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FORECASTING SOCIAL EVENTS

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ABSTRACT

In this essay we attempt to assess the likely rate of progress in developing forecasting capabilities for the trends and events which have interest for sociologists. We initially describe the alternative strategies which can be adopted when time series data are "well behaved," in the sense that the temporal variation can be characterized by an orderly trend or by some fixed (or slowly changing) relationship to its determinants. Next, we consider types of concrete events which have several functional substitutes, or multiple causes, or which represent newly invented expressions. The problems associated with forecasting in these environments are exceedingly difficult and in most instances researchers will have to be content with the more modest task of offering post hoc explanations, for the temporal variation if the time series was sufficiently long or for the locations of the events if there was a spatial distribution to the phenomenon. Finally, we discuss the relation between explaining and forecasting, note the often contradictory requirements for being able to perform these two activities, and assess the implications of this discussion for explanation in different sociological subfields.

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Current interest in social forecasting can be attributed to the confluence of a number of factors. Public concern regarding certain difficulties our country will encounter in the not too distant future-- over-population, depletion of natural resources, excess production of scientific manpower--has created an awareness of the importance of specifying optimal rates for consumption and technological growth, and anticipating supply and demand levels in the advanced skills we provide our youth. Related to these issues, the complementary notions of social goals, social accounting, and social planning have been steadily acquir- ing legitimacy, even in a nation which still retains the patina of a laissez-faire ideology. Matters such as quality of health care, incidence of poverty, and educational attainment by minority children are now considered proper arenas for governmental intervention and manipulation; indeed, they may even require adjustment to levels which are politically acceptable.

The success that economists have achieved in constructing quanti- tative indicators and formal models of economic phenomena has also been a stimulant to social forecasting. In an age where "relevance" is upheld as a criterion for assessing the utility of research, and the funding it deserves, the adoption of econometric methods by many govern- mental agencies has spurred sociologists to investigate the applicability of these techniques to social processes. The additional fact that economists are now routinely consulted by political influentials has

not passed unnoticed among those sociologists who share an interest

in policy formulation and believe that they can also contribute to

the attainment of national objectives.

The attractiveness of econometric methods derives from their

ability to forecast aspects of the future condition of the economy;

indeed alternative futures, contingent upon the adoption of different

policies, so that a choice can be made among competing programs. The

importance of such a capability for an administrator is easily apparent:

confronted with an array of complex programs, each ostensibly suitable

for achieving the same economic objective--reducing the unemployment

rate; stabilizing the price of farm commodities--he must be able to

evaluate their relative effectiveness in terms of narrow cost/benefit

ratios, as well as on the basis of secondary consequences which might

be engendered (change in rate of inflation; effect on farm income). It

is also evident that similar calculations would be desirable in choos-

ing among social programs; for instance, selecting a strategy to reduce

the incidence of poverty, or one to combat street crime and delinquency.

To date, the activity of sociologists in this research area has

been largely limited to subjects allied with social forecasting--social

indicator construction, field experimentation--although the topic of

forecasting has received some attention as well.[1] By a social indicator

we mean a time series in an institutional or demographic variable. A

useful indicator would relate to an issue of concern and either summarize

some aspect of institutional performance (such as GNP measures economic

output), lead some institutional condition (an increase in housing

starts often signals an economic upturn), or be a variable in a fore-

casting model. In the first instance the indicator charts progress so

that we can assess how well the institution has performed; in the second it anticipates change, permitting an adaptive strategy to be prepared beforehand. The third use of a social indicator relates more directly to the construction of dynamic models appropriate for fore-casting. A collection of time series would constitute the material from which the interrelations among social processes are derived and would also provide the initial conditions for priming the forecasting instrument. Validity of the model could be ascertained by comparing its projections with subsequent values of the empirical time series.[2]

The participation of sociologists in field experiments such as the negative income tax studies, in which structural variables are artifi-cially adjusted, has served to acquaint them with many of the component tasks in constructing complex models, especially dynamic models, of social processes. One purpose of experimentation is to supplement the natural variation in key variables when the institutional arrangements make for stable behavior or fail to exhibit the organizational forms which are of interest to investigators. Thus, since virtually no school system in the country offers concrete inducements to students--money and other valued commodities--to supplement the motivational impact of school grades, it becomes necessary to create this type of reward structure in order to assess the utility of a pedagogical arrangement which appears promising in light of theoretical argument (Spilerman 1971). Another reason for experimenting is to separate among the effects of variables which are highly correlated in the normal operation of an institution. For example, a serious critique of the Coleman Report (Cain and Watts 1970) stressed the point that it underestimated the importance of teacher competence for student

performance, since teacher characteristics are highly correlated with SES measures of student background. Coleman used survey data and, being unable to separate between the effects of these two sets of variables, assigned their joint contribution to the latter factor.

A third use of experimentation is to provide information on the transient response of a social system to an exogenous manipulation, such as altering the level of a variable. How long it will take for change to begin, how much will result, and how long the effect will last, are the kinds of questions which the sponsors of field research typically want answered. In the process of addressing these issues, experimentation can constitute a powerful instrument in the repertoire of theory-testing techniques since competing explanations which are consistent with the same equilibrium conditions often predict divergent transitory effects. For example, the income maintenance experiments presently being conducted in New Jersey, Pennsylvania, and in other states, although undertaken for the narrow purpose of investigating the work effort response by families to the provision of income support, may enable us to compare the utility of cultural and situational explanations of poverty with respect to different aspects of behavior and different groups in the poverty population. The short-run adaptation to the experimental manipulation should vary according to whether a particular behavioral facet (e.g., poor school performance by children) is situationally determined or maintained by cultural factors such as values and peer pressure (Spilerman and Elesh 1971).

For the above reasons the information that is obtained through experimentation, in addition to illuminating the probable consequences of adopting particular policies, should contribute to our modeling and

forecasting capabilities in innumerable ways. By permitting statistical devices such as randomization, control groups, and different treatment levels to be employed, field experiments will permit important multivariate relationships to be estimated with greater accuracy than can be accomplished with survey data alone, and more complex dynamic models to be constructed than would be possible otherwise.

