
OLD, NEW AND POST KEYNESIAN PERSPECTIVES ON THE IS-LM FRAMEWORK: A CONTRAST AND EVALUATION

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1.1 INTRODUCTION

The IS-LM framework has been the standard model used for understanding and teaching Keynesian macroeconomics since 1960. Indeed, even a monetarist such as Friedman could subscribe to a modified version of the IS-LM model (1970); Sargent and Wallace (1975) formulated the first New Classical neutrality proposition with an IS-LM model of aggregate demand. The main decisive break from this tradition was Barro's textbook, *Macroeconomics*, whose first edition was 1984. This relegated the IS-LM analysis to an afterthought at the end of the book; the bulk of the textbook was devoted to the market clearing intertemporal equilibrium approach to macroeconomics, which had its origins in the work of Lucas and Rapping (1969). In this paper we trace a brief history of the IS-LM framework, and how it has been reinterpreted over the last few decades by economists of an essentially "Keynesian" viewpoint.

The IS-LM model was developed as a way of understanding Keynes's General Theory. What defines the IS-LM approach? There are two crucial factors:

1. Output is an endogenous variable which is demand-determined.
2. The rate of interest is an endogenous variable, and affects both the demand for goods (investment and possibly consumption) and the demand for money.

The IS-LM model can be viewed either as merely a model of aggregate demand (as in the AD-AS model), in which case (1) becomes the demand for output. Alter-

natively, the IS-LM model can be viewed as a model of the output determination (implicitly including the supply side).

The main driving force behind the reinterpretations of the IS-LM model has been an attempt to provide it with some sort of microfoundations. When Keynes formulated the General Theory and related writings, the relationship between the new macroeconomic approach that he pioneered and traditional microeconomics (price theory or general equilibrium analysis) was unclear. The whole thrust of research in macroeconomics since the Second World War has been to try to integrate our understanding of macroeconomic systems with our understanding of microeconomics.

This paper examines several successive waves in this enterprise: from Hick's original formulation of the IS-LM model, through the work of Hansen and Patinkin to the 1960's textbook (exemplified by Ackley), to the Keynesian reappraisal of the 1960's and the resultant fix-price approach of the 1970's, to New Keynesian economics of the 1980s. Of course, the division of time and people into these compartments is a little false; for example, part of the Keynesian reappraisal was presaged by Patinkin's analysis of quantity constraints in the 1950's. We will not be paying much attention to Monetarist and New Classical thought in all of this. This is not because it is unimportant. Clearly "classical" thought had reemerged by 1980 as the dominant school of macroeconomics in the US. The IS-LM model was always an essentially Keynesian framework, and even when Monetarist or New Classical economists did use it, they did so in the context of a vertical aggregate supply curve so that the classical dichotomy held.

What are our general conclusions? We believe that the IS-LM model has become a largely irrelevant framework in mainstream macroeconomics. Modern reinterpretations of the theory of effective demand have tended to concentrate on quantity constraints of one kind or another: either in the output market (menu costs), the labor market (involuntary unemployment and efficiency wages), or the credit market (liquidity constraints). The role of the interest rate has become very unimportant in these treatments. One could argue that the case of the completely interest-inelastic (i.e. vertical) IS curve was always part of the extreme Keynesian character in textbooks. Thus, to a certain extent, the IS-LM model is "dead" as a framework for contemporary macroeconomic research.

1.2 THE ORIGINS OF THE IS-LM MODEL

The IS-LM model emerged out Hicks's paper, 'Mr. Keynes and the "Classics": a suggested interpretation', published in *Econometrica* in April 1937.¹ Hicks's paper had originally been presented at a symposium on Keynes's General Theory held at the Sixth European meeting of the Econometric Society in Oxford in September 1936. The symposium consisted of three papers by Harrod (1937), Meade (1937) and Hicks. All three papers sought to clarify Keynes's departure from prevailing classical theory. The three papers presented broadly similar algebraic expositions of Keynes's theory but only Hicks illustrated his arguments with a set of diagrams. These diagrams were eventually developed into the IS-LM model.

Hicks's paper was motivated by a concern to overcome the bewilderment of many readers of Keynes's General Theory caused in part by Keynes's use of Pigou's *The Theory of Unemployment* as typical of classical theory. Hicks considered Pigou's book to be 'fairly new' and 'exceedingly difficult'. Thus Hicks presented a simpler form of classical theory which was more typical and directly comparable with Keynes's own theory.

Hicks set up a common framework within which to compare different variants of both classical theory and Keynes's theory. This common framework consisted of four simplifying assumptions, a model of the supply-side and the demand-side equilibrium condition. Hicks's four simplifying assumptions are: (i) fixed capital stock; (ii) homogeneous labor; (iii) no depreciation; and (iv) fixed money-wage rate. The model of the supply-side is a conventional profit-maximizing model in which price is equated to marginal cost in both the consumption-goods industry and the investment-goods industry. It follows that, given the money-wage rate, the level of output and employment is determined by demand-side conditions. Assuming that the money supply is fixed, the determination of the demand-side equilibrium depends on the form of the three aggregate demand-side functions: the demand-for-money function, the investment function and the saving function. Thus, from Hicks's perspective, Keynes and the "Classics" differed crucially in their analyses of the form of these three aggregate demand-side functions. Hicks examined these differences by means of five models of the demand-side presented in Table 1 below.

Model 1 is Hicks's representation of the typical classical theory. The Cambridge quantity equation, $M = kY$, implies that the quantity of money determines money income. As Hicks noted, it follows that cyclical fluctuations in money income can only be explained by changes in the money supply and/or changes in k . Given that the quantity of money determines money income, the rate of interest becomes a purely goods-market phenomenon, ensuring that investment and saving are brought into equilibrium. This is the loanable funds theory of the rate of interest.

Model 2 is a variant of the classical theory, which Hicks termed the Treasury View. The Treasury View includes one element of Keynes's theory, namely, that saving is perfectly interest-inelastic. When combined with the Cambridge quantity equation, it follows that the quantity of money determines saving and, hence, investment. The rate of interest acts as the rationing device reconciling the level of

Table 1: Hicks's five models of the demand-side.

