THE DEMAND FOR MONEY
Theoretical and Empirical Approaches
Second Edition

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Springer
To Anna and Demitre
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Apostolos Serletis
Calgary, Winter 2007
Almost half a century has elapsed since the demand for money began to attract widespread attention from economists and econometricians, and it has been a topic of ongoing controversy and research ever since. Interest in the topic stemmed from three principal sources.

First of all, there was the matter of the internal dynamics of macroeconomics, to which Harry Johnson drew attention in his 1971 Ely Lecture on “The Keynesian Revolution and the Monetarist Counter-Revolution,” *American Economic Review* 61 (May 1971). The main lesson about money that had been drawn from the so-called “Keynesian Revolution” was — rightly or wrongly — that it didn’t matter all that much. The inherited wisdom that undergraduates absorbed in the 1950s was that macroeconomics was above all about the determination of income and employment, that the critical factors here were saving and investment decisions, and that monetary factors, to the extent that they mattered at all, only had an influence on these all important variables through a rather narrow range of market interest rates. Conventional wisdom never goes unchallenged in economics, except where its creators manage to control access to graduate schools and the journals, and it is with no cynical intent that I confirm Johnson’s suggestion that those of us who embarked on academic careers in the ’60s found in this wisdom a ready-made target. University faculties were expanding at that time, so rewards for hitting that target cleanly were both visible before the event, and quickly available after it, particularly when the weapons employed were those provided by then rapidly developing computer technology. Seldom can a novel hypothesis — in this case that the demand for money is a stable function of a few arguments — have been better calculated simultaneously to undermine established beliefs and to exploit newly available technology. Small wonder that studies of the demand for money flourished in the academic journals.
But second, in the late '50s - early '60s there was a new audience for monetary research outside of the academic community. The relaxation of war-time and post-war controls on economies in the 1950s, and the high employment levels achieved during that decade, began to expose monetary policy to new scrutiny. In Britain, the Radcliffe Committee, in the United States, the Commission on Money and Credit, and in Canada, the Porter Commission, all undertook wide-ranging investigations of the scope and strength of monetary policy at around this time. Though the just beginning academic controversy about the interaction of the supply and demand for money and its effects on output and prices, in which demand for money studies stood at the very centre, was low on the agenda of all of these bodies, they could not ignore it, and their work helped to draw public attention to it.

Third and finally, though it was not readily apparent at the time, the mid-1960s saw the onset of a great and more-or-less worldwide inflation which was to last for the next quarter of a century. This would in due course destroy the international monetary system created for the post-war world at Bretton Woods, force a system of flexible exchange rates on the western economies, and provide them with their principal macroeconomic policy problem of the 1970s and ’80s. The fact that this inflation, like all the others that had gone before it, turned out to be largely monetary in nature was the final factor ensuring the demand for money function a place of lasting importance in macroeconomic research.

For a while indeed, in the early 1970s, it almost looked as if a new conventional wisdom might impose itself on macroeconomics, in which the central issue was the behaviour of prices, and the influence of the quantity of money thereon was the crucial factor. Since the latter influence was thought to be transmitted through a mechanism in which the demand for money function was a critical link, the theoretical underpinnings of, and empirical support for, this relationship inevitably attracted considerable attention. And of course the same internal dynamic described by Johnson that had undermined Keynesian macroeconomics in the 1960s soon got under way. Critical attention is the natural consequence of success for any economic doctrine, and a fresh cohort of academics, looking for ways to make their own mark turned their attention to the above-mentioned story, and it proved to be all too easy to find weaknesses in it.

Crucially, careful empirical scrutiny showed that the relationship was not quite so well supported by the data as it had initially seemed to be. In particular, the very progress of the inflation that had lent
so much importance to the demand for money function, and policies that relied on it, provoked institutional developments that undermined its stability. Even to give precise empirical content to that deceptively simple word “money” turned out to be extremely difficult and controversial. And as new econometric techniques developed, old empirical truths did not always survive their application. But, the implications of all this were not that money, after all, did not matter. Rather they were seen to be, first that its role in the economy was a great deal more complicated than had previously been thought, and second that this role was also likely to be subject to the effects of ongoing institutional change that would need continuous monitoring by anyone interested in the functioning of the system.