With the above introduction at hand, outlining the involvement of sociologists in topics relating to forecasting, I would like to discuss the likely rate of progress in developing actual forecasting capabilities for the trends and events which have interest for sociologists. My thesis is a simple one: Many social phenomena are not "well behaved" in the sense of having properties that would make them amenable to projection. In consequence, the techniques which are routinely employed in the prediction of economic trends are unlikely to be applicable to numerous social processes which, nonetheless, are very important. To lay the underpinnings for this thesis, I will first discuss some properties of time series data and, in this context, sketch the information requirements of different forecasting procedures. The central theme of the essay is then developed by considering the kinds of social phenomena which are likely to generate time series having certain properties. In the final section some of the difficulties inherent in conducting empirical analysis in particular subfields of sociology are reviewed from the vantage point of the preceding considerations.

EXPLANATION AND PREDICTION

While there is an intimate relation between the tasks of explaining and predicting, these two capabilities are not coincident. It is possible to explain the variation in a variable without being able to

forecast its future levels. It is also possible to predict with considerable accuracy while understanding little about the causal processes involved.

<u>Explanation versus a capability to predict</u>. To simultaneously explain and forecast requires the availability of (a) a model of the determinants of the variable of interest at a single point in time, (b) a specification of expected shifts in the values of the determining factors, and (c) a specification of how the structural relationships, themselves, will change.

It is often possible to construct an adequate explanation of a phenomenon at a single instant in time without obtaining a corresponding capability to forecast, particularly when the causes of temporal change have no counterpart in cross-sectional data. For example, having devised an explanation of the determinants of anti-semitism from cross-sectional information, perhaps relating this psychological disposition to an individual's religious beliefs and occupational mobility experience, the model may be unsuitable for forecasting changes in the level of anti-semitism even though future values of the causal factors that were identified are known. The reason is that the most prominent determinants of the longitudinal variation in this disposition may be inherently constant in cross-sectional data—for instance, success or setback in international relations, economic recession or prosperity—and the contextual effects deriving from these conditions cannot be estimated from information at a single point in time. While we commonly infer developmental effects from cross-sectional data, in doing so we are implicitly assuming that the major determinants of longitudinal change also exhibit variation at one point in time.

In contrast, we can often forecast a variable without being able to explain why it should exhibit a particular time path. The most common instance involves the extrapolation of past trends by curve fitting, particularly when our interest is limited to the secular change and long cycles. When a variable is constant over time, or when its rate of change or rate of acceleration are invariant, we can forecast from this knowledge together with the initial conditions <u>without understanding the reasons for the behavior</u>. Such a situation is not infrequent, particularly for social processes which involve widely shared values that are culturally maintained (Spilerman and Elesh 1971), technologies in which breakthroughs are now rare, or "sunk costs" in institutional arrangements. Thus, the year-to-year variation in desired educational attainment for children that is expressed by parents from a particular ethnic (cultural) group is likely to be small, as is the annual fluctuation in mean age of mortality in the United States, the latter being so despite the vast amount spent on medical research. Similarly, even though the metric standard constitutes a more rational measurement apparatus than the English system, owing to the costs of recalibrating machinery and reeducating adults which would accompany adoption of a new standard, we can forecast that the English system will continue in wide use in this country.

Our approach to explaining the variation in a time series must depend upon the time interval under consideration. As the interval is lengthened we expect the effect of the secular trend and long cycles to increase and dominate change; during brief durations small cycle fluctuations should account for the bulk of change. Whether the small cycle fluctuations are considered important or not depends on the

consequences of cycles of different length for the social institutions

of interest. In regard to this point, I would like to comment on one

way in which the impact of cycles of brief duration is muted. This

occurs when an institution can "store" the excess product from cycle

peaks, drawing upon this supply in years of underproduction.

We are accustomed to such considerations in regard to agricultural

produce; perishable crops can be obtained only in season while grains,

by contrast, are available during all months and even in years of

drought. Social institutions show analogous differences in sensitivity

to cycle length. As an example, were the size of successive one-year

age cohorts to exhibit greater variation than is presently the case,

this variation probably would not be burdensome to the efficient func-

tioning of industrial organizations. Individuals who are but a few

years apart in age tend to be similar in their work relevant attributes--e.g.,

educational attainment, physical strength--and hence interchangeable in

most economic roles. In this circumstance, one would not expect the

age-specific unemployment rate, for instance, to exhibit variations

corresponding to the relative sizes of the one-year age cohorts.

Were the cycles of longer duration, substitutability might break

down and some institutional time series (such as the unemployment rate)

would contain an age structure which parallels the variation in age-

cohort size. A related way in which the impact of brief cycles is

muted occurs when institutions are sensitive to the total stock of a

factor, not to the new product alone. Thus, organizations which

respond to total population size or to adult population size (such as

marketing divisions of automobile manufacturers) would find the annual

fluctuations in one-year age cohorts to be of minor importance. In

age-specific structures such as the university, by contrast, an increase in the magnitude of these annual fluctuations would present major problems and require extensive organizational restructuring to ensure efficient operation. What constitutes relevant cycle length for a given time series, then, is a specifiable matter, but only in conjunction with the requirements of particular social institutions.

It is of interest to note that contradictory requirements exist in being able to forecast by extrapolating trends, and in constructing structural or explanatory models. Forecasting by extrapolation requires that past relationships continue to operate unaltered and that levels, or manner of change in levels, of the determining variables be constant or nearly so. Explanation, by contrast, requires an abundance of variation so that the incidence of an event, or of different values of a variable, can be related to combinations of its suspected determinants. When we are able to forecast accurately by extrapolation we usually lack sufficient variation to construct adequate explanations. For instance, we can predict with some reliability that a revolution is unlikely in the United States next year, simply because this type of event has been so rare in our history. Yet, due to its infrequency, we are deficient in the information necessary for constructing an explanatory model of the determinants of political stability in the American context. It is not that we lack imagination in suggesting factors which might be pertinent, rather, it is that we are incapable of assigning weights to them, indicative of their relative importance, because of the rarity of this type of governmental disruption.

