1 Introduction

Modern money is intrinsically valueless—the unit of account and the means of exchange are not defined in terms of any commodity that enters into production or consumption. It has been a puzzle for economic theory to understand how such an intrinsically useless money comes to acquire value in exchange and to do so in a way that is consistent with whichever picture we choose to espouse of how the ‘real’ side of the economy functions.

As we shall see in the brief historical survey that we present in the rest of this chapter, in answering this question successive generations of economists have been driven to two opposite poles.

On one hand are the economists who have taken the representative character of money to be absolute, but have thereby been driven to conclude that monetary changes cannot have any influence on real allocations and well-being. This is the position of the classical quantity theory of money as well as its successive reformulations in the hands of later economists. This position is somewhat paradoxical, since were it to be exactly true then monetary phenomena would hardly be a matter of much practical interest—a conclusion completely opposite to that of the adherents of the quantity theory.
However, this is the view that presently dominates monetary and macroeconomic theory, albeit with the qualification that money may indeed have real effects in the short run and it is only in the long run that it is completely neutral.

The opposite pole is of those economists who believe that the representative character of money is only formal and in its functioning modern money too has its value bound to some real commodity. Ricardo (in some of his writings) and Marx worked in terms of a commodity money model where in which the monetary commodity too is produced under conditions of free competition and its value is determined just like the value of other commodities through the equalisation of the rate of profit. They continued to use the same framework for analysing systems of inconvertible paper money, for eg. the English monetary system during the period of the Napoleonic Wars. In modern economics the greatest exponent of this position, of course, was Keynes in whose theory the fixity of money wages is a central institutional fact and who argued that a capitalistic economy without such fixity would not be stable at all.

The present study is an attempt to investigate the determination of the value of intrinsically valueless money in a framework that draws on as well as departs from both these opposite poles in significant ways. We begin with the fact that for contemporary monetary systems there is no automatic convertibility of monetary unit into any commodity. Indeed, there is not even any guaranteed lower bound on the value of money in terms of any commodity. While the State may intervene in periods of hyperinflation to
dictate money prices of commodities, as a matter of historical experience such interventions are not guaranteed to succeed. Moreover, most monetary systems spend most of their time away from hyperinflationary regimes. Therefore, we believe it to be worthwhile to investigate the determination of the value of intrinsically valueless money in worlds in which there are no a priori restrictions at all on what this value might be. In this we follow the first pole of monetary theory—one that emphasises the representative character of money.

However, we depart sharply from the quantity theory in asserting that monetary phenomena does have real effects. In particular, we consider it to be of primary importance that a monetary economy always exists in time and that therefore agents taking decisions in such an economy must form expectations regarding the future on the basis of unchangeable historical information. Without making any claims to the exclusivity of this mechanism, we study how history and expectations might work to determine the value of intrinsically valueless money and might also prevent the model from lapsing into the barrenness of monetary neutrality.

We carry out our investigations in two very different settings. In chapter 2 we study the determination of the value of money in a world where the primary function of money is as a medium of exchange and the technology of exchange is explicitly modelled as a process of search. In this world we are able to demonstrate intrinsically valueless money being acceptable in exchange because it is expected to remain acceptable in the future is a self-

\[1\] Though to fulfil that role it must be a store of value too.
consistent configuration of beliefs and actions. This allows the existence of equilibria with valued money.

To show that these results do not necessarily depend on the means of exchange function, we investigate in chapter 3 a ‘cashless’ competitive economy in which there is no monetary asset which stands apart from other assets in being more acceptable in exchange. Rather, money enters the model as a unit of account in terms of which prices and debts are quoted. At any point of time, agents inherit from the past commitments in money terms as well as expectations of normal prices. These are sufficient to guarantee the existence of an equilibrium with a positive value of the unit of account. Moreover, money is non-neutral in this model. The model in chapter 3 is particularly robust in that it can establish the existence of monetary equilibrium without requiring any artificial assumptions like the existence of money in the utility function or Clower constraints.

In the rest of this chapter we briefly survey the existing literature on the determination of the value of representative money.

