Monetary Theory

K. Nagatani

MONETARY THEORY

KEIZO NAGATANI

University of British Columbia

NORTH-HOLLAND PUBLISHING COMPANY
AMSTERDAM · NEW YORK · OXFORD

Introduction to the Series

The aim of the series is to cover topics in economics, mathematical economics and econometrics, at a level suitable for graduate students or final year undergraduates specializing in economics. There is at any time much material that has become well established in journal papers and discussion series which still awaits a clear, self-contained treatment that can easily be mastered by students without considerable preparation or extra reading. Leading specialists will be invited to contribute volumes to fill such gaps. Primary emphasis will be placed on clarity, comprehensive coverage of sensibly defined areas, and insight into fundamentals, but original ideas will not be excluded. Certain volumes will therefore add to existing knowledge, while others will serve as a means of communicating both known and new ideas in a way that will inspire and attract students not already familiar with the subject matter concerned.

The Editors

Preface

This monograph is a revised version of the lecture notes I prepared for a graduate monetary theory course during years 1973-1975 at the University of British Columbia and the University of Tokyo. It consists of a total of thirteen chapters and can be covered adequately in one semester. These thirteen chapters are divided up into three parts. Part I studies individuals' demand for money. A special attention is paid to commercial banks as demanders of high-powered money. An emphasis is laid on the comparisons of various alternative formulations of demand for money. Part II is entitled "Markets". In this part we pursue some of the fundamental questions about money in a general equilibrium framework. What is a monetary economy? Why does money exist? How should we measure the benefit of money in a static exchange economy? In a dynamic economy? Other problems relevant to market organization are also discussed. Part III deals with various issues concerning money in a more conventional macroeconomic framework. The basic strategy employed in this part is to examine and compare the two opposing views on money-macro issues, namely, the Monetarism and the Keynesianism. We shall attempt to identify the two theories and assess the evidence in the light of the identified theories. Finally we draw implications of the two theories as to how money should be managed.

As lecture notes, this monograph has certain constraints in terms of the coverage of materials and objectivity. These constraints, I hope, are minimally satisfied. But the main theme of this monograph is money in general equilibrium

theory. In my view, money has not been handled properly in general equilibrium analysis and this gap we must fill. A partial equilibrium model of money not only precludes the analysis of exact mechanisms through which money affects the rest of the system but also leaves many crucial variables undetermined. A case in point is price expectations. An increase in real cash balances can be interpreted as the result of an expansionary (inflationary) monetary policy if price expectations are assumed to be given and fixed. A decrease in real cash balances can also be interpreted as the result of an expansionary monetary policy if price expectations are assumed to be adjusting quickly to the actual price changes. Unless a theory as to how expectations are formed and the model is closed, any interpretation is possible. The conventional general equilibrium models, on the other hand, have largely ignored money and financial variables as well as the important problems of market adjustments. It is our hope that a workable temporary equilibrium theory which has all these essential ingredients will soon be developed. Such a theory will no doubt contribute significantly to our understanding of the problems in monetary theory and in macro-economics in general.

In the course of preparation, I received help from many of my colleagues and graduate students in the above institutions. But my special thanks go to Erwin Diewert, John Helliwell, David Rose, Ronald Shearer and John Young, all of the University of British Columbia, and to Koichi Hamada and Takashi Negishi of the University of Tokyo. I am also grateful to Dr. Donal Donovan for his valuable editorial assistance. Needless to say, all the errors and shortcomings are solely mine. Efficient typing services were provided by Mrs. May McKee throughout my preparation. Finally, I acknowledge the kindness of the Sobunsha Publishing Company of Tokyo, from whom an earlier version of this book had been published in Japanese, to generously support the publication in the present form.

KEIZO NAGATANI
University of British Columbia

Contents

Part I

Individuals

One of the oldest unresolved problems of monetary theory
is to explain the use and holding of money.

K. Brunner and A. Meltzer (1971)

In this part we plan to survey theories of money with respect
to the micro foundations of the demand for money. As
Brunner and Meltzer noted, the existence of a positive
demand for money is still an unresolved problem and has
been made to depend on such diverse factors as the anti-
cipation of price or interest rate changes, uncertainty, the
embarrassment of default, legal restrictions, or some
undefined set of services – such as "liquidity" – that money
provides. Our survey inevitably reflects such diversity, but
we shall try to be clear in assessing various alternative
formulations.

