Forecasting and Planning Models

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A macroeconomic model is immensely helpful in the analysis and understanding of the interactions among the macrovariables of an economy. It can help in getting a bird's eye view of the economy, preparing a coordinated picture of the numerous aspects of the economy, in under-standing its structure, in forecasting and planning and in influencing and improving upon the public policy macrogoals. The significant development of large macro-models in the U.S. and other advanced countries over the last four decades can be easily noticed. It is now being felt that the developing countries should go in for the construction of such models suited to their condi-tions and environment. Some of these countries have already got a few models of their economies in spite of difficulties of data collection, lack of computer facilities and other problems but much more needs to be done in this regard in these countries. The maximum work in the field has been done in the U.S. and that will form a substantial part of this study which covers very briefly some of macromodels of the U.S. economy. Models of other countries and other aspects of mac-romodelling and planning will follow thereafter.

The interdependence among the macrovariables and economic problems of our times cannot be adequately represented by neoclassical or Keynesian systems alone or any other simple model. The recent tendency has been to amalgamate the Leontief interindustry flow system into the Keynesian model of demand and income determination resulting in a sort of empirical general equilibrium model.

The macroeconomic relation is basically stochastic in nature. A macroeconomic model

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with its functional form decided and the list of its endogenous and exogenous variables specified alongwith any restrictions on its parameters is a symbols of a scientific theory to be tested with the help of observed data. The accuracy of the equations decribing the data and the confidence in the model when applied to the same data or data of a subsequent period, can be judged by the size of disturbance terms. Using the known values of exogenous variables in a future sample period one may forecast the value of an endogenous variable with the help of model equations. In several of the large models the practice has been to adjust one or more of the constant terms or slopes in the model to improve the forecast. This introduces a subjective element into the use of the model. This may also imply the inadequacy of the model unless there are some fixed rules for doing so and that these rules are a part of the model.

Every model depends on some theory which may be something as simple as a mere supposition or conjecture or which may be a scientific hypothesis. Economic theory is used to generate some variables and statistical procedures are used to select from a variety of approximations. In the case of most models, a similar theory of firm runs underneath. Microbehavioural equations are assumed to be able to explain adequately macroeconomic behaviour by means of stocks adjustment equations. Controversies in economic theories are transmitted into economic models involving these theories so that models are often judged on the basis of these theories. There is of course, the difficulty of inadequate representation of behavioural decisions of economic entities by means of a small set of structural equations.

Most macromodels emphasise demand side changes and pay less attention to the supply side: They take an aggregative view of the economy and concentrate more on short term adjustments. Aggregation, to a limited or greater extent, introduces some complications in macromodels. A higher degree of disaggregation is generally associated with a larger model. However, the extent of disaggregation depends on the objectives of the model and the availability of data. A high degree of disaggregation may be difficult to manage and may even prove to be meaningless in the ultimate analysis. A low degree of disaggregation may lead to biases or irrelevant time series.

Difficulties can arise from errors of measurement, paucity or inadequacy of data and differences in the interpretation of various aspects of a model. Similar models may be used for different economies in spite of their remarkably different international structures and different bases for decision making.

Numerous micro-units with all their peculiarities, when looked upon as parts of a

single complex organism, present a complicated pattern of consumption, production and exchange within the system which is supposed to be working for the good of the society. A macroeconomic model analyses the interdependence between various major parts of the system, examines its operational aspects and gives a picture, often subjective, depending upon the skill and experience of the model builder, of the simplified aggregative relationships which give an approximate idea of the structure of the economy. On the basis of certain criteria, like the use to which the model is to be put, the institutional and political set up and even the availability of data, the model builder divides the economy into some sectors on the basis of some functional pattern and tries to capture the interactions in the economy. The stability of some key relationships in the model is desirable.

Most economic models venture to predict or at least represent some aspect of reality. They present one or more statements about economic behaviour purposes of hypothesis testing depending upon statistical techniques used. Thus a model may be in the form of a single equation or a set of two or more simultaneous equations. Some models may have nonlinear equations. Forecasting and/or historical validation could be the basic purpose of a model. For this purpose the model should adequately represent the data to which it has been applied in the first place i.e. predictions within the sample data should be accurate. Then we should consider the ability of the model for other similar data as well as for going beyond the sample period. Essentially it is a goodness of fit problem for which the commonly used statistic to consider the performance of certain key variables is the Root Mean Square Error. Several attempts may have to be made in arriving at the precise form of the structural equations which would yield reasonable estimates and the set of simultaneous equations thus brought together must present a logical system.

A macroeconometric model may be very small giving a good intuitive grasp of the essential aspects of the economy. It may be elaborate with a large number of real world sectors and their interactions. Or, it may be reasonably large: not very large yet capable of taking care of the complexity of several important sectors of the economy, not very small yet capable of taking care of changes in endogenous variables based on the specifications of tne model. The first case would give a very rough and incomplete picture of the world while the second case may be too complex to handle and grasp. A moderately large sized model seems to be convenient to work with in most practical cases.

Various types of models have been used to analyse the impacts of several policy alternatives and as forecasting devices. The predictive policy formation ability of a model can be used as a criterion to assess a model and also a hyothesis. This is because these models are

presented as structural hypotheses and the problem of choice of a model becomes that of choice of the best structural hypothesis.

The construction and use of large scale economic models is now common in many countries. Plenty of work has been done even in socialist countries but relatively little has been done in this regard in developing countries where need is being felt of constructing such models in spite of some difficulties.

Quantitative models of the functioning of economies were first introduced by Tin-bergen in 1939 who used ordinary least squares for the statistical analysis of his model. It was in late forties and after that when large scale economic models started being commonly used. Simultaneous equation methods were gradually put to use to deal with biases resulting from single equation methods.

Almost all early macroeconomic models were Keynesian in their specification and concentrated on the consumption, investment, imports and employment equations to the neglect of monetary and financial relations and even output equations. These early models were short run models of business cycles and were required to estimate the government expenditure multipliers. In the later models supply constraints were attended to and equations pertaining to money market and prices included in the simulateneous equation systems by the synthesis of Keynesian and neoclassical economics. Availability of time series data over long periods, high speed computers and phenomenal development and use of simultaneous equation methods are some of the factors which have contributed significantly to the growth of these models.