There is no need to go into more detail about all this in this brief Foreword. In what follows, Apostolos Serletis has provided his readers with a comprehensive account, not just of the current state of play in the field, but also with a sense of how it got there, and where it is likely to go next. He begins with a brief exposition of macroeconomic theories, showing how the demand for money function fits in not only to the old-fashioned short-run IS-LM model that underlay early work on the topic but into more modern models, both long and short run as well. He then describes the theoretical literature on the demand for money function, beginning with its origins in the pre-Keynesian literature and proceeding to the formulations used in the latest theoretical models. He goes on to provide a wide-ranging survey of the principle econometric techniques that have been and are being used to bring empirical discipline to the area. And, as the final chapter shows, he treats the whole area as a field in which research is in progress, rather than as a collection of established truths.

Here, then, is a book which will be valuable to anyone wishing to get up to date with the state of play in this area, and, more important, to anyone looking for a starting point for further work of their own.

David Laidler,
Bank of Montreal Professor
University of Western Ontario
Introduction

The purpose of the second edition of *The Demand for Money: Theoretical and Empirical Approaches*, is the same as that of the first edition. That is, to provide an account of the existing literature on the demand for money, to show how the money demand function fits into static and dynamic macroeconomic analyses, and to discuss the problem of the definition (aggregation) of money. In doing so, it shows how the successful use in recent years of the simple representative consumer paradigm in monetary economics has opened the door to the succeeding introduction into monetary economics of the entire microfoundations, aggregation theory, and micro-econometrics literatures.

A stable demand function for money is a necessary condition for money to exert a predictable influence on the economy so that control of the money supply can be a useful instrument of economic policy. As such, the notion of a stable money demand function appears to require that money holdings, as observed in the real world, should be predictably related to a small set of variables representing significant links to spending and economic activity in the real sector of the economy.

Prior to 1973, both the theoretical derivation and the econometric form of the money demand function were considered settled, and the evidence was interpreted as showing that the money demand function was stable. This evidence, occurring as it did in a climate of worsening inflation, convinced the Federal Reserve to give emphasis to monetary aggregates targeting. After 1973, however, the standard money demand formulation performed poorly, showing inaccurate forecasting ability and parameter instability — both of which remain largely unexplained today despite extensive research devoted to determining the reasons for this poor performance.

In trying to explain what happened, economists in addition to reopening the pre-1973 agenda of empirical issues (mainly concerned with the inappropriate specification of the original function and the choice
of dependent and explanatory variables), pointed to financial innovations (and to a lesser extent regulatory changes) which have led to the emergence of new assets and the changing of the relative degrees of ‘moneyness’ possessed by the various assets. A review of the vast literature devoted to these issues [see Edgar Feige and Douglas Pearce (1977) and John Judd and John Scadding (1992)] reveals that these studies were largely unsuccessful in explaining the instability in money demand after 1973.

There is another problem with this literature, and this is that the many studies of the demand for money (and of the influence of money on the economy in general) are based on official simple-sum monetary aggregates. There are conditions under which such aggregates are appropriate, but if the relative prices of the financial components that constitute the aggregates fluctuate over time (as the evidence suggests) then simple-sum aggregation will produce theoretically unsatisfactory definitions of money. The problem is the incorrect accounting for substitution effects that simple-sum aggregation entails, and the result is a set of monetary aggregates that do not accurately measure the actual quantities of the monetary products that optimizing economic agents select (in the aggregate).

Recently, attention has been focused on the gains that can be achieved by a vigorous use of microeconomic- and aggregation-theoretic foundations in the construction of monetary aggregates. This new approach to monetary aggregation was advocated by William Barnett (1980) and has led to the construction of monetary aggregates based on Erwin Diewert’s (1976) class of superlative quantity index numbers — the most recent example is Richard Anderson, Barry Jones, and Travis Nesmith (1997). The new aggregates are Barnett’s monetary services indexes (also known as Divisia aggregates), and Julio Rotemberg, John Driscoll, and James Poterba’s (1995) currency equivalent (CE) indexes. These aggregates represent a viable and theoretically appropriate alternative to the simple-sum aggregates still in use both by central banks and researchers in the field.

