No. 5

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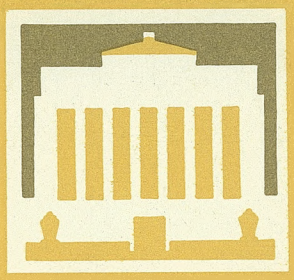

THE DYNAMICS OF RDX1

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PREFACE

This study contains an examination of the dynamic properties of the macroeconomic model presented in Staff Research Study No. 3, *The Structure of RDX1*. We have described elsewhere [4] some of the results of our simulation experiments. Here a fuller description is given of all our policy simulations, supplemented by some experiments that attempt to see which parts of the model's structure are responsible for certain of its important simulation properties.

In order to make this study as self-contained as possible, we have reproduced the appendices of *The Structure of RDX1*. These appendices contain the equation titles grouped by sector, a full alphabetical listing of the structural equations along with ordinary least squares and consistent parameter estimates, and a list defining all the endogenous and exogenous variables in the model. We have added a flow chart (Chart 10) of the causal influences in RDX1, and a schematic version of this chart (Chart 9). These charts are discussed in a new appendix (Appendix D).

As was the case with *The Structure of RDX1* the following colleagues were associated with the testing and simulations recorded here: Robert Evans, Fred Gorbet, Claude Huot, Jules Hurtubise, Peter Miles, Diane Nymark, Lynne Orman, Lawrence Smith, and Donald Stephenson. To this list we wish to add André Lemelin, who is responsible for the flow chart mentioned above.

The further experiments we have conducted since the first publication of RDX1 have given us ample justification for the modesty of our initial statements about the model, and lots of ideas for improvements to be built into RDX2. Though the dynamics

of RDX1 may not be exactly, or even approximately, those of the Canadian economy, the dynamic simulations using RDX1 have made a valuable contribution to our search for improved descriptions of how the economy works.

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PRÉFACE

L'étude ci-après contient une analyse des propriétés dynamiques du modèle macroéconomique qui a fait l'objet de l'étude N° 3—intitulée *The Structure of RDX1*—dans la série des Travaux de recherche à la Banque. Nous avons exposé ailleurs [4] quelques résultats de nos expériences de simulation. Nous donnons ici une description plus complète de toutes les simulations de politiques auxquelles nous avons procédé, en y ajoutant certaines expériences dont l'objet était de déterminer les éléments du modèle qui expliquent certaines de ses importantes propriétés de simulation.

Afin que cette étude forme un tout aussi complet que possible, nous y avons ajouté les annexes de l'étude *The Structure of RDX1*. Elles contiennent les titres des équations groupés par secteur, une liste alphabétique complète des équations structurelles, y compris les estimations par la méthode des moindres carrés et des variables instrumentales, et une liste de définitions portant sur toutes les variables endogènes et exogènes du modèle. Nous avons ajouté un diagramme des flux, le Graphique 10, indiquant les rapports de causalité dans RDX1, ainsi qu'une version schématique du diagramme, le Graphique 9. On trouvera une explication de ces deux graphiques dans une nouvelle annexe, l'Annexe D.

Comme pour l'étude *The Structure of RDX1*, MM. Robert Evans, Fred Gorbet, Claude Huot, Jules Hurtubise, Peter Miles, Mlles Diane Nymark et Lynne Orman, MM. Lawrence Smith et Donald Stephenson ont pris part aux simulations et aux tests relatés dans cette étude. Nous tenons à mentionner également M. André Lemelin, à qui nous devons le diagramme des flux susmentionné.

Les expériences que nous avons menées depuis la première publication du RDX1, nous ont démontré que nous avions eu raison d'être plutôt modestes lors du nos premières présentations du modèle et nous ont suggéré plusieurs idées concernant les améliorations susceptibles d'être incorporées dans le modèle RDX2. Bien que le comportement dynamique du modèle RDX1 ne corresponde pas exactement, ni même approximativement, à celui de l'économie canadienne, ses simulations dynamiques nous ont considérablement aidés dans nos recherches de meilleures descriptions du fonctionnement réel de l'économie.

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THE DYNAMICS OF RDX1

1. Introduction

A model as non-linear as RDX1 offers a wide range of possibilities for simulation experiments. In the specification of RDX1, non-linearities arise in a number of places where rates of utilization of the capital stock (Y/YC) and of the labour force (NU/NL) affect aggregate demand, the balance of trade, wages, and prices. Further, prices and wages themselves have various impacts on aggregate demand, average hours worked, and so on. We started out with the expectation, therefore, that RDX1 would behave rather differently in two important respects from the largely demand-determined models more commonly used for policy analysis. First, supply considerations play an important role. Second, the model contains important non-linearities. Thus the values of our dynamic policy multipliers depend as usual on the passage of time and are related in an important way to:

(a) Initial conditions, in particular, the rates of utilization of the capital stock and the labour force.

(b) Particular features of the policy change. For example, changes in government wage payments (GW), nonwage expenditure (GNW), and transfer payments (GTR) all have different multipliers for all succeeding periods, and also show different time patterns of response.

(c) Values given to the exogenous variables.

In the face of these complexities, experimental design requires a mix of courage and ingenuity. One is tempted to suspect that the reason so many models are linearized for simulation purposes is not only to make computations easier but also to reduce the bewildering range of potential experiments. The set of experiments reported here is but a small subset of possible experiments and we recognize that our priorities may not be shared by others.

The present paper presents the results and analysis of an extensive series of simulations designed to reveal the essential dynamic properties of RDX1. Section 6 of the paper contains a range of somewhat different simulation experiments intended to test the sensitivity of these dynamic properties to changes in certain aspects of RDX1. Particular attention is paid to the sensitivity of the 'import leakage' and to the effects of price changes. In an open economy, such as that of Canada, these aspects of the model are of special significance.

2. Long-Period Simulations and Forecasting Results

Our first runs of RDX1 were intended to find out how well the model as a whole could predict the endogenous variables within and outside the sample period. After first running a forty-quarter simulation, starting in 1Q58, we divided most of our simulations into two main blocks of sixteen quarters each. The first block, from 1Q58 to 4Q61, is characterized by low levels of output and employment in relation to capacity. The second block, from 1Q64 to 1Q67, covers a period of rising capacity utilization and upward pressures on prices and wages. In addition, the latter half of this period lies outside the sample period, which ended in 4Q65. The purpose of these experiments is to discover any severe defects of the model that could make it tend to deviate drastically from the path of the economy. The sixteen-quarter and eight-quarter simulations provide comparisons of the forty-quarter run with experiments that re-initialize the lagged endogenous variables to their true values at certain points (4Q63, 4Q65) during the sample period.

Our prediction runs (control solutions) for all these periods showed that the dynamic characteristics of the model keep the main endogenous variables close to their actual values during times of radically different economic conditions. Our forty-quarter simulation showed that the model performed well even ten years later. Charts 1, 2 and 3 show the actual and predicted values of some of the principal endogenous variables in the forty-quarter, sixteen-quarter, and eight-quarter simulations. These charts also reveal that the model traces the actual path of the economy remarkably well from 1958 to 1967. This is true not only

for gross output and expenditure but also for their component aggregates, although of course there are some problems in detail. The predictive ability of the model, however, does deteriorate somewhat outside the sample period (see Charts 2 and 3). Although the errors are small, they tend at times (e.g., in the period 1Q62-1Q65) to exhibit autoregressive patterns. The chief cause of the autoregressive errors in the early 1960's was a string of autoregressive errors in the export equations. When these errors ended, the model came fairly quickly back on track. Thus over a dynamic simulation as long as forty quarters there is no tendency for the model to explode. Re-initialization of the lagged endogenous variables to their actual values at 4Q63 (Chart 2) and 4Q65 (Chart 3) produces only marginal and temporary improvements in the model's predictive power.

A major forecasting weakness of RDX1 is its failure to generate satisfactory predictions of the unemployment rate (NU/NL). Unemployment is determined residually from an identity in which the labour force and most of the components of total employment have stochastic explanations. Small predictive errors in any of these components lead to relatively large percentage errors in the unemployment rate. Our experiments indicate, however, that the present version of RDX does provide a suitable framework for analyzing the employment effects of alternative economic policies.

The typical error in predicting the short-term interest rate (R03) is about 30 basis points. Furthermore, the model correctly predicts turning points in R03 about two-thirds of the time. The rest of the time forecasted changes lag the actual changes by one quarter. On the whole, interest rate predictions are substantially better in the latter half of the sample period.

As a further initial check on the properties of the system we re-initialized the model at 4Q65 and put it to work outside the sample period. Chart 3 illustrates the forecasting performance for 1966 and 1967 under these conditions. However, because we use the actual values of exogenous variables, this is not an adequate test of the model's ability to act as a forecasting tool. As noted above, the forecast errors for 1966 and 1967 are larger than those encountered over the sample period. The performance of the foreign sector deserves special comment. Underestimation of both imports and exports reflects the role of the Canada-

Chart 1

FORTY-QUARTER SIMULATION
1958-1967
Millions

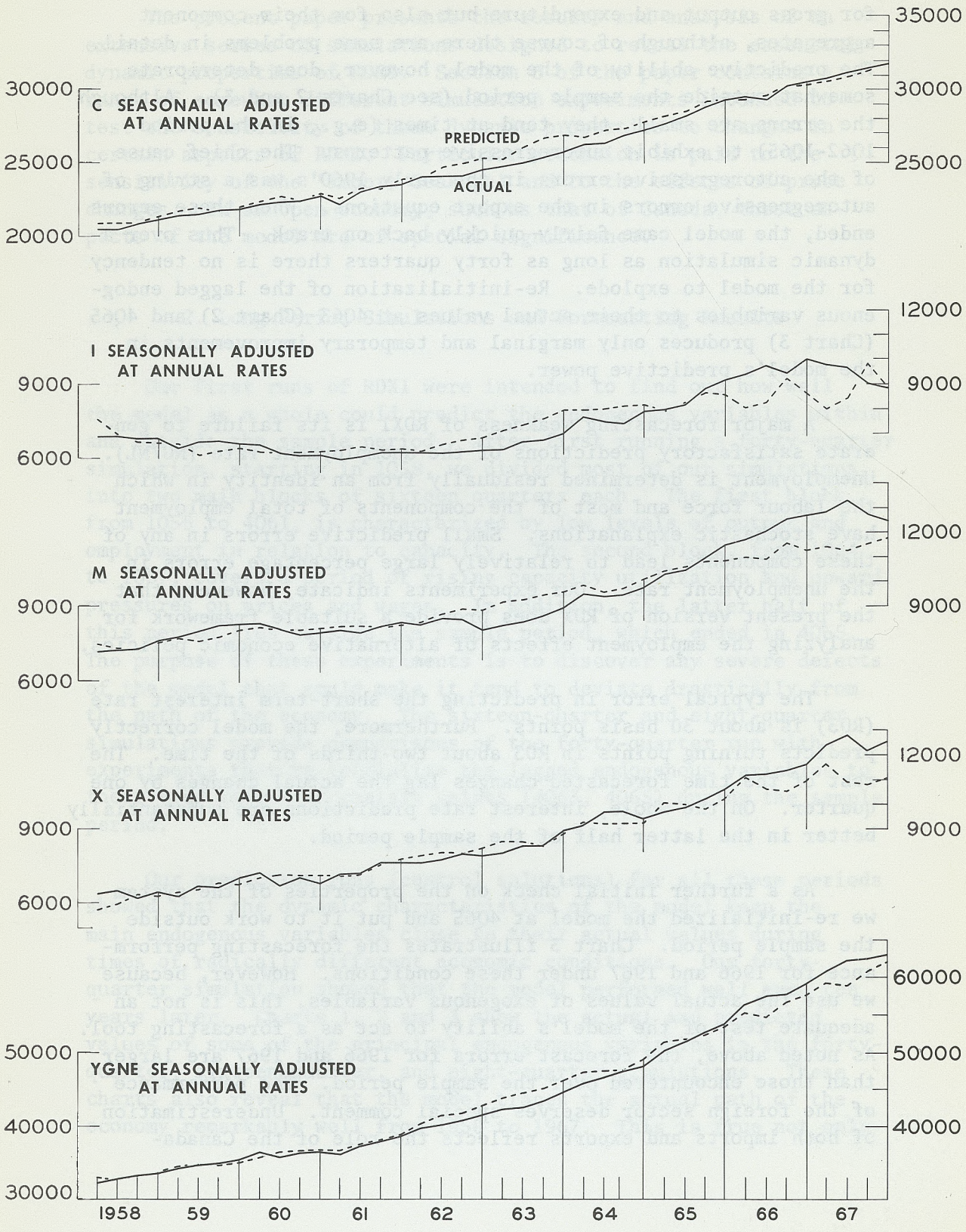


Chart 1 (cont'd)