Model	Demand for Money	Investment	Saving
1. Classical Theory	$M = kY$	$I = I(r)$	$S = S(r, Y)$
2. Treasury View	$M = kY$	$I = I(r)$	$S = S(Y)$
3. Keynes's Special Theory	$M = L(r)$	$I = I(r)$	$S = S(Y)$
4. Keynes's General Theory	$M = L(r, Y)$	$I = I(r)$	$S = S(Y)$
5. Generalised General Theory	$M = L(r, Y)$	$I = I(r, Y)$	$S = S(r, Y)$

where $M \equiv$ money supply, $L(\cdot) \equiv$ demand-for-money function, $k \equiv$ constant (the so-called Cambridge 'k'), $I \equiv$ investment, $S \equiv$ saving, $r \equiv$ rate of interest and $Y \equiv$ money income.

investment with the pre-determined level of saving. This theory underpinned the Treasury View that crowding-out is complete; deficit-financed public works programs would displace an equal amount of private investment given the available fixed amount of saving.

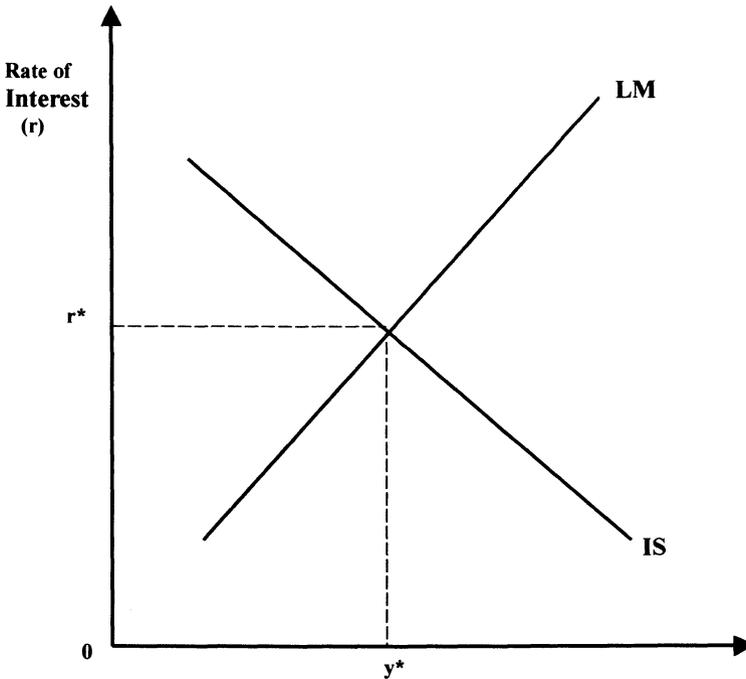
Model 3 is Keynes's special theory. As with the Treasury View, saving is perfectly interest-inelastic. However, unlike the two classical models, the Cambridge quantity equation is dropped. Instead liquidity preference is introduced such that the demand for money depends only on the rate of interest. In this restricted version of Keynes's theory, the rate of interest becomes a purely money-market phenomenon, ensuring equilibrium between money demand and supply. The rate of interest is no longer affected by either investment or saving. Given the equilibrium rate of interest, investment is determined by the marginal-efficiency-of-capital (MEC) schedule and, in turn, money income is determined by the multiplier (i.e. the saving function). Thus it is the introduction of liquidity preference in place of the Cambridge quantity equation, which is the key innovation of Keynes since this is the necessary condition for income to be determined by goods-market conditions via the multiplier process. However, as Hicks pointed out, liquidity preference was not Keynes's innovation. Both Lavington and Pigou had conceived of the demand for money depending on the rate of interest. Rather Keynes's contribution was to be the first to recognize the important macroeconomic implications of liquidity preference.

Model 4 is the more general form of Keynes's theory in which the demand for money depends on both money income and the rate of interest. The implication is that money income and the rate of interest are determined simultaneously by both goods-market and money-market conditions. It is at this point that Hicks had recourse to a diagram (see Figure 1). He represented the goods-market equilibrium condition, $I(r) = S(Y)$, by a downward-sloping IS curve. The money-market equilibrium condition, $M = L(r, Y)$, is represented by an upward-sloping LM curve (denote as the LL curve in Hicks's original paper). Together these two curves determine the equilibrium level of money income, Y^* , and the equilibrium rate of interest, r^* .

Hicks viewed Keynes as having taken 'a big step back to Marshallian orthodoxy' by incorporating traditional classical elements (i.e. the quantity theory and the loanable funds theory) within his new theory of liquidity preference and the multiplier. Ultimately Hicks considered the crucial difference between Keynes and the "Classics" as their respective views on the slope of the LM curve. Indeed, as Hicks illustrated diagrammatically, Keynes and the "Classics" could be seen as analyzing the opposite extremes of the same LM curve. Keynes's General Theory is the 'Economics of Depression' appropriate at low levels of income when liquidity preference dominates the determination of the rate of interest and the multiplier dominates the determination of money income (i.e. the LM curve is relatively flat). Classical theory, on the other hand, is appropriate at high levels of income when the quantity of money dominates the determination of money income and goods-market conditions dominate the determination of the rate of interest (i.e. the LM curve is relatively steep).

Hicks's argument that Keynes and the "Classics" provide complementary analyses appropriate under different phases of the cycle is reinforced by Model 5, the Generalized General Theory. In this model Hicks considered the possibility that all

Figure 1. The IS-LM model.



three aggregate demand-side functions could be determined by both the rate of interest and money income. The two classical models and Keynes's two models are all restricted cases nested within this more general model. In the context of this more general model Hicks considers various other special cases including the Wicksellian case of a horizontal IS curve at the natural rate of interest, the possibility of an upward-sloping IS curve due to the effects of inflationary expectations on investment, and extending the LM curve to allow for changes in the money supply if the monetary authorities target the rate of interest.

Overall, a re-examination of Hicks's original 1937 paper from which the IS-LM model emerged suggests the following observations. First, Hicks was well aware of the importance of specifying supply-side microfoundations and, indeed, did so before commencing on his IS-LM analysis of the demand-side. Second, Hicks considered the key difference between Keynes and the "Classics" to be liquidity preference, a necessary condition for the multiplier process to determine money income. Third, Hicks viewed Keynes and the "Classics" as complementary analyses, restricted versions of a more general model with the empirical relevance of the different restrictions depending on the phase of the business cycle. Finally, Hicks considered the IS-LM analysis to be limited. It was a 'skeleton apparatus', 'a rough and ready sort of affair'. He acknowledged difficulties in specifying the concept of income as well as the need to introduce the distribution of income in order to render the curves determinate. He also flagged the importance of the timing of the various processes, con-

cluding that the ‘... *General Theory* is a useful book; but it is neither the beginning nor the end of Dynamic Economics.’ (p. 159).

