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AN EVALUATION OF A SHORT-RUN FORECASTING MODEL

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1. INTRODUCTION

AN IMPORTANT QUESTION in econometric model-building is how useful econometric models are likely to be for short-run forecasting purposes. The current practice of most model proprietors who issue regular forecasts is to adjust the forecasts from their models before the forecasts are released. The forecasts from the models can be adjusted by changing the values of the constant terms in the equations (including having the constant terms differ for different quarters in the forecast period) and by adjusting the values of the exogenous variables used for the forecasts. The studies of Evans, Haitovsky, and Treyz [2] and Haitovsky and Treyz [7] analyzing the Wharton and OBE models conclude that the adjusted forecasts of the model proprietors (the *ex ante* forecasts) are on average more accurate than the non-adjusted forecasts from the models. The *ex ante* forecasts are even more accurate than forecasts based on the actual values of the exogenous variables and on either no constant adjustments or on the same constant adjustments as were used for the *ex ante* forecasts.[1] The non *ex ante* forecasts from the two models are poor enough as to lead the authors to be pessimistic about the possibility of using econometric models in a mechanical way for forecasting purposes. In fact, Evans, Haitovsky, and Treyz go so far as to chide anyone as being naive who believes "that econometric models should not need any [constant-term] adjustments."[2] This view appears to be quite widespread, since the adjustment of constant terms is almost a universal practice among model proprietors, and model proprietors seldom release the unadjusted forecasts from their models in addition to the adjusted forecasts.[3]

One important consequence of this view is that it gives little incentive for trying to improve the specification of models and for trying to develop better estimation techniques. If it is felt that models will never be able to be used in a mechanical way and that forecasts from models will always be subjectively

[1] See Evans, Haitovsky, and Treyz [2, (1137–1138)] and Haitovsky and Treyz [7, Table 1, (319)]. For the OBE model, Evans, Haitovsky, and Treyz conclude that the *ex ante* forecasts are "no better or no worse" than the forecasts based on the actual values of the exogenous variables and on the *ex ante* constant adjustments (p. 1137). For the results in Table 1 in [7], however, the OBE *ex ante* forecasts are better than any of the other forecasts.

[2] Evans, Haitovsky, and Treyz [2, (957)].

[3] It is important to note the distinction between mechanical constant-term adjustments and other kinds of adjustments. Mechanical adjustments are adjustments for which rules can be made ahead of time, such as a rule that says adjust the constant term in an equation by the amount of the last observed error in the equation. Accounting for first-order serial correlation, as is done in the present model, can also be considered to be a form of mechanical constant-term adjustment. The discussion in this paper regarding constant-term adjustments is meant to refer only to the non-mechanical types of adjustments.

adjusted, the expected payoff in terms of increased forecast accuracy from model improvement is not likely to be very large.[4]

During 1968 and 1969 a short-run forecasting model of the United States economy was developed by the author. The model is described in Fair [5]. Since 1970 III, regular forecasts from the model have been released quarterly. No constant-term adjustments have ever been made for any of the forecasts. The main aim of this work has been to try to guage the likely forecasting accuracy of a model for which forecasts are not subjectively adjusted before being released. The purpose of this paper is to describe the results that have been obtained from the model for the 1970 III—1973 II period.

The model is described briefly in Section 2. Then in Section 3 the *ex ante* forecasts from the model are compared with two other sets of forecasts: one set using the same coefficient estimates as were used for the *ex ante* forecasts, but using the actual values of the exogenous variables instead of the *ex ante* predicted values (outside sample forecasts); and one set using the coefficient estimates obtained by estimating the model through 1973 II and using the actual values of the exogenous variables (within sample forecasts). The results provide an indication of how much of the forecast error is due to errors made in forecasting the exogenous variables and how much is due to having to make outside-sample forecasts rather than within-sample forecasts. These three sets of forecasts are also compared with the *ex ante* forecasts released from the ASA/NBER Survey of Regular Forecasters. These forecasts are the median forecasts from the survey of forecasters. The survey is primarily a survey of non-econometric forecasters.

2. THE MODEL

Since the model is described in detail in [5], it will only be briefly discussed here. Some of the features of the model are the following.

1. The model was designed primarily for short-run forecasting purposes, and use was made of expectational variables when they appeared to aid in the explanation of the endogenous variables. The model was also kept fairly small (14 stochastic equations and 5 identities).

2. The concept and measurement of "excess labor" played an important role in the explanation of employment. Disequilibrium considerations played an important role in the specification and estimation of the housing sector. The price-wage nexus was avoided by specifying a price equation that did not include any wage variables among the explanatory variables.

3. The primary estimation technique that was used accounted for both first-order serial correlation of the error terms and simultaneous equations bias. A method of estimating markets in disequilibrium was used to estimate the housing sector.

[4] This view has led Brunner [1, (930)] to quip that "The Evans procedure of 'sophisticated forecasting' . . . involves an abandonment of empirical science for a numerology similar to astrology."