FORTY-QUARTER SIMULATION
1958-1967

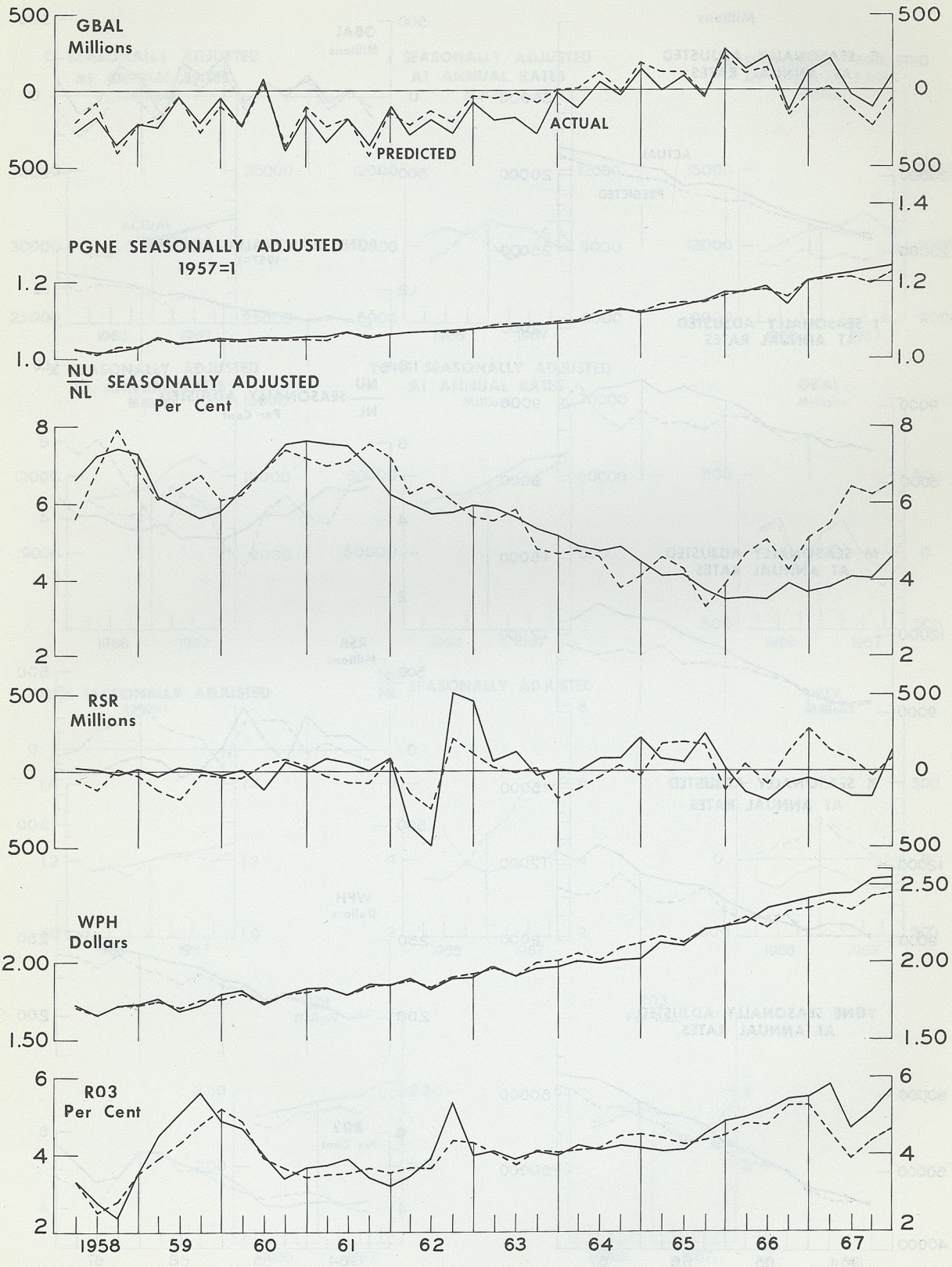


Chart 2

SIXTEEN-QUARTER SIMULATION
1964-1967

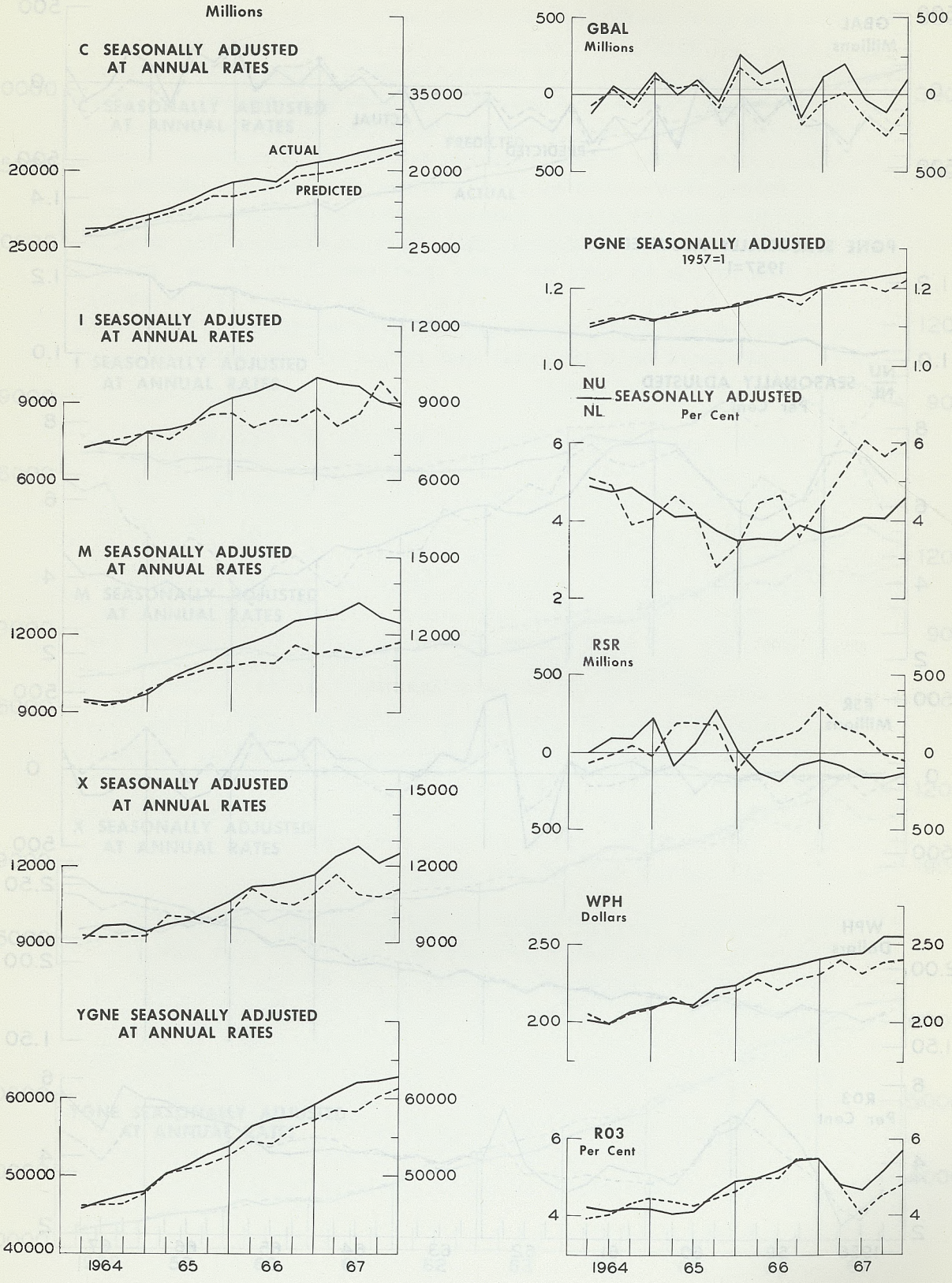
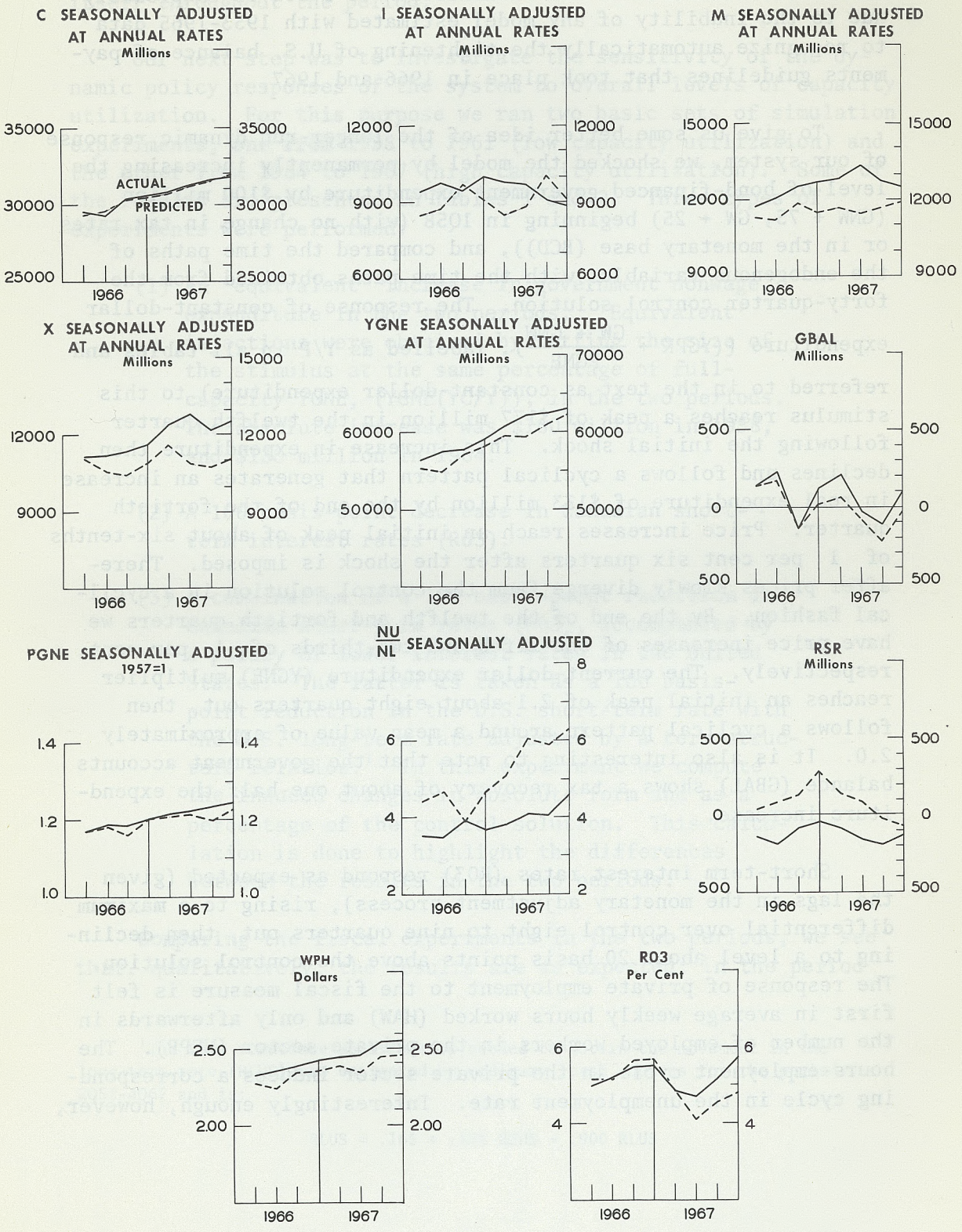


Chart 3

EIGHT-QUARTER SIMULATION
1966-1967



United States Agreement on Automotive Products in expanding trade, while overestimation of the accumulation of reserves is probably due to the inability of any model estimated with 1953-1965 data to recognize automatically the tightening of U.S. balance of payments guidelines that took place in 1966 and 1967.

To give us some better idea of the longer-run dynamic response of our system, we shocked the model by permanently increasing the level of bond-financed government expenditure by $100 million (GNW + 75, GW + 25) beginning in 1Q58 (with no change in tax rates or in the monetary base (BCD)), and compared the time paths of the endogenous variables with the time paths obtained from the forty-quarter control solution. The response of constant-dollar expenditure ($(YGPK + \frac{GW + GNW}{PGNE})$, labelled as Y/P in all tables and referred to in the text as constant-dollar expenditure) to this stimulus reaches a peak of $177 million in the twelfth quarter following the initial shock. This increase in expenditure then declines and follows a cyclical pattern that generates an increase in real expenditure of $133 million by the end of the fortieth quarter. Price increases reach an initial peak of about six-tenths of 1 per cent six quarters after the shock is imposed. Thereafter prices slowly diverge from the control solution in a cyclical fashion. By the end of the twelfth and fortieth quarters we have price increases of one-fifth and two-thirds of 1 per cent, respectively. The current-dollar expenditure (YGNE) multiplier reaches an initial peak of 2.1 about eight quarters out, then follows a cyclical pattern around a mean value of approximately 2.0. It is also interesting to note that the government accounts balance (GBAL) shows a tax recovery of about one-half the expenditure increase.

Short-term interest rates (R03) respond as expected (given the lags in the monetary adjustment process), rising to a maximum differential over control eight to nine quarters out, then declining to a level about 20 basis points above the control solution. The response of private employment to the fiscal measure is felt first in average weekly hours worked (HAW) and only afterwards in the number of employed workers in the private sector (NEPP). The hours-employment cycle in the private sector induces a corresponding cycle in the unemployment rate. Interestingly enough, however,

the induced rise in private hourly wage rates (WPH) maintains itself throughout the period.

Our next step was to investigate the sensitivity of the dynamic policy responses of the system to overall levels of capacity utilization. For this purpose we ran two basic sets of simulation experiments, one from 1958 to 1961 (low capacity utilization) and the other from 1964 to 1967 (high capacity utilization). Some of the results are presented in Tables 1 and 2. Three types of experiments were performed:

(1) An 'equivalent' increase in government nonwage expenditure in the two periods. 'Equivalent' injections were obtained by setting the size of the stimulus at the same percentage of full-capacity YGNE, (YGNE(YC/Y)), in the two periods. The absolute increase was $100 million in 1958, and $130 million in 1964.

(2) A 100 basis-point decrease in Canadian short-term interest rates (R03).

(3) A combination of a 100 basis-point reduction in Canadian short-term rates (R03), accompanied by a policy of lower interest rates in the United States. The latter is taken as a 100 basis-point reduction in the U.S. short-term rate with the U.S. long-term rate adjusted by a term structure relation.[1] In this experiment we compute the induced changes in absolute form and as a percentage of the control solution. This calculation is done to highlight the differences between the results in the two periods.

