

HANDBOOKS IN ECONOMICS 8

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HANDBOOK OF MONETARY ECONOMICS

VOLUME 1

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NORTH-HOLLAND



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INTRODUCTION TO THE SERIES

The aim of the *Handbooks in Economics* series is to produce Handbooks for various branches of economics, each of which is a definitive source, reference, and teaching supplement for use by professional researchers and advanced graduate students. Each Handbook provides self-contained surveys of the current state of a branch of economics in the form of chapters prepared by leading specialists on various aspects of this branch of economics. These surveys summarize not only received results but also newer developments, from recent journal articles and discussion papers. Some original material is also included, but the main goal is to provide comprehensive and accessible surveys. The Handbooks are intended to provide not only useful reference volumes for professional collections but also possible supplementary readings for advanced courses for graduate students in economics.

KENNETH J. ARROW and MICHAEL D. INTRILIGATOR

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PREFACE TO THE HANDBOOK

Monetary economics has always represented a symbiosis, albeit at times an uncomfortable one, between a priori theorizing and the development and exploitation of empirical evidence. Formal theory describing an economy with money, and perhaps other financial instruments as well, has its clear antecedents in the more general structures of utility maximization and economic equilibrium. Just as clearly, this theory has steered decades of empirical research in the field. In the other direction, quantitative analysis of such fundamentals as the relationship between money and prices (for example, Smith, Tooke, Thornton) antedated anything remotely recognizable as modern economic theory. Indeed, the very existence of money itself is not a missing link for which analysis of formal models has cried out in order to connect otherwise loose conceptual strands, but – quite to the contrary – an institutional datum, the incorporation of which has proved either naggingly untidy or endlessly challenging, depending on one's point of view. The interaction here between theory and evidence has been very much a two-way street.

Yet a further influence that has significantly complicated the development of monetary economics is the direct relevance of so many of the behavioral questions at issue for the conduct of actual public policies. Which policy framework is optimal under any particular set of circumstances, or which policy action is optimal in any specific situation within a given overall framework, not only depends importantly on theoretical presumptions but often turns on comparisons among identifiable quantitative magnitudes. As a result, it is difficult if not impossible to separate either theoretical or empirical work in monetary economics from the evaluation (explicit or otherwise) of actual policies carried out in the past or, correspondingly, judgments about potential future policies.

Because of this fundamental two-way interaction between the theoretical and the empirical aspects of monetary economics, together with the relationship of both to matters of public policy, any organization of material comprehensively spanning the subject is bound to be arbitrary. We have arranged the 23 surveys commissioned for this Handbook in a way that we think reflects some of the most important logical divisions within the field. No single way of organizing this material, however – especially a linear sequencing, as publication in book form requires – can fully encompass interrelationships as rich, and among lines of thinking as diverse, as is the case in monetary economics. Different

arrangements are in some ways equally plausible, and we could just as well have chosen any of several potential alternatives.

It is important to recognize at the very outset that monetary theory has to contend with the handicap that it is not easily accommodated within the most complete and general theory of equilibrium which we have. It has been recognized for a long time, and many chapters in this Handbook refer to it, that at the very heart of any satisfactory theory there will have to be an account of transaction costs and of "missing markets". Monetary theory cannot proceed in the elegant manner of Arrow and Debreu, which collapses the future into the present, nor can it ignore the actual process of exchange. These are the facts of the situation, and they have the consequence of launching the monetary economist on journeys where no generally agreed upon axiomatic guideposts are available. This in turn has two further consequences: the assumptions that monetary economists make often attempt to encapsulate empirical regularities rather than axioms, and the subsequent theorizing has not often attained the definiteness one would like.