TABLE 1

EQUATIONS OF THE MODEL BY SECTOR

Equation No. in [5]		$\hat{\rho}$	SE	$R\Delta^2$	No. of observations
	The Monthly Housing Starts Sector				
(8.23)	$HS_t = \sum_{l=1}^{11} \hat{a}_l DI_l + 2.70 W_t + 112.95 \quad - .0709 \sum_{i=1}^{t-1} HS_i$ (4.63) (2.46) (2.27)				
	2.07 + 113.36 − .0078 (4.69) (2.02) (0.48)	.841 (17.54)	8.98	.790	127
	$+ 8.48t - .127RM_{t-2} - .412\|\Delta RM_t\|$ (2.31) (1.45) (2.81)				
	+ 1.66 − .154 − .154 (0.82) (1.52) (1.25)	.919 (30.36)	9.87	.178	169
(8.24)	$HS_t = \sum_{l=1}^{11} \hat{a}_l' DI_l + 2.84 W_t - 49.22 \quad - .164t$ (4.42) (1.75) (2.63)				
	2.20 + 24.91 + .011 (4.39) (0.99) (0.12)				
	$+ .0541 DSF6_{t-1} + .0497 DHF3_{t-2}$ (8.07) (5.27)	.507 (6.64)	8.30	.822	127
	+ .0262 + .0166 (8.64) (2.23)				
	$+ .100RM_{t-1} - .412\|\Delta RM_t\|$ (2.67) (2.81)				
	+ .025 − .154 (0.61) (1.25)	.653 (11.21)	9.68	.213	169
	The Money *GNP* Sector				
(3.3)	$CD_t = -25.43 + .103GNP_t + .110MOOD_{t-1}$ (4.22) (39.78) (1.88)				
	−34.09 + .114 + .068 (4.99) (33.20) (1.22)	.648 (6.01)	1.125	.554	50
	$+ .092MOOD_{t-2}$ (1.54)				
	+ .148 (2.44)	.824 (11.37)	1.318	.606	61
(3.7)	$CN_t = .081GNP_t + .646CN_{t-1} + .147MOOD_{t-2}$ (5.40) (9.30) (4.67)	−.381 (2.47)	1.383	.550	36
	.067 + .738 + .065 (4.54) (11.49) (2.83)	−.077 (0.53)	1.649	.612	47
(3.11)	$CS_t = .022GNP_t + .945CS_{t-1} - .023MOOD_{t-2}$ (4.15) (47.77) (7.37)	−.077 (0.55)	.431	.891	50
	.025 + .931 − .022 (4.01) (40.27) (5.66)	.100 (0.78)	.547	.903	61
(4.4)	$IP_t = -8.50 + .063GNP_t + .687PE2_t$ (4.86) (8.87) (8.34)	.689 (6.72)	1.011	.633	50
	− 6.96 + .069 + .556 (3.94) (9.89) (6.63)	.774 (9.55)	1.061	.697	61

(*Continued on next page*)

TABLE 1 (*Continued*)

Equation No. in [5]		$\hat{\rho}$	SE	$R\Delta^2$	No. of observations
	The Money *GNP* Sector (*Continued*)				
(5.5)	$IH_t = -\ 3.53 + .016GNP_t + .0242HSQ_t$ (2.31) (13.12) (5.37)	.449 (3.01)	.582	.792	36
	$-\ 29.99 + .043 + .0244$ (3.81) (6.05) (7.56)				
	$+ .0230HSQ_{t-1} + .0074HSQ_{t-2}$ (4.45) (1.66)	.996 (25.75)	.687	.786	47
	$+ .0224 + .0108$ (6.21) (3.11)				
(6.15)	$V_t - V_{t-1} = -114.76 + .728(CD_{t-1} + CN_{t-1})$ (4.09) (4.27)				
	$-\ 9.38 + .092$ (0.86) (1.30)				
	$-\ .357V_{t-1} + 0.95(CD_{t-1} + CN_{t-1} - CD_t - CN_t)$ (3.94) (0.42)	.791 (9.51)	2.540	.589	50
	$-\ .043 + .496$ (0.90) (3.28)	.782 (9.80)	2.931	.329	61
(7.3)	$IMP_t = .078GNP_t$ (8.70)	1.0	.637	.437	45
	$.106$ (12.87)	1.0	.812	.651	53
Income identity	$GNP_t = CD_t + CN_t + CS_t + IP_t + IH_t + V_t - V_{t-1} - IMP_t + EX_t + G_t$				
	The Price Sector				
(10.5)	$GAP2_t = GNPR_t{}^* - GNPR_{t-1} - (GNP_t - GNP_{t-1})$				
(10.7)	$PD_t - PD_{t-1} = -1.037$ (1.44)				
	$+ 165.76 \dfrac{1}{78.36 + \frac{1}{8}\sum_{i=1}^{8} GAP2_{t-i+1}}$ (1.19) (2.00)	0	.183	.810	50
	$PD_t - PD_{t-1} = 1.280 - .0247\left(\frac{1}{20}\sum_{i=1}^{20} GAP2_{t-i+1}\right)$ (16.32) (7.89)	0	.391	.501	64
(10.8)	$GNPR_t = 100\dfrac{GNP_t - GG_t}{PD_t} + YG_t$				
(10.9)	$Y_t = GNPR_t - YA_t - YG_t$				
	The Employment and Labor Force Sector				
(9.2)	$M_tH_t = \dfrac{1}{\alpha_t} Y_t$				
(9.8)	$\log M_t - \log M_{t-1} = -\ .514 + .0000643t$ (3.44) (1.57) $-\ .548 + .0000720$ (4.48) (2.21)				

(*Continued on next page*)

TABLE 1 (*Continued*)

Equation No. in [5]		$\hat{\rho}$	SE	$R\Delta^2$	No. of observations
	The Employment and Labor Force Sector (*Continued*)				
	$- \underset{(3.41)}{.140}(\log M_{t-1} - \log M_{t-1}H_{t-1}) + \underset{(2.34)}{.121}(\log Y_{t-1}$				
	$- \underset{(4.46)}{.150} \qquad + \underset{(1.75)}{.073}$				
	$- \log Y_{t-2}) + \underset{(6.43)}{.298}(\log Y_t - \log Y_{t-1})$	.336 (2.52)	.00310	.778	50
	$+ \underset{(8.14)}{.297}$	.407 (3.56)	.00303	.783	64
(9.10)	$D_t = -\underset{(8.23)}{13014} - \underset{(6.15)}{71.10}t + \underset{(9.39)}{.358}M_t$	.600 (5.30)	181.4	.460	50
	$- \underset{(5.79)}{13246} - \underset{(4.84)}{86.40} + \underset{(6.68)}{.378}$	.773 (9.74)	202.3	.389	64
(9.9)	$E_t = M_t + MA_t + MCG_t - D_t$				
(9.11)	$\frac{LF_{1t}}{P_{1t}} = \underset{(652.38)}{.981} - \underset{(8.57)}{.000190}t$	.265 (1.94)	.00193	.447	50
	$\underset{(248.62)}{.990} - \underset{(6.43)}{.000326}$	.776 (9.84)	.00190	.114	64
(9.12)	$\frac{LF_{2t}}{P_{2t}} = \underset{(2.69)}{.180} + \underset{(4.97)}{.000523}t + \underset{(3.67)}{.447}\frac{E_t + AF_t}{P_{1t} + P_{2t}}$	.797 (9.32)	.00228	.373	50
	$\underset{(3.67)}{.225} + \underset{(5.92)}{.000774} + \underset{(3.03)}{.336}$	.905 (17.07)	.00203	.351	64
(9.14)	$UR_t = 1 - \frac{E_t}{LF_{1t} + LF_{2t} - AF_t}$				