A second example, from a study in which I am currently engaged, may also prove illuminating. I have collected data on lynching events

in the South during the period 1882-1935. Except for some erratic

behavior in the initial years of the time series (possibly reflecting

inadequacies in early data collection procedures at Tuskegee Institute),

there is a consistent secular decline. The annual rate for the five

years beginning with 1891 is 188. The comparable rate for the con-

cluding five years of the series is 17. Certainly we have here a sys-

tematic change which begs for explanation. Yet, if we were restricted

to a single, regional-level time series this pronounced decline could

not be explained. There are too many other time series (rates of

urbanization, mechanization of farming, professionalization of law

enforcement) that are consistent with the noted secular decline and

provide plausible explanations for it. Were it not for our ability to dis-

aggregate the regional-level time series in lynching events and examine

parallel time series for groups of counties having particular economic

and demographic characteristics, we would be limited to addressing the

variation about the secular trend. Only this aspect of the temporal change

in the regional-level data has sufficient complexity to permit selection

among competing explanations. Thus, in the absence of substantial

variation our ability to comprehend is hampered; at the same time,

though, there is little need for understanding in order to forecast.

Forecasting from the unrestricted reduced form versus from a

structural model. By the unrestricted reduced form we mean an equation

in which the variable of interest is related only to exogenous factors,

and parameter estimation has been carried out by a direct application of

ordinary least squares. There are several advantages to forecasting

from this formulation: (a) the dynamics of the process does not have

to be delineated or fully understood; (b) estimation is a simple affair

and identification problems do not arise; and (c) multicollinearity is not a difficulty since a collinear independent variable can be deleted with little effect on projections.

In terms of the degree of understanding that is required, forecasting from the unrestricted reduced form is intermediate between trend extrapolation and forecasting from a structural model, the latter representing an explicit theory of behavior. In trend extrapolation we assume the continuation of past history with respect to change in the variable of concern, and do not introduce explanatory variables. In forecasting from the unrestricted reduced form we do specify which exogenous variables are important, but not the dynamics of the process. If it is reasonable to assume that relationships among the variables are stable, and if we have knowledge about future values of the exogenous factors, this approach can yield satisfactory forecasts. Indeed, if the determinants are specified as lagged we can use their current values to predict future levels of the dependent variable. The hooker, however, is that if the structural relationships were to change, even in a simple fashion, the corresponding alterations in the reduced form coefficients could be exceedingly complex.

The importance of a structural model for forecasting when relationships are changing can be illustrated by comparing the mechanics of projection from structural equations (that is, from the _derived_ reduced form) with projection from the unrestricted reduced form. By way of illustration consider the following model of shifts in vote intention during the course of an election campaign:

$$
\left.
\begin{aligned}
Y_{1t} &= a_1 Y_{2t} + c_0 Y_{1t-1} + c_1 Z_{1t} + c_3 + e_{1t} \\
Y_{2t} &= a_2 Y_{1t} + c_2 Z_{2t} + c_4 + e_{2t}
\end{aligned}
\right\} \quad (1)
$$

Y_{1t} and Y_{2t} are endogenous variables representing an individual's candidate preference (leaning toward candidate A) and his expectation during an interview in month t as to who will win the election; Z_{1t} and Z_{2t} are exogenous variables that report the condition of the economy and candidate A's relative popularity from the latest opinion poll; e_{1t} and e_{2t} are disturbance terms.[3] In this model a respondent's candidate preference is therefore postulated to be a function of his expectation as to who will win, his preference in the preceding month, and the state of the economy. His expectation concerning who will be victorious is a function of current candidate preference and the published poll results.

Solving equations (1) for Y_{1t} and Y_{2t} in terms of the exogenous and lagged endogenous variables we obtain (providing $a_1 a_2 \neq 1$),

$$
\left.
\begin{aligned}
Y_{1t} &= \frac{c_0}{1-a_1 a_2} Y_{1t-1} + \frac{c_1}{1-a_1 a_2} Z_{1t} + \frac{c_2 a_1}{1-a_1 a_2} Z_{2t} + \frac{a_1 c_4 + c_3}{1-a_1 a_2} + u_{1t} \\
Y_{2t} &= \frac{c_0 a_2}{1-a_1 a_2} Y_{1t-1} + \frac{c_1 a_2}{1-a_1 a_2} Z_{1t} + \frac{c_2}{1-a_1 a_2} Z_{2t} + \frac{a_2 c_3 + c_4}{1-a_1 a_2} + u_{2t}
\end{aligned}
\right\} \quad (2)
$$

which is the _derived_ reduced form of the system and expresses the dependent variables in terms of the predetermined variables _after_ the interdependency specified by (1) has been taken into account. These equations provide the most convenient way to forecast Y_{1t} and Y_{2t}, assuming the relationships specified by the structural model.

If we are interested solely in projecting candidate preference, and not in the explicit details of the dynamic process, we could proceed instead by estimating the _unrestricted_ reduced form equation for Y_{1t} from observational data using ordinary least squares:

$$Y_{1t} = d_1 Y_{1t-1} + d_2 Z_{1t} + d_3 Z_{2t} + d_0 + u'_{1t} \qquad\qquad (3)$$

These coefficients will not be identical to the derived reduced form

parameters in (2a) [which we denote by d_1^*, d_2^*, d_3^*, and d_0^*] unless

all the structural equations are just-identified. However, even when

this is not the case, as in the present example, the unrestricted

reduced form parameters often will not be very different from the

derived ones and, so long as the coefficients in the structural equa-

tions remain constant, equation (3) permits a forecasting capability[4]

without requiring a researcher to specify the linkages among variables

in the dynamic process (Walters 1970, pp. 188-190).