Comparing the fiscal experiments in the two periods, we see that, qualitatively, the results are as expected; in the period

[1]The term structure relationship needed to obtain the movement in the long-term rate (RLUS) was estimated by ordinary least squares for the period 2Q52-4Q67 and is:

$$RLUS = .165 + .108\ RTUS + .900\ RLUS$$

TABLE 1

SIXTEEN-QUARTER SIMULATION RESULTS (1Q58-4Q61) FOR SELECTED VARIABLES
(Shocked-Control)

	Units	1Q58	2Q58	3Q58	4Q58	1Q59	2Q59	3Q59	4Q59	1Q60	2Q60	3Q60	4Q60	1Q61	2Q61	3Q61	4Q61
YGNE	Millions of current dollars																
Fiscal		108	133	145	168	171	187	190	208	191	202	201	213	191	209	210	213
Monetary		4	10	14	21	27	34	41	50	54	61	67	77	73	79	80	87
Monetary + U.S.		4	10	15	24	34	46	58	73	83	98	111	132	132	147	156	176
% of Control		.054	.13	.16	.28	.44	.54	.60	.83	1.02	1.10	1.10	1.43	1.57	1.59	1.53	1.79
Y/P	Millions of 1957 dollars																
Fiscal		96	108	105	117	121	135	137	160	152	164	163	177	160	169	167	174
Monetary		4	11	16	24	30	38	45	55	58	65	69	77	73	76	75	78
Monetary + U.S.		4	12	17	27	38	50	63	80	90	105	117	135	135	146	151	165
% of Control		.05	.16	.21	.31	.50	.62	.74	.91	1.14	1.26	1.32	1.48	1.68	1.68	1.65	1.72
CD + CND + CS	Millions of 1957 dollars																
Fiscal		17	28	35	49	50	60	62	81	71	69	77	95	82	90	88	105
Monetary		1	2	4	11	6	22	25	33	34	39	41	50	47	51	52	59
Monetary + U.S.		1	2	4	13	20	29	36	48	52	63	70	86	85	96	100	118
% of Control		.02	.04	.08	.22	.39	.53	.67	.81	.99	1.11	1.27	1.40	1.57	1.65	1.77	1.84
IME + INRC + IRC	Millions of 1957 dollars																
Fiscal		7	11	18	36	43	52	56	68	65	66	63	65	61	56	53	51
Monetary		6	12	16	20	23	27	32	40	43	47	49	54	53	50	47	47
Monetary + U.S.		6	12	17	23	28	36	44	58	66	75	81	93	97	97	97	104
% of Control		.39	.65	.92	1.37	2.14	2.17	2.55	3.58	5.15	4.55	4.71	5.82	7.64	5.74	5.53	6.35
MG + MS/PMS	Millions of 1957 dollars																
Fiscal		26	39	47	62	60	66	67	73	64	66	64	66	54	56	57	57
Monetary		2	5	6	10	12	12	19	23	23	26	27	30	27	28	27	27
Monetary + U.S.		2	5	7	11	15	20	27	34	36	43	47	54	51	55	56	61
% of Control		.12	.26	.38	.58	.87	.98	1.38	1.67	1.95	2.02	2.31	2.60	2.73	2.54	2.78	2.87

XG + XS/PXS	Millions of 1957 dollars															
Fiscal		-11	-13	-15	-17	-15	-17	-18	-17	-14	-13	-14	-13	-11	-10	-11	-10
Monetary		0	-1	-1	-2	-2	-3	-3	-3	-3	-3	-3	-4	-3	-2	-3	-2
Monetary + U.S.		0	-1	-1	-3	-2	-4	-4	-5	-5	-5	-6	-7	-6	-5	-6	-6
% of Control		0	-.066	-.059	-.18	-.15	-.24	-.22	-.29	-.32	-.28	-.31	-.38	-.39	-.27	-.30	-.30
GBAL	Millions of current dollars															
Fiscal		-70	-69	-67	-58	-57	-51	-56	-49	-49	-44	-52	-48	-50	-44	-52	-48
Monetary		1.0	3.0	3.0	5.0	7.0	11.0	11.0	15.0	16.0	20.0	18.0	22.0	22.0	24.0	21.0	23.0
Monetary + U.S.		1.0	3.0	3.0	7.0	9.0	14.7	15.0	21.0	26.0	31.2	30.0	37.0	41.0	45.0	42.0	47.0
NU/NL	Percentage points															
Fiscal		-.19	-.30	-.37	-.42	-.44	-.50	-.49	-.53	-.53	-.54	-.55	-.57	-.54	-.53	-.50	-.80
Monetary		-.01	-.03	-.04	-.07	-.10	-.13	-.16	-.20	-.22	-.24	-.27	-.30	-.30	-.30	-.30	-.30
Monetary + U.S.		-.01	-.03	-.05	-.08	-.12	-.16	-.22	-.28	-.32	-.37	-.44	-.50	-.53	-.56	-.58	-.62
R03	Percentage points (Basis points/100)															
Fiscal		.06	.11	.16	.19	.21	.23	.24	.25	.24	.24	.24	.24	.22	.22	.21	.20
RSR	Millions of current (Canadian) dollars															
Fiscal		-28	-34	-34	-35	-28	-26	-23	-22	-15	-15	-14	-14	-7	-11	-11	-15
Monetary		-63	-78	-89	-97	-102	-106	-109	-111	-110	-112	-113	-114	-112	-113	-113	-112
Monetary + U.S.		-7	-16	-19	-23	-27	-31	-33	-35	-35	-38	-40	-41	-39	-41	-42	-44
WPH	Cents															
Fiscal		.2	.4	.6	1.0	1.2	1.4	1.5	1.7	1.9	2.0	2.2	2.3	2.5	2.6	2.8	3.0
Monetary		0	0	0	.1	0	.1	.1	.1	.3	.3	.4	.4	.5	.6	.7	.8
Monetary + U.S.		0	0	0	.1	0	.1	.1	.2	.3	.4	.5	.6	.7	.9	.11	.13
PGNE	1957=1															
Fiscal		.002	.003	.005	.006	.006	.006	.005	.005	.004	.004	.003	.002	.003	.003	.003	.004
Monetary		0	0	0	0	-.001	-.001	-.001	-.001	-.002	-.001	-.001	-.001	-.001	-.001	0	.001
Monetary + U.S.		0	0	0	0	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001	-.001	0	.001

TABLE 2

SIXTEEN-QUARTER SIMULATION RESULTS (1Q64-4Q67) FOR SELECTED VARIABLES
(Shocked-Control)

	Units	1Q64	2Q64	3Q64	4Q64	1Q65	2Q65	3Q65	4Q65	1Q66	2Q66	3Q66	4Q66	1Q67	2Q67	3Q67	4Q67
YGNE	Millions of current dollars																
Fiscal		136	168	196	231	238	264	294	322	284	293	277	289	239	248	251	272
Monetary		4	8	11	19	27	36	50	64	67	76	86	95	86	90	91	97
Monetary + U.S.		4	8	12	23	35	48	71	93	103	123	144	166	159	173	181	200
% of Control		.038	.070	.094	.19	.31	.38	.51	.70	.83	.92	1.11	1.15	1.18	1.19	1.13	1.29
Y/P	Millions of 1957 dollars																
Fiscal		107	118	114	124	127	136	137	156	136	138	135	148	119	124	126	139
Monetary		4	8	10	18	26	32	39	47	49	53	56	62	55	56	56	60
Monetary + U.S.		4	8	11	22	33	43	55	70	77	88	98	115	109	117	122	135
% of Control		.041	.077	.10	.20	.32	.39	.49	.59	.71	.77	.81	.91	.97	.97	.98	1.04
CD + CND + CS	Millions of 1957 dollars																
Fiscal		28	32	41	58	62	74	78	102	91	100	93	110	92	98	91	106
Monetary		0	2	3	10	15	21	25	32	34	41	42	50	48	52	51	56
Monetary + U.S.		0	2	3	11	19	28	36	48	54	66	72	89	88	98	100	116
% of Control		0	.030	.048	.15	.29	.40	.53	.62	.79	.91	1.00	1.11	1.23	1.29	1.35	1.37
IME + INRC + IRC	Millions of 1957 dollars																
Fiscal		6	9	14	31	39	48	49	59	53	52	47	46	37	31	26	24
Monetary		5	8	11	15	20	25	29	35	38	41	42	45	44	42	39	38
Monetary + U.S.		5	9	13	18	25	33	40	51	59	67	72	83	85	85	84	88
% of Control		.080	.13	.63	.87	1.52	1.56	1.80	2.29	3.33	3.03	3.05	3.64	4.75	3.69	3.38	3.78
MG + MS/PMS	Millions of 1957 dollars																
Fiscal		29	43	55	73	72	79	83	91	76	76	72	72	53	53	51	54
Monetary		1	3	5	8	11	15	19	25	24	27	29	32	27	27	25	25
Monetary + U.S.		1	3	5	10	14	20	27	36	38	45	50	58	53	56	56	59
% of Control		.047	.12	.21	.39	.60	.74	1.03	1.29	1.51	1.59	1.76	1.96	2.02	1.89	1.93	1.93

XG + XS/PXS	Millions of 1957 dollars															
Fiscal		-11	-13	-16	-17	-17	-19	-23	-21	-18	-19	-19	-17	-13	-13	-14	-13
Monetary		0	-1	0	-1	-2	-2	-4	-3	-3	-4	-4	-4	-3	-3	-4	-3
Monetary + U.S.		0	-1	0	-2	-2	-3	-5	-5	-5	-6	-7	-8	-7	-7	-8	-7
% of Control		0	-.042	0	-.082	-.09	-.12	-.19	-.19	-.21	-.22	-.25	-.29	-.27	-.25	-.28	-.25
GBAL	Millions of current dollars															
Fiscal		-102	-88	-83	-73	-70	-62	-64	-56	-61	-56	-65	-64	-73	-66	-74	-70
Monetary		1	1	3	6	8	11	13	16	18	22	21	24	24	26	24	25
Monetary + U.S.		1	2	3	7	10	15	18	24	28	35	36	43	46	51	47	52
NU/NL	Percentage points															
Fiscal		-.19	-.30	-.42	-.44	-.40	-.38	-.50	-.44	-.32	-.24	-.21	-.17	-.10	-.06	-.04	-.02
Monetary		-.01	-.02	-.03	-.05	-.07	-.09	-.14	-.16	-.15	-.14	-.17	-.17	-.15	-.13	-.13	-.12
Monetary + U.S.		-.01	-.02	-.03	-.05	-.08	-.11	-.19	-.23	-.23	-.24	-.29	-.31	-.30	-.29	-.30	-.32
R03	Percentage points (Basis points/100)															
Fiscal		.06	.13	.18	.23	.26	.28	.31	.32	.31	.29	.28	.27	.22	.19	.18	.18
RSR	Millions of current (Canadian) dollars															
Fiscal		-35.3	-44.9	-46.7	-53.3	-46.2	-44.8	-45.0	-47.8	-34.7	-34.1	-32.6	-35.4	-20.7	-23.2	-24.3	-31.5
Monetary		-63	-77	-86	-97	-104	-110	-115	-118	-118	-120	-122	-124	-120	-121	-122	-119
Monetary + U.S.		-8	-13	-17	-24	-29	-35	-41	-46	-47	-51	-55	-60	-55	-57	-60	-60
WPH	Cents															
Fiscal		.2	.5	1.1	1.7	2.3	2.7	3.3	4.0	4.5	4.4	4.4	4.5	4.7	4.4	4.4	4.6
Monetary		0	0	.1	.1	.1	.2	.3	.5	.7	.8	.9	1.0	1.2	1.1	1.2	1.2
Monetary + U.S.		0	0	.1	.1	.1	.2	.4	.7	1.0	1.2	1.4	1.6	1.9	1.8	1.9	2.0
PGNE	1957=1															
Fiscal		.002	.003	.006	.008	.009	.010	.012	.012	.012	.011	.010	.009	.008	.008	.008	.008
Monetary		0	0	0	0	0	0	.001	.001	.001	.001	.001	.001	.002	.002	.002	.002
Monetary + U.S.		0	-.001	0	0	0	0	.001	.001	.001	.002	.002	.002	.002	.003	.003	.003

of high capacity utilization (1964-1967) the expansion of real output is lower and the price inflation more severe. In the low-capacity period (1958-1961), for example, the fiscal stimulus produced an increase in constant-dollar expenditure of 1.76 times the initial injection by the sixteenth quarter. Accompanying this growth in output was a decrease of 0.8 percentage points in the unemployment rate. A larger absolute fiscal stimulus (but equivalent as a proportion of full-capacity output) in the high-capacity period (1964-1967), produces, by the sixteenth quarter, an increase in constant-dollar expenditure of only 1.19 times the initial injection. By 4Q67, the unemployment rate is hardly affected at all, while the induced price inflation is almost twice as great in 4Q67 as in 4Q61.

The monetary experiments reveal several notable characteristics. First, as expected, the real expansionary effects of a given decrease in interest rates are much weaker at higher levels of capacity utilization. During the 1964-1967 period the specified policy of monetary ease produced an increase in constant-dollar expenditure, which dropped the unemployment rate by only 0.12 percentage points. By contrast, the same policy of ease in 1958-1961 produced an increase nearly 30 per cent larger in real expenditure and a fall of 0.30 percentage points in the unemployment rate. Once again the inflationary impact is greater in the period of relatively high utilization.

Second, as expected, a policy of monetary ease in the United States strengthens the effect of similar Canadian policy actions. This is simply a reflection of the important constraint that the U.S. capital market places on our system. U.S. monetary ease also offsets the considerable reserve loss (RSR) of a unilateral Canadian policy of monetary ease, the extent of the 'offset' being about one-half. In both periods aggregate demand responds strongly, although with a lag, to the expansionary monetary policy. Finally, we note that in the case of these monetary experiments, which involve no initial expenditure effects, the delay in the response of unemployment is longer than in the fiscal experiment.

Now we are in a position to consider more carefully the possibilities open to economic policy as revealed by our model. First, we shall consider how the model reacts in the short run to internal and external shocks, assuming no change in government

policies. This will give us some idea of the strength that policies must have if they are to stabilize or improve conditions brought about by shocks to the system. With this information in hand, we can calculate the impact on our model of a number of individual monetary and fiscal policies. Then we can go on to consider the effects of choosing various 'policy mixes' (i.e., particular values for a selected pair of monetary and fiscal instruments).

3. Short-Term Effects of Changes in Domestic and Foreign Activity

To set the stage for a discussion of the effectiveness of various instruments of economic policy on the model, we first consider the domestic effects of shocks that stabilization policies might be intended to offset. The first part of Table 3 shows the effects, after six quarters:[2] of changes in foreign output and prices (as our first example), of an exogenous increase in domestic expenditure on consumer durables, and, finally, of an increase in expenditure on machinery and equipment. In all three cases we have assessed the effects of such shocks during both the low capacity utilization period and the high capacity utilization period.

To represent the impact of a fairly widespread recession in other countries, we lowered the world activity index (AWI) by 5 per cent of its actual value, and accompanied this with a 1 per cent reduction in the price of world exports of goods (PWXG) and in the price of Canadian imports of goods (PMG) and services (PMS). The resulting proportionate drop in national output is somewhat greater in 1958 than in 1964 (3 per cent versus 2.5 per cent), since in 1964 there were higher marginal import requirements and other factors reflecting the greater degree of capacity utilization that reduced the real value of induced expenditure. In both periods the proportionate fall in domestic output is less than half the proportionate fall in foreign output that induced it. Domestic prices are almost unaffected by the fall in activity and the 1 per cent reduction in foreign prices. This stickiness of prices in response to relatively small changes in output, partic-

[2]Six quarters was selected as one 'reasonable' planning horizon (i.e., a period for which sufficiently accurate forecasts of exogenous variables are available).