While a "high" monetary theory is, at best, incomplete at present, it is not obvious that this is widely felt to be a serious matter. Much of monetary theory and econometrics is macroeconomics, and the aim is to build (simple) models which can be estimated. Such models are often based on "the representative agent" who behaves very much as in a microeconomic textbook. This construct often allows one to sidestep problems of multiple equilibria or, for instance, the distribution of money balances. But there clearly is a tension between this manner of proceeding and the recognition that, for instance, money is a means of exchange between agents differently situated, with different preferences and possibly different beliefs. This tension is even more readily apparent if the model is to encompass borrowing and lending, or the trading of debts, neither of which can strictly occur in an economy made up only of "representative" agents. The reader will find some of these tensions reflected, repeatedly, in the present volume.

We decided to start this Handbook with "fundamentals" which are of concern to those who study the transition from an Arrow-Debreu economy to one in which an intrinsically worthless means of exchange has value. The chapters by Ostroy and Starr (Chapter 1) and by Duffie (Chapter 3) study this question. The first of these concerns the transaction role of money and so takes explicit note of transaction costs. It is interesting to realize that what appears so simple, and for so long has been taken as so simple, is not so at all but requires all the wit of a theorist. Duffie, also paying attention to transaction costs, achieves a satisfactory integration of money into general equilibrium theory. It goes beyond the shortcuts of the assumed "money in advance" requirement. There are still assumptions here which one would wish to relax, but the chapter goes a long way toward providing the required understanding.

The other chapter in Part I, by Hahn (Chapter 2), is not so much concerned with foundations of general equilibrium theory with money, but with one consequence of allowing explicitly for transaction costs: the “flexibility” or “liquidity” property of assets. In an economy with transaction costs, which has trading at all dates, uncertainties may be resolved or reduced as time proceeds, and the optimum plan would then allow for the probability that asset composition should be changed.

But of course it may be argued that general equilibrium theory is itself open to sufficient empirical objections as to make it doubtful that modifying it to allow for money is a profitable strategy. For instance, the theory neglects strategic interactions of agents as well as the more familiar possibilities of imperfect competition. Moreover, it is essentially a long-run equilibrium theory. Benassy (Chapter 4) gives an account of what has come to be known as “non-Walrasian equilibrium” theory, to which he has made many contributions. He shows how such a theory may form a foundation for macroeconomics. The reader will note that it is useful to recognize that equilibrium must be defined relatively to the environment in which agents operate, and that it is a mistake to think of the models Benassy discusses as “disequilibrium” models.

Shubik (Chapter 5) gives an account of his research into a game-theoretic approach to monetary theory. For some readers these will be unfamiliar waters. But we have learned in recent years that game theory is a promising route to a theory of institutions, and it is these that will have to be understood before monetary theory has been properly formulated. Shubik’s chapter discusses the main lines such theorizing can take.

As we have already noted, the problems of “fundamentals” need to be understood and, one hopes, resolved. They arise whether one is concerned with macroeconomic theory or, indeed, with empirical investigation. Both have a need to “simplify”, but in each case it is important that one knows what it is that is being simplified. On the other hand it is possible that investigating how the presence of money and other financial instruments modifies simple models which we already know well may itself be a route along which new insights can be gained.

The contributions in Part III are just of this type. Orphanides and Solow (Chapter 6) undertake a thorough and exhaustive study of canonical growth models modified by the presence of money. They critically examine earlier work in this direction, and they pay particular attention to the investment decision when there is an alternative asset to which savings can be directed. As elsewhere in this Handbook, the reader will find that paying attention to the existence of money in an economy matters.

In recent years the overlapping generations (O.G.) model has come to play a large part in macroeconomic theorizing. Brock (Chapter 7) modifies it to allow

for transaction costs. This is a desirable modification, since in many O.G. models money has no recognizable purpose other than being the (often the only) means of transferring consumption from one period to the next. Brock's chapter is thus an advance on what we have, and exactly the right move to bring genuine monetary phenomena into the orbit of the model. Here too the analysis goes deeper than merely postulating a "money in advance" constraint.

