as to the role of money in an economy can thus be summarized in a simplified way as “money is all that matters for changes in *nominal* income and for *short-run* changes in real income.”¹⁶ Money has been

to be needed for the compensation of expected price increases.

¹²James Tobin illustrates individuals’ desire to dispose of their excess nominal cash balances by referring to the additional money as a “hot potato”: it is passed from one person to another without that the community can get rid of it unless the economy adjusts. Cf. James Tobin (1963), “Commercial Banks as Creators of Money”, in: James Tobin (1987), *Essays in Economics. Volume I: Macroeconomics*, Cambridge (MA): MIT Press, p. 273

¹³Milton Friedman (1974), *loc. cit.*, p. 29

¹⁴The asserted short run impact on real output is the result of a short run fixation of prices and especially wages on the basis of expected prices. An increase in nominal aggregate demand is initially taken as an increase in real demand and leads to higher output and employment, as wages have not adjusted. Cf. Milton Friedman (1968), *loc. cit.*, p. 10

¹⁵As real output is assumed to be determined independently of monetary forces in the long run, the orthodox quantity theory holds as

$$M \cdot \bar{V} = Y = p \cdot \bar{y}$$

with the result that the long run price level is given by

$$p = \frac{M \cdot \bar{V}}{\bar{y}}$$

where p is a constant multiple of M if $\bar{V}$ and $\bar{y}$ are given.

¹⁶Milton Friedman (1974), *loc. cit.*, p. 27

established as principally beneficial to the economy as long as it does not deviate from its expected behavior. If the latter is the case, it becomes a disturbance to the economy that prevents real magnitudes from attaining their long run equilibrium values.

3.2 The exogeneity of the money supply

In the description of the monetarist transmission mechanism the emphasis has so far been laid on (changes in) the quantity of money as a given magnitude. It has not been explicitly analyzed yet which are the factors that determine the stock of money in an economy, and in particular, if these factors are variables determined in the economy itself, or if they have their origin outside the economy.

The causation behind changes in the magnitudes of variables, in a monetarist framework, in the long run uniquely runs from money to nominal income ($\Delta M \rightarrow \Delta Y$), while repercussions from money income to the money stock exist only in the short run ($\Delta M \rightarrow \Delta Y \rightarrow \Delta M$).¹⁷ In the monetarist conception of the money supply process, this corresponds with the assumed way of determination of the money stock in an economy. Money is regarded as a possible cause of disturbance to the real equilibrium of an economy because its supply is basically determined independently of market forces: Money is 'exogenous' to the economy in that its supply is under the control of an external source, namely the central bank.¹⁸

[T]he monetary authority controls nominal quantities – directly the quantity of its own liabilities. In principle, it can use this control to pay [...] the [nominal] quantity of money by one or another

¹⁷Cf. quote above (p. 29)

¹⁸For an extensive definition of the term 'exogenous' cf. below (pp. 45ff.). Here, the term is used in the control sense.

definition.¹⁹

As far as the latter point is concerned, monetarists do not profess a tight definition of a monetary aggregate (that they regard as directly controllable). They assume a more pragmatic position, requiring the chosen measure to be one that contains assets that are "a temporary abode of purchasing power".²⁰ The specific aggregate chosen then depends on the question which quantity statistically fits best in its relationship to a measure of economic activity.²¹

The desirability of closely controlling the relevant monetary aggregate in a monetarist framework of an economy follows directly from the depicted transmission mechanism: An excessive growth rate of the money stock only leads to a persistently higher rate of inflation without affecting the real sphere permanently.²² The monetarist conclusion is to target the growth rate of the monetary aggregate and set it to a constant in order to provide a stable monetary framework to the economy.²³

The problem of targeting a monetary aggregate lies in the fact that it is composed of outside money (which is monopolistically supplied by the monetary authority) and inside money (which is created through the banking system). Accordingly, changes in a monetary aggregate can have their origins in the determinants of the supply of state money and in those of bank money. Monetarists

¹⁹Milton Friedman (1968), *loc. cit.*, p.11

²⁰Cf. Milton Friedman and Anna J. Schwartz (1963), *loc. cit.*, p. 650

²¹Cf. James Tobin (1965), "A Monetary Interpretation of History", in: James Tobin (1987), *loc. cit.*, p. 472

²²"Inflation over any substantial period is always and everywhere a monetary phenomenon, arising from a more rapid growth in the quantity of money than in output." Milton Friedman (1991), *loc. cit.*, p. 49

²³Friedman proposed his famous rule of smoothly increasing the money supply by 2-3 and 4-5 %, respectively, each year. "A steady rate of monetary growth at a moderate level can provide a framework under which a country can have little inflation and much growth." Milton Friedman (1990), *loc. cit.*, p. 19

emphasize the first channel, i.e., they propose “to use control of the base, or components of the base, as an instrument to achieve the target”²⁴, while regarding the second channel, in a given institutional and regulatory environment, as active only in the short run.

From a monetarist point of view, the control over the base is a powerful tool that grants the central bank indirect control over a monetary aggregate.²⁵ The monetary base, including currency and reserves, in its entirety represents a liability of the central bank, so that it is, in monetarist view, a strictly logical conclusion that “[t]he authorities can control the monetary base directly”²⁶, as the decision is at their own discretion whether to go into “debt”, i.e., increase the high-powered money stock, or not.²⁷

The money supply process in a monetarist framework has accordingly been presented by Friedman in a famous illustrative description as being basically equivalent to taking place through a direct injection of high-powered money, as if a helicopter flew over the economy and dropped money into the purses of economic agents.²⁸ Although this metaphor has been attacked as being a too simplistic representation of the money supply process, it gives the right taste of the effects of an expansion of the money stock in a monetarist framework, in particular as far as long run effects are concerned. The increase of the quantity

²⁴Milton Friedman (1982), “Monetary Policy”, *Journal of Money, Credit and Banking* 14 (1), p.101

²⁵“Control over the base exerts about as much influence on nonmember commercial banks as on member banks, on thrift institutions as on commercial banks, and so on in unending circle.” (*ibid.*, p. 115)

²⁶Milton Friedman (1991), *loc. cit.*, p. 55

²⁷Friedman, however, recognizes that (in practice) base money is created in part upon request of member banks of the monetary system. He insists, however, that this is a “serious mistake”, and that if would theoretically be possible to fix the supply of base money to any level desired. Cf. *ibid.*

²⁸Cf. Milton Friedman (1969), *The Optimum Quantity of Money and Other Essays*, Chicago: University of Chicago Press, pp. 4ff.

of money circulating in an economy to the λ -fold of its original value, induced by an external source ("the helicopter"), finally leads to a λ -fold price level.

Corrected for independent (e.g. technology-induced) changes in real variables, variations in the supply of money are linear-homogeneously translated into price movements in the long run.²⁹

Short run changes in the quantity of money are not necessarily a result of changes in base money. This is an observation acknowledged by montarists despite their insistence on the independence of the money supply from influences from within an economy in the long run. The joint analysis of the major determinants of the money stock determines the quantity of money M as a multiple of the quantity of base money B , where the difference between M and B is the volume of *monetized* bank credit C . The theoretical concept of analyzing the determinants of the quantity of a monetary aggregate in terms of the product of two factors, one of which is the monetary base, has been called the *monetary multiplier analysis*.

3.3 The monetary multiplier

The concept of the monetary multiplier is based upon the simple idea of representing a previously defined measure of the money stock M_i as the multiple of the monetary base B , consisting of currency in the hands of the public and bank reserves (held either in accounts at the central bank or as vault cash in the banking system). The resulting factor that determines how much money M_i can be

²⁹Tobin criticizes Friedman's "quantity of money' theory of prices " as not being a correct representation of the impact of monetary policy in a real world economy. He notes that only "a Gaullist monetary reform scales all [prices] up or down in proportion, ordinary monetary operations do not." James Tobin (1974), "Friedman's Theoretical Framework", in: Robert J. Gordon (1974), *loc. cit.*, pp. 86f.

supported by a given supply of outside money B is called the money multiplier mmi . Formally, one obtains the multiplier by simple division of the monetary aggregate by the base: It holds:

$$Mi = mmi \cdot B$$

so that:

$$mmi = \frac{Mi}{B}$$

Though yielding the correct value of the multiplier as defined above, the derivation of the money multiplier by mere division of the magnitudes that are to be put into a relation to one another has little explanatory value regarding the determination of the money stock. A more appropriate form of the multiplier requires its derivation from a different background that allows the assignment of those economic agents to particular components of the money multiplier who determine their magnitudes. Thus it becomes possible to distinguish the impact of different groups of agents in an economy on the aggregate money stock.

The goal of disentangling the monetary multiplier into its components can be achieved by rewriting the fraction $\frac{Mi}{B}$ in terms of the components of the respective monetary aggregate.

The monetary aggregate Mi chosen consists of basically two components. One is the currency in the hands of the public that is legal tender, the other are deposits that are considered close substitutes for money regarding the problem under consideration, and that are either used alternatively to money in exchange or can relatively easily be transferred into the legal tender money.

3.3.1 The monetary multiplier linking the monetary base and M_1

In the case of M_1 , the monetary aggregate is composed of currency and checkable deposits at depository institutions:

$$M_1 = C + D \quad (3.4)$$

(where C is currency and D are checkable deposits).

The monetary base B has already been defined as consisting of currency C and reserves R held by the banking system:

$$B = C + R \quad (3.5)$$

Both equations describe definitional identities which can be used to derive an expression for the monetary multiplier in terms of its components:

$$mm_1 = \frac{M_1}{B} = \frac{C + D}{C + R} \quad (3.6)$$

A division of numerator and denominator by D yields:

$$mm_1 = \frac{1 + k}{r + k} \quad (3.7)$$

where k is the ratio of currency to checkable deposits, and r the ratio of total reserves held by the banks to checkable deposits.

As the multiplier is, in this context, analyzed with respect to the question of what are the determinants of the money supply, and who has control over the components of the multiplier, it is helpful to further split up the reserves aggregate. The major portion of total reserves held by the banking system are required reserves R_r , imposed by the monetary authority on certain types of deposits, whereas a smaller portion is held for precautionary reasons: In order to

avoid illiquidity in case of an unforeseen cash outflow of deposits, banks usually hold excess reserves R_e to be able to meet their conversion obligations.

The consideration of this qualitative distinction allows the disaggregation of the reserves measure R into its components R_r and R_e . As a result, the total reserves to deposits ratio r can be written as the sum of the required ratio r_r and the excess reserves ratio r_e .³⁰ This leads to a more detailed version of the relation between $M1$ and B :

$$M1 = mm1 \cdot B = \frac{1 + k}{r_r + r_e + k} \cdot B \quad (3.8)$$

3.3.2 The generalized monetary multiplier

A multiplier can be derived for any monetary aggregate, since it is merely a tautological representation of the simple quotient $\frac{M_i}{B}$. A general form, comprising the monetary multipliers for $M1$, $M2$, and $M3$ as special cases, can be obtained in the same way as the $M1$ -multiplier above, if base and aggregate are expressed in general terms.

A monetary aggregate basically comprises two classes of assets. First, there is the currency C in the hands of the public that enters as the asset of ultimate redemption. Second, there is a smaller or larger number of assets D_m that serve the purpose of transaction, of a temporary or permanent store of value, depending on the intention behind the definition of an aggregate. Formally, M_i can therefore be defined as:

$$M_i = C + \sum_m D_m \quad (3.9)$$

where m is the number of assets included.³¹

³⁰It is important to note that r_r is a ratio that relates *total* required reserves to the checkable deposits component of $M1$. The former term includes, however, reserves held due to obligatory requirements on D , i.e., r_D , itself. Cf. more detailed disaggregation of R below (p. 39).