TABLE 3

SIXTH-QUARTER EFFECTS OF SIX-QUARTER SIMULATIONS, 1Q58-2Q59 AND 1Q64-2Q65
(Shocked-Control)

Variables →		YGNE	GBAL	RSR	Y/P	C	I	M	X	PGNE	NU/NL	R03	WPH
Units →		Millions of current $			Millions of 1957 $					1957=1.0	Percentage Points		Cents
Effects of Exogenous Disturbances													
World Activity													
AWI - 5%	2Q59	-228	-62	-72	-244	-81	-80	-62	-107	.003	.92	-.03	-1.0
PWXG, PMG, PMS - 1%	2Q65	-344	-94	-82	-280	-110	-81	-89	-142	-.002	.89	-.02	-2.6
Consumption													
CD + 50 million	2Q59	71	23	-25	79	76	25	32	-5	-.001	-.32	0	.3
CD + 65 million	2Q65	110	35	-42	85	100	25	43	-6	.001	-.29	-.01	1.0
Investment													
IME + INRC + 100 million	2Q59	176	42	-47	193	75	155	61	-3	-.003	-.76	.28	.7
IME + INRC + 130 million	2Q65	175	54	-36	210	88	179	76	-5	-.003	-.67	.36	2.7
Effects of Policy Instruments													
Government Expenditure													
GNW + 75 million, GW + 25 million	2Q59	184	-50	-22	143	60	56	64	-16	.004	-.61	.24	1.6
GNW + 97.5 million, GW + 32.5 million	2Q65	266	-61	-41	139	76	50	76	-19	.010	-.44	.28	3.2
Government Transfer													
GTR + 100 million	2Q59	78	-59	-9	86	85	21	29	-6	-.001	-.31	.19	.2
GTR + 130 million	2Q65	107	-74	-18	89	103	18	36	-6	.001	-.27	.22	.7
Tax Rate Change													
RW1, RW2, RW3, RW4	2Q59	-20	19	2	-22	-23	-6	-8	1	0	.07	-.05	.0
+ 1%	2Q65	-39	38	7	-36	-40	-6	-14	3	0	.10	-.10	.2
Depreciation													
PMG, PMS, PWXG	2Q59	229	56	24	197	55	62	-31	25	.003	-.65	-.02	2.1
+ 5%	2Q65	279	66	6	164	53	49	-40	19	.009	-.40	0	3.6
Government Expenditure													
GNW + 100 million	2Q59	187	-51	-26	135	60	52	66	-17	.006	-.50	.23	1.4
GNW + 130 million	2Q65	264	-62	-45	136	74	48	79	-19	.010	-.38	.28	2.7

ularly at low levels of capacity utilization, is a recurring feature in our six-quarter simulation results. The proximate reason is that the unit-labour-cost variable moves up, at first, in response to moderate decreases in aggregate demand under conditions of less than full employment. This is because aggregate money wages, (WP)(NEPP), fall proportionately slightly less than output (YGPK). Since the unit-labour-cost variable has large positive coefficients (largest in the current period) in the price (PGNE) equation, we can find (e.g., in 1958) that in the sixth quarter PGNE stays level or even rises slightly in response to a 5 per cent drop in world activity and a 1 per cent drop in world prices. By the time eight to twelve quarters have elapsed, this perverse price movement is usually eliminated.

For the second experiment we chose to increase constant-dollar personal expenditure on consumer durables (CD) by seven-tenths of 1 per cent of private gross national expenditure (YGPK). Again the procedure was tested in both periods. For the 1958 period this implied an injection of $50 million; for the 1964 period the implied stimulus was $65 million. The induced changes in real expenditure (Δ(Y/P) - initial ΔCD) by the sixth quarter are much more substantial (as a per cent of total output) in 1958-1959, the years of relatively low utilization rates (see Table 3). Finally, similar experiments were carried out assuming an autonomous increase in expenditure on machinery and equipment in both periods. Once again the results were markedly sensitive to the rate of capacity utilization represented in the initial conditions.

4. Short-Term Effects of Individual Stabilization Policies

In order to assess the flexibility and efficacy of various stabilization policies in the context of this model, we need to establish some standards of reference. First, it is necessary to consider the size of the offset required to counterbalance a given shock to the economy (see above). Then we must make some assumptions about how far ahead the behaviour of the exogenous variables can be forecast with reasonable accuracy. As a basis for our investigation and analysis, we consider the alternate implications of assuming that the exogenous variables can be forecast for either three or six quarters ahead. Thus we assess

alternative policies on the basis of their effects both three and six quarters later.

Tables 1 and 2 show, amongst other things, quarter by quarter effects (in both 1958 and 1964) of three policies: an increase in government nonwage expenditure, a 15 per cent increase in the size of the banking system, and a similar monetary expansion coupled with declines in short- and long-term U.S. interest rates. In the lower part of Table 3 we show the sixth-quarter effects of four additional policy actions: an increase in government transfer payments to persons, an increase in personal income tax rates of 1 percentage point in each income class, a reduction of 5 per cent in the external value of the Canadian dollar (represented by 5 per cent increases in PMG, PMS, and PWXG), and a reduction in government wage and nonwage expenditure. In the fiscal policy simulations the sizes of the policy dosages in 1964 are constrained to be the same proportion of the capacity level of YGNE as those in 1958. For example, transfer payments are increased by $100 million per quarter in 1958 and by $130 million per quarter in 1964, since full-capacity YGNE was 30 per cent higher in 1964 than in 1958.

Two results reported in the six-quarter simulations of various policy instruments can be combined to throw light on an interesting question. What would be the increase in personal income tax rates (RW1, RW2, RW3 and RW4) necessary to maintain budget balance (i.e., deficit or surplus equal to control) given any increase in government nonwage expenditure (GNW) during our low and high capacity utilization periods and what would be the resulting balanced budget multipliers? In a recent article [1], Michael Evans has examined the balanced budget multiplier properties of several U.S. models contrasting them in particular with values derived from the Wharton model. He distinguishes an ex ante and ex post formulation of the balanced budget multiplier concept. The ex ante multiplier is defined as the result of the change in tax rates that would deliver a volume of receipts equal to the volume of expenditures in the first period based upon the first-period control values of the relevant tax base. The ex post multiplier is derived by permitting tax rates to vary continuously in order to keep the budget in balance. We are concerned with the latter formulation. The results reported here are virtually linear combinations of the values reported in Table 3; although simula-

tions were run for five quarters beginning in 1Q58 and 1Q64 with personal tax rate changes and government nonwage expenditure changes imposed together, subject to the constraint that the budget surplus or deficit is equal in the control and shocked runs. This constraint allows for interactions of the two policies. In effect we attempt to provide an answer to the fiscal policy maker who, at the first quarter of a year, asks, What would be the real income effects of any change in government expenditure and compensating change in tax rates imposed now and maintained over this and the following four quarters?

Not surprisingly our multipliers are relatively low, being less than unity with respect to constant-dollar expenditure. They fall from .86 to .69 over the period 2Q58 to 1Q59 and from .74 to .62 over the period 2Q64 to 1Q65. With respect to current-dollar gross national expenditure (YGNE), they are slightly over unity, averaging slightly less than 1.2 in the 1958 period and less than 1.1 in the 1964 period. During the 1958 period, budget balance is maintained by a rise of 3.1 percentage points in each of the basic personal income tax rates, balancing an increase of $100 million in GNW; and during the 1964 period by a rise of 2.3 percentage points in each rate balancing an increase of $130 million in GNW. These results are a reflection of the relatively low multipliers associated with the stimulus of government nonwage expenditure. These low multipliers, relative to those of the Wharton model, are due chiefly to foreign trade leakages. Thus, in contrast to the Wharton model, only about half of the expenditure is recovered from induced tax receipts. For the Wharton model the induced tax recapture alone very nearly offsets the expenditure increase with a resulting need for only modest changes in personal tax rates.

By comparing the individual effects of various kinds of policy actions with the effects of typical exogenous 'shocks' (shown at the top of Table 3) we can study what the model says about the short-term efficacy of various policies. The revealed ability of various policies to offset destabilizing influences (shocks) depends, of course, on the point in time at which the evaluation is made. Thus we can make a comparison, for example, in the sixth quarter of the real output effects of a 5 per cent devaluation as a means of offsetting the domestic effects of a 5 per cent reduction in world activity and a 1 per cent drop in world prices.

Our experiment shows that the devaluation would offset slightly less than 80 per cent of the effects of a world depression on real aggregate expenditure in 1958 and about 60 per cent of these effects in 1964. If we use an increase in government nonwage expenditure (GNW) to counter the effects of a world depression, it remains the case that the relative effectiveness of the policy is greater in 1958 than in 1964. 'Equivalent' injections of government expenditure offset a considerably larger percentage of the fall in constant-dollar expenditure during the period of relatively low levels of capacity utilization. Data presented in Tables 1, 2 and 3 enable us to make numerous comparisons of this nature by simply pairing various policies and disturbances.

To assess the likelihood of strong interacting effects between external shocks and offsetting policies, we also did simulations for both 1958 and 1964 that combined these events simultaneously (e.g., a decline in world activity and an offsetting devaluation policy). The combined effects were almost exactly equal to the sum of the effects of the two experiments run separately.

Although this pairing of shocks and policy instruments is a convenient way of examining the short-term effects of a range of alternative policies, it is nevertheless a very artificial exercise. Aside from ignoring the uncertainty surrounding the structure of the model and the forecasts of the exogenous variables, as we do in all our experiments, the one by one examination of policies forces us to ignore what is perhaps the most important aspect of the problem, namely, the choice of a mix of policies best adapted to several conflicting policy goals. In these circumstances the most powerful and fast-acting policies may not be at all appropriate, because we need a range of policies having differential effects on the various target variables. Using a pair of monetary and fiscal policies to indicate the type of analysis open to us, we now turn to the larger question of the effects of sets of policies.

5. Analysis of the Effects of Policy Mixes

We take as our example of a policy mix a change in government nonwage expenditure (fiscal policy), coupled with a change in

short-term interest rates (monetary policy). To illustrate the effects of various dosages of this combination, we have prepared two sets of charts. The first set, Chart 4 for 1958 and Chart 5 for 1964, shows what combinations of real output and changes in foreign exchange reserves would be achieved six quarters after the initiation of a particular mix of economic policies. The second set, Chart 6 for 1958 and Chart 7 for 1964, evaluates the achievements of economic policy in terms of output and foreign exchange reserves three quarters after the application of a particular set of policies. Our experiments assume that fiscal policy takes longer to implement than monetary policy. Thus we assume that an 'easy' monetary policy lowers short-term interest rates by one-half the target amount in the first quarter, with the remainder of the reduction being achieved in the second quarter. Because of the various lags involved, fiscal policy does not achieve the full target change in government expenditures until the third quarter. Half of the target is achieved in the second quarter and none in the first quarter.

The vertical axis of each graph measures the size of the quarterly alteration in government nonwage expenditure as a per cent of current-dollar full-capacity expenditure in the first quarter. The zero point on the axis represents a level of GNW equal to its actual value in the quarter. The horizontal axis measures (in basis points) the change in short-term interest rates (R03). Lines on the charts join pairs of policies that produce the same impact on a particular target variable after six (three) quarters of application. It is possible to draw such lines for any endogenous variable whose value is thought to have some independent effect on welfare. On our charts we have drawn iso-target lines only for changes in total output (the relatively flat lines in Charts 4 to 7) and for foreign exchange reserves (the steeper lines). Since RDX1 is a preliminary model, we think it more important to illustrate how such a model can be used to assess alternative policies than to provide a complete set of charts purporting to show the effects of all feasible sets of policies on all potential target variables.

The income variable we use here is equal to private real expenditure (YGPK) plus the deflated value of government expenditure (GW + GNW/PGNE). The line marked "2%", for example, joins those pairs of monetary and fiscal policies that would make income