Notes:

1. t-statistics in absolute value are in parentheses.
2. $\hat{\rho}$ = estimate of the serial correlation coefficient.
3. SE = estimate of the standard error of the regression.
4. $R\Delta^2$ = percent of the variance of the change in the left-hand-side variable explained by the regression except for equations (10.7) and (9.8), where it is simply the percent of the variance of the level of the left-hand-side variable explained by the regression.
5. For the first set of estimates, the values for $\hat{d}_I$ and $\hat{d}_I'$ are presented in Chapter 8 in [5].
6. α_t = production-function coefficient obtained by peak to peak interpolations.
7. Sample periods:
   - 127 obs. = June 1959—December 1969
   - 169 obs. = June 1959—June 1973
   - 50 obs. = 1956 I—1969 IV, excluding 1959 III, 1959 IV, 1960 I, 1964 IV, 1965 I, 1965 II
   - 61 obs, = 1956 I—1973 II, excluding 1959 III, 1959 IV, 1960 I, 1964 IV, 1965 I, 1965 II, 1970 IV, 1971 I, 1971 II
   - 36 obs. = 1960 II—1969 IV, excluding 1964 IV, 1965 I, 1965 II
   - 47 obs. = 1960 II—1973 II excluding 1964 IV, 1965 I, 1965 II, 1970 IV, 1971 I, 1971 II
   - 45 obs. = 1956 I—1969 IV, excluding 1959 III, 1959 IV, 1960 I, 1960 II, 1964 IV, 1965 I, 1965 II, 1965 III, 1968 IV, 1969 I, 1969 II, 1969 III

53 obs. = 1956 I—1973 II, excluding 1959 III, 1959 IV, 1960 I, 1960 II, 1964 IV, 1965 I, 1965 II, 1965 III, 1968 IV, 1969 I, 1969 II, 1969 III, 1970 IV, 1971 I, 1971 II, 1971 IV, 1972 I, 1972 II

64 obs. = 1956 I—1973 II, excluding 1959 III, 1959 IV, 1960 I, 1964 IV, 1965 I, 1965 II

8. The much lower $R\Delta^2$ for the second set of estimates of equations (8.23) and (8.24) is due in large part to the use of seasonally adjusted data for the second set of estimates. For the first set of estimates the seasonal dummy variables explain a large part of the variance of the non-seasonally-adjusted HS_t series.

TABLE 2

VARIABLES OF THE MODEL IN ALPHABETICAL ORDER BY SECTOR

The Monthly Housing Starts Sector

†$DHF3_t$ = Three-month moving average of the flow of advances from the Federal Home Loan Bank to Savings and Loan Associations in millions of dollars

†DI_t = Dummy variable I for month t, $I = 1, 2, \ldots, 11$

†$DSF6_t$ = Six-month moving average of private deposit flows into Savings and Loan Associations and Mutual Savings Banks in millions of dollars

HS_t = Private nonfarm housing starts in thousands of units

†RM_t = FHA mortgage rate series on new homes in units of 100

†W_t = Number of working days in month t

†$/\Delta RM_t/$ = [see equation (8.21) in [5]].

†$\backslash\Delta RM_t\backslash$ = [see equation (8.22) in [5]].

The Money GNP Sector

CD_t = Consumption expenditures for durable goods, SAAR

CN_t = Consumption expenditures for nondurable goods, SAAR

CS_t = Consumption expenditures for services, SAAR

†EX_t = Exports of goods and services, SAAR

†G_t = Government expenditures plus farm residential fixed investment, SAAR

GNP_t = Gross National Product, SAAR

HSQ_t = Quarterly nonfarm housing starts, seasonally adjusted at quarterly rates in thousands of units

IH_t = Nonfarm residential fixed investment, SAAR

IMP_t = Imports of goods and services, SAAR

IP_t = Nonresidential fixed investment, SAAR

†$MOOD_t$ = Michigan Survey Research Center index of consumer sentiment in units of 100

†$PE2_t$ = Two-quarter-ahead expectation of plant and equipment investment, SAAR

$V_t - V_{t-1}$ = Change in total business inventories, SAAR

The Price Sector and the Employment and Labor Force Sector

†AF_t = Level of the armed forces in thousands

D_t = Difference between the establishment employment data and household survey employment data, seasonally adjusted in thousands of workers

E_t = Total civilian employment, seasonally adjusted in thousands of workers

†GG_t = Government output, SAAR

(*Continued on next page*)

TABLE 2 (*Continued*)

$GNPR_t$ =	Gross National Product, seasonally adjusted at annual rates in billions of 1958 dollars
†$GNPR_t^*$ =	Potential GNP, seasonally adjusted at annual rates in billions of 1958 dollars
LF_{1t} =	Level of the primary labor force (males 25–54), seasonally adjusted in thousands
LF_{2t} =	Level of the secondary labor force (all others over 16), seasonally adjusted in thousands
M_t =	Private nonfarm employment, seasonally adjusted in thousands of workers
†MA_t =	Agricultural employment, seasonally adjusted in thousands of workers
†MCG_t =	Civilian government employment, seasonally adjusted in thousands of workers
M_tH_t =	Man-hour requirements in the private nonfarm sector, seasonally adjusted in thousands of man-hours per week
†P_{1t} =	Noninstitutional population of males 25–54 in thousands
†P_{2t} =	Noninstitutional population of all others over 16 in thousands
PD_t =	Private output deflator, seasonally adjusted in units of 100
UR_t =	Civilian unemployment rate, seasonally adjusted
Y_t =	Private nonfarm output, seasonally adjusted at annual rates in billions of 1958 dollars
†YA_t =	Agricultural output, seasonally adjusted as annual rates in billions of 1958 dollars
†YG_t =	Government output, seasonally adjusted at annual rates in billions of 1958 dollars

Notes: † Exogenous variable.
SAAR Seasonally adjusted at annual rates in billions of current dollars.

4. Different versions of the model were put through extensive tests before deciding on the final version. The stability of the estimated relationships over time was also examined in some detail, as was the sensitivity of the forecasting results to likely errors made in forecasting the exogenous variables.