In the recent models, stocks of assets, use of socials accounting methods and inter-sectoral transaction schemes play important roles. An integration of Keynesian and Leontief models is achieved by bringing together a system of demand, social accounting and an analysis of factor rewards and pricing. For the generation of inter-sectoral flows, the input output technique acquires a prominent place in the system. The Brooking Model, the Wharton Model, the Due-senberry-Ecastein-Fromm Model and various other models are some of the works that may be mentioned in this connection. Many of these models are based on quarterly data and have been used for short run policy analysis and forecasting though there are several models which consider long run analysis of the economies concerned.

Most models are broadly divided into three principal sectors comprising of aggregate demand, aggregate supply and the identities relating the two. Within each of these sectors

several relations are included. Some models do leave out of consideration such issues as house-hold and entrepreneurial behaviour, distributional aspect, technology and dynamic response patterns, budget constraint, complexity of tax revenues, industry value added and so on. It is not possible for any model to take care of all the aspects of an economy but the degree of comple-teness of the system may be gradually improved even with fewer equations in some cases.

The Statistical Side

The problem of macroeconometric models is concerned with the formulation, esti-mation and evaluation of its various components. In the set of simultaneous equations represen-ting a model, each equation as a part of the system is important and provides a causal link in the system. Consistent and useful working hypotheses depending on the nature and availability of data need to be made about various components of the model. The ordinary least squares (OLS) method is a commonly used technique to get parameter estimates which should be subjec-ted to statistical analysis and testing. Unfortunately in spite of its relative simplicity and wide usage, the OLS regression may be inadequate when the relations are of a simultaneous nature. The presence of two or more endogenous variables in one or more equations of the model gives rise to the identification problem. In principle, a number of endogenous variables could enter any equation of a set of interrelated structural equations. Methods other than OLS have to be used for consistent estimation of the parameters when the problem of identification presents itself.

The maximum likelihood estimators which are consistent, efficient as well as suffi-cient and which also provide a variance covariance matrix of the parameters, involve heavy computational work and are sensitive to certain specifications errors. Between these two extre-mes. more or less, lie some practical methods like those of instrumental variables (IV) two stage least squares (2SLS) and limited information maximum likelihood(LIML). Each of these methods can be used for simultaneous equation systems but the procedure involves estimation of a single equation of the system at a time while the simultaneity aspect is not ignored. Only a limited amount of priori information is utilised by these methods which do provide consistent estimates. Both the 2SLS and LIML estimators are efficient among estimators depending only on identi-fying restrictions of the equation under consideration.

The three stage least squares (3SLS) gives efficient estimaters if there is no restric-tion on the error variance convariance matrix. The computational work involved is heavy. The 3SLS method converges in distribution with FIML which, although it provides efficient estima-tors has not been much in use.

Some Models of the U.S. Economy:

We will consider here some early models of the U.S. economy followed by the later and more sophisticated models. Most early models used annual data. Quarterly and even monthly data started being used later.

The pioneering work in the field is that of Tinbergen whose modest beginning set the trail for large scale developments which were to follow in the field. Tinbergen (1939 made use of 1919–32 US annual data. His model consists of 32 stochastic equations which includes three each of consumption, investment and liquidity preference functions, and also other equation like those for profits, wage determination, derived demand for labour, capital gains and so no. Most of the equations are in real terms. Besides these, there are 18 definitional equations in the model. All the equations are linear though a few of them are subject to boundary conditions. The time trend has also been used. The model makes use of 32 endogenous and 18 exogenous variables. Lagged variables with lags upto four years have been used. Only 13 observations have been employed. The monetary sector finds extensive treatment while the agricultural sector enters only endogenously through its demand. Tinbergen's synthesis in 1939 of "statistical business cycle research and quanttative economic theory" was the first attempt to introduce an econometric model of an economy. He attempted to test some economic theories regarding the character and causes of cyclical fluctuations in business activity. Tinbergen's model was followed by numerous attempts by others using annual, quarterly and monthly data analysed with the help of more sophisticated techniques.

Suits (1962) made use of 13 observations obtained from annual first differences of 1947–60 US annual data. This 33 equation model consists of 5 definitional equations. There are 28 endogenous and 21 exogenous variables, all expressed in real terms. First differences have been used in the study. There are several consumption and investment functions.

Equations for price level determination and monetary sector are absent from the model. The OLS method of estimation has been utilised in this model.

Duesenterry-Eckstein–Fromm (1960) model of the US economy isbased on a variety of postwar periods and uses quarterly aswell as some annual data. Of the 28 equations in the model, 13 are definitional. Most of these equations are in money terms. There are 28 endogenous and 11 exogenous variables including lagged variables. This model makes use of the capacity variable and a combination of differenced variables. The monetary sector is absent and prices are treated as an exogenous variable.

This model is recursive and the use of OLS may be justified if there is no serial correlation and residuals in different equations are not contemporareously correlated.

We now consider Klein's earlier model and its revised versions and development Klein's (1950) model makes use of 1921-41 US annual data which provide 20 observations for his model. There are 12 stochastic equations most of them in real terms, including 1 consumption function, 2 investment and 2 liquidity preference functions. There is no explicit production function. Instead, the employment output relation is determined by a derived demand for labour. There are 4 definitional equations. Lagged variables and time trends have been used. The model makes use of limited information maximum likelihood method of estimation. This earlier Klein model, though small in size and without the supply side and the monetary side has been a popular model. It may be written :

$$C_t = \alpha_0 + \alpha_1 P_t + \alpha_2 P_{t-1} + \alpha_3 (W_1 + W_2)_t + u_{1t}$$

$$I_t = \beta_0 + \beta_1 P_t + \beta_2 P_{t-1} + \beta_3 K_{t-1} + u_{2t}$$

$$W_{1t} = r_0 + r_1 (Y + T - W_2)_t + r_2 (r + T - W_3)_{t-1} + r_3 (t-1931) + u_{3t}$$

$$C + I + G = Y = P + W_1 + W_2$$

$$K_t - K_{t-1} = I_t$$

Where

C = Consumption
G = Government Expenditure
I = Investment
Y = National Income
K = Capital
P = Price level
T = Taxes
W_1 = Private wage bill
W_2 = Government wage bill

The Keynesian structure which formed the basis of a number of macromodels beginning with those of Klein and Goldberger may be written

$$C = C\,(Y)$$
$$I = I\,(Y)$$
$$L = f\,(Y, K, t)$$
$$\frac{w}{p} = \frac{dY}{dL}$$
$$w = I\,(P, U)$$
$$M_s = M_d$$
$$C + I + G = Y$$

where Y, C, I, G and L stand for national income, consumption, investment, government expenditure and labour respectively, i for interest rate, w for wage rate, U for unemployment, M_s for money supply and M_d for money demand

This model being inadequate for analysis and forcasting, equations were added to it to obtain a workable model. This was done by expanding aggregate demand components (consumption, investment, imports etc.) and by distinguishing between G.N P., national income and personal disposable income. Fquations of aggregate demand were added and separate functions for depreciation, taxes and transfers, corporate savings etc. were also included in later models.

