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SIMPLIFICATION OF LARGE SCALE MACROECONOMETRIC MODELS

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Introduction

It is often said that contemporary macroeconometric models are too difficult to understand because they consist of hundreds or thousands of intricate interrelationships. They are sometimes called "black boxes," although that is not literally true because the equations can, in principle, be examined -- in many cases they are openly available for examination and study of the relationships, one-at-a-time or altogether. But even if the equations are opened to inspection, their study may prove to be so tedious that the external investigator would never undertake the task.

A research paper on the Wharton Model carried, some years ago, the title "The Wharton Model, Mark III: A Modern IS-LM Construct." IS-LM curves are plotted in two dimensional diagrams that plainly show the workings of the implied macroeconomic system. It is a typical "back-of-the-envelope" rendition of the Keynesian system, and since the mainstream macroeconometric model is usually called a Keynesian system it should have an IS-LM core. Actually, it is more descriptive to label the mainstream macroeconometric model as a synthetic neoclassical-Keynesian system, but there still may be an IS-LM nucleus within it. For pedagogical purposes it is useful to construct this nucleus from prevailing systems.

There is yet another motivation and approach for looking at the IS-LM diagram of the macroeconomy. The large scale model, whether being examined in all its detail or whether being reduced to an IS-LM nucleus, requires the use of a large mainframe computing system. By contrast, there is much interest nowadays in micro (desk top) computer systems that are self-contained. There is, therefore, good reason to construct some renditions of the IS-LM system that can be used readily on a micro computer and, thus, as a pedagogical tool for aids to learning. Either a derived IS-LM system or a directly estimated IS-LM system can be prepared for small computers for pedagogical use.

In this paper, the two approaches to simplification will be demonstrated. Some direct estimates of the IS-LM system will be prepared, both in phases of estimation and in phases of simulation analysis for microcomputer use. The n some simulations of the Wharton Model on a large mainframe computer will be investigated for derivation of an implied IS-LM nucleus. First let us examine the structure and meaning of the IS-LM system.

The well known savings-investment equality and the liquidity preference equation (supply-demand for money equation) produce the compact system

(1) $$s(r,Y) = I(r,Y)$$

(2) $$M = L(r,Y)$$

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This interpretation of the Keynesian system at an early stage by J.R. Hicks lent itself readily to a diagrammatic treatment that is important for the understanding and teaching of macroeconomics.[1]

The savings-investment equation (1) defines an implicit relationship between r and Y. It is downward sloping and constitutes the IS curve. The liquidity preference equation (2) also defines an implicit relationship between r and Y given an exogenous supply of money (M) to the economy. It is upward sloping.

Let us suppose that a linear approximation (or specification) could be made for each of the two equations. They would then take the form

$$(1)' \qquad s_0 + s_r r + s_Y Y = i_0 + i_r r + i_Y Y$$

$$(2)' \qquad M = l_0 + l_r r + l_Y Y$$

These two implicit relationships can be made into explicit relationships, in the linear case. They are

$$(1)'' \qquad r = \frac{i_0 - s_0}{s_r - i_r} + \frac{i_Y - s_Y}{s_r - i_r} Y$$

$$(2)'' \qquad r = -\frac{l_0}{l_r} - \frac{l_Y}{l_r} Y + \frac{1}{l_r} M$$

Although there is some doubt in the Keynesian literature about the sign of s_r, we believe that it is safe to assume that it is positive; that is surely indicative of recent behavior of savers, in response to high interest rates since 1980. It is standard macroeconomic theory to accept the view that i_r is negative; therefore, we should expect

$$s_r - i_r > 0$$

The sign of the constant term in (1)" is likely to be positive, since savings at low income levels turns negative in a significant way, and certainly less than investment at low income levels. We thus assume

$$\frac{i_0 - s_0}{s_r - i_r} > 0 .$$

For stability in Keynesian macroeconomic analysis, we require that the savings function have steeper slope (w.r.t.Y) than the investment function, or

$$i_Y - s_Y < 0$$

With these restrictions, we can look upon the IS curve as a falling curve with a positive intercept.

To position and define the shape of the LM curve, we note that

$$l_0 > 0$$

[1] J.R. Hicks, "Mr. Keynes and the 'Classics': A Suggested Interpretation," Econometrica, V (1937), 147-59.

to ensure that there will always be a positive amount of money in the system, no matter how low r and Y may be. The liquidity preference function normally reacts negatively to changes in interest rates and positively to changes in income or activity levels. This makes

$$l_r < 0$$

$$l_Y > 0$$

With all these sign restraints, equation (2)" should have positive intercept and positive slope. The two relations interact, as in Figure 1.