The model is presented in Table 1, along with two sets of coefficient estimates. The first set is the set presented in Table 11–4 in [5] and consists of estimates through 1969 IV. The second set consists of estimates through 1973 II. Two changes have been made in the model since [5] was published. First, seasonal dummy variables are no longer used in equations (8.23) and (8.24), but instead HS_t, $DSF6_{t-1}$, and $DHF3_{t-2}$ are now seasonally adjusted before estimation. Second, the price equation (10.7) is now linear and has a lag length of 20 quarters rather than of 8 quarters. The variables of the model are listed in alphabetical order by sector in Table 2.

The model is structured as follows. Monthly housing starts are determined from the supply and demand equations in the monthly housing starts sector. The predicted value of monthly housing starts, HS_t, is taken to be the average of the predicted values from the two equations. The predicted values of HS_t

are averaged across time to obtain predicted values of quarterly housing starts, HSQ_t. Given HSQ_t, current dollar *GNP* and seven components are determined in the money *GNP* sector, which is a linear, simultaneous block. Given GNP_t, the price level and then constant dollar *GNP* are determined in the price sector. After real output is determined, employment, the labor force, and the unemployment rate are determined in the employment and labor force sector. The price and employment and labor force sectors are nonlinear, but are recursive, and the predicted values from these sectors do not feed back into the money *GNP* sector. There is no monetary sector: the mortgage rate and deposit flows are exogenous to the housing sector. There is likewise no income side: *GNP* enters as the income variable in the consumption equations.

In Chapter 12 in [5] the stability[5] of the coefficient estimates to additions of observations to the sample period was examined for the 1965 III—1969 IV period. The results in Table 1 can be considered to be an extension of this analysis. The conclusion in [5] was that the most unstable equations are the two monthly housing starts equations (8.23) and (8.24), the inventory equation (6.15), the price equation (10.7), and the labor force participation equation for secondary workers (9.12). This conclusion is also true of the results in Table 1. In addition, the results in Table 1 are characterized by generally larger estimates of the serial correlation coefficients for the latest set of estimates.

3. A COMPARISON OF THE FORECASTS

Between July 21, 1970, and April 23, 1973, twelve sets of forecasts from the model were released. The number of periods ahead forecast was either four or five, depending on the time of the year. Error measures for these forecasts are presented in the first row of Table 3 for each variable. These forecasts are denoted *ex ante/ex ante*. Both mean absolute errors for levels (*MAE*) and mean absolute errors for changes (*MAE*Δ) are presented. The actual data used for the comparisons are the most recent data as of July 21, 1973. To make the forecasts comparable to the most recent data, the level of each forecast value for each variable was adjusted in the following way. Consider a forecast made at the beginning of period $t + 1$ for period $t + 1$ and beyond, where preliminary estimates of the actual values for period t are available. For a variable y, let y_t^0 denote the estimate of y for period t available at the beginning of period $t + 1$, and let y_t^a denote the most recent (as of July 21, 1973) estimate of y for period t. Then the forecasts of y made at the beginning of period $t + 1$ for periods $t + 1$ and beyond were adjusted by adding $y_t^a - y_t^0$ to them before they were compared to the actual data (i.e., to the actual data as of July 21, 1973).

In the second row of Table 3 for each variable, error measures are presented for forecasts generated using the same coefficient estimates as were used for the *ex ante* forecasts, but using the actual values of the exogenous variables. All of the

[5] "Stability" in this context refers to how much or little the coefficient estimates of an equation change as the sample period is lengthened.

TABLE 3

ERROR MEASURES FOR THE DIFFERENT SETS OF FORECASTS
MAE = MEAN ABSOLUTE ERROR FOR LEVELS
$MAE\Delta$ = MEAN ABSOLUTE ERROR FOR CHANGES

	MAE Quarters Ahead					*MAEΔ* Quarters Ahead				
	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)
GNP_t										
1. *Ex Ante/Ex Ante*	4.38	9.20	12.73	14.72	17.88	4.38	5.50	4.96	4.70	5.75
2. *Ex Ante/Ex Post*	4.17	5.92	6.99	9.42	9.55	4.17	5.03	4.49	4.41	5.17
3. *Ex Post/Ex Post*	3.82	5.16	5.68	7.65	8.40	3.82	4.26	4.27	4.25	5.47
4. ASA/NBER *Ex Ante*	3.98	6.49	8.79	10.58	12.80	3.98	4.04	4.39	3.73	3.45
CD_t										
1. *Ex Ante/Ex Ante*	1.84	2.91	3.66	4.29	4.00	1.84	1.76	1.74	1.84	1.10
2. *Ex Ante/Ex Post*	1.84	2.51	3.37	3.86	3.80	1.84	1.68	1.57	1.61	0.78
3. *Ex Post/Ex Post*	1.59	1.62	2.01	2.11	1.61	1.59	1.45	1.32	1.47	1.30
4. ASA/NBER *Ex Ante*	2.35	3.36	4.75	6.13	6.47	2.35	2.16	2.21	2.06	0.75
CN_t										
1. *Ex Ante/Ex Ante*	1.80	3.26	4.06	4.64	5.48	1.80	2.05	1.80	1.92	2.10
2. *Ex Ante/Ex Post*	1.69	2.95	3.85	4.19	4.34	1.69	1.79	1.70	1.78	1.84
3. *Ex Post/Ex Post*	1.55	2.34	2.74	2.73	2.80	1.55	1.69	1.60	1.64	1.64
CS_t										
1. *Ex Ante/Ex Ante*	0.70	0.97	0.98	1.26	1.58	0.70	0.67	0.69	0.56	0.63
2. *Ex Ante/Ex Post*	0.66	0.87	0.71	0.65	0.61	0.66	0.68	0.63	0.50	0.44
3. *Ex Post/Ex Post*	0.63	0.84	0.98	1.25	1.23	0.63	0.66	0.67	0.50	0.34
IP_t										
1. *Ex Ante/Ex Ante*	1.15	2.71	3.87	4.67	5.60	1.15	1.81	1.54	1.72	1.43
2. *Ex Ante/Ex Post*	1.35	1.83	1.91	2.09	1.62	1.35	1.20	1.07	0.96	1.58
3. *Ex Post/Ex Post*	1.18	1.63	1.89	1.88	1.76	1.18	1.11	1.13	1.02	1.54

(Continued on next page)

TABLE 3 (*Continued*)

