NBER WORKING PAPER SERIES

1944, 1963 AND 1985: MODIGLIANIESQUE MACRO MODELS

Stanley Fischer

Working Paper No. 1797

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 1986

NBER Working Paper #1797
January 1986

1944, 1963 and 1985: Modiglianiesque Macro Models

ABSTRACT

In 1944 Franco Modigliani published a famous article summarizing the Keynesian model; in 1963 he extended the 1944 framework. This paper, written for a conference in honor of Modigliani, asks how the earlier papers would be modified in the light of recent developments in macroeconomics. The attempt is not to summarize modern macroeconomics, but rather to describe the structure modern macroeconomists should have in mind in thinking about the way the economy and macroeconomic policy work. The paper argues that the basic structure of the 1963 model still stands, with modifications. The 1985 version is an extended Phillips-curve-augmented IS-LM model. The major modifications to the 1963 model are in the treatment of the Phillips curve and aggregate supply, in the analysis of expectations, and in the openness of the economy.

Stanley Fischer
Department of Economics
E52-280, M.I.T.
Cambridge, MA 02139

617-253-6666

December 1985

1944, 1963, AND 1985:
Modiglianiesque Macro Models

Stanley Fischer[1]

Franco Modigliani's 1944 article coming at the end of the period of absorption of the General Theory started a remarkable career in macroeconomics that continues to provide insight and inspiration to generations of members of the MIT Money Workshop and a far wider audience outside MIT. "My 1944 article" is certainly the most cited work in the Money Workshop. "My 1963 article" is a distant second, though it has not been clear why the work of the younger Modigliani finds more favor with its author than that of the mature scholar, pointing in 1963 to developments that were soon to be embodied in the MPS model.

The 1944 and 1963 Modigliani articles continue to be worth reading today, both for their insights and as summaries of the state of knowledge at the time.[2] The 1944 article is decisive in its discussion of the role of wage stickiness in generating real effects of monetary

---

[1]This is a revised version of a paper prepared for the conference in honor of Franco Modigliani, Martha's Vineyard, September 1985. It is to be published in a volume Macroeconomics and Finance: Essays in Honor of Franco Modigliani (MIT Press, 1986). Comments from and discussion with Andrew Abel, Olivier Blanchard, Peter Diamond, Rudiger Dornbusch, Paul Krugman, Merton Miller, Franco Modigliani, Danny Quah, Julio Rotemberg, Paul Samuelson and Martin Weitzman, none of whom--least of all Franco Modigliani--should be held responsible for the views expressed in this paper, and financial assistance from the National Science Foundation are gratefully acknowledged.

[2]As the author acknowledges in his Collected Papers, (Vol. I, pp 66-67, and "The Monetary Mechanism ..." Vol. I, pp 69-78) the 1944 article contains errors in its discussion of the controversy over the properties of a monetary economy initiated by Lange (1942) and settled by Patinkin (1963).

policy and unemployment "equilibria" in the Keynesian model. It is interesting too for its grappling with the Hicksian Value and Capital argument that the short term interest rate is determined by the transaction costs of moving between zero interest money and interest-bearing short-term securities. The same issue has been emphasized recently by Neil Wallace (1981); the well-known difficulty of generating a demand for the non-interest bearing asset, money, when interest-bearing assets are available is typically overcome by modern theorists by postulating that money has to be used to make a purchase (the Clower constraint) or that money-holding yields unspecified utility services.

The 1963 article describes its macroeconomics as those of the mid-fifties. The basic macroeconomic model is more sophisticated than the 1944 version in its handling of the banking system and the distinction between inside and outside money, the consumption and investment functions, and the explicit inclusion of a government budget constraint potentially linking monetary and fiscal policy. Most interesting from the viewpoint of current controversies are the brief discussion of markup pricing as an alternative to the Keynesian supply function that makes output a decreasing function of the real wage, the demonstration that credit rationing does not much change the macroeconomic analysis of the operation of monetary policy[3], and the

---

[3]Recent work on the microeconomics of credit rationing (for example, Jaffee and Russell (1976), Keeton (1979), Stiglitz and Weiss (1981)) has not been assimilated into analytic macroeconomic models, though credit rationing is an essential component of the operation of monetary policy in the MPS model. See Blinder (1985) for a recent attempt at a simple macroeconomic model in which credit rather than interest rates is the main transmission mechanism for monetary policy; Friedman (1983) has emphasized the credit-GNP relationship.

discussion of the problem facing a monetary authority confronted with real wage rigidity. There is in addition a hint that the author did not at the time regard the Phillips curve trade-off dilemma as a serious one.[4]

In this paper I ask what "my 1985 article" would look like if Franco Modigliani had the time to set out a representative macroeconomic model--or rather two models--of the mid-eighties. The attempt to set out representative models may reasonably be regarded as not only presumptuous but also foolish. I trust that the presumptuousness will be excused as an attempt to smoke out the views of the discussant.[5]

The attempt may be regarded as foolish because no single model can possibly hope to encompass the many substantial analytic contributions to modern macroeconomic theory. To name only a few: .Overlapping generations models by Samuelson (1958), Diamond (1965), Lucas (1972), Barro (1974), Wallace (1981), Sargent and Wallace (1983), Grandmont (1985), et al make important points about the role of money and social security in promoting efficiency, about capital over-accumulation and the effects of debt on capital accumulation, about the Phillips curve and the information-conveying role of prices, about discounting of future tax payments, about the difficulty of distinguishing between money and bonds in formal modelling, about commodity monies, and about multiple equilibria arising from non-linearities, each of which is part of the modern canon.

---

[4] Collected Papers, Vol. I, pp 80-81. The discussion of the Phillips curve tradeoff concludes: "According to some views this is the predicament of our times, but I don't propose here to assess this claim or, even less, to propose remedies".

[5] The paper was discussed at the conference by Franco Modigliani; written comments will appear in the conference volume.

.Disequilibrium models by Patinkin (1963), Mundell (1964), Clower (1965), Solow and Stiglitz (1968), Barro and Grossman (1976), Benassy (1982), Neary and Stiglitz (1983), et al show in fixed or sticky price models why quantities enter behavioral equations, identify the wage-price vectors that generate classical or Keynesian behavior, and demonstrate the role of self-justifying pessimism in producing Keynesian unemployment.

.The explosion of work on labor contracting by Baily (1974), Azariadis (1975), MacDonald and Solow (1981), Hart (1984), Hall and Lazear (1984), Stiglitz (1985), et al, has examined the implications of non-spot-market relationships between firms and workers for wage and output determination and shown when contracts will lead to under- or overemployment equilibria.

.The loose notion of efficiency in asset pricing has been made precise by Samuelson (1965), Fama (1970), Merton (1973), Breeden (1979), Tirole (1985), et al and the efficiency of asset markets has been tested by Shiller (1981), Leroy and Porter (1981), Singleton (1981), Marsh and Merton (1985) et al.

.Rational expectations econometrics has been applied to the testing of standard optimizing models of consumption, fixed investment, inventory investment, labor demand and supply, by Hall (1978), Hansen and Singleton (1980), Flavin (1981), Shapiro (1984), Blanchard (1983), Eichenbaum (1983), Sargent (1978), Mankiw, Rotemberg and Summers (1985) et al, and to questions about the effects of anticipated and unanticipated policy changes by Mishkin (1983) and others.

.The notion of policy making as a game between government and the private sector, implied by the work of Lucas (1973) and Sargent and Wallace (1975), has led far beyond the Tinbergen (1967) approach in the work of Kydland and Prescott (1977), Barro and Gordon (1983), Rogoff (1983), Backus and Driffill (1985) et al.