1.1 The quantity theory of money

1.1.1 Background

It is hard to find a historical example of a community which has known exchange but did not have any kind of monetary arrangement. Yet, for most of its history money and the exchanges that it facilitated have existed only
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on the margins of the social production system. Most of the social product changed hands through means other than exchange—through gifts, compulsory free labour, rents or tithes in kind. Money was needed only for trade in the limited number of goods whose production was geographically specialised—salt or metals for example, and that of exotic luxury goods. Or it was needed to facilitate the transfer of the rural surplus to the few urban centres that existed. Given this marginal role of money, monetary changes presumably had little influence on the economic well-being of a community and hence we find little attention given to monetary questions in the ancient and medieval worlds.

Capitalism, and the social and technical changes associated with it, fundamentally changed this. By making monetary exchange the central organising principle of social production, it made exchange and the monetary system which supports it of prime importance for the functioning of the economic system. Historically, this growing importance of money prices in the European economies which were developing on capitalistic lines took place at the same time as the large influx of gold and silver into these economies from the freshly conquered mines of the New World. This perhaps explains why the earliest recognisably modern monetary theory—the quantity theory of money—sought to link these processes directly together and to claim that it was this increase in the quantity of the means of exchange which was responsible for the Europe-wide inflation which was supposed to have taken place.
1.1.2 The early quantity theory

In its strictest form the Quantity Theory of Money says that an increase in the quantity of money leads to an equiproportionate increase in all prices. In what follows we shall refer to this as the 'Quantity Theory Proposition'. David Hume was one of the first to clearly put forward this claim. In his essay 'On Interest' (Hume, 1985) he presents the following justification for the Quantity Theory Proposition:

Money having chiefly a fictitious value, the greater or less plenty of it is of no consequence, if we consider a nation within itself; and the quantity of specie, when once fixed, though ever so large, has no other effect, than to oblige every one to tell out a greater number of those shining bits of metal, for clothes, furniture or equipage, without increasing [sic] any one convenience of life [...] as these metals are considered chiefly as representations, there can no alteration arise, from their bulk or quantity, their weight or colour, either upon their real value or their interest.

We believe that the argument in the quotation above—which has often been repeated, in essence, by subsequent economists—can be fruitfully broken into two parts. The first part of the argument, according to us, draws a distinction between commodity and representative money. This is a distinction which we believe to be of primary importance for understanding the contemporary monetary system. The second part of the argument then tries to
derive the Quantity Theory Proposition as a consequence of the distinction. As we shall see, this latter part of the argument is not tenable even in the most favourable circumstances.

1.1.3 Representative money

In economics, we are accustomed to making a distinction between nominal and real variables. What is the basis in principle of this distinction? A simple-minded answer would be that nominal variables are those which are expressed in monetary units. But imagine a community where some commodity which enters into general consumption—salt or tobacco, say—functions as money. In such an economy, a price or income expressed in terms of this commodity is no different in terms of its determinants or its influence than prices and incomes expressed in terms of any other commodity. There is little scope for a monetary theory which is separate from general economic theory in such an economy.

In the quotation above, when Hume says "as these metals are considered chiefly as representations" he is pointing to a characteristic feature of contemporary monetary arrangements which make them different from such primitive economies. Since modern money does not enter into consumption or production, prices or incomes expressed in terms of money are meaningless by themselves. It is only when they are brought into juxtaposition with another money price that they produce terms-of-trade between different commodities and acquire economic meaning.
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For an economy with representative money of this kind, descriptions of economic states must exhibit a certain kind of symmetry. An equiproportionate scaling of all money prices and incomes leaves opportunities of consumption and production unchanged. Therefore such a scaling must map one valid description of the economic state into another valid description of the economic state.

Now we can answer our question about nominal and real variables by the following definition.

**Definition 1.** Suppose we can divide the variables describing an economy into two subsets such that for the description of any possible state of the economy scaling the variables in the first subset by a common factor while leaving the variables in the second subset unchanged produces a description of a state of the economy which can also possibly occur. If such a decomposition exists, we seek the maximal such decomposition in the sense of the decomposition which has the most variables in the first subset and the fewest variables in the second subset. The first subset in such a maximal decomposition can be identified with the nominal variables and the second subset with the real variables.