This is all very neat and compact, but will it serve us well? There are two problems associated with equations (1) and (2) or with the linearized versions as well. The first problem concerns economic theory, and the second concerns the econometric principles of identification.

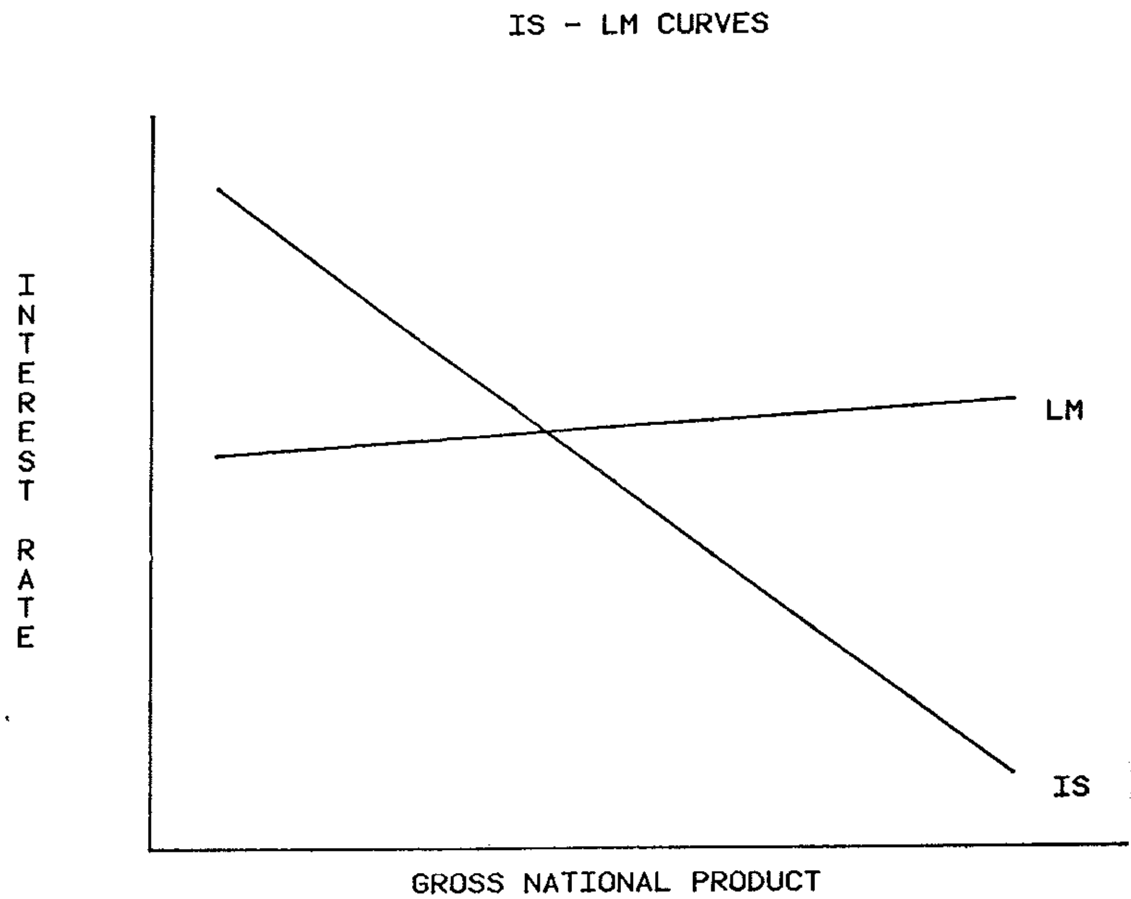
From a theoretical point of view, the macro Model should eschew money illusion; therefore the r and Y variables should indicate real interest rate and real income. But if these are real magnitudes, then M in equation (2) should represent real balances, M($)/p, where M($) are nominal cash balances, while p is an index of the price level. The problem with the real Model is that monetary authorities cannot exogenously control real cash balances; they have a hard enough time trying to hit their nominal cash balance targets, let alone managing inflation and real balance targets at the same time. If M($) is the appropriate exogenous variable, then there are three endogenous variables, r, Y and p, but only two equations.

It is not simply a matter of adding a third equation to determine p because an appropriate equation of this type would involve additional endogenous variables such as employment, unemployment, capital stock, wage rate, inventory stock, and other variables. Some authors add a synthetic aggregate supply-demand equation to determine price, but this is a short-cut procedure that has a poor theoretical base. If theory is fully taken into consideration, several equations -- labor supply, wage bargaining, technology, inventory accumulation, and associated optimization equations -- will have to be introduced, and the two dimensional simplicity that we are seeking will vanish. Okun's Law, mechanical capacity trends and other synthetic devices are hard to justify, in a theoretical sense, and they usually have limited empirical validity.