.The modelling of price and wage stickiness has advanced under the hands of Barro (1972), Fischer (1977), Phelps and Taylor (1977), Sheshinski and Weiss (1977), Taylor (1980), Rotemberg (1982), Blanchard (1983), Mankiw (1985), Akerlof and Yellen (1985), Blanchard (1985), Caplin and Spulber (1985) et al.

The list of topics is incomplete--among the missing are indexation, the microeconomics of money, models of banking, information-based macroeconomics, real business cycle theory, and search theoretic models of labor market dynamics and the natural rate of unemployment--and the lists of authors can be multiplied many times. However, in the spirit of the earlier papers, the attempt is not to summarize all of modern macroeconomics but rather to describe the structure most modern macroeconomists should have in mind if and when they think about the way the economy and macroeconomic policy work.

The essential question is what difference do the many contributions described above make to our basic understanding of the way the economy works? Does "my 1963 model" have to be thrown away, or does the basic structure still stand? Modern textbooks, and this paper, say the structure still stands, to be sure with some rooms added, with some altered, and with modern styling replacing the fashions of twenty years ago.

In saying this, I certainly do not mean we have learned nothing in the last twenty years: the sample of topics and papers above is sufficient evidence of the fundamental significance of much of the research of the past twenty years. Nor would I want to encourage any Bourbons who see no reason to go beyond what they knew under the previous regime: the technical level and sophistication of modern macroeconomics demand full time attention and effort.

While no single model comfortably encompasses the basic views of unreconstructed Keynesians, old-line monetarists, and fresh-water macroeconomists[6] along with those of the eclectic center, the model that comes closest, and that best serves to focus discussion of macroeconomic controversies, is the extended Phillips-curve-augmented IS-LM model.[7] The choice of a non-maximizing model may render the exercise suspect to many in the profession.[8] But it has the benefit of providing a believable account of the operation of the economy.

The major modifications that have to be made to the 1963 model are in the treatment of the Phillips curve and aggregate supply, in the

---

[6]The phrase is Robert Hall's.

[7]Policano (1985) expresses some surprise that the IS-LM model is still the basic model used in modern macroeconomics textbooks. The versatility of the model is responsible for its survival: it can be used to analyze both monetary and fiscal policy, in both full employment and unemployment modes; it can generate quantity theory or pure Keynesian results with only minor modifications. The model is capable of accommodating monetarist and Keynesian views, as Friedman's (1970) theoretical framework shows. In my view it can also accommodate a basic rational expectations-market clearing view, though I am not sure adherents of that approach would agree.

[8]There is no necessary inconsistency between IS-LM type models and maximizing models; see for instance Aiyagari and Gertler (1985).

analysis of expectations[9], and in the openness of the economy. Because dynamics depends sensitively on details of lag specifications in each component of the model, I will not lay much stress on the specifics of dynamic adjustment.[10]

I. THE SIMPLEST CLOSED ECONOMY MODEL.

The general structure of the models is the same as that of the 1944 and 1963 versions and the standard textbook model in using separate equilibrium conditions for the goods market, the asset markets, and the labor market.

In the closed economy model, the level of output is determined by aggregate demand and supply. Aggregate demand is a function of permanent labor income (Y^p), current income (Y), wealth, the real interest rate (r), government spending on goods and services (G), and taxes net of transfers (T).

---

[9] The earlier models assumed unitary elasticity of expectations, which translates into the assumption that all changes that take place are expected to be permanent. The assumption is not fully specified until it becomes clear whether it applies to levels of variables or their rates of change.

[10] A view implicit in much recent literature is that each dynamic adjustment mechanism by itself should be capable of explaining business cycle dynamics, which --waiving questions about the existence of a trend--can be summarized by the second order difference equation for detrended output, $y_t = \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \varepsilon_t$ where ε is serially uncorrelated, α_1 is about 1.35 and α_2 is about (-.45). The multiplier-accelerator mechanism or Metzlerian inventory dynamics come close to producing this adjustment pattern, but it may rather be the interaction of the many dynamic adjustment mechanisms in the economy--slow price and wage adjustment, slow adjustment of labor and capital inputs, inventory and fixed investment dynamics, exchange rate dynamics--that is responsible for GNP's hump shape. Rose (1985) in ongoing research asks why so many economic variables appear to have very similar, and very simple, dynamic behavior when lagged adjustment is assumed to be widespread.

$$(1)' \quad Y = \phi\left(Y^P,\ Y,\ \frac{H+B}{P} + K,\ r,\ q,\ G,\ T \right)$$

Current income enters in addition to permanent labor income because of evidence that consumption demand is more sensitive to current income than is implied by the pure life cycle-permanent income hypothesis.[11] Permanent income may affect not only consumption but also investment demand, as has been emphasized by Eisner (1978). Real non-human wealth consists of real high-powered money (H) and government bonds (B) plus the value of physical capital. We discuss below the issue of whether debt is wealth, and the related question of whether future taxes should also affect aggregate demand. The inclusion of just a short-term interest rate is a simplifying assumption; the long rate, or Tobin's q--the ratio of the market value of capital to its replacement cost--is more relevant to the investment decision than the short rate.[12]

Assuming the marginal propensity to consume out of current income is less than unity, (1)' can be rewritten:

$$(1) \quad Y = A\left(Y^P,\ \frac{H+B}{P} + K,\ r,\ G,\ T \right)$$

---

[11] For example, Flavin (1981) and Hall and Mishkin (1982).

[12] In an alternative formulation of the model, q would enter explicitly, both in determining the value of the capital stock, and in affecting the investment decision. The model would then be essentially that of Tobin (1969). With q normally inversely related to r, an open market purchase that reduces the interest rate then increases aggregate demand both through a wealth effect on consumption demand and a cost of capital effect on investment (Modigliani, 1971). However, as Tobin shows, the inclusion of q does not sigificantly change the analysis of the operation of policy so long as bonds and capital are gross substitutes.

The demand for real balances is a function of the level of income and output (in some versions spending replaces income), of the nominal interest rate, and of real wealth, designated V. Assuming a constant ratio between the stock of money and the stock of high-powered money[13], the equilibrium condition in the money market can be written

(2) $H/P = L(Y, r+\pi, V)$

where π is the expected rate of inflation and

$$i = r + \pi$$

is the nominal interest rate.

The treatment of capital in the assets markets is the same as that of the 1944 and 1963 papers, implicitly assuming that capital and bonds are perfect substitutes (Tobin, 1963). The more complete treatment in which adjustment costs imply that the price of installed capital--Tobin's q--may vary and in which capital and bonds are gross substitutes does not much affect the analysis of open market operations (Tobin, 1969).

Aggregate supply starts with a wage setting equation:

(3) $W_t = P_t^e + \underline{f}(Y_t^e, Y_t)$

where W_t is the predetermined wage rate in period t, P_t^e and Y_t^e are the price level and level of output expected to obtain in period t at the time wages are set;[14] Y_t appears in the wage setting equation to reflect the possibility that the wage in period t is determined in part on the

---

[13] Movements in the money multiplier have at times, notably in the Great Depression, played a significant role. But they are not normally sufficiently important to carry the money multiplier as a separate variable through the remainder of the paper.

[14] Where time subscripts are not used, the subscript should be understood to be $_t$.

basis of a pre-determined overtime schedule. A price setting equation completes the supply side:

(4) $P_t = h(W_t, Y_t)$

The price setting equation is consistent with two major alternatives: first that output supplied is a decreasing function of the real wage; or second that price is set as a constant mark-up on the wage or on costs. The conventional Keynesian supply function with output a decreasing function of the real wage can obtain when the function h( ) is increasing in both its arguments; the simplest mark-up pricing equation holds when Y drops out of the function h( ).

