Chapter Nine

The Properties of the Model

9.1 INTRODUCTION

Section 9.3 contains a detailed examination of the properties of the model. The properties are examined by observing how the model responds to changes in the exogenous variables. The results in section 9.3 are useful not only in showing the quantitative properties of the model, but also in pointing out the various asymmetrical properties of the model, in pointing out the various tax leakages that occur when a government policy variable is changed, and in indicating what the consequences are of the fact that the model is closed with respect to the flows of funds. Before proceeding to the detailed examination in section 9.3, the model will be briefly reviewed in the next section.

9.2 A BRIEF REVIEW OF THE MODEL

The important variables affecting the household sector are: the various price deflators, the wage rate, nonlabor income, the marginal personal income tax rate, the bill and mortgage rates, the value of assets of the previous period, the hours constraint variable, and the loan constraint variable. Nonlabor income includes transfer payments from the government. The seven main decision variables of the household sector are: expenditures on services, nondurable goods, durable goods, and housing, the labor force participation of men 25–54 and of all persons 16 and over except men 25–54, and the percentage of people moonlighting. These latter three variables are referred to as "work effort" variables.

When prices rise relative to the wage rate, this has a negative effect on consumption and work effort. The negative effect on work effort means that a rise in prices relative to the wage rate has, other things being equal, a negative effect on the unemployment rate. The effect on the unem-

ployment rate is negative in this case because the size of the labor force has decreased. The interest rates have a negative effect on consumption and a slight positive effect on work effort. This latter effect means that a rise in the interest rates has a direct positive effect on the unemployment rate.

Raising net taxes either by increasing the marginal tax rate or by decreasing the level of transfer payments has a negative effect on consumption, the effect of the decrease in transfer payments working through the nonlabor income variable. Increasing the marginal tax rate has, however, a negative effect on work effort, while decreasing the level of transfer payments has a positive effect. Therefore, raising net taxes by increasing the marginal tax rate has a direct negative effect on the unemployment rate, whereas raising net taxes by decreasing the level of transfer payments has a direct positive effect.

The value of assets of the previous period (A_{t-1}) has a positive effect on consumption and a negative effect on work effort. Much of the variance of A_{t-1} is due to the variance of CG_{t-1}, the variable measuring capital gains or losses on corporate stocks held by the household sector. Consequently, much of the effect of A_{t-1} on the household sector is reflecting the effect of CG_{t-1}. Since A_{t-1} has a negative effect on work effort, this means that an increase in stock prices in period $t-1$ has a direct negative effect on the unemployment rate in period t.

The five main decision variables of the firm sector are its price, production, investment, employment demand, and wage rate. The important variables affecting this sector are: the price of imports, the bond rate, the investment tax credit, the level of sales, the amounts of excess labor and capital on hand, the variable measuring labor market tightness (J_t^*), the labor constraint variable, and lagged values of the price level, the wage rate, production, and the stock of inventories.

The bond rate has a contractionary effect on the firm sector. An increase in the bond rate causes the firm sector to raise its price, thus lowering sales. Lower sales lead the firm sector to decrease its production, investment, and employment demand. In a similar manner, a decrease in the investment tax credit has a contractionary effect on the firm sector, since it causes the firm sector to raise its price. The same also holds true for an increase in the price of imports.

With respect to the various stock variables in the firm sector, the stock of inventories of the previous period has a negative effect on current production; the amount of excess capital on hand at the end of the previous period has a negative effect on current investment; and the amount of excess labor on hand at the end of the previous period has a negative effect on the current number of jobs and hours paid per job.

Labor market conditions have two main effects on the firm sector. One is that J_t^* has a direct positive effect on the wage rate that the

firm sector sets. The other effect is through the labor constraint variable, ZJ_t. If the firm sector does not get in a period as much labor as it expected that it would at the wage rate that it set, then it raises its price and contracts. In this case the firm and household sectors are assumed to interact a number of times within the quarter, with the effect in the end being that the price and wage rate are raised enough so that the final employment demand from the firm sector is equal to the amount that the household sector is willing to supply. These interactions are assumed to be captured in the model through the specification of simultaneous equations.

Regarding the relationship between the price level and the wage rate, the current price level has a positive effect on the current wage rate, but not vice versa. The wage rate instead affects the price level with a lag of one quarter. As discussed in Chapter Five, the inclusion of the wage rate in the price equation is designed to pick up expectational effects, whereas the inclusion of the price level in the wage rate equation is more designed to reflect the assumption that the firm and household sectors bargain over the real wage.

The two main links between the household and firm sectors are through the price level and wage rate, and through the hours and labor constraint variables. The firm sector sets the price level and the wage rate, and the household sector responds negatively to the former and positively to the latter. The firm sector constrains the household sector through the hours constraint variable, and the household sector constrains the firm sector through the labor constraint variable. In theory, when the hours constraint is binding, the labor constraint should not be, and vice versa. This is not quite true in the empirical model, however, because of the approximations that have been used.

Since the bill rate is implicitly determined in the model, all sectors contribute to its determination. The bill rate results from equating the aggregate constrained demand for funds to the aggregate constrained supply. The effect of the financial sector on the firm and household sectors is assumed to be reflected in the loan constraint variable. The net effect of the loan constraint variable is to make the model more nonlinear in the bill rate when the loan constraint is binding than it otherwise would be.

9.3 THE RESPONSE OF THE MODEL TO CHANGES IN VARIOUS EXOGENOUS VARIABLES

The analysis in this section is based on the results of a number of experiments. Each experiment corresponds to changing the value of at least one exogenous variable. The effects of fifteen exogenous variables are examined, the variables being exports, the price of imports, and the thirteen government

variables with a † beside them in Table 7–1. Two periods were used for the experiments, a period beginning in 1969I and a period beginning in 1971I. 1969I is at or near the top of an expansion, and 1971I is at or near the bottom of a contraction.

The experiments were performed as follows. Consider the period beginning in 1969I. The model was first simulated (dynamically) beginning in 1969I for ten quarters using the actual values of the exogenous variables. The predicted values of the endogenous variables from this simulation were recorded. Other simulations were then run for the ten quarters using different values of the exogenous variables, and the predicted values of the endogenous variables from these simulations were compared to the predicted values from the base simulation. When a value of an exogenous variable was changed, it was changed for the entire ten quarters, not for just the first quarter.

Most of the experiments corresponded to changing the value of only one exogenous variable. The individual effects of fourteen of the fifteen exogenous variables were examined in this way. Both positive and negative changes were considered for the two periods, which resulted in 58 experiments. The other experiments corresponded to changing more than one exogenous variable at a time.

A Decrease in XG_{t+i} of $1.25/PG_{t+i}$ —No Change in VBG_{t+i}

It will be useful to examine the results of five experiments in detail and then to examine the other results in a more summary fashion. The results for the first experiment are presented in Table 9–1. This experiment is for the second period and corresponds to decreasing government purchases of goods by 1.25 billion dollars (5.0 billion dollars at an annual rate) in each quarter from the level that actually prevailed in that quarter. This was accomplished by decreasing XG_{t+i}, government purchases of goods in real terms in quarter $t+i$, by $1.25/PG_{t+i}$ ($i = 0, 1, \ldots, 9$), where PG_{t+i} is the actual value of the price deflator for government purchases of goods in quarter $t+i$. Since PG_{t+i} is generally rising over time, this procedure means that the changes in XG_{t+i} are generally getting smaller over time. Because PG_{t+i} is an endogenous variable, this procedure is not quite equivalent to decreasing government purchases by 1.25 billion dollars each quarter, but it is quite close. (Note that the actual values of PG_{t+i} were used for the deflation, not the predicted values.)

Results for 46 variables are presented in Table 9–1. The figure for each variable and time period in the table is the difference between the predicted value of the variable that resulted from the simulation with XG_{t+i} changed and the predicted value of the variable that resulted from the base simulation.

Consider the results for quarter t first. The fact that no variable except XG_t was changed for this experiment means that any surplus that the government ran because of the decrease in XG_t resulted in a change in either bank reserves (BR_t) or bank borrowing ($BORR_t$). The saving of the government ($SAVG_t$) increased by 0.69 billion dollars in quarter t, which took the form of a decrease in BR_t of 0.40 billion dollars and an increase in $BORR_t$ if 0.29 billion dollars. The decrease in XG_t led to a decrease in Y_t of 1.40 billion dollars (in real terms) and a decrease in GNP_t of 1.37 billion dollars (in current dollar terms). The unemployment rate increased by 0.13 percentage points.

The bill rate rose by 0.81 percentage points. Loosely speaking, the bill rate rose because of the funds taken out of economy by the increased saving of the government. The increase in the bill rate is the reason for the increase in bank borrowing. The increase in the bill rate also caused the bond rate and mortgage rate to increase. The increase in the bond rate then resulted in the price level being higher. The decrease in XG_t thus resulted in an initial increase in the price level because of the higher interest rates that the decrease caused.

Although government expenditures on goods decreased by roughly 1.25 billion dollars in quarter t, the saving of the government only increased by 0.69 billion dollars. Much of this discrepancy of 0.56 can be explained by the 0.41 billion dollar decrease in net tax collections (TAX_t) that occurred in quarter t as a result of the contraction in the economy. The 0.41 figure includes a 0.05 increase in unemployment insurance benefits (TPU_t) that resulted from the increase in unemployment. The rest of the discrepancy can be explained by the other endogenous changes in government spending that occur when the economy changes. The endogenous variables that are relevant in explaining the rest of the discrepancy are $INTG_t$, WGC_t, WGM_t, and PG_t. $INTG_t$, the interest paid by the government, for example, increased by 0.09 billion dollars as a result of the higher bill and bond rates.

The contraction of the firm sector in quarter t took the form, in addition to a higher price level and a lower level of production, of a decrease in investment (INV_t) of 0.04 billion dollars in real terms, a decrease in the number of jobs ($JOBF_t$) of 129 thousand, a decrease in the average number of hours paid per job for the quarter (HPF_t) of 0.68 hours, and a decrease in the wage rate (WF_t) of 0.013 points. The positive effect that the higher price level had on the wage rate was offset by the negative effect of fewer worker hours needed. The fact that the number of jobs and hours paid per job decreased meant that the hours constraint on the household sector became more restrictive. The hours constraint was already binding in quarter t because the quarter (1970I) is at or near the bottom of a contraction. The level of profits of the firm sector was lower by 0.31 billion dollars, and its cash flow was lower by 0.78 billion dollars.