Suppose, now, being interested only in forecasting Y_{1t}, we have

estimated equation (3) directly. Also assume that some structural para-

meter, say a_1, is changing in a simple manner, such as linearly. The

effect on the reduced form equations will be that <u>all</u> coefficients d_0^*,

d_1^*, d_2^* and d_3^* (and d_0, d_1, d_2, and d_3) will change, and this change

will be non-linear. An illustration of how the reduced form parameters

might vary as a result of a linear shift in a_1 is presented in Figure 1.

<u>Figure 1 about here</u>

The essential point is that in situations of structural change,

even simple structural change, it is vital to have available a behav-

ioral model of the process. While structural relationships have a high

degree of automony--few coefficients are affected by a particular alter-

ation in the process--this property is not shared by the reduced form

relationships. What would be a simple adjustment in a structural model

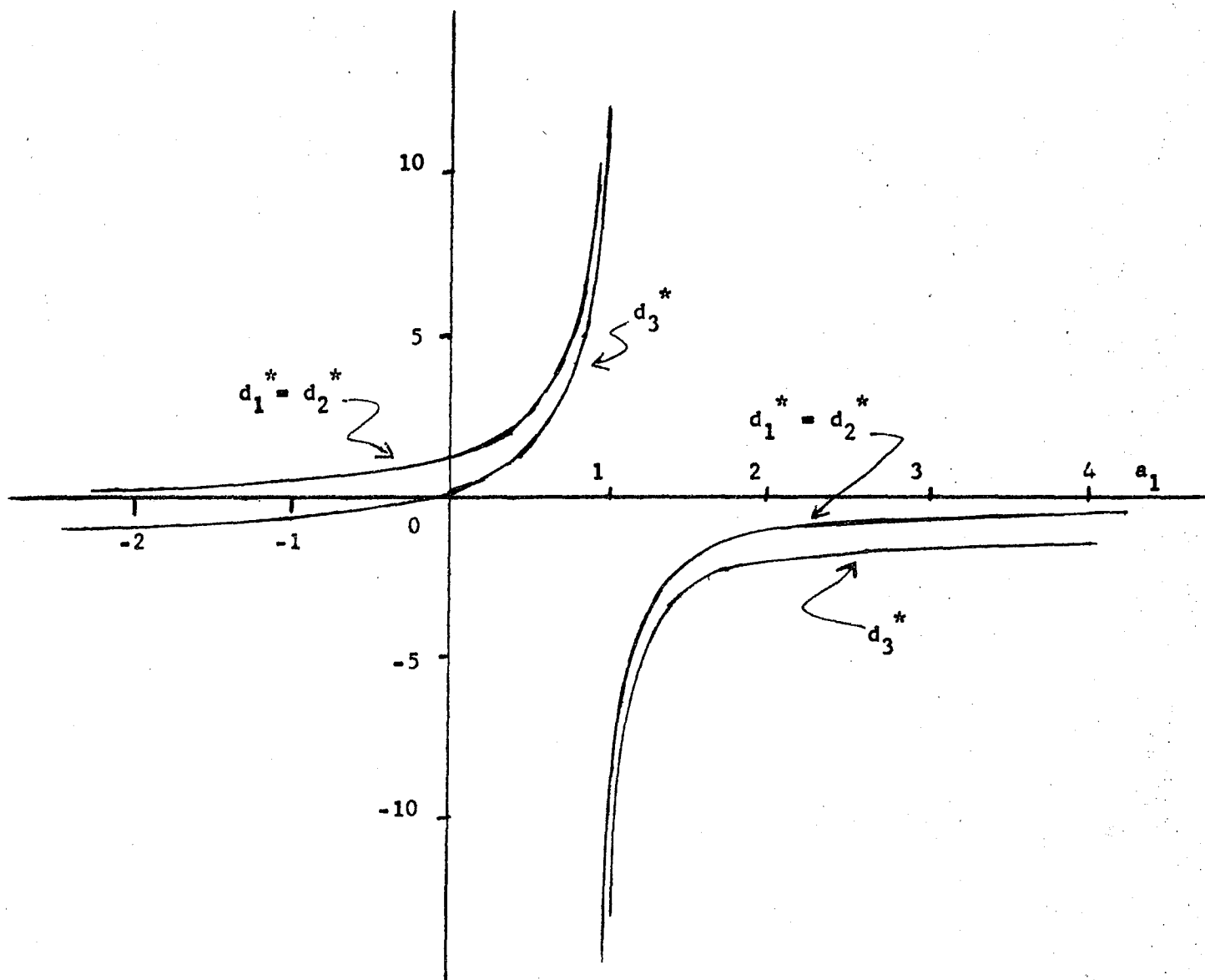becomes far more complex when only the reduced form coefficients are known.

Figure 1. Coefficients of the reduced form equation for Y_{1t} versus a_1.†

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†The values of a_2, c_0, c_1, and c_2 have been set equal to one.

Use of the unrestricted reduced form is therefore appropriate only where change is limited to the levels of the determinants. Yet, this situation is not an uncommon one for social processes. For example, in geographic migration, the effects of age, income, and length of stay at current residence on a decision to move are relatively stable through time, by comparison with changes in the values of these factors. Indeed, assuming constant relationships, the pattern of inter-regional migration for a population sample has been predicted fairly accurately through a 21-year interval (Spilerman 1972). As a second example, consider projecting the distribution of black occupational status. It is likely that the return in occupational status from educational attainment will remain stable during the present decade, although mean school years completed by Negro youth should increase substantially. This suggests that the current relationship between these variables, together with extrapolations of the distribution of educational attainment among Negro youth, could be used to forecast the occupational status distribution of Negro males several years hence.

Selecting variables for explanation and prediction. The factors which provide illuminating explanations often are not the ones which yield efficient predictions, and vice versa. For instance, it was reported in The American Voter (Campbell et al., 1960) that in the weeks before a presidential election the best predictor of an individual's partisan decision is his expressed vote intention. Important though this variable may be for predictive purposes, it is not very revealing for theorizing about the determinants of party preference. The task of explaining requires the use of theoretically significant variables, which are so distinguished because they relate particular aspects of

social structure (such as organizational affiliations or class back-
ground in the present illustration) to the dependent variable (party
preference). Typically, these variables are more distant temporally
than are efficient predictors and explain less of the variation. This
observation, incidently, carries by implication a criticism of the
excessive emphasis placed upon high R^2 values in the sociological lit-
erature, where the objective is traditionally one of explanation.