The model is completed by the government budget constraint:

(5) $G_t - T_t + i_t(B_t/P_t) = (M_{t+1}-M_t + B_{t+1}-B_t)/P_t$

In (5), net transfers, T, are defined exclusive of interest payments on the debt. The interest payments are singled out for separate treatment for the later discussion of debt dynamics.

Comparison with 1963 and Discussion.

Equations (1), (2) and (5) are virtually identical to equivalent equations in the 1963 paper[15]. The major differences are in the lack of detail about the banking system in the 1985 version and in the specification of aggregate supply. The details of the 1963 version were heavily influenced by the author's desire to discuss both the Gurley-Shaw inside-outside money distinction and the Patinkin dichotomy-neutrality controversy. The 1985 version shares the judgment of both

---

[15]That model did not explicitly include government spending however.

the 1944 and 1963 papers in placing the main leverage of monetary policy in price stickiness rather than equilibrium non-neutralities.

On the aggregate supply side, the 1963 version formalized the notion that the wage is constant up to the point of full employment with labor input determined by the demand for labor, and that thereafter the nominal wage adjusts to generate the real wage at which labor supply is equal to demand.[16] As previously noted, there is also a discussion of markup pricing, in which in the short run output is determined by demand at the price level determined by the prevailing level of wages.

In the 1985 version the wage for each period is mostly predetermined by a Friedman-Phelps-Phillips curve. The length of the period is not specified. Output and labor input is then determined by demand, perhaps even beyond the point of conventional full employment as workers go on overtime. The formulation in terms of output rather than unemployment saves an Okun's law equation relating output to unemployment; it is possible that this formulation beyond its parsimony has served also to reduce the attention paid to unemployment as the macroeconomic problem.

The demand determination of output is at the heart of one of the key controversies in macroeconomics. The fact of predetermination of wages is not necessarily disputed, but the Keynesian notion that demand determines output--implying that there might be either under- or overemployment of labor--is (Barro, 1977). I have nothing new to

---

[16] Equation (6) of the 1963 model comes close to writing down the "min" formulation of disequilibrium economics in which labor input is determined by the minimum of quantity supplied and demanded at the existing wage/price vector.

contribute on the issue of whether the labor market should be thought of as clearing in some sophisticated sense in the very short as well as the long period, but record the view that the aggregate supply framework of this paper, which includes the expectations-adjusted Phillips curve, has performed well in recent years in providing an interpretation of the recent disinflation.

The long-run Phillips curve in the 1985 model is vertical: nominal wages adjust to anticipated changes in the price level so that there is no trade-off between output and inflation when the inflation is anticipated.[17] In this framework, the length of the period over which the wage is predetermined is a major determinant of macroeconomic dynamics. The model's dichotomy in which the wage is predetermined for a period is a substantial simplification of the real-world adjustment process in which staggered wage and price setting can generate long-lived adjustments out of comparatively short contracts.[18]

A further controversy centers around the role and determinants of expected price and output levels in the wage setting process. The

---

[17] The specification of the wage setting equation in levels is not innocent. One implication is that past mistakes are forgotten in the wage-setting process. A formulation in which the rate of change of the real wage is made a function of the level of output builds mistakes permanently into the real wage. Another implication is that there is a unique full employment real wage, whereas in the rate of change formulation, the steady-state level of employment is independent of the real wage. The latter property would be more plausible if the wage equation (3) were formulated in terms of the unemployment rate rather than output. The two formulations do not differ in their implications for short-run output determination, but have different dynamic and policy implications. The empirical evidence is mixed, though for the period since the mid-sixties the rate of change formulation appears more consistent with the data (Blanchard, 1985a)

[18] Taylor (1980), Blanchard (1983). See also footnote 10.

spirit of the rational expectations approach is to condition those expectations on expectations of policy and other exogenous variables. Counterposed to this view is the undoubtedly true statement that most people do not know what the money supply--let alone its expectation--is, and thus that they base expectations on the actual behavior of the relevant variable. Adaptive expectations are likely used in routine circumstances when the consequences of error are small and more comprehensively-based expectations at times when there are major changes in policy.

Assuming expectations are rational neutralizes expectations as an independent source of economic dynamics; the implications of alternative expectations assumptions can usefully be investigated if there is reason to believe they are not rational. So can questions of the credibility of announced changes in policy. But rational expectations is the right initial hypothesis.

The Aggregate Supply Curve.

The aggregate supply curve, AS, in Figure 1 is derived from (3) and (4). If the markup is constant and the nominal wage is not a function of the current level of output, the aggregate supply curve is horizontal, as on AS'. If the mark-up and/or the wage increases with the current level of output, the aggregate supply curve is positively sloped, as is AS. We henceforth assume the short-run supply curve is positively sloped.

Held constant along an aggregate supply curve are the expected price level and expected level of output. An increase in either shifts

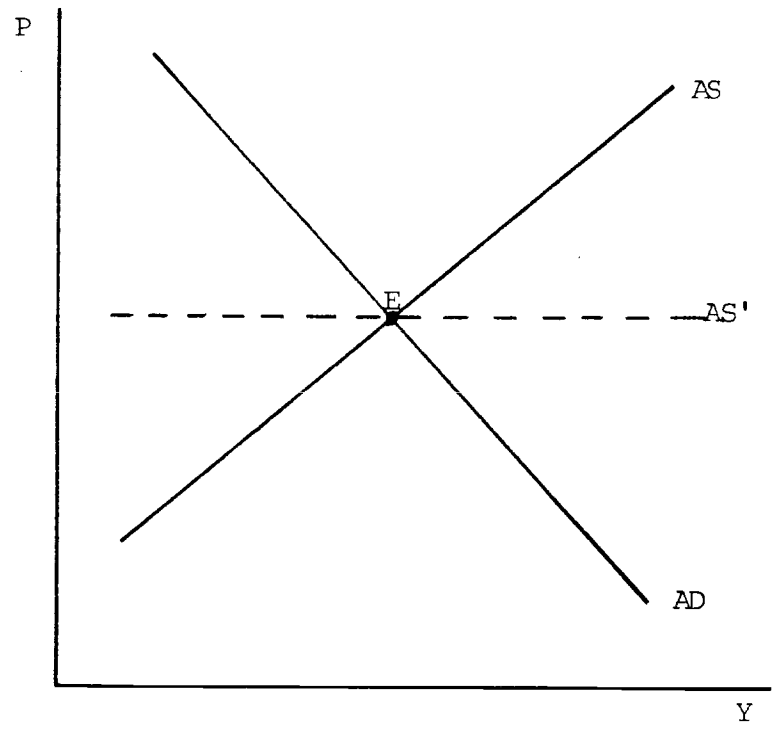

Figure 1.

the aggregate supply curve up, raising price at each level of output. Provided output in equation (4) is a function of the real wage, there is a unique long-run full employment level of output at which the long run aggregate supply curve is vertical.

Aggregate Demand.

The aggregate demand curve AD in Figure 1 represents equilibrium in both the goods and the assets markets. Substituting for the real interest rate in (1) from (2) and the relationship between real and nominal rates, we obtain the AD curve as a relationship between the price level and current level of output; its position depends on the expected rate of inflation, the stock of bonds, and fiscal policy parameters. In calculating the slope of the AD curve we assume permanent income increases, but not much, with current income.[19]

The negative slope of the AD curve reflects both the so-called Hicks-Keynes effect that arises from the increase in the nominal interest rate (and with expected inflation held constant, the real rate of interest) as real balances fall, and the wealth effect of an increase in prices on the real value of wealth. The Hicks-Keynes effect is sufficient to produce AD's negative slope.