1.3 THE DEVELOPMENT OF IS-LM KEYNESIANISM

Hicks’s exposition of Keynes’s theory was first formulated as the IS-LM model by Alvin Hansen (1949, 1951, 1953). It was largely due to Hansen that the IS-LM model became established in the postwar period as the principal model of the macro economy. Hansen acknowledged Hicks’s contribution in integrating the classical loanable funds theory (the IS curve) and Keynes’s liquidity preference theory (the LM curve) to provide a fully determinate theory of the rate of interest:

‘... a determinate theory of interest is based on: (1) the investment demand function, (2) the saving-function (or conversely the consumption function), (3) the liquidity preference function, and (4) the quantity of money. The Keynesian analysis, looked at as a whole, involved all of these. But Keynes never brought them all together in a comprehensive way to formulate an integrated interest theory. He failed to point out specifically that liquidity preference plus the quantity of money can give us not the rate of interest, but only an LM-curve. It was left for Hicks to supply us with the tools needed for a comprehensive analysis.’ (Hansen, 1951, pp. 431-2)

The IS-LM soon become a familiar element in macroeconomics textbooks. Gardner Ackley’s, *Macroeconomic Theory* (1961), provides a representative treatment of the IS-LM model. Ackley designated the IS-LM model as the Hicks-Hansen analysis. The algebraic formulation adopted is that of Hicks’s Generalized General Theory (Model 5) but the explanation of the causal processes reverts to the standard Keynesian presentation (Model 3) with the effects of the rate on interest on saving and income on investment treated as secondary influences which can be neglected. Unlike Hicks, Ackley assumes that prices are fixed, determined autonomously. Ackley considers fixed prices as part of the standard Keynesian system but recognizes that this an exaggeration given Keynes’s own lengthy discussions of prices and wages. Ackley constructs the IS and LM curves from the underlying functions both algebraically and diagrammatically. He also supplements the standard IS-LM diagram with three-dimensional diagrams and numerical examples. He then uses the IS-LM model to examine the comparative statics of changes in the money supply and the marginal propensity to save. In addition Ackley follows Hicks in considering the classical special case of a vertical LM curve and the Keynesian special case of a horizontal LM curve. Ackley discusses the limitations of the IS-LM model: too aggregative and too static. He is also concerned that its ‘elegant simplicity’ means that ‘most of the “works” are out of sight’ (p. 372). Thus Ackley complements the IS-LM model with an alternative four-quadrant diagram of the underlying aggregate behavioral functions.

The IS-LM model provided a focus for the Keynesian-neoclassical debate. Much of the debate can be seen as following from Hicks’s contention that the main differ-

ences between Keynes and the “Classics” concerns the slopes of the IS and LM curves. The Keynesians tended to believe that the IS curve is relatively steep (i.e. interest-inelastic) but the LM curve is relatively flat (i.e. interest-elastic). The Keynesians denied that the rate of interest has a significant impact on investment, stressing instead the capacity-adjustment role of investment in the accelerator theory in which investment depends on changes in output (Chenery, 1952). The Keynesians also argued that the demand for money is highly interest-elastic. The Baumol-Tobin inventory model showed how the rate of interest influences the transactions demand for money as rational agents minimize the opportunity cost of holding non-interest-bearing money balances (Baumol, 1952; Tobin, 1956). In contrast the neoclassical view was that the IS curve is relatively flat but the LM curve is relatively steep. Jorgenson’s cost-of-capital model highlighted the role of the rate of interest in determining investment (Jorgenson, 1967). The intertemporal theories of consumption, namely, the permanent income hypothesis (Friedman, 1957) and the life cycle hypothesis (Ando and Modigliani, 1963), downplayed the role of current income in determining current consumption while emphasizing the importance of expected future income, the stock of wealth and the rate of interest. In addition the revival of the quantity theory of money (Friedman, 1956) in which the demand for money is treated as a portfolio allocation process involving a wide range of financial and real assets suggested that the demand for money is not highly interest-elastic.

Taken together the Keynesian arguments suggest that the Hicksian mechanism (Modigliani, 1977), whereby demand shocks are automatically partially offset by the money-market feedback effects via the rate of interest, is weak. There is, therefore, a need for active stabilization policies. Fiscal policy is relatively effective. The neoclassical view, on the other hand, is that the Hicksian mechanism is strong, implying that stabilization policies are unnecessary and fiscal policy is relatively ineffective due to the crowding-out effect.

The ISLM model also provided a starting point for the development of various extensions of Keynes’s analysis. The IS-LM model was extended to deal with the open economy by Mundell (1960, 1963) and Fleming (1962). The Mundell-Fleming model, sometimes referred to as the IS-LM-BP model, introduced a third equilibrium condition, the balance of payments equilibrium, represented by the BP (or foreign-exchange, FE,) curve. There were also attempts to introduce dynamic adjustment into the IS-LM model. The “discovery” of the Phillips-curve relationship between unemployment and the rate of change of money-wages (Phillips, 1958) was seen as providing the supply-side price dynamics to complement the static demand-side ISLM model. A more sophisticated dynamic analysis was developed by Smyth (1963) who integrated the Keynesian trade cycle theory based on the multiplier-accelerator interaction due to Samuelson (1939) and Hicks (1949, 1950) within the IS-LM framework to produce a dynamic IS-LM model in which the IS and LM curves are recast as second-order difference equations. Smyth’s model allowed for cyclical adjustments and suggested the possibility that active monetary policies may be destabilizing.