Table 9–1. Detailed Experimental Results: A Decrease in XG_{t+i} of $1.25/PG_{t+i}$. No Change in VBG_{t+i} ($t = 1971$I [bottom of contraction])

Equation No. in Table 2–2	*Change in:*	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+6$	$t+7$	$t+8$	$t+9$
10.	Y	−1.40	−2.44	−2.75	−2.75	−2.30	−1.88	−1.63	−1.59	−1.79	−2.07
9.	PF	0.280	0.171	0.041	−0.056	−0.186	−0.295	−0.256	−0.206	−0.120	−0.114
	GNP	−1.37	−2.86	−3.57	−3.78	−3.45	−3.17	−2.84	−2.74	−2.93	−3.39
83.	$100 \cdot UR$	0.13	0.34	0.40	0.35	0.25	0.13	0.06	0.07	0.13	0.23
68.	$SAVG$	0.69	−0.25	−0.41	−0.31	−0.10	0.17	0.44	0.47	0.35	0.08
70.	$RBILL$	0.81	0.09	−0.67	−1.22	−1.21	−0.61	0.11	0.84	1.07	1.11
1.	CS	−0.16	−0.23	−0.19	−0.13	−0.06	0.02	0.00	−0.07	−0.18	−0.28
2.	CN	−0.05	−0.14	−0.17	−0.19	−0.18	−0.16	−0.15	−0.14	−0.13	−0.13
46.	CD	−0.39	−0.82	−0.68	−0.70	−0.60	−0.42	−0.37	−0.42	−0.46	−0.54
47.	IH	0.00	−0.09	−0.28	0.19	0.06	0.06	0.07	0.09	−0.03	−0.13
5.	TLF_1	−2.	−4.	−5.	−5.	−5.	−3.	−2.	1.	−1.	−1.
6.	TLF_2	−20.	−37.	−130.	−211.	−268.	−311.	−328.	−308.	−284.	261.
7.	$MOON$	−3.	−38.	−100.	−159.	−197.	−210.	−204.	187.	−167.	−152.
8.	DDH	−1.96	−2.01	−1.34	0.87	0.43	0.24	1.15	2.35	3.70	−4.35
11.	INV	−0.04	−0.18	−0.32	−0.45	−0.51	−0.49	−0.44	−0.38	−0.35	−0.36
12.	$JOBF$	−129.	−365.	−564.	663.	669.	−620.	−565.	−538.	−552.	−602.
13.	HPF	−0.68	−1.13	−1.16	−1.01	−0.67	−0.37	−0.19	−0.14	−0.20	−0.30
14.	$HPFO$	−1.10	−1.90	−2.05	−1.85	1.22	−0.69	−0.37	−0.27	−0.42	−0.63
15.	WF	−0.013	−0.072	−0.166	−0.276	−0.387	−0.492	−0.583	−0.665	−0.745	−0.834
16.	DDF	−0.24	−0.26	−0.17	−0.07	0.04	0.13	0.08	−0.03	−0.18	0.28

17.	*DIVF*	−0.01	−0.04	0.06	−0.07	−0.07	−0.08	0.09	−0.10	−0.10	−0.12
18.	*INTF*	0.08	0.05	0.02	−0.00	0.04	−0.07	−0.07	−0.08	−0.07	−0.09
19.	*IVA*	−0.46	0.15	0.20	0.13	0.18	0.14	0.10	−0.13	−0.21	−0.09
20.	*BORR*	0.29	0.04	−0.24	0.46	−0.45	−0.23	0.04	0.30	0.39	0.38
21.	*RAAA*	0.49	−0.02	−0.09	−0.09	−0.19	0.19	0.00	0.06	0.15	0.10
22.	*RMORT*	0.13	0.35	−0.04	0.06	−0.09	−0.18	−0.15	−0.02	0.04	0.11
23.	*CG*	−44.01	40.23	10.10	5.66	12.98	2.25	−16.53	−6.14	−8.76	4.34
24.	*IM*	−0.13	−0.16	−0.19	0.20	−0.21	−0.19	−0.20	−0.19	0.21	−0.22
25.	*TPU*	0.05	0.14	0.16	0.13	0.09	0.04	0.01	0.02	0.04	0.08
26.	*INTG*	0.09	0.07	0.03	−0.02	−0.06	−0.09	−0.06	0.02	0.04	0.06
45.	*BR*	0.40	−0.41	−0.27	−0.18	−0.07	0.02	−0.19	−0.40	−0.65	−0.75
48.	*X*	−1.42	−2.20	2.35	−2.35	−1.97	−1.67	−1.54	1.56	−1.78	−2.02
51.	$V - V_{-1}$	0.02	−0.24	−0.40	−0.40	−0.34	−0.20	−0.09	−0.03	−0.01	−0.05
52.	πF	−0.31	−1.45	1.58	−1.37	−1.05	−0.83	−0.34	0.12	0.05	−0.13
53.	*CF*	0.78	−0.80	−0.47	−0.13	0.28	0.28	0.32	0.35	0.37	0.38
55.	*LF*	0.39	0.48	0.30	0.10	−0.77	−1.40	1.99	−2.60	−3.21	−3.85
58	*YH*	0.43	−1.26	−1.93	−2.29	−2.38	−2.36	−2.28	−2.31	−2.51	−2.85
60.	*SAVH*	0.13	0.57	0.38	0.06	−0.44	−0.66	−0.74	−0.71	−0.52	−0.32
61.	*A*	−41.93	−1.07	8.74	13.99	26.08	27.48	11.12	5.47	−2.47	2.20
62.	*DDB*	−2.20	−2.27	1.51	−0.94	−0.38	−0.11	1.07	−2.37	−3.88	−4.63
64.	*LBVBB*	−1.50	−1.81	−1.47	−1.21	−0.76	−0.32	−0.85	−1.69	−2.86	−3.52
65.	*SAVR*	−0.20	−0.22	0.24	−0.25	−0.24	−0.22	−0.23	−0.24	−0.28	−0.32
67.	*TAX*	−0.41	−1.40	−1.66	−1.65	−1.53	−1.34	−1.06	−1.01	−1.07	−1.34
81.	*EMPL*	−126.	−327.	464.	504.	−471.	−410.	361.	−351.	−385.	−450.
82.	*U*	104.	286.	329.	288.	198.	95.	32.	42.	101.	188.
	VBG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The household sector suffered a capital loss (CG_t) of 44.01 billion dollars in quarter t as a result of the higher bond rate and lower cash flow of the firm sector. The consumption expenditures of the household sector (CS_t, CN_t, CD_t) decreased as a result of the higher price level, lower wage rate, higher interest rates, and more restrictive hours constraint. Housing investment (IH_t) did not change in quarter t because there are no contemporaneous right-hand side variables in the equation explaining housing investment. The labor force of men 25–54 (TLF_{1t}) decreased by 2 thousand, the labor force of all persons 16 and over except men 25–54 (TLF_{2t}) decreased by 20 thousand, and the number of moonlighters (MOON_t) decreased by 3 thousand. A higher mortgage rate has a positive effect on the labor force of all persons 16 and over except men 25–54, but this effect was more than offset by the various negative effects. The taxable income of the household sector (YH_t) fell by 0.43 billion dollars, but the net effect of all the factors on the household sector with respect to its saving behavior was to have the amount saved ($SAVH_t$) increase by 0.13 billion dollars.

The lower levels of consumption and plant and equipment investment meant that the level of sales (X_t) was lower. The level of sales decreased by 1.42 billion dollars in real terms. Since production fell by only 1.40 billion dollars in real terms, this means that inventory investment ($V_t - V_{t-1}$) rose by the difference (0.02 billion dollars in real terms).

Demand deposits and currency of the household sector (DDH_t) decreased by 1.96 billion dollars in quarter t, and demand deposits and currency of the firm sector (DDF_t) decreased by 0.24 billion dollars. These decreases were caused by the higher bill rate, the lower income of the household sector, and the lower sales of the firm sector. The financial sector, having fewer demand deposits, made fewer loans. $LBVBB_t$ decreased by 1.50 billion dollars. The loans of the firm sector (LF_t) actually increased by 0.39 billion dollars to finance in part its decreased cash flow. The liabilities of the foreign sector also increased since $SAVR_t$ decreased by 0.20. (From Equation 66 in Table 2–2, a decrease in $SAVR_t$ implies a decrease of the same amount in $SECR_t$, the value of "all other" securities held by the foreign sector.) This discrepancy of 2.09 ($1.50 + 0.39 + 0.20$) must, from Equation 70 in Table 2–2, be offset by the household sector. This was in fact the case since A_t decreased by 2.08 less than did CG_t. (The difference of 0.01 is due to rounding.) In other words, had it not been for capital losses, A_t would have increased by 2.08. The 2.08 figure takes the form of a 1.96 decrease in demand deposits and currency of the household sector and a 0.13 increase in the saving of the household sector. (The difference of 0.01 is due to rounding.)

The results for the other time periods in Table 9–1 are fairly self-explanatory. The bill rate began to fall in quarter $t + 2$ and the price level began to fall in quarter $t + 3$ as a result of the more sluggish economy. The government actually began to run a deficit as early as quarter $t + 1$ as

a result of the contractionary effects. There are some cycling effects evident in Table 9–1. The change in Y is at its smallest, for example, aside from in quarter t, in quarter $t + 7$, where it is -1.59. The change in the unemployment rate is 0.07 in quarter $t + 7$, and it then rises to a value of 0.23 in quarter $t + 9$.

An Increase in VBG_{t+1} of 1.25—No Change in XG_{t+1}

The results for the second experiment are presented in Table 9–2. This experiment corresponds to increasing the value of government securities outstanding (VBG) by 1.25 billion dollars in each quarter from the value that actually prevailed in that quarter.

The increase in VBG_t in quarter t caused a contraction of the economy. Y_t decreased by 0.70 billion dollars (in real terms), the unemployment rate increased by 0.07, and the bill rate increased by 1.96 percentage points. The increase in the bill rate led to an increase in the bond rate of 0.98 percentage points, which is the reason for the higher price level in quarter t. The saving of the government increased by 0.16 billion dollars. The economy absorbed the 1.25 increase in VBG_t and the 0.16 increase in the saving of the government in quarter t by a 0.71 decrease in bank reserves and a 0.70 increase in bank borrowing.

The bill rate increased more in quarter t in the second experiment than it did in the first (1.96 versus 0.81). The overall economy, however, contracted less in the second experiment than it did in the first. In the first experiment the government took funds out of the economy through the decrease in its expenditures on goods. In the second experiment the government took funds out of the economy through a direct sale of securities. There is no theoretical reason why the economy should contract less in the second case than in the first, but as an empirical proposition this is the case, at least as reflected in the coefficient estimates of the present model.

