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SHORT-RUN VARIATIONS IN FORECASTERS' PERFORMANCE

INCIDENCE OF FORECASTING ERRORS IN DIFFERENT PERIODS

A view often encountered in the financial and the business press is that forecasters score and err collectively—that they generally do well in some periods and go wrong in others. The reasons for the forecasters' "off years" are assumed to lie in some difficulties inherent in the type of economic change that occurred at these particular times. In other periods, when there were no such special hazards, forecasters would presumably tend to be "right."

It is also sometimes alleged that forecasts are alike because most of their authors tend to follow either a few reputed leaders or the "herd instinct." This view may well have some validity, but clearly no one has ever established just how much, since the originality of forecasts is hardly subject to reliable measurement. It certainly is true that forecasters interact in various ways. The important point here, however, is that, since all forecasters must face the vicissitudes of economic change at the same times, their products may all be similarly affected. It is, therefore, not necessary to assume that they copy from each other in order to explain why large errors may cluster in some periods and be rare in others, or why errors may be generally in one direction at one time and generally in the other direction at another.

A review of forecasters' performance in each successive year (or over shorter periods) should help to answer such pertinent questions as what the characteristics are of "good" and "bad" years for the forecasters and whether certain events surprise all forecasters in much the same way or whether they generate errors that show substantial differences in size or type.

There is little doubt that some periods present much greater ob-

stacles to the forecaster, and hence cause larger errors, than others. In the period after World War II, the earliest years were apparently the worst in this respect. The widespread failure of predictions in these years is well known and has been ably analyzed.[1] In our materials, that failure is clearly documented. Quite generally, the forecasters represented in our sample apparently expected a major decline in economic activity to develop in 1947 and a smaller one again in 1948. Instead, large increases occurred in each of these years. As shown by the accompanying figures, the average errors of forecasts of annual percentage change for 1947–48 contrast sharply indeed with the much smaller errors for the later postwar years (per cent).[2]

	Gross National Product		*Industrial Production*	
	1947–48	1949, 1954–63	1947–48	1949–63
With regard to sign	−14.5	−1.1	−4.6	−1.0
Without regard to sign	14.5	2.1	4.6	3.6

This was, no doubt, a grave misjudgment of the situation that few contemporary observers managed to avoid. But it is also true that the disruption of economic relationships caused by the war made the early postwar forecasts particularly vulnerable.[3]

In the forecasts of industrial production for 1950–51, very large underestimation errors were made again (particularly over the spans of twelve and eighteen months). Here the reason is, of course, obvious (*ex post facto*), namely, the outbreak of the Korean War and its early

[1] For a comprehensive appraisal, see Michael Sapir, "Review of Economic Forecasts for the Transition Period," *Studies in Income and Wealth, 11,* National Bureau of Economic Research, New York, 1949, pp. 273–367.

[2] Because of trends, the mean values of the series for the two periods differ substantially; hence it is preferable here to use errors computed by taking differences between the predicted and the actual percentage changes rather than errors based on either levels or absolute changes. However, our conclusion on the inferiority of the early postwar forecasts does not depend on which of these types of error measurement are used. Nor is it invalidated by the fact that the averages for the post-1948 period conceal some large errors of opposite sign that partly offset each other. In the data for GNP, the errors for 1947 and 1948 are larger than those in any of the subsequent years covered. In the data for industrial production, only the year 1950 produced decidedly larger errors. (It should be noted that the samples for GNP and industrial production include different forecasters and that the years 1950–53 are not covered by the GNP data.)

[3] Misspecified relationships seem to be responsible for a substantial share of errors in these forecasts. The reliance on the projected consumption function of the 1930's is a prime example (this involved underestimation of the effects of wartime accumulation of both liquid assets—the wealth factor—and pent-up demand).

consequences. As this was an exogenous event that could hardly have been foreseen, these particular errors appear largely excusable.

The period since 1953 did not witness external "shocks" of comparable magnitude, but clusters of large errors are nevertheless evident in some of these years. Table 2 shows that the increases in GNP were underestimated the most in the boom year 1955 (column 3). Consequently, the level of GNP was also underestimated the most in that year (Table 1, column 3). Errors of the same kind were also made in 1959 and 1961, which are again years of upswings following recessions, and in 1963, when the economy showed unexpected vigor after a retardation. But these movements were less vigorous than the expansion of the mid-1950's, and the underestimation errors were less (the second highest, on the average, were those made in the forecasts for 1963).