This new literature is actually an ongoing one that has only just begun to produce empirical results worthy of the effort required to understand it. The main research lies in two areas — the construction of monetary aggregates that conform to the specifications of systems of demand theory and the estimation of systems of monetary asset-demand equations in which the restrictions of demand theory are incorporated in such a manner as to assure consistency with the optimizing behavior of economic agents. I think that this new literature suggests answers to
a number of problems raised over previous studies of the demand for money. Most important, I think, is the idea that traditional measures of money and log-linear money demand functions are simply unbelievable in the volatile financial environment in which we find ourselves.

My aim in this textbook is to discuss the problem of the definition (aggregation) of money and to show how the successful use in recent years of the simple representative consumer paradigm in monetary economics has opened the door to the succeeding introduction into monetary economics of the entire microfoundations, aggregation theory, and microeconometrics literatures. In particular, the book will illustrate how a simultaneous-equations monetary assets structure both fits neatly into the new microeconomic- and aggregation-theoretic approach to the definition of money and provides a structure that can be used to measure income and interest rate elasticities as well as the important elasticities of substitution among financial entities.

Although this text has undergone a major revision, it retains the basic hallmarks that have made it the best book on money demand:

- A microeconomic- and aggregation-theoretic approach to the demand for money
- Focus on issues pertaining to the idea that traditional measures of money and log-linear money demand functions are inappropriate for monetary policy purposes
- The presentation of empirical evidence using state-of-the-art econometric methodology
- The recognizing of the existence of unsolved problems and the need for further developments

In addition to the expected updating of all data used in the text, there is major new material in every part of the text. Moreover new material to this edition is:

- a new chapter (Chapter 3) on rational expectations macroeconomics and issues such as the Lucas critique, rules versus discretion in monetary policymaking, and time inconsistency
- a new chapter (Chapter 6) on money demand issues and estimation of the welfare cost of inflation using tools from public finance and applied microeconomics
- increased coverage of the univariate and multivariate properties of the money demand variables, nonlinear chaotic dynamics, and self-organized criticality (see Chapter 11)
• increased coverage of theoretical and empirical approaches to the demand for money, including a new chapter (Chapter 14) on cross-country evidence

• revised coverage of monetary asset demand systems based on locally flexible functional forms such as the translog, generalized Leontief, almost ideal demand system, Minflex Laurent, and the Normalized Quadratic reciprocal indirect utility function (see Chapter 20)

• revised coverage of monetary asset demand systems based on globally flexible functional forms such as the Fourier and the Asymptotically Ideal Model (see Chapter 21)

• increased coverage of the econometrics of demand systems highlighting the challenge inherent with achieving both economic and econometric regularity (see Chapter 22)

*The Demand for Money* is primarily aimed at upper-level undergraduate and graduate students. The emphasis is on theoretical and empirical approaches to the demand for money and the empirical analysis of data sets. Although the book uses data from the United States economy, it is intended to be used internationally as the main text in one-semester courses in Monetary Economics and as a supplement in a wide range of courses in Macroeconomics, Applied Microeconomics and Applied Econometrics. I hope that those interested in various aspects of the demand for money will find this book valuable.

Apostolos Serletis
Part 1: Static Monetary Macroeconomics

Chapter 1. Classical Macroeconomic Theory
Chapter 2. Keynesian Macroeconomic Theory

Overview of Part 1

Chapters 1 and 2 concern macroeconomic analysis with a strong emphasis on monetary aspects, in the context of static ‘classical’ and ‘Keynesian’ models. These models, as Bennett McCallum (1989, p. 13) puts it, “have been extremely important in macroeconomic analysis and teaching over the last 40 years.”