In this spirit of retaining simplicity, we have specified the model in terms of the nominal interest rate and nominal income, thus admitting the existence of money illusion. Empirical analysts have often estimated nominal relationships on the grounds that they fit the data very well. The choice is either to build a more elaborate model that does a better job of avoiding several relationships with money illusion and also explaining the price level, or a simple model with money illusion. The latter approach is taken here because simplicity is a strong goal.

For practical implementation of system (1) and (2), a linearized version will be used, as in (1)' and (2)'. But this system is not identified. There is only one exogenous variable, namely M($). There are two realistic directions for expanding the list of variables without adding equations that complicate the simplistic presentations of the system. A public sector with fiscal structure will be introduced, and the economy will be opened to foreign trade. On the fiscal side, public spending and revenues will be introduced; this has the added advantage of permitting fiscal policy analysis, as well as some international trade analysis.

FIGURE 1
IS - LM CURVES



To show how the addition of these new exogenous variables will contribute to identification, the parametric structure of the system will be specified more closely. Many of the variables will be normalized, expressed in ratio form. This makes some contribution to avoiding problems of inflationary growth in a nominal Model stretching over a fairly long period of time -- two or more decades. Also, the equations will be made dynamic in the sense that macroeconomic reactions will take time, in the form of lag distributions. These lag variables will also contribute to identification, as predetermined variables.

The extended system will be written as

$$(3)\quad (GNP)_t - [c_o + c_1(L)\, r_t + c_2(L) \frac{(GNP-T)_t}{(GNP)_t}] (GNP)_t =$$

$$(GNP)_t\, [i_o + i_1(L) r_t + i_2(L) \frac{(GNP)_t}{(GNP)_{t-1}}] + G_t + E_t$$

$$- (GNP)_t\, [m_o + m_1(L) \frac{(GNP)_t}{(GNP)_{t-1}}]$$

$$(4)\quad \frac{(GNP)_t}{M(\$)_t} = v_o + v_1 r_t$$

$$(5)\quad T_t = t_o + t_1\, (GNP)_t$$

It is evident that nominal government expenditure on goods and services have been included as an exogenous variable G_t. In the same way, nominal exports, E_t, are included. Taxes less transfers are represents by T_t, and they are explained in nominal terms, as a simple function of nominal GNP is equation (5). This equation could be directly substituted into (3) in order to retain the two-equation structure, but it makes the writing of (3) somewhat cumbersome. The exogenous element is not T, but the tax transfer parameter t_1. For all practical purposes t_o is approximately zero, although it could be changed for policy considerations.

A few words of explanation are needed for interpretation of equations (3) and (4). The first of these two equations is the savings-investment equation (1), but it is written as

$$C + I + G + E - IM = GNP$$

and transposed as

$$(GNP - C) = I + G + E - IM$$

The left-hand side may be identified as saving and the right-hand side as investment (including public spending plus net foreign investment). From an empirical point of view, we find it more comfortable to build up a savings equation by estimating consumption and subtracting from GNP instead of estimating a savings function directly. The writing of linear coefficients as $c_1(L)$, etc. indicates that a lag distribution, written as a polynominal in the lag operator (L), is being considered. The equations for cnsumption, investment, and imports are all estimated with dependent variables as ratios to GNP $(C/GNP)_t$, $(I/GNP)_t$, $(IM/GNP)_t$. The independent variables are correspondingly scaled, either as ratios to current or lagged GNP or as interest rates, which are automatically scaled. Equation (3), together with (5), constitutes the implicit relationship for the IS-curve, given G, E, t_0, t_1, and lags in $(GNP)_t$ or r_t.

The LM-curve is based on (4), which expresses velocity of circulation of nominal cash balances as a function of the nominal interest rate. In monetarist and classical economic theory velocity is a constant or a smooth anonymous trend. In Keynesian theory, velocity is a positive function of the interest rate. This is a fundamental difference in viewpoint between the two schools of thought. It should also be noted that the concept of velocity as a positive function of interest rate is an original idea of Kalecki, developed at about the same time as the Keynesian theory of liquidity preference, but a functional relationship between velocity and interest rate is an idea that goes back to much earlier writings of Keynes in the 1920s.