The existence of such a decomposition of course depends on the particular economy under examination and Hume's argument can be interpreted as saying that such a decomposition existed for the economies he was studying.

Defining nominal variables using a symmetry property as we have done
has the great advantage that it does not require a prior definition of what money is—a question that has given economists much occasion for hair-splitting over the centuries. It also allows us to abstract away from the specific payment technologies.

However, there is a problem with this definition as it stands. Suppose we append to our description of an economy some completely irrelevant variable—say the average temperature on Mars during the period of observation. Presumably any change in this variable will leave economic activity on Earth unchanged. Therefore under our definition the temperature on Mars, and any other irrelevant variable of that sort, would have to be considered as a nominal variable.

For individual irrelevant variables we can solve this problem by simple technical expedients. But what of the nominal variables taken as a whole? Indeed, if we take the quotation by Hume at the beginning of this section at face value then it would seem that even the traditional nominal variables are in essence no more relevant than the temperature of Mars. If different levels of nominal prices and incomes lead to the same allocation of goods, “without encreasing [sic] any one convenience of life” as it were, then the actual price level which prevails cannot be of much interest. This notion of money being a ‘veil’, apart from being a curious instance of a monetary theory which dissolves the subject of monetary economics itself, also happens to

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2For example we can define a variable to be relevant if there is an impossible state of the economy which differs from a possible state only in having a different value of this variable. Then we can require that any variables that are not relevant in this sense be removed from the description of the economy.
completely contradict the general belief that movements in nominal variables are of great importance for economic life. Why this might be so is the question to which we next turn.

1.1.4 The neutrality of money

The idea of the neutrality of money, colourfully expressed by the classical economists by saying that "money is a veil", is the claim that an equiproportionate change in all nominal variables leaves real variables unchanged.

At first sight it would seem that this claim would be tautologically true if we adopt the definition of nominal variables suggested in 1.1.3. But that is not the case. The neutrality of money claim speaks of a change in nominal variables whereas our definition of neutrality in 1.1.3 did not mention time at all. If we were to extend that definition to take time into account, then descriptions of the economy would have to cover its entire past and future since economic decisions and well-being in different periods are interlinked. The variables that form part of the description, such as prices and quantities, would have to be tagged with the dates they refer to.

Once these extensions are made, the definition of nominal variables implies that an equiproportionate change in all nominal variables with the real variables unchanged maps possible economic states to other possible economic states. This is very different from the neutrality claim that an equiproportionate change in all nominal variables that happens on a particular date in history will leave the future path of real variables unchanged.
We would not expect the latter to follow from the former except in very restrictive circumstances. In section 1.1.5 we examine in greater detail why the neutrality of money breaks down. In short, the reason why we do not expect neutrality to hold even in a world with representative money is that history influences the future through pre-existing commitments and agents' expectation-formation mechanisms.

1.1.5 A simple exchange economy

The model

Consider a competitive exchange economy with the following characteristics. There are two dates, 0 and 1. We model risk by assuming that there are \( S \) states of nature on date 1 so that there are \( S + 1 \) date-state pairs in all. There are \( G \) (physical) goods and \( H \) households.

Our model differs from the basic general equilibrium model in two respects. Firstly, we do not require that there be a complete set of contingent futures markets. Rather we assume that there are \( J \) exogenously given kinds of assets, where \( J \) may be less than \( S \). We assume that asset returns are given in some unit of account and each asset is characterised by the exogenously specified amount \( y^t \) that it pays in each of the date-state pairs \( t = 1, \ldots, S \). Households are forced to transfer their purchasing power between the date-state pairs using only these assets as best as they can. Our second generalisation is that of not assuming perfect foresight or any of its variants. Therefore much of our discussion remains valid regardless of the particular expecta-
Because of the sequential nature of our economy, each household has to satisfy multiple budget constraints. They are,