The IS-LM model focused on the demand-side of the macro economy. As a result the implicit supply-side microfoundations were not given sufficient attention. Modi-

gliani (1944) gave the definitive statement of the ‘neoclassical synthesis’, highlighting the importance of the Keynesian assumption of rigid wages:

It is usually considered as one of the most important achievements of the Keynesian theory that it explains the consistency of economic equilibrium with the presence of involuntary unemployment. It is, however, not sufficiently recognized that, except in a limiting case ..., this result is due entirely to the assumption of ‘rigid wages’ and not to the Keynesian liquidity preference. (Modigliani, 1944, p. 65)

However there was little attempt to justify the assumption of rigid wages in choice-theoretic terms. It became conventional wisdom that the Keynesian analysis rested on the assumption of rigid wages. This was made explicit in the aggregate demand and supply (AD-AS) model in which the price level is determined endogenously. The Keynesian analysis is characterized by an upward-sloping AS schedule due to rigid money-wages. The AD schedule, representing the real balance effect, is derived from the IS-LM model. Again, however, the main focus was the demand-side. Patinkin (1956, 1959) and Hicks (1957) debated the size of the real balance effect. Patinkin criticized Hicks for only allowing for the Keynes effect (represented by shifts in the LM curve) and ignoring the more direct Pigou effect (represented by shifts in the IS curve).

In summary, the IS-LM model provided a simple and very effective framework for the exposition and extension of Keynesian analysis. It embodied the twin characteristic features of the early Keynesian research program: an emphasis on the determination of aggregate demand but with little attention given to the supply-side microfoundations. The latter was a significant contributory factor to the decline of Keynesian economics from the mid-1960s onwards. It became the task of subsequent new Keynesian theorists to re-establish the mainstream Keynesian research program as progressive by providing the missing choice-theoretic explanations of price and/or wage rigidity.

1.4 FIX-PRICE MODELS

Traditional textbook IS-LM models had always talked about the assumption of constant prices underlying the IS-LM approach. However, this was merely a device to ensure that changes in nominal income were translated directly into changes in real output. There was no direct thought given to the microeconomic foundations of consumer and producer behavior when prices were fixed. In textbook microeconomic theory, at least of the perfectly competitive variety, agents act as price-takers and choose quantities. An assumption of this approach is that agents can make unlimited trades at the prices they face (firms of course are limited to technical feasibility). But this assumption only makes sense if there is a Walrasian price ruling: one that clears the market, so that supply is equal to demand. If the price is not the Walrasian price, then there will be excess demand/supply: agents desired actions are inconsistent, and hence someone will be disappointed. Hence price-taking with no restrictions on trade

only makes sense if it goes along with instantaneous market clearing, so that Walrasian prices are always maintained.

The textbook IS-LM model of course still stayed with Keynes in treating consumption as a function not of prices, but of a quantity, namely income. This was one of the major innovations of the *General Theory*. There was a tension between the generally accepted macroeconomic theory of the consumption function, and the way economists thought about most other things. The “reappraisal of Keynes” movement which gathered momentum in the 1960s was an attempt to resolve this tension (Clower, 1965; Leijonhufvud, 1967, 1968), building on the insights of the “neoclassical synthesis” of Patinkin (1956) and Hansen (1953).² The culmination of this was the work on fix-price temporary equilibria in the 1970’s by, amongst others, Barro and Grossman (1971), Benassy (1975, 1976, 1978) and popularized by Malinvaud (1977). It is perhaps appropriate that the most comprehensive work in this research program was undertaken by Jean-Pascal Benassy in his Ph.D thesis at Berkeley under the supervision of Gerard Debreu (Benassy, 1973).

The research program aimed to keep the price-taking assumption of Walrasian microeconomics, but drop the assumption that prices equate demand with supply. Rather, prices were to be assumed to be fixed exogenously. This was of course a weakness of the theory. However, it must be remembered that the assumption of fixed prices was quite common at the time in this context, and, furthermore, that this was seen as the only alternative to the assumption of perfectly flexible prices. Thus the theory of the firm and the consumer had to be extended to allow for quantity constraints and rationing if agents could not sell or buy all that they wanted in one market, then this would affect their demands in other markets. For example, if households were unable to supply as much labor as they wanted to at the prevailing prices,³ then this may affect their consumption decision. If firms are unable to sell all that they want in the output market, this may affect their employment decisions. Thus, in addition to the budget constraint, there were quantity constraints that the firm or household needed to take into consideration. This was seen as the microfoundation for the concept of effective demand, which Keynes had introduced. The distinction was made between a notional demand (supply), which was the demand (supply) derived in the traditional manner without any attention to limits to trade, and the effective demand (supply) which took these into account.

There are many themes here that we could pursue, but since this chapter is focusing on the IS-LM framework rather than more general theory of macroeconomic equilibrium, we will examine the model of Rankin (1986,1987) which interpreted the IS-LM framework in terms of a fix-price model (henceforth the “Rankin” model). In the Rankin model there is an overlapping generation’s framework: households demand assets in order to save for old age. In a world of certainty, bonds dominate money (since they earn a positive return): hence in order to have money and bonds coexisting, the Rankin model introduces real money balances into the utility function. Hence the consumers’ problem is:

$$\begin{aligned}
& \max U(c_t^y, M_t / P_t, c_{t+1}^o) \\
& \text{s.t. } w_t L_t \geq c_t^y + M_t + B_t \\
& \quad (P_{t+1} / P_t) c_{t+1}^o \leq M_t + (1 + r_t) B_t \\
& \quad L_t \leq L
\end{aligned}$$

where c_{t+1}^o is the consumption when old in $t+1$, c_t^y is consumption when young in t . The solution can be written in general form as:

$$\begin{aligned}
c_t^y &= c(w_t L_t, r_t, P_{t+1} / P_t) \\
M_t &= M(w_t L_t, r_t, P_{t+1} / P_t) \\
c_{t+1}^o &= (M_t + B_t) / P_{t+1}
\end{aligned}$$