The contractionary effects in Table 9–2 are similar to the effects in Table 9–1, only smaller. The price level began to fall in quarter $t + 3$ as a result of the more sluggish economy. The wage rate increased in quarter t. In this case, unlike the case for the first experiment, the positive effect of a higher price level outweighed the negative effect of a looser labor market. The wage rate then began to fall in quarter $t + 1$. The labor force of all others 16 and over rose slightly in quarter t, contrary to the case in the first experiment. This means that the positive effect of a higher mortgage rate outweighed the negative effect of a more restrictive hours constraint.

There is also evidence of cycling in Table 9–2. The production of the firm sector is actually greater in quarters $t + 4$ through $t + 8$ than it otherwise would have been. The contraction in quarter t induced a moderate decrease in the bill rate in quarters $t + 1$ through $t + 4$, which can be considered (in a loose sense) as leading to a reversal of the contraction in quarter

Table 9–2. Detailed Experimental Results: An Increase in VBG_{t+i} of 1.25. No Change in XG_{t+i} ($t = 1971$I [bottom of contraction])

Equation No. in Table 2–2	*Change in:*	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+6$	$t+7$	$t+8$	$t+9$
10.	Y	−0.70	−1.48	−1.09	−0.59	0.18	0.52	0.55	0.37	0.06	−0.20
9.	PF	0.555	0.191	−0.004	−0.067	−0.147	−0.160	−0.069	−0.021	0.051	0.045
	GNP	0.10	−1.52	−1.50	−0.94	−0.02	0.35	0.56	0.44	0.13	−0.22
83.	$100 \cdot UR$	0.07	0.27	0.20	0.08	−0.06	−0.15	−0.17	−0.11	−0.05	0.02
68.	$SAVG$	0.16	−1.15	0.76	−0.33	0.12	0.36	0.44	0.28	0.10	−0.13
70.	$RBILL$	1.96	−0.40	−1.39	1.69	−1.09	−0.21	0.43	0.82	0.71	0.39
1.	CS	−0.31	−0.32	0.15	−0.04	0.04	0.08	0.04	−0.02	−0.09	−0.12
2.	CN	−0.04	−0.10	−0.05	0.04	−0.01	0.01	0.02	0.00	−0.01	−0.01
46.	CD	−0.41	−0.74	0.07	−0.10	0.06	0.21	0.17	0.06	−0.01	0.08
47.	IH	0.00	−0.15	−0.43	−0.11	0.30	0.16	0.14	0.12	−0.01	−0.05
5.	TLF_1	−3.	−4.	4.	−4.	−3.	−1.	0.	1.	1.	−0.
6.	TLF_2	5.	52.	−57.	−99.	−102.	−94.	−70.	−38.	−22.	−8.
7.	$MOON$	−5.	−21.	−56.	−78.	−76.	−51.	−21.	2.	10.	8.
8.	DDH	−3.43	−1.87	0.13	1.06	1.51	1.32	0.32	−0.44	−1.11	−1.12
11.	INV	−0.02	−0.10	−0.17	−0.19	−0.16	−0.05	0.02	0.08	0.08	0.04
12.	$JOBF$	−65.	207.	−282.	−246.	−127.	−10.	57.	66.	32.	−18.
13.	HPF	−0.34	−0.69	−0.44	−0.13	0.26	0.40	0.37	0.24	0.06	−0.07
14.	$HPFO$	−0.56	1.17	−0.78	−0.25	0.48	0.76	0.72	0.48	0.13	−0.14
15.	WF	0.018	−0.011	−0.057	−0.096	−0.115	−0.117	−0.104	−0.090	−0.080	−0.081
16.	DDF	−0.44	0.32	−0.08	0.08	0.18	0.21	0.11	0.02	0.08	−0.11

17.	*DIVF*	0.03	0.00	−0.01	0.01	0.03	0.03	0.04	0.03	0.03	0.03
18.	*INTF*	0.14	0.03	0.02	−0.04	−0.06	−0.06	−0.04	0.03	−0.02	−0.02
19.	*IVA*	−0.91	0.55	0.29	0.10	0.12	0.01	−0.15	−0.08	−0.12	−0.00
20.	*BORR*	0.70	−0.14	−0.50	−0.63	−0.40	−0.08	0.16	0.29	0.27	0.14
21.	*RAAA*	0.98	−0.36	−0.22	−0.11	−0.17	−0.09	0.07	0.04	0.11	0.03
22.	*RMORT*	0.26	0.62	−0.31	−0.13	−0.10	−0.15	−0.08	0.02	0.03	0.07
23.	*CG*	−78.97	105.92	−6.24	5.05	6.61	−8.85	−16.79	−1.36	6.51	6.84
24.	*IM*	−0.07	0.03	−0.04	−0.04	0.01	0.01	0.01	0.01	−0.01	−0.01
25.	*TPU*	0.03	0.12	0.08	0.03	−0.03	−0.07	−0.07	−0.05	0.02	0.01
26.	*INTG*	0.18	0.09	0.00	−0.05	−0.08	−0.07	−0.03	0.01	0.05	0.05
45.	*BR*	−0.71	−0.39	0.01	0.21	0.31	0.28	0.08	−0.07	−0.20	−0.20
48.	*X*	−0.72	−1.37	−0.83	−0.45	0.21	0.40	0.38	0.22	−0.03	−0.22
51	$V - V_{-1}$	0.01	−0.12	−0.26	−0.14	−0.03	0.12	0.17	0.15	0.09	0.01
52.	πF	1.17	−1.13	−0.81	−0.23	0.23	0.32	0.52	0.38	0.29	0.04
53.	*CF*	0.19	−0.34	0.02	0.32	0.63	0.29	0.14	0.01	−0.07	−0.05
55.	*LF*	−0.07	−0.11	−0.26	−0.51	−0.91	−1.02	−1.01	−0.92	−0.80	−0.74
58.	*YH*	0.08	−0.63	−0.88	−0.76	−0.38	−0.06	0.16	0.17	0.06	−0.14
60.	*SAVH*	0.35	1.05	0.43	−0.03	0.67	−0.52	0.35	−0.12	0.14	0.24
61.	*A*	−75.18	30.22	22.42	16.40	21.90	12.72	−3.42	−4.13	−9.84	−2.75
62.	*DDB*	−3.88	−2.19	0.05	1.14	1.69	1.52	0.44	−0.43	−1.19	−1.23
64.	*LBVBB*	−2.46	−1.91	0.44	0.32	0.99	1.17	0.53	−0.05	−0.72	−0.88
65.	*SAVR*	−0.15	−0.07	−0.06	−0.04	0.03	0.04	0.02	0.01	−0.02	−0.03
67.	*TAX*	0.45	−1.02	0.77	−0.42	−0.01	0.22	0.38	0.27	0.14	−0.08
81.	*EMPL*	−61.	−186.	−226.	−168.	52.	41.	78.	64.	22.	−26.
82.	*U*	62.	233.	165.	65.	−53.	−136.	−148.	−101.	−43.	18.
	VBG	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25

$t + 4$. By quarter $t + 9$ production was again slightly below what it otherwise would have been.

A Decrease in XG_{t+i} of $1.25/PG_{t+i}$ and a Decrease in VBG_{t+i} of 1.25

The results of the third experiment are presented in Table 9–3. This experiment is a combination of the first two, namely an experiment in which the value of the government purchases of goods is decreased by 1.25 billion dollars (in current dollars) *in combination with* a decrease in the value of government securities of 1.25 billion dollars. The government, in other words, is off-setting its initial decrease in expenditures on goods with a decrease of the same amount in its outstanding securities.

A decrease in XG has a negative effect on the economy, and a decrease in VBG has a positive effect. The net result of these two effects in Table 9–3 is negative. This is what one would expect from the results for the first two experiments, where the negative effect of a decrease in XG was greater than the negative effect of an increase in VBG. The production of the firm sector decreased in quarter t by 0.50 billion dollars (in real terms) in Table 9–3. This decrease is close to the difference between the two decreases in Tables 9–1 and 9–2 (-1.40 and -0.70). The bill rate decreased by 0.69 percentage points in quarter t in Table 9–3. This is again what one would expect from the results for the first two experiments, where the positive effect on the bill rate of a decrease in XG_t was less than the positive effect of an increase in VBG_t. Each number in Table 9–3 in fact roughly equal to the difference between the respective number in Table 9–1 and the respective number in Table 9–2. The results in Table 9–3 definitely show that the net effect of a decrease in government expenditures on goods in combination with an equal decrease in the value of securities outstanding is contractionary.

A Decrease in XG_{t+i} of $1.25/PG_{t+i}$ —VBG_{t+i} Changed so as to Keep DDB_{t+i} Unchanged

The results for the fourth experiment are presented in Table 9–4. This experiment is the same as the first experiment except that VBG_{t+i} is now adjusted each quarter so as to keep the value of demand deposits and currency of the financial sector (DDB_{t+i}) unchanged. Keeping DDB_{t+i} unchanged in this context means keeping its predicted value in quarter $t + i$ ($i = 0, 1, \ldots, 9$) equal to its predicted value in quarter $t + i$ in the base simulation. It does *not* mean, for example, keeping the predicted value of DDB_{t+i} equal to the predicted value of DDB_{t+i-1}.

The contractionary effects in Table 9–4 are less than they are in Table 9–1. By quarter $t + 9$ the production of the firm sector is virtually the same as it would have been without the changes. In order to keep DDB_{t+i}

unchanged, the government had to buy securities each quarter. By quarter $t + 9$ the value of *VBG* was 6.31 billion dollars lower than it otherwise would have been.

The values of *VBG* in quarters t and $t + 1$ are -0.62 and -1.02 billion dollars, respectively. These values are less in absolute value than the value of -1.25 used for the results in Table 9–3. Consequently, the economy contracted more in the first two quarters in Table 9–4 than it did in Table 9–3. After quarter $t + 1$, however, the economy contracted less in Table 9–4 as the government continued to decrease *VBG*. In quarter t, the decrease in government purchases of goods of 1.25 billion dollars is accounted for by a 0.60 increase in $SAVG_t$, a 0.02 decrease in $BORR_t$, and a 0.62 decrease in VBG_t. (These numbers add to 1.24 rather than to 1.25 because of rounding.) In this case BR_t did none of the adjusting because DDB_t was unchanged.