PROBLEMS IN FORECASTING VOLATILE SOCIAL PROCESSES

In the preceding section we have distinguished among time series
according to their degree of continuity with past trends. This consider-
ation was shown to be essential in selecting a forecasting procedure,
as well as in determining our capability to explain a particular pheno-
menon. The following points were emphasized: (a) Where a time series
is characterized by some manner of orderly trend, its future course
can be predicted from its own past history. For the narrow purpose of
forecasting, there is no need to consider causal or equilibriating
factors that may affect the course of its development; (b) where the
variation is more complex but a constant relationship can be assumed
between the variable of interest and its determinants, the unrestricted
reduced form will yield satisfactory projections and has the advantage
of not requiring a comprehensive specification of the dynamic process;
and (c) where change in relationships cannot be neglected we must fore-
cast the nature of the alterations,[5] as well as shifts in the values
of the independent variables. This makes the use of a structural
model imperative.

By a volatile time series we mean one in which the amount of change
between sample points is considerable. Thus, the very notion of

volatility depends upon sampling frequency and on judgments of magni-
tude, the latter presumably reflecting the consequences of particular-
sized variations for the institutions of concern. Some volatile
phenomena present little in the way of forecasting problems, particu-
larly when the variation largely stems from cyclical behavior such as
might be generated by seasonal factors. A second category differs
only in degree from the processes that have been already considered.
While the values of the independent variables may change rapidly, and
the relationships among factors might be subject to sizable alterations,
in theory such a time series could be projected by the structural model
formulation of the preceding section. The kind of volatility I want
to discuss here concerns, instead, phenomena which have only tenuous
historical antecedents.

Forecasting underlying conditions versus forecasting concrete
phenomena--two-stage projection. Many social phenomena of considerable
consequence can be viewed as concrete manifestations of more fundamen-
tal processes. Outbreaks of racial disorders in our ghettos may reflect
the level of frustration among blacks, bomb plantings by radical youth
have co-varied with the extent of U. S. engagement in Vietnam, and the
intensity of anti-semitism is possibly related to the performance of
the economy. A problem which we must consider in attempting to fore-
cast such phenomena is that alternative expressions can arise from the
same underlying conditions.

In order to predict the rate of occurrence of racial disorders,
for instance, it seems reasonable to first forecast the level of frus-
tration in black neighborhoods and then consider the conditions under
which high discontent will be translated into collective violence.

Stated in this way, the procedure is formally one of constructing the requisite structural model. Nevertheless, the unusual difficulties encountered in modeling a volatile social process deserve special attention.

The task of forecasting a psychological state of a population, such as its frustration level, is exceptionally difficult because objective indicators of the attitude will serve this function only so long as the particular inequities which they tap continue to be invested with significance. Elaborating the preceding example, there are a great many injustices which Negroes suffer, any collection of which, potentially, could provoke extreme discontent and frustration. Negroes might respond to unsatisfactory housing conditions, to a lack of economic opportunity relative to the prospects of whites, to the segregated and inferior schools provided for their children, or to disappointment over the failure of improvements in these conditions to keep pace with expectations. Presumably all these factors contribute to frustration; yet, at any given time, some will be especially salient owing to scandals, news documentaries, or other reasons for receiving extensive media coverage. In attempting to forecast this collective psychological state one must therefore contend with shifts in emphasis upon the component deprivations--structural change, to be sure, but of a particularly volatile sort because of the ephemeral nature to the significance of a specific deprivation. Added to this difficulty is the powerful interactive role assumed by a quality such as "trust." With the same living conditions and economic opportunities for blacks, Robert Kennedy might have secured the calm ghettos which eluded Lyndon Johnson.

The second stage would also require elaborate theory, but of a more traditional kind. If alternative manifestations may arise from a single underlying condition, we must be able to predict which of the potential concrete expressions will occur. For instance, high levels of frustration in ghetto neighborhoods could foster the development of millenial movements or encourage organized political activity, as well as stimulate outbreaks of rioting. Because all these activities are possible manifestations of the same underlying discontent, if our interest is in forecasting a particular expression (such as the rate of riot outbreaks) we must have available theories which (a) identify the possible transformations of discontent and (b) suggest the conditions under which each manifestation will ensue.

We are not entirely ignorant on this score, although our theories are not very powerful. One literature relevant to this topic deals with the processing of frustration by persons from different class strata or with different socialization experience (Henry and Short 1954; Bronfenbrenner 1958). For instance, Henry and Short (1954, pp. 54-81) argue that loss of relative status leads to different types of aggressive acts according to social class--suicide among middle class persons, homicide by lower class individuals. Much analysis in political sociology has been concerned with the related issue of managing grievance and discontent. Examples may be found in the writings of William Kornhauser (1959) on the functions of secondary associations for maintaining political stability, in investigations by James S. Coleman (1957) concerning the consequences of particular organizational structures for the dynamics of community controversy, and in David Lookwood's (1958) analysis of some necessary conditions for collective action by members of a class stratum.

A different approach to predicting concrete manifestations involves
the notion of "natural histories" of social movements and major socie-
tal transformations such as revolutions (Hopper 1950; Brinton 1952).
Studies of this genre attempt to delineate developmental sequences or
stages through which movements of protest, in particular, tend to pro-
gress and invoke conceptual mechanisms of the sort, "no enemies to the
left,"[6] or "vulnerability of the social structure to rising expecta-
tions."[7] While these investigations are ordinarily deficient in iden-
tifying the causal forces responsible for the stage progression (Rule
and Tilly 1972), the perspective may have value in forecasting, much
as trend extrapolation can be useful. It is not my intention at this
point to consider in detail the merits of these contrasting research
strategies, only to stress the importance of addressing transformational
questions if we are to develop a capability to predict the course of
particular expressions which emanate from more fundamental conditions.
Interestingly, the problems we encounter in social forecasting compel
us to revisit some of the more traditional topics in social theory.