An important feature of these models is that they each incorporate a demand for money function, but make different assumptions about the flexibility of some prices. Our purpose, then, is to investigate the implications for monetary macroeconomics of different assumptions about the money demand function, in different economic environments.
Classical Macroeconomic Theory

1.1. The Complete Classical Model
1.2. The Classical Dichotomy
1.3. The Classical AD-AS Model
1.4. The Neutrality of Money
1.5. Conclusion

We begin with an issue described by David Laidler in the (last) 1993 edition of his book, *The Demand for Money: Theories, Evidence, and Problems*, as follows

“Macroeconomics is controversial. There is no single model upon whose validity all practitioners agree. One area of disagreement of particular importance is the behavior of money wages and money prices. If these are extremely flexible in their response to shocks to the economy, then so will be the general price level. If they are not, then the price level will be slow moving, or ‘sticky.’ This matters because the general price level is one of the key variables upon which the demand for money depends. If the price level is flexible, then it is free to move to absorb the consequences of shifts in exogenous factors such as the supply of money, and their effects on other variables, notably real income and employment, will be relatively muted. If the price level is sticky, those consequences will spill over onto real income and employment and cause them to fluctuate relatively more.” (p. 8)
The above quotation shows that the assumptions we make about the flexibility of prices (and wages) matter. In this chapter, we address the issue by discussing a model that has been extremely important in monetary macroeconomics — the classical model. One important feature of this model is its assumption that prices and nominal wages are fully flexible, in the sense that they continuously adjust to clear markets; the implications of introducing some inflexibility of prices are discussed in the next chapter.

Another important feature of the classical model is that it incorporates a money demand function, a function that explains people’s willingness to hold money. Our task is to make as clear as possible what the implications are for monetary macroeconomics of different assumptions about the demand for money function. In describing the model, we follow Chapter 1 of Thomas Sargent’s 1979 book, *Macroeconomic Theory*.

### 1.1 The Complete Classical Model

The classical model can be summarized as consisting of the following seven equations, potentially able to determine seven endogenous variables,

\[
\frac{w}{P} = F_L; \\
L = L\left(\frac{w}{P}\right); \\
Y = F(K,L); \\
C = C(R - \pi^e); \\
I = I\left(q(K,L,R - \pi^e, \delta)\right); \\
Y = C + I + G; \\
\frac{M}{P} = \Phi(Y, R). 
\]

Equation (1.1) is the demand function for labor, derived by maximizing economy wide profits with respect to employment. The basic hypothesis is that firms maximize profits (that is, gross revenue less factor costs). Formally, the firms’ problem is

\[
\max_L \left\{PF(K,L) - wL - (R - \pi^e + \delta)PK \right\},
\]
where $P$ the price of the economy’s single good, $w$ the money wage rate, and $(R - \pi_e + \delta)$ the cost of capital. The reader should note that $R$ is the nominal interest rate on bonds, $\pi_e$ the expected inflation rate, and $\delta$ the rate of depreciation of capital. Taking the stock of capital as given, the first-order condition for profit maximization with respect to $L$ is

$$PF_L - w = 0,$$

which can be rewritten as in equation (1.1), and states that firms maximize profits by equating the marginal product of labor, $F_L$, to the real wage rate, $w/P$.

Equation (1.2) is the labor supply function and describes the labor-leisure preferences of workers. It is assumed that the supply of labor is an increasing function of $w/P$ (that is, $L' > 0$) and that the labor market is in equilibrium (that is, actual employment, $L$, equals labor supply, $L^s$). Equation (1.3) is the aggregate production function where $Y$ is output of the economy’s single good, with $K$ and $L$ denoting capital and labor inputs. We assume that both marginal products are positive but diminishing, that is,

$$F_L > 0, F_K > 0, F_{LL} < 0, F_{KK} < 0,$$

where subscripts stand for partial derivatives. We also assume that capital and labor are complements, that is,

$$F_{LK} = F_{KL} > 0.$$

Equation (1.4) is the consumption function relating real consumption spending, $C$, to the real interest rate on bonds, $R - \pi_e$, which is the difference between the nominal interest rate, $R$, and the expected inflation rate, $\pi_e$. It is assumed that $C' < 0$, because of the intertemporal substitution effect arising from changes in the rate of interest — see Robert Barro (1997, Chapter 3). Equation (1.5) is the investment function that relates real investment spending by firms, $I$, to the relative price $q$, defined by