These will be effective demands if employment when young L_t is less than the endowment L . Turning to firms, the labor demand depends on the output demanded (assuming that firms are demand constrained), so that:

$$L_t = L_t(y_t, K_t)$$

We will not outline the capital accumulation side of the Rankin model, and refer interested readers to the original references for the full model. However, there will be an investment equation of the “accelerator” type if the firm is demand constrained, but the wage-rental ratio will also affect the cost-minimizing input:

$$I_t = I_t(K_{t-1}, y_t, w_t/r_t)$$

Putting together all of these equations gives us a simple IS-LM type model:

$$\text{IS equation: } y_t = c(w_t L_t, r_t, P_{t+1} / P_t) + (M_{t-1} + B_{t-1}) / P_t + I(K_{t-1}, y_t, w_t/r_t)$$

$$\text{LM equation: } \bar{M}_t = M(w_t L_t, r_t, P_{t+1} / P_t)$$

The Rankin IS-LM model provides consistent microfoundation for the IS-LM model within the context of a fix-price model. However, money in this model has a double role. First, there is a direct lagged effect of money on consumption: old people spend all of the money balances that they accumulated last period in the current period. This acts in a similar way to the wealth effect in the augmented IS-LM model. Second, the young in the current period desire to hold money because it gives them utility: the trade-off between money and bonds is affected by the interest rate. Hence the LM curve is the result of a portfolio decision, and of course the lagged money holdings M_{t-1} will be linked to the money supply in period t , \bar{M}_t . Whilst the Rankin model provides a fully coherent IS-LM framework, it is clearly a far cry from the original spirit of Keynes’s analysis.

1.5 NEW KEYNESIAN DEVELOPMENTS

The fix-price reinterpretation of the IS-LM had several features: it treated some or all wages and prices as exogenous; it was a static model; it did not have a coherent view of the monetary sector. New Keynesian developments of the 1980's were a direct response to these issues. We must stress that we use the phrase "New Keynesian" in a broad sense, not just to the narrower definition of menu-cost New-Keynesian (see, for example, Mankiw, 1992).

Turning to the first feature: wages and prices were treated as exogenous. In a Walrasian model, of course, wages and prices are "endogenous" only in the sense that they solve a set of demand/supply equations: all agents are price-takers, and the vague notion of "the market" or its embodiment as "the Auctioneer" needs to be invoked to tell a story. One natural response to the issue of having a real account of price determination is to introduce explicit price setting agents: and this is precisely what happened in the 1980's. If agents set prices, then we are in a world of imperfect competition, which may or may not have perfect competition as an interesting special or limiting case. The theories of wage and price determination were:

- a) Efficiency wage theory (Salop, 1979; Shapiro and Stiglitz, 1984; Solow, 1979; Weiss, 1980),
- b) Firm/union wage bargaining (Layard and Nickell, 1985, 1986),
- c) Insider-outsider theory (Lindbeck and Snower, 1986),
- d) Oligopolistic/monopolistic models of product markets (for example, Blanchard and Kiyotaki, 1987; Dixon, 1987; Hart, 1983; Mankiw, 1988),
- e) Overlapping contracts (Fischer, 1977; Taylor, 1979).

In this brief exposition, we cannot discuss all of these, but will look briefly at the menu-cost idea.

The idea of the menu-cost literature is quite simple (see Akerlof and Yellen, 1985; Parkin, 1986; Mankiw, 1985). Suppose that a monopolist sets prices, but incurs a lump-sum (menu) cost every time it changes price. Let us first think of the "hypothetical optimum" being the optimal price in the absence of menu costs. The optimal pricing rule with menu costs is of the (S, s) type: the firm will set a price, and only change it when the actual price is far enough away from the hypothetical optimum. Thus there is at any instant a "band of inertia" within which the firm will not choose to vary its price. The reason for this band of inertia is that at the hypothetical optimum the derivative of profit with respect to price is zero: hence there is no first-order loss to small deviations of price from the hypothetical optimum. Even small second-order menu costs can cause significant first-order effects. The main problem of this account is how a result for an individual firm aggregates to the economy. Caplin and Leahy (1991) show how individual rigidities of this kind generated by menu costs are perfectly consistent with aggregate price flexibility.

Now, in addition to this nominal inertia, monopolistic pricing adds a crucial second ingredient. A monopolist will want to set price in excess of marginal cost: in

effect it will want to equate marginal cost with marginal revenue, and hence a markup of price over marginal cost which is related to the elasticity of demand. This means that the firm is demand constrained, in the sense that it can increase its profits if demand is higher (the marginal profit is just the difference between price and marginal cost if prices are fixed). If there were menu costs with perfect competitors (price takers), then the firm might choose to turn away customers. If we put together the two ideas of menu costs and imperfect competition, then we get some nominal rigidity and the responsiveness of real output to changes in nominal demand.

The literature on menu costs and nominal price rigidity has always been open to the problem of translating individual rigidities into aggregate price rigidity. Caplin and Spulber (1987) have presented an example where individual price rigidities are perfectly compatible with complete aggregate flexibility. The idea is simple: suppose that firms change price once a year, with 25% of firms changing price each quarter. It is perfectly possible to have an annual aggregate growth in the money supply of 10%, and in each quarter the firms that then change price raise their price by 10%. The average inflation rate in each quarter is $10/4=2.5\%$, giving an annual rate of about 10%. Thus the nominal money supply and aggregate price level both rise at 10% per annum despite the fact that any individual firm only changes its price once per year. Caplin and Spulber's model is very much a special case, and as Sutherland (1995) shows, it is much more likely that micro rigidity will give rise to some degree of macro nominal rigidity (the key feature is how price changes are clustered over time).

The second important feature that New Keynesian thought has highlighted is the intertemporal nature of the decisions of households and firms. This is of course a direct response to the emphasis put on these by New Classical and Real Business Cycle analysis. The consumption function of Keynes was without microfoundations: the fix-price literature provided a coherent microfoundation in terms of the theory of effective demands and quantity constraints. This linked current rationing constraints to current demands: the relationship was conceived of in mainly static terms.⁴

The role of the intertemporal dimension was first highlighted by John Flemming (1973). In a Fisherian model of the intertemporal there is no direct link between current income and current consumption: current income only affects current consumption via lifetime income, which determines the position of the intertemporal budget constraint. Flemming argued that in practice there is a "kink" in the intertemporal budget constraint, since the borrowing rate exceeds the lending rate, as depicted in Figure 2. The one thing we know about kinks is that optima may well cluster around the kink, and that they imply the optimum may be insensitive to changes in constraints. (This occurs because the first order conditions become inequalities.) The kink in the intertemporal budget constraint occurs at the point of no borrowing or lending (i.e. consumption in each period equals income). We would expect many people to be at this kink, and hence current consumption would become very sensitive to current income (the marginal propensity to consume of people at this kink is unity). This is different to when there is a linear intertemporal budget constraint: in this case any change in income can be moved around intertemporally, and only affects current consumption insofar as it influences life-time income. Hence with a linear budget constraint, an increase in income in one period is spread out into consumption over all periods. This difference is depicted in Figure 3: in Figure 3(a) cur-

rent income increases, and due to the kink all of the extra income is consumed in the current period: in Figure 3(b), with a linear constraint (no interest differential), both current and future consumption rise in response to a rise in current income.