In 1955 Klein and Goldberger, using the 1929-52 annual data, omitting the war years 1942-45, presented a 20 equation model. These 20 simultaneous equations show the interdependence among 20 jointly dependent variables, the explanatory variables being one or more of these variables in some of the equations and 45 predetermined variables made up of 19 lagged endogenous, 19 exogenous and 7 lagged exogenous variables. Among the 20 equations are accounting identitites which close the statistical system. A single price system in the whole system, time trends and lag structures in the income consumption response pattern, a linear production function, corporate profits and savings functions are some of the features of this model. Besides, there is a monetary sector consisting of equations pertaining to interest rate, wage adjustment and agricultural price. While exports are an exogenous factor imports are assumed to depend on real output and relative prices.

In 1959, Goldberger gave a revised model with 21 endogenous and 17 exogenous variables. There are 6 identities in this system of 21 behavioural, technological and definitional equations characterising the US economy, providing a complete system explaining the US eco-

nomic behaviour. Limited information maximum likelihood method of estimation is used to estimate the parameters of the model.

In this revised model, the production function is now introduced explicitly and inventory investment is not treated separately from fixed investment. Most equations are in real terms. Time trends and are also used.

While Klein Golbarger model was itself revised, updated and re-estimated, its related forms either by the introduction of first differences or by inclusion of greater sectoral disaggregation or by replacing annual by quarterly data have led to some other well known models.

Klein Goldberger model has the advantage of being one of the oldest model whose dynamic properties are known so that the model can be easily used for experimentation, alternative methods of parameter estimation and for forecasting. It is relatively small sized with a simple lag structure and absence of sectoral disaggregation so that it does not give rise to problems of instability or multiple equilibria. There is, however, ample scope for the enlargement of the model. Several equations in Klein Goldberger model are of an empirical nature with little support from economic theory. The level of aggregation is high. Interaction among various sectors of the economy are not reflected. The agricultural sector is inadequately represented.

Among the other models which make use of annual data are mainly those of Valavanis (1955), Morishima Saito (1972) and Hickman Coen (1975) which are all models of long term economic growth. The periods covered are an extended period 1869–1953 in Valavanis Model, 1902–1952 in Morishima Saito model and 1924–1940 and 1949–1966 in Hickman Coen Model.

Valvanis makes use of 1869-1948 US annual data. His model has 12 stochastic equations including those for consumption, investment, liquility preference, production, derived demand for labour and capital consumption function. There are eight definitional equations which are assumed to hold in real terms.

With 20 endogenous and 7 exogenous variables, the model makes use of time trends and employs the estimation technique of limited information maximum likelihood and also OLS for some equations.

The Valvanis model resembles the Klein Goldberger model so far as the size and types of variables used are concerned. Howevers, there are some variables which, unlike in Klein Goldberger model, are treated as endogenous or exogenous depending on the requirement

of the Valavanis model. Thus population, labour force, employment and birthrate are endogenous while money supply, net immigration, death rate, unionised labour force, standard houses, value of land and time are exogenous.

There are 7 stochastic and 2 definitional equations in the Morishima–Saito model. According to Morishima Saito the investment function is responsible for much of the failure of Klein Goldberger model on forecasting. They explain this by saying that in their model, gross investment is regarded as exogenous and empirical results are superior to those in Klein Goldberger model.

Along with the short run properties of their model, Morishima Saito also consider the long run properties of the model. They examine the neoclassical state of long run growth maintaining perpetually full employment of labour and capital and the state of balanced growth in which prices remain constant over time.

Morishima Saito model of long term growth has been used for a) structural analysis, b) policy evaluation and c) study of relative effectiveness of monetary and fiscal policy. The model has been applied to the US at different degress of aggregation. The model analyses the problem of existence and stability of the state of long run growth equilibrium maintaining full employment and of the state of balanced growth with constant prices. Morishima Saito model goes further to study the relative effectiveness of monetary and fiscal policy, these being taken as two short term measures to achieve full employment. The model also analyses the contradiction between price wage stability and the maintenance of full employment.

Morishima Saito model supports the Keynesian contention that public investment policy has advantages over traditional monetary policy as a measure to promote full employment. This is done by studying the rate of change in employment with respect to the strategic variable of the policy.

The Hickman Coen model of long term growth has been used for medium and long term forecasting of annual time paths of some important macroeconomic variables like GNP, labour force, unemployment, wages and prices.

The Hickman Coen model uses the annual US observations for the sample period 1924–40 and 1949–60. There are 50 stochastic equations and 70 endogenous variables. The system is nonlinear as there is a large number of behavioural equations which are logarithmic.

The model is used for long range and medium range forecasting over a horizon of 10 years or more. Short run cyclical phenomena are not emphasised. The main variables whose annual time path projections are examined are GNP, labour, employment and unemployment. The model has a Keynesian approach as it has an income expenditure framework to determine real effective demand and a specification linking real and monetary sectors through interest rates. The neoclassical element in this model is noticed when we find marginal productivity conditions incorporating relative factor prices are used to derive factor demand equation. The model has an integrated cost, production and pricing framework and interrelated labour and capital demand function.

The structure of the model consists of five blocs comprising final demand equations. These and the next three blocs of output, income, and taxes and transfers constitute a sort of multiplier and accelerator model. There are six more blocs concerned with labour force, capital stock, potential output money supply, wages and resource utilisation. Labour input consists entirely of a demand function for man hours with output and factors prices as the principal arguments. Wage changes depend on labour demand and wage expectations. The utilisation bloc has equations to determine measures of aggregate resource utilisation. A supply and demand model of the banking sector determines the money stock and a term structure model relates short and long term interest rates. There is a unified view of firms' decision processes connecting investment employment, production and price equations.