$$q(K, L, R - \pi_e, \delta) = \frac{F_K - \delta}{R - \pi_e}.$$  

The assumption is that investment demand is a function of the gap between the real rate of return to physical capital, $F_K - \delta$, and the real rate of return to financial capital, $R - \pi_e$. In particular, investment demand is higher the higher is the marginal product of capital and the lower is the real interest rate, $R - \pi_e$; that is, $I' > 0$ — see Barro
(1997, Chapter 9) for more details regarding a theoretical analysis of investment. Notice that the derivatives of \( q \) with respect to \( K, L, \) and \( R - \pi^e \) are

\[
q_K = \frac{F_{KK}}{R - \pi^e} < 0;
\]

\[
q_L = \frac{F_{KL}}{R - \pi^e} > 0;
\]

\[
q_{R - \pi^e} = -\frac{q}{R - \pi^e} < 0,
\]

so \( q \) is an increasing function of \( L \) and a decreasing function of \( K \) and \( R - \pi^e \).

Equation (1.6) is the national income identity linking aggregate real output, \( Y \), and its components — real consumption, \( C \), real investment, \( I \), and real government purchases, \( G \). Finally, equation (1.7) characterizes portfolio equilibrium by equating the real money supply, \( M/P \) — which is the ratio of the nominal money supply, \( M \), to the price level, \( P \) — and the real money demand, \( \Phi(Y, R) \). Notice that real output, \( Y \), enters the \( \Phi(\cdot) \) function as a proxy for the rate of transactions in the economy and also that the nominal interest rate, \( R \), enters the \( \Phi(\cdot) \) function as a proxy for the opportunity cost of holding money — which is the real interest rate on bonds, \( R - \pi^e \), less the real interest rate on money, \( -\pi^e \). We assume that

\[
\Phi_Y > 0;
\]

\[
\Phi_R < 0,
\]

that is, the demand for money depends positively on real income and negatively on the nominal interest rate.

Assuming that at any moment the stock of capital is fixed, equations (1.1)-(1.7) determine seven endogenous variables:

\[
L, \frac{w}{P}, Y, C, I, R, \text{ and } P.
\]

The exogenous variables are:

\[
G, K, M, \text{ and } \pi^e.
\]

The parameters of the model,
1.2 The Classical Dichotomy

The hallmark of classical macroeconomic theory is its separation of real and nominal variables, known as the classical dichotomy. This classical dichotomy arises because in the classical model changes in the money supply do not influence real variables and allows us to study first how the values of the real variables are determined in isolation. Given the equilibrium values of the real variables, the equilibrium in the money market then determines the price level and, as a result, all other nominal variables.

It is easy to verify that the classical model we have been studying dichotomizes. Consider the model formed by equations (1.1)-(1.7) and assume that an initial equilibrium exists. Write the model in change form to obtain the following linear system (assuming, for simplicity, that $\delta$ is always constant, so $d\delta = 0$)

\[
d \left( \frac{w}{P} \right) = F_{LL} dL + F_{LK} dK; \\
dL = L' d \left( \frac{w}{P} \right); \\
dY = F_K dK + F_L dL; \\
dC = C' (dR - d\pi^e); \\
dI = I' q_K dK + I' q_L dL + I' q_{R-\pi^e} (dR - d\pi^e); \\
dY = dC + dI + dG; \\
\frac{dM}{P} - \frac{M}{P} \frac{dP}{P} = \Phi_Y dY + \Phi_R dR.
\]

Notice that this system is not fully simultaneous. In particular, only two endogenous variables, $d(\frac{w}{P})$ and $dL$, appear in the first two equations, implying that these two equations form an independent subset that can determine employment and the real wage rate. Similarly, only three endogenous variables, $d(\frac{w}{P})$, $dL$, and $dY$, appear in the first three equations. As a consequence, these equations form an independent subset that determines employment, the real wage, and output. This very important property of the classical model is known as block
Chapter 1. Classical Macroeconomic Theory

`recursiveness` and is what yields the dichotomy. That is, the key real variables (output and employment) are determined solely in a subsystem involving only production considerations, and are independent of the level of the money supply and the general price level. In such a system money is a veil.

1.3 The Classical AD-AS Model

In order to solve the classical model, we utilize the aggregate demand (AD)-aggregate supply (AS) apparatus. That is, we collapse equations (1.8)-(1.14) into a system of two equations in \( dR \) and \( dY \). This is accomplished by eliminating \( d(w/P) \), \( dL \), \( dC \), \( dI \), and \( dP \) by substitution.

