Appendix B

The Forecasting Model Used for Comparison Purposes

The forecasting model was estimated through 1974II for the comparisons in Chapter Eight. The notation for the model is presented in Table B–1, and the model is presented in Table B–2. The same techniques were used to estimate the model for the work in this study that were used in Fair [14] and that have been used all along to reestimate the model each quarter. One of the techniques described in Fair and Jaffee [24] for estimating markets in disequilibrium is used to estimate the monthly housing starts sector. The two stage least squares technique described in Fair [22] for estimating simultaneous equations models with lagged endogenous variables and first order serially correlated errors is used to estimate the equations in the money GNP sector and Equation (9.12). The other equations in the model are estimated by ordinary least squares under the assumption of first order serial correlation of the error terms.

Strikes were handled in [14] by excluding the strike observations from the estimation periods. For the work in this study, however, no observations have been excluded from the estimation periods, and strikes have been handled by adding dummy variables to the equations most affected by the strikes. This was done to allow the models to be simulated over a longer period than would have been possible with gaps in the estimation period. For the forecasting model, four dummy variables were added to the equation explaining consumer durable expenditures (CD_t); two to the equation explaining plant and equipment investment (IP_t); three to the equation explaining inventory investment ($V_t - V_{t-1}$); five to the equation explaining imports (IMP_t); and two to the equation explaining employment (M_t). These are the same dummy variables that were added to the corresponding equations in the empirical model.

For the sake of completeness, the results of estimating the inventory, import, and price equations are presented in Table B–2, even though these equations are not used for the comparisons in Chapter Eight.

These equations are (6.15), (7.3), and (10.7). Since the forecasting model is described in detail elsewhere, no further discussion of it will be presented here.

Table B–1. The List of Variables in the Forecasting Model in Alphabetic Order by Sector

The Monthly Housing Starts Sector

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

$\dagger DSF6_t$ = 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

$\dagger RM_t$ = *FHA* mortgage rate series on new homes in units of 100

$\dagger W_t$ = Number of working days in month t

$\dagger/\Delta RM_t/$ = [see Equation (8.21) in [14]]

$\dagger\backslash\Delta RM_t\backslash$ = [see Equation (8.22) in [14]]

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*

$\dagger EX_t$ = Exports of goods and services, *SAAR*

$\dagger G_t$ = 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*

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

$\dagger PE2_t$ = 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

$\dagger AF_t$ = 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

$\dagger GG_t$ = Government output, *SAAR*

$GNPR_t$ = Gross National Product, seasonally adjusted at annual rates in billions of 1958 dollars

$\dagger GNPR^*$ = Potential GNP, seasonally adjusted at annual rates in billions of 1958 dollars

LF_{1t} = Level of the labor force of males 25–54, seasonally adjusted in thousands

LF_{2t} = Level of the labor force of all others 16 and over, seasonally adjusted in thousands

M_t = Private nonfarm employment, seasonally adjusted in thousands of workers

$\dagger MA_t$ = Agricultural employment, seasonally adjusted in thousands of workers

$\dagger MCG_t$ = Civilian government employment, seasonally adjusted in thousands of workers

M_1H_t = Worker hour requirements in the private nonfarm sector, seasonally adjusted in thousands of worker hours per week
$\dagger P_{1t}$ = Noninstitutional population of males 25–54 in thousands
$\dagger P_{2t}$ = Noninstitutional population of all others 16 and over 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
$\dagger YA_t$ = Agricultural output, seasonally adjusted at annual rates in billions of 1958 dollars
$\dagger YG_t$ = Government output, seasonally adjusted at annual rates in billions of 1958 dollars

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Notes: † Exogenous variable.
SAAR: Seasonally adjusted at annual rates in billions of current dollars.
The following dummy variables are also used in the model: $D593_t$, $D594_t$, $D601_t$, $D644_t$, $D651_t$, $D652_t$, $D691_t$, $D692_t$, $D693_t$, $D704_t$, $D711_t$, $D714_t$, $D721_t$. (See Table 2–1 for a list of these variables.)

Table B–2. The List of Equations in the Forecasting Model by Sector

Notes:
1. Absolute values of the t-statistics are in parentheses.
2. DW = Durbin-Watson statistic.
3. R^2 = coefficient of determination.
4. $\hat{\rho}$ = estimate of the first order serial correlation coefficient for the equation. "1.0" means the coefficient was constrained to be one.
5. When $\hat{\rho} \neq 0$, DW and R^2 are computed using the estimates of the transformed residuals.
6. logs are natural logs.
7. α_t = production function coefficient obtained from peak-to-peak interpolations.

