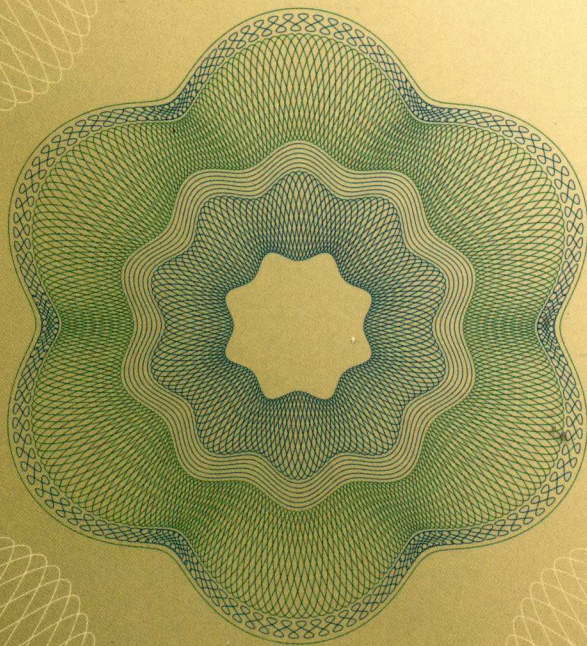




# MONETARY POLICY

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JOHN FENDER





# Monetary Policy

John Fender  
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# Introduction

The aim of this book is to present an up-to-date analysis of monetary policy. It has been written primarily with advanced undergraduate courses in monetary policy in mind, but hopefully it will also be of interest to many who are not taking such courses. It may be useful for several other undergraduate courses as well as introductory graduate macroeconomic courses. Although there is some focus on the UK, other countries' experiences, particularly those of the USA and eurozone, will be discussed as well. The approach adopted is to explore the various aspects of monetary policy through the exposition of a series of models that illuminate some facet of the question at issue. So the overall approach might be described as basically theoretical, but the theory is not advanced. We do not discuss dynamic stochastic general equilibrium (DSGE) models, which dominate the contemporary research agenda in macroeconomics, at any great length, nor do we discuss the intricacies of the various econometric tests employed in testing relationships. Important as these topics are, there is not enough space for such a discussion in this book, nor is such a discussion too relevant given the intended level and audience of the book. Those who do wish to pursue these issues at greater length will have to look elsewhere. Instead, the author will apply what he considers to be his comparative advantage, namely that of expounding a number of simple models and using them to shed light on current monetary policy. Doing this provides ample material for a book of this size.

The idea of writing this book occurred to the author some time ago, when teaching third year undergraduate courses in Monetary Policy at the University of Birmingham there did not seem to be a suitable textbook. The idea of writing one himself seemed to be an obvious solution, and this is the result. Perhaps the book which is most similar, in topics covered, overall approach and level is Goodhart (1989). But there have been enormous changes in both macroeconomic theory and monetary policy since 1989. Another excellent book is Walsh (2010); but this is an advanced graduate textbook, intended for second-year postgraduate courses; it is far too difficult even for advanced undergraduates. Woodford's monumental treatise (Woodford, 2003a) should be mentioned as well, but this is even more demanding than Walsh.

The book may be of interest to many who are not students, but who have some knowledge of basic economics and who wish to acquire an understanding of monetary policy. We consider



questions of how policy actually works in practice, and what it should do. We now know a great deal about monetary policy and how it operates, although there is much we are still ignorant about. One of the aims of the book is to impart this knowledge in an intelligible way to those who have a reasonable grasp of basic economics.

There is a great deal of literature on virtually all the topics covered by this book, and we can cover only a tiny fraction of it here. We hope that readers will wish to find out more about many of these topics, and, where appropriate, we have tried to include some appropriate references for those who do wish to investigate these issues further.