³¹In the case of $M1$, it holds $m = 1$. D_1 thus represents all checkable accounts at depository

The monetary base consists of currency C and the total reserves R held in the banking system. Instead of focusing on aggregate required reserves, i.e., the product of total required reserves to checkable deposits ratio r_r and checkable deposits D , required reserves can be written as the sum of the volumes of different types of deposits D_m multiplied with the respective reserve ratio r_m , and the excess reserves position R_e . It follows that

$$R = \sum_n r_n \cdot D_n + R_e \quad (3.10)$$

so that the monetary base can be written as

$$B = C + \sum_n r_n \cdot D_n + R_e \quad (3.11)$$

The multiplier mmi again is the fraction $\frac{M_i}{B}$. After division of numerator and denominator by those checkable deposits D_1 included in $M1$ and some reorganizing, the generalized relation between a monetary aggregate M_i and base money B is given by

$$M_i = \frac{1 + k + \sum_{m \neq 1} \frac{D_m}{D_1}}{r_1 + r_e + k + \sum_{n \neq 1} r_n \cdot \frac{D_n}{D_1}} \cdot B \quad (3.12)$$

3.4 Determinants of the money supply

The multiplier analysis leads to the recognition of three major factors as determinants of the supply of money. These have also been clearly recognized by monetarists.³²

1. An increase in the stock of high-powered money B leads to an increase in the stock of money M_i in the economy by the mmi -fold. The former is

institutions (except for those with a maximum number of checks allowed that are included in $M2$).

³²In their extensive analysis of the money supply in the U.S., Milton Friedman and Anna J. Schwartz have explicitly derived those determinants out of a multiplier framework (Cf. Milton Friedman and Anna J. Schwartz (1963), *loc. cit.*, pp. 776-798). They used a slightly different

assumed to be under the control of the monetary authority.³³

2. The ratio of cash to deposits ($\frac{C}{D}$) is primarily determined by the private sector. The decision as to whether to hold money in the form of currency or deposits is up to individual economic units.³⁴ *Ceteris paribus*, changes in the currency-to-deposits-ratio are negatively correlated with changes in the stock of money, so that behavioral patterns *within* the economy exert an impact on the available money stock.
3. The ratio between bank reserves and deposits ($\frac{R}{D}$) is jointly determined by the central bank and the banking sector. The former has the right to impose minimum reserve requirements on the monetary system in order to set an upper limit to the quantity of deposits that can be created on a given monetary base,³⁵ while the latter are free to hold excess reserves. Thus the banking system can either buffer out impulses on the reserves-to-deposits-ratio emanating from the central bank, or autonomously affect the ratio through non-induced variations in its excess reserves position.³⁶

formulation of the multiplier in that they expressed it with inverse currency and reserve ratios:

$$M = H \cdot \frac{\frac{D}{R}(1 + \frac{D}{C})}{\frac{D}{R} + \frac{D}{C}}$$

(*ibid.*, p. 791)

³³Cf. *ibid.*, pp. 785, 789f.

³⁴"The public's choice of the proportion in which it holds deposits and currency depends on the relative usefulness of the two media, on the costs of holding them, and perhaps on income."
(*ibid.*, p. 787)

³⁵If the quantity of high-powered money is completely fixed.

³⁶It must, however, be considered that banks will have an incentive to economize on their idle cash balances (due to opportunity costs). They hold excess reserves as an instrument to manage the trade-off between liquidity and profitability (cf. Wilfried Fuhrmann (1987), *Geld und Kredit. Prinzipien monetärer Makroökonomik*, München: Oldenbourg, pp. 122f.) Only in an economy without any temporary credit facilities that banks could utilize to bridge periods of lacks in liquidity would there be larger fluctuations in excess reserve positions.

Although B , $\frac{C}{D}$ and $\frac{R}{D}$ are the primary magnitudes and ratios, respectively, that determine an economy's supply of money, there are other influential factors not mentioned yet. In particular, the multiplier of a narrow monetary aggregate (like $M1$) incorporates the impact of structural changes from outside the range of assets included in the definition of the aggregate. As the generalized form of the multiplier shows, the denominator is dependent on changes in the relative size of non-aggregated asset D_n as compared to the transaction accounts in $M1$, since this ratio, together with the respective minimum required reserves ratio r_n , determines the quantity of total reserves in the banking system necessary to support a given volume and distribution of assets over a whole range of possible types. Without that a change in the $\frac{C}{D}$ -ratio occurs, portfolio decisions of the private sector in (with respect to the chosen narrow aggregate) nonmonetary assets affect the supply of narrow money (like $M1$) via an indirect reserves mechanism.

Interdependences of this type make it impossible to assign single agents the role of exercising control over a particular determinant of the money supply. Moreover, the behavioral patterns of both the banking and the private sector are interwoven, affecting different components of the monetary multiplier simultaneously.

The monetarist approach emphasizes the short run variability of the money multipliers. It acknowledges that there are 'endogenous' elements in the money supply process that can be identified using the component ratio approach of the multiplier analysis. The public and the banks, respectively, as a whole are assumed usually to be able to control the component ratios, reacting to signals from within the economy.³⁷ In particular, Friedman notes that "there are influences

³⁷Cf. Milton Friedman and Anna J. Schwartz (1963), *loc.cit.*, p. 788

running from income to the quantity of money”³⁸, which must be taken to work through the multiplier mechanism in his point of view since Friedman insists on the principally direct controllability of the monetary base through the central bank.

As fine tuning is impossible due to the complex behavioral interference of economic agents in the money supply process, “[c]ontrol of the monetary base does not produce rigid and precise control of the money supply.”³⁹ Over the long run, however, the money stock as a target variable is in its movements subject to exogenously determined changes in base money. “Strong influences running from the quantity of money to income”⁴⁰ are in the long run under the control of the central bank, using the monetary base as an instrument.⁴¹

The monetarist claim of controllability of the money supply through the central bank has been the recurring subject of controversy in economic theory. The issue of dispute can generally be summarized in the question if the supply of money is exogenously or endogenously determined in a real- world monetary production economy. A closely related question is if the causation of changes in variables runs from money to nominal measures like income, prices etc., or if the direction is reversed, i.e., if changes in the stock of money are more likely a reflection of changes in other (nominal) variables.

³⁸Milton Friedman, quoted from Nicholas Kaldor (1982), *The Scourge of Monetarism*, Oxford: Oxford University Press, p. 33

³⁹Milton Friedman (1991), *loc. cit.*, p. 55

⁴⁰Milton Friedman, quoted from Nicholas Kaldor (1982), *loc. cit.*, p. 33

⁴¹Monetarists see their conclusion supported by empirical evidence. They find a 90 % correlation between high-powered money and the monetary aggregate in long run (e.g. annual) data, while attributing changes in the money stock in the short run (on a weekly or monthly basis e.g.) mostly to changes in the multiplier due to variability in its components, in particular in the currency-to-deposits-ratio. Cf. overview in Laurence Harris (1981), *Monetary Theory*, New York etc.: McGraw-Hill, pp. 135f., and Basil J. Moore (1988b), *Horizontalists and Verticalists. The Macroeconomics of Credit Money*, Cambridge: Cambridge University Press, pp. 70ff.

The following chapter will begin with a clarification of the meaning of the terms 'exogenous' and 'endogenous', that are used in different senses which seems to have lead to some confusion in debating related issues. Following the definitional part, alternative concepts of endogenous money are presented in their essential features and opposed to the neoclassical view of exogenous money, of which the monetarist approach that has just been outlined is a prime example.

Chapter 4

Concepts of Endogenous Money

Economic theory is conducted with the help of models of those parts of an economy that are relevant for the analysis of a given problem. The goal of model building can generally be described as achieving an abstraction from the real world without losing the basic relationships and interdependences between variables that are of importance for the problem regarded. An appropriate specification of a model has a structure that incorporates all those forces in the form of structural equations that are important for a quantitative and/or qualitative derivation of variable values. Economic parameters that are not assumed to be affected by those determined in the model are regarded as independently fixed outside the constructed frame. Such as the analysis of a closed economy takes the behavior of the foreign sector as given and independent of the problems considered in the closed framework, most 'textbook' treatments of questions concerning the supply of money stipulate the latter as determined outside the respective macroeconomic model, i.e., as provided by an agent whose decisions are not a direct response to events inside the model.

It is common usage to refer to the respective types of variables as either 'endogenous' or 'exogenous'. The intended meaning behind the terms can, however,

vary widely if used by different people in different circumstances. Thus, neither the proponents of an exogenous view of the money supply, nor those who consider it as determined endogenously necessarily agree amongst themselves upon a single framework for the analysis of the supply process. In particular, the picture of the money supply process is often not painted in black (exogenous) or white (endogenous), but more shaded in greyish colors, directing the focus on the constituting components of a monetary aggregate instead of on the sum of the components alone.

Different uses of the terms 'exogeneity' and 'endogeneity' can in general be classified as in a technical, i.e., statistical, or non-technical (non-statistical) sense.¹ While the former use of the terms makes them subject to a unique meaning, the use of 'exogeneity' and 'endogeneity' in a non-statistical sense requires the definition of further distinguishing criteria. In models of the money supply, these are normally associated with the question of controllability of the quantity of money through the economic unit assumed responsible, i.e., the central bank.

4.1 Exogeneity and endogeneity in the statistical sense

A technical (statistical) definition of the meaning of 'exogenous' ('endogenous') presupposes the existence of a developed model of the macroeconomy and, in particular, the identification of the variables determined endogenously in the system of structural equations (such as prices, income, interest rates etc. in standard macroeconomic models). A variable representing the supply of money can then be regarded as exogenous if it can not be explained by variables deter-

¹Victoria Chick (1979), *loc. cit.*, pp. 84f.; L. Randall Wray (1990), *loc. cit.*, pp. 72ff.

mined within the system of structural equations of the model. Formally, it may specially not be possible to express an exogenous variable M as determined by a regression equation using endogenous variables Y , i , q etc.:

$$M = \alpha + \beta Y + \gamma i + \delta p + \epsilon.$$

The attribute 'exogenous' is not invariant to the context of a model.² One and the same variable can be statistically exogenous or endogenous, depending on the scope of the framework into which an analysis is set.

The criterion is that "a variable is exogenous if none of its determinants are current values of the endogenous variables. Endogenous variables are those whose equilibrium values are to be determined by the model."³ Or, as Cooley and LeRoy put it, "a variable in a regression is statistically exogenous only if it is independent (in the probability sense) of the unobserved explanatory variables."⁴ If these conditions are not fulfilled, then a variable has some degree of endogeneity. The distinction between statistical exogeneity and endogeneity is drawn according to the criterion if the definition of an exogenous variable is fulfilled, or if it is to be regarded as non- exogenous: Whereas endogeneity (i.e., non-exogeneity) can be differentiated by degrees, the property of exogeneity is uniquely defined.

The problem with the statistical concept of exogeneity is that it is often not directly verifiable due to the lack of a comprehensive and explicit theoretical framework as a background for the analysis of the money supply process.⁵ But

²Thus, 'exogenous' is closer related to an attribute like 'wide' (which is only a meaningful term if related to a standard) than 'white' (which has a unique, context-invariant meaning by itself).

³Victoria Chick (1979), *loc. cit.*, p. 85

⁴Thomas F. Cooley and Stephen F. LeRoy (1981), "Identification and Estimation of Money Demand", *The American Economic Review* 71 (5), p. 838

⁵Cf. Victoria Chick (1979), *loc. cit.*, p.85

even if this is the case and the money supply is assumed exogenous in the model, it is not independent of the endogenous variables determined in the model. This is due to the fact that even though there may be a monetary authority that has the ability to fix a monetary aggregate $\bar{M}$, the assumption of rationality and policy-guidedness on the part of the central bank in conducting autonomous changes in the quantity of money supplied provides an indirect link to major economic endogenous key variables like prices p and income Y . Central bank policy is not arbitrary, but oriented on influencing economic indicators derived from within the model economy.