Other US Model

The Klein–Goldberger models and others of the type are useful in analysing the direct and indirect impact of fiscal–monetary policy. It is obvious that a better insight into these impacts on GNP components could be available with a higher degree of disaggregation leading us to large and complete models with many more equations and relationships. These may help in in forecasting the results of changes in particular component of final demand. These large sized models are very difficult to handle statistically. Various techniques have been used to simplify the econometric work involved. In particular, mention should be made of Fishers' block recursiveness concept which helped in constructing near recursive submodels (implying the applicability of the causality criterion to certain sub models of the whole system) and simplified the specification problem.

Soon after the Klein Goldberger model, the large models, some of which had over three hundred simultaneous equations and several small models used quarterly instead of annual data.

Even monthly observations were used in some cases. Several sectors and components of economic activity were incorporated into these models.

In 1961, Klein and Popkin introduced a 44 observation model for 1948-58 US quarterly data and made use of limited information maximum likelihood and two stage least squares techniques of estimation. There are 5 definitional equations in this 37 equation model. Its behavioural equations are in real terms while the definitional quations are in money values. There are 37 endogenous and 19 exogenous variables including lagged variables and multiplicative variables combinations.

The mobel has, apart from other equations, 3 consumption and 3 investment functions, a liquidity preference function and 2 interest rate determination function.

The Liu (1963) quarterly model is based on 50 observations from 1947-59 US data. It has 34 equations of which 15 are definitional, the latter being in real terms. Apart from the usual equations, the model has an extensive monetary "sector. Output is determined entirely from the demand side. There are 34 endogenous and 17 exogenous variables including lagged variables, several stock variables and ratio variables. The model makes use of 2SLS method of estimation.

Fromm's (1963) quarterly model consisting of 24 observations from 1953-60 US data has 23 stochastic and 10 definitional equations most of which are in money terms. There are 33 endogenous and 15 exogenous variables including lagged variables, ratio variables and some multiplicative variable combinations. The use of OLS for this model may be justified if its structure canbe reasonably assumed to be recursive.

Sargent's (1976) classical postwar model for the US covers the period 1951.1-1973.3. It is a small, linear model with monetary policy implications with short run Keynesian properties. The model formulates, tests and estimates a version of the classical model that has its origin in hypotheses that place severe restrictions on the random behaviour of unemployment, output and the interest rate. It formulates a drastic statistical definition of the natural unemployment rate hypothesis. There are 5 equations in 5 endogenous variables in the | prototype of the model. The finally estimated model has 8 equations in 8 endogenous variables. The instrumental variable estimation technique is used to estimate the coefficients.

Evan's (1966) quarterly model of the U.S. economy covers the period 1948-62. It makes use of 31 behavioural equations and 19 identities so that there are 50 endogenous varia-

bles in the model which does not have a foreign trade sector. There are fairly well diaggregated equations for investment, consumption and factor shares and also for the price level and the interest rates.

This model attempts to explain price levels in terms of various measures of capacity and finds that ingeneral, changes in the various price levels, depend on relevant measures of capacity for different sectors. The determinants of consumption of nondurables and services are assumed to be similar and estimated in a single equation. The disposable income has been obtained by adding wage and nonwage disposable income to emphasise the mechanism by which higher profits and higher capacity utilisation lead to higher wages and lower profits. Depreciation is a function of capital stock, taxes of their respective revenues base and transfer payments are a function of unemployment. The calculation and discussion of multipliers for various monetary and fiscale policies finds a prominent place in this model. The multipliers are found to be much larger than those in the models.

Pindyck (1973) has constructed a small quarterly model of the post-Korean-war US economy using the data over the period 1955.1 to 1967.4. There are 9 behavioural equations and one income identity. This ten equation macroeconomic model was used to test certain optimum control results and falls into line with Keynesian and post Keynesian theory. The model includes the basic macro variables like consumption, investment, GNP, interest rate, price level. wages and unemployment apart from some basic policy variables. The mobel has been found useful in providing a guideline for stabilisation policy.

Kuh and Schmalense (1973) present a medium sized quarterly model of US using 1954.1–1969.4 data.

In this model of 42 stochastic equations and 40 identities there are 82 endogenous and 35 exogenous variables. Like most recent macroeconometric models this model has a post Keynesian orientation and makes use of quarterly data to examine short run fluctuations. There are linear as well as nonlinear equations in the model and the OLS technique of estimation is used in spite of its providing inconsistent and biased estimates because, as the authors claim, the OLS is simpler and easier to interpret than the alternatives and also because least squares estimates of macroeconomic stochastic equations seldom differ from those produced by consistent estimation method.

Total consumption expenditure is a distributed lag function of disposable personal income

and the implicit price deflator for consumption. As for fixed investment, external estimates of the distributed lags between the decision to invest and investment spending are imposed on the behavioural equations in the model. The statistical estimation of the investment sector is focussed on the process of expectation formation. The inventory sector insists of only one important endogenous variable, inventory investment. The sector for international trade, assumed to have little impact on the level of aggregate economic activity is treated only briefly in this model.

The most elaborate sector consisting of 20 equations (of which there are 7 identities) is the income sector. This is necessary, according to the authors, because important policy parameters like taxes and transfer rates, are often neglected to obtain a more condensed description of disposable income determination. Besides these, there are equations for the labour sector to analyse employment, labour force and unemployment, the wage price sector to derive the average compensation per man hour in the private sector of the economy, the financial sector to determine the corporate and treasury bill and commercial paper rates which influence fixed investment and income distribution sectors and the sector for government demand for goods and services. fiscal policy and budgetary accounts.

The FRB–MIT model of Leeuw and Gramlich (1968) is a quarterly model of the US economy which among other things attempts to quantify monetary policy and its effects on the economy. The model emphasises the role of economic instruments. It finds that both monetary and fiscal policies have powerful effects on the economy though monetary policy operates with a longer lag. The response of money income to these policies is stronger than that implied by other large models.

There are three large blocks of equations in the model. The financial block- made of supply and demand equations for financial claims and their dynamics–consist of 12 equations; the second block which deals with fixed investment including housing, plant and equipment and behaviour of state and local governments has 32 equations; the third i.e. consumption inventory block which covers income shares, imports, taxes, consumption and inventory investment has 21 equations. By combining the three blocks into a single group of simultaneous equations, the main exogenous variables are found to be population and other demographic variables, government taxes and expenditures, monetary policy variables, exports, wages and prices.

The public version of FRB–MIT model is called the MPS model which is a large quarterly model with more than 100 equations. A simplijed version has been analysed by Ando.