The study of individuals' motives to hold money originates
in Walras. Walras developed the notion of *encaisse désirée*
(desired cash balance) on the basis of the *service d'appro-
visionnement* (service of storage or availability) of money.
He then postulated the utility of such services and incor-
porated money into his system of general equilibrium in a
logically consistent manner. However, Walras' utility analy-
sis of money was defective in a few important respects and
was to be remedied and refined by Schlesinger and more
significantly by Patinkin. This development is described un-
der the title The Direct Utility Approach (Chapter 1).

The portfolio theory of demand for money which constitutes the kernel of Keynes' theory is surveyed under The Risk–Return Approach (Chapter 2) and The Expected Utility Approach (Chapter 3). The main feature of these approaches is to confine attention to the asset market and study the allocation of wealth among various types of assets, money being one of them. This is in contrast to the traditional quantity theory which focused attention to the relationship between the stock of money and the flow of magnitude – the volume of transactions. The main virtue of this asset approach is that it provides a neat choice-theoretic basis for the demand for money, even though any theory of demand for money which has no bearing on the volume of expenditures must be deemed incomplete. In Chapter 2 we study the Markowitz–Tobin mean-variance model as a model of choice involving risk. We pay a particular attention to the applicability of this model to the demand for money. Chapter 3 describes the expected utility theory as a general theory of choice involving risk of which the mean-variance model can be thought of as an approximation. Again, the relevance of this theory as a theory of demand for money will be investigated.

Finally, the recent revival of interests in the exchange mechanisms and hence in the medium of exchange function of money is reflected in The Transactions Cost Approach (Chapter 4). After a very brief discussion of the classic models of Baumol–Tobin, we proceed to the precautionary demand by introducing uncertainty concerning cash needs which will be discussed using a few simple models. The study of this type of models again dates back to Edgeworth (1888). It will be found that the implications of the precautionary demand models are considerably different from those of the portfolio selection models discussed in Chapters 2 and 3. Chapter 4 (The Transactions Cost Approach) closes with a discussion of models of Commercial bank behaviour.

The Direct Utility Approach

(A) In the Preface to the 4th edition of the *Elements*, Walras (p. 38) wrote:[1]

"Chiefly, however, it was my theory of money that underwent the most important changes as a result of my research on the subject from 1876 to 1899 .... In the first edition, this solution [of the problem of the value of money] was founded on a consideration of the 'circulation to be cleared', which I had borrowed from the economists. In the second and subsequent editions, however, I based the solution on the concept of a 'desired cash balance' (encaisse désirée).... Nevertheless, I continued in the second and third editions, as in the first, to write the equation of offer and demand for money apart from the other equations and as empirically given. In the present edition this equation is deduced rationally from the equations of exchange and maximum satisfaction as well as from the equations showing equality between the demand and offer of circulating capital goods. In this way, the theory of circulation and money, like the theories of exchange, production, capital formation and credit, not only posits, but solves the relevant system of equations."

[1]Page numbers are those of the English translation (1954).

According to Walras (Lesson 29), various commodities and raw materials in inventories render "services of availability" either in the larders and cupboards of consumers or in the storerooms and salerooms of producers, just as capital goods in use render productive services. Cash held by individuals can be looked upon as one such circulating capital good.

Let $A, B, C, \ldots$ be commodities, and $T, P, K, \ldots$ be productive fixed capital goods. Let $A', B', C', \ldots$ be the same commodities considered, however, as circulating capital goods, i.e., as goods rendering services of availability. If the prices of $A, B, C, \ldots$ are $1, p_b, p_c, \ldots$ in terms of the numéraire A, then the prices of the services $A', B', C', \ldots$ will be $p'_a = i$, $p'_b = ip_b$, $p'_c = ip_c, \ldots$, where i is the interest rate. Here Walras ignores the "depreciation and insurance" of circulating capital goods. Further, let U be money with its price (in terms of A), p_u. Then the price of its services U' will be $p'_u = ip_u$. Finally, let E be perpetuities whose price (in terms of A) is p_e, with the price of its services $p'_e = ip_e$.