The results in Table 9–4 thus indicate that a policy of decreasing government purchases of goods while keeping the money supply (DDB) unchanged is initially contractionary. The lower interest rates that this policy induces eventually bring the economy out of the contraction, but not for the first few quarters.

A Decrease in XG_{t+i} of $1.25/PG_{t+i}$ —VBG_{t+i} Changed so as to Keep $RBILL_{t+i}$ Unchanged

The results for the fifth experiment are presented in Table 9–5. This experiment differs from the fourth experiment in that the predicted value of $RBILL_{t+i}$ rather than of DDB_{t+i} is kept unchanged from its predicted value in the base simulation ($i = 0, 1, \ldots, 9$).

The results in Table 9–5 are more contractionary than the results in Table 9–4. The decreases in *VBG* needed in Table 9–5 to keep *RBILL* unchanged are much less than the decreases needed in Table 9–4 to keep *DDB* unchanged. The bill rate is always lower in Table 9–4, and so keeping the bill rate unchanged in Table 9–5 leads to more contraction in Table 9–5 than in Table 9–4.

The results for the first five quarters are more contractionary in Table 9–1, where *VBG* was not changed, than they are in Table 9–5. This is not, however, generally the case after quarter $t + 4$. The policy in Table 9–5 does not allow any expansionary effects from a lower bill rate, whereas the policy in Table 9–1 does.

A Comparison of Results for 26 Experiments

Summary results for 26 experiments are presented in Table 9–6. Results for six variables (*Y*, *PF*, *GNP*, *UR*, *SAVG*, and *RBILL*) and three quarters (t, $t + 1$, and $t + 9$) are presented in the table for each experiment.

Table 9–3. Detailed Experimental Results: A Decrease in XG_{t+i} of $1.25/PG_{t+i}$ and a Decrease in VBG_{t+i} of 1.25. ($t = 1971$I [bottom of contraction])

Equation No. in Table 2–2	*Change in:*	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+6$	$t+7$	$t+8$	$t+9$
10.	Y	−0.50	−0.67	−1.57	−2.16	−2.70	−2.58	−2.25	−1.91	−1.73	−1.74
9.	PF	−0.419	0.021	0.049	0.046	0.003	−0.128	−0.239	−0.223	−0.198	−0.180
	GNP	−1.47	−0.91	−1.90	−2.81	−3.66	−3.73	−3.60	−3.17	−2.95	−3.03
83.	$100 \cdot UR$	0.03	0.02	0.20	0.29	0.36	0.34	0.25	0.17	0.15	0.18
68.	$SAVG$	0.49	1.22	0.36	0.00	−0.38	−0.34	−0.12	0.22	0.32	0.28
70.	$RBILL$	−0.69	1.19	1.39	1.02	−0.01	−0.58	0.54	−0.12	0.33	0.82
1.	CS	0.23	0.12	−0.04	−0.11	0.13	−0.08	−0.01	−0.01	−0.06	−0.12
2.	CN	0.00	−0.02	−0.12	−0.14	−0.17	−0.18	0.17	−0.15	−0.13	−0.12
46.	CD	0.14	0.06	−0.67	−0.55	0.73	−0.71	−0.55	−0.44	0.44	0.43
47.	IH	0.00	0.09	0.23	−0.15	−0.37	−0.12	0.90	−0.00	0.04	−0.04
5.	TLF_1	2.	1.	0.	−1.	2.	−2.	−2.	−1.	1.	0.
6.	TLF_2	−25.	−91.	−35.	81.	−140.	−201.	257.	−279.	−268.	−255.
7.	$MOON$	3.	12.	−30.	−64.	107.	−154.	−187.	−197.	183.	−161.
8.	DDH	2.44	−0.24	−1.73	2.30	−2.31	−1.66	1.09	−1.52	−2.35	−3.14
11.	INV	−0.01	−0.06	−0.11	−0.24	0.34	−0.45	−0.48	−0.48	0.43	−0.39
12.	$JOBF$	−46.	−111.	−234.	390.	−550.	−639.	650.	−612.	−573.	−561.
13.	HPF	−0.24	−0.31	−0.69	−0.90	−1.06	−0.87	−0.60	−0.34	−0.20	−0.18
14.	$HPFO$	−0.40	−0.52	−1.24	1.66	−1.91	−1.61	1.14	−0.69	−0.43	−0.38
15.	WF	−0.036	−0.054	0.095	−0.161	−0.254	−0.363	−0.474	−0.574	−0.663	0.749
16.	DDF	0.32	0.07	−0.11	−0.19	0.19	−0.10	0.01	0.01	−0.06	−0.14

17.	*DIVF*	−0.05	−0.04	−0.07	−0.11	−0.13	−0.15	−0.16	−0.16	−0.16	−0.17
18.	*INTF*	−0.09	0.05	0.05	0.05	0.03	−0.01	−0.04	−0.05	−0.06	−0.08
19.	*IVA*	0.69	−0.69	−0.05	−0.01	0.05	0.19	0.15	−0.06	−0.10	−0.09
20.	*BORR*	−0.26	0.43	0.49	0.36	−0.01	−0.21	−0.20	0.05	0.13	0.28
21.	*RAAA*	−0.65	0.63	0.10	0.07	0.01	−0.14	−0.16	0.01	0.04	0.07
22.	*RMORT*	−0.19	−0.36	0.47	0.05	0.06	−0.01	−0.12	−0.10	0.01	0.03
23.	*CG*	47.83	−102.10	41.04	3.90	7.55	18.13	5.18	−10.77	−2.56	−3.10
24.	*IM*	−0.05	−0.12	−0.13	−0.16	−0.23	−0.21	−0.21	−0.21	−0.20	−0.20
25.	*TPU*	0.01	−0.00	0.08	0.11	0.15	0.14	0.10	0.06	0.05	0.06
26.	*INTG*	−0.13	−0.02	0.03	0.05	0.04	−0.01	−0.05	−0.05	−0.03	0.00
45.	*BR*	0.50	−0.03	−0.33	−0.46	−0.46	−0.32	0.19	−0.25	−0.40	−0.53
48.	*X*	−0.51	−0.58	−1.47	−1.91	−2.39	−2.20	−1.96	−1.72	−1.64	−1.70
51.	$V - V_{-1}$	0.01	−0.09	−0.10	−0.25	−0.32	−0.37	−0.29	−0.19	−0.09	−0.04
52.	πF	−1.79	0.15	−0.77	−1.16	−1.43	−1.31	−1.06	−0.49	−0.17	−0.12
53.	*CF*	1.03	−0.35	−0.56	−0.55	−0.53	−0.02	0.16	0.39	0.49	0.43
55.	*LF*	0.49	0.61	0.59	0.48	0.29	−0.28	−0.93	−1.68	−2.47	−3.20
58.	*YH*	−0.51	−0.45	−0.92	−1.47	−2.06	−2.42	−2.57	−2.54	−2.56	−2.66
60.	*SAVH*	−0.31	−0.69	−0.03	0.17	0.49	−0.06	−0.38	−0.71	−0.79	−0.65
61.	*A*	45.08	−55.04	−12.53	−7.90	0.15	17.56	21.79	10.75	8.23	5.28
62.	*DDB*	2.76	−0.17	−1.84	−2.49	−2.50	−1.76	−1.08	−1.51	−2.41	−3.28
64.	*LBVBB*	1.99	0.28	−1.03	−1.67	−2.06	−1.66	−1.11	−1.33	−1.91	−2.51
65.	*SAVR*	−0.00	−0.16	−0.17	−0.21	−0.30	−0.26	−0.25	−0.25	−0.25	−0.28
67.	*TAX*	−0.97	−0.04	−0.86	−1.22	−1.64	−1.71	−1.58	1.27	−1.16	−1.19
81.	*EMPL*	−49.	−100.	−204.	−326.	−442.	−485.	−463.	−415.	−390.	−399.
82.	*U*	25.	9.	168.	245.	301.	282.	204.	134.	121.	145.
	VBG	−1.25	−1.25	−1.25	−1.25	−1.25	−1.25	−1.25	−1.25	−1.25	−1.25

Table 9–4. Detailed Experimental Results: A Decrease in XG_{t+i} of $1.25/PG_{t+i}$. VBG_{t+i} Changed So as to Keep DDB_{t+i} Unchanged ($t = 1971$I [bottom of contraction])

Equation No. in Table 2–2	*Change in:*	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+6$	$t+7$	$t+8$	$t+9$
10.	Y	−1.00	−1.40	−1.53	−1.51	−1.31	−1.10	−0.86	−0.56	−0.25	−0.03
9.	PF	−0.033	−0.083	−0.147	−0.213	−0.279	−0.348	−0.412	−0.469	−0.518	−0.563
	GNP	−1.41	−2.01	−2.30	−2.43	−2.33	−2.22	−2.07	−1.84	−1.58	−1.40
83.	$100 \cdot UR$	0.08	0.17	0.20	0.17	0.12	0.06	0.02	−0.02	−0.06	−0.08
68.	$SAVG$	0.60	0.36	0.30	0.34	0.43	0.54	0.67	0.83	0.98	1.10
70.	$RBILL$	−0.06	−0.16	−0.37	−0.65	−0.57	−0.34	−0.26	−0.41	−0.29	−0.42
1.	CS	0.01	0.03	0.06	0.10	0.14	0.19	0.24	0.28	0.33	0.38
2.	CN	−0.03	−0.07	−0.10	−0.10	−0.10	−0.08	−0.07	−0.05	−0.02	−0.00
46.	CD	−0.15	−0.28	−0.32	−0.30	−0.25	−0.18	−0.09	0.01	0.09	0.14
47.	IH	0.00	−0.01	0.00	0.03	0.09	0.10	0.09	0.12	0.15	0.15
5.	TLF_1	−0.	−1.	−0.	−0.	1.	2.	3.	5.	6.	7.
6.	TLF_2	−22.	−63.	−107.	−146.	−177.	−198.	−208.	−205.	−196.	−182.
7.	$MOON$	1.	25.	60.	−90.	−108.	−115.	−111.	−100.	−82.	−60.
8.	DDH	−0.01	−0.04	−0.07	−0.10	−0.14	−0.17	−0.20	−0.23	−0.25	−0.26
11.	INV	−0.03	−0.12	−0.19	−0.27	−0.29	−0.28	−0.25	−0.20	−0.15	−0.09
12.	$JOBF$	−92.	−228.	−328.	−372.	−376.	−355.	−319.	−271.	−213.	−155.
13.	HPF	−0.48	−0.64	−0.63	−0.54	−0.38	−0.22	−0.07	0.08	0.21	0.28
14.	$HPFO$	−0.79	−1.09	−1.13	−0.99	−0.69	−0.41	−0.14	0.16	0.44	0.58
15.	WF	−0.023	−0.070	−0.134	−0.205	−0.278	−0.348	−0.415	−0.475	−0.527	−0.573
16.	DDF	0.01	0.04	0.07	0.10	0.14	0.17	0.20	0.23	0.25	0.26

