Is Keynesian Economics a Dead End?

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Classical economic theory did not recognize a need for a special branch, with its own special postulates, designed to explain the business cycle. It was Keynes who founded that special branch, called macroeconomics, because he thought that it was impossible to explain the characteristics of business cycles within the discipline imposed by classical economic theory, a discipline imposed by its insistence on adherence to the two postulates (a) that markets be assumed to clear, and (b) that agents be assumed to maximize their utility. The outstanding fact that seemed impossible to reconcile with the postulates of rational agents and markets that always cleared was the length and severity of depressions in business with accompanying mass unemployment. A related observation is that measures of aggregate demand and prices are positively correlated with measures of real output and employment, contrary to classical neutrality results. Freed of the straight-jacket (or discipline) imposed by the classical postulates, Keynes described a model in which rules of thumb, such as the consumption function and liquidity preference schedule, took the place of decision functions that a classical economist would insist be derived from the theory of choice. And rather than require that wages and prices be determined by the postulate that markets clear--which for the labor market seemed patently contradicted by the severity of business depressions--Keynes took as an unexamined postulate that money wages are "sticky," meaning that they are set at a level or by a process that could be taken as uninfluenced by the macroeconomic forces Keynes proposed to analyze.

Since its inception, macroeconomics has been criticized for its "lack of foundations in microeconomic and general equilibrium theory." But to create a distinct branch of theory with its own distinct postulates wasy Keynes' conscious aim, as astute commentators like Leontief (disapprovingly) and Tobin (approvingly) recognized early on.

Models in the style advocated by Keynes were quickly embraced by econometricians. This was natural because the practical success of the Keynesian paradigm depended on being able to discover empirically the aggregate behavior rules governing aggregate demand and the "law of adjustment" governing wage movements. Econometrics contributed to the development of Keynesian macroeconomics in several vital ways. In the twenty years following the publication of General Theory, the key behavioral rules described by Keynes--the consumption, investment, and portfolio balance schedules--were given specific functional forms and estimated on the basis of data, both cross sections and time series. This work increased the precision of hypotheses about those behavioral schedules. It substantially elevated the scientific content of business cycle analysis by raising the standards for judging a theory's adequacy in explaining the data. The work seemed to confirm large parts of Keynes' theory in the sense that estimated schedules for consumption and portfolio balance fit the data well. This stream of work culminated in the generations of large macroeconometric models that succeeded the celebrated Klein-Goldberger model. These models have by and large been successful according to one important criterion of success: the models are able to explain well the course of key economic aggregates during the periods over which they have been fit.

Despite their enormity and the more precise and sophisticated mathematical forms they have assumed, all modern macroeconometric models follow Keynes' theoretical dicta in two critical respects. First, the models incorporate behavioral rules that fall short of having been deduced from the assumption of optimizing behavior; and second, the models all take as given and, beyond the province of the model to explain, certain rigidities that prevent some markets from clearing. True, these modern models don't assume that wages are rigid in the sense that they are constant over time. The rigidity assumption instead surfaces in a subtler form, though its analytical role is much the same as Keynes' fixed-wage assumption. Thus, a modern macroeconometric model typically assumes that the regression of the rate of change of wages on past rates of change of wages, unemployment, and past rates of inflation is fixed with respect to the interventions that the model user wants to analyze. These two characteristics of the models mean that, according to their own internal logic, they describe a hypothetical state of affairs in which there exist persistent, unexploited profit and utility-generating opportunities. We call a model with these characteristics a disequilibrium model. A model which describes a hypothetical state of affairs in which agents act in their own best interests and markets clear, so that there are no systematic unexploited profit or utility-generating opportunities, is called an equilibrium model or a classical model.