Chart 4

INCOME AND BALANCE OF PAYMENTS CONSEQUENCES OF MIXES OF MONETARY AND FISCAL POLICY 6Q AFTER POLICY CHANGE IN 1Q58

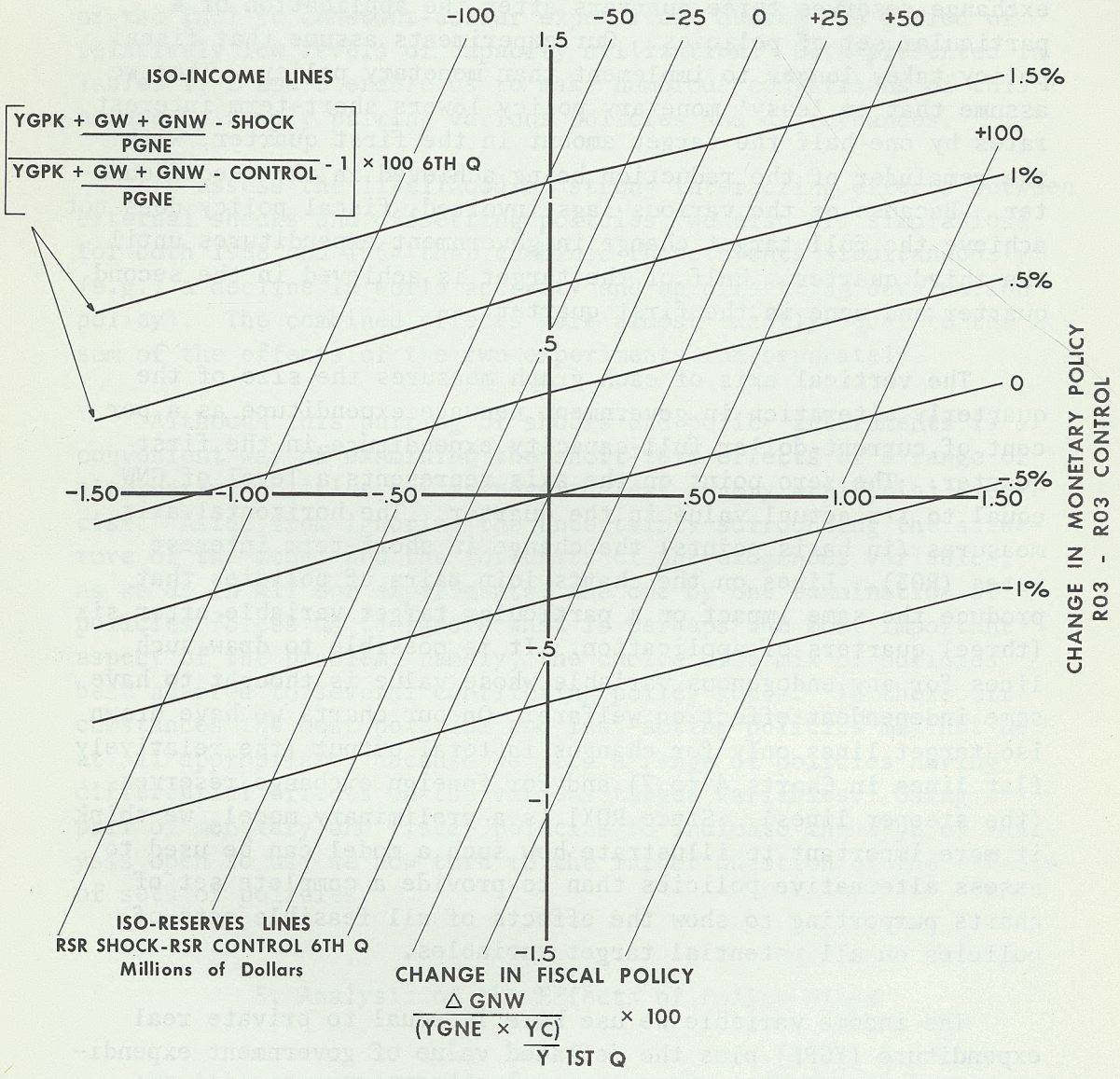


Chart 5

INCOME AND BALANCE OF PAYMENTS CONSEQUENCES OF MIXES OF MONETARY AND FISCAL POLICY 6Q AFTER POLICY CHANGE IN 1Q64

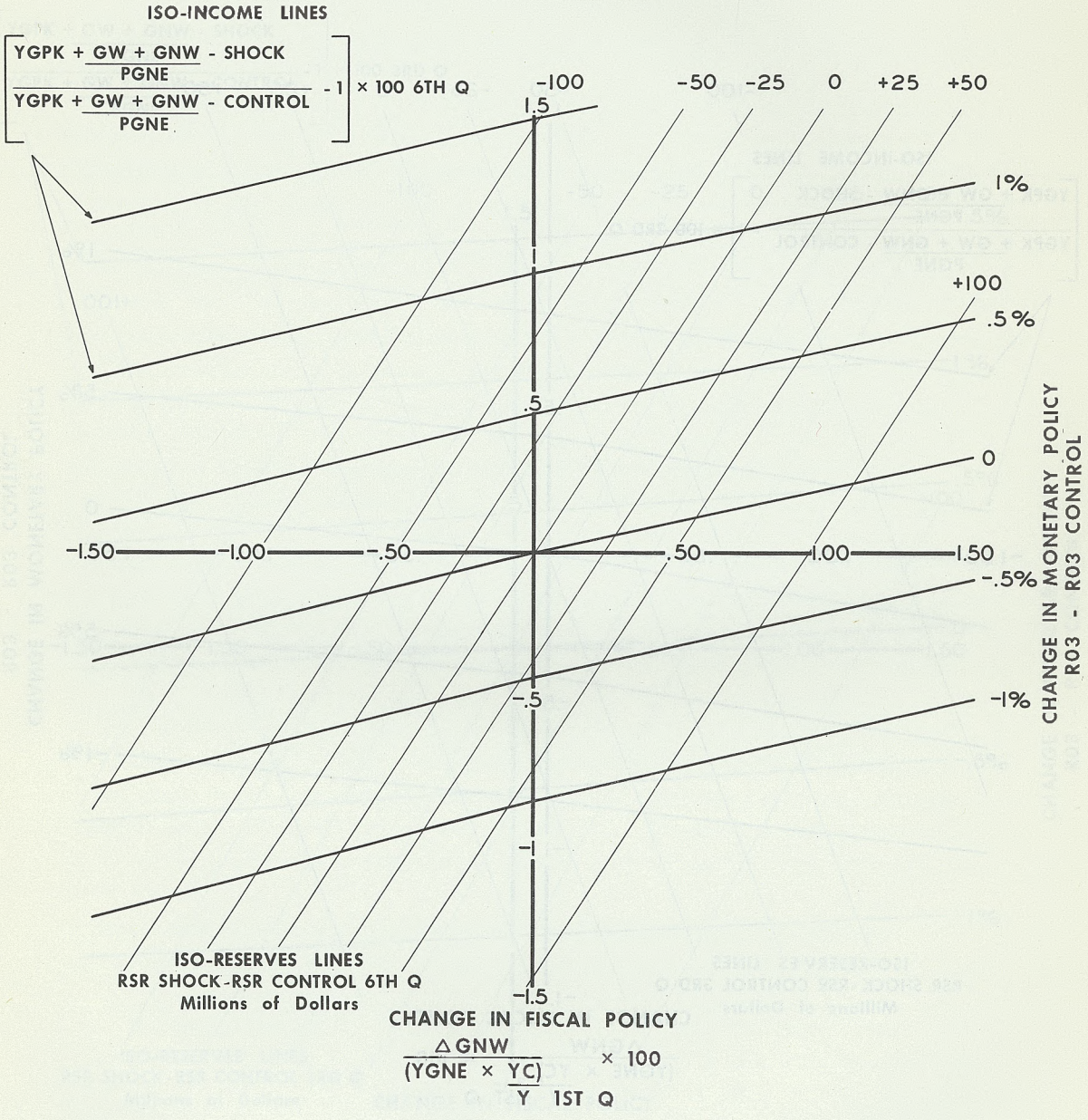


Chart 6

INCOME AND BALANCE OF PAYMENTS CONSEQUENCES OF MIXES OF MONETARY AND FISCAL POLICY 3Q AFTER POLICY CHANGE IN 1Q58

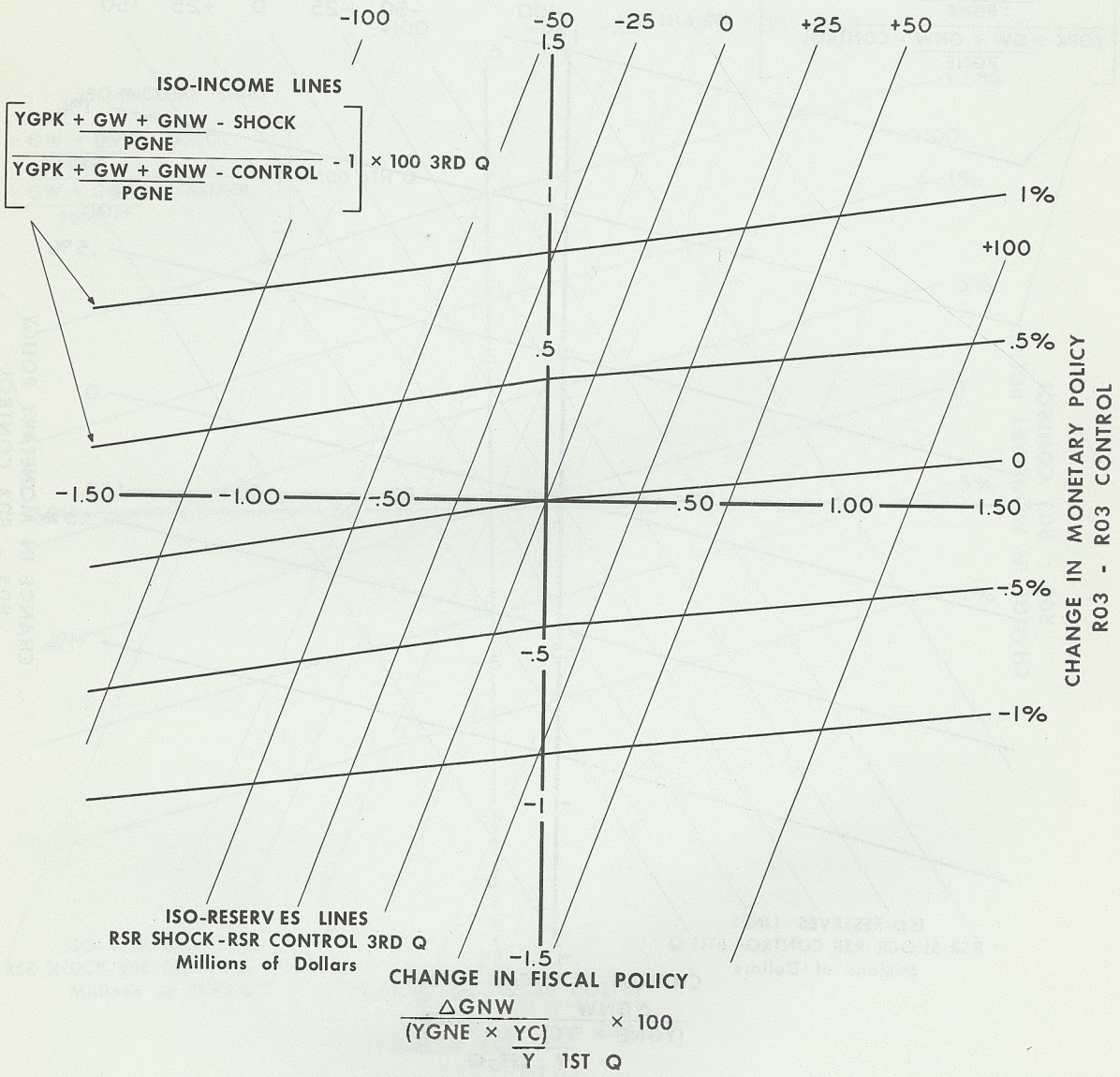


Chart 7

INCOME AND BALANCE OF PAYMENTS CONSEQUENCES OF MIXES OF MONETARY AND FISCAL POLICY 3Q AFTER POLICY CHANGE IN 1Q64

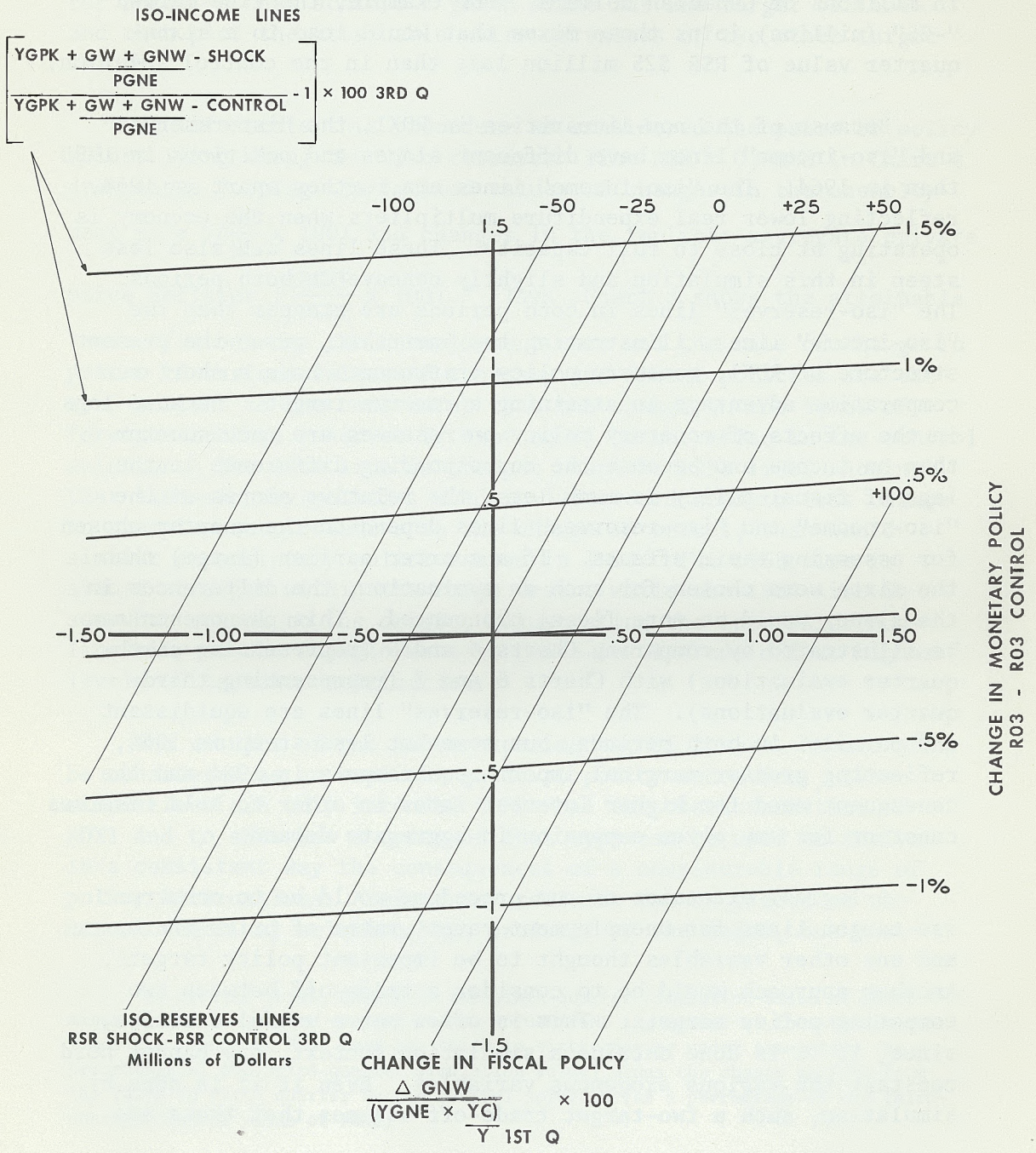
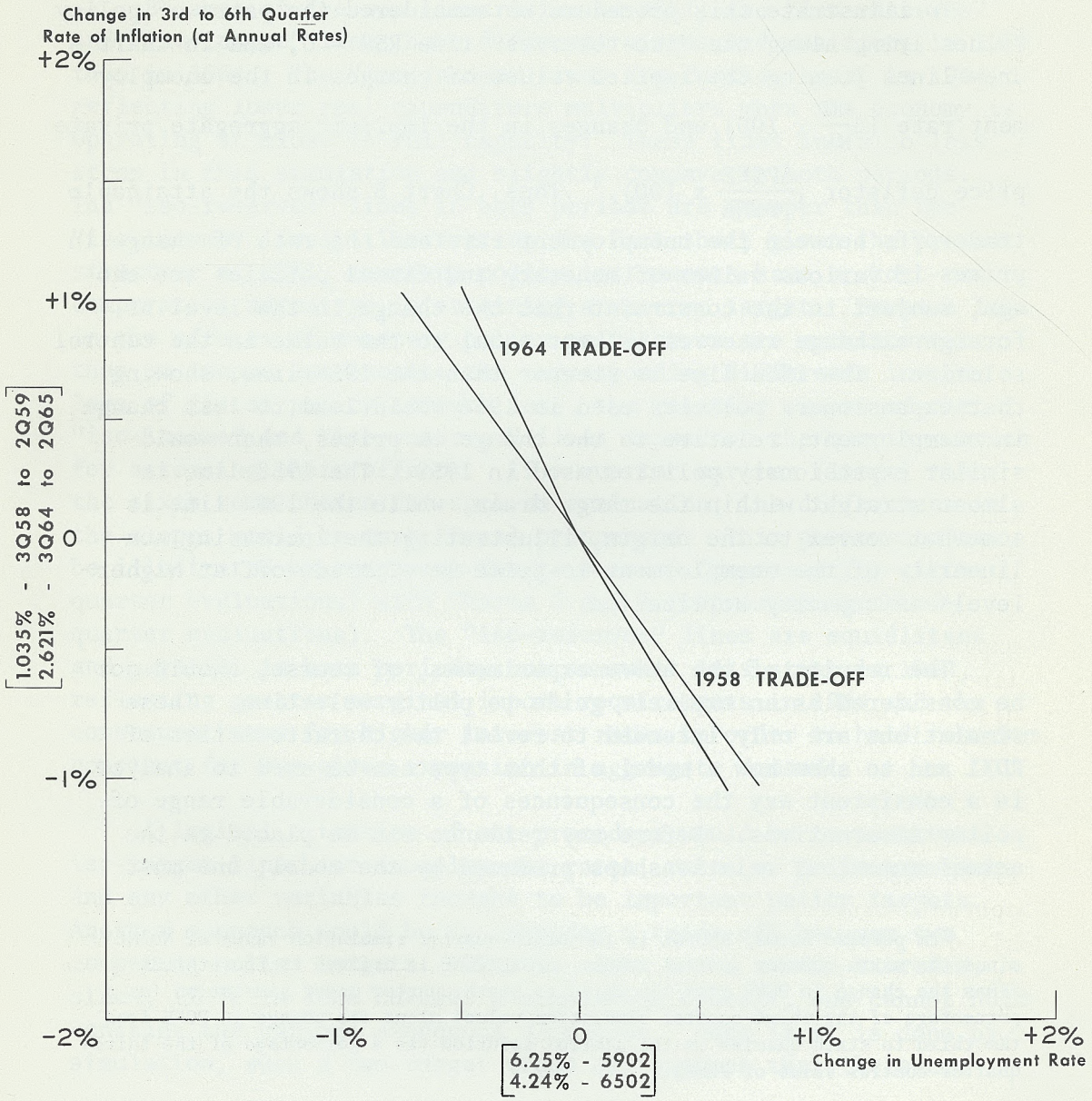