A single activity arising from different underlying conditions. In
addition to the difficulties that are posed when a single underlying
process can give rise to multiple concrete expressions, certain acti-
vities, such as rioting, may constitute general expressive forms, able
to serve as manifestations for a number of more basic conditions. This
possibility was entertained in a limited version when it was noted that
the frustrations which provide the preconditions for ghetto riots may
derive from different combinations of objective conditions. More
generally, riots may have causes apart from the level of deprivation
or frustration. They could represent conspiracies--that is, intentional

acts carried out for political purposes--or result from the behavior of criminals intent on vandalism and destruction. Indeed, in the weeks subsequent to the outbreak of large scale urban violence in the mid-1960's, both views were widely expressed in the media. The fact that they proved to be largely erroneous in light of later investigations does not alter the fact that rioting is capable of deriving from such factors.

Disorders may also be invested with symbolic significance and performed to acknowledge collective membership. Many of the student disturbances in the late 1960's were probably carried out as expressions of solidarity with demonstrators on other campuses. "We did our share" was a slogan of the period. This point is not intended to downgrade the importance of the war in Vietnam as an instigating factor in the campus disorders, but rather to stress the fact that this particular act of protest, rather than some other (hunger strikes, silent vigils), acquired significance as the college campus manner of expressing opposition. With each escalation of fighting in Vietnam, college towns came to expect further disruption and violence instead of a different expression of protest. In summary, our ability to forecast the rate of an activity such as rioting, which can derive from diverse underlying conditions, is hampered by this very fact and by the continual emergence of altogether new conditions for which the activity is functional.

Fads and social contagion. There are events of considerable importance for which a capability to forecast rates of occurrence[8] is unlikely to ever be developed because of their extreme sensitivity to suggestion, fad, and contagion. This remark is especially pertinent to activities that can be carried out by a solitary individual or that involve many persons but do not require coordination, a division of labor, or prior planning. Examples

and even as far away as France. Indeed, in a New York Times (1971)

article on the prison disorder in Clairvaux, France it was reported

that "two young guards resigned on the ground that they 'didn't want

to die for 1,100 francs ($200) a month.' They complained among other

things that recent reforms, permitting the prisoners to receive news-

papers and to listen to the radio, had spread the news of the Attica,

N. Y. mutiny among them."

Prison environments permit few alternative forms of protest. How-

ever, the range of activities available to deranged and socially marginal

individuals who are not institutionalized is considerably broader; there

often are several expressions which are substitutable in the sense that

each is capable of articulating, or temporarily relieving, the under-

lying condition--"functional alternatives," in the disciplinary jargon.

In terms of the perspective of this section, the particular activity

that is undertaken may be largely fortuitous and would depend on which

expression happened to occur at an auspicious time, proved newsworthy

and received extensive media coverage, and "caught on." In contrast

to the histories of social movements, the succession of expressions

adopted by disorganized individuals lacks a developmental character;

there is no learning, no organizational elaboration, no continuity, and

therefore no coherence to the progression of activities. We have little

reason to expect epidemics of skyjackings, shootings of random pedes-

trians, or phone calls announcing the placing of bombs in buildings, to

follow one another in any meaningful sequence.

It is this substitutability among expressions which makes fore-

casting the next fad an impossible task. Yet, we can say that the most

destructive expressions will usually have short lifetimes. Some inci-

dents (e.g., bomb threats) are not so spectacular as to continually

receive prominent media coverage, and decline in number from lack of

propagation. Other types of events provoke governmental adjustments

to reduce the vulnerability of the target. The parachute skyjackings

referred to earlier were ended by altering the rear exit in passenger

airliners so that the door could not be opened in flight. Skyjacking

incidents of all types have now been sharply curtailed through the

implementation of stringent search procedures at American airports.[10]

Thus, although we may be unable to forecast the character of a new

expression, merely knowing that adjustments will be made to an exposed

institution, and that newsworthiness decays rapidly (and publicity given

to violent and potentially contagious events may be limited intention-

ally), permits us to suggest that destructive expressions will be

quickly extinguished.

The notion of substitutability among a collection of activities

warrants additional comment. It was introduced above in the context

of indicating the considerable difficulty in forecasting the next

expression to be adopted by disorganized persons. Nonetheless, this

concept can provide administrators with a powerful apparatus for pre-

dicting the consequences of particular policy changes. For certain

categories of individuals a "hydraulic" model may appropriately charac-

terize their rates of performing activities from a collection, in the

sense that by removing the possibility of carrying out some, we raise

the rates for others. As an illustration, narcotics addicts in New

York City may be able to support the high price of their habits only

by engaging in crime. If this presumption is correct, then the removal

of one kind of potential victim would result in displacing criminal

activity onto other targets, rather than in reducing the aggregate

amount of crime. Some evidence for this possibility can be found in newspaper accounts which reported an increase in robberies of taxi drivers in New York City following the termination of selling transit tokens on city buses. It is also possible that the subsequent reduction in the victimization of cab drivers (accomplished by installing bullet proof partitions between the driver and the passenger compartment) was achieved at a cost of shifting criminal activity onto muggings of pedestrians. This is not the place to pursue these questions in detail; I simply wish to indicate that the complementary notions of substitutability and displacement are intriguing ones, and may be employed to advantage in forecasting the consequences of removing certain options from a class of alternatives.[11] In the preceding example, incidently, if our concern is to reduce _violent_ crime, one might conclude that the decision to remove bus drivers from the list of potential victims was an unfortunate one.