The MPS model as analysed by Ando (1974) is a comprehensive model discussing questions of stabilisation policies and the contentions of monetarists. Only a brief description of the simplified form will be considered here.

The MPS model tries to accommodate the points stressed by monetarists in the existing macromodels. It is recognised that the central issues in the analysis of stabilisation policies are interactions among effective demands, conditions of financial markets and the forces determining the level of prices and wages. To accommodate the reality of the economy and to provide sufficient details for actual policy making purposes, the MPS model has been made sufficiently comprehensive.

There are 22 endogenous variables and 6 exogenous variables in the simplied discrets time form of the MPS model. The first 4 equations describe the demand for real output. The consumption function is derived from the life cycle hypothesis of saving. The government expenditure is taken as the sum of the exogenous federal expenditure and the endogenous state and local government expenditure.

There are 7 investment functions: investments in producers' equipment, producers' structures, consumer durables, in single family units, in multiple family units, by state and local governments and in net inventories. For income identities, taxes and the market value of assets there are 7 equations which include the definition of disposable income, the summary tax function, the definition of net worth of households, equations for changes in the value of net worth or saving, market value of real assets and the expected stream of income, current actual income from real assets, market valuation of capital and finally, the equation for changes in the value of real assets.

The observed relationship between the employment and output is not the production function out of which the investment function is derived. For this use is made of a short term relationship between the output and labour modified by the presence of overhead labour.

There are equations: for responsiveness of labour to employment in the from of unemployment rate as a function of manhours and population characteristics, for the rate of change of wages, for the level of output price given the level of money wage.

For the financial side, there are equations for demand for real assets and for expected rate of change of prices are so on. There is also a budget identity for government. In all there are 22 independent equations in the simplified model.

For the discussion of stabilisation policies the model focuses attention on the government budget constraint even though the latter is only implicit in the model. The model emphasises that meaningful long run equilibrium is something close to a golden age path which can be generated by this model with some minor adjustments. It is realised that the historical path of the unstable U.S. economy is far away from any conceivable golden path. It is suggested that when analysing the impacts of stabilisation polcies we should be concerned with time path of the effects of a policy change over some specified length of time.

The response of the economy, according to this model, to an increase in the government expenditure is likely to be a cyclical one. In case of serious instability in the economy, will designed fiscal and monetary policies can keep the economy fairly close to the golden path. This analysis is different from the monetarists' belief that the economy is stable around golden age paths so that monetary and fiscal policies move the economy from one golden age path to another. The MPS model this serves as a framework to analyse several theoretical questions related to economic stabilisation.

THE Brookings Quarterly Model

The Brookings model was the outcome of the coordination of several experts, each working with a part of the model in his own field of specialisation. Expansion of the model continued with modifications, extensions and additional industrial classifications. Consistent methods of estimation were used to reestimate the model after putting together the efforts of all the contributors. Use was made of seasonally adjusted quarterly data of the U.S. economy 1949-60.

The Brookings model (1970) in its condensed from contains 68 behavioural and 13 additional variables in the input output sector. There are 200 endogenous and 126 exogenous variables. The period covered is 1954-65.

The large version of the Brookings model (1978) contains 343 endogenous and 130 exogenous variables. There are 107 behavioural equations. The large version differs from the condensed version in the industrial detail. It has eight sectors in place of the four of the condensed version in the industrial detail.

The large Brookings model uses the 2SLS technique for a system of 176 equations divided into recursive simulteneous blocks. The seven blocks are those for one, investment; two, consumption; three, outputs; four employment; five, labour supply; six, wages, prices and profits; and seven, interest, money and other factor shares.

There is a high degree of disaggregation in the model which treats in detail investment, production, price wage behaviour, employment output relations, financial sectors, government receipts and expenditure. The model uses lagged exogeneous and suitable combinations of laggedexogenous and endogenous variables. The economy is looked upon as a dynamic system of interrelated processes involving feedbacks between production, distribution etc.

The model started with two sectors: manufacturing and nonmanufacturing and was expanded by the addition of five more sectors to seven: durable and nondurable manufacturing, trade regulated construction,farming and residual industries. This helped in a closer analysis of highly volatile production and demand components of the business cycle. This was an improvement over the Wharton model. Also, some equations, almost neglected by the Wharton model, viz. those pertaining to government, agriculture, financial and labour sectors were added in the Brookings' model. Most expansion took place on the supply side of the model while demand side remained practically the same as in Wharton model.

In the Brookings model prices are a function of unit labour costs and change in the inventory output originating ratio. The wage equations, which are of a disequilibrium type, are related to consumer price index, profit rate, unemployment and percentage wage change of the last period. To close the supply side, use is made of labour requirement functions, inventory valuation adjustment, unincorporated business income, rent interest and dividends.

A weekness of this model, as also that of several other models has been the use of lagged dependent variable, particularly in the context of quarterly data. They may lead to biased coefficients. The forecasting ability of the model is affected by a weak linkage of the monetary sector in the model and also by the weakness of its price, wage and other equations. Moreover, the model being a combined product of independant studies, compromises had to be affected on several counts.

Liu-Hwa Model

This macroeconomic model of national income determination by Liu and Hwa (1974) is a monthly model for the period 1954.01–1971-12. This model which is intended for forecasting and policy analysis is a recursive monthly monel and is expected to involve the least specification error concerning causal directions. The serial correlation in disturbance terms may be less than in models with longer unit periods. This last possibility was examined by Liu in 1969 when he also considered the feasibility of a monthly model and the advisability of including in

the relations lagged values of dependent variables. Since the 2SLS method for lagged dependent variables and auto-regressive errors which under certain assumptions, gives maximum likelihood estimates of regression coefficients.

In a monthly model, the recursive relationship is justified because the extent of simultaneity may be less than in longer unit period models.

As claimed by Liu and Hwa, short term forecasts and important policy decisions are often influenced by the latest change in monthly economic data which, therefore. need to be subjected to a more systematic rigorous analysis

The Liu Hwa model consists of 100 equations including 51 stochastic relations and 49 identities. 31 more identities are used to close the model. The number of dependent variables is 100.

The consumer expenditure functions on nondurables, services, autombiles and other durables, based on classical consumer demand theory, have as explanatory variables lagged endogenous variables and also disposable personal income, initial liquid assets and relative prices. Initial liquid assets are found to be significant in all equations except for automobiles. The relative price variable is important in all equations except nonautomobile durable goods. These variables are not adequately utilised in the Wharton and BEA models, which are of sizes comparable with Liu Hwa model. These models do not disaggregate business fixed investment function into plant and equipment functions as in the Liu Hwa model. Similarly there are differences in the disaggregation of functions for residential housing investment, inventories, manufacturers' new orders, shipments and unfulfilled orders.