Equation Number in [14]		$\hat{\rho}$	DW	R^2
	The Monthly Housing Starts Sector			
(8.23)	$HS_t = \underset{(2.14)}{114.4} + \underset{(3.93)}{1.77}W_t - \underset{(1.27)}{0.0191}\sum_{i=1}^{t-1} HS_i + \underset{(1.55)}{2.98}t - \underset{(1.65)}{0.151}RM_{t-2} - \underset{(0.94)}{0.104}/\Delta RM_t/$	0.921 (31.85)	2.54	0.874
(8.24)	$HS_t = \underset{(1.58)}{41.4} + \underset{(3.78)}{1.91}W_t + \underset{(0.01)}{0.000760}t + \underset{(8.08)}{0.0258}DSF6_{t-1} + \underset{(1.91)}{0.0137}DHF3_{t-2} + \underset{(0.25)}{0.0109}RM_{t-1} - \underset{(0.94)}{0.104}/\Delta RM_t/$	0.661 (11.86)	2.16	0.880

(3.3)	$CD_t = \underset{(4.53)}{-38.5} + \underset{(30.82)}{0.108}GNP_t + \underset{(1.31)}{0.0820}MOOD_{t-1} + \underset{(3.23)}{0.229}MOOD_{t-2}$ $\underset{(1.50)}{-2.47}D644_t + \underset{(1.29)}{2.12}D651_t - \underset{(3.65)}{6.03}D704_t + \underset{(0.90)}{1.48}D711_t$	0.783 (10.83)	1.96	0.997
(3.7)	$CN_t = \underset{(2.55)}{0.0380}GNP_t + \underset{(14.05)}{0.876}CN_{t-1} - \underset{(0.03)}{0.000662}MOOD_{t-2}$	0.140 (1.07)	2.02	0.999
(3.11)	$CS_t = \underset{(2.05)}{0.0121}GNP_t + \underset{(44.24)}{0.979}CS_{t-1} - \underset{(4.32)}{0.0145}MOOD_{t-2}$	−0.269 (2.41)	1.87	0.9999
(4.4)	$IP_t = \underset{(3.23)}{-7.98} + \underset{(10.07)}{0.0727}GNP_t + \underset{(6.12)}{0.521}PE2_t - \underset{(3.51)}{3.33}D704_t$ $\underset{(1.87)}{-1.79}D711_t$	0.862 (14.66)	1.88	0.999
(5.5)	$IH_t = \underset{(5.15)}{-17.2} + \underset{(8.85)}{0.0281}GNP_t + \underset{(7.03)}{0.0235}HSQ_t + \underset{(8.70)}{0.0291}HSQ_{t-1}$ $+\underset{(4.18)}{0.0141}HSQ_{t-2}$	0.897 (15.31)	2.17	0.995
(6.15)	$V_t - V_{t-1} = \underset{(3.11)}{-59.6} + \underset{(4.13)}{0.471}(CD_{t-1} + CN_{t-1}) - \underset{(3.81)}{0.310}V_{t-1}$ $\underset{(0.10)}{-0.0140}(CD_{t-1} + CN_{t-1} - CD_t - CN_t) - \underset{(2.42)}{7.32}D593_t$ $\underset{(0.61)}{-2.14}D594_t + \underset{(1.27)}{3.83}D601_t$	0.925 (20.94)	2.00	0.622

Table B–2. (continued)

Equation Number in [14]		$\hat{\rho}$	DW	R^2
(7.3)	$IMP_t = \underset{(6.83)}{0.146}GNP_t - \underset{(0.93)}{2.21}D651_t + \underset{(0.33)}{0.78}D652_t - \underset{(1.98)}{4.96}D691_t$ $+\underset{(0.77)}{2.23}D692_t - \underset{(0.13)}{0.34}D693_t - \underset{(1.88)}{4.46}D714_t + \underset{(1.29)}{3.04}D721_t$	1.0	0.55	0.989
Income Identity	$GNP_t \equiv CD_t + CN_t + CS_t + IP_t + IH_t + V_t - V_{t-1} - IMP_t + EX_t + G_t$			
	The Price Sector			
(10.5)	$GAP2_t = GNPR_t^* - GNPR_{t-1} - (GNP_t - GNP_{t-1})$			
(10.7)	$PD_t - PD_{t-1} = \underset{(2.38)}{2.20} - \underset{(1.13)}{0.0285}\left(\frac{1}{20}\sum_{i=1}^{20} GAP2_{t-i+1}\right)$	0.937 (23.14)	2.54	0.784
(10.8)	$GNPR_t = 100\,\frac{GNP_t - GG_t}{PD_t} + YG_t$			
(10.9)	$Y_t = GNPR_t - YA_t - YG_t$			
	The Employment and Labor Force Sector			
(9.2)	$M_t H_t = \frac{1}{\alpha_t}\,Y_t$			

(9.8)	$\log M_t - \log M_{t-1} = -0.416 + 0.000106_t$ (3.47) (3.31) $-0.113(\log M_{t-1} - \log M_{t-1}H_{t-1})$ (3.44) $+0.0814(\log Y_{t-1} - \log Y_{t-2})$ (1.92) $+0.288(\log Y_t - \log Y_{t-1})$ (7.89) $-0.00192D593_t - 0.000782D594_t$ (0.55) (0.23)	0.400 (3.75)	1.92	0.737
(9.10)	$D_t = -11353 - 71.1t + 0.321M_t$ (7.61) (6.10) (8.55)	0.624 (6.87)	2.04	0.930
(9.9)	$E_t = M_t + MA_t + MCG_t - D_t$			
(9.11)	$\frac{LF_{1t}}{P_{1t}} = 0.991 - 0.000349t$ (234.04) (6.64)	0.810 (11.89)	2.13	0.942
(9.12)	$\frac{LF_{2t}}{P_{2t}} = 0.233 + 0.000827t + 0.315\frac{E_t + AF_t}{P_{1t} + P_{2t}}$ (3.76) (6.48) (2.79)	0.912 (19.14)	2.11	0.987
(9.14)	$UR_t = 1 - \frac{E_t}{LF_{1t} + LF_{2t} - AF_t}$			