First we obtain the total differential of the aggregate supply schedule. Substituting (1.9) into (1.8) to eliminate \( dL \) yields

\[
d \left( \frac{w}{P} \right) = \frac{FLK}{1 - FLL L'} dK, \tag{1.15}
\]

which implies that an increase in the capital stock increases the real wage, since

\[
FLK > 0, \quad FLL < 0, \quad L' > 0,
\]

and hence

\[
\frac{FLK}{(1 - FLL L')} > 0.
\]

Also, substituting (1.15) into (1.9), to eliminate \( d(w/P) \), yields

\[
dL = L' \frac{FLK}{1 - FLL L'} dK, \tag{1.16}
\]

which implies that an increase in the capital stock also increases employment.

The total differential of the aggregate supply curve can be obtained by substituting (1.16) into (1.10), to eliminate \( dL \)

\[
dY = \left( FK + \frac{FLL F_{LK}}{1 - FLL L'} \right) dK. \tag{1.17}
\]

Equation (1.17) implies that an increase in the capital stock would increase output. In fact, the increase in capital increases output, both because the marginal product of capital is positive as well as because the increase in capital increases the marginal product of labor.

Clearly, equations (1.15)-(1.17) completely determine the values of the only three endogenous variables involved and show that \( K \) is the
only exogenous variable that enters into the determination of \( Y \), \( L \), and \( w/P \) — in this model, there is no interaction with other variables. Thus output, \( Y \), is determined independently of the price level. In what follows we assume that capital can be accumulated only by investing, thus ruling out once-and-for-all changes in the stock of capital. This implies that, at a point in time, output, employment, and the real wage are constants, independent of fiscal and monetary variables and the public’s expectations.

We now turn our attention to deriving the total differential of the aggregate demand schedule. Assuming that \( dK = 0 \) [which implies, from solving (1.8)-(1.10), that \( dY = dL = 0 \)] and substituting (1.11) and (1.12) into (1.13) yields the total differential of the AD schedule or, equivalently, the total differential of the reduced form of \( R \) (after solving for \( dR \))

\[
dR = -\frac{1}{C' + I'q_{R-\pi^e}}dG + d\pi^e, \tag{1.18}
\]

where \( C' + I'q_{R-\pi^e} \) — the total derivative of aggregate demand with respect to the interest rate — is negative since \( C' < 0, I' > 0 \), and \( q_{R-\pi^e} < 0 \).

Manipulation of the reduced form for \( R \), equation (1.18), implies that

\[
\frac{\partial R}{\partial G} = -\frac{1}{C' + I'q_{R-\pi^e}} > 0;
\]

\[
\frac{\partial R}{\partial \pi^e} = 1.
\]

Thus the nominal interest rate rises in response to an increase in government spending. Also, a change in \( \pi^e \) produces an equivalent change in \( R \), with no change in \( R - \pi^e \) — the Fisher effect. Notice that in this version of the model, the interest rate bears the entire burden of adjusting the level of aggregate demand, so that it equals the level of aggregate supply determined by equations (1.1)-(1.3), given the capital stock.

To determine the effect of changes in \( G \) and \( \pi^e \) on consumption and net investment we substitute (1.18) into (1.11) and (1.12), respectively, and solve for the reduced form partial derivatives with respect to these exogenous variables, keeping \( dK = dL = dY = 0 \). The effects on consumption and investment are
\[ \frac{\partial C}{\partial G} = C' \frac{\partial R}{\partial G} < 0; \]
\[ \frac{\partial I}{\partial G} = I' q_R - \pi_e \frac{\partial R}{\partial G} < 0; \]
\[ \frac{\partial C}{\partial \pi_e} = C' \frac{\partial R}{\partial \pi_e} - C' = 0; \]
\[ \frac{\partial I}{\partial \pi_e} = I' q_R - \pi_e \frac{\partial R}{\partial \pi_e} - I' q_R - \pi_e = 0. \]

Thus, an increase in government expenditures tends to increase the interest rate, which in turn, through equations (1.11) and (1.12) induces changes in consumption and rates of capital accumulation. In fact, the rise in the interest rate *crowds out* both forms of private spending, \( C \) and \( I \). However, changes in \( \pi_e \) do not affect consumption and investment. This is so because of the Fisherian link, according to which a change in \( \pi_e \) leads to an equivalent change in \( R \), leaving \( R - \pi_e \) unchanged.