While large scale econometric models seem to do a good job of describing the data over the periods for which they were estimated, that is not the sole or even the main use their builders have in mind. The models are intended to be structural in the sense that their parameters will remain invariant when some policy intervention occurs, so that the models are supposed to be capable of simulating and evaluating the effects of alternative ways of conducting monetary and fiscal policies. To the extent that such models really are structural, they promise to convert the subject of macroeconomic policy--long one of the "softest" areas of economics--from a discipline whose main tool was the armchair into one whose tool is the computer. Given a set of preferences about inflation, unemployment, and so on for the policy maker, and given a working econometric model of the economy, the problem of deducing the optimal monetary and fiscal policies is a technical one which mathematicians more or less know how to solve. There is wide agreement that this is the correct way to think about making macroeconomic policy. Even at an entirely a priori level the approach has had major successes. An example was the way Poole and Kareken, Muench, and Wallace were able substantially to clarify long-standing issues in the monetary policy area by using the tools of optimal control theory.

The cornerstone of this approach is that the econometric model to be handed over to the optimal control expert must be structural. In order for the control expert's calculations to make sense it is necessary that the model's parameters not be expected to change in unknown ways once alternative policy regimes are implemented.

The characteristics of the optimal rules for monetary and fiscal policies that Keynesian macroeconomic models yield provides the scientific basis for the Keynesian economists' advocacy of an "activist" macroeconomic policy. Given that the models are structural they typically imply, say, that it is optimal for the monetary authority to "look at and respond to everything" in setting monetary policy. Typically the computed optimal policy implies that the authority should lean against the wind, say, increasing the money supply faster during recessions, more slowly during booms. Such results, and similar results for settings of fiscal variables, are the scientific basis for objections to the no-feedback rules that Milton Friedman and Henry Simons advocated.

While the Keynesian research strategy necessarily involves disposing of at least some of the restrictions implied by classical economic theory, the requirement that models be structural necessarily requires that some theoretical restrictions be called upon. As we shall see, there is a persistent tension between the unavoidable need for the extensive theoretical restrictions that are required to deliver a structural model and an opposing need to discard at least certain critical aspects of classical doctrine in order to remain Keynesian in conception.

Constructing a structural macroeconometric model necessarily requires the imposition of a great deal of a priori information. Econometric identification of behavioral relationships requires that a great deal be known about each relationship a priori. A recurring theme among builders of Keynesian macroeconometric models is that the "reduced form" nonstructural models fit by various monetarists are of little interest because they ignore the a priori information on behavior relations that Keynesians believe they possess. Because they ignore that information, it is claimed that unrestricted estimation of reduced forms provides less statistically efficient estimates of the reduced forms themselves and moreover could never yield models capable of studying the rich variety of policy interventions that a Keynesian model could. So Keynesian macroeconometric models cannot be viewed as the products of purely empirical findings. The parameter estimates of the individual behavior relations and therefore the response of the models to various interventions necessarily are heavily influenced by the prior information imposed by the model builder.

What are the sources of the a priori identifying information used in Keynesian macroeconometric models? As the models have evolved over the last twenty years, increasingly microeconomic theory has been used to some extent to guide the specification of key behavioral relationships, for example, the consumption, portfolio balance, and factor demand schedules. But as yet, as I shall argue below, that theory is still used in a very casual way so that the models fall far short of using the theory of optimizing agents to identify behavioralships. Furthermore, the faith of the Keynesian is that there are definite limits beyond which the application of the theory of optimizing agents and cleared markets is no longer useful. Other sources must be called upon to supply many of the critical identifying restrictions incorporated in macroeconometric models.

A standard linear econometric model takes the structual form

(1) $$A_0 y_t + A_1 y_{t-1} + \ldots + A_m y_{t-m} = B_0 x_t + B_1 x_{t-1} + \ldots + B_n x_{t-n} + \varepsilon_t$$

(2) $$R_0 \varepsilon_t + R_1 \varepsilon_{t-1} + \ldots + R_r \varepsilon_{t-r} = u_t, \; R_0 \equiv I.$$

Here y_t is an (Lxl) vector of endogenous variables, x_t is a (Kxl) vector of exogenous variables, and ε_t and u_t are each (Lxl) vectors of random disturbances. The matrices A_j are each (LxL); the B_j's are (LxK), and the R_j's are each (LxL). The (Lxl) disturbance process u_t is assumed to be a serially uncorrelated process with contemporaneous covariance matrix $Eu_t u_t' = \sum$ and $Eu_t u_s' = 0$ for all $t \neq s$. The defining characteristics of the exogenous variables x_t is that they are uncorrelated with the ε's at all lags so that $Eu_t x_s'$ is an (LxK) matrix of zeroes for all t and s.