It is worth remarking that O.G. models are both more robust and more interesting than is sometimes believed, at least at the abstract level. Of course the postulate of two-period lives is highly unrealistic. On the other hand, it is difficult to think of a *qualitative* conclusion of these models – for example, the existence of many equilibrium paths, or of sunspot paths – that is plausibly at risk from more realistic life times. At first sight one might think this false, since infinitely lived agents who with perfect foresight plan their optimal future must obey a transversality requirement. The latter, it might then be thought, will preclude "disagreeable" paths for the economy. But recent research has shown this not to be the case when agents discount the future sufficiently highly.¹ On the other hand, infinitely lived agents may make a difference to the "indeterminacy" results of standard O.G. models. There may then be a difference in qualitative conclusions as one passes from finitely to infinitely lived agents. It takes, however, a peculiar perception of the world to regard the latter as the more "realistic" approach. In general, economies with finitely lived agents who discount the future are unlikely to be grossly mal-analyzed in O.G. models with two-period lives.

In parallel with such "fundamental" analyses of why money exists and under what circumstances it will be valued, investigation of the empirical and institutional facts of the demand for and supply of money has also made recognizable advances in recent years. As Goldfeld and Sichel (Chapter 8) show, the main "event" in this regard has been the collapse of previously long-standing empirical regularities relating familiar measures of money to aggregate income and prices over time. Although their chapter documents this phenomenon only for the case of the United States, research along the lines of that which they summarize has amply shown that conventional money demand functions have suffered similarly in other countries as well.² As their chapter shows, there is no lack of potential explanations for the breakdown of these prior relationships, and so there is at least room for cautious optimism that, in the future, "normalcy" (if a stable money demand function is that) may be restored. But it is also possible that that may not occur or, if it does, that it may not be for some substantial time. Along the way, investigation of competing hypotheses about just why all this has happened is a potentially rich source of new insights.

¹See Boldrin and Montruchio (1986).

²See, for example, Fair (1987).

The other two chapters in Part IV, by Brunner and Meltzer (Chapter 9) and by Modigliani and Papademos (Chapter 10), lay out these authors' conceptions of how money demand interacts with money supply in a setting that explicitly includes the important institution of a banking system.³ As a result, the analysis distinguishes "inside" from "outside" money. In addition, both sets of authors further enrich the institutional setting by distinguishing debt (or "credit") from either money or capital. Brunner and Meltzer's analysis provides the basis for the emphasis on the monetary base which has characterized many of their contributions over the years, an emphasis that has by now influenced the practical conduct of monetary policy in many countries. Modigliani and Papademos focus even more directly on the working of the banking system itself and its implications for the money supply process.

Although much of monetary economics not surprisingly concentrates on the role of money per se, it is also important to recognize that actual economies (unlike many O.G. models) have more assets than just money. Willingness to hold money itself therefore represents, in part, a decision not to hold wealth in other forms. At the same time, conditions determined by the interaction of money supply and money demand can also influence the terms on which other assets will be held, terms that in turn potentially affect macroeconomic outcomes in any of a variety of familiar ways. The three chapters in Part V address several important features of the pricing of non-money assets that have also played important roles in monetary economics.

Merton (Chapter 11) systematically lays out in a general form the theory of pricing of speculative assets in a frictionless continuous-time setting, which his own work, along with that of Samuelson and others, has developed.⁴ The theory in this form has long been the central workhorse of "finance", as a distinct field of economic inquiry. But an important development in recent years, which is still ongoing, is the erosion of any recognizable barrier between financial economics and monetary economics.⁵

The other two chapters in Part V use more specialized apparatus, based on a discrete-time framework, to focus on specific aspects of asset pricing that have traditionally been important to empirical monetary economics. Intertemporal aspects of asset pricing – what makes the subject interesting, really – are at the heart of both. Singleton (Chapter 12) reviews not only the empirical evidence bearing on asset pricing behavior per se (and presents the results of new tests) but also the connections that the literature in this area has drawn between asset pricing and macroeconomic behavior in explicitly dynamic settings. Shiller's

³Our friend and colleague Karl Brunner co-authored this chapter with Allan Meltzer, but died before the Handbook went to print. We take this opportunity to express our admiration for Karl's outstanding contribution to monetary economics, and our sorrow at his passing.