An increase in the expected rate of inflation, or government spending, or a reduction in taxes, shifts the AD curve up and to the right, increasing output and the price level. An increase in the stock of high-powered money or government bonds likewise shifts the AD curve

---

[19] For the AD curve to slope down, the total effect of a unit increase in current income on aggregate demand, operating on consumption both directly and through permanent income, and on investment through the accelerator has to be less than unity.

to the right. We discuss later the question of whether bonds are net wealth. An equiproportionate increase in the stocks of money and bonds shifts the AD curve up proportionately, indicating the potential neutrality of such a policy change.

Equilibrium.

Output and the price level are determined at point E in Figure 1. We describe E as a position of short-run equilibrium, though the expectations on which wages were determined may be falsified. If either the price level or the level of output is different from the level that was expected, the quantity of labor employed will not be equal to the quantity workers would prefer to supply. Point E can be a position of long-run equilibrium only if workers' expectations are fulfilled, if the budget is balanced, and if the remaining exogenous variables are constant.

We now use the model to analyze a variety of policy changes.

An Open Market Purchase.

An open market purchase increases H while decreasing B by an equal amount. There is no wealth effect at the initial price level. At any given level of income, the larger money stock reduces the interest rate, shifting the aggregate demand curve to the right.

If the change in the money stock was unanticipated, both the level of output and the price level rise in the short run. Then as expectations adjust, the short run supply curve shifts up, and more of the adjustment takes the form of a price increase. Eventually output returns to the full employment level at a higher price level. The real

and nominal interest rates fall because the ratio of money to bonds has risen; the stock of real high powered money increases, implying that prices rise proportionately less than the money stock.

Because the open market purchase reduces the public's holdings of bonds, disposable income would fall unless there were an offsetting reduction in net taxes, which we therefore assume to have been made. In addition, the lower real interest rate increases the rate of investment, implying the full employment level of output rises relative to what it would otherwise have been. We do not take explicit account of this effect of the monetary change.

Fiscal Expansion in the Short Run.

Suppose the government increases spending and reduces taxes; the change has not been anticipated in wage setting. Both the tax reduction and the increase in spending raise aggregate demand; if the expected rate of inflation remains unchanged or rises, the price level and level of output will rise. Again provided the expected rate of inflation does not fall, and if wealth effects on the demand for consumption and real balances are small, both the real and the nominal interest rates will increase. The analysis is entirely that of the conventional IS-LM model, except for the need to consider the effects of the fiscal expansion on the expected rate of inflation.

Except when fiscal policy takes the form of balanced budget changes in expenditure, fiscal expansion implies subsequent changes in the stocks of money and bonds. If the fiscal policy change is transitory, there need be only one-time changes in asset stocks; if the

change is permanent there will be ongoing changes in asset stocks. We consider permanent fiscal changes.

Money-Financed Deficits.

Suppose there was initially no government debt and that after the fiscal expansion, high-powered money is printed to cover the deficit. In the new steady state, and absent growth of output, the growth rate of money and the inflation rate will both be θ where θ satisfies

(6) $\theta.(H/P) = G - T.$

Permanent money financing of deficits is possible only if the deficit is small, for the maximum amount of steady state seigniorage is small.

The goods market equilibrium condition can be rewritten

(7) $Y = A(Y^p, L(Y, r+\theta, V) + K, r, G, T)$

The fiscal expansion--the increase in G and reduction in T--tend to increase the real interest rate at the full employment level of output. Offsetting that effect is the reduction in real balances that arises from the increase in the expected rate of inflation. But if the wealth effect of reduced high-powered money holdings on consumption demand is small--as it is--the real interest rate will increase to maintain goods market equilibrium in the long run. With the real interest rate higher, the nominal rate too must rise.

Thus permanent fiscal expansion, even if it is money financed, raises the real interest rate in both the short and the long runs. This conclusion would be changed if individuals were infinite horizon maximizers with a constant rate of time preference: in that case saving

behavior adjusts so that the real after-tax interest rate is always driven to the rate of time preference. The real interest rate could be changed in the long run in such models only through taxation of the return on capital.

Bond Financing of Deficits.

Pure bond financing of deficits is not possible in the steady state in a non-growing economy. Holding the stock of nominal balances constant, the government budget constraint is

$$(8)\quad B_{t+1}/P_t = G_t - T_t + (1+i_t)(B_t/P_t)$$

If interest payments are not included in T (net taxes minus transfers), or if the non-interest deficit does not for any other reason decrease as the stock of bonds increases, then (8) is an unstable equation provided the real interest rate is positive; the simple notion that ever-increasing interest payments overwhelm the budget is true in this case.[20] Even if the budget deficit is defined inclusive of real interest payments, there can be no steady state unless the deficit is zero.[21]

---

[20] Rewriting the left hand side as $(B_{t+1}/P_{t+1})(P_{t+1}/P_t)$ and dividing through by (P_{t+1}/P_t) the coefficient on the real stock of bonds on the right hand side becomes the real interest rate. The effect of (P_{t+1}/P_t) in reducing the real value of G - T on the right hand side is an artifact of discrete time and should be ignored. Modification of this equation to the case of a growing economy is straightforward.

[21] If the budget deficit is defined inclusive of nominal interest payments on the debt, then equation (8) appears to make possible a steady state with positive deficit. But (a) this is purely a result of an inflation illusion in fiscal policy, in which non-interest transfer payments are reduced as the debt increases and (b) there will be a steady state only if the stock of money is increasing at the same rate as the nominal stock of debt.

Although pure debt financing of a deficit is not possible in steady state in a non-growing economy, mixed money and debt financing of small deficits is possible: essentially the seigniorage pays the interest bill on the outstanding stock of debt as well as covering the deficit. This is one sense in which Sargent and Wallace's (1980) argument that deficit financing is inflationary is correct. Similarly, transitory debt financing of a deficit will leave a larger debt and larger interest payments than money financing, so that eventually a higher inflation rate will be needed to finance the larger interest-inclusive deficit.

The contrast between the short run discussed in the previous section and the long run in this section is very sharp. In the short run debt financing probably raises the price level less than money financing; in the long run it does not. Equivalently, short term debt financing of a transitory deficit, with all future interest-inclusive deficits held constant, raises the price level less than money financing of the same deficit.[22]

Bonds and Net Wealth

The long-run non-neutrality of money when the ratio of money to bonds is changed results from the assumption that government bonds are net wealth. The assumption that bonds are net wealth was discussed by Patinkin (1963) who recognized that the issue was whether individuals in aggregate regarded themselves as having a future tax liability with

---

[22]This implies that future net taxes are increased to offset the effects of higher interest payments resulting from the transitory debt financed deficit.

present value equal to that of the debt. If the debt was to be paid off by future generations, the logical assumption seemed to be that the debt was net wealth. Barro's (1974) contribution to the debate was the recognition that finitely lived individuals could nonetheless have effectively infinite horizons if they cared in a particular way about their heirs' utility. In this case the debt would not be wealth.[23]

The issue turns out to be surprisingly far-reaching. For instance, does the pay as you go nature of social security affect capital accumulation? Is the national debt a burden in the Modigliani (1960) sense that it leaves future generations with a smaller capital stock? Does deficit rather than tax financing raise the real interest rate? In all cases the answer turns on the same considerations as whether the debt is wealth.[24]

Further, if individuals act as if they are infinitely lived, the life-cycle hypothesis of consumption has to be significantly modified to include the making of bequests. Indeed, recent research by Kotlikoff and Summers (1981) argues that most wealth is the result not of life-cycle saving, but of bequests.