Statistical Estimation

There are two approaches for statistical estimation of an IS-LM Model. We could try direct estimation of semi reduced equations like those in (1)" and (2)", which are written in explicit form. Of course, in order to estimate these equations, they would have to be extended by the addition of exogenous variables for exports, government expenditures and receipts. These exogenous variables would make identification possible. Attempts at direct estimation of such suitably extended equations have not been satisfactory in turning up an acceptable IS-curve. This has been the case with samples of annual and of quarterly data. A second approach is to estimate separate equations for C (consumption), I (investment), and IM (imports). These are substituted into the GNP identity and an estimate of (3) defines the implicit relationship between r_t and $(GNP)_t$, which can be put into explicit form for an IS-curve. The LM-curve is estimated directly from a velocity equation.

First, using annual data (1955-1983) for GNP, C, I, IM, T, r, M_1, G and E, we have estimated the following equations:

$$(6)\quad \left(\frac{C}{GNP}\right)_t = \underset{(1.64)}{-0.0063}\left(\frac{r_t}{r_{t-1}}\right) + \underset{(143.6)}{0.37}\left(\frac{GNP-T}{GNP}\right)_t + 0.28\left(\frac{GNP-T}{GNP}\right)_{t-1} + 0.18\left(\frac{GNP-T}{GNP}\right)_{t-2} + 0.092\left(\frac{GNP-T}{GNP}\right)_{t-3}$$

$$R^2 = 0.611 \quad D.W. = 0.53$$

$$(7)\quad \left(\frac{I}{GNP}\right)_t = \underset{(3.97)}{-0.40} - \underset{(4.73)}{0.0013} r_t - 0.00097 r_{t-1} - 0.00065 r_{t-2} - 0.00032 r_{t-3} + \underset{(5.54)}{0.21}\frac{(GNP)_t}{(GNP)_{t-1}} + 0.16\frac{(GNP)_{t-1}}{(GNP)_{t-2}} + 0.11\frac{(GNP)_{t-2}}{(GNP)_{t-3}} + 0.05\frac{(GNP)_{t-3}}{(GNP)_{t-4}}$$

$$R^2 = 0.519 \quad D.W.\ 1.31$$

$$(8)\quad \left(\frac{IM}{GNP}\right)_t = \underset{(7.42)}{-0.98} + \underset{(7.94)}{0.39}\frac{(GNP)_t}{(GNP)_{t-1}} + 0.29\frac{(GNP)_{t-1}}{(GNP)_{t-2}} + 0.20\frac{(GNP)_{t-2}}{(GNP)_{t-3}} + 0.098\frac{(GNP)_{t-3}}{(GNP)_{t-4}}$$

$$R^2 = 0.689 \quad D.W. = 0.461$$

$$(9)\quad T_t = \underset{(1.60)}{8.64} + \underset{(85.63)}{0.30}(GNP)_t \qquad R^2 = 0.996 \quad D.W. = 0.998$$

$$(10)\quad \left(\frac{GNP}{M_1}\right)_t = \underset{(12.46)}{3.21} + \underset{(7.85)}{0.26} r_t \qquad R^2 = 0.717 \quad D.W. = 0.700$$

$$(11)\quad C_t + I_t + G_t + E_t - (IM)_t = (GNP)_t$$

By substituting (6), (7), (8), and (9) into (11) we obtain a relation between r_t and $(GNP)_t$ given lags, G_t and E_t. This is the IS-curve. Similarly, equation (10) produces a relation between r_t and $(GNP)_t$, given $(M_1)_t$.

These are reasonable and well fitting curves, but they represent a first attempt and are not definitive, especially because they all have serially correlated residuals. There could be more intensive time series probing into the stochastic structure, but with annual data and fairly long lags, the number of degrees of freedom is limited. The lag distributions in (6), (7), and (8) are all linear, each declining to zero by an equal amount, year-by-year. Since there is only one estimated lag parameter in these distributions, the t-statistic is attached to only the first coefficient in each distribution. There has not been an exhaustive search over many plausible polynomial lag distributions, but the distributions that are estimated have sensible properties.

Let us next examine some properties of this system, and then look into a finer time series analysis with quarterly data for the same variables.

The IS-LM diagram is calculated by computing values for $(GNP)_t$ at different assumed levels of r_t, given the initial conditions and exogenous magnitudes for 1983. The GNP value at the intersection point of these is about 2 percent above the observed value for this magnitude in 1983, which is fairly close, but the interest rate value is too high, at about 12.8 percent, compared with an observed value of just 9.1 percent. Rates were only temporarily low in 1983, jumping back to more than 11 percent in 1984.

The relative slopes of the IS-LM curves are interesting. The absolute value of the LM slope is much smaller than that of the IS curve; this is a stability condition according to Hicks.[1]

There is yet another way of looking at the performance of this small system, namely, by simulating it over the historical sample period from fixed initial conditions. The period chosen in 1960-83. Some summary statistics of its historical simulation performance are shown in Table 1.