It follows that changes in endogenous variables within a model lead to a feedback of some kind from monetary policy, as long as the chosen indicators include one or more of the endogenous variables. Even though there will be no direct dependence of M on those factors, there will be at least an intermediated one if central bank policy pursues some 'reasonable' goal, i.e., conducts non-random changes in the stock of money. At least in the probability sense the determinants of an observed supply of money can be traced back to endogenous variables, so that Cooley and LeRoy's definition of exogeneity does not hold.

4.2 Exogeneity and endogeneity in the control sense

Taking the statistical concept as a standard for classifying a theory of money supply as 'exogenous' or 'endogenous' does not prove to be an appropriate measure since it combines in other respect clearly distinct positions on the money supply process in the second category. It proves more useful to concentrate on policy parameters at the disposal of the government and the question in how far their

values can be set without influence from endogenous magnitudes in the economy. If a variable can be determined by the government, which is seen as “‘outside’ the private sector”⁶, then it can be called *exogenous in the control sense*.

In macroeconomic theory a variable, the level of which is set by government as an implementation of economic policy, is represented analytically as an exogenous variable [...]. Analysis then centers on the effect of policy changes, represented by shifts in the exogenous policy variable(s), on endogenous variables.⁷

Endogenous in the control sense is a variable if its value is partly or completely determined by changes inside the private sector.

Victoria Chick introduces another definition of exogeneity that moves away from the control-criterion and replaces it with an initiative-concept. “[T]he exogeneity issue is not about control, but initiative and influence.”⁸ In her view, the term ‘exogeneity’ means “initiated by government as a deliberate policy change”⁹. A definition of ‘exogenous’ in this sense covers a wide range of views on the money supply that would have been called strictly exogenous on the one end of the spectrum to partly endogenous on the other end, if the definition in the control sense had been applied.

The aversion from the technical definition of exogeneity and the adoption of the one in the control sense allows an effective classification of different positions concerning the money supply process. The monetarist approach to the supply of money is an example of an exogenous view. Not only do monetarists regard the monetary base as under the control of the central bank, they basically assert

⁶ *ibid.*

⁷ Thomas F. Cooley and Stephen F. LeRoy (1981), *loc. cit.*, p. 838

⁸ Victoria Chick (1979), *loc. cit.*, p. 89

⁹ *ibid.*, p. 85

the same of monetary aggregates (like their preferred aggregate $M2$). Those are under the control of the central bank at least in the long run whereas monetarists concede some money stock endogeneity, due to multiplier variability, in the short run.

Approaches to the supply of money emphasizing an endogenous supply process not only recognize from the central bank's point of view non-controllable variability of the multiplier, but also see the monetary base itself as not being under the perfect control of the central bank.¹⁰ However, there are some differences as to the extent to which endogenous movements in single components of the money supply are assumed to dominate behavior of the money supply, e.g., if endogeneity mainly results from banks' balance sheet operations, or from the central bank's "lender of last resort" function.

A categorization of different approaches to endogenous money can be undertaken utilizing the formal concepts of the interest rate elasticity of the money supply function and a second criterion of interdependence or independence of money supply and demand functions.¹¹

4.3 Endogenous money and the interest elasticity of the money supply

The problem with the concept of the money supply curve lies in its interpretation. In the case of money demand, the derivation of a functional relationship linking the quantity of money demanded in an economy to some determinants (like

¹⁰This is a crucial distinguishing characteristic. Proponents of an endogenous view of money regard it as lying in the nature of monetary economies that the monetary base can not be controlled. Monetarists, e.g., view a strict control of the money supply as completely compatible with real world economies.

¹¹Cf. Paul Davidson (1988), "Endogenous Money, the Production Process, and Inflation Analysis", *Economie Appliquée* 41 (1), pp. 151-169

income Y , interest rate i , or planned consumption $C + I$) allows to depict a specific quantity of means of payment in the form of currency or deposits that the private sector wants to hold, given specific parameter values of the determinants. Which quantity is then finally realized depends upon the money supply function and the question which determinants of the supply and/or demand function will adjust to install an equilibrium solution.

Contrary to the situation with the money demand function, it is difficult to interpret a predicted quantity of money supplied that is part of the supply schedule but not the currently demanded quantity, i.e., not the equilibrium quantity. Money supply can not be thought of independently of money demand: money supplied is always money demanded, there can be no excess supply in the market (like there can be excess demand). If a supply function is nevertheless defined also for non-equilibrium combinations, it describes the *maximum* quantity of money made available in an economy by both the central bank and the banking system for alternative rates of interest, under the presumption that in fact all of it would be demanded.

Kaldor¹² presents the notion of an endogenous money supply in terms of a money supply curve in interest rate–money– space (i - M -space).¹³ He represents a strictly exogenous money supply by an interest-inelastic supply curve of money. Due to its vertical position in the i - M -space, adherents to the exogeneity of money-position have been termed ‘verticalists’ by Moore¹⁴. As a result of the stable money supply function, movements in the demand for money schedule do not change the quantity of money in an economy, but find their reflection in the

¹²Cf. Nicholas Kaldor (1982), *loc. cit.*, pp. 23f.

¹³The interest rate i chosen is a representative loan interest rate, while M is a monetary aggregate comprising both currency and bank deposits.

¹⁴Cf. Basil J. Moore (1988b), *loc. cit.*, Preface

level of interest rates that adjust.

Although a vertical supply curve of money may represent a *desirable* state of affairs for economists (like Friedman) who support the view of an exogenous and stable money supply, it must be doubted that the same group would agree to accept the vertical position as a good *description* of the situation in the real world. Even monetarists admit that exogeneity is more a long term notion than an appropriate attribute for the short run situation in which autonomous impacts emanating from the private sector on the supply of money exist.¹⁵

Kaldor criticizes the verticalist position on the money supply as inappropriate to an economy operating on credit money.¹⁶ In an economy in which loans are extended upon demand and create deposits on the liability side of the banks' balance sheets, he assumes the *interest rate*, instead of the quantity of money, an exogenous variable under the control of the central bank. This follows directly, Kaldor argues, from the central bank's function as a "lender of last resort".¹⁷

A representation of Kaldor's view in i - M -space leads to a horizontal money supply curve, being perfectly elastic at any interest rate set by the central bank. The endogeneity Kaldor assumes in this simple diagrammatic exposition of his position results entirely from the accommodation of banks' demand for reserves through the central bank, following a demand-driven increase in loans and deposits.

The horizontalist view regarding the supply of money is as extreme an ap-

¹⁵For a short interpretation of the monetarist position on interest elasticity and stability of the money supply curve cf. below (p. 59)

¹⁶This becomes clear if an exogenous supply of money is regarded under consideration of the components of the monetary aggregate. If the supply of money does not change following an increase in demand for it, this means that banks are unable to extend credit at the going interest rate as they can not obtain the reserves necessary to back further lending. Bank credit is implicitly assumed constrained to the initial volume in the verticalist view, with the constraint working through the interest rate.

¹⁷Cf. Nicholas Kaldor (1982), *loc. cit.*, p. 25

proach as is the verticalist position. It is certainly unrealistic to assume that there exist no quantity constraints at all as to the quantity of reserves available from the central bank upon demand. The most realistic as well as the most general case is a somewhat upwards sloping supply curve of money, i.e., a curve which is neither perfectly elastic nor inelastic with respect to the rate of interest. The absolute value of its slope is determined by the interest sensitivity of the components of the money stock, i.e., the money multiplier mm and the base B .

Amongst adherents to an endogenous approach to money there is basically an agreement that the multiplier is to some extent interest elastic. A higher level of interest rates not only induces banks to hold fewer excess reserves, it also gives individuals an incentive to economize on their cash holdings of money. As a result, both the $\frac{C}{D}$ and $\frac{R}{D}$ -ratios tend to fall with a rise in interest rates, which leads to a comovement of interest rates and monetary multiplier ($\frac{dmm}{di} > 0$).

While the dependence of the money multiplier on the interest rate is compatible with a positive slope of the money supply curve, it can not support the perfectly elastic curve conception that Kaldor asserts to be representative for the endogenous approach to money. If all adjustments have to run through the multiplier, then this would imply that the private sector would always exactly adjust its behavior to equilibrate the demand for and supply of money even in the short run, i.e., that it would create its own supply completely without help from outside. This is where the accommodative policy of the central bank comes in. Under the assumption that it is willing to supply additional reserves at a *fixed* price in any quantity, banks will be willing to borrow reserves at the central bank's discount window at the announced price and extend credit at the higher given credit market interest rate. As long as there are economic agents

who are willing to borrow at the prevailing credit market rate¹⁸, under such an arrangement banks will supply any amount of money demanded to the economy.

While nonborrowed reserves react to interest rate changes only with respect to the public's desired $\frac{C}{D}$ -ratio (less cash holdings mean more reserves to the banking system), borrowed reserves are perfectly interest elastic in Kaldor's view. If borrowing costs at the discount window were constructed to rise with an increase in borrowing, a positive elasticity response of the money supply to the credit market interest rate would be the result: Banks would only increase lending if they could cover the additional borrowing costs through higher credit interest rates.

A money supply curve that is interest elastic in i - M -space corresponds with the notion of endogeneity of the money supply in the control sense. Shifts in the demand for money function result in movements *along* the money supply curve, so that expansionary money demand impulses lead to an expansion of the quantity of money and either leave the interest rate in the credit market unaffected (Kaldor's perfect accommodation assumption), or increase it to a greater or lesser extent, depending on the slope of the money supply curve.

4.4 Endogeneity as interdependence of money demand and supply functions

The description of endogeneity in terms of interest elasticity of the money supply curve so far focuses exclusively on the link between money demand and money

¹⁸The credit market interest rate on additional loans must necessarily be adjusted for lending risk. In a period of high credit demand firms might increase their leverage ratios and, thus, increase the risk of default on their loans. Kaldor's horizontal, credit-driven money supply curve only makes sense if the fixed credit market rate is the standard lending rate which is from case to case increased for risk premiums that are recognized by individual borrowers when they express demand for credit at a given standard lending rate.

supply that works through changes in the interest rate. Depending on the sensitivity of behavior in the private sector and the banking system with respect to changes in credit market interest rates, the slope of the money supply curve is determined by variations in monetary multiplier and base in response to movements in the interest rate.

Another possible source of endogenous money supply behavior lies in shifts of the money supply curve itself in response to exogenous changes in the private sector. Of particular importance are those supply curve shifts initiated by exogenous changes in the demand for money. The interdependence of demand and supply curves may be the result of either an indirect or a direct linkage of the supply schedule to the demand decision.

4.4.1 Money supply and demand: the indirect connection

An *indirect connection* can be said to exist if one or more of the determinants of the supply of money are at the same time determinants of money demand.¹⁹ Using Keynes' classification²⁰ in order to determine the most important factors, the demand for money is not only dependent on the interest rate i via a speculation motive for holding money, but also on planned expenditures for transaction and precautionary purposes of households and businesses, i.e., the finance motive. A simplified money demand function can therefore be written as:

$$M^d = M^d(i, C + I) \quad (4.1)$$

with the partial derivative being negative for the rate of interest, and a positive partial derivative with respect to planned expenditures. While changes in i lead

¹⁹As shifts of the money supply curve are considered that occur in i - M -space, at least one of the common determinants must not be the interest rate.

²⁰Cf. John M. Keynes (1936), *loc. cit.*, p. 170; and for the finance motive Paul Davidson (1978), *loc. cit.*, p. 166

to movements along a demand curve in i - M -space, variations in planned $C + I$ lead to shifts of the whole demand schedule.