---

[23]The question arises whether the government can keep rolling over the debt rather than paying it off. The rolling over strategy is possible only if the growth rate of population exceeds the real interest rate, in which case the equilibrium is inefficient. When the equilibrium is efficient, a transversality condition for the government debt in effect implies that the debt is paid off.

[24]That is, provided individuals are not liquidity constrained. Liquidity constraints dominate the issue of Ricardian equivalence in the sense that with liqudity constraints, flows of current income affect aggregate demand whether or not individuals would treat the debt as wealth if they were not constrained.

Despite the importance of the issue, there have been no empirical tests sufficiently decisive to move prior beliefs about the issue.[25] The Ricardo-Barro hypothesis implies that private consumption should be invariant to the financing of government spending; private saving should thus rise when the budget deficit increases. Neither this implication of the hypothesis or its opposite, nor the effects of social security on savings, have yet been convincingly established econometrically. Those willing to accept more casual evidence point to reductions in private saving rates and increases in real interest rates as budget deficits have increased since 1981 as prima facie evidence against the hypothesis.

Tobin and Buiter (1981) have shown that childlessness, zero bequests, and a variety of other likely events cause the failure of the Ricard-Barro mechanism, all in the direction that causes the debt to be treated as net wealth. Drazen (1978) suggests that a national debt overcomes the difficulty for parents of appropriating some of the return from investing in their children's human capital and thereby raises national wealth. Barsky, Mankiw and Zeldes (1984) show that in the absence of human capital insurance, future taxes to repay debt reduce the variance of future income, raising current consumption and thus in effect making the debt net wealth. Abel (1985) shows that with uncertain lifetimes, the debt may be net wealth.

---

[25] Seater (1985) provides a useful review of research on this issue, with references to much of the literature. See also Modigliani and Sterling (1985).

The weight of the theoretical arguments[26] and in my view the empirical evidence suggests the debt is to a significant extent net wealth, but those whose priors are sufficiently strong can continue, at least for the present, to believe it is not. In the remainder of the paper we treat the debt as net wealth, recognizing that in practice future tax liabilities fall to some extent on those now living, and that the debt would thus be discounted to some extent.

The short run effectiveness of monetary policy is not dependent on whether the debt is net wealth. So long as wages and prices are sticky in the short run, monetary policy will have real effects. This is very much the message of Modigliani (1963), who downplays the importance of the long-run non-neutralities of money of the type that arise when the debt is wealth. On the fiscal policy side, the issue of whether the debt is net wealth is crucial to the question of whether a tax cut is expansionary and raises the real interest rate.[27]

The Fisher Relation and the Mundell-Tobin Effect.

Because the 1963 paper was written before persistent inflation became a primary concern of United States macroeconomics, the Fisher relation and its distinction between the real and the nominal interest rates was not discussed.[28]

---

[26] Bernheim and Bagwell (1985) make what they describe as the reductio ad absurdum argument that if all individuals are effectively linked--for instance by the possibility that their descendents might marry each other--then all redistributions have no effects on real resource allocation, being immediately undone by the recipients. Further, tax distortions are non-existent because individuals internalize the operation of the government.

[27] Cf footnote 24.

[28] The Fisher effect is discussed by Friedman (1968).

The pure Fisher effect, in which the real interest rate is invariant to the inflation rate, does not obtain in the current model, even when the nominal stocks of both money and bonds increase at a constant rate. The Mundell-Tobin effect is responsible for the non-neutrality.

Consider the full employment version of the current model in which inflation has been anticipated in wage setting. Suppose for simplicity that the stock of bonds is zero, and that the growth rate of money has increased from zero to some positive rate. The money enters the economy through transfer payments, but there is an offsetting reduction in disposable income arising from capital losses on existing holdings of money.

Real balances will be constant in the new steady state. Suppose for the moment that the real interest rate remained unchanged, with the nominal interest rate increasing one for one with the inflation. Then real balances would be reduced. But this means the goods market cannot be in equilibrium, because aggregate demand is reduced below supply. The real interest rate has to fall to maintain equilibrium, the final result being an increase in the nominal and a reduction in the real interest rate. Because the real high powered money stock is small, though, this non-neutrality is likely to be empirically unimportant in the long run.[29] Tax distortions of the type emphasized by Feldstein (1983) are potentially a more important source of non-Fisher results.

---

[29]The mechanism that has been described here is that of Mundell (1964). The Tobin (1965) non-neutrality of inflation arises from the assumption that individuals consume a constant fraction of disposable income, which includes the value of net (inflation adjusted) transfer payments. In a growing economy, the value of these net transfer payments includes a term $g.m$ where g is the growth rate of the economy and m is the value of real balances. With m falling with the rate of inflation, consumption at a given level of output will fall when the inflation rate rises, producing the same effect on aggregate demand as that in the text.

Perhaps the most interesting Fisher-related result is the claimed rejection of the Fisher effect by Summers (1982). Summers, working with decadal averages, finds almost no relationship between the nominal interest rate and the inflation rate. He interprets this as showing that even in the long run the nominal interest rate barely changes with the expected inflation rate, thus going well beyond Irving Fisher's claim that it takes decades for the Fisher neutrality to obtain.[30]

The question of the Fisher effect is still open though. Barsky (1985) argues that the price level in the ineteenth century essentially followed a random walk, so that the ex ante nominal and real rates were the same; he also shows that the differences in decade average real rates are not significant. Further, controversy still obtains (McCallum (1984) and Summers (1984)) over whether working with data averaged over long periods, or with the low frequency end of the spectrum as Summers does in his econometric tests, handles the difficulty of the distinction between actual and anticipated inflation.

II. Opening the Economy..

---

[30]The early Fama result (1975) of constancy of the real interest rate appeared even then to be a result peculiar to the period of the regression; after the real interest rate changes of the early eighties, any notion of even approximate real interest rate constancy must be rejected.

In 1944 it was certainly reasonable for the basic model of U.S. macroeconomics to represent a closed economy.[31] Even in 1963 when balance of payments concerns were serious, recognizing the openness of the economy would not have required much change in the basic model. With the nominal exchange rate fixed and the price level assumed constant, the real exchange rate in an open economy version of the 1963 model would have been constant and the current account a simple function of the level of income. With capital flows relatively insignificant, the current account could be taken as the driving force in international transactions.

In 1985 international transactions play a larger role in determining the behavior of the U.S. economy. Supply shocks that originated abroad were instrumental in the two inflationary episodes of the seventies; the volume of trade has more than doubled as a percentage of GNP in the last twenty years; the gap between domestic absorption and output amounts at present to several percent of GNP. Under flexible exchange rates and substantial capital mobility, monetary and fiscal policy affect the nominal exchange rate quickly and, because domestic prices are sticky, also affect the real exchange rate and resource allocation.[32] Monetary policy changes, such as the ill fated late 1978

---

[31] Keynes' own use of a closed economy model of Britain has frequently been criticized. It is not obvious what features of the Keynesian message would have been changed by recognizing the openness of the British economy: government spending and tax cuts are still expansionary in an open economy, as is an increase in the money supply unless the economy is in a liquidity trap.

[32] Dornbusch and Fischer (1984) contains an extended discussion of international linkages of the U.S. economy and presents an open economy model on which I draw.

contraction, and the October 1979 "regime change" can be triggered by concern over the dollar. No modern forecaster of inflation can ignore the dollar.