Whilst current consumption will be very sensitive to current income in the presence of kinks, the converse is that it will be insensitive to other variables, namely the real interest rate (which determines the slopes on either side of the kink). As Mankiw argues: ‘...sophisticated examinations of the data usually find that the real interest rate has little effect on consumption and savings. Keynes’ conjecture that consumption depends primarily on income and not on the interest rate has stood up well in the face of much empirical testing’ (1992, p. 405).

An extreme form of interest rate differential is the case where no borrowing is allowed to occur at all: current consumption cannot exceed current income, or there is a fixed quantity of borrowing. There is a rich and varied New Keynesian literature on this topic (see, for example, the survey by Hillier and Worral, 1995). On the one hand it can simply be assumed that there is no borrowing. Alternatively, it can be assumed that there is some adverse selection or moral hazard problem, which means that the optimal loan contract involves rationing (i.e. limiting the amount borrowed at the equilibrium interest rate to a certain amount per borrower). This can also be applied to firm borrowing, so that investment expenditure is constrained by current profitability or cash flow. Let us take the simple case where there is no borrowing. Here we have the intertemporal budget constraint as in Figure 4(a). Let us suppose that “unconstrained” consumers have an mpc of c (that is, an increase in current income of $x\%$ will lead to an increase in current consumption of $cx\%$ through the lifetime income, as in Figure 3(b)). Those who are constrained will have an mpc of 1. The aggregate mpc will be a weighted average of the two: $c^* = h + (1-h) \cdot c$, where h is the proportion of households which are constrained in the current period.

Figure 2. Fleming’s Model of the Kinked Intertemporal Budget Constraint.

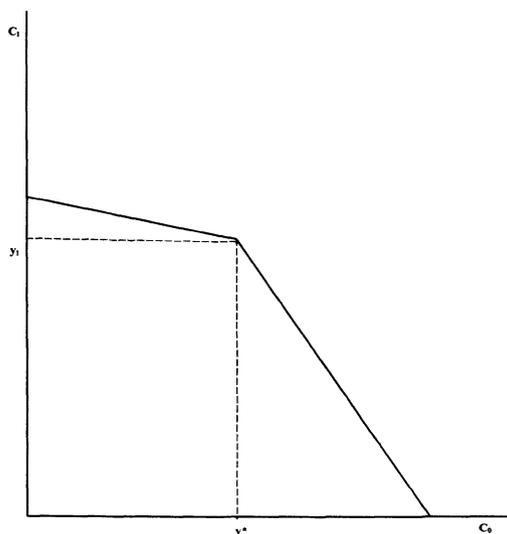
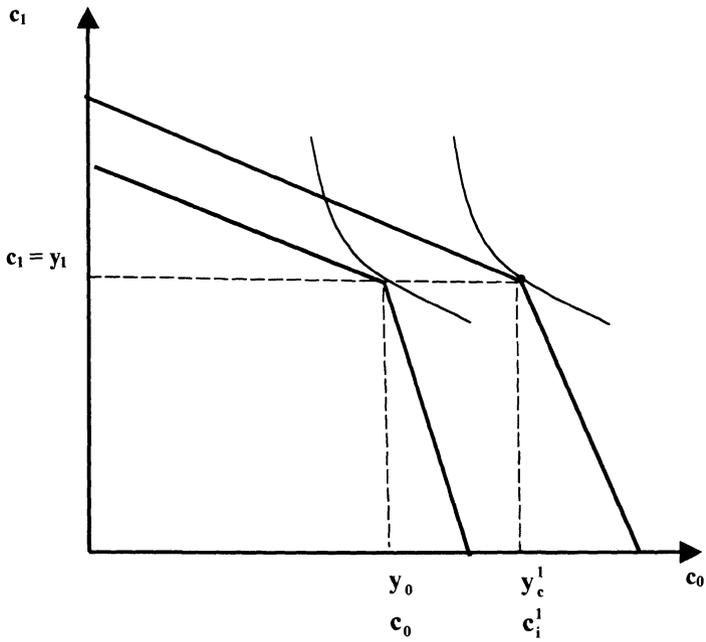
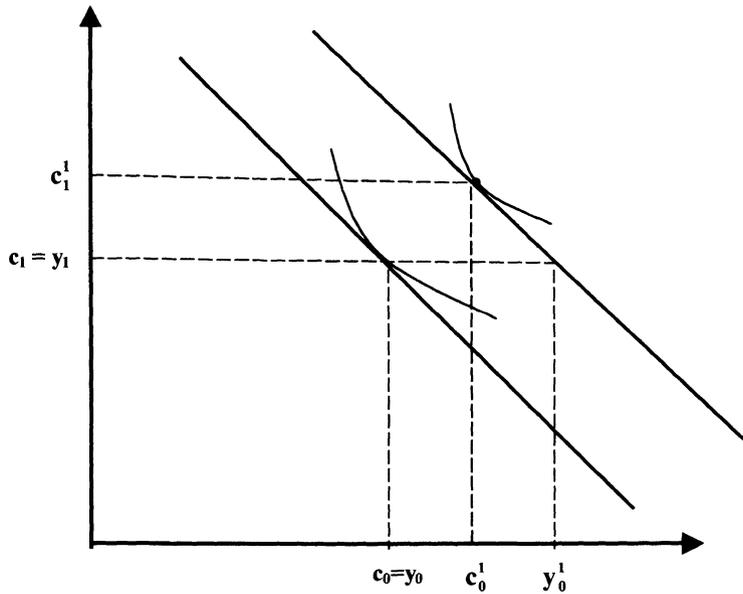


Figure 3. The Sensitivity of Current Consumption to Current Income.