On the other hand, underestimation of the slowdown that was to result from the recession of 1957–58 caused the predicted level of GNP in 1958 to be too high. The same type of error was also common in the forecasts for 1960, which turned out to be another recession year. The retardation of 1962 was widely missed, with the result that the forecast levels were again too high. Finally, the 1954 decline, as already noted, proved to be milder than many forecasters had apparently anticipated. But all these errors connected with phases of sluggishness were much smaller than the underestimates relating to upswings or recoveries.

The results for industrial production are similar. Again, the largest errors are the underestimates for 1955. These forecasts, however, produced overestimates of levels in all years marked by either recession or retardation (including 1954) and also in 1956 and 1957. It should be recalled that the behavior of GNP and industrial production in the latter years differed considerably; the expansion of general economic activity lasted through the first half of 1957, but in the manufacturing sector it tapered off much earlier, coming to a virtual halt in 1956.

For total consumption expenditures as well as for GNP, 1955 was the year when the forecasters made their largest errors and 1963 their second largest (comparing once more the average errors of change for each year since 1953). These were all underestimates of growth, the predominant type of errors in consumption forecasts (see Table 7, line 4).

Among the forecasts of gross private domestic investment, a variable

with very different properties, 1955 was again marked by the largest underestimation errors, though 1958 and 1959 were not far behind (in 1958, the large decline in the series was underestimated). Here, however, overestimates and turning-point errors were occasionally just as conspicuous; diffusion and diversity, rather than concentration in time and by type, seem to be characteristic of the errors of these forecasts (Table 7).

YEAR-TO-YEAR COMPARISONS OF PREDICTED AND ACTUAL CHANGES

Chart 1 shows the forecasts of annual changes in gross national product for each of the eight sets A to H. In the left column, predicted changes are superimposed upon the actual ones. In the right column, the discrepancies between the two, i.e., the errors-of-change forecasts, are plotted on the same scales. The same arrangement is used in Chart 2 for the forecasts of annual changes in industrial production.

The charts make it clear that the predicted changes generally followed a course similar to that of the actual changes. This is true of both GNP and industrial production. To be sure, the correspondence is fairly close in some cases, very broad in others. It is not difficult to discern visually the more important differences among these patterns, which reflect major differences in accuracy (compare, for example, the GNP forecasts E and F). But surely the main lesson of these charts is that substantial positive correlations exist between the forecast changes and the realizations for both variables. As this implies, the time profiles of the forecasts themselves also resemble each other considerably in most cases.

The observed errors are on the whole much smaller than the corresponding changes: as already noted, the forecasts are typically better than last-level extrapolations which produce errors identical to the recorded changes. The errors, too, tend to be positively correlated for the different forecasts, consistently with the preceding comparisons. This shows itself primarily in the directional agreement between changes in the errors from one year to the next. This "co-movement" tendency in errors is indeed striking.[4]

[4] For GNP, errors of all forecasts change in the same direction in seven of the ten intervals covered; in the remaining three intervals, all but one forecast (F) show complete agreement in this respect. For industrial production, the agreement is only slightly less pronounced.

CHART 1

Eight Sets of Annual Forecasts of GNP, Actual and Predicted Changes and Errors, 1953–63