The exchange rate directly affects both goods and assets market equilibria, and the aggregate supply or markup equation. In the goods market:

(1)" $Y = A(Yp, V, r, G, T, e/P)$

V is real wealth. The variable P now denotes the consumer price index. The variable q will be used to denote the price of domestic output.33

The money demand equation remains unchanged, though there is an issue of whether the price of domestic output or the CPI, or some combination, should be the deflator for real balances. The asset market equilibrium condition has to be extended because domestic residents can now hold an extra asset--foreign bonds. The simplest, risk neutral, assumption is that expected returns on domestic and foreign bonds are equalized. If i* is the foreign interest rate, then

(9) $i = i^* + \underline{e}$

where $\underline{e}$ is the expected rate of change of the exchange rate. Attempts to locate a risk premium in the relationship between domestic and foreign rates, perhaps as a function of the outstanding stocks of the assets (Frankel, 1982) have not been successful. We thus will use (9),

---

33 Denoting the price of domestic output by q, and setting the price of foreign goods at unity, the CPI can be written

$P = q^s e^{1-s}$; the relative price of foreign goods is then

$e/q = (e/P)^{1/s}$; thus e/P in (1)" represents the price of foreign relative to domestic goods.

together with the assumption that the foreign interest rate is given, as the portfolio equilibrium condition linking domestic and foreign interest rates.[34]

The price of domestic output, q, depends not only on wages and output but also on the exchange rate:

$$q = H(W, Y, e)$$

An increase in e is a depreciation of the exchange rate that increases the price of domestic output. Using the definition of the CPI as a weighted average of the price of domestic output and the exchange rate, the pricing equation can be rewritten as:

$$(10)\quad P = h(W, Y, e).$$

Net wealth now consists not only of high-powered money, bonds and capital, but also net ownership of foreign securities, F. Foreign asset accumulation is equal to the current account surplus:

$$(11)\quad V = ((M+B)/P) + K + eF/P$$

$$(12)\quad e_{t(Ft+1-Ft)/Pt} = NX(Y, e/P) + eti^*(Ft/Pt)$$

The analysis of monetary and fiscal policy is essentially that of the Mundell-Fleming model.

An Open Market Purchase.

Suppose the economy starts from a position of equilibrium and that an open market purchase takes place. The domestic interest rate

---

[34] Although there is no compelling evidence for risk premia, there is also no evidence that suggests the forecast implicit in (9) is a good one. See for example Cumby and Obstfeld (1984).

tends to fall, output and the price level to rise. Assuming the open market purchase is a once over event, with budgetary implications neutralized by offsetting changes in taxes, the domestic price level will be expected to rise further next period as wages adjust.

With the domestic nominal interest rate lower, international interest rate equalization implies that the exchange rate has to be expected to fall next period. The real exchange rate therefore depreciates (rises) this period (Dornbusch, 1976). Equivalently, the lower domestic interest rate produces a capital outflow that causes the exchange rate to depreciate. The depreciation increases the inflationary effect of the expansionary monetary policy; to the extent that the trade balance responds in the short run to the exchange rate, the exchange rate effect also increases aggregate demand.

In the longer term as prices adjust fully the exchange rate returns close to its initial level. The increase in the ownership of foreign assets during the adjustment period implies a capital inflow in future years, requiring a slightly appreciated future exchange rate.

Fiscal Expansion

Expansionary fiscal policy tends to increase the domestic interest rate and appreciate (reduce) the exchange rate. The inflationary impact of the expansion is modified by the exchange rate appreciation. Both domestic investment and net exports are crowded out. The decline in ownership of foreign securities during the adjustment periods requires a slightly depreciated exchange rate in future to

generate the current account surplus to pay the interest on the foreign borrowing.

Recognition of the openness of the economy thus modifies the analysis of monetary and fiscal policy. For a given increase in nominal aggregate demand, a monetary expansion is more inflationary and a fiscal expansion less inflationary in the short run than they would be in the closed economy. Empirical estimates suggest the differential effects are not mere theoretical niceties, but are rather empirically significant and to be taken account of in the choice of policy, for instance during a process of disinflation.[35]

III. Concluding Comments.

None of us has not heard the joke about the unchanging questions and the changing answers in economics exams. Contrary to the joke, the basic answers in this paper to how monetary and fiscal policy work are close to those of the earlier papers. But it is only the basic answers to the question of whether changes in monetary and fiscal policy have real effects that are unchanged. The modern answers differ in placing much greater emphasis on expectations, on stock-flow relations, on the openness of the economy, and in the modelling of aggregate supply. They differ also because they are less certain than they were then, and they command less consensus within the profession.

---

[35] Dornbusch and Fischer (1984), Sachs (1985); Fischer (1985) discusses the effects of exchange rate appreciation on the costs of disinflation.

Part of the loss of certainty arises from the complexity of dynamics in model even as simple as the present ones[36]: serious macroeconomics that attempts to describe the behavior of the economy rather than illustrate particular points may no longer be possible with just pen and paper, but may rather need more powerful technology. Certainly analysis of the adjustment of the economy to disturbances or policy changes to be used in actual policy making is bound to use a more detailed model than can be solved explicitly. The dynamic properties of the major econometric models, or of maximizing models such as those of Kydland and Prescott (1982), can be understood by means of simulations, but not from analytic exercises. It could be argued that the right way to do macroeconomics is to study the detailed structure of such models and to develop understanding of how they work through a variety of simulation exercises. That is the only way to understand a particular large-scale model; the purpose of simpler models like those in this paper is to develop a sense of the overall structure of the economy and intuition about its working.

The loss of assurance is best explained by asking what view was being contested in the 1944, 1963, and 1985 papers. In 1944 Franco Modigliani was contesting Keynes' claim to have produced an unemployment equilibrium and analyzing Keynesian interest rate theory. In 1963 he was contesting the Gurley-Shaw-Radcliffe view that the basic model would be significantly altered by including financial intermediation, and the

---

[36]For instance, the analysis of the open economy model in Section II did not pursue the dynamics of foreign and domestic debt accumulation in detail; the analysis of Section I did not pursue the dynamics of capital accumulation.

Patinkin emphasis on equilibrium non-neutralities. The 1985 paper implicitly contests the views of the rational expectations-market equilibrium school that anticipated changes in money have no real effects and that the only significant fiscal variables are government spending and the micro-structure of tax rates.[37]

Two factors are responsible for the loss of mainstream self-assurance. The first is empirical. Lucas and Sargent (1978) emphasize the inconsistency of the 1970's inflation with 1960's vintage Phillips curves. But the expectations-augmented Phillips curve was rapidly assimilated into the mainstream and has stood up well from the early 1970s to the present. The deeper reason for unease is that significant components of the mainstream model have had empirical difficulties, in different ways. The demand function for money has shifted. The investment function refuses to conform to neoclassical theory. The consumption function shows more sensitivity than it should to current income. There is no consolation in these difficulties for competing schools in macroeconomics, for none has produced empirically superior formulations.

The second factor responsible for the loss of mainstream self-assurance and lack of consensus within the profession is the theoretical depth of the rational expectations-equilibrium attack. The models analyzed in this paper are not fully based on maximization--the wage and price setting assumptions in particular are ad hoc.[38] Progress in

---

[37] Modigliani (1977) directly confronts those views.

[38] The use of "ad hoc" as a term of derision makes the point; ad hoc could also be interpreted as fulfilment of the terms of Occam's Razor.

repairing that weakness is being made by many of those cited in the introduction. But until and unless a new model appears that both satisfies the critical standards of the best theorists and is consistent with the behavior of the macroeconomy, macroeconomics will continue to be faced with a tradeoff between theoretical purity and relevance. That will be the macroeconomist's burden for a long time.

As a master macroeconomist, Franco Modigliani has shown the ability to live creatively with that tension.