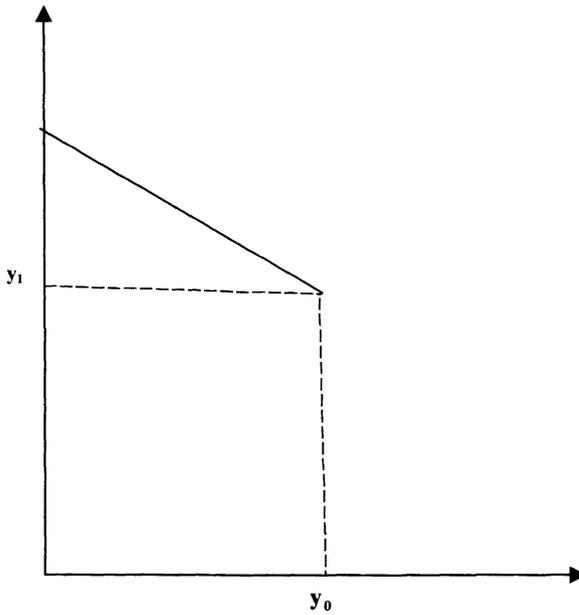


(a) Imperfect Capital Market

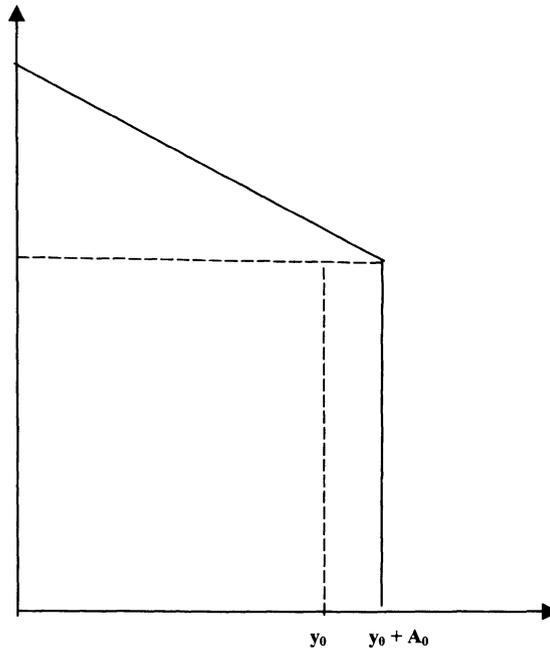


(b) Linear Budget Constraint

Figure 4. Quantity Constraints on Borrowing.



(a) No Borrowing: $c_0 \leq y^0$



(b) No Borrowing with Assets: $c_0 \leq y^0 + A_0$

Whilst the presence of credit rationing can lead to an “effective demand” like relationship between current consumption and income, it should be clear that the IS-LM dichotomy no longer holds. The stock of money in the private sector will influence consumption (and possibly investment). To see this, we can augment the simple model above to include the current endowment of money and assets: in this case current consumption is not just constrained by the flow of current income, since the position of the budget constraint is also influenced by the position of stock of assets A_0 , as in Figure 4(b). In this situation, a household would always prefer to use its stock of assets to finance current consumption rather than save it and have the extra income in the future. (This follows from the fact that the household is constrained in current consumption.) Thus a change in the money stock can have a direct impact on current consumption. Even “inside assets” (i.e. assets which have corresponding private liabilities such as bonds) can have an effect: an increase in deposits of savers (who are unconstrained) at banks can lead to more liquidity available for borrowers (who are constrained). Thus the redistribution of liquidity with an aggregate wealth effect of zero can have a net affect on consumption.

A model which captures some of these New Keynesian perceptions in a IS-LM-like environment is the Bernanke and Blinder (1988) CC-LM model. In the traditional IS-LM model, bank assets (loans or bonds) and liabilities (deposit money) are treated asymmetrically: money is included in the LM curve, whilst bonds/loans are suppressed using Walras’s Law. Bernanke and Blinder develop a framework, which allows for both to play a role. There are two credit instruments: loans with interest rate ρ and bonds with interest rate r , so that the demand for loans is assumed to be

$$L^d = L(\rho, y)$$

The supply of loans comes from the banks’ balance sheet, which is

$$B^d + L^s + E = D(1-\tau)$$

where $B^d \equiv$ bonds held by banks, $L^s \equiv$ the supply of loans, $E \equiv$ the excess reserves, $D \equiv$ deposits and $\tau \equiv$ reserve ratio requirement. Banks allocate their assets between bonds and loans depending on the interest rate, so that the supply of loans is

$$L^s(\rho, r) = \lambda(\rho, r)D(1-\tau)$$

In equilibrium the quantity of loans is determined by

$$L^d(\rho, r, y) = \lambda(\rho, r)D(1-\tau) \quad (1)$$

The supply of money is equal to the “money multiplier” $m(r)$ times bank reserves R . The demand for deposits is the usual $D(r,y)$, so that we have:

$$D(r,y) = m(r)R \quad (2)$$

This is the standard LM curve. From (1) and (2) the loan interest rate ρ can be expressed as a function of r , R , and y :

$$\rho = \phi(r, R, y), \phi_r > 0 > \phi_R, \phi_y > 0$$

The IS curve is of the standard form:

$$y = y(r, \rho) = y(r, \phi(r, R, y)) \quad (3)$$

This is denoted the CC curve (“commodities and credit”), since it includes the goods market (commodities) and the loans interest rate (credit). If bonds and loans are perfect substitutes, then $r = \rho$, and the model is equivalent to the IS-LM model. If money and bonds are perfect substitutes (as in the liquidity trap case) so that r is fixed, then credit can play a crucial role (since ρ can still vary to influence demand for output). However, in general “credit” can play an important role here as distinct from “money”. It is, Bernanke and Blinder argue, an empirical question of which is the most important explanatory variable of what happens in practice. Bernanke and Blinder argue that the instability of the money demand relationship indicates that the credit approach may be more fruitful, and present some supporting US evidence.

The New Keynesian school of macroeconomics has developed our understandings of the theory of effective demand. In particular, it has developed the theory of nominal rigidities in an imperfectly competitive environment, and in an intertemporal setting for firms and households.