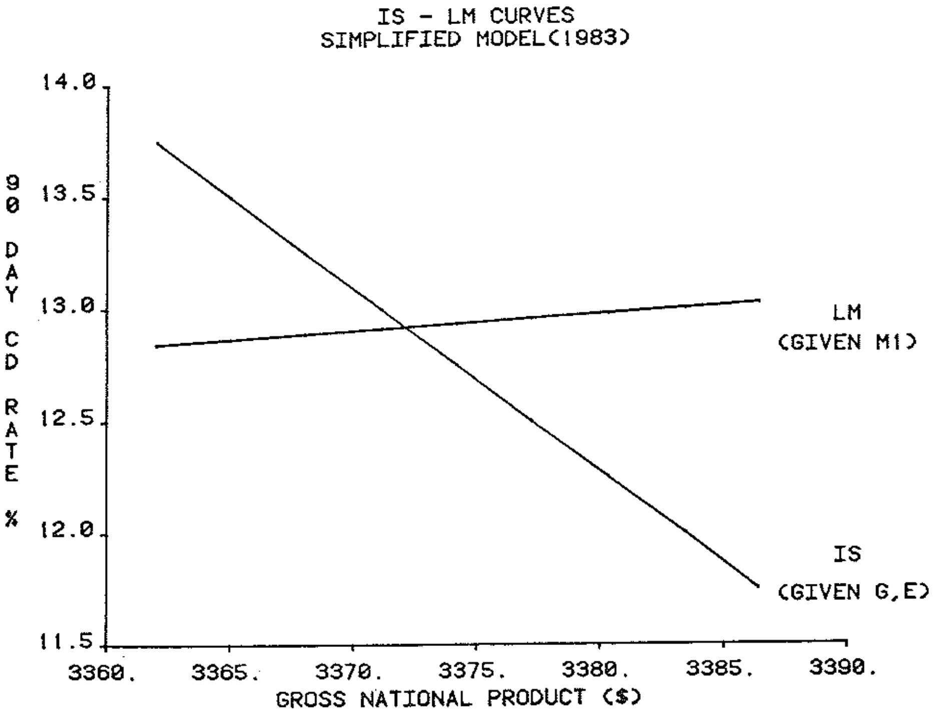
Table 1
Average Simulation Errors, 1960-83

	Mean Absolute percentage error	Root Mean Square percentage error
GNP	1.81	2.36
C	2.08	2.48
I	7.85	10.04
IM	16.23	21.55
T	3.96	4.58
r*	1.83	2.19

*percentage point error (mean absolute and root mean square error)

[1] J.R. Hicks, A Contribution to the Theory of the Trade Cycle, (Oxford: Clarendon Press, 1950), pp. 145-54.

FIGURE 2



The small and volatile variables, investment and imports, are subject to considerable percentage error, but the two central variables of the IS-LM diagram are fairly well estimated by the system, at about 2 percent error levels, on average.

The annual Model is a first approximation. From a statistical point of view, its main deficiency is the prevalence of autocorrelated error. We have accordingly estimated the same system from quarterly time series data, for the same variables. In this case, we have estimated "best fitting" ARIMA functions for each equation, i.e., we have introduced autoregressive terms in the l.h.s. dependent variable, and moving average terms in the r.h.s. independent variables, including the error term. We have a twofold objective or criterion with the use of ARIMA methods. We seek a best fitting function that also isolates "white-noise" error and also gives steady state values of the parameters that conform to a prior economic analysis (appropriate signs and conventional ranges for magnitudes of coefficients).

Using quarterly data for 1950.1 to 1983.4, we estimate the following Model:

$$(12)\quad \left(\frac{C}{GNP}\right)_t = \underset{(0.75)}{0.022} + \underset{(9.91)}{0.752}\left(\frac{C}{GNP}\right)_{t-1} + \underset{(2.40)}{0.217}\left(\frac{C}{GNP}\right)_{t-2}$$

$$- \underset{(1.68)}{0.113}\left(\frac{C}{GNP}\right)_{t-3} - \underset{(2.87)}{0.124}\, r_{t-1} + \underset{(2.90)}{0.130}\, r_{t-2}$$

$$+ \underset{(7.17)}{0.461}\left(\frac{GNP-T}{GNP}\right)_t - \underset{(5.32)}{0.362}\left(\frac{GNP-T}{GNP}\right)_{t-1} \qquad R^2 = 0.866 \quad \rho = 0.146$$