A structural equation is a behavioral relationship, identity, or market clearing condition each of which in principle can involve a number of variables that are endogenous (endogenous variables are determined by the model). The structural equations are usually not "regression equations" because the ε_t's are in general, by the logic of the model, supposed to be correlated with more than component of the vector y_t and very possibly one or more components of the vectors y_{t-1}, ... y_{t-m}.

The structural model (1) and (2) implies a system of reduced form equations

$$(3) \qquad y_t = -P_1 y_{t-1} - \dots - P_{r+m} y_{t-r-m} + Q_0 x_t + \dots + Q_{r+n} x_{t-n-r} + A_0^{-1} u_t$$

where

$$P_s = A_0^{-1} \sum_{j=-\infty}^{\infty} R_j A_{s-j}$$

$$Q_s = A_0^{-1} \sum_{j=-\infty}^{\infty} R_j B_{s-j}.$$

The reduced form equations are "regression equations," that is, the disturbance vector $A_0^{-1} u_t$ is orthogonal to y_{t-1}, ..., y_{t-r-m}, x_t, ..., x_{t-n-r}. This follows from the assumptions that the x's are exogenous and that the u's are serially uncorrelated. Therefore, under general conditions the reduced form can be estimated consistently by the method of least squares. The population parameters of the reduced form (3) together with the parameters of a vector autoregression for x_t,

$$(4) \qquad x_t = C_1 x_{t-1} + \dots + C_p x_{t-p} + a_t$$

where $Ea_t \cdot x_{t-j} = 0$ for $j \geq 1$ completely describe all of the first and second moments of the (y_t, x_t) process. Given long enough time series, good estimates of the reduced form parameters--the P_j's and Q_j's--can be obtained by the method of least squares. Reliable estimates of those parameters is all that examination of the data by themselves can deliver.

It is not in general possible to work backwards from estimates of the P's and Q's alone to derive unique estimates of the structural parameters, the A_j's, B_j's, and R_j's. In general, infinite numbers of A, B, and R's are compatible with a single set of P's and Q's. This is the "identification problem" of econometrics. In order to derive a set of estimated structural parameters, it is necessary to know a great deal about them in advance. If enough prior information is imposed, it is possible to extract estimates of the (A_j, B_j, R_j)'s implied by the data in combination with the prior information.

Large Keynesian macroeconometric "identify" structural parameters by imposing several types of _a priori_ restrictions on the A_j's, B_j's, and R_j's. These restrictions usually fall into one of the following categories:

(a) _A priori_ setting of many of the elements of the A_j's and B_j's to zero.

(b) Restrictions on the orders of serial correlation and the extent of cross serial correlation of the disturbance vector u_t, restrictions which amount to _a priori_ setting many elements of the R_j's to zero.

(c) _A priori_ categorization of variables into "exogenous" and "endogenous." A relative abundance of exogenous variables aids identification.