All variables that lead to changes in either the monetary base or the multiplier are determinants of the money supply. If the demand curve for money shifts due to variations in planned $C + I$, and if this leads to changes in the component ratios of the multiplier, a simultaneous shift of the supply curve will be the result. In particular, a necessary condition for exogeneity in the independence-sense is the constance of the $\frac{C}{D}$ -ratio with respect to changes in planned $C + I$. If this condition does not hold, the money supply curve will shift, with the direction depending on whether it is negatively (outward shift) or positively (inward shift) related to the influencing variables.²¹

Another source of indirect connection lies in the behavior of the central bank itself. In its policy it has the choice between rules and discretion, or a mixture of both. If a central bank pursues the policy to "meet the needs of trade" and accommodate the increased demand for money needed for planned expenditures by supplying the required additional reserves *through the purchase of securities* out of the portfolios of the banking sector ('open market operations'), then changes in the base will be the source for a shift of the money supply function.²²

²¹The constance of the $\frac{R}{D}$ -ratio is, of course, also required for an independent supply curve. It can however be regarded as approximately fulfilled in the short run since most of the reserves held in modern monetary economies are required reserves, with (interest- elastic) excess reserves a rather constant and small fraction of total reserves. Cf. Jean Gauger and Harold A. Black (1991), "Asset Substitution and Monetary Volatility", *Journal of Money, Credit and Banking* 23 (4), p. 680

²²Although this seems to be a situation similar to the one described above as Kaldor's accommodative view, there are crucial differences:

1. Kaldor sees accommodation functioning through the borrowed reserves provision, here it is the nonborrowed reserves position that is enhanced.
2. Whereas the provision of the borrowed reserves upon demand is regarded as unavoidable, the provision of nonborrowed reserves through open market operations is a "voluntary" act of the central bank, theoretically it would not have to react (in the strict control sense, open market operations according to a self-imposed rule are not necessarily endogenous).

4.4.2 Money supply and demand: the direct connection

A *direct connection* between money supply and demand is here defined to exist when the quantity of money demanded itself appears as an argument in the money supply function, i.e., if it holds:

$$M^s = M^s(\dots, M^d(i, C + I), \dots) \quad (4.2)$$

It is in so far a special case of the indirect connection described above in that *all* the explanatory variables of the demand for money function enter as an argument into the money supply function. The functional specification of the demand function directly enters into the money supply function so that also preferences incorporated in the former are considered.

The notion of a direct connection between money supply and demand highlights the fact that institutional factors may not be neglected in the analysis of the money supply process. Emphasis must be put primarily on money held in the form of bank deposits. The main source through which bank deposits come into existence are bank loans. Whenever a bank extends a credit, it issues a liability claim on itself in the form of a bank deposit. As long as the quantity of base money in an economy is fixed, and $\frac{C}{D}$ - and $\frac{R}{D}$ -ratios are given, banks will be willing to expand loans up to a maximum quantity determined by the multiplier.

However, banks must often satisfy demand for loans in excess of a maximum quantity desired. In modern monetary economies, businesses and households attempt to have access to means of payment upon demand in order to avoid illiquidity. Often they have negotiated automatic credit facilities that can be utilized at their discretion, i.e., an overdraft system.²³ To the extent that an in-

²³Businesses have usually negotiated lines of credit that are guaranteed and provided by their

crease in the demand for money is at the same time an increase in the demand for credit, banks *must* accommodate the additional demand at the predetermined rate of interest (which is usually tied to the market rate of interest).

Independent of the way in which banks acquire the additionally needed reserves, the money supply is, at least in the very short run, determined by the demand exercised by the non-bank sector *within its lines of credit*. Additional demand for credit that is not covered by overdraft obligations can be rejected by the banks if they have a shortage of reserves at the market rate of interest. In these circumstances, a shift in the demand for money curve leads to a smaller shift in the supply of money curve into the same direction, where the fraction to which the latter follows the movement of the former can depend mainly on the share of binding commitments to supply money amongst the additional quantities demanded.

This limited overdraft situation can be compared to the view that describes the central bank as providing a perfect accommodation. An increase in the quantity of money supplied that exactly matches the increase in demand is compatible with the notion of a concomitant shift of the supply curve in response to a shift in the demand curve. This perfect accommodation case differs from the more general result derived earlier in that the latter assumes unlimited access of banks to (fixed-price borrowed) reserves. Consequently, banks not only can satisfy the proportion of demand that they must under their overdraft commitments, but also the demands that are not covered by overdraft facilities. A perfectly interest-elastic money supply curve can therefore also be interpreted as an expansion path of short-run equilibria, resulting from concomitant shifts of supply and demand

banks upon request against a fee. In some countries (like Germany e.g.) banks provide considerable overdraft facilities on household transaction accounts (in Germany, the automatic credit limit is usually set to the three-fold of a household's monthly income).

curves under the assumption of banks having unlimited access to reserves at fixed prices.

Summary

The concepts of 'exogeneity' and 'endogeneity' of variables have been introduced in two different ways. The formulation of the concepts in a technical, statistical sense has been shown to be rigorous, but of little value with respect to providing a distinguishing criterion in the comparison of different positions on the money supply process, as it denotes virtually all approaches as endogenous. The concepts of exogeneity and endogeneity in a control sense, however, provide a fruitful criterion for distinguishing rival theories according to a major conceptual difference. Formally, the concepts presented can be defined either in terms of interest rate elasticity of the supply curve of money or interdependence of supply and demand curves. Whereas 'exogeneity' is in both interpretations analytically identifiable through unique properties (namely perfect interest inelasticity and stability of the money supply curve, respectively), 'endogeneity' covers a wide range of money supply arrangements (namely all those that do not meet strict exogeneity criteria).

The possibility of formal representation of different views on the question as to whether the money supply can be regarded as endogenous implies that two concepts of endogeneity can (roughly) be associated with Post Keynesian thinking. The *accommodative endogeneity*²⁴ approach can be associated with authors like Nicholas Kaldor and Basil J. Moore. The basic tenet of this approach is that a central bank has no choice but to accommodate any demand for reserves so that the decision on the money supply is in the hands of the private sector. The

²⁴Cf. Robert Pollin (1991), "Two Theories of Money Supply Endogeneity: Some Empirical Evidence", *Journal of Post Keynesian Economics* 13 (3), p. 366-396

*structural endogeneity*²⁵ approach on the other hand questions the assumption of unlimited availability of fixed-price reserves. Rather it emphasizes the innovative forces inherent in the banking system that allow the latter to support increased lending on the basis of an existing quantity of total reserves.

In order to be able to compare these two endogenous approaches to a neo-classical, monetarist approach – from which accommodationists and structuralists differ much more than they do from one another – the latter must first be translated into a formal framework.

4.5 The monetarist concept of exogenous money in a formal framework

The monetarist position regarding the supply of money has been summarized as asserting controllability of the money supply by the central bank (at least in the long run) while conceding the possibility of short run endogenous money. Although the monetarist position is often referred to as a strict exogenous money supply system, the necessary conditions for exogeneity are very explicit. A stable, vertical money supply curve is guaranteed only if

the public's desired cash/deposit ratio is a constant, there are no borrowed reserves and banks always expand to the limit allowed by the (fixed) reserve requirement.²⁶

Of course, even if these conditions are fulfilled, the money supply curve may still be shifting in an uncontrolled manner if banks restructure their liabilities from deposits with a higher to those with a lower reserve requirement.²⁷

²⁵*ibid.*

²⁶Victoria Chick (1979), *loc. cit.*, p. 86

²⁷In order for it to be a shift of the money supply at any given rate of interest, the costs of funds for the bank may not rise as a result of the restructuring of the portfolio of bank liabilities.

To suggest that monetarists argue that the short run money supply is associated with a vertical and stable money supply curve in i - M -space is an oversimplification, although it describes a situation that monetarists would regard as desirable. Friedman admits that the supply of money can not be viewed as completely under the control of the central bank. This implies that Friedman recognizes the fact that the short run supply function of money has a positive slope and is not necessarily stable at a given market rate of interest. Nevertheless, monetarists suggest that the central bank has the possibility to make the supply of money (almost) exogenous also in the short run.

Proposals that pursue strict exogeneity as a goal are for example

- to dispense with passive borrowed reserves accommodation and to strictly control via quantity the discount window so that the monetary base can be regarded as under the control of the central bank.²⁸ This would both reduce the interest elasticity of the money supply²⁹ and diminish shifts in the money supply schedule.
- to "[m]ake the discount rate a penalty rate, and tie it to a market rate so it automatically moves."³⁰ This presumed trade-off between profitability and solvency results in holding an approximately constant quantity of excess reserves due to a constant interest rate differential to the cost of refinance.
- to make reserve requirements uniform for all types of reservable deposits³¹ so that a shifting of liabilities, i.e., liability management, between different

Otherwise, an upward sloping supply curve would result.

²⁸Cf. Milton Friedman (1991), *loc. cit.*, p. 55

²⁹Since, at higher levels of market interest rates and a given supply price of borrowed reserves, banks would be induced not so much to make use of the interest rate differential between lending and short-term borrowing rates if they know about the quantity constraint.

³⁰Milton Friedman (1982), *loc. cit.*, p. 117

³¹*ibid.*

types of deposits does not affect the quantity of total required reserves to be held.

Even though these measures still will not make the money supply strictly exogenous on a short term basis, they will enhance supply controllability considerably. In a monetarist economy where the money supply is largely deprived of any non-controllable, endogenous influences from within the economy, causation must necessarily run from autonomous (i.e., central bank induced) changes in the supply of money to a subsequent adaption of key variables in the economy.

4.6 The accommodationist view of money supply endogeneity

What basically distinguishes accommodationists like Kaldor and Moore from monetarists like Friedman is their position on the role of the central bank in a credit-money economy. While the monetarist conception of money is more that of a stock, accommodationists emphasize the deposit (flow) component of the monetary aggregate. Money in the form of deposits is created in the course of banks extending credit, "[t]he money supply is *credit driven* as well as *demand determined*."³²

Basic to the accommodationist endogeneity approach is the emphasis it puts on bank behavior. Banks have the key position in a modern monetary economy. Credit money is a liability of the banking system and not of the central bank itself. Banks are regarded as "price setters and quantity takers" in the retail markets in the short run, i.e., banks are assumed to provide any quantity of credit upon demand to agents in the economy. As the quantity of a loan is

³²Basil J. Moore (1988c), "Concluding Comments", *Journal of Post Keynesian Economics* 10 (3), p. 398

usually credited to the borrower's deposit account, "loans make deposits."³³

This conception has important repercussions on the money supply process. While monetarists believe in the controllability of monetary aggregates because they regard the quantity of deposits as under the control of the central bank via control of total reserves and the monetary base, accommodationists reject the notion that reserves determine the quantity of deposits. Accommodationists argue that the orthodox view of the temporal relation between reserves and deposits must be reversed. In a modern credit money economy, where deposits are created simultaneously with an expansion of loans, deposits create reserves.

4.6.1 The role of the central bank

This reversion of the orthodox view of the reserves-deposits relation in an accommodationist view is inherent in credit-money economies. The key proposition is that central banks do *not* have the choice whether to accommodate an increased demand for borrowed reserves through the banking system or not, as it is implied in monetarist thinking. The major function of the central bank is to protect the liquidity (in the subjective sense of "ability to pay") of the banking system. This central bank function is known as the "lender of last resort". As a consequence, "[t]he Central Bank cannot close the 'discount window' without endangering the solvency of the banking system".³⁴

The necessity of full accommodation of bank demand for reserves implies an assumption that it is impossible to put the burden of keeping deposits in line with reserves on the banking system.³⁵ A necessary condition that forces the

³³Basil J. Moore (1989b), "A Simple Model of Bank Intermediation", *Journal of Post Keynesian Economics* 12 (1), p. 4

³⁴Nicholas Kaldor (1982), *loc. cit.*, p. 25

³⁵If banks were able to deny the extension of additional loans to the public, the central bank could decide not to supply the required reserves without endangering the banking system's sol-

monetary authority to assume an accommodative position is the prevalence of credit commitments in the economy. If in the aggregate the volume of negotiated credit agreements that is utilized by bank customers increases, then banks can neither borrow excess reserves from other banks who need them themselves nor obtain them from another source within the private sector. Instead the central bank must be the ultimate lender of liquidity.