$$(13)\quad \left(\frac{I}{GNP}\right)_t = \underset{(5.93)}{-0.344} + \underset{(8.30)}{0.739}\left(\frac{I}{GNP}\right)_{t-1} + \underset{(0.57)}{0.051}\left(\frac{I}{GNP}\right)_{t-2}$$

$$- \underset{(0.15)}{0.011}\left(\frac{I}{GNP}\right)_{t-3} - \underset{(2.37)}{0.169}\left(\frac{I}{GNP}\right)_{t-4} + \underset{(0.38)}{0.020}\left(\frac{I}{GNP}\right)_{t-5}$$

$$+ \underset{(1.59)}{0.081}\, r_t + \underset{(1.13)}{0.078}\, r_{t-1} - \underset{(2.45)}{0.138}\, r_{t-2} - \underset{(0.53)}{0.031}\, r_{t-5}$$

$$- \underset{(0.61)}{0.032}\, r_{t-6} + \underset{(10.1)}{0.402}\frac{(GNP)_t}{(GNP)_{t-1}} - \underset{(0.10)}{.0055}\frac{(GNP)_{t-1}}{(GNP)_{t-2}}$$

$$R^2 = 0.890 \quad \rho = 0.017$$

$$(14)\quad \left(\frac{IM}{GNP}\right) - \left(\frac{IM}{GNP}\right)_{t-1} = \underset{(2.93)}{-0.078} + \underset{(1.00)}{0.086}\left[\left(\frac{IM}{GNP}\right)_{t-1} - \left(\frac{IM}{GNP}\right)_{t-2}\right]$$

$$- \underset{(0.50)}{0.047}\left[\left(\frac{IM}{GNP}\right)_{t-2} - \left(\frac{IM}{GNP}\right)_{t-3}\right] - \underset{(0.58)}{0.050}\left[\left(\frac{IM}{GNP}\right)_{t-3} - \left(\frac{IM}{GNP}\right)_{t-4}\right]$$

$$- \underset{(1.85)}{0.159}\left[\left(\frac{IM}{GNP}\right)_{t-4} - \left(\frac{IM}{GNP}\right)_{t-5}\right] + \underset{(0.16)}{.004}\frac{(GNP)_t}{(GNP)_{t-1}} + \underset{(2.98)}{0.073}\frac{(GNP)_{t-1}}{(GNP)_{t-2}}$$

$$R^2 = 0.086 \qquad D.W. = 1.96$$

$$(15)\quad R = \underset{(3.66)}{0.013} + \underset{(4.61)}{0.006}\left(\frac{GNP}{M}\right)_t + \underset{(13.41)}{1.162}\, R_{t-1} - \underset{(5.78)}{0.767}\, R_{t-2}$$

$$+ \underset{(5.62)}{0.799}\, R_{t-3} - \underset{(3.79)}{0.537}\, R_{t-4} + \underset{(3.28)}{0.441}\, R_{t-5}$$

$$- \underset{(4.18)}{0.358}\, R_{t-6} \qquad R^2 = 0.95 \qquad \rho = 0.03$$

$$(16)\quad e_t = - \underset{(10.58)}{0.889}\, e_{t-1} + \underset{(1.15)}{0.096}\, e_{t-2} + \underset{(2.34)}{0.113}\, e_{t-12} \qquad R^2 = 0.989 \quad \rho = 0.19$$

This is a complete equation system (with the GNP identity added) for generating quarterly estimates of the same endogenous variables that constituted the annual Model, given lags and exogenous variables. In this quarterly system there are many more lags, a point of some importance. The most significant point about these quarterly estimates by time series methods is that we cannot reject the hypothesis that they all have serially uncorrelated random errors. We have, in a sense, isolated "white noise." One of these equations is in first difference form and have low correlation, but such transformations often lower the degree of association, and the equivalent level form has high correlation. The l.h.s. variable in each equation was differenced (once) in order to achieve stationarity. Randomness of residual error was determined by the flatness and boundedness of the correlogram of error; i.e., it was reduced to "white noise."

In equation (12), it can be noted that the consumption ratio (C/GNP) is practically a negative linear function (partial) of the change in interest rate. The corresponding annual equation (b) has the consumption ratio a negative linear function of the ratio of current to lagged interest rates. Essentially these are similar specifications and correlations. IS-LM and simulation analysis of the quarterly Model is not yet complete, but it does show that estimates exist, with additive random error.

There is yet another way of reducing a system to an IS-LM nucleus, and this is from a complete large scale macroeconometric model. It is, in a sense, a way of getting into the system's "black box" and extracting a simple rendition of the whole system that is quite transparent -- just the opposite of the "black box."