	MAE Quarters Ahead					*MAEΔ* Quarters Ahead				
	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)
IH_t										
1. *Ex Ante/Ex Ante*	1.78	4.45	7.13	9.44	11.58	1.78	2.62	2.47	2.23	1.83
2. *Ex Ante/Ex Post*	1.62	3.35	4.82	6.25	8.22	1.62	1.85	1.54	1.46	1.44
3. *Ex Post/Ex Post*	1.03	1.69	2.70	3.52	4.24	1.03	1.07	1.08	1.15	0.66
$V_t - V_{t-1}$										
1. *Ex Ante/Ex Ante*	3.59	4.33	4.98	6.00	6.65	3.59	2.18	2.49	2.59	1.23
2. *Ex Ante/Ex Post*	2.91	3.36	4.07	5.03	5.38	2.91	2.10	2.16	2.21	1.37
3. *Ex Post/Ex Post*	1.76	2.09	2.52	2.20	1.87	1.76	1.80	1.87	1.87	1.29
4. ASA/NBER *Ex Ante*	2.10	2.77	2.83	3.22	3.38	2.10	1.76	1.85	2.08	1.35
IMP_t										
1. *Ex Ante/Ex Ante*	1.56	2.95	3.80	4.59	5.92	1.56	1.81	1.91	2.08	2.40
2. *Ex Ante/Ex Post*	1.46	2.56	3.21	3.80	5.12	1.46	1.54	1.67	1.84	2.20
3. *Ex Post/Ex Post*	1.36	2.24	2.22	1.61	2.13	1.36	1.33	1.40	1.50	1.77
HSQ_t										
1. *Ex Ante/Ex Ante*	12.02	19.58	25.24	29.53	32.25	12.02	10.67	11.72	9.11	6.24
2. *Ex Ante/Ex Post*	9.55	13.05	12.98	15.49	15.35	9.55	8.58	10.82	9.94	9.22
3. *Ex Post/Ex Post*	9.84	13.10	12.72	12.36	10.62	9.84	13.88	16.37	16.62	21.50
4. ASA/NBER *Ex Ante*	13.68	19.37	24.90	29.46	25.69	13.68	14.94	13.80	14.06	18.52
PD_t										
1. *Ex Ante/Ex Ante*	0.58	0.84	0.98	1.00	0.96	0.58	0.60	0.58	0.62	0.73
2. *Ex Ante/Ex Post*	0.58	0.84	1.00	0.95	0.94	0.58	0.60	0.57	0.60	0.71
3. *Ex Post/Ex Post*	0.55	0.73	0.86	0.87	0.89	0.55	0.55	0.55	0.59	0.80
$GNPD_t$										
1. *Ex Ante/Ex Ante*	0.60	0.87	1.02	1.16	1.08	0.60	0.64	0.57	0.64	0.70
2. *Ex Ante/Ex Post*	0.58	0.83	0.98	0.92	0.91	0.58	0.59	0.56	0.59	0.71
3. *Ex Post/Ex Post*	0.53	0.71	0.83	0.83	0.87	0.53	0.54	0.53	0.58	0.80
4. ASA NBER/*Ex Ante*	0.51	0.86	1.02	0.88	0.82	0.51	0.60	0.65	0.54	0.59

(*Continued on next page*)

TABLE 3 (*Continued*)

	MAE Quarters Ahead					*MAEΔ* Quarters Ahead				
	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)
$GNPR_t$										
1. *Ex Ante/Ex Ante*	3.52	5.22	6.22	8.72	8.12	3.52	3.63	2.81	3.74	6.22
2. *Ex Ante/Ex Post*	4.79	7.52	8.29	10.60	5.92	4.79	5.55	5.41	5.81	6.82
3. *Ex Post/Ex Post*	3.89	4.94	5.62	7.20	6.94	3.89	4.72	4.85	5.06	7.60
5. ASA/NBER *Ex Ante*	2.78	2.95	4.83	6.26	6.97	2.78	3.25	3.47	3.69	4.80
M_t										
1. *Ex Ante/Ex Ante*	198	296	368	471	397	198	188	114	122	147
2. *Ex Ante/Ex Post*	244	351	398	461	452	244	249	173	149	165
3. *Ex Post/Ex Post*	211	296	300	327	269	211	204	185	146	197
D_t										
1. *Ex Ante/Ex Ante*	294	353	301	364	544	294	228	217	198	245
2. *Ex Ante/Ex Post*	309	364	392	473	658	309	242	235	208	265
3. *Ex Post/Ex Post*	200	262	193	212	312	200	202	213	188	225
E_t										
1. *Ex Ante/Ex Ante*	147	283	455	608	824	147	171	182	163	242
2. *Ex Ante/Ex Post*	196	278	416	484	620	196	180	175	170	216
3. *Ex Post/Ex Post*	214	265	329	351	473	214	157	164	179	255
LF_{1t}										
1. *Ex Ante/Ex Ante*	58	89	110	122	189	58	53	59	58	72
2. *Ex Ante/Ex Post*	86	145	186	206	228	86	58	60	51	71
3. *Ex Post/Ex Post*	48	65	72	76	90	48	51	58	53	68
LF_{2t}										
1. *Ex Ante/Ex Ante*	125	161	147	77	201	125	129	126	149	242
2. *Ex Ante/Ex Post*	157	205	190	140	191	157	176	172	171	264
3. *Ex Post/Ex Post*	171	181	152	173	171	171	167	179	186	191

(*Continued on next page*)

TABLE 3 (*Continued*)

	MAE Quarters Ahead					*MAEΔ* Quarters Ahead				
	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)	1 (12 obs.)	2 (11 obs.)	3 (10 obs.)	4 (9 obs.)	5 (4 obs.)
UR_t										
1. *Ex Ente/Ex Ante*	.0018	.0034	.0044	.0041	.0028	.0018	.0018	.0009	.0006	.0011
2. *Ex Ante/Ex Post*	.0030	.0051	.0068	.0078	.0075	.0030	.0023	.0015	.0013	.0013
3. *Ex Post/Ex Post*	.0017	.0033	.0044	.0058	.0071	.0017	.0018	.0016	.0016	.0013
4. ASA/NBER *Ex Ante*	.0008	.0015	.0026	.0033	.0028	.0008	.0012	.0010	.0010	.0008

Notes: 1. $GNPD_t$ = GNP deflator, seasonally adjusted in units of 100

$$= 100\left(\frac{GNP_t}{GNPR_t}\right).$$

2. *Ex Ante/Ex Ante* = *Ex ante* forecasts released.
Ex Ante/Ex Post = Forecasts generated using *ex ante* coefficient estimates but actual data on the exogenous variables.
Ex Post/Ex Post = Forecasts generated using coefficient estimates through 1973 II and actual data on the exogenous variables.
ASA/NBER *Ex Ante* = ASA/NBER *ex ante* forecast released.