⁴Merton's chapter is an expanded and updated version of his contribution to the *Handbook of Mathematical Economics* (1981), edited by Arrow and Intrilligator.

⁵See, for example, the discussion in Fischer and Merton (1984).

chapter (Chapter 13), including McCulloch's data for the United States which we hope will be useful to many researchers in the field, consolidates and interprets the literature of the term structure of interest rates. While this subject may at first seem somewhat specialized, the term structure has long been a central issue in monetary economics because of the need to bridge the gap between asset returns that are at least proximately (and, in most models, in the short run) subject to direct influence by the central bank – primarily short-term interest rates – and the long-term asset prices and yields that are typically more important in theories of how what happens in financial asset markets influences non-financial economic activity.

But how *do* the prices and yields determined in the asset markets affect the nonfinancial economy? This question, which moves monetary economics to the center of macroeconomics, is the focus of all four chapters in Part VI. Abel (Chapter 14) adopts a partial equilibrium approach, reviewing the literature of consumption and investment, and surveying both theoretical developments and empirical results. Blanchard (Chapter 15) assumes a general equilibrium perspective, and therefore frames the issue as the specific question of whether changes in the quantity of money or its growth rate affect real output (Is money non-neutral?) and, if so, why. Both Abel's chapter and Blanchard's leave the reader with a strong sense of the ultimately empirical nature of monetary economics as a field of study. While it is straightforward to state, in the abstract, hypotheses about what determines consumption and/or investment, and likewise to advance theories about whether money is neutral and why, these chapters show that comparative evaluation of competing theories in this area is also, in the end, largely an empirical matter.

Although it is often merely implicit, an aspect of economic behavior that underlies much of what monetary economics has to say about how money affects spending and output is that credit markets are imperfect. For example, Abel's review of the modern consumption literature makes clear the importance of any constraints that arise from consumers' not being able to borrow at the same interest rate at which they can lend – in some cases, being unable to borrow at all – and hence having to base consumption spending in part on the flow of current income. The same phenomenon is also relevant to investment behavior (as well as in the field of "corporate finance").⁶ Jaffee and Stiglitz (Chapter 16) show how "credit rationing" can arise, not just temporarily when lending rates adjust slowly, but as a consequence of profit-maximizing lenders' equilibrium response to adverse selection and incentive effects due to information imperfections and asymmetries. It is worth pointing out explicitly that, here again, a phenomenon that has played an important part in monetary economics but would be difficult if not impossible to rationalize in a world

⁶See, for example, the "pecking order" hypothesis advanced by Myers and Majluf (1984).

populated only by “representative agents”, is fully consistent with standard norms of economic theorizing in a more general setting. Jaffee and Stiglitz also review the empirical evidence bearing on effects of credit rationing on spending and output.

Whether or not credit markets are perfect also bears importantly on questions of fiscal policy. Haliassos and Tobin (Chapter 17) review the issues that have dominated the discussion of fiscal effects on non-financial economic activity. Along with the Barro–Ricardo “debt neutrality” hypothesis, according to which debt-for-taxes substitutions do not affect spending, Haliassos and Tobin also address whether money is “superneutral” in the sense that real variables in the steady state are invariant with respect to the growth rate of money, and whether debt-for-money substitutions (“open market operations”) affect real behavior. In each case they first show the conditions under which the kind of policy action in question would leave all real variables unchanged, and then evaluate the theoretical and empirical plausibility of these conditions.