\[ \sum_{i} p^{i,0}(x_{h}^{i,0} - \omega_{h}^{i,0}) + \sum_{j} q^{j}(z_{h}^{j} - z_{h}^{j}) \leq 0 \]  
\[ \sum_{i} p_{h}^{i,s}(x_{h}^{i,s} - \omega_{h}^{i,s}) \leq \sum_{j} y^{i,s}z_{h}^{j} \quad \text{for } s = 1, \ldots, S \]

where \( p^{i,0} \) and \( q^{j} \) are the prices on date 0 of good \( i \) and asset \( j \) respectively. For each household \( h \), \( x_{h}^{i,t} \) and \( \omega_{h}^{i,t} \) are the quantity consumed and the endowment respectively of good \( i \) in date-state \( t \), and \( p_{h}^{i,s} \) is the price that it expects for that good in date-state \( s > 0 \). \( z_{h}^{j} \) is its holding and \( z_{h}^{j} \) its endowment of the asset \( j \). In what follows, we shall usually drop the subscript for the household where no confusion is likely to arise.

While the economic interpretation for eq.(1.1) is clear enough, eq.(1.2) means that households do not plan to default. A more detailed analysis would replace this equation with some mechanism which penalises default. However, any such mechanism would have to distinguish between planned default and default which takes places because of incorrect expectations. Our equation can be taken to summarise a situation where this distinction can be made perfectly and wilful default attracts an infinite penalty.

Coming to equilibrium conditions, the first thing that we require is the equalisation of demands and supplies for both assets and goods on date 0,
i.e.

\[ \sum_{h}(x^{i,0}_h - \omega^{i,0}_h) = 0 \quad \text{for } i = 1, \ldots, G \]
\[ \sum_{h}(z^i - z^i_h) = 0 \quad \text{for } j = 1, \ldots, Q \] (1.3)

If our equilibrium concept is that of temporary equilibrium then this is all that we demand. However, another equilibrium concept that is often applied to such models is that of Radner (1972) which requires that households have common expectations and that the plans formed by different agents on the basis of these expectations be mutually consistent. This requires that apart from (1.3) we impose the additional conditions

\[ \sum_{h}(x^{i,s}_h - \omega^{i,s}_h) = 0 \quad \text{for } s = 1, \ldots, S \text{ and } i = 1, \ldots, G \] (1.4)

Note, however, that Radner equilibrium does not require that agents have identical beliefs about the probabilities of the different date-states occurring.

**Homogeneity**

Consider two economies which differ from each other only in the respect that if a household's endowment in the first economy is \((\omega_h, z_h)\), then its endowment in the second economy is \((\omega_h, \lambda z_h)\) for some \(\lambda > 0\). Now if \((x, z)\) satisfies (1.1) and (1.2) at prices \((p, q)\) in the first economy, then so does \((x, \lambda z)\) at prices \((\lambda p, q)\) in the second economy and vice-versa.

If we now assume that household's utility depends only on its consump-
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tion vector $x$ and not on the portfolio it holds then it follows that if $(x, z)$ is demanded at prices $(p, q)$ in the first economy then $(x, \lambda z)$ is demanded at prices $(\lambda p, q)$ in the second economy. This is so because the set of consumption vectors that each household can afford is the same in both situations and hence the best consumption plan must be the same. If portfolio $z$ finances this consumption vector in the first economy then $\lambda z$ finances it in the second economy. Therefore the excess supply of goods is the same in both situations while the excess demand of assets in the second economy is $\lambda$ times that in the first economy. However, the aggregate endowments of assets in the second economy is also $\lambda$ times the first. Therefore if $(p, q)$ is an equilibrium price vector for the first economy then $(\lambda p, q)$ is a equilibrium price vector in the second economy. The equilibrium allocation corresponding to this equilibrium is the same in both economies.