Bureau of Economic Analysis Quarterly Model for US (BEA)

The BEA model for short term forcasting and for quantitative analysis of policy alternatives is based on the early Wharton model and resembles that in size and structure.

Broadly speaking, the model has three sectors: the output market for components of GNP, the labour market for wages and labour and the prices for deflators of GNP and wages.

In a system of 117 relations making the model, there are 67 stochastic equations. The short run employment function converges to the Cobb Douglas production funcion which relates potential output to capital stock, potential employment and a normal work week. Actual manhours are differentiated from measured man hours, each being allotted separate equations.

The hours worked are looked upon as a partial buffer variable between employment and labour requirements. The Wharton index of capacity utilisation is determined from the ratio of actual to potential output. This index is also used in equations for nonresidential fixed investment, imports and prices. Other equations in the model are those for the private sector wage rate, implicit price deflators, nonwage income components, taxes and transfers and a financial sector.

There are final demand equations for six consumption components: residential and non residential fixed investment, inventory components and import categories. Government purchases and exports of goods and services are services are made exogenous. The following section gives further details about the BEA model.

The Wharton Model

The Wharton model (1967) initially made use of 1948.1–1964.4 data though later (1969) for forecasting purposes (1953.1 – 1968.3 data were used along with additional equations to make some of the monetary variables endogenous. This is a medium sized quarterly model of the US economy and may be looked upon as an extension of Klein Goldberger model. The model has been developed to forecast national income components and employment in the US economy. The later version includes price equations which are more responsive to high capacity utilisation than those in the earlier model.

There are 47 behavioural and 29 definitional equations in the model. The number of endogenous and exogenous variables is 76 and 42 respectively. There are 5 categories each for consumption and investment, production relations of Cobb–Douglas type, a monetary sector and an equation for capacity utilisation, apart fron several other features. Lags upto nine quarters are included in the model. The time trend is also employed.

The 2SLS technique of estimation has been successfully employed in the model for forecasting purposes: There are several variants of this model.

Among the variants of the Wharton model is the Wharton Mark III model of 1972 which treats more elaborately the financial and nonmanufacturing sectors and the behaviour of prices, wages and labour demand. The Wharton Annual and Industry Forecasting model of 1974 makes use of input output information and gives disaggregated forecasts of certain variables. The Wharton III Anticipations model of 1974 uses anticipated variables and analyses their effects on the multiplier and error properties of the model. The results of this model show that anticipating variables can increase the accuracy of a model and reduce error even when advance information is not introduced.

The Wharton Model initially made use of 1948.1-1964.4 data. The BEA quarterly model based on an early version of Wharton model, is of the same size as the Wharton Model but has been continuously revised over the years. It started with the use of 1953.2-1966.4 data on the pattern of Klein's model. Later different parts of the model were revised and re-estimated and the BEA model evolved in a way different from the Wharton model.

Both the BEA Wharton models explain the GNP components with about a dozen equations. In both, consumption is explained by current and lagged disposable income, lagged values of consumption and stock variables.

In the Wharton model, investment is related to various lagged monetary and real variables. Its investment sector is more disaggregated than the BEA investment sector. The BEA model has several investment equations for each component in the investment sector but makes use of one or more specific equations for different purposes. The monetary sector uses the idea of liquidity preference.

The two models have similar import equations. In the Wharton model imports depend on aggregate domestic demand and import prices while exports depend on world trade and the US export prices in relation to world prices.

In both the models, output is determined by the demand side and employment is determined through a production function and subtracted from the endogenously determined labour force to find the employment rate.

In both the models, prices and wages are explained by past price and wage changes and the prime age unemployment rate. In the income sector, wage income is determined by employment and average wages. Wages and prices are useful in forecasting and in explaining inflation.

In the Wharton model corporate profits are determined as the residual difference between national income and all other income claims while in the BEA model they are determined by an estimated equation. There are nine tax functions in BEA while Wharton has four.

In the Wharton model, out put orders and shipments have been disaggregated into seven equations while BEA has three equations for these. However Keynesian orientation and non linear specifications are found in both cases.

The Wharton model is a synthesis of Keynesian and Leontief systems through the conversion of final demand into effective demand. The model gives a structural description of the economy and helps in forecasting and policy analysis though not in the analysis of technical change.

Michigan Quarterly Economic Model

The MQEM model, has passed through several versions and has been continuously used for forecasting. It is a medium size, non-linear quarterly econometric model useful short term forecasting and policy analysis. It makes use of 1954.1–1970.4 date.

There are 35 stochastic equations and 24 identities in this model which has 59 endogenous variables of which 12 from a recursive block. The output variable is primarily expenditure determined making the model a short term one. The supply constraints in the model operate on prices and through the effects of prices on expenditures.

Although the model is an integrated and interdependent system it can be divided into six blocks of equation pertaining to wages and prices, productivity and employment, expenditures, income flows, interest rates and output composition.

In the block of wages and prices there are ten equations to explain the basic wage rate and prices in the private nonfarm sector. These are used to explain seven implicit deflators relating to various components of GNP. The wage equation which is an expanded versions of Philips Lipsey mechanism, explains the rate of change of the money wage over a two quarter interval. The short run Philips curve in the model is not very steeps but in the longer run, with the rate of growth of the money wage adjusting to reduce any deviation between the annual rate of growth of the real wage and the normal productivity standard, the Philips curve grows steeper over time without becoming vertical.

Productivity growth is embodied in capital in the long run but in the short run, productivity growth is responsive to changes in output resulting from such factors as work speed-ups and labour hoarding. Output and productivity are explained within the model.

The expenditure block contains five consumption equation, three investment equations and one import equation.

The residential construction equation resembles the equation for consumption. Busi-

ness fixed investment expenditures are explained by a distributed lag mechanism defined on the desired stock of capital based on neoclassical theory. There are separate distributed lags on output and relative input costs which allow for a different expectation formation process with respect to these determinants of desired stock. The inventory investment equation is of the stock adjustment type.

Private wages, corporate profits, dividends and tax flows are all parts of the block of income flows in which the profit it equation is the most important to explain the dynamic behaviour of the model.