Regardless of whether money does or does not affect output in either the short or the long run, money and monetary policy are still of prime interest to economists on account of their consequences for prices – a subject about which, at least at the qualitative level, disagreement like that surrounding the effect of money on output is strikingly absent. The three contributions in Part VII focus on the relationship between money and inflation, importantly including implications for economic welfare. McCallum’s chapter (Chapter 18) is a broad survey of theoretical models and empirical evidence on this subject, encompassing both steady-state relationships and the co-movements of money and prices (and output) over the business cycle. McCallum also reviews the growing literature that provides a different perspective on inflation via a positive analysis of the behavior of monetary policy.

For many macroeconomic theories, the cost of inflation is the induced economizing in money balances and hence the induced increase in transaction costs. On the face of it, however, this (except perhaps in hyperinflation) seems too small a cost to explain the belief that inflation is ever enemy number one. Driffil, Mizon and Ulph (Chapter 19) consider, both theoretically and empirically, this and other possible costs – most importantly, the possibility that higher inflation necessarily implies greater uncertainty about inflation and/or greater variability of relative prices, and hence an erosion of the price system’s ability to allocate resources efficiently. Like so much else in economics, it will be found that the subject requires more sophisticated treatment than it usually receives from politicians and bankers.

The subject of inflation is also related to what, since Milton Friedman, has been called the theory of the optimum quantity of money. Woodford (Chapter 20) provides a very detailed and sophisticated analysis of this problem. For instance, it has been held that rising price levels, by leading agents to hold less

money in their portfolios, would lead in steady states to a higher capital–labor ratio than would otherwise be the case. Hence, it was argued, the rise in output per capita would have to be taken into account in a judgment of the welfare effects of inflation. Woodford shows this view to be mistaken. Indeed, his chapter’s range is so wide and his arguments so meticulous that it is likely that his will become the standard account of this matter.

As we have been at some pains to emphasize, in monetary economics the connections between research on economic behavior and implications for economic policy are sufficiently pervasive that most of the chapters in this Handbook bear on matters of monetary policy, either implicitly or directly, despite the fact that their principal focus lies elsewhere. Even so, no collection of essays attempting to survey the field could be complete without a straightforward examination of some of the major issues surrounding the conduct of actual monetary policy. The Handbook therefore concludes with three contributions that do just that.

The chapters by Fischer (Chapter 21) and by Friedman (Chapter 22) mostly take up aspects of monetary policy that arise in the context of monetary policy for a single (closed) economy. Although Fischer discusses the gold standard, his interest in it here is not as a means of regulating exchange rates among countries’ currencies but as a way of resolving, for any one country, the age-old dilemma of rules versus discretion (which, of course, also pervades many other aspects of decision-making, both public and private). As he shows, recent advances, based in part on game-theoretic concepts, have done much to clarify long-standing views as well as to open new roads for analysis. Friedman takes the discussion closer to the actual practice of monetary policy by addressing the nuts-and-bolts question of how the central bank operates: How should it evaluate the merits of alternative policy instruments? And should it use any target(s) intermediate between its policy instrument and the intended macroeconomic outcomes? As is so often the case, while the way of framing these questions is fundamentally shaped by underlying theoretical constructs, the answers, for any given country at any given time, turn on magnitudes that can only be determined empirically.

Finally, Dornbusch and Giovannini (Chapter 23) broaden the discussion by introducing the entire range of considerations that become relevant when the economy whose monetary policy is in question is interacting, in non-trivial ways, with others. At the most basic level, placing the economy in an explicitly international setting relaxes one constraint (its spending must equal its output) and introduces one extra variable to be determined (the price of its money in terms of foreign currency). But the immediate implication of a gap between aggregate spending and output (for any one economy) is a capital inflow or outflow, which over time accumulates into a stock of assets or liabilities with further consequences for behavior in both financial and real markets. At this

stage, as Dornbusch and Giovannini aptly show both theoretically and empirically, the economics of monetary policy becomes inseparable from open-economy macroeconomics – a fitting place for this Handbook to conclude.

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