If $(x_h, z_h)$ satisfies (1.1) and (1.2) for prices $(p, q)$ then it continues to do so if we divide all date 0 goods prices (i.e. all the $p^{(i,0)}$) and the asset prices $q$ by the same number $\lambda$. From this it follows that all demand functions and hence the equilibrium set remains invariant under this transformation of prices. Now dividing date 0 asset prices by $\lambda$ is equivalent to raising the inflation rate by $100(\lambda - 1)\%$ while dividing asset prices is equivalent to raising the nominal interest rate by the same percentage. Thus the nominal interest rate is indeterminate in our model—for any given real interest rate the nominal interest rate and the rate of inflation can be anything.
1.1.6 Neutrality of money

These homogeneity conditions show that our model satisfies Hume’s criteria of a world where money is purely representative. Yet the neutrality of money need not prevail in this model because:

- The symmetry conditions require asset endowments to be increased for all dates in the future. Just increasing the endowments on date 0 is not enough.

- Only a proportionally greater money supply is not enough. The endowment of all assets must increase in the same proportion. Thus, open market operations are ruled out.

- It is not enough for the aggregate supply of all assets to be higher proportionally. Each household’s endowment must increase in the same proportion.

- Equilibrium allocations will in general not be unique. In fact for almost all economies with incomplete markets there will be indeterminacy of equilibrium. Since we have provided no explanation of how the observed outcome may be chosen out of the multiplicity, a change in nominal endowments may modify observed outcomes even if it manages to leave the equilibrium set unchanged.
1.1.7 Conclusion

The greatest historical service of the Quantity Theory of Money was in identifying the representative character of modern money. This achievement was obfuscated by fact that the quantity theorists own claim of a causal relationship between the quantity of money and the price level were incorrect and the neutrality arguments they used were untenable. Moreover, both the classical political economy and the marginalised school which developed in the nineteenth century sought to subsume monetary economics under their respective general value theories and in doing so took a retrograde step by rejecting the fundamental insight of the quantity theory and trying to apply a model of commodity money to a representative money world. Despite this, the attempts to establish the Quantity Theory claim without using neutrality lead to the brilliant work of Wicksell and early Keynes and laid the foundations of 20th century macroeconomics and monetary theory.

1.2 Ricardo

The late-eighteenth and early nineteenth century saw major debates in monetary policy in England. As a result of the Napoleonic Wars, the Bank of England suspended the convertibility of its notes in 1797. The consequences of this suspension, whether the inflation experienced during the period of suspension was due to the over-issue of notes by the Bank of England, as well as the conditions under which convertibility could be restored
at the end of the War brought forth contributions from the leading economic thinkers of that period. These debates are interesting to us particularly since England by that time already had a fairly developed financial system, with the Bank of England acting as a de facto central bank. The choice then was to either take the development of credit and banking as opening up the possibility of new ways of using monetary policy as an instrument of economic control, as Thornton and Tooke argued should be done. Or it could be argued that the only way to maintain the stability of the monetary system was to make credit money conform as closely as possible to metallic money—which was the position of Ricardo and his followers. These two ways of looking at a monetary system have been at the heart of much of the debates of the twentieth-century monetary theory and continues to pose a challenge for contemporary monetary theory.

The dominant school, that of Ricardo, lacked a clear monetary theory. On the one hand it took a step backward from the quantity theorists by modelling money as a commodity money and claiming that the general Ricardian theory of labour values applied equally well to the money commodity. At the same time, and inconsistently, it held on to the Quantity Theory Proposition that changes in the quantity of money had an equiproportionate influence on prices. If we take the conditions of production of the money commodity to be independent of the quantity produced then the inconsistency between these positions is direct—since the conditions of production remain unchanged, the value of money too must remain constant regardless of any changes in its quantity. On the other hand, if the conditions of pro-
duction depended on quantity of money produced, then applying Ricardo’s
theory requires extra assumption regarding the stock of money held and the
flow of newly produced money commodity. In a zero-growth steady-state of
a closed economy, money would have to be newly produced only to replace
the amount of money commodity lost due to wear-and-tear and disappear-
ance into permanent hoards. If we take the amount of these losses to be
proportionate to the total amount of money held, then the Quantity Theory
Proportion is inconsistent with Ricardo’s belief in diminishing returns. If
the price level were to increase two-fold, then the Quantity Theory Proposi-
tion holds that the demand for money will also increase two-fold. But under
diminishing returns, a two-fold increase in the quantity produced leads to
a more than two-fold increase in the costs of production. Hence it is not
possible to get an equilibrium.