Accommodationists emphasize the existence of outstanding credit agreements not only because it is of importance for the central bank's "lender of last resort" function, but also because it supports the view of banks as price setters and quantity takers.³⁶ In setting their price of lending, i.e., their loan interest rates, banks focus on the costs of funds they face in selling their liabilities in financial markets. Banks generally set their lending rates at a markup over their average borrowing rates which covers the costs of financial intermediation and yields an appropriate profit.³⁷

Accommodationists deny the possibility of direct targeting of a monetary aggregate like the monetary base or $M2$ through the central bank. Instead, they assign the monetary authority a different policy variable that helps it to *indirectly* exert an impact on the money stock *after the short run*. The monetary authority is seen as having under its control interest rates, and especially short-term rates. If the monetary authority can influence banks' refinance rates, and if the markup is approximately constant, then the central bank can influence the level of bank lending rates and indirectly affect the volume of total credit vency. In this case, only the bank's profitability would be affected due to the lost gain from the interest rate differential between borrowing and lending of the not extended loan.

³⁶Lines of credit are usually negotiated for a certain period of time and promise the delivery of a loan by a bank at a predetermined interest rate (normally tied to a representative market interest rate plus a constant premium) and for a maximum volume.

³⁷Cf. Stephen Rousseas (1985), "A Markup Theory of Bank Loan Rates", *Journal of Post Keynesian Economics* 8 (1), pp. 135-144

extended and deposits created.

One of the instruments the monetary authority can use in the medium and long run to affect the level of lending rates is the price at which it supplies borrowed reserves to the banking system, i.e., the discount rate. An increase in the discount rate should, *ceteris paribus*, raise lending rates.³⁸ Also, through open market operations supply and demand conditions in financial markets (and thus the prices of alternative sources of funds) can be affected and market-clearing interest rates changed.³⁹

4.6.2 A formal representation of the accommodationist approach

The geometric representation of the accommodationist approach in i - M -space is a perfectly interest-elastic money supply curve. As Moore formulates it, "[t]he supply of credit money is horizontal, but it is merely a point on the demand for bank credit schedule, since credit money cannot exist independent of its demand."⁴⁰ The central bank can exogenously determine (short-term) rates of interest, but is, in the short run, restricted to accommodating whatever quantity of money is demanded thereafter, as "money comes into existence in consequence of [...] the extension of bank credit."⁴¹

³⁸As there are no quantity constraints on reserve borrowing in the accommodationist view, it follows that "[t]he marginal supply price of reserves determines the general level of domestic short-term interest rates." (Basil J. Moore (1989b), *loc. cit.*, p. 27)

³⁹More importantly, open market operations affect the availability of total reserves in an economy. Whereas discount window borrowing represents a *temporary* acquisition of liquidity by the banking system, open market purchases (sales) of securities through the central bank represent a *permanent* increase (decrease) of the monetary base in the economy, apart from their impact on interest rates.

⁴⁰Basil J. Moore (1989b), *loc. cit.*, p. 27. He thus implicitly recognizes the fact that a horizontal money supply curve, drawn as a continuous line, has more the nature of an expansion path for short run equilibria.

⁴¹Nicholas Kaldor (1982), *loc. cit.*, p. 22. Proponents of an endogenous money approach have sometimes been accused of confusing money with credit. Although it is certainly true that money

Changes in the quantity of money are, therefore, always initiated endogenously in the accommodationist approach. The cause for changes in economic activity no longer lies in exogenously controlled movements in the supply of money, but in forces inherent in the private economy itself. In particular, the monetarist chain $\Delta M \rightarrow \Delta Y \rightarrow \Delta M$ is reversed into the accommodationist causation direction $\Delta Y \rightarrow \Delta M$. Despite different assumptions about the direction of causation, both accommodationists and monetarists have in common that they regard the velocity of money as approximately stable. This follows out of the definition of velocity $V = \frac{Y}{M}$, and the assumed full accommodation and full translation of monetary impulses, respectively.⁴²

4.7 The structuralist view of money supply endogeneity

The reverse direction of causation between money and income also is recognized by a second group of economists who regard the supply of money as endogenously determined by market forces. The money-income-link is, however, not exclusively seen as any one way direction. Moreover, it is recognized that interactions exist.⁴³

The structuralist position is distinguished from the accommodationist approach in that it does not share the view that the central bank always fully supplies the reserves demanded, be it through the discount window or open market operations. "Demand does create, to a greater or lesser extent but never

and credit do not have to move *pari passu* (cf. e.g. George A. Kahn (1991), "Does More Money Mean More Bank Loans?", Federal Reserve Bank of Kansas City, *Economic Review July/August*, p. 21-31), a higher demand for bank credit necessarily means the creation of deposits. How long these deposits remain in existence depends upon their subsequent use.

⁴²Cf. Stephen Rousseas (1989), "On the Endogeneity of Money once More", *Journal of Post Keynesian Economics* 11 (3), p. 477

⁴³Cf. Dieter Duwendag (1985), *loc. cit.*, pp. 180ff.

entirely so, its own supply.”⁴⁴ Pollin, who has introduced the term ‘structural endogeneity’, notes that

the structural endogeneity theory is initially distinguished from the accommodative endogeneity approach because it does not recognize any imperative on the part of the central bank toward pursuing full quantitative accommodation.⁴⁵

Consequently, Moore depicts as the major characteristic of the different positions on endogeneity the assumptions of ‘reserve price setting’ and ‘reserve quantity setting’ in the case of an accommodationist and a structuralist approach, respectively.⁴⁶ Structuralists accept the restrictiveness of the central bank in operating its ‘discount window’ as an effective constraint on the quantity of reserves available on a short-term borrowing basis.⁴⁷

If banks rely on borrowed reserves as a substitute for nonborrowed reserves on a regular basis, they can face the danger of being under close scrutiny through the central bank and be denied or diminished access to funds in cases they really needed them. While accommodationists basically regard holding reserves in the form of borrowed or nonborrowed reserves as equivalent⁴⁸, structuralists clearly distinguish both types of reserves, with the former mainly serving the purpose of an emergency fund.

⁴⁴Stephen Rousseas (1989), *loc. cit.*, p. 478

⁴⁵Robert Pollin (1991), *loc. cit.*, p. 373

⁴⁶Cf. Basil J. Moore (1991a), “Money Supply Endogeneity: “Reserve Price Setting” or “Reserve Quantity Setting”?”, *Journal of Post Keynesian Economics* 13 (3), pp. 404-413

⁴⁷Banks are usually not supposed to rely on borrowing reserves at the ‘discount window’ on a permanent basis. Therefore, the higher the indebtedness of a bank in borrowed reserves, the more critical further borrowing will be viewed (with the suspicion that the bank borrows for profit and not in dire need for liquidity).

⁴⁸Cf. Robert Pollin (1991), *loc. cit.*, pp. 367f. If borrowed reserves are, however, held on a permanent basis, the bank is subject to exogenous changes in the refinance interest rate set by central bank in the medium and long run, if the latter deems those necessary to achieve a desired target in an economic indicator.

Since structuralists also assume that additional required reserves will normally not be fully supplied to the economy through open market operations⁴⁹, they emphasize banks' balance sheet operations as a key factor that responds to increased demand for bank loans. The idea behind *liability management* is to better utilize the stock of total reserves within the banking system by shifting liabilities out of types of deposits subject to a high required reserve ratio (like normally transaction accounts) into instruments with a low or zero reserve requirement (like short-term money market instruments as interbank loans ('federal funds'), Eurodollars etc.). The disadvantage of such a strategy is an increase in the general price level of funds which exerts upward pressure on the lending rate.⁵⁰

To the extent that the increased total reserves requirement necessary to back the larger quantity of loans extended can not be compensated by lowering the average reserve requirement through structural changes, banks utilize the discount window, while the central bank pursues its "lender of last resort" function. This is however a very short term solution.⁵¹ If banks do not expect an improvement in their liquidity position in the near future (e.g., by the repayment of loans), they might be forced either to sell assets or even call in loans.⁵²

Short run structural shifts are accompanied by the evolution of (institutional and product) financial innovations whenever the central bank persistently refuses

⁴⁹Cf. Robert Pollin (1991), *loc. cit.*, p. 374

⁵⁰In terms of the generalized monetary multiplier (cf. p. 39), a structural shift in the liability sphere is reflected in the third term of the sum in the denominator, i.e., $\sum_{n \neq 1} r_n \cdot \frac{D_n}{D_1}$.

⁵¹As explained before, a bank does not want to risk obtaining borrowed reserves in the future by relying too much on the latter over an extended period of time.

⁵²Cf. Robert Pollin (1991), *loc. cit.*, p. 376. This tends both to further increase the general level of interest rates and creates a more unstable financial environment. Accommodationists would reject the assumption that banks may be forced to call in loans, arguing that the central bank would always provide necessary reserves in order to avoid this.

to supply an appropriate amount of required reserves via security purchases.⁵³

The goal behind the emergence of innovative financial structures is always the circumvention of restrictions prevailing in financial markets. In particular, the possibility of circumvention of reserve requirements through the development of relatively liquid (and therefore low interest bearing), but at the same time low reserve requirements bearing types of deposit is a strong incentive for the development of new forms of liabilities.⁵⁴

Liability management puts pressure on interest rates. Consequently, interest rates can not be regarded as completely exogenous from a structuralist point of view. The shift of liabilities from the most liquid (highest required reserve ratio bearing) to less liquid (lower ratio) assets can be accomplished only by increasing the average cost of funds to the banks. By setting the discount rate, the central bank influences the general level of short-term interest rates, although financial market conditions (i.e., the "scissors of demand and supply") will have a considerable impact on the exact level of the prevailing rate of interest.⁵⁵

4.7.1 A formal representation of the structuralist approach

The structuralist approach regards the quantity of money as endogenously determined both in the interest elasticity and the interdependence sense. Different

⁵³Cf. Hyman P. Minsky (1982), *Can "It" Happen Again? Essays on Instability and Finance*, Armonk: M.E. Sharpe

⁵⁴As a result of financial innovation, a given monetary base can be used more efficiently: the velocity of narrow monetary aggregates (out of which funds are moved into the innovative products that are component of a broader aggregate) rises. (Cf. Steffen Wende (1990), "Finanzinnovationen und Geldpolitik", PhD-Dissertation, Frankfurt: Peter Lang, pp. 158ff.). This is in how far banks and other financial intermediaries are related in their role in the economy and must both be considered in analyzing the money supply process. (Cf. e.g. Dieter Duwendag et. al. (1985), *loc. cit.*, pp. 114ff.)

⁵⁵Thus, the impact of agents in the private economy on the determination of the rate of interest is the stronger the smaller the extent to which the central bank is willing to further affect interest rates through the use of open market instruments.

time frames, however, apply to both notions of endogeneity.

Under a short run perspective, the money supply curve is upwards sloping in interest-money-space with the possibility of slight shifts. The slope is the result of the fact that banks need to raise lending rates if they are forced to obtain reserves through structural shifts of liabilities which increase the costs of borrowing. Small shifts in the money supply curve can occur only if banks partly use the 'discount window' to obtain borrowed reserves in order to meet contractual loan extensions, *and* if borrowed reserves are obtained at a fixed price matching the prevailing cost of funds.

In the medium and long run, shifts of the money supply curve are the result of financial innovations.⁵⁶ The possibility of lowering the average reserves-to-deposits-ratio with the help of new types of deposits that are similar in function to existing ones but carry a lower reserve requirement allows, *ceteris paribus*, the support of a higher quantity of money at a given lending rate. In an ideal case, financial innovations shift the money supply curve enough to reinstall the original credit interest rate.