Chart 8

TRADE-OFFS BETWEEN INFLATION AND UNEMPLOYMENT USING POLICY MIXES THAT KEEP FOREIGN EXCHANGE RESERVES CONSTANT



take explicit account of the uncertainties surrounding its dynamic causal structure, the estimated coefficients in the equations, and the forecasts of the exogenous variables.

6. Some Additional Experiments

In order to assess the sensitivity of our simulation results to particular features of the structure of RDX1, we did a number of experiments that suppressed or altered certain of the model's mechanisms. The key relationships whose importance we wished to assess were those that dampen the induced expenditure effects of a change in bond-financed fiscal policy. We selected for particular attention the influence of induced changes in foreign trade, the degree of utilization of capital stock, tax and transfer payments, and prices.

The method followed in these tests was quite simple. We subjected the model several times to expansionary fiscal policies of the sort described earlier, each time removing the effects of the induced change in one of the above mechanisms by setting values of relevant variables equal to the values they took in the initial control solution. The specific changes and results are reported in the following text. As well, Table 4 shows the resulting induced changes in several key endogenous variables six, eight, and sixteen quarters after the application of an expansionary fiscal policy in 1Q58 (GNW + 100 million) and 1Q64 (GNW + 130 million). The first lines in the table show the consequences of expansionary fiscal policy if RDX1 is left as is, while the lower lines show the consequences of this policy if the specified mechanism is made inoperative.

(a) Foreign Trade

The effects of induced foreign trade are revealed by our first experiment, which sets both exports and imports at their control solution values. Table 4 shows, for example, that, after six quarters of fiscal expansion starting in 1Q58, induced changes in constant-dollar expenditure are more than ten times as great if no induced changes occur in imports and exports. The differences are somewhat less striking in 1964, because the remaining supply

TABLE 4

EFFECTS OF FISCAL POLICY ON VARIANTS OF RDX1
(Results reported after six, eight and sixteen quarters of simulations starting in 1Q58 and 1Q64)

Variables →		YGNE	GBAL	RSR	Y/P	C	I	M	X	PGNE	NU/NL	R03	WPH
Units →		Millions of current $			Millions of 1957 $					1957=1.0	Percentage Points		Cents
Fiscal policy applied to unaltered RDX1													
GNW + 100 million	2Q59	187	-51	-26	135	60	52	66	-17	.006	-.50	.23	1.4
	4Q59	208	-49	-22	160	81	68	73	-17	.005	-.53	.25	1.7
	4Q61	213	-48	-15	174	105	51	57	-10	.004	-.50	.20	3.0
GNW + 130 million	2Q65	266	-62	-45	136	74	48	79	-19	.010	-.38	.28	2.7
	4Q65	306	-56	-48	156	102	59	91	-21	.012	-.44	.32	4.0
	4Q67	271	-70	-31	139	106	30	54	-13	.008	-.02	.18	4.6
(a) Foreign trade experiments													
Trade leakages removed													
GNW + 100 million $\Delta(X-M)$ = control	2Q59	480	20	94	454	158	128	-1	-1	.001	-1.57	.26	2.3
	4Q59	688	58	146	655	262	211	0	0	0	-2.26	.33	3.7
	4Q61	1,358	98	255	1,073	597	370	1	-12	.021	-3.51	.43	15.8
GNW + 130 million $\Delta(X-M)$ = control	2Q65	654	29	91	436	189	105	0	-8	.014	-1.21	.29	6.4
	4Q65	1,011	84	140	612	309	167	1	-14	.025	-1.48	.37	10.9
	4Q67	1,336	167	159	727	530	225	0	-19	.033	-.68	.11	19.7
Alternative import equation													
GNW + 100 million MG with $1/4 \sum_{0}^{3} (1.03 - NU/NL)_{t-i}$	2Q59	196	-48	-23	146	64	56	64	-18	.006	-.52	.23	1.5
	4Q59	220	-46	-20	172	87	73	73	-17	.004	-.58	.25	1.7
	4Q61	223	-48	-16	171	106	50	59	-10	.004	-.49	.21	3.2
GNW + 130 million MG with $1/4 \sum_{0}^{3} (1.03 - NU/NL)_{t-i}$	2Q65	287	-55	-39	155	82	52	74	-20	.010	-.44	.29	2.8
	4Q65	364	-47	-44	179	116	67	90	-24	.013	-.55	.33	4.5
	4Q67	299	-65	-26	146	118	25	59	-15	.009	.02	.16	5.3

(b) Capacity utilization held constant in import equation

GNW + 100 million; $\frac{1}{4}\sum_{0}^{3}(Y/YC)_{t-i}$ = control	2Q59	222	-42	-5	174	73	62	55	-20	.005	-.61	.24	1.5
	4Q59	257	-38	-8	211	102	86	65	-20	.004	-.70	.26	1.9
	4Q61	271	-37	-7	209	132	68	59	-11	.005	-.63	.22	3.8
GNW + 130 million; $\frac{1}{4}\sum_{0}^{3}(Y/YC)_{t-i}$ = control	2Q65	314	-50	-29	176	90	57	65	-22	.010	-.50	.28	3.1
	4Q65	415	-36	-34	204	130	74	85	-27	.015	-.44	.34	5.3
	4Q67	306	-63	-29	148	123	23	50	-15	.011	.10	.13	5.8

(c) No induced changes in taxes and transfers

GNW + 100 million; ΔGBAL = control - ΔGNW	2Q59	231	-99	-29	174	97	74	85	-21	.006	-.55	.33	1.9
	4Q59	279	-99	-26	222	139	103	103	-23	.005	-.66	.37	2.5
	4Q61	394	-99	-22	299	231	114	110	-20	.008	-.74	.41	5.5
GNW + 130 million; ΔGBAL = control - ΔGNW	2Q65	323	-130	-55	180	124	67	101	-23	.011	-.46	.41	3.3
	4Q65	439	-130	-44	227	186	88	131	-26	.015	-.63	.51	3.0
	4Q67	479	-130	-53	259	252	75	109	-23	.013	-.13	.40	7.5

(d) No induced price changes

GNW + 100 million; PGNE, PND = control	2Q59	137	-54	-22	160	61	54	62	-13	0	-.62	.25	1.2
	4Q59	199	-50	-18	209	87	76	73	-13	0	-.73	.27	1.5
	4Q61	216	-49	-10	206	116	60	56	-6	0	-.69	.22	3.2
GNW + 130 million; PGNE, PND = control	2Q65	204	-75	-43	181	77	48	71	-12	0	-.59	.33	1.5
	4Q65	271	-71	-53	238	122	62	91	-13	0	-.93	.38	4.6
	4Q67	248	-78	-27	206	147	37	52	-6	0	-.23	.19	6.4

constraints are more strongly operative then than in 1958. Since this result showed us, amongst other things, that import leakages are the dominant cause of RDX1's relatively small expenditure multipliers, we also ran a simulation that altered the structure of the import equation while leaving imports endogenous. As the non-linear interaction of aggregate demand and capacity utilization is apparently necessary to get an accurate import equation, we kept this basic idea but substituted the degree of utilization of the labour force[4] for that of the capital stock. This new variable gave us an import equation with a somewhat poorer fit than the original, and produced only a slightly smaller import leakage when the model was subjected to expansionary fiscal policy under either 1958 or 1964 conditions. Thus our high import leakages are not simply a result of the particular capacity utilization variable we used in building the RDX1 trade equations.

(b) The Degree of Utilization of the Capital Stock

Although the size of the existing capital stock in relation to its desired level is the basic determinant of investment expenditure, our next experiment, recorded in Table 4, was not intended to shortcut this mechanism but rather to remove any foreign trade effects of the induced change in the import equation's capacity utilization term. When the four-quarter moving average of Y/YC is set equal to its control solution, the effects of any increase in capacity utilization on the propensity to import are eliminated. As can be seen from the results, this change increases induced constant-dollar expenditure after eight quarters by a factor of about 2 both in 1958 and in 1964. Thus changes in the degree of capacity utilization have a substantial impact, acting through the import equation, on the size of expenditure multipliers. Naturally, these effects would be much larger if we also cut off the induced investment in construction, machinery and equipment, and inventories.

[4]The new labour force utilization variable is equal to a four-quarter moving average of (1.03 - NU/NL), where NU/NL is the unemployment rate expressed as a proportion. 1.03 is used on the assumption that 3 per cent is a reasonable estimate of frictional unemployment.

(c) Tax and Transfer Payments

Our expansionary fiscal policy is assumed to be bond-financed to the extent that induced tax and transfer revenues do not cover the larger government expenditures. The basic simulation shown at the top of Table 4 indicates that about half the increase in government expenditure is offset by increases in tax and transfer revenues. It follows that if these induced revenues did not arise, the multiplier effects of the initial change in expenditures would be much greater. The experiment constraining the change in the government national accounts balance (GBAL) to be equal to the initial change in government expenditure shows that induced real expenditures are more than twice as great if the 'automatic stabilizers' are shut off. Certain more involved experiments we have undertaken with the tax and transfer mechanisms (reported in [3]) suggest, however, that if the initial expenditure shock is cyclical, rather than a once-and-for-all change, the automatic stabilizers do not necessarily decrease the induced changes in expenditure.

(d) Prices

Finally, we ran simulations designed to show how much larger the multipliers of RDX1 would be if induced price increases did not lead to various reductions in real domestic expenditure. The last results recorded in Table 4 show that when domestic prices are set equal to their control solution values, the real expenditure multipliers do increase very considerably, especially in 1964. This is as might be expected, since the induced price increases, and hence the importance of the various price effects on aggregate demand, are much greater in 1964 than in 1958.

7. Conclusion and Prospects

In performing various simulations with RDX1, we discovered a number of respects in which the model ought to be improved. On the basis of these ideas, we have embarked on further research. In this further research, we are interested not only in improving the less plausible elements of the structure of RDX1, but also in building a model that can be used to deal with a larger variety of questions. It is too early to give a precise description of

A P P E N D I X A

SECTORAL BREAKDOWN OF RDX1

A. PRIVATE AGGREGATE DEMAND

1. Consumer Expenditures
    1. Consumer Expenditure, Durables (CD) - Equation 2
    2. Consumer Expenditure, Non-Durables (CND) - Equation 7
    3. Consumer Expenditure, Services (CS) - Equation 8

2. Residential Construction
    1. Construction Costs (CLC) - Equation 6
    2. Housing Starts (HST) - Equation 21
    3. Investment, Residential Construction (IRC) - Equation 26
    4. Stock of Houses (STH) - Equation 68
    5. Conventional Mortgage Rate (RC) - Equation 63
    6. Price of Houses (PH) - Equation 57

    Technical Relationships and Identities
    1. Estimated Logarithm of Investment in Non-Residential Construction (LINE) - Equation 36
    2. Estimated Logarithm of Investment in Residential Construction (LIRE) - Equation 37
    3. Mortgage Rate (RM) - Equation 66

3. Gross Private Business Investment
    1. Investment, Machinery and Equipment (IME) - Equation 22
    2. Investment, Non-Residential Construction (INRC) - Equation 23
    3. Change in Non-Farm Business Inventories (INV) - Equation 25

    Technical Relationships and Identities
    1. Cash Flow Ratio (CFR) - Equation 3
    2. Trended Cash Flow Ratio (CFRT) - Equation 4
    3. Stock of Non-Farm Inventories (H) - Equation 16
    4. Stock of Machinery and Equipment (KME) - Equation 27
    5. Desired Stock of Machinery and Equipment (KMED) - Equation 28
    6. Gap between Desired and Actual Stock of Machinery and Equipment (KMEG) - Equation 29
    7. Trended Stock of Machinery and Equipment (KMEY) - Equation 30
    8. Stock of Non-Residential Construction (KNR) - Equation 31
    9. Desired Stock of Non-Residential Construction (KNRD) - Equation 32
    10. Gap between Desired and Actual Stock of Non-Residential Construction (KNRG) - Equation 33
    11. Trended Stock of Non-Residential Construction (KNRY) - Equation 34
    12. Undistributed Corporate Profits (PCRT) - Equation 53
    13. Long-Term Interest Rate Index (RLCI) - Equation 65
    14. Real Domestic Product less Agriculture (Y) - Equation 89
    15. Capacity Real Domestic Product less Agriculture (YC) - Equation 95