The basic structure of the book is as follows: Chapter 1 explores some basic issues concerning the foundations of a monetary economy, and Chapter 2 presents a very brief history of macroeconomics, in particular emphasising Keynes's contribution and the IS-LM framework. Chapters 3 and 4 discuss two of the main components of aggregate demand, consumption and investment, whereas Chapter 5 considers what used to be absolutely fundamental topics for a course in monetary policy, the demand for, and supply of, money. The move towards the use of a short-term interest rate as the instrument of monetary policy means that these topics are much less important than they once were but they are still, we argue, not to be ignored. Chapter 6 analyses the fundamental issue of nominal price and wage rigidities, a crucial ingredient of the approach to macroeconomics we take in this book. Chapter 7 explores the vital question of the relationship between inflation and unemployment, and Chapter 8 considers the theoretical underpinnings of the institutional reforms which have taken place in monetary policy in the last quarter of a century or so. The fact that inflation is socially costly is a crucial reason for having inflation targets, and we explore reasons why and how inflation is socially costly in Chapter 9. Much of macroeconomics and monetary economics ignores the existence of financial intermediaries, particularly banks. This is not so in this book, however, which considers their relevance for monetary policy in Chapter 10. Chapter 11 studies a topic that is also somewhat neglected in monetary policy texts, the significance of the open economy for monetary policy and Chapter 12 is devoted to another important yet often neglected topic, that of the term structure of interest rates. One of the main ways in which monetary policy works is, we argue in this book, through affecting asset prices so Chapters 13 and 14 focus on two of the main assets through which monetary policy has an impact, namely the stock market and the housing market. Although the book is about monetary policy and not fiscal policy, there are relationships between the two, and therefore we feel justified in devoting Chapter 15 to fiscal policy. Chapter 16 considers the evidence for the effectiveness of monetary policy, and Chapter 17 focuses on the targets and instruments of monetary policy. In Chapter 18 we summarise much of the discussion in the previous chapters and put together a picture of the transmission mechanism of monetary policy. Chapter 19 discusses monetary policy in practice in the UK, the US and the eurozone. Chapter 20 considers the significance of the extraordinary events that unfolded in 2007 and 2008 and Chapter 21 discusses what is perhaps the main innovation in monetary policy recently, that of 'quantitative easing'. Chapter 22 presents some concluding thoughts about current and future policy.

Once upon a time, monetary policy was analysed using a framework where it was assumed that the money supply was the instrument of monetary policy, something the monetary authorities chose and implemented. Those days are long gone, and there seems to be a widespread consensus that monetary policy is implemented (mainly) through the central bank choosing a short-term interest rate. While we agree that this is the appropriate way to characterise monetary policy, it does not mean that we can dispense with all discussion of the supply and demand for money, for a number of reasons. Firstly, sometimes the analysis using the money supply as the instrument is the same as that using the interest rate as the instrument, as in the simple IS-LM framework. Secondly, some issues are easier to handle in a framework where the money supply is the policy instrument; that of exchange rate overshooting is an obvious example. It is not clear that overshooting has any meaning in an interest-targeting framework, and considerable insights can be derived from distinguishing and analysing both the shorter run and longer run implications of a money supply increase. Thirdly, the demand for money is particularly relevant for the costs of inflation. Fourthly, much of the literature, both theoretical and empirical, especially the older literature (some of which is still worth reading), considers a framework where the money supply is the instrument of monetary policy. Fifthly, much of undergraduate macroeconomics is taught using the assumption that the money supply is the policy instrument and it might be too abrupt a transition to move to considering monetary policy being conducted exclusively in terms of an interest rate rule. Sixthly, changes in the money supply may contain useful information about the state of the economy, so it should be, at least, something policy makers should pay attention to. For example, M4 (the main measure of the money supply in the UK) was increasing at an annual rate of about 15% in the years before the financial crisis whereas in the last two years or so its growth has effectively been zero. Had policy makers paid more attention to what now seems to be excessive monetary growth in the pre-crisis era, it might have set off warning bells and perhaps the worst of the crisis could have been averted. Seventhly, and finally, monetary aggregates still play a role in some central banks' policy-making frameworks, most notably the 'twin pillars' approach of the ECB.

So, while we agree with those who emphasise that the main instrument of monetary policy is the short-term interest rate, there are a whole host of reasons why this book will not dispense entirely with discussion of the money supply and monetary aggregates.

There may be a certain amount of overlap between chapters. This is not necessarily unintended; it may not be inappropriate to discuss, for example, measures designed to stabilise house prices both in the chapter on the housing market and in a more general discussion of monetary policy later in the book. The author is aware that readers are under no obligation to read the entire book. Some readers who are particularly interested in the housing market, for example, may wish to read just Chapter 12. Those who are interested mainly in monetary policy in practice might concentrate on the last five or six chapters. Nevertheless, the book is intended to be structured in a fairly logical way and there should be no problems if a reader starts at the beginning and reads it straight through. The topics are

ordered in the sequence the author would cover them in a course on monetary policy, and hopes that such a sequence is not too eccentric.

There may be some slight discrepancies in notation between chapters. One reason for this is that when we are expounding a particular model, we may well use the notation customarily used for that model, or used in the original exposition, and sometimes notation differs between such models. We hope such differences are not too confusing to readers; we try to define notation where appropriate, and to avoid inconsistencies within chapters.