Now consider an individual with certain initial endowments of productive capital goods as well as commodities and money. Denote the prices of the services of productive capital goods (in terms of A) by $p_t, p_p, p_k, \ldots$, his excess supplies of circulating capital goods including money by $o'_a, o'_b, o'_c, \ldots, o'_u$; and his excess demands for commodities including perpetuities by $d_a, d_b, d_c, \ldots, d_e$. Also denoting the amounts of capital goods offered by o_t, o_p, o_k, the equation of exchange can be written as

$$o_t p_t + o_p p_p + o_k p_k + \cdots + o'_a p'_a + o'_b p'_b + o'_c p'_c + \cdots + o_u p'_u$$

$$= d_a + d_b p_b + d_c p_c + \cdots + d_e p_e. \qquad (1.1)$$

For solutions for $o_t, o_p, o_k, \ldots$ and $d_a, d_b, d_c, \ldots, d_e$, we have the following conditions of maximum satisfaction (p. 278):

$$\phi_i(q_i - o_i) = p_i \phi_a(d_a), \qquad i = t, p, k, \ldots,$$
$$\phi_j(d_j) = p_j \phi_a(d_a), \qquad j = b, c, \ldots, e, \qquad (1.2)$$

where q are the amounts of initial holdings. As for $o'_a, o'_b, o'_c, \ldots$, we have (p. 320)

$$\phi'_j(q'_j - o'_j) = p'_j \phi_a(d_a), \qquad j = b, c, \ldots, \tag{1.3}$$

where q' are the initial holdings of the services of availability. Finally, as for money o_u, let his desired quantities of the services of availability of $A', B', C', \ldots$ and perpetual net income E', *not in kind but in money*, be $\alpha, \beta, \gamma, \ldots, \varepsilon$. Then for these quantities, we have the following conditions of maximum satisfaction (p. 321):

$$\begin{aligned}
\phi_\alpha(\alpha) &= p'_a \phi_a(d_a), \\
\phi_\beta(\beta) &= p'_b \phi_a(d_a), \\
\phi_\varepsilon(\varepsilon) &= p'_a \phi_a(d_a).
\end{aligned} \tag{1.4}$$

Upon solving (1.1)–(1.4), $\alpha, \beta, \gamma, \ldots, \varepsilon$ will each be a function of $(p_t, p_p, p_k, \ldots; p_b, p_c, \ldots, p_e; p'_a, p'_b, \ldots, p'_u)$. The value of these quantities in terms of A will be

$$\alpha p'_a + \beta p'_b + \gamma p'_c + \cdots + \varepsilon p'_a.$$

So the excess supply of money will be

$$\begin{aligned}
o_u &= q_u - \frac{\alpha p'_a + \beta p'_b + \cdots + \varepsilon p'_a}{p'_u} \\
&= q_u - \left(\alpha \frac{p_a}{p_u} + \beta \frac{p_b}{p_u} + \cdots + \varepsilon \frac{p_a}{p_u} \right).
\end{aligned} \tag{1.5}$$

Thus, the optimum amount of cash holdings is determined in exactly the same way as those of other types of inventory goods through the notion of the services of availability.

Walras' theory of demand for money is unconvincing in two important respects. First, what are the reasons that individuals wish to hold stores of goods, i.e., what causes individuals to appreciate services of availability of circulating capital? Second, given that individuals wish to hold inventories, what determines the choice between money and other forms of circulating capital goods?

As for the first question, we note that Walras mentions

"uncertainty" in two places in Lesson 29 (pp. 317, 318), but these passages indicate that Walras tended to ignore it. For example, on p. 317:

> "In a real operating economy, every consumer, whether landowner, labourer or capitalist, has at every moment a fairly exact idea of (1) what stocks of [final] products he ought to have for his convenience, and (2) what cash balance he ought to have, not only in order to replenish these stocks and make current purchases of consumers' goods and services for daily consumption while waiting to receive rents, wages and interest payable at fixed future dates, but also in order to acquire new capital goods. There may be a small element of uncertainty which is due solely to the difficulty of foreseeing possible changes in the data of the problem. If, however, we suppose these data constant for a given period of time and if we suppose the prices of goods and services and also the dates of their purchase and sale to be known for the whole period, there will be no occasion for uncertainty."

The relevant passage on p. 318 makes the same point regarding entrepreneurs. With the amounts of payments and receipts along with their dates all known for certain, however, there would be no demand for money as the source of liquidity, i.e., as reserves against contingencies. Instead, Walras seems to depend on the lack of synchronization between payments and receipts for some reasons external to the individuals. While such lack of synchronization compels them to carry stores of goods, it hardly provides room for choice among different types of inventory goods. This leads us to the second question raised above.