17.	*DIVF*	−0.03	−0.05	−0.06	−0.07	−0.08	−0.09	−0.10	−0.10	−0.10	−0.10
18.	*INTF*	0.00	−0.00	−0.01	−0.02	−0.04	−0.05	−0.07	−0.08	−0.09	−0.11
19.	*IVA*	0.06	0.08	0.11	0.10	0.10	0.11	0.10	0.09	0.08	0.09
20.	*BORR*	−0.02	−0.06	−0.13	−0.24	−0.21	−0.13	−0.10	−0.15	−0.11	−0.15
21.	*RAAA*	−0.05	−0.08	−0.12	−0.15	−0.17	−0.19	−0.20	−0.23	−0.22	−0.25
22.	*RMORT*	−0.01	−0.05	−0.08	−0.12	−0.15	−0.17	−0.19	−0.20	−0.22	−0.22
23.	*CG*	−0.92	2.63	5.34	5.77	3.84	2.11	0.76	1.48	−1.41	1.05
24.	*IM*	−0.09	−0.12	−0.13	−0.14	−0.15	−0.14	−0.14	−0.13	−0.12	−0.11
25.	*TPU*	0.03	0.07	0.07	0.06	0.04	0.02	−0.00	−0.02	−0.03	0.04
26.	*INTG*	−0.01	−0.02	−0.03	−0.05	−0.06	−0.07	−0.08	−0.08	−0.08	−0.08
45.	*BR*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48.	*X*	−1.01	−1.22	−1.30	−1.30	−1.14	−0.99	−0.80	−0.55	−0.31	−0.13
51.	$V - V_{-1}$	0.02	−0.17	−0.23	−0.22	−0.18	−0.11	−0.06	−0.00	0.06	0.10
52.	πF	−0.97	−1.12	−1.10	−1.05	−0.89	−0.80	−0.70	−0.55	−0.39	−0.33
53.	*CF*	−0.89	−0.65	−0.44	−0.28	−0.12	−0.11	−0.11	0.09	0.07	−0.13
55.	*LF*	0.43	0.56	0.50	0.31	0.03	−0.25	−0.49	−0.70	−0.87	−0.96
58.	*YH*	−0.47	−0.91	−1.25	−1.43	−1.50	−1.52	−1.50	−1.44	−1.35	−1.25
60.	*SAVH*	−0.07	−0.12	−0.24	−0.41	−0.58	−0.70	−0.80	−0.94	−1.08	−1.11
61.	*A*	−0.98	1.56	6.69	12.08	15.38	16.82	16.81	17.37	14.90	14.86
62.	*DDB*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64.	*LBVBB*	−0.02	−0.06	−0.14	−0.26	−0.23	−0.16	−0.14	−0.21	−0.18	−0.25
65.	*SAVR*	−0.11	−0.14	−0.15	−0.15	−0.16	−0.14	−0.13	−0.11	−0.08	−0.07
67.	*TAX*	−0.66	−0.93	−1.04	−1.05	−1.00	−0.92	−0.83	−0.71	−0.58	−0.50
81.	*EMPL*	−91.	−204.	−268.	−282.	−268.	−240.	−208.	−171.	−132.	−95.
82.	*U*	69.	140.	161.	136.	92.	44.	3.	30.	59.	80.
	VBG	−0.62	−1.02	−1.40	−1.85	−2.24	−2.70	−3.35	−4.23	−5.17	−6.31

Table 9–5. Detailed Experimental Results: A Decrease in XG_{t+i} of $1.25/PG_{t+i}$. VBG_{t+i} Changed So as to Keep $RBILL_{t+i}$ Unchanged ($t = 1971$I [bottom of contraction])

Equation No. in Table 2–2	*Change in:*	t	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+6$	$t+7$	$t+8$	$t+9$
10.	Y	−1.03	−1.54	−1.85	−2.07	−2.16	−2.23	−2.24	−2.14	−1.97	−1.81
9.	PF	−0.006	−0.019	−0.039	−0.061	−0.082	−0.103	−0.127	−0.155	−0.186	−0.222
	GNP	−1.41	−2.08	−2.51	−2.87	−3.08	−3.25	−3.38	−3.37	−3.29	−3.23
83.	$100 \cdot UR$	0.09	0.19	0.25	0.25	0.25	0.23	0.22	0.21	0.20	0.20
68.	$SAVG$	0.61	0.32	0.17	0.09	0.01	−0.02	−0.02	0.04	0.13	0.19
70.	$RBILL$	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.	CS	−0.00	−0.02	−0.03	−0.04	−0.06	−0.07	−0.09	−0.11	−0.13	−0.14
2.	CN	−0.03	−0.08	−0.12	−0.14	−0.15	−0.16	−0.17	−0.15	−0.13	−0.10
46.	CD	−0.18	−0.36	−0.47	−0.53	−0.58	−0.61	−0.62	−0.54	−0.45	−0.40
47.	IH	0.00	−0.02	−0.03	−0.05	−0.06	−0.06	−0.07	−0.07	−0.07	−0.07
5.	TLF_1	−1.	−1.	−2.	−2.	−2.	−2.	−2.	−2.	−2.	−1.
6.	TLF_2	−22.	−61.	−104.	−147.	−189.	−226.	−255.	−269.	−271.	−268.
7.	$MOON$	−1.	−26.	−66.	−104.	−135.	−159.	−177.	−187	−182.	−167.
8.	DDH	−0.18	−0.47	−0.82	−1.14	−1.46	−1.79	−2.11	−2.37	−2.62	−2.79
11.	INV	−0.03	−0.13	−0.21	−0.31	−0.38	−0.41	−0.44	−0.44	−0.43	−0.41
12.	$JOBF$	−95.	−245.	−373.	−461.	−526.	−574.	−609.	−625.	−621.	−605.
13.	HPF	−0.50	−0.71	−0.78	−0.78	−0.73	−0.67	−0.58	−0.45	−0.30	−0.19
14.	$HPFO$	−0.81	−1.20	−1.39	−1.43	−1.33	−1.23	−1.10	−0.90	−0.64	−0.40
15.	WF	−0.022	−0.069	−0.135	−0.214	−0.301	−0.395	−0.493	−0.591	−0.688	−0.783
16.	DDF	−0.01	−0.02	−0.04	−0.05	−0.06	−0.08	−0.09	−0.10	−0.11	−0.12

17.	*DIVF*	−0.02	−0.04	−0.06	−0.08	−0.09	−0.11	−0.12	−0.12	0.12	−0.12
18.	*INTF*	0.01	0.01	0.01	0.01	0.00	−0.01	−0.03	0.05	−0.07	0.10
19.	*IVA*	0.01	0.02	0.03	0.02	0.01	0.00	−0.01	−0.00	−0.01	−0.00
20.	*BORR*	0.00	0.00	−0.00	−0.01	−0.01	0.00	0.00	−0.01	0.00	−0.01
21.	*RAAA*	0.00	−0.00	−0.00	−0.00	−0.00	−0.01	−0.01	−0.01	−0.01	−0.01
22.	*RMORT*	0.00	−0.00	−0.00	−0.00	−0.01	0.01	−0.01	−0.01	−0.01	−0.01
23.	*CG*	−4.57	−0.17	2.37	3.73	2.98	2.14	1.69	1.71	1.60	1.08
24.	*IM*	−0.10	−0.13	−0.15	−0.16	−0.20	0.20	−0.21	−0.21	−0.20	−0.20
25.	*TPU*	0.03	0.07	0.09	0.10	0.09	0.09	0.08	0.08	0.07	0.07
26.	*INTG*	−0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.	*BR*	−0.03	−0.09	−0.15	−0.22	0.28	−0.34	−0.39	−0.42	−0.46	−0.47
48.	*X*	−1.05	−1.36	−1.60	−1.80	−1.90	−1.99	−2.03	−1.96	−1.84	−1.73
51.	$V - V_{-1}$	0.02	−0.18	−0.25	−0.27	0.26	−0.24	−0.21	0.18	−0.13	−0.08
52.	πF	−0.91	−1.06	1.06	−1.06	−0.97	−0.89	0.78	−0.61	0.36	−0.23
53.	*CF*	0.88	−0.65	−0.44	−0.28	0.11	−0.00	0.11	0.27	0.45	0.51
55.	*LF*	0.43	0.55	0.45	0.20	−0.20	−0.68	−1.24	−1.89	−2.62	−3.35
58.	*YH*	−0.47	−0.94	−1.35	−1.67	−1.93	−2.17	−2.38	−2.55	−2.70	−2.78
60.	*SAVH*	−0.05	−0.04	−0.07	−0.12	−0.14	−0.19	−0.26	−0.41	−0.58	−0.64
61.	*A*	−4.44	−4.35	−1.70	2.24	5.39	7.67	9.42	10.97	12.24	12.85
62.	*DDB*	−0.19	−0.50	−0.86	−1.19	−1.52	−1.87	−2.21	−2.47	−2.73	−2.91
64.	*LBVBB*	−0.15	−0.41	−0.71	−0.98	−1.25	−1.53	−1.82	−2.08	−2.29	−2.47
65.	*SAVR*	−0.12	−0.15	−0.18	−0.20	−0.25	−0.26	−0.27	−0.26	−0.26	−0.27
67.	*TAX*	−0.64	−0.94	−1.11	−1.22	−1.32	−1.38	−1.40	−1.38	−1.33	−1.30
81.	*EMPL*	−95.	−219.	−308.	−357.	−391.	−415.	−432.	−438.	−439.	−438.
82.	*U*	72.	157.	202.	208.	200.	186.	174.	167.	166.	168.
	VBG	−0.58	−0.84	−0.95	−0.97	−0.92	−0.83	−0.76	−0.79	−0.87	−1.06

Table 9–6. Summary Results for 26 Experiments

A: $t = 1971$I (bottom of contraction)
B: $t = 1969$I (top of expansion)