3. Let $\hat{y}_t^{(j)}$ denote the j-quarter-ahead forecast of y for quarter t (the forecast being made in quarter $t-j$), and let y_t denote the actual value of y for quarter t. Then *MAE* and *MAEΔ* for the j-quarter-ahead forecast are:

$$MAE = \frac{1}{T}\sum_{t=1}^{T}|y_t - \hat{y}_t^{(j)}| \qquad MAE\Delta = \frac{1}{T}\sum_{t=1}^{T}|(y_t - y_{t-1}) - (\hat{y}_t^{(j)} - \hat{y}_{t-1}^{(j-1)})|,$$

where in the second expression $\hat{y}_{t-1}^{(j-1)}$ is the $(j-1)$-quarter-ahead forecast of y for quarter $t-1$. The forecasts $\hat{y}_t^{(j)}$ and $\hat{y}_{t-1}^{(j-1)}$ are made at the same time (in quarter $t-j$), and so the difference in these two forecasts is the j-quarter-ahead forecast of the change in y for quarter t. For the one-quarter-ahead forecast, *MAE* and *MAEΔ* are the same.

4. Forecast periods:
12 obs. = 1970 III—1973 II
11 obs. = 1970 IV—1973 II
10 obs. = 1971 I—1973 II
9 obs. = 1971 II—1973 II
4 obs. = 1971 IV, 1972 II, 1972 IV, 1973 II

data used for these results, including data on the lagged endogenous variables needed to begin the forecasts, were the data as of July 21, 1973. A more detailed description of the procedure used to obtain these forecasts is presented in the Appendix. These forecasts are denoted *ex ante/ex post*. In the third row of Table 3 for each variable, error measures are presented for forecasts generated using the second set of coefficient estimates in Table 1 (estimates through 1973 II) and the actual values of the exogenous variables. These forecasts are denoted *ex post/ex post*. Finally, in the fourth row of Table 3 for relevant variables, error measures are presented for the *ex ante* forecasts released from the ASA/NBER Survey of Regular Forecasters. These forecasts are denoted ASA/NBER *ex ante*. The same level adjustments were made for these forecasts as were made for the *ex ante* forecasts from the present model.

Consider the GNP_t results in Table 3 first.[6] The *ex ante/ex post* forecasts are obviously better than the *ex ante/ex ante* forecasts, and the *ex post/ex post* forecasts are obviously better than the *ex ante/ex post* forecasts. Both of these results are what one would expect for a model, but the first result is contrary to what Evans, Haitovsky, and Treyz [2] and Haitovsky and Treyz [7] found for the Wharton and OBE models. Here, knowing the actual values of the exogenous variables certainly improves the accuracy of the forecasts. The gain in improved accuracy on this score is greater than the gain in using *ex post* coefficients rather than *ex ante* coefficients.

The housing starts sector depends heavily on hard-to-forecast exogenous variables (the mortgage rate and especially deposit flows), which is reflected in the results for HSQ_t in Table 3. The *ex ante/ex post* forecasts are considerably better than the *ex ante/ex ante* forecasts for HSQ_t, a conclusion which is then also true for housing investment, IH_t. An important variable in the equation explaining nonresidential fixed investment, IP_t, is $PE2_t$, the two-quarter-ahead expectation of plant and equipment investment, and data other than proxies for this variable are only known two quarters ahead. This characteristic of $PE2_t$ is reflected in the results for IP_t in Table 3, where the *ex ante/ex post* forecasts are much better than the *ex ante/ex ante* forecasts for three quarters ahead and beyond. The unstable nature of the coefficient estimates of the inventory equation is reflected in the results for $V_t - V_{t-1}$ in Table 3, where the *ex post/ex post* forecasts are much better than the *ex ante/ex post* forecasts.

Consider next the price and employment and labor force sectors. The price equation does not depend directly on any exogenous variable except potential *GNP*, $GNPR_t^*$, and because of the long lag length in the equation, the price forecasts are not very sensitive to recent forecasts of current dollar and constant dollar *GNP*. Consequently, the *ex ante/ex ante* and *ex ante/ex post* forecasts of the private output deflator, PD_t, and the *GNP* deflator, $GNPD_t$, are of about the same accuracy. Real *GNP*, $GNPR_t$, is the ratio of GNP_t and $GNPD_t$, and since the *ex ante/ex post* forecasts of GNP_t are more accurate than the *ex ante/ex ante*

[6] The discussion in this section will concentrate on the *MAE* results in Table 3. The *MAEΔ* results are similar to the *MAE* results, although the *MAEΔ* values are generally closer to each other.

forecasts (with the different forecasts of $GNPD_t$ being of about the same accuracy), one would also expect the *ex ante/ex post* forecasts of $GNPR_t$ to be more accurate than the *ex ante/ex ante* forecasts. This is not true for all but the five-quarter-ahead results, however, which turns out to be caused by fortunate error cancellation for the *ex ante/ex ante* forecasts. For the *ex ante/ex ante* forecasts, errors made in forecasting GNP_t were offset to some extent by errors made in forecasting $GNPD_t$, which was not true as much for the *ex ante/ex post* forecasts.

The variables in the employment and labor force sector are not dependent on any hard-to-forecast exogenous variables, and for all of these variables except the unemployment rate, UR_t, the *ex ante/ex ante* and *ex ante/ex post* results are close. On average, the *ex ante/ex ante* forecasts are slightly better, which is at least in part caused by the more accurate *ex ante/ex ante* forecasts of $GNPR_t$. The better *ex ante/ex ante* forecasts of UR_t must again be caused by fortunate error cancellation, since the forecasts of the employment and labor force variables are close for the two sets of forecasts.