The structure of the Wharton Quarterly Model, which consisted of 1,167 equations in 1983 can be decomposed approximately into three parts:

(i) A liquidity preference equation relating nominal GNP to the treasury bill rate and M_1 (exogenous).

(ii) A set of equations for other interest rates that are recursively related to the treasury bill rate.

(iii) A remaining set of interdependent equations to determine real quantities and prices.

The liquidity preference equation in (i) contains three other types of variables, namely, real output growth, domestic asset holding and other interest rates. The other interest rates are in a recursive part of the system (ii); so they present no problem.

The system is not fully decomposable because of the real output change and domestic asset variables, but they can tentatively be assigned some plausible values -- the most recent ones -- for the construction of an IS-LM diagram for 1983. Given values for these two variables (real output change and domestic asset holding), we can plot values of GNP_{83} for a sequence of assumed values of r_{83}. Other interest rates that are needed for this equation can be determined recursively for each assumed value of r_{83}.

This procedure gives us values of points along the LM-curve. To get the IS-curve, we solve 1166 equations (including those for the recursive other interest rate values) for a sequence of assumed values of r_{83}. The solution values for GNP_{83} can be plotted against each of the assumed values for r_{83}. Their joint relation traces the path of the IS-curve. That is a simple and straightforward way of constructing the IS-LM nucleus of a large model. We can trace out shifts in these equations for different exogenous inputs and see plainly how policy works in a simplifed setting.

The values that were used or computed for 1983 are

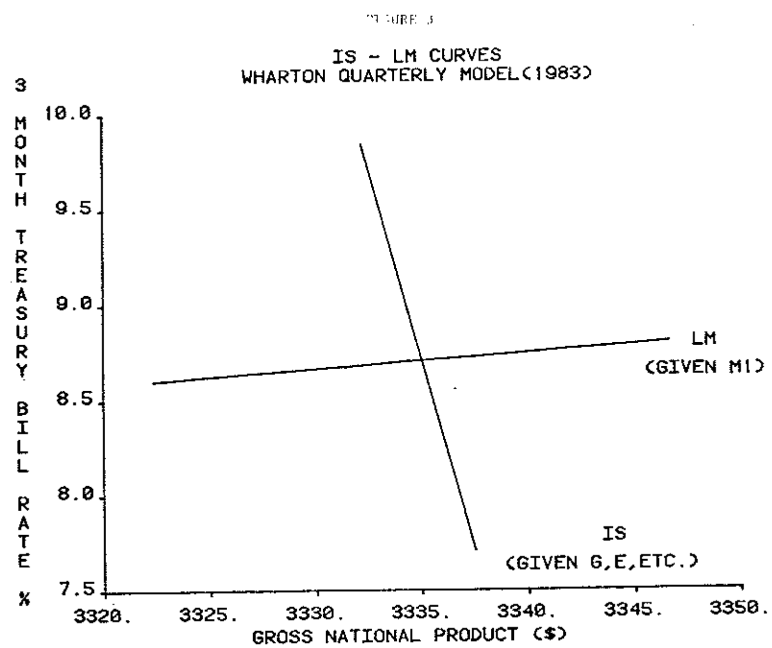
Treasury Bill Rate (percent)	GNP (billions of current dollars)
7.63	3337.71
8.63	3335.15
9.03	3334.18
9.49	3333.10

These are the coordinates of the IS-curve. The two curves are plotted in Figure 3, and it can be seen that their intersection is close to observed values of 8.6 percent and $3305 billion for treasury bill rate and GNP respectively.

The entire Wharton Model is much more powerful, on reduction, than are the simple estimates. The former comes much closer to the "correct" values. It should be noted that the two curves in Figure 1 have shapes much like those that are estimated from the simple system. The LM-curve is quite flat, and upward sloping, while the IS curve is fairly steep and falling from left to right. It is downward sloping.

Contrary to the expressed opinions of some economists, large scale macroeconometric models do have a simple interpetation in familiar terms, and simple systems for pedagogical use in a micro computer environment can readily be constructed.