NUMBER OF OBSERVATIONS AND RESEARCH STRATEGY: SOME CONCLUDING REMARKS

Empirical research in sociology has become characterized increasingly by cross-sectional studies. This trend has occurred despite the fact that many influential early writers (e.g., Marx, Weber, Sorokin, Ogburn) showed a marked predilection for topics relating to social change and societal transformation, for which temporal data are relevant. There are a number of reasons for the ascendency of cross-sectional investigation and its emergence as the dominant data analytic style. Perhaps most important is the consideration that the information gathering instrument can be designed so as to be fully appropriate to the research question at hand, and the required data can be quickly collected. In cross-sectional studies the data commonly pertain to current

properties of the observational units (individuals, formal organiza-

tions, communities) or to past properties which nonetheless can be

ascertained by interrogating and measuring the existing units.[12] By

contrast, with studies involving time series data, if we wish the

flexibility of designing the information base so it corresponds closely

to the substantive issue we must conduct a panel study and possibly

have to wait several years for the data, literally, to come into

existence. Alternatively, we could resort to archival files or use

materials collected by others, but this entails a cost of working with

data prepared for different purposes and operating within the confines

of that information base. In neither case does temporal analysis per-

mit a researcher the possibility of responding to preliminary findings,

or to the recent work of other investigators, by quickly returning to

the field with an expanded or more directed schedule. This latter

flexibility is a vital one for the rapid elaboration of empirically

supported theory.

A second reason why cross-sectional analysis is attractive is

because the powerful multivariate methodologies which can be brought to

bear are simpler than the corresponding procedures for exploring time

series data. In particular, the researcher using regression methods

with data at one point in time need not concern himself with problems

such as autocorrelation, time lags, transient responses, stability of

the equilibria, or with other esoteric topics in systems analysis. It

is not that these considerations are unimportant for elaborating and

testing social theory, only that they would introduce unnecessary com-

plications into many studies which do not require these concerns and

which can be pursued more simply with cross-sectional data.

To capitalize on the advantages of cross-sectional analysis, it is necessary for both the target population and the sample to be large. The importance of a large population is that the sampling operation can be carried out in a manner which is appropriate for the specific research question. Social groups that represent small proportions in the population can be oversampled, variables that have little variation in the population can have their variation inflated in the sample (permitting more reliable estimates of effects), and multicollinearity can be reduced by the sampling framework. It is advisable to draw a large sample when many factors need to be controlled, when the form of response to key determinants may be non-linear (hence requiring several terms for representation), when there is interest in interaction effects, and when accurate estimation of the regression coefficients is important. In many respects the introduction of multivariate methods into sociology has been responsible for creating a need for large numbers of observations. Despite the saving in degrees of freedom that regression provides over tabular analysis, its greater flexibility has stimulated an interest in posing questions which require the preceding procedures; in particular, controls for many confounding factors.

In light of this discussion it is not surprising that the substantive areas which have developed most rapidly through application of cross-sectional methods have utilized either the individual as the observational unit (e.g., status attainment models), or some small structure such as the formal organization or the community. Before the advent of multivariate techniques it made little difference whether one studied individuals or nation-states because our technical ability to control simultaneously on several variables was non-existent. With the

development of such a capability the drawback to the nation-state as an observational unit has become apparent: too few exist to tolerate the many control variables necessary to adjust for contextual differences among them[13] (e.g., level of economic development, availability of natural resources, ethnic and class cleavages, religious traditions) in order to estimate the relationship between a dependent variable (e.g., presence of a competitive party structure) and the specific determinants of interest. Thus, questions about nation-states do not lend themselves to powerful explanations by cross-sectional methods. Recent attempts to explain national differences in rates of violent acts (Gurr 1969; Feierabend, Feierabend, and Nesvold 1969) suffer in an especially serious way from this limitation.

It is to the credit of sociologists who study nation-state processes that most have resisted the trend to cross-sectional formulations. When the number of observations is small the principal recourse in empirical analysis is to time series data,[14] and the proper activity in theory construction is to pose questions which can be answered by examining temporal variations. The strategy in constructing testable theories about nation-state features must therefore assume a historical perspective and use the tools of that discipline, even though the emphasis in history is more on description and accounting for unique events than on generalization. Methodologically sophisticated analysis in macro-sociology must employ dynamic models, that is, system models of temporal change, and utilize long time series on features of the nation-states. With sufficient time points we could estimate the parameters of a model (theory of relationships) from a single observational unit. More likely, we would pool temporal and cross-sectional information from several units

to increase the degrees of freedom. Verification would be accomplished by examining the fit of the model, by comparing its predictions with observed values from future time points, and by·forecasting the variables of interest in other nation-states that are presumed to be characterized by the same process. Theoretical elaboration would proceed by showing that while a particular model applies to some states, other system models, representing different causal relationships, describe behavior in the remaining units. Comparative historical analysis has used this strategy to advantage, although without formal quantitative models; for instance, Moore's (1966) case studies on the origins of dictatorships and democracies.

I do not wish to minimize the very serious difficulties that attend the analysis of temporal data. For many crucial issues the relevant time series will change too slowly for a model of the process to be estimated and verified. The notion of "sunk costs" again provides a pertinent illustration: once established, many arrangements are perpetuated because the cost of replacing them by more efficient operations would be exceedingly high. In technical language the problem is one of severe autocorrelation in that the continuation of an arrangement (such as the Electoral College procedure for selecting a president) is attributable only to a minor extent to the action of causal factors besides the prior existence of the institution. For this reason successive observations in a time series may contain little additional new information about temporal behavior, and the presence of observations at many time points may be deceptive with respect to the total amount of information contained in the data. An important point is that this

difficulty is a consequence of how the time series has evolved and

cannot be overcome by better analytic procedure.