Consider now the ASA/NBER *ex ante* forecasts. For GNP_t, the *ex ante/ex post* and *ex post/ex post* forecasts are generally better than the ASA/NBER forecasts, but the *ex ante/ex ante* forecasts are worse. For consumer durable expenditures, CD_t, the ASA/NBER forecasts are always the worst. For $V_t - V_{t-1}$, the *ex post/ex post* forecasts are better than ASA/NBER, but ASA/NBER is better otherwise. For HSQ_t, the *ex ante/ex ante* and ASA/NBER forecasts are about the same, with the *ex ante/ex post* and *ex post/ex post* forecasts being much better. For $GNPD_t$, the results are all fairly close, and for $GNPR_t$, ASA/NBER does better except for the five-quarter-ahead forecasts. For UR_t, ASA/NBER is the best. Overall, the *ex ante/ex ante* forecasts are not quite as accurate as the ASA/NBER forecasts.

The results in Table 3 can also be used to pinpoint those areas where improved specification would be likely to yield the most gain in forecasting accuracy. The model does not, for example, do well in forecasting the unemployment rate. The employment equation (equation (9.8) explaining M_t) is one of the best equations of the model, but the equations involved in going from the forecasts of M_t to the forecasts of UR_t are not accurate enough to yield forecasts of UR_t that are as good as, say, the ASA/NBER forecasts. More work is clearly needed in this sector, especially regarding the explanation of the secondary labor force, LF_{2t}, and possibly also regarding the link between establishment-based employment, M_t, and household-survey employment, E_t. The *ex ante* forecasting accuracy of the model is also likely to be greatly increased if good equations can be developed or better ways found for forecasting $PE2_t$ and deposit flows.

4. CONCLUSION

The results in Table 3 show that the model as it now stands leads to the production of *ex ante* forecasts that are almost as good as the ASA/NBER *ex ante* forecasts[7] and that the forecasting accuracy of the model is generally improved when the actual values of the exogenous variables are used in place of the forecast values and when more recent coefficient estimates are used. The results are thus contrary to the view that forecasts from models have to be adjusted in order to produce at all accurate results. The results are also encouraging as to the possibility of being able to increase forecasting accuracy by improving model specification and by developing better estimation techniques. The fact that the accuracy of the model is generally improved when the actual values of the exogenous variables are used and when more recent coefficient estimates are used makes it seem likely that any improvement in the model, such as the addition of a good equation explaining a hard-to-forecast exogenous variable or the replacement of an equation with an equation that has better properties, will lead to improved forecasting accuracy.[8]

The main conclusion of this paper is thus that it does appear possible to build econometric models that can be used in a mechanical way and still produce reasonably accurate results. There is clearly a long way to go to the attainment of the goal of building highly accurate models, and the present model is by no means put forth as being anywhere close to this goal. But the results do look encouraging enough to warrant the suggestion that a more scientific approach be taken to econometric model-building and forecasting.

The main conclusion of this paper should not be interpreted to mean that the author believes that no subjectivity is involved in forecasting. Clearly subjectivity is involved in the choice of the model in the first place and in the choice of the forecasts of the exogenous variables. For the *ex ante* forecasts evaluated in this paper, subjectivity was also involved, as can be seen from the discussion in the Appendix, in the choice of which price and labor force participation equations to use, of whether to use seasonally adjusted or unadjusted data in the housing sector, and of how to adjust for the effects of the auto and dock strikes.

One of the reasons why the present model performs as well as it does is probably the use of more advanced techniques to estimate the model than have been used previously. The results of two recent studies, [3] and [4], indicate that substantial gain in prediction accuracy can be achieved by the use of more advanced estimation techniques, and in the present case it seems likely that improved forecasting accuracy can be achieved in the future by the use of an even more advanced technique than the one currently used.

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[7] In a recent analysis of the *ex ante* forecasts of ASA/NBER, Chase, DRI, Wharton, and the present model, McNees [**8**, (23)] concluded that the accuracy of the ASA/NBER forecasts was on average about the same as the accuracy of the Chase, DRI, and Wharton forecasts. The ASA/NBER forecasts thus appear to be a good benchmark from which to make comparisons of forecasting accuracy. The conclusion of McNees regarding the *ex ante* forecasts from the present model is similar to the conclusion reached in this paper, namely that the *ex ante* forecasts are on average not quite as accurate as the *ex ante* forecasts of the others.

[8] An example of an equation with better properties would be an equation with a better fit and more stability of the coefficient estimates to changes in the sample period. Another example of an improvement in the model would be the use of an alternative estimation technique that led to more accurate within-sample predictions and more stability of the estimates to changes in the sample period.

APPENDIX

DETAILS ON THE GENERATION OF THE FORECASTS

The release dates of the twelve sets of forecasts analyzed in this paper are: 1) July 21, 1970, 2) October 20, 1970, 3) January 20, 1971, 4) April 20, 1971, 5) July 21, 1971, 6) October 25, 1971, 7) January 24, 1972, 8) April 21, 1972, 9) July 24, 1972, 10) November 9, 1972 11) January 22, 1973, and 12) April 23, 1973. A new set of forecasts was always made right after the preliminary national-income-accounts data were released for the previous quarter. The forecast dated November 9, 1972, was delayed until after the 1972 election. For all forecasts except 3), 4), and 5), the model was reestimated before the forecasts were generated. Most equations of the model were not reestimated for forecasts 3), 4), and 5) because of the auto strike in 1970 IV. When the entire model was begun to be reestimated again for forecast 6), observations for 1970 IV, 1971 I, and 1971 II were excluded from the sample periods for the expenditure equations. The following are the changes that were made to the model during the three year period under consideration.

For the *ex ante/ex ante* forecasts (the actual forecasts released), the length of lag in the price equation was gradually changed from 8 in [5] to 20 currently. For forecast 1) the lag was 12, for forecast 2) the lag was 14, for forecast 3) the lag was 16, for forecasts 4)—10) the lag was 18, and for forecasts 11) and 12) the lag was 20. The nonlinear version of the price equation was used for forecasts 1)—4), and the linear version was used thereafter. The price equation to be used for a particular forecast was chosen on grounds of goodness of within-sample fit, with more weight being given to the accuracy of the equation for the more recent quarters. For the generation of the *ex ante/ex post* forecasts, the same price equation was used for each set of forecasts as was used for the *ex ante/ex ante* forecasts. For the generation of the *ex post/ex post* forecasts, the (current) linear price equation with a lag of 20 was used for all sets of forecasts.