It may be the case that Ricardo intended the Quantity Theory to be a short-
term theory of the price level while in the long-term it would be conditions
of production which determine the value of money. Such a position would
be free of inconsistency, though it would still be possible to question the
relevance of the long-term part on the theory since given the high durability
of the money commodity its stocks would generally be much higher than
the production flows and hence it would take quite a long time for the latter
to bring about any changes in the price level by influencing the quantity of
money. On the other hand, the short-term quantity theory of money would
be open to any criticism that can be made against the quantity theory of
money in general. We have already discussed some of these criticisms in
section 1.1.2 and we shall have occasion to see more of them as we discuss Wicksell's own theory as well as in section 3.

### 1.3 Wicksell and the pure credit economy

Wicksell was an economic theorist of the late-nineteenth century who made major contributions to monetary economics in the form his theory of the pure credit economy and that of the natural rate of interest. While drawing on the quantity theory of money, Wicksell at the same time provided a thoroughgoing critique of that theory and showed how rather than fluctuations in the supply of precious metals, it was banking policy which determined movements of the price level.

As we have discussed above, the quantity theory proposition claims that a change in the quantity of precious metals leads to an equiproportionate change in the price level. We have also seen that this proposition is not automatically valid by virtue of the money being representative. An alternative way of putting this is that the quantity theory provides no mechanism for prices to actually increase following an increase in the quantity of money. Wicksell's study started out as a search for such an mechanism.

Wicksell begins by assuming that gold\(^3\) is held only for the purpose of making payments.\(^4\) Then the relation between the quantity of gold \(M\) and

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\(^3\)Wicksell's argument is trying to trace the changes in the quantity of means of payment. We shall refer to this means of payment throughout as gold for ease of presentation.

\(^4\)This ignores the possibility that the means of payment may also serve as a long-term store of value and that therefore a quantity of gold may also be held in idle hoards. Taking this possibility into account would strengthen the case against the quantity theory. But
the price-level $P$ is given by the famous quantity theory equation:

$$ MV = PT $$

(1.5)

where $T$ is the volume of transactions per period and $V$ is the velocity of circulation of money, i.e. the number of times a unit of money changes hands on an average. From this equation, it directly follows that even for a given volume of transactions $T$ the quantity theory proposition holds good only if $V$ could somehow be shown to be a constant. Wicksell held that it was not possible to do so.

Wicksell held that in an economy which had developed organised credit, it is possible to increase $V$ by substituting instruments of credit in the place for gold in making payments. Thus long chains of payments can be made with the help of bills of exchange and gold would have to paid only for the settling the net balance. Or if the participants in an exchange trusted the same bank, payments could be made by drawing cheques on the bank. Stronger still, even if payments could be made only in gold, in a world with developed finance agents would hold their assets in financial form (say as bank deposits) till the last moment before making a payment and convert them back into financial form at the earliest moment after receiving a pay-

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ignoring it does not weaken Wicksell's argument.
Wicksell's argument so far is not enough to refute the quantity theory proposition. We could always assume all the expedients for raising the velocity of money that we have mentioned to have taken effect, and then let the $V$ in eq 1.5 be the maximum velocity thus achieved. One way of extending Wicksell's argument could have been to explicitly model the trade-offs involved in moving between financial assets and money and thereby deduce $V$ as a function of some other economic variables. If these other variables interacted with $M$, then the quantity theory would no longer be tenable as a change in $M$ would be guaranteed to change $V$.

However, Wicksell himself did not take that path. His genius lay in recognising that even that $V$ may have a ceiling under the institutional arrangements prevailing at a point of time, there is no fundamental bound to the increase in $V$ as a result of institutional innovations. Therefore the position of any monetary theory that bases itself on the means of exchange function of money must be precarious. Instead, he based his own positive theory of money on the limiting case of an infinite $V$ where all payments are carried out through the transfer of financial assets—his pure credit economy. In this world money is completely endogenous and payments can be made by transferring these endogenously created assets. The real rate of interest

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5 This incidentally is also an argument against the Clower constraint used in many equilibrium models to produce a demand for money. The crucial content of Clower's constraint is not his dictum that "money buys goods, goods buy money but goods do not buy goods" but rather the discreteness of time in the models within which the constraint is embedded. It is this discreteness which prevents the agents from making the instantaneous conversions to and from money which Wicksell is talking about.