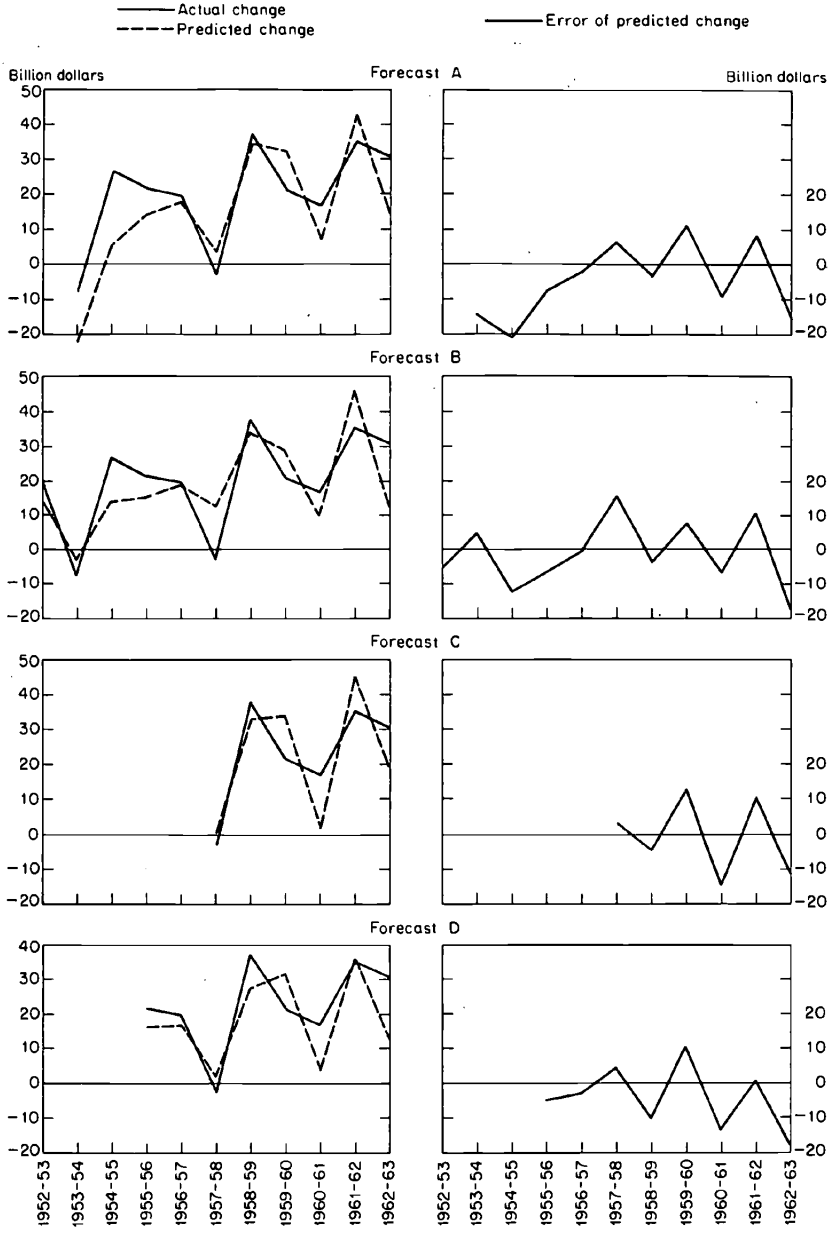


CHART 1 (*concluded*)