Summary

Despite the differences of opinion about the role of the central bank in the money supply process and the different assumptions about the banking system's behavior in response to changes in the demand for money, the accommodationist and structuralist approaches to the theory of the money supply process are closer related to one another than they are to an exogenous view like the monetarist one described before. As Moore puts it,

⁵⁶This result is unique for broader aggregates, which are not affected by the shifts of funds between its components (one of which is the innovation), but are enhanced by the additional transaction deposits created. A more narrow aggregate like *M1* grows because of the latter effect, but shrinks due to movements out of transaction accounts into the innovative account, so that the overall effect is indeterminate.

[b]oth positions are in complete agreement that the supply of credit money should be viewed as endogenously credit- driven, and not exogenously controlled by the monetary authorities. Both can be loosely characterized as "Horizontalists" rather than "Verticalists".⁵⁷

While accommodationists assume a rigorous position by depicting the short run money supply curve as perfectly interest elastic, the structuralist approach allows endogenous and exogenous elements to be active in determining the money supply. The endogenous element involved is the described responsive adjustment process within the banking system (including the possibility of utilizing the central bank's 'discount window') with ensuing variations in the monetary aggregate.⁵⁸ However, the monetary authority remains in possession of the discretionary, exogenous power of conducting open market operations, increasing the liquidity of the banking system and having an impact on the economy via the traditional Keynesian transmission mechanism.⁵⁹

In the following chapter it is analyzed in how far the institutional framework of real world money supply processes supports the notion of 'exogeneity' and 'endogeneity', respectively, of the money supply. The institutional conditions in the United States and in Germany are briefly described in their essential characteristics and evaluated with respect to conclusions as to the problem under consideration. Then the question shall be answered which theoretical position (exogenous, structuralist endogenous or accommodationist endogenous) is best supported by institutional arrangements.

⁵⁷Basil J. Moore (1991a), *loc. cit.*, p. 405

⁵⁸This corresponds with Paul Davidson's notion of the 'income- generating finance process'. Cf. Paul Davidson (1988), *loc. cit.*, pp. 164f.

⁵⁹The increased supply of money reduces the costs of financing planned spending and thus stimulates economic activity. Open market operations shift the supply of money schedule. This process has been termed 'portfolio- change process'. *ibid.*, pp. 165f.

Chapter 5

The Institutional Framework of the Supply of Money

The answer to the question of the extent to which a central bank can control the money supply in an economy is closely connected with the given institutional background from which the central bank operates. The analysis of the previous chapter demonstrated that there are forces inherent in a monetary production economy that lead to the creation of money upon demand. As long as bank money is regarded as a perfect substitute for state money, the absence of any type of regulation of the banking system would give every bank (almost) the *widow's cruse*: Banks would extend credit as long as the marginal revenue from an additional loan exceeded the marginal costs of providing it.¹ This quantity could be expected to be so high for the economy as a whole that practically any demand for loans at a given market rate of interest would be satisfied,² deposits created in this process, and the supply of money thus extended.

A precondition for a meaningful discussion of the possibilities of controlling

¹Cf. James Tobin (1963), *loc. cit.*, p. 279

²It must be noted that the term "at a given market rate of interest" refers to a standard, 'prime' lending rate. A risk premium will come along with the extension of riskier loans. In the absence of reserve requirements, any demand for loans at a given standard lending rate plus an appropriate risk premium could be satisfied.

the money supply, therefore, requires the existence of some type of constraint on the ability of banks to extend credit. In most economies, this constraint is given by a legal restriction that requires banks to hold a fraction of their deposits in the form of high-powered money either in an account at the central bank or in the form of cash in their registers.

The following discussion of institutional factors affecting the money supply process focuses on the existence of reserve requirements and on regulations of banks. The institutional conditions in the United States and Germany, respectively, are compared with the basic assumptions implied or explicitly stated in theories of either an endogenous or exogenous supply of money. Existing legal and habitual restrictions on the behavior of banks are regarded with respect to their meaning for the validity of the different approaches presented in the previous chapter.

5.1 Reserve requirements as basic restraint on the money supply

Banks are profitable if the interest spread between the rates at which they extend credit and the rates at which they borrow is large enough not only to cover their operating costs and write-offs due to default of debtors, but also to yield a residual. If banks are forced to hold as reserves some fraction of their liabilities, this will limit their ability to create additional loans. As a result, banks are inclined to keep the volume of reserves at a minimum close to the legally required fraction.

The requirement to hold reserves is usually legally imposed on all institutions that accept deposits which serve as close substitutes for currency. The require-

ments themselves are usually imposed on transaction, time and savings deposits. The size of the reserve ratio depends on the liquidity of a deposit, i.e., generally falls as one moves from transaction to savings deposits.

In the United States, all depository institutions³ are subject to reserve requirements on their deposits. The Federal Reserve can determine the reserve ratio on different types of accounts "for the purpose of implementing monetary policy"⁴. Under normal conditions, the Federal Reserve can set the ratio for transaction accounts within a permissible range between 8 and 14 percent, for nonpersonal time and savings deposits between 0 and 9 percent (differentiated by maturity), and for Eurocurrency liabilities, any rate that seems appropriate to the Federal Reserve.⁵ The reserves themselves can be held in the form of either vault cash or deposits at the Federal Reserves Banks.

Deposit reserve regulations require that depository institutions hold a given level of reserves over a fourteen day period beginning every other Wednesday. Depending on the type of deposit, the *maintenance period*, i.e., the period over which a certain level of reserves must be held, is either near-contemporaneous to the calculating period (for transaction accounts) or lagged (for savings and time deposits). Under the near-contemporaneous operating procedure, a bank must hold an average level of reserves during the maintenance period that is determined by the average reserve requirement on transaction accounts during the 14day period ending two days before the end of the maintenance period. Under the lagged reserve operating procedure, the 14day calculating period ends two days

³ "[C]ommercial and savings banks, savings and loan associations, credit unions, U.S. agencies and branches of foreign banks, and Edge act and agreement corporations." Board of Governors of the Federal Reserve System (1985), *loc. cit.*, p. 65

⁴ *ibid.*, p. 66

⁵ Personal time and savings deposits are exempt from reserve requirements, and a (small) basic volume of both transaction accounts and all reservable liabilities bears a reserve ratio of 3 and 0 percent, respectively. Cf. *ibid.*, pp. 66f.

before the beginning of the maintenance period. Excesses and deficiencies in reserves may be carried over into the next maintenance period up to an amount of two percent of total reserve requirements. A penalty can be levied if depository institutions do not behave in accordance with these regulations.

The situation is similar in Germany. Article 19 of the *Deutsche Bundesbank Act* determines that the Bundesbank may, "[i]n order to influence the quantity of money in circulation and of credit granted"⁶, require banks to hold minimum reserves (up to 30 percent) on sight liabilities, (up to 20 percent) on time liabilities, and (up to 10 percent) on savings deposits. On Eurocurrency liabilities a reserve ratio of up to 100 percent can be imposed. In general, reserve requirements only apply to book liabilities with a period to maturity of less than four years, and to liabilities in respect of bearer bonds with a period to maturity of less than two years.⁷ Reserve requirements can be differentiated according to the amount of each type of liability a bank issues.⁸

Reserves are held lagged with respect to the calculating period.⁹ A calculating period starts with the 16th of a month and ends with the 15th of the next month. The average level of required reserves is calculated on a daily basis or on the basis of deposits held on four specified days during that period. The maintenance period is from the first to the last day of the next month, so that calculating and maintenance periods overlap for two weeks. Reserves can be held either in an account at the Bundesbank, or in form of cash (up to 50 percent of total required

⁶Deutsche Bundesbank (1989), *The Deutsche Bundesbank - Its Monetary Policy Instruments and Functions*, Deutsche Bundesbank Special Series No. 7, Frankfurt: Deutsche Bundesbank, p. 116

⁷Cf. *ibid.*, p. 57

⁸Currently, reserve requirements differentiated by volume exist only with respect to sight liabilities.

⁹The period for which reserve requirements are calculated does not coincide with the period in which they must be held. The former precedes the latter.

reserves only). Due to the long period banks have to adjust their actual reserve holdings to the required ones (from the 16th to the last day of each month), there is no rule that allows the carrying over of excess or deficient reserve holdings into the next maintenance period. Finally, a penalty applies to banks that do not meet their requirements.

Two issues should be noted. First, the central banks in both countries consider reserve requirements an important tool for controlling the money supply.¹⁰ Changes in reserve ratios are regarded as a strong instrument to cause an expansion or contraction of the money supply on a permanent, long run basis. However, changes in reserves requirements are rarely used as an operative, short run instrument due to their strong impact on the banking system.¹¹

Second, the effectiveness of reserve requirements for preventing short run fluctuations in the money supply relies on a close temporal correlation between required and actual reserves. Accordingly, lagged reserve accounting has been criticized for its role in allowing "wide short-term swings"¹² in monetary growth due to banks' ability to offset deficiencies in reserve holdings in the short run (which is up to four weeks due to the carry over option in the U.S., and due to the maintenance period length of four weeks in Germany) through excess reserves held in the same maintenance period (in the U.S., in the sequence of two maintenance periods.). The implementation of perfectly contemporaneous reserve maintenance requirements is regarded as a means of controlling the supply of money more tightly, especially by economists in the monetarist camp.¹³

¹⁰This is instantly clear, using the monetary multiplier as a tautological identity: *ceteris paribus* (in particular, at a given structure of deposits), an increase in reserve requirements decreases the quantity of money supported by the monetary base.

¹¹Cf. Federal Reserve Bank of Richmond (1988), *A Primer on the Fed*, Richmond: Federal Reserve Bank, p. 43; Deutsche Bundesbank (1989), *loc. cit.*, p. 63

¹²Milton Friedman (1982), *loc. cit.*, p. 113

¹³Cf. e.g. Daniel E. Laufenberg (1976), "Contemporaneous versus Lagged Reserve Account-

Implicit in this view is the assumption that banks are, in their deposit creating activities, actually restricted by reserve requirements, which corresponds with the orthodox view of "reserves creating deposits" ($R \rightarrow D$). If, on the other hand, there exists a mechanism that supplies reserves upon demand at a reasonably predictable price, then the reserves-deposits-link would be ineffective as a policy instrument, both under a lagged reserve and a contemporaneous reserve accounting system.¹⁴ From an accommodationist point of view, then it is not of crucial importance whether reserves are held either under a lagged or a contemporaneous accounting system.

5.2 Sources of reserves

Depository institutions can satisfy their reserve requirements in a variety of ways. Four different channels through which the banking system can obtain reserves can be identified:

1. Discount window credit. The central bank supplies reserves both on a short-term and a long-term basis via this channel which is intended to bridge temporal liquidity needs, while open market operations and changes in reserve requirements affect reserves availability on a longer run or permanent basis.
2. Interbank loans of reserves. These loans are mostly on a very short-term basis. This channel allows a more efficient use of reserves in the banking system.

ing", *Journal of Money, Credit and Banking* 8 (2), pp. 239-245

¹⁴Cf. Basil J. Moore (1984), "Contemporaneous Reserve Accounting: Can Reserves be Quantity Constrained ?", *Journal of Post Keynesian Economics* 7 (1), pp. 103-113

3. Reduction of cash ratio through the public. The private (non-banking) sector can supply reserves to the banking system if it reduces its cash ratio in favor of bank liabilities.
4. Eurocurrency loans of reserves. International Money and capital markets are accessible for the provision of reserves in domestic currency.

5.2.1 The central bank as provider of reserves

In the United States, the Federal Reserve operates its discount window under the notion that the option offered to depository institutions to borrow reserves is "a privilege, not a right". There is no legal guarantee that banks' demand for adjustment credit (usually overnight or for a few days) or extended credit (longer-term, for seasonal adjustments) will be satisfied either in full or in part. When an unexpected outflow of deposits from a bank occurs, this, e.g., would be an appropriate reason for the bank to seek credit at the discount window. On the other hand, using the discount window when a bank deliberately pursues an expansionary policy and wants to refinance its need for reserves would be considered inappropriate by the Federal Reserve, although "the accommodation of unexpected increases in loan demand"¹⁵ may be appropriate. In particular, "[c]ontinuous borrowing at the discount window is inappropriate."¹⁶ Banks are expected to tap other sources of funds before utilizing discounts (which technically is a sale of loan to the Federal Reserve) and advances (which is a collateralized loan by a Reserve Bank to the borrowing institution) to accommodate short-term needs of funds.