Existing large Keynesian macroeconometric models are open to serious challenge for the way they have introduced each category of restriction. As for category (a), one standard procedure has been to use microeconomic theory to suggest a list of variables that belong on the right side of a given behavioral schedule, say, a demand schedule for a factor of production or a consumption schedule. But from the point of view of identification of a given structural equation what is needed is reliable prior information that certain variables should be excluded from the right-hand side. Modern probabilistic microeconomic theory almost never implies the exclusion restrictions that are imposed by macroeconometric models. To take one example that has extremely dire implications for the identification of existing macro models, expectations about future prices, tax rates, and income levels play a critical role in many demand and supply schedules in those models. For example, in the best models, investment demand typically is supposed to respond to businessmen's expectations of future tax credits, tax rates, and factor costs. The supply of labor typically is supposed to depend on the rate of inflation that workers expect in the future. Such structural equations are usually identified by the assumption that, for example, the expectation about the factor prices or rate of inflation attributed to agents is a function only of a few lagged values of the variable itself which the agent is supposed to be forecasting. However, the macro models themselves contain complicated dynamic interactions among endogenous variables, including factor prices and the rate of inflation, and generally imply that a wise agent would use current and many lagged values of many and usually most endogenous and exogenous variables in the model in order to form expectations about any one variable. Thus, virtually any version of the hypothesis that agents behave in there own interests will contradict the identification restrictions imposed on expectations formation. Further, the restrictions on expectations that have been used to achieve identification are entirely arbitrary and have not been derived from any deeper assumption reflecting first principles about economic behavior. No general first principle has ever been set down which would imply that, say, the expected rate of inflation should be modeled as a linear function of lagged rates of inflation alone with weights that add up to unity. But that is the hypothesis in almost all existing models. Further, that the weights add to unity is a heavily worked identifying restriction. The casual treatment of expectations is not a peripheral problem in these models. For the role of expectations is pervasive in the models and exerts a massive influence on their dynamic properties, as Keynes himself insisted it must be. The failure of existing models to derive restrictions on expectations from any first principles grounded in economic theory is a symptom of a somwhat deeper and more general failure to derive behavioral relationships from any consistently posed dynamic optimization problems. To take but one telling example, take any Keynesian macroeconometric model you choose and try to determine the horizons over which the various expectations modeled are assumed to be cast. In general, that matter is never addressed, though it must be as a matter of course in any carefully formulated dynamic model.

As for the second category, existing Keynesian macro models make severe _a priori_ restrictions on the R_j's. Typically, the R_j's are supposed to be diagonal so that cross equation lagged serial correlation is ignored and also the order of the ε_t process is assumed to be short so that only low-order serial correlation is allowed. There are presently no theoretical grounds for introducing these restrictions, and for good reasons there is little prospect that economic theory will soon provide any such grounds. In principle, identification can be achieved without imposing any such restrictions. Foregoing the use of category (b) restrictions would increase the category (a) and (b) restrictions needed. In any event, existing macro models do heavily restrict the R's.

Turning to the third category, all existing large models adopt an a priori classification of variables into the categories of strictly endogenous variables, the y_t's, and strictly exogenous variables, the x_t's. This is no longer a necessary or even acceptable econometric procedure because it fails to incorporate the latest insights of time series econometrics. In particular, Christopher Sims has shown that in a time series context, the hypothesis of econometric exogeneity can be tested. That is, Sims showed that the hypothesis that x_t is strictly econometrically exogenous in (1) necessarily implies certain restrictions that can be tested given time series on the y's and x's. Tests along the lines of Sims' ought to be used as a matter of course in checking out categorizations into exogenous and endogenous sets of variables. To date they have not been. Prominent builders of large econometric models have even denied the usefulness of such tests [cite Klein, BPEA, 1973, Ando, Minneapolis Conference].

The preceding observations establish a strong a priori presumption against regarding existing Keynesian macroeconometric models as structural. Maybe these arguments could be dismissed as theoretical and econometric nitpicking if the large models had compiled a record of working in the sense that they held up well across breaks in the stochastic behavior of the exogenous variables and disturbances. If the models had a record of remaining invariant across such breaks, then there would be some empirical evidence in favor of the claim made in their behalf that they have isolated structures that will remain invariant across the class of interventions that policy makers want to consider. However, the models have failed to compile such a record. Formal statistical tests for invariance across breaks have revealed that the large macroeconometric models to which they have been applied fail to remain invariant in important regards. At a less formal level, the failure of the models to be invariant is symptomized by the elaborate system of add-factors that users of the models employ in making forecasts. The models have failed spectacularly in depicting the "tradeoff" between inflation and unemployment. As Lucas reports, "As recently as 1970, the major U.S. econometric models implied that expansionary monetary and fiscal policies leading to a sustained inflation of about 4 percent per annum would lead also to sustained unemployment rates of less than 4 percent, or about a full percentage point lower than unemployment has averaged during any long period of U.S. history." ("Understanding Business Cycles," p. 13.) As we all know, instead of 4-4, in the mid-1970's we got 9-9, a very improbable occurrence if econometric models of 1969 had been correct.