4. Foreign Trade
    1. Imports of Goods (MG) - Equation 40
    2. Imports of Services (MS) - Equation 41
    3. Exports of Goods (XG) - Equation 87
    4. Exports of Services (XS) - Equation 88

B. EMPLOYMENT, PRICES, AND INCOME DISTRIBUTION

1. Employment, Labor Force and Hours
    1. Average Hours Worked, Paid Non-Agricultural Workers (HAW) - Equation 17
    2. Paid Workers, Private Industry (NEPP) - Equation 43
    3. Employed, Unpaid Workers (NEUP) - Equation 44
    4. Labor Force (NL) - Equation 45

    Technical Relationships and Identities
    1. Trended Average Hours Worked (HAWT) - Equation 18
    2. Paid Workers, Total (NEP) - Equation 42
    3. Total Unemployed (NU) - Equation 51

2. Wages
    1. Private Wage Rate Per Man-hour (WPH) - Equation 85

    Technical Relationships and Identities
    1. Government Wage Expenditure (GW) - Equation 15
    2. Private Wages (WP) - Equation 84
    3. The Wage Bill (WSSL) - Equation 86

3. Prices
    1. Implicit Price Index, Consumer Durable Expenditure (PD) - Equation 55
    2. Implicit Private GNE Deflator (PGNE) - Equation 56
    3. Implicit Price Index, Consumer Non-Durable Expenditure (PND) - Equation 58
    4. Price Index, Goods Exports (PXG) - Equation 60
    5. Price Index, Service Exports (PXS) - Equation 61

    Technical Relationships and Identities
    1. Inventory Stock/Sales Ratio (HSL) - Equation 19
    2. Trended Inventory Stock/Sales Ratio (HSLT) - Equation 20
    3. Private Unit Labour Costs (ULC) - Equation 83

4. Income Components
    1. Dividends Paid to Canadians (DIVC) - Equation 10
    2. Dividends Paid to Foreigners (DIVF) - Equation 11
    3. Corporate Profits (PC) - Equation 52

    Technical Relationships and Identities
    1. Disposable Personal Income (YD) - Equation 96
    2. Permanent Real Disposable Personal Income (YDP) - Equation 97
    3. Gross National Expenditure (YGNE) - Equation 98
    4. Private Non-Farm Real Gross National Expenditure (YGPK) - Equation 99
    5. Personal Income (YP) - Equation 100
    6. Simulated Income-Expenditure Residual (YRES) - Equation 101

C. THE GOVERNMENT SECTOR

1. Personal Direct Taxes Sub-Model
    1. Total Number of Taxable Persons (NT) - Equation 46
    2. Total Personal Direct Taxes (TP) - Equation 79
    3. Assessed Taxable Income (YAS) - Equation 90

    Technical Relationships and Identities
    1. Accrued Personal Income Tax (AY) - Equation 1
    2. Number of Taxable Persons, Assessed Incomes between 0 and $3,000 (NT03) - Equation 47
    3. Number of Taxable Persons, Assessed Incomes between $3,000 and $5,000 (NT35) - Equation 48
    4. Number of Taxable Persons, Assessed Incomes between $5,000 and $10,000 (NT51) - Equation 49
    5. Number of Taxable Persons, Assessed Incomes over $10,000 (NT10) - Equation 50
    6. Assessed Taxable Income between 0 and $3,000 (YAS1) - Equation 91
    7. Assessed Taxable Income between $3,000 and $5,000 (YAS2) - Equation 92
    8. Assessed Taxable Income between $5,000 and $10,000 (YAS3) - Equation 93
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2. Other Tax Equations

    Government Revenue
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    2. Customs Duties (TCUS) - Equation 74
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    1. Government Balance (GBAL) - Equation 14
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3. Unemployment Insurance Fund Sub-Model
    1. Claimants Insured by Unemployment Insurance Fund (CL) - Equation 5
    2. Average Level of Enrolment in Unemployment Insurance Fund (INS) - Equation 24
    3. Unemployment Insurance Benefits (UIB) - Equation 81
    4. Unemployment Insurance Receipts (UIR) - Equation 82

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    1. Employed Contributors to Unemployment Insurance Fund (EMPS) - Equation 13

D. THE FINANCIAL SECTOR

1. Chartered Banks' Demand Deposits (DD) - Equation 9
2. Chartered Banks' Loans to Business (LB) - Equation 35
3. Chartered Banks' Loans to Persons (LP) - Equation 38
4. Short-Term Interest Rate (R03) - Equation 62
5. Long-Term Interest Rate (RLC) - Equation 64
6. Chartered Banks' Total Loan Authorizations over $100,000 (TA) - Equation 70

Technical Relationships and Identities

1. Chartered Banks' More Liquid Assets (ELA) - Equation 12
2. Chartered Banks' Personal Savings Deposits and Non-Personal Term Deposits (PNPS) - Equation 59
3. Chartered Banks' Total Major Assets (TBA) - Equation 71
4. Chartered Banks' Trended Total Major Assets (TBAT) - Equation 72
5. Chartered Banks' Total Deposits (TD) - Equation 75
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E. INTERNATIONAL CAPITAL FLOWS

1. Net Long-Term Capital Inflows (LTK) - Equation 39
2. Net Private Short-Term Capital Inflows (STK) - Equation 69

Technical Relationships and Identities

1. Change in Reserves as Defined by the Balance of Payments (RSR) - Equation 67

A P P E N D I X B

RDX1 STRUCTURAL EQUATIONS

O.L.S. = Ordinary least squares

T.S.F. = Two-stage Fisher

$\overline{R}^2$ = Adjusted coefficient of determination

SEE = Standard error of estimate

COV = Coefficient of variation, as a percentage

D/W = Durbin/Watson statistic

O.L.S. coefficients above, T.S.F. below

The absolute values of Student's t statistics are in brackets below each coefficient.

1. Accrued Personal Income Tax, 1Q50 - 4Q65

$$AY = \sum_{i=1}^{i=4} RW_i \, (YAS_i - NT_i YEX_i) - RDC \, (DIVC)$$

2. Consumer Expenditure, Durables, 1Q52 - 4Q65

$$CD = \underset{(3.06)}{340.6} - \underset{(8.31)}{0.0211}\, Q1(YDP) + \underset{(3.38)}{0.0077}\, Q2(YDP) - \underset{(7.11)}{0.0318}\, Q3(YDP) + \underset{(11.68)}{0.3500}\, YDP$$

$$\underset{(1.91)}{373.0} - \underset{(8.20)}{0.0211} + \underset{(3.30)}{0.0076} - \underset{(6.73)}{0.0315} + \underset{(7.00)}{0.3584}$$

$$+ \underset{(2.47)}{0.0662}\left(\frac{YD}{PGNE} - YDP\right) - \underset{(4.52)}{0.2551}\, YDP\left(\frac{PD}{PGNE}\right) - \underset{(2.86)}{44.62}\, RLC_{t-3}$$

$$\underset{(2.33)}{0.0627} - \underset{(2.70)}{0.2721} - \underset{(1.92)}{41.53}$$

O.L.S. $\bar{R}^2 = 0.962$, SEE = 33.83, COV = 5.107, D/W = 1.97

T.S.F. $\bar{R}^2 = 0.962$, SEE = 33.87, COV = 5.11, D/W = 1.95

3. Cash Flow Ratio

$$CFR = \left(\frac{CCAC + PCRT}{PGNE}\right)/CFRT$$

4. Trended Cash Flow Ratio, 1Q50 - 4Q65

$$CFRT = \underset{(9.01)}{272.1} + \underset{(13.88)}{8.698}\, T$$

O.L.S. $\bar{R}^2 = 0.752$
SEE = 92.61
COV = 14.05
D/W = 1.48

5. Claimants on the Unemployment Insurance Fund, 1Q52 - 4Q65

$$CL = \underset{(2.32)}{-0.2128} - \underset{(3.30)}{0.00328}\, T + \underset{(3.00)}{0.1064}\, INS + \underset{(22.42)}{1.218}\, Q1(NU) + \underset{(13.78)}{1.0621}\, Q2(NU)$$

$$\underset{(1.98)}{-0.2548} - \underset{(2.77)}{0.00372} + \underset{(2.45)}{0.1225} + \underset{(21.14)}{1.218} + \underset{(13.43)}{1.066}$$

$$+ \underset{(6.76)}{0.7248}\ Q3(NU) + \underset{(11.71)}{1.020}\ Q4(NU)$$

$$\underset{(6.64)}{0.7318} \qquad \underset{(11.30)}{1.025}$$

O.L.S. $\bar{R}^2 = 0.953$
SEE = 0.0416
COV = 11.26
D/W = 1.92

T.S.F. $\bar{R}^2 = 0.953$
SEE = 0.0417
COV = 11.28
D/W = 1.91

6. Construction Costs, 3Q55 - 4Q65

$$\ln CLC - \ln CLC_{t-4} = \underset{(.61)}{-0.00356} + \underset{(1.93)}{0.0418}\ (\ln INRC - LINE)_{t-1}$$

$$\underset{(.49)}{-0.00315} \qquad \underset{(1.90)}{0.0445}$$

$$+ \underset{(3.88)}{0.0902}\ (\ln IRC - LIRE)_{t-1} + \underset{(1.09)}{0.1246}\ (\ln WC - \ln WC_{t-4})$$

$$\underset{(3.45)}{0.0850} \qquad \underset{(.63)}{0.0781}$$

$$+ \underset{(2.60)}{0.1122}\ (\ln L - \ln L_{t-4}) + \underset{(3.34)}{0.0311}\ (\ln R03 - \ln R03_{t-4})$$

$$\underset{(2.26)}{0.1249} \qquad \underset{(3.40)}{0.0377}$$

$$+ \underset{(5.03)}{0.0279}\ DVST$$

$$\underset{(5.15)}{0.0298}$$

O.L.S. $\bar{R}^2 = 0.741$
SEE = 0.0136
D/W = 1.56

T.S.F. $\bar{R}^2 = 0.735$
SEE = 0.0138
D/W = 1.52

7. Consumer Expenditure, Non-Durables, 1Q52 - 4Q65

$$CND = \underset{(8.92)}{705.7} - \underset{(30.58)}{0.1010}\ Q1(YDP) - \underset{(26.18)}{0.0779}\ Q2(YDP) - \underset{(14.76)}{0.0845}\ Q3(YDP) + \underset{(12.73)}{0.9796}\ YDP$$

$$\underset{(5.49)}{589.8} - \underset{(30.00)}{0.1012} - \underset{(25.38)}{0.0775} - \underset{(14.65)}{0.0830} \underset{(7.82)}{0.8580}$$

$$+ \underset{(1.94)}{0.0673}\left(\frac{YD}{PGNE} - YDP\right) - \underset{(6.20)}{0.5556}\, YDP\left(\frac{PND}{PGNE}\right)$$

$$\underset{(1.63)}{0.0559} \qquad \underset{(3.23)}{- 0.4128}$$

O.L.S. $\bar{R}^2 = 0.992$, SEE = 44.39, COV = 1.63, D/W = 2.34

T.S.F. $\bar{R}^2 = 0.992$, SEE = 45.54, COV = 1.67, D/W = 2.13

8. Consumer Expenditure, Services, 1Q52 - 4Q65

$$CS = \underset{(5.84)}{-149.7} - \underset{(.19)}{0.000403}\, Q1(YDP) + \underset{(3.97)}{0.00856}\, Q2(YDP) - \underset{(5.32)}{0.0113}\, Q3(YDP) + \underset{(82.47)}{0.3813}\, YDP$$

$$\underset{(5.94)}{-152.1} - \underset{(.19)}{0.000403} \qquad \underset{(3.98)}{0.00857} \qquad - \underset{(5.32)}{0.0113} \qquad \underset{(82.51)}{0.3818}$$

O.L.S. $\bar{R}^2 = 0.992$, SEE = 32.29, COV = 1.64, D/W = .91

T.S.F. $\bar{R}^2 = 0.992$, SEE = 32.30, COV = 1.64, D/W = .91

9. Demand Deposits, 1Q55 - 4Q65

$$\frac{DD - DD_{t-1}}{TBA} = \underset{(3.24)}{0.0840} - \underset{(5.37)}{0.0158}\, Q1 - \underset{(2.92)}{0.00561}\, Q2 - \underset{(1.52)}{0.00473}\, Q3 - \underset{(6.11)}{0.2526}\frac{DD_{t-1}}{TBA}$$

$$\underset{(2.73)}{0.0742} - \underset{(4.91)}{0.0152} - \underset{(2.84)}{0.00549} - \underset{(1.71)}{0.00560} - \underset{(5.60)}{0.2426}$$

$$+ \underset{(1.12)}{0.03655}\frac{YGNE}{TBA} - \underset{(7.82)}{0.00825}\, R03 + \underset{(2.51)}{0.000247}\, S2_{t-1}$$

$$\underset{(1.38)}{0.0484} \qquad \underset{(7.42)}{- 0.00869} \qquad \underset{(2.61)}{0.000262}$$