   If the institutional arrangements external to individuals are the only reason for individuals to carry inventories of goods, what explanation could we give to the choice among different types of goods to be stored? In particular, why

would they wish to hold cash rather than some other goods? To explain such portfolio choice, we would have to postulate differential storage costs and transaction costs. But as his ignoring of the "depreciation and insurance" of circulating capital suggests, he does not consider these costs either. Walras merely postulates a utility function which is additive in different types of services of availability without any explanation. It is for these reasons that Patinkin argued that "Walras did not succeed in providing a conceptual framework which logically entitles him to introduce the service d'approvisionnement of money into the utility function" [Patinkin (1965, pp. 549–550)].

(B) Karl Schlesinger (1914), one of the important followers of Walras, develops a similar analytical framework but carefully distinguishes between the demand for money arising out of the known patterns of payments and receipts over time (the "transactions demand") and the demand for money due to uncertainty concerning the amounts and the dates of these transactions (the "precautionary demand").[2]

Schlesinger restricts the use of the utility concept to the latter case, i.e., the case where uncertainty and risk exists. [See, however, Patinkin (1965, p. 576, fn. 21).] Moving directly to this uncertainty case, we find in Schlesinger (p. 29):

> "Every economic unit reckons with the sudden appearance of consumption needs, as well as with unexpectedly favourable new business opportunities

---

[2]*Theorie der Geld- und Kreditwirtschaft* (1914). An English translation of Ch. iii of this book is in International Economic Papers (1959), pp. 20–38. Unfortunately, this translation is the only source available to me to date. The famous study by Howard Ellis (1934), *German Monetary Theory 1905–1933*, is totally helpless, for Ellis dismisses Schlesinger by simply saying that Schlesinger's mathematical exposition in a foreign tongue "prevents my utilizing" the book (footnote on p. 175).

or unexpected business expenditures. Similarly, account has to be taken of the possibility of an interruption in the sales – whether of labour, services or products – which provide the economic unit with an income. Unless these goods are traded on a stock or product exchange, individual receipts cannot be determined in advance at all, and the total amount of receipts can be so determined only approximately, according to the law of large numbers.

Let us suppose that chance deficits cannot be covered by credits. They can then be covered only by selling the firm or part of its assets negotiable in the form of shares, or else by cash reserves held against such contingencies. Depending on the intensity of frictions, . . . , the sale of a firm or its assets may become a very costly affair. If these frictions are considerable, it may well pay to forestall this risk by large cash reserves which, being usable for all kinds of needs, are in any case preferable to stocks of particular goods. The individual loss involved in not earning an interest on these cash reserves can be regarded as a risk premium.

. . . .

Cash reserves are increased to the point where the real value of the resulting annual loss of interest is less than the marginal utility of the premium determined by the sum of the two elements: (a) the product of the possibility that the losses forestalled by higher reserves will actually occur in the course of the year, times the real value of these losses; plus (b) the real value of the insurance quota in excess of mathematical equivalence which the individual is prepared to pay in these, as in any other, insurance transactions. We have to prove that there exists a point at which loss of interest equals marginal utility of [insurance] . . . ."

Now, let $f(r_v)$ be the marginal utility of the insurance service of a real reserve r_v, and let i be the annual interest rate. Then the equilibrium of the firm, says Schlesinger, is expressed by

$$i = f(r_v). \tag{1.6}$$

This expression is not quite right. Since the right-hand side measures the contribution of an extra dollar put in reserve and since i is the interest a dollar could earn per year, the left-hand side must be the marginal utility of the marginal i dollars. The minor error aside, Schlesinger improves on Walras by laying down the basis for the utility of money. From (1.6) or its corrected version, the cash reserve in terms of money can be written as

$$r_v p_u = \phi(i), \qquad \phi' < 0. \tag{1.7}$$

Recalling the dependence of the desired cash reserve on the (expected) volume of transactions, (1.7) may be written

$$r_v = \frac{\phi(i, v)}{p_u} \tag{1.8}$$

Adding the first source of demand (in the absence of uncertainty) which depends exclusively on the volume of trade, and aggregating over all units, the aggregate demand for money can be written as

$$Q_u = \frac{F_v(V) + \Phi_v(i, V)}{p_u}, \tag{1.9}$$

which shows a remarkable resemblance to our modern demand for money functions.

(C)   So much for history. Let us proceed to Patinkin. In his book, *Money, Interest and Prices*, the utility analysis is presented in Chs. V–VII and Mathematical Appendix 2. We shall confine ourselves to Chs. V and VI.