The failure of estimated econometric models to reveal the interactions between inflation and unemployment or real output outside the period of estimation is especially damaging to the Keynesian research strategy. An essential feature of all Keynesian macroeconometric models is that wages and prices follow laws that cannot be deduced from the classical hypotheses of cleared markets and optimizing agents but that statistical descriptions of those laws can be discovered econometrically. Assuming that those empirical laws remain fixed, it is then possible to compute a time path for aggregate demand that will keep real GNP and unemployment along desired paths outside the period that was used to estimate the model. There is strong evidence that the existing macroeconometric models cannot be used in this way.

If one accepts the preceding arguments and evidence that existing macroeconometric models cannot be regarded as structural, there are several possible responses. The typical response of those engaged in the construction and use of the models is that the problems are surmountable within the existing framework and that the models can be refined by changing a few structural equations, adding or subtracting a few variables here and there, and perhaps disaggregating various blocks of equations. This response fails to recognize the generic character of the preceding criticisms. All of our criticims of the three types of identifying restrictions will continue to apply to the products of such a strategy. It, therefore, does not seem likely that things can be patched up by proceeding in this way. There are simply too many "plausible" behavioral hypotheses and alternative assumptions about invariance with respect to interventions to expect success to follow from the same old undisciplined way of doing macroeconometric research.

A second response is to give up on the hope of using estimated econometric models and the theory of optimal macroeconomic policy, instead returning to "judgmental" methods. That would be a mistake and is in any event not an admissible option for anyone who entertains the notion that he is engaged in science. There is no denying that the Keynesians' applications of econometric methods and optimal control theory have set new and higher standards for precision and empirical verification that must be met.

A third path involves retaining the use of econometric methods and the theory of optimal macroeconomic policy but agreeing to submit once again to the discipline imposed by "classical" or "equilibrium" theory. It is this path that a number of us believe will lead eventually to a successful, econometrically verified theory of the business cycle, one that can serve as the foundation for quantitative analysis of macroeconomic policy. There is no denying that this approach is "counterrevolutionary," for it says that Keynes and his followers were wrong to give up on the possibility that an equilibrium theory could account for the business cycle. As of now, no successful equilibrium macroeconometric model at the level of details of say, the FMP model, has been constructed. But small theoretical equilibrium models have been constructed that show potential for explaining some key features of the business cycle long thought to be inexplicable within the confines of classical postulates. The equilibrium models also provide reasons for understanding why estimated Keynesian models fail to hold up outside of the sample over which they have been estimated. I now turn to describing some of the key facts about business cycles and how the new classical models confront them.

For a long time most of the economics profession has with good reason followed Keynes in rejecting classical macroeconomic models because they seemed incapable of explaining some important characteristics of time series measuring important economic aggregates. Perhaps the most important failure of the classical model seemed to be its inability to explain the positive correlation in the time series between prices and/or wages, on the one hand, and measures of aggregate output or employment, on the other hand. A second and related failure was its inability to explain the positive correlations between measures of aggregate demand, like the money stock, and aggregate output or employment. Static analysis of classical macroeconomic models typically indicated that the levels of output and employment were predetermined with respect to both the absolute level of prices and measures of aggregate demand. The pervasive presence of the above mentioned positive correlations in the time series seems consistent with causal connections flowing from aggregate demand and inflation to output and employment, contrary to the classical "neutrality" propositions. Keynesian macroeconometric models do imply such causal connections.