¹⁵Board of Governors of the Federal Reserve System (1984), *loc. cit.*, p.60

¹⁶David L. Mengle (1986), "The Discount Window", in: Timothy Q. Cook and Timothy D. Rowe (eds.), *Instruments of the Money Market*, sixth edition, Richmond: Federal Reserve Bank of Richmond, p. 28

While operating procedures of the discount window affect the availability of borrowed reserves, open market operations supply reserves to the banking system for a longer period of time. 'Outright' purchases and sales, taking almost exclusively place in Treasury bills, affect the total of reserves available in the banking system on a permanent basis. Temporary variations of the availability of reserves in the economy are possible through repurchase agreements (for purchases) or matched sale-purchase transactions (for sales). While the former temporarily increase liquidity in the banking system, the latter drain liquidity for a limited time. Open market operations are undertaken at the discretion of the Federal Reserve.

The instruments used by the Bundesbank in conducting open market operations are basically the same used by the Federal Reserve.¹⁷ The Bundesbank also operates mainly in the money market, applying both outright and repurchase transactions in its attempt to affect reserve availability in the economy.

Refinance through the discount window, however, has a different institutional setting in Germany.¹⁸ Although the central bank is not legally obliged to operate a discount window¹⁹, it actually sets an individual rediscount quota for each bank, determining the volume of funds a bank can at maximum borrow at the discount rate. Technically, it derives a standard quota according to objective criteria (volume of liable capital, portfolio structure) and subjective moments (conduct of business) which is then multiplied with the same scaling factor for every bank to yield a desired aggregate rediscount volume for the economy. Rediscount quotas are fixed for a period of one year and can be utilized at the free disposal of a bank.

¹⁷Cf. Deutsche Bundesbank (1989), *loc. cit.*, pp. 65ff.

¹⁸Cf. Deutsche Bundesbank (1989), *loc. cit.*, pp. 45ff.

¹⁹Cf. *Article 19 Bundesbank Act*

Beside the quantitative constraint on the discount window there is a qualitative one as well. Loans from the discount window require the sale of *trade bills* of a specified quality to the Bundesbank.²⁰ In addition to the discount rate, the Bundesbank sets a *lombard rate* at which it is willing to provide short-term (not longer than 3 months) collateralized loans to banks that have to bridge temporary liquidity needs.²¹ Lombard credits are subject to approval by the Bundesbank²², and the lombard rate is administered consistently above the discount and normally also the short-term market interest rate.

These institutional factors of the refinance process through the central bank have important implications for the controllability of total (nonborrowed and borrowed) reserves due to unforeseen increases in the demand for bank loans. In Germany, the Bundesbank fully accommodates demand for reserves at the discount rate within the range of unutilized rediscount quotas and, to an extent of its own choice, partly at the lombard rate. If the extension of demand for credit is, therefore, small enough to be supported by reserve borrowing exclusively at the discount rate, the money supply can validly be taken as horizontal in the short run. If, however, other (more expensive) sources of reserves must be utilized, some additional credit demand will even in the short run be crowded out by rising lending rates.²³

The situation is different in the United States in so far as no guaranteed quotas exist. Any additional demand for reserves at the discount window is subject to

²⁰This regulation breathes the spirit of the real bills doctrine: Additional reserves are supplied to the banking system to meet the needs of trade and (optimally) to provide finance for a productive purpose.

²¹The lombard credit is the equivalent of advances of the Federal Reserve.

²²The criteria for approval are similar to those applied by the Federal Reserve in deciding on advances and discounts. Cf. Deutsche Bundesbank (1989), *loc. cit.*, pp. 48-51

²³It is assumed that not all of the additional loan demand is based on overdraft facilities or lines of credit with predetermined rates of interest.

approval by the Federal Reserve. In particular, there is no guarantee that all of the increase in loan demand will be supported by making borrowed reserves available. The chance that part of the additional demand will be crowded out – due to higher cost of refinance outside the central bank and subsequently higher lending rates for that part of the additional demand where interest rates are free negotiable – can, *ceteris paribus*²⁴, be estimated as higher for the United States than for Germany.

5.2.2 Supply of reserves through the private sector

Any interaction between the central bank and the private sector of the economy (which is here defined as including financial and nonfinancial institutions) with respect to the purpose of affecting the reserves situation of the banking system affects the size of the monetary base.²⁵ Without any impact on the monetary base, the volume of (required) reserves available to the banking system can also be increased by interactions of the banking system with the private economy itself. It can be distinguished between reserve acquisition in the interbank market and in interactions with the nonbank public itself.

The interbank market

Both in the United States and in Germany, a good source to cover short-term needs for reserves is the interbank market. The main purpose of banks' trading funds on a short-term basis in the interbank market lies in the efficient use of reserves within the banking system. As usually banks hold a small fraction of

²⁴The *ceteris paribus*-clause refers to the criteria underlying credit provision decisions of the central banks regarding the discount window and lombard credit facilities, respectively.

²⁵The only exception is a change of reserve requirements that affects the depository institutions' reserves pressure without changing the value of the monetary base.

their required reserves as excess reserves in order to be able to offset unforeseen cash outflows without having to borrow reserves from outside, they are inclined to keep the opportunity costs of holding idle balances low by lending their unused excess reserves out at the end of a day. They do so mostly on an overnight basis so that they have them available again the next day.

In the United States, the (money) market for interbank loans is called the *Federal funds*²⁶ market.²⁷ Federal funds are exempt from reserve requirements which reflects the circumstance that they are officially intended to be an alternative mainly to discount window borrowing.²⁸ Participants in the Federal funds market are mostly depository institutions. The interest rate paid on overnight loans is basically market (i.e., supply and demand) determined, although it is oriented on the discount rate set by the Federal Reserve and bears a close relation to other money market rates.²⁹

Two cases must be distinguished. If an increased demand for credit occurs at only a few institutions, it can be covered in the Federal funds market. Due to the small impact a single institution exerts on demand conditions, it can regard the refinance rate it faces in the Federal funds market as a constant and might provide a horizontal supply curve of credit money, as accommodationists predict.

However, accommodationists predict the horizontal curve as the *aggregate* outcome. If the average bank faces an increase in aggregate demand for bank credit, a considerable shift of the demand schedule for Federal Reserve funds will be the result while, at the same time, the supply of unused excess reserves will

²⁶For a description of the Federal funds market cf. Marvin Goodfriend and William Whelpley (1986), "Federal Funds", in: Timothy Q. Cook and Timothy D. Rowe (eds.) (1986), *loc. cit.*, pp. 8-22

²⁷The German equivalent of the Federal funds market is the *Tagesgeldmarkt* (market for day-to-day money). Cf. Deutsche Bundesbank (1989), *loc. cit.*, p.28

²⁸Cf. *ibid.*, p. 17

²⁹For the pricing of Federal funds cf. *ibid.*, pp. 11ff.

shrink for the economy as a whole. Refinance in the interbank market becomes the more expensive, the more the aggregate demand for bank loans curve shifts outward. If banks can not borrow all the additional reserves in the discount window, lending rates will have to rise due to a price hike in the Federal Funds rate.

Provision of reserves through the nonbank public

Reserves can also be provided by the nonbank public if economic agents can be induced either to shift their funds from high reserve ratio bearing (transaction) deposits into low reserve ratio bearing (savings-type) deposits, or to exchange cash holdings into bank deposits. Especially in the United States, there has been a trend to offer innovative products (like CD's, NOW, ATS, MMDA's etc.) with the goal (amongst others) of reducing the cash holdings of the public and thus attract nonborrowed reserves.

The mechanism through which this liability management works is the interest rate differential between different types of deposits. Whereas in Germany there have been no price controls in effect so that the shift of deposits can be accomplished via a relative price mechanism, in the United States a large number of interest rate ceilings have existed (especially on deposits included in *M2*)³⁰ before they were abolished in the *Monetary Control Act of 1980*. Thereafter, liability management has become an effective instrument for influencing the total volume of required reserves.

³⁰Cf. Brian Motley (1988), *loc. cit.*

5.2.3 Acquisition of reserves in international financial markets

The analysis so far has only focused on the domestic economy and neglected the international sector. The importance of the international sphere for the domestic supply of money lies in its impact on both the monetary base³¹ and the availability of reserves for domestic banks.

If domestic financial markets are 'congested', it may be cheaper for a depository institution to borrow funds in a foreign financial market. Of particular importance, both for German and U.S. banks, is the Eurocurrency and Euro-CD money market. If a German bank, for example, faces a tight domestic money market, it can borrow British pounds (e.g. from a French bank) and convert them into German marks. As long as the Bundesbank assumes some responsibility for exchange rate stability, the Bundesbank must, under the rule of the *European Monetary System* (EMS) that determines narrow target zones for exchange rate movements, intervene and exchange the British pounds into the domestic currency by creating additional money. This represents an increase in the monetary base that occurs through the Bundesbank, but not its initiative.

Although the U.S.-dollar is not tied to other currencies as closely as this is the case for European moneys, several informal agreements exist to keep the dollar

³¹Depending on the exchange rate system in effect, a central bank has more or less control over the monetary base. In a fixed exchange rate system, e.g., the Bretton Woods system in effect until 1973, a central bank is forced to supply domestic against foreign money at a specified exchange rate. In case of, e.g., a surplus of the balance of payments, the supply of base money grows accordingly without that the central bank could directly intervene. In a flexible exchange rate environment, discrepancies of supply and demand of a currency should theoretically make the exchange rate attain a level at which both are equal. Cf. Wolfgang Salomo (1971), *Geldangebot und Zentralbankpolitik. Eine Studie zur Theorie des Geldangebots*, Kieler Studien Nr. 116, Tübingen: J.C.B. Mohr, pp. 123ff. and Jürgen Spreter (1983), *Theoretische und Empirische Analyse der Determinanten des Geldschöpfungsmultiplikators*, PhD-Dissertation, Krefeld: Marchal und Matzenbacher, pp. 138ff.

exchange rate relatively stable in the short and the medium run.³² Thus also the Federal Reserve is subject to involuntary impacts on the monetary base from the international sector.

After they had been first introduced without reserve requirements imposed on them, Eurocurrency and similar liabilities to non-residents have been quickly subjected to respective reserve ratios by both the Federal Reserve and the Bundesbank. By retaining the possibility of imposing a reserve ratio of up to 100 percent on these liabilities, both central banks recognize the strong impact that can emanate from virtually unlimited reserve supply in international money markets under conditions of capital transactions free from all controls.³³

5.3 Capital adequacy and liquidity requirements

So far only factors have been mentioned that make depository institutions want to increase their lending and, therefore, 'hunt' for reserves. From a purely technical standpoint this is a reasonable assumption since the existence of reserve requirements creates a situation where marginal revenues of lending usually exceed marginal costs so that banks try to be fully loaned up and possibly even extend their balance sheets by granting new loans.³⁴ Due to the nature of the banking business when an asset (a loan) is automatically financed by a liability (the

³²As an example may serve the *Louvre accord* of 1987 that intended to achieve an international coordination of efforts to influence the dollar exchange rate. Cf. Deutsche Bundesbank (1989), *loc. cit.*, p. 13

³³In 'extraordinary' economic conditions, capital transactions can usually be restricted by law. In Germany, e.g., the *Foreign Trade and Payments Act* allows the Federal Government to restrict capital imports, or interest payments to non-residents. Cf. *ibid.*, p. 79

³⁴Cf. James Tobin (1987), *loc. cit.*, p. 279

deposit created), 'natural' liable-capital-to-asset-ratios³⁵ are very low.³⁶ From the point of view of the bank's profitability, measured as return-on-investment, a high leverage ratio is desirable.