BIBLIOGRAPHY.

Abel, Andrew B, 1984. "Bequests and social security with uncertain lifetimes", National Bureau of Economic Research Working Paper # 1372.

Aiyagari, S. Rao and Mark Gertler, 1985. "The backing of government bonds and monetarism", Journal of Monetary Economics, 16, 1 (July), 19-44.

Akerlof, George and Janet Yellen, 1984. "A near rational model of the business cycle with wage and price inertia", mimeo, Berkeley.

Azariadis, Costas, 1975. "Implicit contracts and underemployment equilibria", Journal of Political Economy, 83, 6 (Dec.), 1183-1202.

Backus, David and E.J. Driffill, 1985. "Inflation and reputation", American Economic Review, 75, 3 (June), 530-538.

Baily, Martin N. 1974. "Wages and employment under uncertain demand", Review of Economic Studies, 41, 1 (Jan.), 37-50.

Barro, Robert J. 1972. "A theory of monopolistic price adjustment", Review of Economic Studies, 39, 1 (Jan.), 17-26.

---------, 1974. "Are government bonds net wealth?", Journal of Political Economy, 82, 6 (Nov/Dec), 1095-1118.

---------, 1977. "On long term contracting, sticky prices and monetary policy", Journal of Monetary Economics, 3, 3 (July), 305-316.

-------- and David Gordon, 1983. "A positive theory of monetary policy in a natural rate model", Journal of Political Economy, 91, 4 (Aug), 589-610.

------- and Herschel Grossman, 1976. Money, employment and inflation, Cambridge University Press.

Barksy, Robert, 1985. "Tests of the Fisher hypothesis and the forecastability of inflation under alternative monetary regimes", Chapter 2, M.I.T. Ph.D. dissertation.

-------, N. Greg Mankiw and Stephen Zeldes, 1984. "Ricardian consumers with Keynesian propensities", National Bureau of Economic Research working paper #1400.

Benassy, Jean-Pascal, 1982. The economics of market disequilibrium, Academic Press.

Bernheim, Douglas and Kyle Bagwell, 1985. "Is everything neutral? The implications of intergenerational altruism in an overlapping generations model with altruism", mimeo, Stanford.

Blanchard, Olivier, 1983. "Price asynchronization and price level inertia", in R. Dornbusch and M. Simonsen, eds, Inflation, debt, and indexation, MIT Press.

--------, 1983a. "The production and inventory behavior of the American automobile industry", Journal of Political Economy, 91, 3 (June), 365-400.

-------, 1985. "Monopolistic competition, small menu costs and real effects of nominal money", mimeo, MIT.

-------, 1985a. "Output, prices and wages: an empirical structural investigation", mimeo, Department of Economics, M.I.T.

Blinder, Alan S., 1985. "Credit rationing and effective supply failures", NBER working paper #1619.

Breeden, Douglas, 1979. "An intertemporal asset pricing model with stochastic consumption and investment opportunities", Journal of Financial Economics, 7, (Sept), 265-296.

Caplin, Andrew and Daniel F. Spulber, 1985. "Inflation, menu costs and endogenous price variability", mimeo, Department of Economics, Harvard University.

Clower, Robert, 1965. "The Keynesian counter-revolution: a theoretical appraisal", in F.H. Hahn and F. Brechling, eds, The Theory of Interest Rates, Macmillan.

Cumby, Robert and Maurice Obstfeld, 1984. "International interest-rate and price-level linkages under flexible exchange rates: a review of recent evidence", in John Bilson and Richard Marston, eds, Exchange Rate Theory and Practice, University of Chicago Press.

Diamond, Peter A., 1965. "National debt in a neoclassical growth model", American Economic Review, 55, 5 (Dec), 1126-1150.

Dornbusch, Rudiger, 1976. "Expectations and exchange rate dynamics", Journal of Political Economy, 84, 6 (Dec), 1161-1176.

------- and Stanley Fischer, 1984. "The open economy: implications for monetary and fiscal policy", NBER Working Paper # 1422

Drazen, Allan, 1978. "Government debt, human capital, and bequests in a life-cycle model", Journal of Political Economy, 86, 3 (June) 505-516.

Eichenbaum, Martin, 1983. "A rational expectations equilibrium model of inventories of finished goods and employment", Journal of Monetary Economics, 12, 2 (Aug), 259-278.

Fama, Eugene F., 1970. "Efficient capital markets: a review of theory and empirical work", Journal of Finance, 25, 383-417.

---------, 1975. "Short-term interest rates as predictors of inflation", American Economic Review, 65, 3 (June), 269-282.

Feldstein, Martin, 1983. Inflation, tax rules, and capital formation, University of Chicago Press.

Fischer, Stanley, 1977. "Long term contracts, rational expectations, and the optimal money supply rule", Journal of Political Economy, 85, 1 (Feb), 191-205.

-------- 1985. "Real balances, the exchange rate and indexation: real variables in disinflation", mimeo, MIT.

Flavin, Marjorie A., 1981. "The adjustment of consumption to changing expectations about future income", Journal of Political Economy, 89, 5 (Oct), 974-1009.

Friedman, Benjamin M. 1983 "The roles of money and credit in macroeconomic analysis", in J. Tobin ed, Macroeconomics, prices and quantities, Brookings Institution.

Friedman, Milton, 1968. "The role of monetary policy", American Economic Review, 78, 1 (March), 1-17.

----------, 1970. "A theoretical framework for monetary analysis", Journal of Political Economy, 78, 2 (March/April), 193-238.

Grandmont, Jean-Michel 1985. "On endogeneous competitive business cycles", Econometrica, forthcoming

Grossman, Herschel I., 1983. "The natural rate hypothesis, the rational-expectations hypothesis, and the remarkable survival of non-market clearing assumptions", in Carnegie-Rochester Conference Series on Public Policy, Vol. 19, Variability in Employment, Prices, and Money.

Hall, Robert E., 1978. "Stochastic implications of the life cycle-permanent income hypothesis: theory and evidence", Journal of Political Economy, 86, 6 (Dec), 971-987.

--------- and Edward Lazear, 1984. "The excess sensitivity of layoffs and quits to demand", Journal of Labor Economics, 2, 233-257.

------- and Frederic S. Mishkin, 1982. "The sensitivity of consumption to transitory income--estimates from panel data on households", Econometrica, 50, 2 (March), 461-481.

Hansen, Lars P. and Kenneth Singleton, 1983. "Stochastic consumption, risk aversion, and the temporal behavior of asset returns", Journal of Political Economy, 91, 2 (April), 249-265.

Hart, Oliver, (1983). "Optimal labour contracts under asymmetric information, an introduction", Review of Economic Studies, 50, 1 (Jan), 3-35.

Jaffee, Dwight M. and Thomas Russell, 1976. "Imperfect information, uncertainty, and credit rationing", Quarterly Journal of Economics, 90, 4 (Nov), 651-666.

Keeton, William, 1979. Equilibrium credit rationing, Garland Publishers.

Kotlikoff, Laurence J. and Lawrence H. Summers, 1981. "The role of intergenerational transfers in aggregate capital accumulation", Journal of Political Economy, 89, 4 (Aug), 706-732.

Kydland, Finn E. and Edward C. Prescott, 1977. "Rules rather than discretion--the inconsistency of optimal plans", Journal of Political Economy, 85, 3 (June), 473-491.

----------, 1982. "Time to build and aggregate fluctuations", Econometrica, 50, 6 (Nov), 1345-1370.

Lange, Oskar, 1942. "Say's law: a restatement and criticism", in O. Lange ed, Studies in mathematical economics and econometrics, University of Chicago Press.