We now have rigorous theoretical models due mainly to the work of Robert Lucas that are capable of explaining these correlations while retaining the classical postulates that markets clear and agents optimize. The key step in obtaining such models has been to relax the ancillary postulate used in much classical economic analysis that agents have perfect information. The new classical models continue to assume that markets always clear and that agents optimize. The postulate that agents optimize means that their supply and demand decisions must be functions only of preceived relative prices. Each agent is assumed to have limited information and to receive information about some prices more often than other prices. On the basis of their limited information--the lists that they have of current and past absolute prices of various goods--agents are assumed to make the best possible estimate of all of the relative prices that influence their supply and demand decisions. Because they don't have all of the information that would enable them to compute perfectly the relative prices they care about, agents make errors in estimating the pertinent relative prices, errors that are unavoidable given their limited information. In particular, under certain general conditions, agents will tend temporarily to mistake a general increase in all absolute prices as an increase in the relative price of the good that they are selling. This will make them increase their supply of that good over what they had previously planned. Since everyone is, on average, making the same mistake, aggregate output will rise above what it would have been. This increase of output above what it would have been will occur whenever the period's average economy-wide price level is above what agents had expected this period's average economy-wide price level to be on the basis of previous information. Symmetrically, aggregate output will be decreased whenever the aggregate price turns out to be lower than agents had expected. The hypothesis of "rational expectations" is being imposed here because agents are supposed to make the best possible use of the limited information they have and are assumed to know the pertinent objective probability distributions. This hypothesis is imposed by way of adhering to the tenets of equilibrium theory.

The preceding theory leads to a positive correlation between unexpected changes in the aggregate price level and revisions in aggregate output from its previously planned level. Further, it is an easy step to show that the theory implies correlations between revisions to aggregate output and unexpected changes in any variables that help cause the price level. In most macroeconomic models, the money supply is one determinate of the price level. The preceding theory easily can account for positive correlations between revisions to aggregate output and unexpected increases in the money supply.

While such a theory predicts positive correlations between the inflation rate or money supply, on the one hand, and the level of output on the other, it also asserts that those correlations do not depict "tradeoffs" that can be exploited by a policy authority. That is, the theory predicts that there is no way that the monetary authority can follow a systematic activist policy and achieve a rate of output that is on average higher over the business cycle then what would occur if it simply adopted a no-feedback, X-percent rule of the kind Friedman and Simons recommended. For the theory predicts that aggregate output is a function of current and past unexpected changes in the money supply. Output will be high only when the money supply is and has been higher than it had been expected to be, i.e., higher than average. There is simply no way that on average over the whole business cycle the money supply can be higher than average. Thus, while the preceeding theory is capable of explaining some of the correlations long thought to invalidate classical macroeconomic theory, the theory is classical both in its adherence to the classical theoretical postulates and in the "nonactivist" flavor of its implications for monetary policy.

While the new classical theory is consistent with positive price-output and money-output correlations, it has been harshly criticized by prominent Keynesian economists who claim that it cannot explain two other key facts. The first criticism begins with the correct observation that if agents' expectations are rational and if agents' information includes lagged values of the variable being forecast, then agents forecast errors must be a serially uncorrelated random process. That is, on average there must be no detectable relationships between this period's forecast error and any previous period's forecast error. But it is a fact that real output, employment, and unemployment are each highly serially correlated, that is, each is highly correlated with recent lags of itself. The critics argue that serially uncorrelated errors in forecasting prices or the money supply can explain at most only a small part of the total variance in aggregates like real output, employment, and unemployment. They claim that such serially uncorrelated forecast errors can explain at most the very small proportion of variance left over after accounting for the overwhelming proportion of the variance in say, real output, that is explained by lagged values of real output. Gordon, Modigliani, and Tobin have all made this argument. Tobin put the argument succinctly:

> One currently popular explanation of variations in employment is temporary confusion of relative and absolute prices. Employers and workers are fooled into too many jobs by unexpected inflation, but only until they learn it affects other prices, not just the prices of what they sell. The reverse happens temporarily when inflation falls short of expectation. This model can scarcely explain more than transient disequilibrium in labor markets.
>
> So how can the faithful explain the slow cycles of unemployment we actually observe? Only by arguing that the *natural rate itself fluctuates, that variations in* unemployment rates are substantially changes in voluntary, frictional, or structural unemployment rather than in involuntary joblessness due to generally deficient demand.

The critics typically conclude that the theory only attributes a very minor role to aggregate demand fluctuations and necessarily depends on disturbances to aggregate supply to account for most of the fluctuations in real output over the business cycle. As Modigliani characterized the implications of the theory: "In other words, what happened to the United States in the 1930's was a severe attack of contagious laziness."