Both the short and long term interest rates are explained in the block for interest rates. The supply of credit represented by the increase in unborrowed reserves which as a variable reflecting monetary policy, is exogenous to the model.

The block of output composition includes service component, tax corrected output variable which affects business fixed investment manufacturing index of industrial production and capacity utilisation in manufacturing.

The Data Resources Quarterly Econometric Model of US Economy (DRI)

The DRI model, with several unique features of its own is one of the largest model with 718 endogenous and 170 exogenous variables. The equations in each sector of the model are shown below:

Sector	Stochastic Equations	Total Equations
Final Demand (C, G. I, F)	66	176
Incomes	11	31
Financial	103	202
Supply Capacity, Operating rates	66	10
Employment, Unemployment, Labour etc.	9	10
Prices, Wages, Productivity	56	81
Industry	128	208
	379	718

There are 339 nonstochastic equations with a considerable degree of disaggregation in some sectors. The model is revised every year and moved toward and explicit treatment of physical stocks and demographic factors and the determination of the composition by age, sex, race, employment and unemployment. A wholly endogenous and behavioural state and local government sector in the model responds to macro conditions, demographic factors and financial conditions.

In the two market model of interest rates, the long term capital market is mainly affected by inflation expectations and supply of liquidity alongwith portfolio considerations.

The links between housing activity and the sale of housing related durables are explicitly modelled by using consumption functions for some components at current prices. There is an inventory equation which takes care of the unintended stock variations caused by sudden changes in sales.

The model relates the income and expenditure variables following the Keynesian approach. In the block containing the expenditure equations there are also equations pertaining to the financial sector and wage price mechanism.

The consumption sector has been divided into 13 categories corresponding to disposable income, demographic factors, physical stocks, household financial assets, debts and prices Many individual equations embody the consensus of current theory such as those for the neoclassical investment function, employment adjustment functions for productivity and a price cost relationship for profits.

The DRI model is designed to minimise forecasting error. This is done by selection of proper time series, annual reestimation of the model and use supplementary data filters and systematic error analysis. The model is highly structural and displays several economic processes. This improves forecasting accuracy and enables one to consider the microimplications of macroforecasts and vice versa. The model exhibits both the cyclical and trend characteristics of the US economy.

FAIR MODEL

Fair developed in 1969 a short run model of the U.S. economy. The main aim of this model is to tackle the problem of subjective adjustments of forecasts before being released. Evans, Haitovsky and Treyz (1972) in their analysis of the forecasting properties of US econo-

metric models firmly believe that constant term   adjustments are essential in econometric models. In an analysis of the Wharton and OBE models they   conclude that the adjusted   forcasts are on the average more accurate than the nonadjusted forecasts from the models and still more accurate than forecasts based on the actual values of the exogenous variables together with either no constant adjustments or on the same constant   adjustments   as used for the adjusted   forcasts. This means that econometric models cannot be used   mechanically for forecasting purposes and subjective adjustments are likely to discount any improvement in the model specification or estimation techniques. Fair's short run model is found to give exante forcasts which are almost as good as those of some other models. It gives improved   results with values of the exogenous variables and with more recent coefficient estimates.

Fairs' model has the added advantage that improvement in model specification and estimation techniques can lead to the possibility of increased forecasting accuracy.

This model of macroeconomic activity is fairly general to include the most important behavioural sectors of economy. It is based on microeconomic   foundations and is a short run forcasting model of U.S.

The five basic sectors are   banks, firms, households, a bond dealer and the government. The model is recursive inasmuch as the   flow is from the bond dealer, to banks, to firms, to households.

The model uses expectational variables which help in the explanation of endogenous variables. Excess labour variable is used to explain employment. The price equation does not include any explanatory wage variable. The specification of the housing sector is based on disequilibrium considerations so that its estimation   as been done as would   be done for markets in disequilibrum.

With 14 stochastic equation   and 5 identities the   model is fairly small and still has the advantage that no constant   term adjustments are required for forecasting purposes. The stability of the estimated relationships and the   sensitivity of the forecasting results to likely errors made in forecasting the exogenous variables have been satisfactorily examined.

In the Fair model, there is one good in the   economy which can be use for consumption or investment. There are no consumer durables and all consumption is in the current period. All labour is assumed to be homogenous.

There is no currency in the system. Bank loans and government bills are one period entities and government bonds are consols. Banks perform the usual of activities of accpeting deposits and lending money etc. The three main decision variables of the government are the various tax rates in the system and the reserve requirement ratio. The number of goods to purchase, the number of hours to pay for, the value of bills to issue and the number of bonds to have outstanding. The government decisions are exogenous in the model.

The decision variables of the firm are seven. They are its price, production, investment, wage rate, loans from banks, number of workers and sales. Like banks the firms must be prepared for the possibility that their expectations are incorrect.

Households receive wages from firms and the government, purchase goods from firms and pay taxes to the government. The two main decision variables of a household are the number of hours to work and the purchases.

The decision variables of the bond dealer are the bill rate, the bond rate and the average stock price. He is not a profit maximiser in the model and represents both the bill and bond market and the stock market.

Stock and savings deposits are assumed to be perfect substitutes. Also bills and bonds are assumed to be perfect substitutes.

Distributional issues are ignored in the model. Fair's model of macroeconomic activity assumes neither perfect competition nor a period clearing of markets. The model assumes directional flow of information between the behavioural units like farms, households, government etc. The flow of funds between these units incorporates important links between the behavioural units like farms, households, government etc. The flow of funds between these units incorporates important links between real and financial sectors. Optional control technique is used to arrive at the decisions made by the units.

The Fair model was primarily designed for short run forecasting and expectational variables were usefully employed. Excess labour plays an important role in explaining employment. The household sector depends on various price deflators, wage, rate, value of assets of previous period etc. The household is linked to the firms sector through the price level and wage rate, hours and labour constraint variables. The responses of the model to changes in various exogenous variables has also been examined in this model.

St. Lousis Model

The St. Louis model of Federal   Reserve Bank was developed in 1960 and later revised and consolidated in 1970   whereafter its basic form was kept   unchanged.   The model was reestimated as the new data became available.

The St. Louis model stresses the role of monetary aggregates and is to be utilised in the development   and evaluation   of stabilisation   policies.   By assessing the monetary as well as fiscal impacts on national   income, employment,   prices and interest rates,   this model looks different from the existing Keynesian models. Indeed, in its methodology and implications it is a challenge to other models.