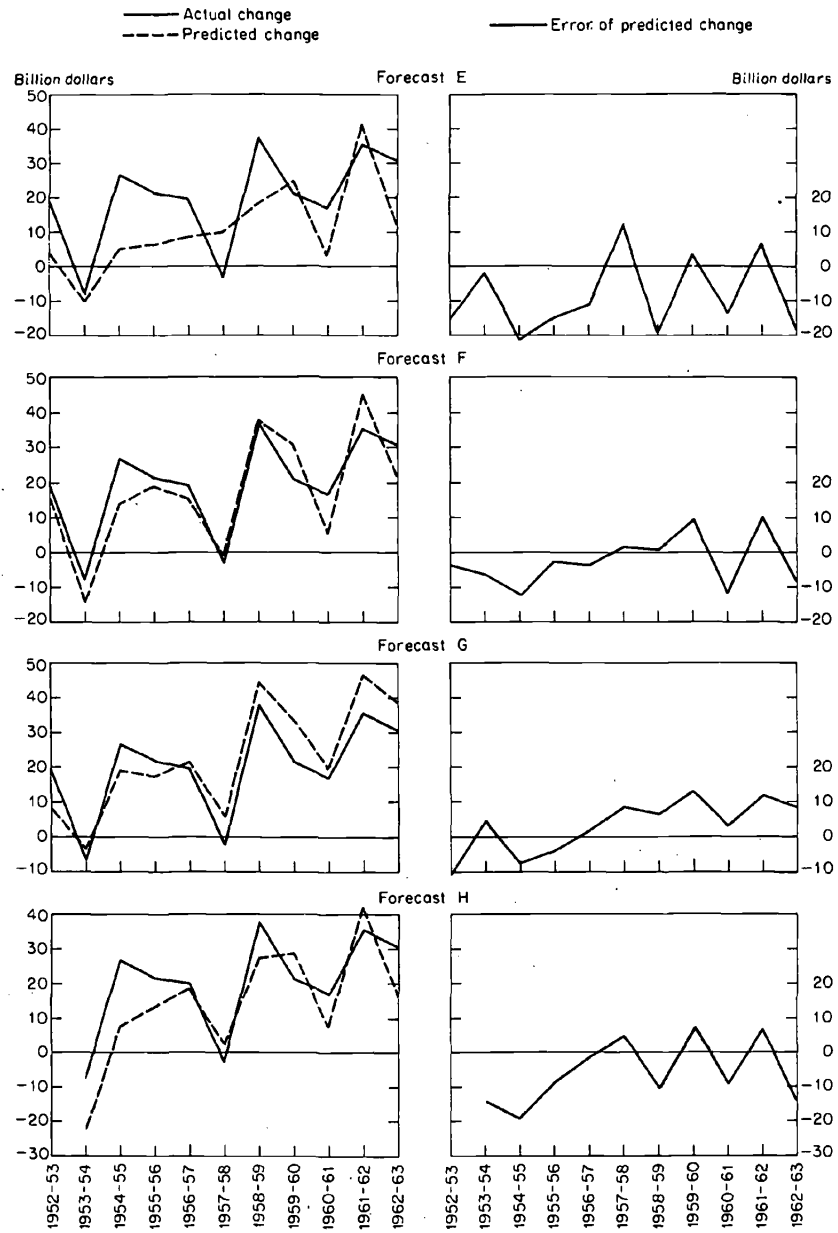
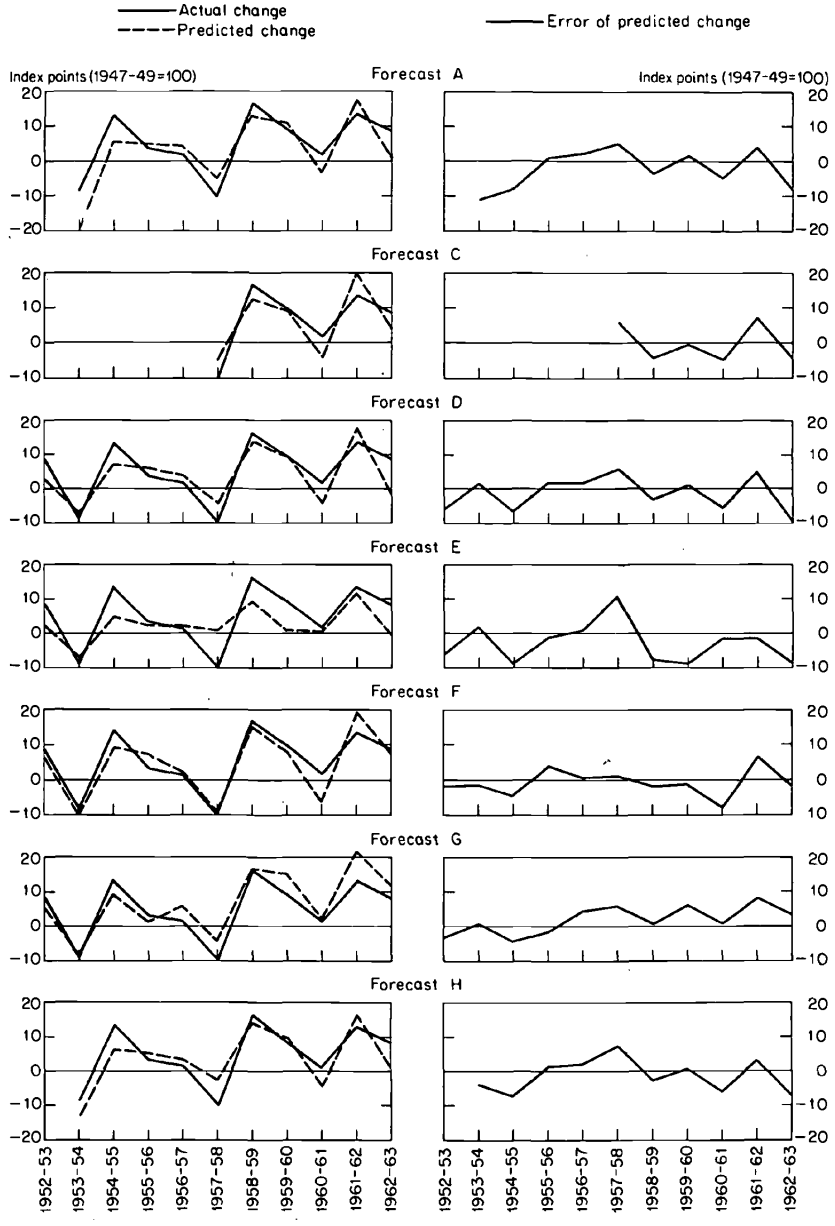


CHART 2

Seven Sets of Annual Forecasts of Industrial Production, Actual and Predicted Changes and Errors, 1953–63



Finally, a comparison of Charts 1 and 2 discloses some significant similarities between the forecast and error patterns for GNP and industrial production. These reflect the correlation between the actual year-to-year changes in the two variables.