Finally, readers should be aware that this edition of the book was completed in late July 2011, so when the 'current situation' is discussed, it is the situation as of that date that is meant.

# Foundations of a Monetary Economy

**T**here is a problem faced by economists who wish to study money. Typically, economists make a number of basic assumptions about the economy; they assume that consumers derive utility from consuming various goods and disutility from supplying labour, that firms seek to maximise profits by producing goods using factors of production such as labour and capital in accordance with a production technology, and so forth. But it seems that this approach does not contain any role for money.<sup>1</sup> One would guess that the existence of money has something to do with avoiding the 'double coincidence of wants' problem that occurs under barter – in the absence of money, if agents have to find a trading partner who wants to consume what they produce and vice versa, then carrying out such transactions can be a long, arduous and costly process. It is easy to see how money can help to reduce these costs: agents can accept money (a generally accepted medium of exchange) in exchange for the good they wish to sell and then take the money and exchange it for the good they wish to acquire. However, although it may be easy to see what the problem is, solving it is by no means straightforward. The reason is that for the 'double coincidence of wants' to be a problem, there must be certain frictions in the economy. If there were perfect information and no transactions costs, there would be no problem in finding a suitable trading partner and trading (so no need for money). It seems, then, that the existence of money requires there to be various frictions in the economy, but modelling these frictions

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<sup>1</sup>Hahn states the problem thus: 'The most serious challenge that the existence of money poses to the theorist is this: the best developed model of the economy cannot find room for it.' (Hahn, 1982, p. 1.)



and explaining how they give rise to the existence of money is no trivial task. Going beyond this and deriving a satisfactory theory of monetary policy from such foundations is a major challenge and something economists are far from achieving. In this chapter we shall discuss some of the approaches that have been taken in the literature to solving this problem and modelling the existence of money rigorously. Inevitably, we shall have to be highly selective; the models we discuss will be just a very small subset of those that have been produced. But hopefully our account can give some idea of how economists have sought to explain the existence and role of money, discuss some of the conclusions that have emerged and suggest directions for future research.

## 1.1 The Emergence of a Medium of Exchange in a Primitive Economy

To fix ideas, we might start by thinking of a primitive economy where agents produce goods which, by and large, they do not consume. In order to obtain the goods they do wish to consume they need to find someone who is willing to exchange what they have produced for their product. Such a search may be long and arduous – a hairdresser who wants a pair of shoes will have to find a shoemaker who wants a haircut. In such an environment, not much trading may take place; agents may instead produce what they consume and hence do not obtain the benefits of specialisation and trade according to comparative advantage. Considerable benefits may be derived by establishing a ‘market place’ with a stall for each possible pair wise exchange of goods and this might be a way of reducing the search costs (that of finding a ‘double coincidence of wants’) of barter. So the hairdresser who wanted a pair of shoes would go to the stall where haircuts were exchanged for shoes. However, it is easy to see that if there are a large number of goods in the economy, then to allow for every possible pair wise exchange, there would have to be a large number of stalls. A simple calculation establishes this – if there are  $n$  goods in the economy, then there would be  $(n-1) + (n-2) + (n-3) + \dots + 2 + 1 = n(n-1)/2$  stalls. (There would need to be stalls for the first good to be traded against each of the other  $n-1$  goods, and stalls for the second good to be traded against each of the remaining  $n-2$  goods, and so forth.) Even with a small number of goods, this means a large number of stalls: with 100 goods there are 4950 stalls. It follows that:

1. If there are costs in establishing and running a stall, this arrangement could be very costly.
2. Some markets might be very thin. One might have to wait a long time at a particular stall until a suitable trading partner arrived; alternatively, some stalls might hold inventories, but this too would be costly, and of course some goods are not storable, so this solution would not be available for them.
3. It is easy to see that most stalls are redundant. It is sufficient that there be stalls which enable one particular good to be exchanged against every other good. If this good is good  $i$ , then an exchange of good  $j$  for good  $k$  can be achieved by first of all exchanging good  $j$  against good  $i$  and then exchanging good  $i$  for good  $k$ . So no more than  $n-1$  stalls are required. This argument is not, however, sufficient to establish that one commodity will

emerge which acts as a medium of exchange. Can one rule out, for example, one good being generally acceptable in exchange against some goods, with another good acting as a medium of exchange for all other goods, and the two goods exchanging for each other? It is difficult to say more without modelling the forces that might lead to the emergence of a medium of exchange more explicitly.