Leroy, Stephan F. and Richard D. Porter, 1981. "The present value relation: tests based on implied variance bounds", Econometrica, 49, 3 (May), 555-574.

Lucas, Robert E., 1972. "Expectations and the neutrality of money", Journal of Economic Theory, 4, 2 (April), 103-124.

--------, 1973. "Some international evidence on output-inflation tradeoffs", American Economic Review, 63, 3 (Sept), 326-344.

------- and Thomas Sargent, 1978. "After Keynesian macroeconomics", in After the Phillips curve: persistence of high inflation and high unemployment, Conference Series # 19, Federal Reserve Bank of Boston.

McCallum, Bennett T., 1984. "On low-frequency estimates of long-run relationships in macroeconomics", Journal of Monetary Economics, 14, 1 (July), 3-14.

McDonald, Ian M. and Robert M. Solow, 1981. "Wage bargaining and employment", American Economic Review, 71, 5 (Dec), 896-908.

Mankiw, N. Gregory, 1985. "Small menu costs and large business cycles: a macroeconomic model of monopoly", Quarterly Journal of Economics, 100, 2 (Nov), 529-538.

--------, Julio Rotemberg and Lawrence Summers, 1985. "Intertemporal substitution in macroeconomics", Quarterly Journal of Economics, 100, 1 (Feb), 225-251.

Marsh, Terry A. and Robert C. Merton, 1985. "Dividend variability and variance bounds tests for the rationality of stock market prices", Sloan School of Management Working Paper # 1584-84.

Merton, Robert C., 1973. "An intertemporal capital asset pricing model", Econometrica, 41, 5 (Sept), 867-888.

Mishkin, Frederic S., 1983. A rational expectations approach to macroeconomics, University of Chicago Press.

Modigliani, Franco, 1980. The Collected Scientific Papers of Franco Modigliani, Andrew Abel (ed), Vols. I, II, and III, MIT Press.

--------, 1944. "Liquidity preference and the theory of interest and money", Econometrica, 12,1 (Jan), 45-88.

-------, 1961. "Long-run implications of alternative fiscal policies and the burden of the national debt", Economic Journal, 71, 4 (Dec), 730-755.

--------, 1963. "The monetary mechanism and its interaction with real phenomena", Review of Economics and Statistics, 45, 1 (Feb), 79-107.

--------, 1971. "Monetary policy and consumption linkages via interest rate and wealth effects in the FMP model", Consumer Spending and Monetary Policy: The Linkages, Conference Series #5, Federal Reserve Bank of Boston.

--------, 1977. "The monetarist controversy, or should we forsake stabilization policies?, American Economic Review, 67, 1 (March), 1-19.

------- and Arlie Sterling, 1985. "Government debt, government spending and private sector behavior: a comment", mimeo, Sloan School of Management, M.I.T.

Mundell, Robert A., 1964. "Inflation, saving, and the real rate of interest", Journal of Political Economy, 71, 3 (June), 280-283.

--------, 1964a. "Some subtleties in the interpretation of Keynesian equilibrium", Weltwirtschaftliches Archiv,

Neary, J. Peter, and Joseph E. Stiglitz, 1983. "Toward a reconstruction of Keynesian economics; expectations and constrained equilibria", Quarterly Journal of Economics, 98 (Supplement), 199-228.

Patinkin, Don, 1965. Money, Interest, and Prices, 2nd ed., Harper and Row.

Phelps, Edmund S. and John B. Taylor, 1977. "Stabilizing powers of monetary policy under rational expectations", Journal of Political Economy, 85, 1 (Feb), 163-190.

Policano, Andrew J., 1985. "The current state of macroeconomics; a view from the textbooks", Journal of Monetary Economics, 15, 3 (May), 389-398.

Rogoff, Kenneth, 1983. "The optimal degree of commitment to an intermediate monetary target", mimeo, University of Wisconsin.

Rose, Andrew K., 1985. "The autoregressivity paradox in macroeconomics: implications for simultaneity, equilibrium, and the business cycle", mimeo, MIT.

Rotemberg, Julio J., 1982. "Sticky prices in the United States", Journal of Political Economy, 90, 6 (Dec), 1187-1121.

Sachs, Jeffrey D., 1985. "The dollar and the policy mix:1985", Brookings Papers on Economic Activity, 1, 117-186.

Samuelson, Paul A., 1958. "An exact consumption loan model with or without the social contrivance of money", Journal of Political Economy, 66, 6 (Dec), 467-482.

--------, 1965. "Proof that properly anticipated prices fluctuate randomly", Industrial Management Review, 6, 2 (Spring) 41-49.

Sargent, Thomas J., 1978. "Estimation of dynamic labor demand schedules under rational expectations", Journal of Political Economy, 86, 6 (Dec), 1009-1044.

-------- and Neil Wallace, 1975. "'Rational` expectations, the optimal monetary instrument, and the optimal money supply rule", Journal of Political Economy, 83, 2 (April), 241-254.

--------, 1981. "Some simple monetarist arithmetic", Federal Reserve Bank of Minneapolis Quarterly Review, 5 (Fall) 1-17

--------, 1983. "A model of commodity money", Journal of Monetary Economics, 12, 1 (July), 163-188.

Seater, John J., 1985. "Does government debt matter? A review", Journal of Monetary Economics, 16, 1 (July), 121-132.

Shapiro, Matthew D., 1985. "Capital utilization and capital accumulation: theory and evidence", Cowles Foundation Discussion Paper # 736.

Sheshinski, Eytan and Yoram Weiss, 1977. "Inflation and costs of price adjustment", Review of Economic Studies, 44, 2 (June), 287-304.

Shiller, Robert J., 1981. "Do stock prices move too much to be justified by subsequent changes in dividends?", American Economic Review, 71, 3 (June), 421-436.

Singleton, Kenneth J., 1980. "Expectations models of the term structure and implied variance bounds", Journal of Political Economy, 88, 6 (Dec), 1159-1176.

Solow, Robert M. and Joseph E. Stiglitz, 1968. "Output, employment and wages in the short run", Quarterly Journal of Economics, 82, 537-560.

Stiglitz, Joseph E., 1984. "Theories of wage rigidity", NBER Working Paper # 1442.

-------- and Andrew Weiss, 1981. "Credit rationing in markets with imperfect competition", American Economic Review, 71, 3 (June), 393-410.

Summers, Lawrence H., 1982. "The nonadjustment of nominal interest rates: a study of the Fisher effect", in J. Tobin, ed, Macroeconomics, prices and quantities, Brookings Institution.

Summers, Lawrence H., 1985. "Reply to McCallum", forthcoming.

Taylor, John B., 1980. "Aggregate dynamics and staggered contracts", Journal of Political Economy, 88, 1 (Feb), 1-23.

Tinbergen, Jan, 1967. Economic policy; principles and design, Rand McNally.

Tirole, Jean, 1985. "Asset bubbles and overlapping generations: a synthesis", forthcoming, Econometrica.

Tobin, James, 1961. "Money, capital, and other stores of value", American Economic Review, 51, 2 (May), 26-37.

--------, 1965. "Money and economic growth", Econometrica, 33, 4 (Oct), 671-684.

--------, 1969. "A general equilibrium approach to monetary theory", Journal of Money, Credit, and Banking, 1, 1 (Feb), 15-29.

------- and Willem Buiter, 1980. "Fiscal and monetary policies, capital formation, and economic activity", in G. von Furstenberg, ed, The government and capital formation, Ballinger.

Wallace, Neil, 1981. "A Modigliani-Miller theorem for open market operations", American Economic Review, 71, 3 (June), 267-274.