FORECASTING AND BUSINESS CYCLES

The year-to-year comparisons discussed with the aid of Charts 1 and 2 suggest that predictive errors are affected by the cyclical characteristics of the forecast period. Table 3, which uses forecasts for quarters and half-years, demonstrates this still more clearly. The levels of GNP and industrial production are underestimated the most in the first year of expansion, when the increases in these series are very large. Later in the expansion, when the increases are usually smaller, the levels are underestimated much less and may even be overestimated, as happened in the unexpected retardation of 1962 (see Table 3, line 5). In contractions, overestimation of the levels is the rule, sometimes because the downturn is missed and sometimes because the decline turns out to be larger than predicted.[5]

These cyclical differences among errors can be observed in forecasts of different spans. For each of these stages—early recovery, later expansion, contraction—there are signs of the familiar characteristic of errors to increase with the forecast span. For the longest forecasts included, the eighteen-month predictions of group D, the errors are about equally large in the early and in the late expansion, and the interstage differences are not significant statistically. Elsewhere, however, such differences are definitely significant according to the analysis of variance.[6]

[5] Opposite cases, in which the decline was smaller than expected and as a result the level was underestimated, also occurred (notably in the 1954 recession, as observed earlier for the annual forecasts). These errors, however, are outweighed in most of the contraction averages by the more frequent errors of the types referred to in the text.

[6] The results of that analysis are summarized below. The computed *F*-values are the ratios of the greater to the lesser estimate of variance, in this case, of the variance of error between cycle phases to the variance of error within cycle phases.

	GNP Forecasts (all spans)		*Indus. Product. Forecasts (D)*		
	A	C	6 mos.	12 mos.	18 mos.
Computed *F*-ratio	6.4	28.9	10.4	5.0	1.6
5 per cent level of *F*-ratio	3.7	3.2	3.3	3.3	3.7

TABLE 3

Selected Forecasts of GNP and Industrial Production: Mean Errors Classified by Span and Cyclical Characteristics of the Forecast Period, 1947-62

Line	Forecast Set, Period Covered, and Stage[a]	Span of Forecast (months) Three (1)	Six (2)	Nine (3)	Twelve (4)	Fifteen (5)	Eighteen (6)	All Spans (7)
		Mean Errors of GNP Forecasts[b] (billion dollars)						
	Set A, 1949, 1955-63[c]							
1.	Recovery		−18.2		−20.2			−19.2
2.	Upswing		−3.5		−5.6			−4.4
3.	Contraction		−0.9		+2.8			+1.0
	Set C, 1958-62[d]							
4.	Recovery	−6.6	−11.7	−14.7	−20.3	−32.6		−14.0
5.	Upswing	+1.5	+3.7	+3.4	+3.6	+1.2		+2.9
6.	Contraction	+0.1	+4.7	+8.9	+9.2	+9.6		+4.6
		Mean Errors of Industrial Production Forecasts[e] (1947-49 = 100)						
	Set D, 1947-62[f]							
7.	Recovery		−5.7		−6.9		−10.4	−7.1
8.	Upswing		−1.2		−4.8		−10.3	−4.4
9.	Contraction		+3.6		+4.8		−0.4	+3.2

[a]The following terms are used for brevity: recovery = the first year of expansion; upswing = the rest of expansion. The classification attempts to approximate as closely as possible the NBER business cycle chronology.

[b]Errors of level forecasts.

[c]Based on forecasts for the first and second half of the coming year.

[d]Based on forecasts made quarterly for sequences of four quarters ahead.

[e]Errors of level forecasts. The forecasts for the span in column 6 cover the period from 1948 through the first half of 1956.

[f]Based on forecasts made twice in the year for two or three semiannual periods ahead.