In the United States, regulations for adequate liable capital are issued by the agency that has chartered a bank. The Federal Reserve System, the Comptroller of the Currency, and the Federal Deposit Insurance Corporation determine the adequate amount of liable capital according to criteria like the default risk on assets, quality of management, 'moneyness' of assets etc.³⁷

In Germany, the independent Federal Banking Supervisory Office has formulated, in cooperation with the Bundesbank, the following principles concerning minimum capital and liquidity requirements of depository institutions.

Principle I measures the ratio of principally risky assets to liable capital and sets a maximum value for that ratio.³⁸ Banks are required to obey the regulation since a violation of one of the Principles would result in negative effects for their rediscount quotas.³⁹

Principles II and III relate to the liquidity of the banking system. They state that the volume of certain long-term (short- to medium-term) assets shall not be larger than that of certain long-term (short- to medium-term) liabilities,

³⁵The ratio of liable capital to assets can generally be determined as the ratio of funds deposited by a firm's shareholders to the value of the firm's assets.

³⁶In February 1992, the ratio of liable capital to total assets of German banks was only 4.04 percent. Cf. Deutsche Bundesbank (1992), *Monatsberichte der Deutschen Bundesbank* 44 (4), pp. 14f.

³⁷Cf. Marcel Morschbach (1981), *Struktur des Bankwesens in den USA*, Struktur ausländischer Bankensysteme, Heft 18, Frankfurt: Fritz Knapp Verlag, pp. 27f.

³⁸Based upon a simplification by Jürgen Bauer, *Principle I* can be summarized in an algebraic formulation:

$$18 \cdot LC \geq 0.5 \cdot (L_L + L_{GA} + L_F) + 0.2 \cdot L_B + L$$

Cf. Jürgen Bauer (1983), *Die Anforderungen der Bankenaufsicht an das haftende Eigenkapital der Kreditinstitute*, Berlin: Duncker und Humblot, p. 127

³⁹Cf. Deutsche Bundesbank (1989), *loc. cit.*, p. 47

respectively. These regulations thus prohibit large scale movements in liabilities if these would lead to risky concentrations in a certain maturity range. *Principles I and III* impose a strict limit on the liability management of banks.

The potential effect of imposing stricter capital adequacy ratios on the banking system as an instrument to give banks a strong incentive to control their short-term credit commitments in order always to be able to meet their liable capital requirements must be regarded as ambivalent. On the one hand, since any increase in liable capital normally takes some time to achieve, therefore the strict enforcement of such a rule could induce banks to more careful behavior in their traditional lending business. On the other hand, they might tend to increase their activities in off-balance sheet banking. Off-balance sheet commitments are to a great part *potential* commitments (like lines of credit) that promise a fee income and do not bind any bank resources, they provide the basis for a high potential leverage ratio if utilized.

The emergence of credit facilities that can be tapped upon demand makes it more difficult to take the growth of a monetary aggregate as a direct indicator of subsequent higher economic activity.⁴⁰ Larger corporations can, with the help of banks that issue lines of credit as an insurance, directly borrow in the financial markets ('commercial papers'), as investors have the guarantee that the former can provide payments on their debt contracts in case of liquidity problems with the help of their bank credit approvals. The banking system itself provides the means for circumvention. Thus, off-balance sheet activities as well as institutional financial innovations (i.e., the emergence of new types of financial intermediaries) can lead to a more efficient use of a given monetary aggregate in financing expenditures, i.e., a rising velocity of circulation of money is the result.

⁴⁰Cf. L. Randall Wray (1990), *loc. cit.*, pp. 213ff.

Summary

The look at the institutional background on which depository institutions operate has focused on the problem of reserves availability. Banks have been shown to be able to acquire reserves through a large variety of channels. The different sources of funds have different characteristics as to cost and available quantity.

The strict accommodationist view of the money supply depends on unlimited amounts of reserves available upon demand at a constant price. Neither in the United States nor in Germany is full accommodation to any demand for credit guaranteed by the central bank. German banks, however, might be able to completely offset small shifts in the demand for credit money schedule by utilizing previously unused rediscount quotas. Reserve needs that can not be fully covered using central bank funds must necessarily be funded in the financial markets, with rising costs associated with rising quantities for the banking system as a whole. A horizontal money supply curve, therefore, seems to be an extreme case, even in the short run.

A completely exogenous verticalist view of the short run money supply function is not supported by the institutional framework of both countries. The existence of an interbank money market and, in particular, of international sources of funds provides an interest-elastic money supply curve, and as long as the Federal Reserve and the Bundesbank operate their discount window under the described policies, shifts of the money supply curve are also possible.⁴¹ A refusal of the central bank to supply nonborrowed reserves through open market operations

⁴¹Ann-Marie Meulendyke argues that the Federal Reserve could in fact completely close the discount window so that additional demand for credit money would not be accommodated by the central bank's extension of borrowed reserves. (Cf. Ann-Marie Meulendyke (1988), "Can the Federal Reserve Influence Whether the Money Supply is Endogenous? A Comment on Moore", *Journal of Post Keynesian Economics* 10 (3), pp. 390-397. However, this would not result in an exogenous supply of money schedule since banks would buffer out changes in demand for credit money out of their consequently much larger holdings of excess reserves.

does not change this fact in the short run.

Real world institutional arrangements, therefore, lend support to the view of an upwards sloping supply of money schedule with the possibility of partly accommodating shifts in response to demand variations in the short and the long run. The magnitude of any accommodating shift is largely determined by the banks' long term perception of the central banks' refinance policy, which makes them either borrow at the discount window or not, and the implicit costs involved in utilizing the discount window.⁴² Long run shifts are the result of the emergence of innovative financial products. By specifying their policy, the Federal Reserve and the Bundesbank can exercise an *impact* on bank behavior in the short-run, being however far from strictly controlling the short-run money supply.

⁴²As a result, banks may not exploit fixed-price borrowing at the central bank to the maximum quantity possible in order not to face more difficult refinance (due to closer scrutiny of borrowing requests) in the future.

Chapter 6

Conclusion

Different viewpoints regarding the supply of money function have been described in the preceding chapters. The major line of distinction has been drawn between exogenous and endogenous approaches to the theory of the supply of money. This division has been shown to be based on differing assumptions about the role of money in an economy.

An exogenous money approach, as exemplified in a monetarist framework, focuses on money as a stock concept. This leads to the notion that the prime function of money is as a unit of account in the longer run. The quantity of money in an economy is regarded as (almost) uniquely determined by a given stock of high-powered money supplied from outside the economy. This basic relationship dominates impacts of changes in the quantity of money emanating from the banking system. Although, in the short run, disturbances from within the economy may affect the outside-inside money link, which finds its representation in the money multiplier, its validity is assumed at least in the long run.

Endogenous money approaches concentrate on endogenous changes in demand factors within the economy as the primary source for variations in the stock of money. The role of bank-created credit money is emphasized. Bank

money is seen as inextricably intertwined with real production processes through the necessity of financing productive purposes in advance of producing and selling the products. Money comes into existence as a result of demand for finance. The central bank is assumed to partially (in the structuralist position) or fully (in the accommodationist position) accommodate to the needs of the private sector. In the short run, the supply of money is assumed to be endogenously determined and essential to economic growth.¹

As opposed to the exogenous approach to money in which the quantity of money is, in the long run, determined solely by the central bank, the endogenous approach views the long run growth path of the quantity of money as the result of interacting demand and supply forces. The supply of money is, therefore, regarded as (partly) endogenous in the long run as well. The justification for this assertion varies between the different "camps" of proponents of an endogenous money supply.

Accommodationists like Moore note that "longer runs [...] are simply aggregations of shorter runs."² Even though it is certainly correct that a "long run" can not be thought of without recognizing the existence of "short runs", for the outcome of the former to be a mere aggregation of outcomes of the latter it would still be necessary that each short run was independent from each other. This would be true if the central bank was always willing to supply required reserves on the basis of borrowed reserves in subsequent "short runs". This case is, however, not institutionally supported in the real world.

¹Proponents of endogenous money regard the possibility of creation of money upon demand as an important and indispensable characteristic of monetary production economies, i.e., they assign endogenous variations a positive role, while proponents of an exogenous approach to money regard variations more as a disturbance to long run stability.

²Basil J. Moore (1983), "Unpacking the Post Keynesian Black Box: Bank Lending and the Money Supply", *Journal of Post Keynesian Economics* 5 (4), p. 540

Central banks are usually not willing to supply reserves passively upon demand over a longer period of time.³ Thus, there can be no aggregation of short run situations as characterized by purely accommodationist models. In the longer run, either the central bank must supply additional nonborrowed reserves to turn the temporary endogenous increase in the money supply into a permanent one and allow it to affect the long run growth path of the quantity of money, or banks must look for alternative sources of reserves. If they do so in the financial markets, this will increase their costs of refinance and finally crowd out bank lending due to higher lending rates.

One factor favoring a long run endogenous money supply approach involves structural changes within the banking system, i.e., the emergence of innovative products that are generally less restricted by the central bank. This structuralist approach to the endogeneity of money focuses on the impact of financial innovations on the supply of money as the key element of endogeneity. It also focuses on the effects of new types of nonbank financial intermediaries on the control of the money supply. Contrary to the simple accommodationist approach, the structuralist argument provides a more realistic explanation for money supply endogeneity after the short run. In the light of the structuralist position, the direct control of a monetary aggregate loses in importance since the occurrence of innovations tends to diminish the interpretatory value of previously defined aggregates.⁴

In effect, the structuralist approach emphasizes both exogenous and endoge-

³In particular, both the Federal Reserve and the Bundesbank have explicitly stated that they are not willing to *permanently* finance additional loans via the discount window and lombard facility, respectively.

⁴In particular, a control of aggregate spending via the control of a monetary aggregate becomes the less possible the more innovations occur that affect payment mechanisms and are not part of existing monetary aggregates. Any correlation between money and spending must be regarded as "institutionally based and probably temporary." (L. Randall Wray, *loc. cit.*, p. 218)

nous components in the money supply process. It recognizes that, in the short run, the quantity of money in an economy is largely demand determined due to an interest elastic money supply curve. The slope of the latter depends mostly on tightness or ease of financial markets that supply the required short run reserves. Although this short run supply curve may also shift in response to demand changes, to the extent that required reserves must be obtained at the central bank, while the latter is not seen as automatically *fully* accommodating, instead the central bank has a policy range where it is willing to provide additional reserves (on a temporary or permanent basis). If the central bank, in pursuit of its goal, decides not to provide additional nonborrowed reserves, part of the additional demand for credit money can, in the longer run, be satisfied as a result of innovative financial arrangements in an economy, whereas the other part of demand for credit can not be accepted unless the central bank decides to alter its policy. This view of the money supply is compatible with the institutional and legal arrangements in the real world economies of the United States and Germany. The structuralist approach to the supply of money, therefore, seems to me to deliver an appropriate description of the real world money supply process, while both a simple exogenous and a simple endogenous approach may be regarded as heuristic in that they shed light on *certain aspects* of the determination of the quantity of money in an economy, but fail to give an *overall* acceptable description.

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Vita

Sven-Olaf Vathje was born in Rotenburg (Wümme), West Germany on June 10, 1969. After attending the Grundschule (elementary school) in Bothel (Rotenburg County), he graduated from the Ratsgymnasium Rotenburg (high school) with the Abitur in May, 1988. The following October he was drafted by the Bundeswehr where he spent the next 15 months fulfilling his mandatory military service requirement. At the same time, he commenced undergraduate studies at the Fernuniversität Hagen. He entered the Universität Tübingen in October, 1989 and in July, 1991 passed the Vordiplom in Economics (jointly conferred by the Universität Tübingen and the Fernuniversität Hagen). In August, 1991 he entered The University of Tennessee, Knoxville under a grant by the German-American Fulbright Commission and in August, 1992 received a Master of Arts degree in Economics.