1.6 POST-KEYNESIAN CRITICISMS OF THE IS-LM MODEL

The Post-Keynesian school rejects the mainstream Keynesian research program (i.e. the neoclassical synthesis; fix-price models; New Keynesian macroeconomics) as an inadequate development of Keynes’s analysis. The IS-LM model has tended to be seen by Post-Keynesians as epitomizing the limitations of mainstream Keynesianism. There have been three main Post-Keynesian criticisms. First, the IS-LM model is too mechanical and fails to convey the important effects of uncertainty particularly on the investment function. In the *General Theory* Keynes devoted two chapters to investment: chapter 11 on the MEC schedule and chapter 12 on the state of long-term expectations. For Post-Keynesians the IS-LM model deals with chapter 11 only and hence understates the potential volatility of the macro economy. Indeed Keynes himself had stressed the importance of uncertainty in his QJE 1937 paper in which he drew a sharp distinction between the classical concern for probabilistic risk and his own concern with probabilistic uncertainty (Keynes, 1937). The original Post-Keynesians such as Robinson (1964, 1973) and Shackle (1967) considered uncertainty to be the very essence of Keynes’s contribution. Shackle repudiated the equilibrium frame of analysis of the IS-LM model, arguing that ‘the essential core of

Keynes' conception of economic activity is uncertain expectation, and uncertain expectation is wholly incompatible and in conflict with the notion of equilibrium.' (Shackle, 1982, p. 438)

A second related criticism is that the IS-LM model is a static simultaneous equilibrium analysis and, hence, inappropriate to convey Keynes's understanding of the dynamics of a macro economy. There is a need to replace the IS-LM model with a dynamic sequential analysis. This is the point of Robinson's often-repeated claim that Keynesian analysis should be set in historical, not logical, time with an irrevocable past and unknown future (Robinson, 1973, 1974). The simultaneous equilibrium analysis of the IS-LM model implies that the secondary feedback processes are treated as equally important as the initial primary processes. This may give a misleading understanding of the behavior of actual economies moving through historical time, subject to a series of shocks and structural changes, and in which the feedback processes are only partially realized. In this case it is more appropriate to analyze and use a sequential analysis. Leijonhufvud (1983) endorses this Post-Keynesian criticism, arguing that the problem with the Keynesian IS-LM analysis is that it uses a static (full information) simultaneous framework to deal with issues of dynamic adjustment under conditions of imperfect information.

A final Post-Keynesian criticism of the IS-LM model is its lack of microfoundations. Chick (1982) considers the IS-LM fix-price model as valid only in circumstances in which firms estimate aggregate demand correctly. Weintraub (1982) views the lack of microfoundations as fostering the mainstream wage-rigidity interpretation of Keynes and hence contributing to the general failure to comprehend the meaning of Keynes's analysis. Thus a major task of Post-Keynesian economics has been to provide non-neoclassical supply-side microfoundations for Keynes's analysis. Kalecki's analysis of monopolistic firms using mark-up pricing rules has been particularly influential (see, for example, Sawyer, 1985).

Interestingly Hicks himself was quite sympathetic to some of these Post-Keynesian criticisms. In a reconsideration of the IS-LM model, Hicks (1980) expressed increasing dissatisfaction with the IS-LM model. In particular, Hicks found an inconsistency between the flow equilibrium of the IS curve and the stock equilibrium of the LM curve. Hicks also recognized that the concept of stock equilibrium in the money market is problematic since it is uncertainty about the future, which creates the demand for liquidity. Hicks proposed the concept of an expectational zone in which expectations would not be revised if actual outcomes fall within a certain range. Subsequently Hicks (1988) suggested that it would be better to think of the IS and LM curves as representing the quite different modes of operation of the industrial and financial sectors, respectively.

1.7 SOME CONCLUDING THOUGHTS

In this survey we have traced the history of the IS-LM model from its origins as Hicks's attempt to expose the essential differences between Keynes and the Classics, its central role in the early Keynesian-neoclassical debates, through to its recent de-

cline to irrelevance in both mainstream New Keynesian as well as non-mainstream Post-Keynesian approaches. The IS-LM model provides a simple framework for analyzing the interactions between the goods and money markets in the determination of aggregate demand. In particular the IS-LM focuses attention on the role of the rate of interest in providing a connecting link between the two markets. In the early Keynesian-neoclassical debate the main focus of attention was on the demand-side of the macro economy. The IS-LM model naturally became the principal point of reference. However, as we have argued, from the emergence of the neoclassical synthesis onwards, this turning point being signified by Modigliani's 1944 statement of the importance of the rigid money-wages assumption underpinning the IS-LM framework, the main focus of attention has turned more and more towards the issue of microfoundations, particularly the reconciliation of the Keynesian presumption of price and wage stickiness with the axiom of rationality. As a consequence, the IS-LM model has become marginalized. The IS-LM model still appears in undergraduate macroeconomics textbooks but increasingly it is used as a mere stepping stone in the construction of the aggregate demand schedule in the AD-AS model with the bulk of the argument being devoted to the form of the aggregate supply schedule.

Thus, to conclude, it seems clear that the IS-LM model has gone out of fashion in modern mainstream macroeconomics (and has never been in fashion in non-mainstream macroeconomics). The decline in the importance of the IS-LM model mirrors the New Keynesian emphasis on the real sector, especially the supply-side, and quantity constraints. The emphasis implies that there is little concern for the role of the nominal rate of interest as a connecting link between the real and monetary sectors, thereby invalidating the Classical Dichotomy. Not surprisingly, there is little need for a model to examine this connecting link. However, the development of Real Business Cycle theory as a paradigm in its own right in which macroeconomic behavior is derived from intertemporal optimization, is putting the role of the real rate of interest back near the top of the research agenda. From this perspective, the rate of interest not only links the money and goods markets but also links both of these markets with the labor market via the intertemporal substitution of labor supply. An augmented-IS-LM model, based on the microfoundations of intertemporal optimization and allowing for the supply of output to be directly affected by labor-supply adjustments in response to changes in the rate of interest, may feature more prominently in the near future, in the textbooks at least.

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ENDNOTES

- ¹ The origins and development of the ISLM model are detailed in Young, 1987 and Darity and Young, 1995.
- ² The feeling was that the neoclassical synthesis had achieved the synthesis at the cost of losing some of the key insights of Keynes.
- ³ I will use the term "prices" in its general form, subsuming wages etc.
- ⁴ However, note that there is nothing essentially static in the mathematical formulation. We could interpret the same good at different dates as different commodities as in an Arrow-Debreu world, and interpret all of the work of Benassy and others in this light.