Once the differentials for \( R \) and \( Y \) are determined, equation (1.14) has only one free variable in it — the differential of the price level, \( dP \). In fact, the role of equation (1.14) is to determine \( dP/P \) to equate the nominal demand for money to the given nominal quantity of money.

### 1.4 The Neutrality of Money

So far we have dealt with changes in the demand for money while holding fixed the aggregate supply of nominal money. We have shown that disturbances which end up changing the interest rate or output change the demand for real money balances. With the money stock held constant, the price level then changes to clear the money market. Notice that the price level moves in the direction opposite to changes in the real demand for money. For example, increases in \( R \) reduce the demand for real money and drive the price level upward, while increases in \( Y \) increase the demand for real money and drive the price level downward.

Although disturbances that end up changing output or the interest rate are possible sources of price level changes, many economists argue that fluctuations in nominal money, \( M \), are the principal source of variations in the price level. In fact, if the supply of money is the only
exogenous variable that changes, equation (1.14) implies that only the price level is affected, and it changes proportionately with the money supply — i.e.,

\[
\frac{dP}{P} = \frac{dM}{M},
\]

since \(dY = dR = 0\). This property of the classical model is referred to as the *neutrality of money*, meaning the (null) effect on real variables of a once-and-for-all change in the nominal money supply.

Notice that monetary neutrality and dichotomy are distinct concepts. For example, a system that dichotomizes need not possess the property of neutrality, while a system in which there is neutrality need not dichotomize. See Sargent (1979, p. 47) for an (artificial) example of a system that dichotomizes but in which neutrality fails.

1.5 Conclusion

We began with a representation of the aggregate economy designed to facilitate analysis of the interaction between real and monetary variables, under perfect wage and price flexibility — the classical model. Although the model is essentially static in nature, it is still used by a large part of the economics profession and provides a good introduction to some of the important issues pertaining to the role of money in the economy and the importance of the money demand function.

An important result is that — with wage and price flexibility — the real variables (real wage rate, real interest rate, and the aggregates of output, consumption, investment, and employment) are invariant with variations in the quantity of money. Money is, therefore, neutral in the model — only the general price level and all other nominal variables (nominal output, consumption, investment, and so on) are (equiproportionally) affected by changes in the supply of nominal money balances. In other words, the money market and the money demand function play no crucial role in determining the aggregates of output and employment.

So far we haven’t been able to show why the money demand function is an important relationship. In the next chapter, we investigate how inflexibility of some prices, and the resulting imbalance between quantities supplied and demanded, change the nature of our conclusions regarding the importance of the demand for money function.
Keynesian Macroeconomic Theory

2.1. The Keynesian Consumption Function
2.2. The Complete Keynesian Model
2.3. The Keynesian-Cross Model
2.4. The IS-LM Model
2.5. The Keynesian AD-AS Model
2.6. Conclusion

In Chapter 1 we began our discussion of macroeconomic theory with a view of nominal wages and prices as fully flexible. This approach ensures that markets are always in equilibrium, in the sense that there is continual balance between the quantities demanded and the quantities supplied. The classical model was the dominant macroeconomic theory until the Great Depression in the 1930s. The prolonged unemployment, however, in the United Kingdom and the United States during the 1930s prompted John Maynard Keynes to significantly depart from the classical assumption of perfectly flexible prices and develop models based on the assumption that there are constraints on the flexibility of some prices.

The crucial assumption in the Keynesian models is that some prices are sticky — i.e., do not adjust promptly to ensure continual balance between the quantities supplied and demanded. Hence, unlike the classical model, some markets do not always clear and output and employment typically end up below the optimal amounts. Although Keynes’s analysis and some subsequent treatments — see, for example, Don Patinkin (1965, Chapter 13) and Barro and Herschel Grossman (1976) — focused