St. Louis   model is not meant   to provide   information on allocative detail. It is a small model and instead of quarterly forecasting, it indicates the general nature of the differential response of some key variables to alternative courses of monetary and fiscal actions.

As the model is based on the modern quantity theory of money where money is like any other asset providing service to its holder it becomes necessary with this model to differentiate between the short   and long run effects of monetary   and fiscal actions and the method of financing government expenditures. The construction and analysis   of the model are   consistent with these considerations. In this policy oriented model, the main interest   is in economic stabilisation and in assessing the impact and magnitude of monetary and fiscal policy action. To determine the aggregative effect of these actions a few important   relationship have been found to be adequate.

There are five equations and three identities   in this model. The variables on the left side in the following relations are the eight endogenous variables in the model. $\triangle M$, $\triangle E$, $\triangle X^F$ are exogenous variables.

Total spending equations: $\quad Y_t = a_{10} + a_{11} \triangle M_{t-1} + a_{12} \triangle E_{t-i}$

Price equation: $\quad P_t = a_{20} + a_{21} D_{t-i} + a_{22} P_t^A$

Unemployment rate equation: $\quad U_t = a_{30} + a_{31} Z_t + a_{32} Z_{t-i}$

Long term interest rate: $\quad i_t^L = a_{40} + a_{41} M_t + a_{42} X_{t-i} + a_{43} \dfrac{P}{(u/4)_{t-i}}$

Short term interest rate: $\qquad i_t^S = a_{50} + a_{51}\, M_t + a_{52}\, X_{t-i} + a_{53}\, \dfrac{P}{(u/4)_{t-i}}$

Demand pressure identify: $\qquad D_t = \triangle Y_t - (\, X_t^F - X_{t-i}\,)$

Total spending identify: $\qquad \triangle Y_t = \triangle P_t + \triangle X_t$

GNP gap identify: $\qquad Z_t = \dfrac{X_t^F - X_t}{X_t\ \ F}$

M stands for money stock, E for high employment expenditures, P^A for anticipated price, X for output, X^F for full employment output and Z for GNP gap. The notation for endogenous variables in obvious from the captions for the equations.

The St. Louis model may be conveniently described as having a reduced form equation with its fundament relationship given by total spending equation determined by monetary and fiscal actions. The recursive nature of the model is evident if we note that

$\qquad \triangle Y$ is determined by $\quad \triangle M, \qquad \triangle E$

$\qquad D$ is determined by $\quad \triangle Y \qquad$ (and X)

$\qquad \triangle P$ is determined by $\qquad D \qquad$ (and P^A)

$\qquad \triangle X$ is determined by $\quad \triangle Y, \qquad \triangle P$

$\qquad Z$ is determined by $\qquad X$

$\qquad U$ is determined by $\qquad Z$

interest rates i^L , i^S do not have a direct role in the determination of Y, X, P, in this model. However i^L , i^S are determined by changes in X, P^A and M.

St. Louis model proposes that the private economy is inherently stable and that instability is brought about by monetary and fiscal actions. Simulation studies show that ocillations followed by a steady long run growth path result from changes in any one of the three exogenous variables in the model. It is noticed that while fiscal actions have only a short run effect on economic activity, the monetary actions have lasting effect on nominal variables like Y, P and

i. The monetary actions, which leave out real variables like growth of output and employment contribute significantly to economic fluctuations.

Simulation studies of St. Louis model by Anderson and Carlson (1974) show that although the model was not formulated as a forecasting device, yet because it provides results widely different from experience its validity may be questioned to a certain extent. However, the model has a number of redeeming features. It shows that short run effects of stabilisation policies could differ substantially from long run effects. It uses the reduced from approach to estimate the impact of monetary actions which led to a change in thinking about the quickness of response of G.N.P. It shows how it is possible to avoid excessive sectoral detail as in the large models and still capture the aggregative impact of stabilisation actions with the help of a smaller, alternative and different framework of analysis.

St.Louis model does not capture short run movements in velocity and also cannot analyse the long run effects of short run decisions. It can neither explain price developments during periods of government controls and world wide inflation nor can it explain the variation in government spendings and in money stock.

The models considered here have some common features but there are several points of differences among them. The basic issues, the underlying theories, the level of aggregation, the size and scale of the .model, the nature and quantum of data used and the estimation techniques alongwith statistical difficulties are some of the problems that each model builder faces in his own working environment.

So far as the US models are concerned, the number of equations ranges from 9 (including 5 stochastic equations) to over 350 (including more than 100 identities). There are some very large, highly disaggregated models which are expected to take care of many aspects of the economy, there are small models which are justified on grounds of cost, case of handling and compactness and there are intermediate size models which are supposed to have the good qualities of both.

Many of the models have forecasting as their direct or indirect aim though the nature and route adapted are different.

The OLS technique seems to be the most favoured technique in model building. Its theoretically biased and inconsistent results do not seem to deter the model builders from using it consistently. The 2SLS technique has also been used at time but maximum likelihood methods

have hardly any adherents at all. There is no hard and fast rule about the relative number of stochastic equations and identities.

Although a few models make use of some similar sectors in their structures, the specification of such sectors and their relative importance in different systems is not always the same. The Keynesian structure seems to be present, implicitly or explicitly in most cases although differences in theoretical beliefs can be noticed in some models. The rigour of theory should not be matched with the rigour of the empirical world because the former can soar to any heightswhile the latter is limited by the quantity and quality of data available. We note that most US models struggle with some theoretical issuses; the trend in the models from other countries is being on the practical side, though, as in some other matters, attempts to do what the US does, are on the increase and theoretical issues are being reexamined everywhere. Moreover, many of the older models are being revised and reframed to serve and to perform better. Some of the more recept models like those for Turkey and Yugoslavia are in the category of computable general equilibrium models. Under the auspices of the World Bank, these models focus on issues of growth, trade policy and industrial structure and also trace the implications for different sectors of alternative adjustment strategies over the medium term. They capture the responses of decentralised decision makers to policy actions that change the structure of incentives in product factor markets. In the case of Yugoslavia the model is expected to examine its economic performance during the current planning phase. These models have not yet been found suitable for short term changes in economic performance.

Efforts are also going on to model the world economy to examine the implications of alternative policy choices at the international level and to analyse the interdependance among countries through trade and capital flows. Project LINK and SIMLINK are efforts in this direction. Economic model building activity is in a state of flux and there is much more to happen in the coming years when this luxury of model building will be shared by all the countries of the world and will be put to many more uses than at present.

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