To understand how such results might occur, let us distinguish two predictive patterns, both of which would underestimate current cyclical changes, though in very different ways. First, imagine a series of forecasts which reproduces well, but with a short lag, the fluctuations in the actual series. The observed cyclical amplitudes need not be underestimated but the current changes at certain stages of the cycle will be. Second, imagine a series of forecasts which reproduces well the trend, but not the cyclical movements, of the actual values. The predictions simply cut across the fluctuations, so that both the cyclical amplitudes and the current short-period changes are underestimated.

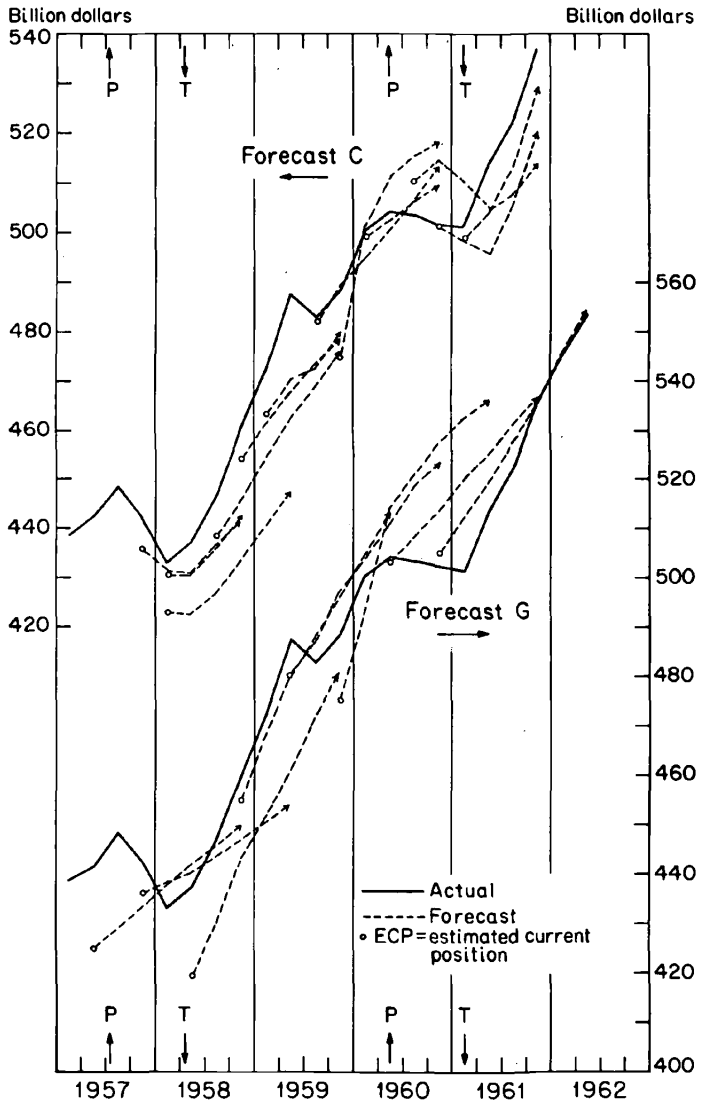
Some forecasts resemble more the lagging cyclical model, others the trend-projection model. In Chart 3, the former is illustrated by forecast C and the latter by forecast G, for GNP during 1958–61. Both these sets consist of forecasts made for several quarters ahead, which in the chart are linked together into chains that fan out to the right from points representing the forecasters' estimates of the current position. The forecasts are made twice or four times in a year, hence the chains overlap. The C chains have "kinks" in 1958 and 1960–61, which lag behind the turning points in GNP; the G chains show no kinks at all.

Forecasts of the trend-projection type may come out rather well in measures of average error if they have no large bias, that is, if they neither underestimate nor overestimate the trend substantially.[7] It is clear, however, that such forecasts must be regarded as failures as far as recognition of turning points is concerned. The chain forecasts with cyclical patterns can be more useful in this role, even when they are late.

[7] The quarterly chain forecasts G for 1955–63 do show a significant overestimation bias for both GNP and industrial production (see Tables 9 and 10 and accompanying text). Incidentally, the annual forecasts G show little over-all bias merely because their underestimation errors in earlier years, 1953–57, largely offset the later overestimates (see Tables 1 and 2).

CHART 3

Two Sets of Chain Forecasts of GNP and the Corresponding Actual Values, 1957–62



NOTE: P and T represent business cycle peaks and troughs.