This criticism is fallacious because it fails to distinguish *properly between "sources of impulses" and "propogation mechanisms" a* distinction stressed by Ragnar Frisch in a classic 1933 paper that provided many of the technical foundations for Keynesian macroeconometric models. Even though the new classical theory implies that the forecast errors which are the aggregate demand "impulses" are serially uncorrelated it is certainly logically possible that "propogation mechanisms" are at work that convert these impulses into serially correlated movements in real variables like output and employment. Indeed, two concrete such propogation mechanisms have already been shown in detailed theoretical work to be capable of performing precisely that function. One mechanism stems from the presence of costs of firms of adjusting their stocks of capital and labor rapidly. The presence of these costs is known to make it optimal for firms to spread out over time their response to the relative price signals that they receive. In the present context, such a mechanism causes a firm to convert the serially uncorrelated forecast errors in predicting relative prices into serially correlated movements in factor demands and in output.

A second propogation mechanism is already present in the most classical of economic growth models. It is known that households' optimal accumulation plans for claims on physical capital and other assets will convert serially uncorrelated impulses into serially correlated demands for the accumulation of real assets. This happens because agents typically will want to divide any unexpected changes in income partly between consuming and accumulating assets. Thus, the demand for assets next period depends on initial stocks and on unexpected changes in the prices or income facing agents. This dependence makes serially uncorrelated surprises lead to serially correlated movements in demands for physical assets. Lucas showed how this propogation mechanism readily accepts errors in forecasting aggregate demand as an "impulse" source.

A third likely propogation mechanism is identified by recent work in search theory. Search theory provides an explanation for why workers who for some reason find themselves without jobs will find it rational not necessarily to take the first job offer than comes along but instead to remain unemployed for some period until a better offer materializes. Similarly, the theory provides reasons that a firm may find it optimal to wait until a more suitable job applicant appears so that vacancies will persist for some time. Unlike the first two propogation mechanisms mentioned, consistent theoretical models that permit that mechanism to accept errors in forecasting aggregate demand as an impulse have not yet been worked out, for mainly technical reasons. But it seems likely that this mechanism will eventually play an important role in a successful model of the time series behavior of the unemployment rate.

In models where agents have imperfect information either of the first two and most probably the third mechanism is capable of making serially correlated movements in real variables stem from the introduction of a serially uncorrelated sequence of forecasting errors. Thus, theoretical and econometric models have been constructed in which in principle the serially uncorrelated process of forecasting errors is capable of accounting for any proportion between zero and one of the steady-state variance of real output or employment. The argument that such models must necessarily attribute most of the variance in real output and employment to variations in aggregate supply is simply wrong logically. Vis a vis Keynesian models, there seems to be no presumption that the new classical models must impute a smaller proportion of the steady-state variance in output to aggregate demand.*

A second criticism of the new classical models stems from the fact that they assume period-by-period clearing of all markets. It has been asserted that the indisputable fact that there exist long-term labor contracts with horizons of two or three years contradicts the assumption of these models that wages and prices adjust each period to clear all markets. The issue here cannot be the length _per se_ over which contracts run. For we know from Arrow and Debreu that if infinitely long-term contracts are determined so that prices and wages are contingent on the same information that is available under the assumption of period-by-period market clearing, then precisely the same price-quantity process will result with the long-term contract as would occur under period-by-period market clearing. Thus equilibrium theorizing provides a way, probably the only way we have, to construct a _model_ of a long-term contract. So the fact that there exist long-term contracts says nothing about the applicability of equilibrium theorizing. Rather, the real issue here is whether actual contracts can be adequately accounted for within an equilibrium model, that is, a model in which agents are proceeding in their own best interests. Stanley Fischer and Edmund Phelps and John Taylor have shown that some of the "non-activist" conclusions of the equilibrium models are modified if one substitutes for period-by-period market clearing the imposition of long-term contracts drawn contingent on restricted information sets that are exogenously imposed