The variables $DHF3_t$ and $DSF6_t$ were seasonally adjusted for the first time for forecast 5) (to make it easier to forecast these variables exogenously without having to be concerned with seasonal fluctuations), and HS_t was seasonally adjusted and the seasonal dummy variables dropped from the two housing starts equations for the first time for forecast 10). For the generation of the *ex ante/ex post* forecasts, this same timing was used to switch from seasonally unadjusted to seasonally adjusted data. For the generation of the *ex post/ex post* forecasts, seasonally adjusted data were always used.

For forecasts 2)—9) a different equation than (9.12) was used to forecast LF_{2t}. The results in [6] suggest that the real wage rate is important in explaining the labor force participation of some age-sex groups other than prime-age males. Because of these results, a distributed lag of a money wage variable, $WAGE_t$, and a distributed lag of the private output deflater, PD_t, were added to the equation explaining LF_{2t}/P_{2t}.[1] In addition, the equation was estimated in log form, as was done for the work in [6]. The $WAGE_t$ variable was treated as exogenous and was exogenously forecast. The equation was eventually dropped in favor of equation (9.12) because of the difficulty of forecasting $WAGE_t$ accurately and because of the sensitivity of the forecasts of LF_{2t} to the forecasts of PD_t (and thus to errors made in forecasting PD_t). For the generation of the *ex ante/ex post* forecasts, this new LF_{2t} equation was used for forecasts 2)—9), and equation (9.12) was used for the others. For the generation of the *ex post/ex post* forecasts, equation (9.12) was always used.

The 1970 auto strike had a pronounced effect on *GNP* and at least two of its components for 1970 IV. For forecast 3), which was made after the strike was over and after the preliminary data for 1970 IV were released, the 1970 IV values of seven variables were changed from the published data before the forecasts for 1971 I and beyond were generated. The model had no way of knowing that the low values for 1970 IV were due to a special factor and were likely to be made up in large part in 1971 I, and so some of the 1970 IV values were raised. The values of CD_t and IP_t for 1970 IV were raised by two thirds of the difference between the predicted values from forecast 2) and the published values. $GNPD_t$ was lowered by .40 points because part of the increase in $GNPD_t$ in 1970 IV was due to the auto strike. Using these three adjustments, the values for GNP_t, $GNPR_t$, PD_t, and Y_t were adjusted accordingly. For forecast 4), the 1970 IV values of four variables were changed. The values for CD_t and GNP_t for 1970 IV were taken to be the average of the published values for 1970 III and 1971 I, rather than the actual published values. The values for $GNPR_t$ and Y_t were then adjusted accordingly. For forecast 5), the 1970 IV value of GNP_t was changed to be the average of the 1970 III and 1971 I values, and then the values for $GNPR_t$ and Y_t were changed accordingly. The 1971 dock strike had a pronounced effect on imports for 1971 IV, and for forecast 7) the published 1971 IV value of imports was changed to be the value predicted by forecast 6). The two strikes were thus handled by adjusting the lagged values of a few of the variables before generating the forecasts. For the generation of both the *ex ante/ex post* and *ex post/ex post* forecasts, these same adjustments were used.

Since forecasts 1) and 2) were not adjusted in any way to try to account for the auto strike, the predicted values of GNP_t, CD_t, IP_t, and $GNPR_t$ for 1970 IV for these two forecasts were not compared to the actual values in computing the error measures in Table 3. Rather, they were compared to the average of the actual values for 1970 III and 1971 I. Likewise, the *ex ante/ex post*, *ex post/ex post*, and ASA/NBER *ex ante* forecasts were compared to the adjusted values. For ASA/NBER, the comparison with the adjusted values rather than the actual values had the effect of raising the one-quarter-ahead errors for GNP_t and CD_t slightly, but lowering the one-quarter-ahead error for $GNPR_t$ and the two-quarter-ahead errors for all three variables. The adjustment was not relevant for the three-quarter-ahead errors and beyond. The actual 1971 IV value of imports

[1] A truncated Pascal distribution with lag length of 8 was used for this equation.

was also changed to be the average of the 1971 III and 1972 I values before comparing the predicted values to it.[2]

Two important adjustments were made in the CD_t and IH_t equations for the generation of the *ex ante/ex post* forecasts. Consider, for example, the IH_t equation. The important explanatory variables in this equation are the housing starts variables. Over the three year period under consideration here the (NIA) data on IH_t have been revised upward, but the (non-NIA) data on housing starts have not. Consequently, when the *ex ante* coefficient estimates are used to forecast IH_t, the forecast is really more a forecast of the nonrevised IH_t data than of the revised IH_t data. The fact that the revised data on IH_{t-1} and on the other lagged values are used for the forecast is less important than the fact that the data on housing starts have not been revised. This problem is also important in the CD_t equation, where the (non-revised) consumer sentiment variable is an important explanatory variable. In order to account for this problem for the *ex ante/ex post* forecasts, the constant terms in the CD_t and IH_t equations were adjusted for each set of forecasts by adding to them $y^a_{t-1} - y^0_{t-1}$, where y^a_{t-1} is the current estimate of y for period $t - 1$ and y^0_{t-1} is the estimate of y for period $t - 1$ at the time the forecast (for periods t and beyond) was made. This general problem of data comparability makes it difficult to compare *ex ante/ex ante* and *ex ante/ex post* forecasts, and in the end one must attempt to reach some sort of a compromise. In the present case, the fact that none of the other equations were adjusted aside from the CD_t and IH_t equations probably biases the results somewhat against the *ex ante/ex post* forecasts. For the *ex post/ex post* forecasts no adjustments are needed because the coefficient estimates are obtained from the same data base as is used to generate the forecasts.

Problems of data comparability also arise for the *ex ante/ex post* forecasts in deciding what values of potential *GNP*, $GNPR^*_t$, and what values of α_t to use. These two series change slightly for each set of forecasts, and for the *ex ante/ex post* forecasts it was decided to use the same series as were used for the *ex ante/ex ante* forecasts rather than to use the latest series. In this case, however, it made little difference to the final results which series were used. The $WAGE_t$ data used for forecasts 2)—9) were also revised substantially during the period, while the labor force data were not, and so it was decided for the *ex ante/ex post* forecasts to use the same data as were used for the *ex ante/ex ante* forecasts rather than to use the latest data. Otherwise, all of the data used for the *ex ante/ex post* forecasts were the latest data.

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