	ΔY			$100 \cdot \Delta PF$			ΔGNP		
	t	$t+1$	$t+9$	t	$t+1$	$t+9$	t	$t+1$	$t+9$
1. A. *XG*: −1.25/*PG*	−1.40	−2.44	−2.07	0.280	0.171	−0.114	−1.37	−2.86	−3.39
2. B. *XG*: −1.25/*PG*	−1.20	−1.98	−1.98	0.119	0.103	−0.373	−1.26	−2.25	−3.45
3. A. *XG*: +1.25/*PG*	1.47	2.49	2.03	−0.348	−0.155	0.080	1.33	2.96	3.29
4. B. *XG*: +1.25/*PG*	1.23	1.89	2.17	−0.148	0.014	0.329	1.24	2.34	3.64
5. A. *VBG*: +1.25	−0.70	−1.48	−0.20	0.555	0.191	0.045	0.10	−1.52	−0.22
6. B. *VBG*: +1.25	−0.33	−1.10	−0.09	0.275	0.183	0.020	0.09	−1.04	−0.11
7. A. *VBG*: −1.25	1.07	1.98	0.36	−0.834	−0.118	−0.084	−0.14	2.27	0.38
8. B. *VBG*: −1.25	0.51	1.15	0.16	−0.432	−0.158	−0.043	−0.17	1.10	0.16
9. A. 1. and 7.	−0.50	−0.67	−1.73	−0.421	0.022	−0.181	−1.47	−0.91	−3.02
10. A. 1. with *DDB* unchanged	−1.00	−1.40	−0.02	−0.033	−0.083	−0.566	1.41	−2.01	−1.40
11. A. 1. with *BR-BORR* unchanged	−1.01	−1.45	−0.49	−0.023	−0.059	−0.483	−1.41	−2.04	−1.90
12. A. 1. with *RBILL* unchanged	−1.03	−1.54	−1.81	−0.006	−0.019	−0.222	−1.41	−2.08	−3.24
13. A. 3. and 5.	0.61	0.88	1.83	0.331	−0.039	0.130	1.46	1.14	3.07
14. A. d_3: +1.25/*YH*	−0.70	−2.15	−1.99	0.552	0.679	0.234	0.10	−1.49	−2.51
15. A. *YG*: −1.25	−0.88	−2.44	−1.78	0.496	0.497	−0.135	−0.21	−2.17	−2.97
16. A. d_4: +1.25/*a*	−1.08	−2.42	−1.94	0.423	0.405	−0.112	0.68	−1.05	−1.89
17. A. d_1: +1.25/πF	−0.64	−1.93	−1.83	0.494	0.617	0.267	0.08	−1.33	−2.22
18. A. 17. and *DTAXCR*: −1.0	−0.80	−2.46	−2.63	0.716	0.971	0.806	0.27	−1.34	−2.21
19. A. *DEP*: −1.25	−0.36	−1.04	−0.92	0.288	0.324	0.234	0.06	−0.72	−0.91
20. A. *CURR*: +1.25	−0.60	−1.24	−0.19	0.471	0.148	0.040	0.08	−1.29	−0.22
21. A. *RD*: +2.0	−0.43	−0.88	−0.10	0.341	0.098	0.018	0.06	−0.93	−0.12
22. A. *EX*: −1.25/*PEX*	−0.63	−0.17	0.00	−0.409	−0.525	0.516	−1.44	−1.08	0.92
23. A. *PIM*: +1.0%	−0.15	−0.36	−0.40	0.133	0.181	0.309	0.08	−0.08	0.13
24. A. *JOBGC*: −1.25/*b*	−0.28	−0.87	−1.02	0.243	0.286	0.130	−1.18	−1.83	−2.52
25. A. d_5: +1.25/*c*	−0.42	−1.21	−1.03	0.323	0.362	0.147	0.05	−0.87	−1.26
26. A. d_6: +1.25/*c*	−0.88	−2.41	−1.76	0.493	0.490	−0.127	−0.20	−2.15	−2.92

Notes: $a = PCD \cdot CD + PCN \cdot CN + PCS \cdot CS - 1.25$

$b = WGC \cdot HPGC$

$c = WFF/(HPFN + 1.5HPFO \cdot YOPF$

A: t = 1971I (bottom of contraction)
B: t = 1969I (top of expansion)

	$100 \cdot \Delta UR$			$\Delta SAVG$			$\Delta RBILL$		
	t	$t+1$	$t+9$	t	$t+1$	$t+9$	t	$t+1$	$t+9$
1. A. XG: $-1.25/PG$	0.13	0.34	0.23	0.69	−0.25	0.08	0.81	0.09	1.11
2. B. XG: $-1.25/PG$	0.13	0.37	0.12	0.71	0.12	0.27	1.60	1.49	0.13
3. A. XG: $+1.25/PG$	−0.13	−0.37	−0.29	−0.72	0.35	−0.08	−0.61	0.09	−0.83
4. B. XG: $+1.25/PG$	−0.14	−0.38	−0.27	−0.73	0.01	−0.08	−1.48	−1.05	0.28
5. A. VBG: $+1.25$	0.07	0.27	0.02	0.16	−1.15	−0.13	1.96	−0.40	0.39
6. B. VBG: $+1.25$	0.04	0.22	0.02	0.08	−0.71	−0.06	3.24	0.84	0.15
7. A. VBG: -1.25	−0.11	−0.37	−0.06	−0.26	1.73	0.21	−1.06	1.65	−0.18
8. B. VBG: -1.25	−0.07	−0.27	−0.04	−0.17	0.88	0.07	−2.79	−0.30	−0.01
9. A. 1. and 7.	0.03	0.02	0.18	0.49	1.23	0.29	−0.69	1.20	0.83
10. A. 1. with DDB unchanged	0.08	0.17	−0.08	0.60	0.36	1.10	−0.06	−0.16	−0.44
11. A. 1. with BR-$BORR$ unchanged	0.08	0.18	−0.01	0.61	0.35	0.88	−0.04	−0.10	−0.33
12. A. 1. with $RBILL$ unchanged	0.09	0.19	0.20	0.61	0.32	0.19	0.00	0.00	0.00
13. A. 3. and 5.	−0.04	−0.05	−0.27	−0.52	−1.05	−0.21	0.95	0.70	0.56
14. A. d_3: $+1.25/YH$	0.07	0.33	0.14	1.40	0.20	0.27	1.95	1.65	1.86
15. A. YG: -1.25	0.09	0.37	0.20	1.24	−0.12	0.16	1.68	0.89	1.65
16. A. d_4: $+1.25/a$	0.09	0.31	0.10	1.04	−0.12	0.15	1.35	0.66	1.27
17. A. d_1: $+1.25/\pi F$	0.07	0.31	0.25	1.23	0.23	0.26	1.66	1.49	1.85
18. A. 17. and $DTAXCR$: -1.0	0.08	0.38	0.28	1.46	0.24	0.27	2.05	1.80	2.26
19. A. DEP: -1.25	0.04	0.17	0.14	0.66	0.04	0.10	0.82	0.62	0.78
20. A. $CURR$: $+1.25$	0.06	0.23	0.02	0.14	−0.97	−0.11	1.55	−0.38	0.32
21. A. RD: $+2.0$	0.05	0.16	0.01	0.10	−0.71	−0.06	1.01	−0.31	0.18
22. A. EX: $-1.25/PEX$	0.04	0.03	−0.02	−0.74	−0.22	−0.13	−0.68	−0.77	−0.34
23. A. PIM: $+1.0\%$	0.01	0.04	−0.01	0.09	−0.05	0.05	0.09	−0.02	0.12
24. A. $JOBGC$: $-1.25/b$	0.78	0.88	0.79	0.74	0.22	0.11	0.81	0.79	0.70
25. A. d_5: $+1.25/c$	0.04	0.20	0.15	0.76	0.05	0.14	0.94	0.70	0.88
26. A. d_6: $+1.25/c$	0.09	0.36	0.20	1.23	−0.13	0.15	1.66	0.86	1.66

Notes: $a = PCD \cdot CD + PCN \cdot CN + PCS \cdot CS - 1.25$
$b = WGC \cdot HPGC$
$c = WFF \cdot (HPFN + 1.5HPFO) \cdot JOBF$

The first four experiments are designed to explore possible asymmetrical effects between positive and negative changes in government spending and between changes in government spending during contractions and expansions. The first experiment is the same one analyzed in Table 9–1. The second experiment is the same as the first except that it is for the period beginning in 1969I (the top of an expansion). The third experiment is the same as the first, and the fourth experiment is the same as the second, except that government spending was increased rather than decreased for the third and fourth experiments.

The next four experiments in Table 9–6 are designed to explore the same asymmetrical effects for changes in government securities outstanding. The fifth experiment is the same one analyzed in Table 9–2. The sixth experiment is the same as the fifth except that it is for the period beginning in 1969I. The seventh is the same as the fifth, and the eighth is the same as the sixth, except that the value of securities was decreased rather than increased for the seventh and eighth experiments.

Comparing the first and second experiments in Table 9–6, it can be seen that the bill rate rose much more in the first two quarters in the second experiment. Similarly, the bill rate rose much more in the first two quarters in the sixth experiment than it did in the fifth. These results say that taking funds out of the economy at the top of an expansion leads to a larger increase in the bill rate than is the case when funds are taken out at the bottom of a contraction. The contraction in production in the first two quarters is greater for the experiments done at the bottom of the contraction (1 versus 2 and 5 versus 6).

The price level increased more in the first quarter and had then decreased less by quarter $t + 9$ for the experiments done at the bottom of the contraction. The reason for this is that at the top of an expansion the labor constraint is binding on the firm sector. When the economy contracts, the labor constraint becomes less binding, which has a negative effect on the price that the firm sector sets. There is no similar effect at the bottom of a contraction because the labor constraint is not binding (or, given the approximation used, at least not binding very much). The negative effect on the price level of the government contracting the economy is thus greater at the top of an expansion than it is at the bottom of a contraction.

Comparing experiments 3 with 4 and 7 with 8 leads to similar conclusions about asymmetries than the ones just made for experiments 1, 2, 5, and 6. Putting funds into the economy at the top of an expansion (experiments 4 and 8) leads to a larger drop in the bill rate than is the case when funds are put in at the bottom of a contraction (experiments 3 and 7). The expansion in production for the first two quarters is greater for the changes made at the bottom of the contraction, and, for experiments 3 versus 4, the price level falls less initially and then rises more for the changes made at the top of the expansion.