Unfortunately, many issues of great significance in macro-sociology

(e.g., the relative importance of various structural features for socie-

tal stability) are plagued by severe data inadequacies of this sort,

and time series information will not salvage theory testing in regard

to these topics. Our embarrassment here is that we are overly creative

and able to construct several plausible explanations, each consistent

with the small amount of data bearing on the issue. Our theories, in

this circumstance, tend really to be perspectives for viewing a pheno-

menon (e.g., conflict versus consensus "theories" of societal stability)

rather than sets of testable propositions. It is hardly peculiar, then,

that ideological controversy is commonplace in macro-sociology, but not

in fields which use the individual or the small organizational structure

as an observational unit. The latter setting is not conducive to pro-

tracted controversy because, with cross-sectional data and many observa-

tions, it usually is possible to specify and rapidly collect the data

that will distinguish between competing explanations.[15]

Yet, there are time series in nation-state features which show con-

siderable year-to-year variation and would permit the estimation and test-

ing of dynamic models. Examples are changes in partisan preference (in

multi-party countries) especially during the months preceding an election,

public opinion polls on a variety of topics, and rates for different kinds

of crimes. The present interest in social indicator construction and social

forecasting is relevant to this concern as the system models likely to be

developed for analyzing relationships among indicator variables and fore-

casting their trends should prove applicable more generally to the study of

social phenomena where few observational units are available but considerable

temporal variation is present. Quite possibly, then, one spin-off
from methodological activity in this research area will be a new per-
spective on quantitative approaches to macro-sociological and histori-
cal issues.

FOOTNOTES

[1] Some important early studies were by Hart (1945), Sorokin (1957),
Bell (1964), and Moore (1964). More recent discussions, to some extent
derivative of an interest in social indicators and social accounting,
include deJouvenel (1967), Duncan (1969), and Schuessler (1971).

[2] As an example, we might attempt to forecast rates for various
kinds of criminal activities from trends in drug abuse, the age struc-
ture of the population, the high school drop out rate, and the age
specific unemployment rate. Calculations of this nature are routinely
performed by demographers in projecting changes in the size or composi-
tion of a population.

[3] The system (1) could be estimated most conveniently from data on
a sample of individuals at two points in time. The first equation is
just-identified and could be estimated using indirect least squares;
the second equation is over-identified and would require a procedure
such as two-stage least squares. See Kmenta (1971, pp. 531-573) for
details on the estimation of simultaneous equations.

[4] To forecast from equation (3) [or from equation (2)] the researcher
must make some assumption about the future values of Z_{1t} and Z_{2t}.

[5] In principle, this requires recognizing that any number of vari-
ables which might normally be ignored when the model is specified,
either because they show little variation or have insignificant effects,
could acquire importance at later times.

[6]"We may say that in all our revolutions [England (1640), America, France (1789), Russia (1917)] there is a tendency for power to go from Right to Center to Left, from the conservatives of the old regime to the moderates to the radicals or extremists.... The details of this process vary naturally from revolution to revolution. Its stages are not identical in length or in their time sequence. In America power never got as far left as it did in the other countries" (Brinton 1952, p. 130).

[7]Explanations of the genre have been invoked in conjunction with the racial disorders of the 1960's. Typically, it is argued that the Civil Rights movement, by successfully challenging many discriminatory barriers, generated unrealizable expectations and created the preconditions for the subsequent upheavals. According to some (e.g., Rossi 1971, pp. 421-425), the disorders, interpreted as revolts, have in turn produced enhanced self-esteem among blacks (evidenced by dress, hair styles, and interest in their African heritage), and this is a prerequisite for political organization of the ghetto along traditional ethnic lines, which Rossi foresees.

[8]Note that we are not discussing the more difficult problem of forecasting individual events.

[9]Viewed from this perspective the history of skyjacking is quite interesting. The first attempt occurred in Peru in 1930. FAA records then show a 17-year interval without an incident. Between 1947 and 1950, there were 14 skyjacking attempts, of which 13 occurred on flights originating in Eastern Europe. All but one of these involved groups of

persons, usually trying to escape to the West. The first skyjacking of
a flight originating in the United States took place in 1961. Between
that date and the end of 1967 skyjacking attempts on American flights
averaged 2 per year. In 1968, 22 attempts occurred, and from 1968 to
1972 skyjackings of United States flights averaged 28 per year. In
contrast with the early incidents in Eastern Europe the American attempts
have been carried out largely by solitary individuals and constitute the
most contagious form of skyjacking. Data are from FAA records reported
in Hubbard (1973, pp. 310-317).

[10]It is not difficult to imagine innovations in skyjacking technique
which would circumvent current search procedures. For instance, small
plastic bombs could be placed in cigarette packs and would pass unde-
tected by magnetic sensors. The danger comes not so much from innova-
tion, however, as from communication of the techniques, and this raises
the treacherous issue of media guidelines and freedom of the press.

[11]Evaluating the effects of saturating a city precinct with police,
Press (1971) reports that, accompanying a general decrease in crime
within the target area, the crime rates in neighboring precincts in-
creased. Furthermore, there was a small increase in some categories of
less visible, inside crime in the target area.

[12]It is common to collect retrospective information in surveys.
Models of the status attainment process, for instance, incorporate
variables which refer to different points in the life cycle: father's
SES, respondent's education, prestige of respondent's current occupation.
Nevertheless, the analytic perspective here is cross-sectional since these
models do not involve repeated measurements on the same variables.

[13]Studies which utilize the city as an observational unit are less handicapped by this difficulty. First, there are many more cities than nations so a greater number of control variables can be introduced and more extensive explanations tested. Second, many factors which must be controlled in cross-sectional analysis are approximately constant across U.S. cities and can be ignored.

[14]There is one alternative strategy, that of recasting the problem so it can be examined in a setting having a greater number of observational units. For instance, Lipset, Trow, and Coleman (1956), in an investigation of factors which contribute to the maintenance of democratic procedures in trade unions, based several of their findings concerning the importance of various structural features on the functions of these structures in _locals_ of a single union. To increase the number of units they shifted the level of observation. See pages 425-427 of their report for an explicit discussion on this tactic.

[15]This is the typical manner in which theory is elaborated in science, so it is not surprising that, in the past decade alone, we have learned an enormous amount about the status attainment process from the work of Duncan, Sewall, and their colleagues. No comparable rapid cumulation of empirically supported theory can be cited for topics which use the nation-state as an observational unit.

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