We might ask whether there are any characteristics which the commodity that comes to be used as a medium of exchange might have. We would surmise that portability, divisibility, homogeneity and durability would be important characteristics. It is easy to see why. For example, if a good is not homogenous – if some units of the good are, for example, in some way better than others – one might expect the poorer units of the good would be passed on in exchange and the better units retained: the expression ‘bad money drives out good’ comes to mind. However, it is difficult to say much more at this level of generality. The issue really needs to be considered in the framework of a formal model, and to a consideration of some formal models we now turn.

## 1.2 Money and Overlapping Generations

Samuelson (1958) discussed the possibility of introducing money into an overlapping generations (OLG) model. OLG models are employed frequently in economics and are useful for analysing a number of issues. They assume the economy is made up of finitely lived agents who are born at different times, but although individuals have finite lives, the economy may go on forever. Samuelson considered an OLG model without production where each agent lives for two periods (youth and old age) and is endowed with one unit of a perishable commodity in the first period of their lives. Population grows at a rate  $n$ , so the number of young is  $(1+n)$  times the number of old. Since the good is perishable, agents cannot consume it in the second period of their lives. How do they consume, then, in their old age? They would be willing to trade some of their endowment in the first period in exchange for the promise of delivery of the consumption good when they are old. However, this is not something the only possible trading partners the young have when young (the old generation) can deliver. There is hence no trade and the market equilibrium involves each generation consuming their entire endowment when young and nothing when old. This is clearly inefficient and a rather stark example of dynamic inefficiency.<sup>2</sup> (It would clearly be preferable, and feasible given the economy’s resource constraint, for each generation to transfer a portion of the endowment received when young to the old generation. The real interest rate is effectively  $-1$ , which is always less than the population growth rate, so the criterion for dynamic inefficiency – that the interest rate is less than the population growth rate – is met.)

<sup>2</sup>Dynamic inefficiency is where a central planner can make every generation better off by transferring goods between agents. It can occur even when all the usual conditions for Pareto Efficiency are satisfied.

Money may solve the problem. Suppose the government gives to the currently old  $H$  completely divisible pieces of paper (called money) and individuals believe they will be able to exchange money for goods, at price  $P_t$  in period  $t$ . It is straightforward to show (e.g. Blanchard and Fischer, 1989, pp. 158–60) that Pareto efficiency is restored – in fact, what happens is that prices fall at a rate  $n$ , keeping real per capita money balances constant. The (gross) return on saving is now  $1 + n$ , and hence the private and social rates of transformation are equated.

However, if the money stock is increased at a steady rate, the welfare properties of the resultant equilibrium depend on how money is introduced. If additions to the money supply are paid as interest on the existing money stock, then there is no real effect – the nominal rate of return on money and the rate of inflation increase by the same amount, hence leaving the real return on money unaltered. However, if it is paid as, say, transfers to the older generation, then in equilibrium, the real rate of return on money falls and the allocation of resources is altered in an unfavourable direction.

One question that might be asked about this result is how the beliefs necessary to sustain an equilibrium in which money is held are generated? (No-one will hold money unless he believes it will be possible to exchange money for goods when old.) The result is that if these beliefs exist then money can lead to a Pareto improvement, but these beliefs need to be generated and how this happens is not at all clear.

In this model, money has a role as a store of value enabling intergenerational exchange. It might be argued that this is not the most plausible way of modelling money, since its medium of exchange function is not captured at all in the approach and since money is generally dominated as a store of value. (Any asset with a positive rate of return the value of which is fixed in terms of money will dominate money as a store of value, and there are usually many such assets in an advanced economy.)

### 1.3 Money as a Medium of Exchange: The Kiyotaki-Wright Model

Kiyotaki and Wright (1989) (henceforth KW) use a search approach to model the role of money as a medium of exchange. The search framework means there are trading frictions, which possibly money might mitigate. Amongst their assumptions are the following (there are a number of more technical assumptions which are not given here):

1. Time is discrete.
2. There are a large number of agents, who are both producers and consumers. Agents specialise in both consumption and production. Agents produce one particular good, but consume another.
3. There are equal numbers of each of three types of agent, labelled I, II and III.

4. There are three types of indivisible goods, labelled 1, 2 and 3.
5. Agents of type  $i$  derive utility from consuming good  $i$ , but produce good  $i^*$ , where  $i \neq i^*$ .
6. Each agent can produce and store just one unit of her particular production good. Once the good is produced, the agent stores it until she exchanges it for another good. When she acquires her consumption good, she consumes it and then immediately produces another unit of the production good.
7. Agents can store only one unit of the good at a time. There are storage costs – good 1 is the cheapest to store, good 3 the most expensive.
8. For every period, each agent is matched randomly with another agent, and they exchange inventories if it is mutually advantageous for them to do so.