The main asymmetries regarding positive and negative changes in the government's actions occur with respect to the effects on the bill rate. Consider experiments 5 and 7. The increase of 1.25 in *VBG* resulted in an increase in the bill rate in quarter *t* of 1.96 percentage points, whereas the decrease of 1.25 in *VBG* resulted in a decrease in the bill rate of only 1.06 percentage points. (For experiments 6 versus 8, the increase was 3.24 and the decrease was 2.79.) For experiments 1 and 3, the decrease in *XG* resulted in an increase in the bill rate in quarter *t* of 0.81 percentage points, whereas the increase in *XG* resulted in a decrease in the bill rate of 0.61 percentage points. (For experiments 2 versus 4, the increase was 1.60 and the decrease was 1.48.) In other words, the initial increase in the bill rate that results from a contractionary government action is somewhat larger in absolute value than the initial decrease in the bill rate that results from the opposite expansionary action. This phenomenon is more apparent for changes in *VBG* than for changes in *XG*.

Other asymmetries regarding positive and negative changes in the government's actions are quite small. One of the larger asymmetries occurs for changes in *VBG*, where the initial increase in production from a decrease in *VBG* is greater in absolute value than the initial decrease in production from an increase in *VBG*.

The asymmetries that have just been described were also evident for the other government actions considered here. Because of this, the remaining experiments presented in Table 9–6 are only for contractionary government actions (with the exception of experiment 13) and are only for the period beginning at the bottom of the contraction.

Experiments 9, 10, and 12 in Table 9–6 are the same ones analyzed in Tables 9–3, 9–4, and 9–5, respectively. Experiment 13 is the same as experiment 9 except that *XG* and *VBG* were increased rather than decreased. Experiment 13 corresponds to the government's increasing expenditures and financing the initial increase by issuing securities. This action resulted in an expansion of the economy, just as the reverse of this action in experiment 9 resulted in a contraction.

Experiment 11 is the same as experiment 10 except that the level of nonborrowed reserves ($BR - BORR$) is kept unchanged rather than the level of demand deposits and currency of the financial sector (DDB). The results for experiments 10 and 11 are quite similar, although keeping $BR - BORR$ unchanged in experiment 11 is slightly more contractionary than is keeping DDB unchanged in experiment 10.

Although the differences between experiments 10 and 11 are quite small, it is instructive to examine why experiment 11 is slightly more contractionary than is experiment 10. The reason for this has to do with the positive effect of the bill rate on *BORR*. The detailed results for experiment 10 are presented in Table 9–4. It can be seen from this table that keeping

DDB unchanged required a decrease in *VBG*. In this experiment *BR* was unchanged because *DDB* was unchanged, but *BORR* decreased because of the lower bill rate. Now, in experiment 11, where $BR - BORR$ was kept unchanged, the decrease in *VBG* had to be larger than in experiment 10 to allow the bill rate to rise enough (relative to the rate in experiment 10) to nullify the decrease in *BORR* in experiment 10. (A decrease in *VBG* has, other things being equal, a positive effect on the bill rate.) Consequently, experiment 11 is slightly more contractionary than is experiment 10 because of the slightly higher bill rate in experiment 11 than in experiment 10.

Experiments 14 and 15 compare the effects of increasing taxes by increasing the personal tax rate (d_3) to the effects of increasing taxes by decreasing the level of transfer payments (*YG*). *YG* was decreased (permanently) by 1.25 billion dollars in experiment 15, and d_3 was increased for each period in experiment 14 by enough to correspond, other things being equal, to an increase in taxes of roughly 1.25 billion dollars. For each quarter t, d_{3t} was increased by $1.25/YH_t$, where YH_t is the actual value of taxable income that existed in quarter t. Both tax changes in experiments 14 and 15 had similar effects on the economy, even for quarter t. This may seem surprising at first because no constraints were placed on d_3 and *YG* in the estimation work for them to have similar effects. The effects of *YG* are captured through the nonlabor income variable, and the effects of d_3 are captured through a four quarter average of the marginal tax rate lagged one quarter. Nothing like disposable personal income, for example, is used in the consumption equations, which would have constrained the tax effects to be similar.

The reason for the similar effects is, of course, that both actions involve the government's attempt to take 1.25 billion dollars in funds out of the economy. Notice that for the first quarter the decrease in production that occurred in each experiment is virtually the same as the decrease that occurred in experiment 5, where the government took funds out of the economy by selling securities.

The main difference between experiments 14 and 15 is that the decrease in *YG* in experiment 15 resulted in a larger increase in the unemployment rate. In quarter $t + 9$ the unemployment rate was 0.20 larger in experiment 15, but only 0.14 larger in experiment 14. This is true even though production in quarter $t + 9$ is slightly larger in experiment 15 than it is in experiment 14. The reason for this result is, as explained in the previous section, that a decrease in *YG* has a positive effect on the labor force, whereas an increase in d_3 has a negative effect.

The level of saving of the government in quarter t ($SAVG_t$) is greater in experiments 14 and 15 than it is in experiment 1. The reason for this is that there is less tax leakage in experiments 14 and 15 than there is in experiment 1. The tax leakage is less in part because corporate profits are

not affected as much in experiments 14 and 15 as they are in experiment 1. The decrease in XG in experiment 1 leads to a larger drop in sales and production of the firm sector than does the increase in d_3 and the decrease in YG in experiments 14 and 15. The larger decrease in production in experiment 1 means a larger decrease in the profits of the firm sector, which in turn means a larger decrease in taxes paid by the firm sector. The tax leakage is also, of course, less in experiments 14 and 15 because of the direct changes in d_3 and YG. The larger values of $SAVG_t$ in experiments 14 and 15 compared to the value in experiment 1 result in the bill rate in quarter t being higher in experiments 14 and 15 than in experiment 1 (an increase in $RBILL_t$ of 1.95 and 1.68 in experiments 14 and 15, respectively, compared to an increase of 0.81 in experiment 1).

Although the bill rate is higher in quarter t in experiments 14 and 15 than it is in experiment 1, the decreases in production and GNP are less. An increase in taxes is thus less contractionary in the short run than is an equal decrease in expenditures on goods of the government. The latter policy has a direct effect on the sales of the firm sector, whereas the former policy does not, and the net result of this effect and others in the model is to lead to an increase in taxes being less contractionary in the short run than is an equal decrease in expenditures on goods.

In experiment 16 the indirect business tax rate (d_4) was increased each quarter to correspond to an increase in indirect business taxes, other things being equal, of roughly 1.25 billion dollars. A similar procedure was followed in experiment 17 for the profit tax rate. Both experiments had a contractionary effect on the economy. The contractionary effect was somewhat larger for the increase in the indirect business tax rate because it has a direct negative effect on consumption (through the price deflators). The indirect business tax rate also has a negative effect on the labor force (again through the price deflators), which is the reason for the smaller increase in the unemployment rate in quarter $t + 9$ in experiment 16 even though production in quarter $t + 9$ is lower.

Experiment 18 is the same as experiment 17 except that the investment tax credit variable ($DTAXCR$) was decreased by 1.0. A decrease in $DTAXCR$ of 1.0 corresponds roughly to an increase in profit taxes of 1.25 billion dollars. Experiment 18 thus assumes that the increase in d_1, the effective profit tax rate, results from a decrease in the investment tax credit. Experiment 18 is more contractionary than is experiment 17. This is because a decrease in $DTAXCR$ has a positive effect on the price set by the firm sector. A higher price level has, other things being equal, a contractionary effect on the economy because, among other things, of the negative reaction of the household sector to higher prices.

In experiment 19 the depreciation of the firm sector (DEP) was decreased by 1.25 billion dollars each quarter. This experiment corresponds

to the case in which the government changes the depreciation laws so as to lead to 1.25 billion dollars less depreciation being taken each quarter by the firm sector than would otherwise be the case. The effects of this change are contractionary and are about half of the size of the contractionary effects in experiment 17. In experiment 17 the government's policy is to increase corporate taxes by 1.25 billion dollars. In experiment 19 the government's policy is to decrease depreciation by 1.25 billion dollars. With a profit tax rate of about 50 percent, a decrease in depreciation of 1.25 billion dollars corresponds to an increase in taxes by about half of this amount. Therefore, one would expect the contractionary effects in experiment 19 to be about half the size of the contractionary effects in experiment 17, which is the case.

In experiment 20 the *CURR* variable was increased by 1.25 billion dollars each quarter. *CURR* is the value of currency outstanding less the value of demand deposits of the government sector. Demand deposits and currency are aggregated together in the model, so that, for example, *DDH* and *DDF* include the currency holdings of the household and firm sectors. An increase in *CURR* corresponds to either a switch out of demand deposits into currency or a decrease in the value of demand deposits of the government sector. From Equation 69 in Table 2–2 it can be seen that an increase in *CURR* must result in either an increase in bank borrowing, a decrease in bank reserves, or a decrease in the saving of the government. The increase in *CURR* had a contractionary effect on the economy. The contraction was not, however, quite as severe as the contraction that resulted in experiment 5 from an increase in *VBG* of 1.25 billion dollars. This is because an increase in *CURR*, other things being equal, results in a decrease by the same amount in the value of demand deposits of the financial sector (see Equation 62 in Table 2–2). A decrease in the demand deposits of the financial sector means that required reserves are less. An increase in *CURR* thus takes fewer funds out of the system, other things being equal, than does an equivalent increase in *VBG*, which explains the less contractionary effects in experiment 20.

Increases in the reserve requirement ratio, g_1, and the gold and foreign exchange holdings of the government sector, *GFXG*, have the same effect as an equal increase in *VBG*, and so there is no need to examine the effects of these variables separately. In experiment 21 the discount rate was increased (permanently) by 2.0 percentage points. This action had a contractionary effect on the economy. The bill rate rose in quarter t by 1.01 percentage points. Although not shown in the table, bank borrowing decreased by 0.34 billion dollars in quarter t.

In experiment 22 the value of exports in real terms (*EX*) was decreased each quarter by an amount that corresponded to a decrease in the current dollar value of exports of roughly 1.25 billion dollars. The contraction that this action had on the economy was much less than the contraction

in experiment 1 that resulted from the same dollar value decrease in government purchases of goods. The bill rate actually decreased by 0.68 percentage points in quarter t in experiment 22, whereas it rose by 0.81 percentage points in quarter t in experiment 1. The reason for the smaller contraction in experiment 22 is the following.

From Equation 65 in Table 2–2 it can be seen that a decrease in exports causes, other things being equal, an increase in the saving of the foreign sector. Since the demand deposits of the foreign sector (DDR) and the gold and foreign exchange holdings of the government sector ($GFXG$) are exogenous, an increase in the saving of the foreign sector must result, from Equation 66 in Table 2–2, in an equal increase in the value of securities held by the foreign sector ($SECR$). Consequently, a decrease in exports results in there being more loanable funds in the system than otherwise, which leads to a decrease in the bill rate and smaller contractionary effects. The results in experiment 22 are actually fairly close, at least for quarter t, to the results in experiment 9, where the value of government purchases of goods was decreased in conjunction with an equal decrease in the value of government securities outstanding.