6 This is done, for example, in Baumol’s inventory-theoretic treatment of money demand.
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is taken as given. (Following Keynes, we must take this to mean that Wicksell is assuming full employment at the least.) A difference between this 'natural rate of interest' and the nominal interest rate fixed by the banking system leads to changes in the price level. If the nominal interest rates is lower than the natural rate then excess demand for goods cause prices to rise and vice-versa. Equilibrium with zero inflation therefore requires the nominal interest rate to equal the natural rate. However, the exact level of prices at this equilibrium is indeterminate. Wicksell draws an analogy with mechanics by terming the price level in this equilibrium as a neutral equilibrium like that of a cylinder rolling on a flat surface.

Thus Wicksell once again exemplifies our characterisation of monetary theory as falling into two poles. While he gives central role to the representative character of money, he not only holds real variables—including his central variable, the real interest rate—as being independent of monetary phenomena, even the price level becomes indeterminate in his model.

Despite this, Wicksell's project of establishing the existence of monetary equilibrium in a pure credit economy remains attractive since that seems to be the limit point towards which the development of monetary institutions seems to be leading. In our chapter 3 we draw on this fundamental insight of Wicksell while at the same time introducing assumptions that make the price level determinate through the mechanism of historical commitments.
1.4 Money as a risk-free asset

Tobin's (see Tobin (1958)) reformulation of Keynes' (Keynes, 1936, chapter 13) notion of the speculative motive for holding money is representative of an entire class of portfolio choice models which have the diversification of risk as their central theme. While the later models depart from Keynes in important respects—particularly in the treatment of expectations—in both cases the characteristic feature of money is taken to be that it provides a risk-free payoff in nominal terms.

In the Tobin version a demand for money is derived from this premise by assuming that agents are risk-averse and hence demand money for diversification purposes even when its expected returns are less than that of non-monetary assets. In Keynes' original version, some agents expect non-monetary assets to earn a negative return and hence they hold their wealth in the form of money. In either case, the excess return earned by non-monetary assets over monetary assets is determined by the equilibrium conditions of the model.

These models suffer from two shortcomings. Firstly, in any actual economy there is a great variety of assets with fixed nominal returns: currency, demand deposits, short-term bills and so on. The model under consideration only provides an explanation of the demand for these assets as a whole as compared to risky-assets and not of the choice among these assets. Therefore, so far as only a subset of these assets are considered to be 'money', we

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7Keynes assumes that the monetary assets provide a zero rate of return, but that is not essential for his argument.
actually do not have a theory for the demand for money.

Much more serious is the assumption that agents choose their portfolios based on the expectations and variance of the nominal returns of assets. In a world where the price-level can change one would presume that agents would rather decide on their portfolio based on the command over real assets that that portfolio gives. And the possibility of a change in the price-level exists even if we interpret Keynes to have taken prices as fixed within a short period since the payoffs from the assets are received at the beginning of the next period which may well have a different price-level.

Once this possibility is taken into account, the earlier results no longer hold. Imagine a world with only a single commodity which earns a deterministic positive rate of return in terms of itself, perhaps because it can be used to produce more of itself. Money will be held in such a world only if it earns a real rate of return that compensates for the risk of inflation. In particular, money with a zero nominal rate of return will not be held unless prices are expected to fall on an average. Even if we allow the real return of our commodity to be variable, the existence of a demand for money will still be dependent on the relative real riskiness of the two as well as the covariance between the payoffs from holding the commodity and the rate of inflation.\(^8\) Most importantly, once it is granted that the purchasing power of money itself can vary there is no longer anything to distinguish money from any other asset.

\(^8\)To see the latter point, consider a commodity whose real payoff is higher in periods of high inflation. Other things remaining the same, such a commodity will always dominate money