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*Lucas has set forth a model in which agents' errors forecasting in aggregate demand themselves are serially correlated even though agents use all the information that they have rationally. This happens because aggregate demand is supposed to be unobservable, which means that errors in optimal forecasts can be serially correlated.

and that are assumed to be independent of monetary and fiscal regimes. Economic theory leads us to predict that costs of collecting and processing information will make it optimal for contracts to be made contingent on a small subset of the information that could possibly be collected at any date. But theory also suggests that the particular set of information upon which contracts will be made contingent is not immutable but depends on the structure of costs and benefits to collecting various kinds of information. This structure of costs and benefits will change with every change in the exogenous stochastic processes facing agents. This theoretical presumption is backed up by an examination of how labor contracts differ across high-inflation and low-inflation countries and how they have evolved in the U.S. over the last twenty-five years.

So the issue here is really the same fundamental one involved in the dispute between Keynes and the classicals: Is it adequate to regard certain superficial characteristics of existing wage contracts as given when analyzing the consequences of alternative monetary and fiscal regimes? Classical economic theory denies that those characteristics can be taken as given. To understand the implications of long-term contracts for monetary policy, one needs a model of how those contracts are likely to respond to alternative monetary policy regimes.

Acceptance of the new classical theory sketched above necessarily leads to a drastically diminished belief in the efficacy as a countercyclical device of any policy such as monetary policy that has its primary effects by introducing errors into agents' forecasts. Under rational expectations, policy variables that affect real variables by "fooling agents" simply cannot be used to affect the average level of output over the cycle because rational agents cannot be fooled on average over the cycle. This is not to say that "anything the government does has no affect" on the business cycle as the conclusions of the new theory have sometimes been incorrectly characterized. The government sets of a number of marginal tax rates and issues numerous regulations that affect the relative prices pertinent to agents. Many of the new equilibrium theories predict that such policies matter, and that the choice of feedback rules for setting such variables affects the behavior of real aggregates such as employment, real output, and unemployment over the cycle. One of the major goals of the new theories is to obtain a new and better set of tools for predicting and evaluating the effects of alternative policy regimes for setting these variables. However, by their very nature, the new classical theories do raise questions about the appropriate criteria for evaluating macroeconomic policies. A consequence of the Keynesians' decision to abandon the classical postulates was the necessity to use methods for evaluating alternative states of the economy that were divorced from standard welfare economics. Keynesian models often do not carry along a detailed enough description of agents' objectives for one to be able to make statements about which agents are hurt and which ones helped by various interventions. So users of Keynesian macroeconometric models are required to supply a loss function indicating how they evaluate the performance of alternative economic aggregates. For example, a loss function might simply equal the variance of employment or real output around some desired path. This macroeconomic loss function plays a different role than the "social welfare" function of welfare economics. For in welfare analysis it is possible to make certain statements that order alternative policies without having a welfare function.

Since the new classical models identify agents and attribute maximizing behavior to them, they are sometimes susceptible to standard welfare economics. Some of these models present situations in which policies that, say, reduce the variance of aggregate output or employment also diminish social welfare defined as the utility of a representative agent. To take an example, consider a situation in which an unexpected and somewhat temporary shock occurs that increases worker productivity temporarily driving up the real wage. In some equilibrium models the response to this would be that workers would plan on increasing their labor supply while the real wage remained temporarily high. Such a response mechanism is capable of generating serially correlated movements in employment and of increasing the variance of employment above what it would be if workers simply supplied their labor inelastically with respect to the real wage. In such an environment, let the government increase (decrease) marginal tax rates whenever the pretax real wage facing workers increases (decreases). By pursuing such a policy the government could reduce or eliminate the supply response of labor to temporary real wage increases and could thereby reduce the variance of aggregate employment and its serial correlation. In this case, the government would have effectively attenuated the business cycle, at the cost, however, of actually decreasing the welfare of the representative worker. Nor is this an isolated example. There is a variety of interventions that could conceivably reduce the variance of employment over the cycle, though probably at the cost of decreasing welfare. (It does not, of course, follow that there exist no welfare increasing policies which coincidentally decrease the ferocity of the business cycle as conventionally measured.)

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