KW consider only steady-state equilibria. Specifying an equilibrium means defining trading rules – that is, whether an agent of type  $h$  with good  $i$  who meets an agent of type  $j$  with good  $k$  will want to trade – and also the steady-state distribution of inventories – that is, the proportion of agents of type  $h$  who hold good  $i$  at any particular date.

Trade will, of course, only take place if it is mutually beneficial. So it will not occur if agents of the same type meet, and will certainly take place if both agents can obtain their consumption goods by trading (e.g. an agent of type I with good 2 meets an agent of type II with good 1). What needs to be determined is whether an agent will trade to obtain a good which is not his consumption good because it will enhance his chances of acquiring the consumption good sometime in the future – for example, will an agent of type I carrying good 2 ever want to exchange it for good 3? A (pure strategies Nash) equilibrium is characterised by agents maximising their expected utilities, given that other agents also pursue their equilibrium strategies and inventories are at their equilibrium levels. Equilibrium inventory holdings are those which result from all agents adopting their equilibrium trading strategies.

In Model A ( $I^* = 2$ ,  $II^* = 3$  and  $III^* = 1$ , using asterisks to denote the good produced by the particular agent), it can be shown that there is – for certain parameter values – a ‘Fundamental Equilibrium’. This is where agents do not exchange a lower-storage-cost good for a higher-storage-cost good unless the latter is their own consumption good. So agents need look only at ‘fundamentals’ – storage costs and utility values – when deciding whether to trade. However, there is also – for different parameter values – a ‘Speculative Equilibrium’ in which agents may acquire a higher-storage-cost good in exchange for a lower-storage-cost good because of its superior tradeability. Finally, for some parameter values, there is no equilibrium. Things are different in Model B ( $I^* = 3$ ,  $II^* = 1$  and  $III^* = 2$ ) where there is always a fundamental equilibrium, and there is sometimes (i.e. for some parameter values) a speculative equilibrium. (So Model B can possess multiple equilibria.) KW also consider how fiat money might be introduced. In the model it is assumed that fiat money has no storage costs, is not produced or consumed by any agent (so is just held in order to facilitate trade) and (perhaps controversially) agents cannot hold money as well as a good. It can be shown that even if fiat currency exists, there are equilibria in which it is not held – if no one else wants to hold fiat currency, there is no point in holding it. However, there are



other equilibria in which fiat currency is held and operates as a generally acceptable medium of exchange.

What are the welfare properties of an equilibrium? We may look at the steady-state utility levels of agents and ask if the equilibrium is optimal relative to other (non equilibrium) trading strategies. The answer is that it may not be – for example, a situation where agents always trade when they meet may make everyone better off since in deciding whether to trade or not, agents do not take into account the positive externalities they may confer on others. It can also be shown that fiat money may raise welfare – it reduces the wasteful need to incur storage costs in using real commodities as a medium of exchange.

KW is certainly an important contribution to the theory of money. However, there is much still to be done. It does not provide an account of money which enables us to understand the role of monetary policy or the way in which money may affect the price level and output. Important features are the assumptions that goods and money cannot be stored simultaneously, that goods are indivisible, that an agent can only store one unit of a good at a time and trade always takes the form of an agent exchanging all his money holdings for a unit of a good (or vice versa). The reason for this assumption is that it avoids the need for any analysis of the terms at which trade takes place – trade always consists of one agent's exchanging everything he has for everything another agent has. Obviously, relaxing this assumption is an important item on the research agenda. It may seem fairly strange to have indivisible money – however, KW argue that the fundamental property of fiat money is its inherent uselessness, not its indivisibility.

Duffy and Ochs (1999) conducted an experimental study of the KW model and found that subjects have a strong tendency to play fundamental strategies even when speculative strategies have higher payoffs.

## 1.4 More Recent Approaches to the Theory of Money

Of other approaches to the theory of money, that of Banerjee and Maskin (1996) deserves attention. Note that this is described as a 'Walrasian' model – it does not rely on trading frictions, as does KW. It is assumed that there is private information about the quality of commodities and this inhibits barter. (How do I evaluate the quality of the commodity someone is offering in exchange for mine?) Banerjee and Maskin argue that in such an environment a medium of exchange will emerge and, moreover, the medium of exchange will be the good for which the discrepancy between high and low qualities is smallest. So we have a reason for the emergence of a commodity money; historically, numerous commodities have been used as media of exchange – gold, cowrie shells, cigarettes in prisoner of war camps are examples that come to mind – and such an approach can explain this. However, because this good is used as the medium of exchange, an inefficiently high quantity of the good will be