FIGURE 3



	C$	E $	G$	GNP$	I$	IM$	M1$	R
1951	207.07	19.683	60.099	330.76	59.180	15.263		1.9665
1952	217.09	19.127	75.582	347.97	52.109	15.944		2.1317
1953	229.66	17.971	82.524	366.79	53.349	16.717		2.3162
1954	235.84	18.703	75.760	366.85	52.715	16.173		1.4025
1955	253.67	21.007	75.006	400.04	68.377	18.014		1.9871
1956	266.01	25.035	79.391	421.70	71.022	19.757		3.1219
1957	280.41	28.087	87.084	443.96	69.188	20.809		3.6420
1958	289.46	24.231	95.040	449.67	61.916	20.978		2.2696
1959	310.77	24.814	97.586	487.90	78.128	23.399	141.37	3.7980
1960	324.91	28.861	100.26	506.51	75.882	23.397	141.37	3.6792
1961	335.00	29.936	108.16	524.55	74.778	23.313	144.30	2.7606
1962	355.22	31.804	118.03	565.04	85.421	25.439	147.87	2.8750
1963	374.58	34.214	123.66	596.71	90.904	26.646	152.41	3.4542
1964	400.50	38.825	129.81	637.72	97.356	28.769	158.32	3.8975
1965	430.38	41.086	138.35	691.05	113.55	32.312	165.07	4.3708
1966	465.12	44.560	158.67	755.98	125.69	38.050	172.67	5.4958
1967	490.26	47.310	180.19	799.58	122.83	41.001	179.53	4.9900
1968	536.88	52.355	198.97	873.39	133.28	48.098	191.89	5.8586
1969	581.78	57.519	208.75	944.00	149.29	53.349	203.21	7.5894
1970	621.72	65.670	220.14	992.73	144.21	59.013	211.17	7.6003
1971	672.24	68.813	234.85	1077.6	166.42	64.710	225.53	5.0267
1972	737.05	77.467	253.10	1185.9	195.03	76.728	241.62	4.6550
1973	811.96	109.59	270.43	1326.4	229.79	95.383	259.22	8.3958
1974	888.11	146.19	304.07	1434.2	228.65	132.81	272.24	10.244
1975	976.45	154.93	339.89	1549.2	206.09	128.15	284.90	6.4367
1976	1084.3	170.88	362.10	1718.0	257.87	157.10	301.01	5.2683
1977	1204.4	182.74	393.81	1918.3	324.06	186.73	324.01	5.6408
1978	1346.5	218.72	431.91	2163.9	386.59	219.83	350.68	8.2217
1979	1507.2	281.36	474.35	2417.8	423.03	268.14	377.64	11.225
1980	1668.1	338.77	537.81	2631.7	401.87	314.82	401.48	13.067
1981	1849.1	369.93	596.50	2957.8	484.18	341.93	430.05	15.911
1982	1984.9	348.43	650.47	3069.3	414.86	329.40	458.44	12.271
1983	2155.9	336.17	685.52	3304.8	471.63	344.44	509.09	9.0667

	S$	T$
1951	123.70	104.74
1952	130.87	110.23
1953	137.13	114.57
1954	131.00	109.75
1955	146.38	125.08
1956	155.69	128.77
1957	163.55	135.32
1958	160.21	130.66
1959	177.13	149.45
1960	181.60	154.52
1961	189.56	158.80
1962	209.82	178.25

	S$	T$
1963	222.13	190.83
1964	237.22	197.13
1965	260.67	215.27
1966	290.86	242.29
1967	309.32	251.67
1968	336.51	279.97
1969	362.22	305.06
1970	371.01	297.45
1971	405.38	325.87
1972	448.87	375.60
1973	514.43	411.90
1974	546.11	435.87
1975	572.76	453.14
1976	633.75	523.66
1977	713.88	604.31
1978	817.39	689.87
1979	910.59	767.60
1980	963.63	802.83
1981	1108.7	916.03
1982	1084.4	888.73
1983	1148.9	964.72

VARIABLE	FROM	TO	DESCRIPTION	UNITS	SOURCE
C$	192901	- 198301	PERS CON EXP, TOTAL	BILL CURRENT $	NIA 2.2
E $	192901	- 198301	EXPORTS OF GOODS & SVCS	BILL CURRENT $	NIA 4.1
G$	192901	- 198301	GOVT PURCH OF GOODS & SVCS, TOTAL	BILL CURRENT $	NIA 1.1
GNP$	192901	- 198301	GNP, TOTAL	BILL CURRENT $	NIA 1.1
I$	192901	- 198301	GNP, INVEST, GROSS PVT DOM	BILL CURRENT $	NIA 1.1
IM$	192901	- 198301	IMPORTS OF GOODS & SVCS	BILL CURRENT $	NIA 4.1
M1$	195901	- 198301	MONEY STOCK, CURRENCY, TRAVELERS CHECK & DEPS, TOTAL	BILL CURRENT $	FRB H.6
R	195001	- 198301	INT RATE, NEGOT CD'S, SECNDY MARKET, 3-MONTH	PERCENT	FRB OR G.13
S$	194001	- 198301	GROSS SAVINGS	BILL CURRENT $	TRANSFORMATION
T$	194001	- 198301	TAXES	BILL CURRENT $	TRANSFORMATION