In experiment 23 the price of imports was increased by 1.0 percent. This led to a higher price level being set by the firm sector and to slight contractionary effects overall. The decrease in production of the firm sector in quarter $t + 9$ is 0.40 billion dollars, which is about 0.21 percent of the level of production. The increase in the price set by the firm sector in quarter $t + 9$ is 0.309, which is about 0.24 percent of the price level.

In experiment 24 the number of civilian jobs in the government sector was decreased by an amount that corresponded to a decrease in government expenditures on labor of roughly 1.25 billion dollars. This resulted, as expected, in a contraction in the economy. The negative effect on the production of the firm sector was less than in experiment 1 (remember that Y is production of the firm sector, not real GNP) but the effect on the unemployment rate was greater. The effect on the unemployment rate is less in experiment 1 because the firm sector cushions some of the negative effect of lower sales on jobs. When the sales of the firm sector decrease, the firm sector cushions some of the effect on production by letting inventories increase. It then cushions some of the effect of lower production on jobs by decreasing hours paid per job and by holding more excess labor. In experiment 24 there are no leakages into inventories, hours paid per job, or excess labor, and so the effect on the unemployment rate is greater. The leakages wear off after a while, other things being equal, but the effects for the first few quarters are quite pronounced.

The level of saving of the government ($SAVG$) is greater in experiment 24 than it is in experiment 1 for all the quarters. The higher level of saving in experiment 24 leads to a higher bill rate in quarter $t + 1$ (and a few

quarters after that), which in turn leads to a high price level for quarters $t + 1$ and beyond. The price level had in fact not yet begun to fall by quarter $t + 9$ in experiment 24. The fewer jobs in the economy had no effect on the price level through the labor constraint variable because the labor constraint was not binding on the firm sector in quarter t.

SAVG is greater in experiment 24 because the tax leakage is less. The tax leakage is less because corporate profits are not affected as much in experiment 24 as they are in experiment 1. The decrease in *XG* in experiment 1 leads to a larger drop in sales and production of the firm sector than does the decrease in *JOBGC* in experiment 24. The larger decrease in profits of the firm sector in experiment 1 means a larger decrease in taxes paid by the firm sector. This larger decrease in profit taxes in experiment 1 is somewhat offset in experiment 24 by a larger decrease in personal income taxes due to the larger decrease in employment. This offset is not complete, however, because the marginal personal income tax rate is less than the profit tax rate. Consequently, there is less tax leakage in experiment 24 and thus a higher level of saving of the government. The government takes more money out of the system in experiment 24 than it does in experiment 1.

In experiment 25 the employer social security tax rate (d_5) was increased each quarter to correspond to an increase in employer social security taxes, other things being equal, of roughly 1.25 billion dollars. A similar procedure was followed in experiment 26 for the employee social security tax rate (d_6). Both experiments had contractionary effects on the economy. The effects of increasing d_5 are about half the size of the effects of increasing d_6. Employer social security taxes are deducted from corporate profits (Equation 52 in Table 2–2), whereas employee social security taxes are not tax deductable, and so with a corporate tax rate of about 50 percent, an increase in d_5 takes out of the system only about half as much money as does an equal increase in d_6.

This completes the discussion of the experiments. As mentioned in section 9.1, the experiments are useful in pointing out the various asymmetries in the model, the various tax leakages that occur when a policy is changed, and the consequences of the fact that the model is closed with respect to the flows of funds. The experiments that were designed to explore possible asymmetries in the model do show that the quantitative impact of a government policy action is different depending on what the state of the economy is at the time that the action is taken. Many of the experimental results also show the importance of knowing how a change in government expenditures is financed.

A decrease in *XG*, for example, with no change in *VBG*, has a contractionary effect on the economy, while a decrease in *VBG*, with no change in *XG*, has an expansionary effect. The net result of a decrease in both *XG* and *VBG* thus depends on the size of the two decreases. An equal

initial decrease in both variables is contractionary in the model. A decrease in *XG* matched by a sufficient decrease in *VBG* to keep the money supply (*DDB*) unchanged is also contractionary for the first few quarters. Another result of interest along this line is that a decrease in *XG*, with no change in *VBG*, is more contractionary than is an equal decrease in exports. A decrease in exports, with no other changes in the exogenous variables, results in there being more loanable funds in the system than otherwise, which by itself is expansionary.

Regarding tax policy versus expenditure policy, the quantitative properties of the model are such that a decrease in government expenditures is more contractionary in the short run than is an equal increase in taxes. Also, an increase in net taxes through an increase in the personal income tax rate (d_3) has a less contractionary effect on the unemployment rate than does an equal increase in net taxes through a decrease in the level of transfer payments (*YG*) because of the opposite effects that these two variables have on the labor force. Regarding government expenditures on goods versus government expenditures on labor, the former has less of an effect on aggregate employment in the short run because of the cushion that the firm sector provides in the short run between changes in sales and changes in jobs.

The results in Tables 9–1 through 9–5 definitely show that the model cycles somewhat after a shock is inflicted upon it. Speaking loosely, the bill rate is one of the main factors that dampens contractionary and expansionary effects. It should be noted that none of the cycling effects in Tables 9–1 through 9–5 are due to stochastic shocks. As explained in Chapter Three, all the simulations performed in this study were based on the procedure of setting all error terms in the model equal to zero.

The experimental results in this section are quite consistent with the results of analyzing the properties of the theoretical model in Chapter Six of Volume I. The same conclusions about the effects of changing *XG*, *VBG* (*VBILLG* in the theoretical model), d_3, *XG*, and *JOBGC* (*HPG* in the theoretical model) are reached here, for example, as were reached from examining the results in Table 6–6 in Volume I. In some cases the timing of the effects is somewhat different in the two models because of the recursive nature of the theoretical model, but the results by period $t + 2$ in the theoretical model are quite consistent with the results here. A detailed comparison of the results in Table 6–6 in Volume I with the results in Tables 9–1 through 9–6 here is left as an exercise for the reader.

Before concluding this section, mention should be made of a few experiments of a long run nature that were performed to see how the model behaved when simulated for a long time. These experiments were as follows. A dynamic simulation for the 1954I–1974II period (82 quarters) was first run, using the actual values of the exogenous variables. Then a second simulation was run that differed from the first only in that the value of one

exogenous variable was changed in 1954I, the first quarter of the period. The values of this exogenous variable for the other quarters were left unchanged from their historical values. The predictions of the endogenous variables from these two simulations were then compared to see how much the one period shock changed the predictions after a number of quarters had elapsed.

The differences were small for these experiments after the first few quarters, but there was no evidence from any of the experiments that the differences were converging to any particular number for each variable by the end of 82 quarters. The model is not stable in the sense of returning exactly to the original solution path after a one-period shock has been inflicted on it. There is, of course, no reason in the present context to expect the model to be stable in this sense, since no long run constraints of this nature were imposed on the model.

9.4 THE PROPERTIES OF THE MODEL THAT RELATE TO FIVE ISSUES IN MACROECONOMICS

At the end of section 1.1 the properties of the model that relate to five issues in macroeconomics were discussed. These five issues are: (1) the relationship between the unemployment rate and the rate of inflation, (2) the relationship between aggregate demand and the rate of inflation, (3) the relationship between real output and the unemployment rate, (4) the relationship between aggregate demand and the money supply, and (5) the effectiveness of monetary policy and fiscal policy. The discussion in section 1.1 will not be repeated here, but a few further comments on these issues will be made.

Each of the first four issues concerns the relationship between two endogenous variables in the model. For any moderate to large scale model, one would not expect to be able to pick two endogenous variables from the model at random and have the relationship between the two variables be stable over time. One would not expect a plot of one variable against the other to show the points lying on some simple curve. The first four issues concern particular pairs of endogenous variables, and so the question is whether these pairs are in some way special and reveal, contrary to what one would expect in general, stable relationships.

It should be clear from the results in this chapter and from previous discussion of the model that there is no reason to expect stable relationships to exist between any of the above pairs of variables. See in particular the discussion at the end of section 1.1 of the many diverse factors that affect each of the variables. There are important questions in any model regarding stable relationships, but these are questions that concern the stability of the relationships specified in the stochastic equations, not ques-

tions regarding the stability of particular pairs of variables (unless, of course, a stochastic equation has only one right-hand side explanatory variable).

It seems to me that too much of the discussion and work in macroeconomics has focused on the relationships between particular pairs of endogenous variables and that macroeconomics would be better served if more realization were given to the fact that the economy is not likely to be structured in such a way as to lead to stable relationships between very many pairs of endogenous variables.

Regarding the issue of the effectiveness of monetary policy and fiscal policy, it is clear from the results in this chapter that both XG (and other fiscal policy variables) and VBG have important effects. It is also true, of course, that one policy variable can be used to offset the effects of the other. Given the ability of the Federal Reserve to act more quickly than the Administration and the Congress in the United States, this means that the Federal Reserve through its control of VBG can offset the effects of changes in XG that the Administration and the Congress bring about.

Assume, for example, in the context of the present model, that the Federal Reserve desires to achieve a given value of Y in quarter t, and assume also that the model is deterministic. Then given XG_t and the other exogenous variables in the model except VBG_t, one can consider the 83 equation model to be a model in which VBG_t is endogenous and Y_t is exogenous. Taking the value of Y_t to be the target value, one can then solve the model for VBG_t and the other 82 endogenous variables (providing that the model can be solved for the particular value of Y_t chosen). The solution value of VBG_t is the value that achieves the target. In this deterministic context it is thus possible for the Federal Reserve to achieve any level of Y that results in a solution of the model. The solution may, of course, correspond to a very high or a very low value of the bill rate, and the Federal Reserve must be willing to accept any value of the bill rate, however extreme, if it is to be assured of achieving its target. The model thus shows clearly the power of the Federal Reserve to influence the economy, something which is generally much less evident in models that are not closed with respect to the flows of funds in the system.

In a stochastic framework it is generally not possible, of course, to achieve a given target value exactly, but this does not change the thrust of the above discussion. Even in a stochastic world the Federal Reserve has more power than the Administration and the Congress if it puts no bounds on acceptable values of the bill rate.

It should finally be noted that the properties of the empirical model that relate to the five issues discussed in this section and at the end of section 1.1 are also true of the properties of the theoretical model. The reader is again referred to the discussion in Chapter Six in Volume I.