O.L.S. $\bar{R}^2 = 0.840$, SEE = 0.0043, D/W = 1.75

T.S.F. $\bar{R}^2 = 0.838$, SEE = 0.0044, D/W = 1.77

10. Dividends Paid to Residents, 1Q53 - 4Q65

$$DIVC = \underset{(2.91)}{-22.00} - \underset{(2.87)}{13.23}\, Q2 - \underset{(4.26)}{19.70}\, Q3 + \underset{(20.13)}{0.0781}\, (PC + CCAC - TCA)$$

$$\underset{(2.79)}{-21.39} - \underset{(2.87)}{13.23} \qquad \underset{(4.26)}{- 19.68} \qquad \underset{(19.77)}{0.0778}$$

$$+ \underset{(20.13)}{0.0440}\ (PC + CCAC - TCA)_{t-1} + \underset{(20.13)}{0.0195}\ (PC + CCAC - TCA)_{t-2}$$

$$\underset{(19.77)}{0.0438} \qquad \underset{(19.77)}{0.0195}$$

$$+ \underset{(20.13)}{0.0049}\ (PC + CCAC - TCA)_{t-3}$$

$$\underset{(19.77)}{0.0049}$$

O.L.S. $\bar{R}^2 = 0.891$
SEE = 13.59
COV = 11.96
D/W = 0.57

T.S.F. $\bar{R}^2 = 0.891$
SEE = 13.59
COV = 11.97
D/W = 0.57

11. Dividends Paid to Non-Residents, 1Q53 - 4Q65

$$DIVF = \underset{(3.98)}{53.19} - \underset{(5.65)}{37.93}\ Q1 - \underset{(8.78)}{57.23}\ Q2 - \underset{(8.97)}{57.97}\ Q3 + \underset{(2.16)}{15.89}\ D8$$

$$\underset{(3.53)}{48.69} - \underset{(5.53)}{37.26} - \underset{(8.71)}{56.88} - \underset{(8.93)}{57.80} \underset{(1.84)}{13.84}$$

$$+ \underset{(7.81)}{0.0586}\ (PC + CCAC - TCA) + \underset{(7.81)}{0.0329}\ (PC + CCAC - TCA)_{t-1}$$

$$\underset{(7.88)}{0.0613} \qquad \underset{(7.88)}{0.0345}$$

$$+ \underset{(7.81)}{0.0146}\ (PC + CCAC - TCA)_{t-2} + \underset{(7.81)}{0.0037}\ (PC + CCAC - TCA)_{t-3}$$

$$\underset{(7.88)}{0.0153} \qquad \underset{(7.88)}{0.0038}$$

O.L.S. $\bar{R}^2 = 0.874$
SEE = 16.43
COV = 12.76
D/W = 2.08

T.S.F. $\bar{R}^2 = 0.874$
SEE = 16.46
COV = 12.78
D/W = 2.09

12. Chartered Banks More Liquid Assets

ELA = TBA - TL - OCS - VC - BCD

13. Employed Contributors to Unemployment Insurance Fund

EMPS = INS - CL

14. Government Balance

$$GBAL = TP + TOP + TCA + TI + TW + GIM + SSPS + UIR + GX - GW - GNW - MP - GTR - UIB - GINT - SUBS - ASST$$

15. Government Wage Expenditure

$$GW = WG(NEPG) + (GWI)$$

16. Stock of Non-farm Inventories

$$H = H_{t-1} + INV$$

17. Average Weekly Hours Worked, Paid Non-agricultural Workers, 1Q54 - 4Q65

$$\begin{aligned} HAW - HAW_{t-1} = {} & \underset{(8.68)}{53.36}\ Q1 + \underset{(8.98)}{54.88}\ Q2 + \underset{(8.47)}{53.97}\ Q3 + \underset{(8.39)}{52.70}\ Q4 - \underset{(0.84)}{0.01323}\ T(Q1) \\ & \underset{(4.68)}{53.86} \quad \underset{(4.84)}{55.41} \quad \underset{(4.57)}{54.55} \quad \underset{(4.54)}{53.24} \quad - \underset{(1.01)}{0.01710} \\ & - \underset{(1.49)}{0.02495}\ T(Q2) - \underset{(2.01)}{0.03608}\ T(Q3) - \underset{(1.00)}{0.01908}\ T(Q4) + \underset{(3.13)}{0.0006242}\ \left(YGPK + \frac{GNW}{PGNE}\right) \\ & - \underset{(1.61)}{0.02972} \quad - \underset{(2.04)}{0.04125} \quad - \underset{(1.09)}{0.02462} \quad \underset{(2.34)}{0.0007059} \\ & + \underset{(2.41)}{0.01895}\ \frac{NL}{NU} - \underset{(4.03)}{5.087}\ WPH - \underset{(8.51)}{1.230}\ HAW_{t-1} \\ & \underset{(1.69)}{0.01577} \quad - \underset{(2.84)}{5.272} \quad - \underset{(4.69)}{1.243} \end{aligned}$$

O.L.S. $\bar{R}^2 = 0.973$, SEE = 0.209, D/W = 1.90

T.S.F. $\bar{R}^2 = 0.973$, SEE = 0.209, D/W = 1.84

18. Trended Average Weekly Hours Worked, 3Q53 - 4Q65

$$\begin{aligned} HAWT = {} & \underset{(126.5)}{41.13}\ Q1 + \underset{(130.5)}{43.21}\ Q2 + \underset{(146.5)}{42.48}\ Q3 + \underset{(138.1)}{40.75}\ Q4 - \underset{(5.53)}{0.0340}\ T(Q1) - \underset{(6.88)}{0.0423}\ T(Q2) \\ & - \underset{(11.13)}{0.0607}\ T(Q3) - \underset{(5.06)}{0.0276}\ T(Q4) \end{aligned}$$

O.L.S. $\bar{R}^2 = 0.912$, SEE = 0.294, COV = 0.74, D/W = 1.41

19. Inventories Sales Ratio

$$HSL = \frac{H_{t-1}}{YGPK + (GNW/PGNE) - INV}$$

20. Trended Inventories Sales Ratio, 1Q50 - 4Q65

$$HSLT = \underset{(49.2)}{1.302} - \underset{(3.7)}{0.002057}\ T$$

O.L.S. $\bar{R}^2 = 0.172$
SEE = 0.08
COV = 6.70
D/W = 2.0

21. Housing Starts, 1Q57 - 4Q65

$$HST = \underset{(.96)}{28.58} - \underset{(8.67)}{20.21}\ Q1 + \underset{(3.76)}{7.984}\ Q2 + \underset{(3.89)}{7.766}\ Q3 + \underset{(2.55)}{9.350}\ WW + \underset{(3.16)}{9.258}\ \left(\frac{PH}{CLC}\right)$$

$$\underset{(.55)}{17.19} - \underset{(8.62)}{20.20}\ \underset{(3.65)}{7.810}\ \underset{(3.72)}{7.500}\ \underset{(2.34)}{8.708}\ \underset{(3.37)}{10.94}$$

$$- \underset{(3.85)}{12.03}\ RM_{t-1} + \underset{(1.27)}{2.662}\ (RM - RLC)_{t-1} + \underset{(1.31)}{2.868}\ \left(\frac{CMHC}{PH}\right) + \underset{(3.69)}{5.810}\ \left(\frac{CMHC}{PH}\right)_{t-1}$$

$$\underset{(3.96)}{-12.55}\ \underset{(1.50)}{3.244}\ \underset{(1.40)}{3.083}\ \underset{(3.65)}{5.771}$$

O.L.S. $\bar{R}^2 = 0.922$
SEE = 3.52
COV = 9.96
D/W = 1.84

T.S.F. $\bar{R}^2 = 0.921$
SEE = 3.55
COV = 10.03
D/W = 1.83

22. Investment, Machinery and Equipment, 1Q53 - 4Q65

$$IME - 0.05\ KME_{t-1} = \underset{(3.84)}{-212.8}\ Q1 - \underset{(1.87)}{132.7}\ Q2 - \underset{(3.97)}{271.0}\ Q3 - \underset{(3.72)}{233.6}\ Q4 + \underset{(5.58)}{0.1654}\ Q1(KMEG)$$

$$\underset{(3.40)}{-269.3} - \underset{(2.02)}{205.9} - \underset{(3.47)}{341.5} - \underset{(3.30)}{298.1}\ \underset{(5.27)}{0.1604}$$

$$+ \underset{(5.61)}{0.1665}\ Q2(KMEG) + \underset{(5.22)}{0.1442}\ Q3(KMEG) + \underset{(7.40)}{0.1977}\ Q4(KMEG) + \underset{(5.09)}{317.9}\ CFR$$

$$\underset{(5.18)}{0.1585}\ \underset{(5.01)}{0.1409}\ \underset{(7.05)}{0.1929}\ \underset{(4.23)}{383.2}$$

O.L.S. $\bar{R}^2 = 0.878$
SEE = 38.46
COV = 45.26
D/W = .87

T.S.F. $\bar{R}^2 = 0.875$
SEE = 38.94
COV = 45.83
D/W = .88

23. Investment, Non-residential Construction 1Q53 - 4Q65

$$INRC - 0.01\ KNR_{t-1} = -1.052\ T(Q1) + 1.878\ T(Q2) + 4.714\ T(Q3) + 2.942\ T(Q4)$$
$$(2.47) \qquad (4.52) \qquad (11.50) \qquad (7.33)$$

$$+ 0.0299\ KNRG + 299.1\ RLCI$$
$$(13.25) \qquad (15.13)$$

O.L.S. $\bar{R}^2 = 0.931$
SEE = 37.36
COV = 10.46
D/W = 1.25

24. Level of Enrolment in Unemployment Insurance Fund, 1Q52 - 4Q65

$$INS = -0.4422\ Q1 - 0.7563\ Q2 - 0.9460\ Q3 - 0.7588\ Q4 + 0.9695\ NEP(D5)$$
$$(.48) \qquad (.80) \qquad (.96) \qquad (.79) \qquad (3.70)$$
$$-2.375 \qquad - 2.770 \qquad - 3.033 \qquad - 2.796 \qquad 1.524$$
$$(2.14) \qquad (2.34) \qquad (2.53) \qquad (2.39) \qquad (4.78)$$

$$+ 1.002\ NEP(D6) + 0.00218\ T1(NEP)(D5) - 0.00346\ T2(NEP)(D6)$$
$$(4.90) \qquad (1.21) \qquad (2.08)$$
$$1.435 \qquad 0.00151 \qquad - 0.00680$$
$$(5.77) \qquad (.69) \qquad (3.41)$$

O.L.S. $\bar{R}^2 = 0.956$
SEE = 0.098
COV = 2.52
D/W = 1.12

T.S.F. $\bar{R}^2 = 0.952$
SEE = 0.102
COV = 2.63
D/W = 1.20

25. Change in Non-farm Business Inventories, 1Q56 - 4Q65

$$INV = 626.7 + 326.4\ Q1 + 160.3\ Q2 - 39.45\ Q3 - 0.1351\ H_{t-1}$$
$$(3.80) \quad (2.83) \qquad (1.91) \qquad (0.85) \qquad (3.02)$$
$$610.6 \quad 366.8 \qquad 58.80 \qquad - 83.63 \qquad - 0.0830$$
$$(3.68) \quad (3.05) \qquad (0.55) \qquad (1.54) \qquad (1.63)$$

$$+ 0.1601\ \left(YGPK - CS - INV + \frac{GNW}{PGNE}\right) - 0.1896\ \left[\left(YGPK - CS - INV + \frac{GNW}{PGNE}\right)\right.$$
$$(2.65) \qquad (2.26)$$
$$0.0855 \qquad - 0.1020$$
$$(1.21) \qquad (0.95)$$

$$- (YGPK - CS - INV + \frac{GNW}{PGNE}_{t-1}] \underset{(5.74)}{-271.9} \frac{NU}{\sum_{i=1}^{12} NU_{t-i}/12}$$

$$\underset{(5.64)}{-287.9}$$

O.L.S. $\bar{R}^2 = 0.809$
SEE = 72.43
D/W = 1.70

T.S.F. $\bar{R}^2 = 0.797$
SEE = 74.62
D/W = 1.80

26. Investment, Residential Construction, 1Q54 - 4Q65

$$IRC = \underset{(6.62)}{117.2} + \underset{(16.96)}{4.616}\ HST + \underset{(7.69)}{1.958}\ HST_{t-1} + \underset{(3.32)}{0.9238}\ HST_{t-2}$$

$$\underset{(6.56)}{117.9} \quad \underset{(16.42)}{4.600} \quad \underset{(7.70)}{1.958} \quad \underset{(3.29)}{0.9179}$$

O.L.S. $\bar{R}^2 = 0.886$
SEE = 22.06
COV = 5.91
D/W = 1.05

T.S.F. $\bar{R}^2 = 0.886$
SEE = 22.06
COV = 5.91
D/W = 1.05

27. Stock of Machinery and Equipment

$$KME = KME_{t-1} + IME - 0.05\ KME_{t-1}$$

28. Desired Stock of Machinery and Equipment

$$KMED = Y(KMEY)$$

29. Gap between Desired and Actual Stock of Machinery and Equipment

$$KMEG = 0.1000\ (KMED_{t-1} - KME_{t-2}) + 0.1500\ (KMED_{t-2} - KME_{t-3})$$

$$+ 0.3000\ (KMED_{t-3} - KME_{t-4}) + 0.2500\ (KMED_{t-4} - KME_{t-5})$$

$$+ 0.1500\ (KMED_{t-5} - KME_{t-6}) + 0.0500\ (KMED_{t-6} - KME_{t-7})$$

30. Trended Stock of Machinery and Equipment

$$KMEY = 1.903 - 0.0068\ T + 0.0061\ T(D7) - 0.4157\ D7$$

31. Stock of Non-residential Construction

$$KNR = (KNR_{t-1} + INRC) - 0.0100\ KNR_{t-1}$$

32. Desired Stock of Non-residential Construction

$$KNRD = Y(KNRY)\ CFR$$

33. Gap between Desired and Actual Stock of Non-residential Construction

$$KNRG = 0.0600\ (KNRD_{t-2} - KNR_{t-3}) + 0.1100\ (KNRD_{t-3} - KNR_{t-4})$$

$$+ 0.1600\ (KNRD_{t-4} - KNR_{t-5}) + 0.1700\ (KNRD_{t-5} - KNR_{t-6})$$

$$+ 0.1600\ (KNRD_{t-6} - KNR_{t-7}) + 0.1300\ (KNRD_{t-7} - KNR_{t-8})$$

$$+ 0.1100\ (KNRD_{t-8} - KNR_{t-9}) + 0.0700\ (KNRD_{t-9} - KNR_{t-10})$$

$$+ 0.0400\ (KNRD_{t-10} - KNR_{t-11})$$

34. Trended Stock of Non-residential Construction

$$KNRY = 3.103 + 0.0093\ T$$

35. Chartered Banks' Loans to Business, 1Q57 - 4Q65

$$LB - LB_{t-1} = \underset{(4.23)}{-308.0} - \underset{(2.99)}{0.0224}\ Q1(LB_{t-1}) + \underset{(4.09)}{0.0373}\ Q2(LB_{t-1}) + \underset{(6.08)}{0.0437}\ Q3(LB_{t-1})$$

$$- \underset{(3.90)}{0.3111}\ LB_{t-1} + \underset{(4.16)}{0.1514}\ TA + \underset{(2.14)}{0.1286}\ [PGNE\ (IME + INRC + INV)$$

$$- CCAC - PCRT] + \underset{(3.26)}{48.62}\ R03$$

O.L.S. $\bar{R}^2 = 0.820$
SEE = 44.28
D/W = 0.92
ρ = 0.419

36. Estimated Logarithm of Investment in Non-residential Construction, 1Q53 - 4Q65

$$LINE = \underset{(80.6)}{6.152} - \underset{(7.14)}{0.3851}\ Q1 - \underset{(1.70)}{0.9170}\ Q2 + \underset{(2.36)}{0.1276}\ Q3 + \underset{(5.37)}{0.0068}\ T$$

O.L.S. $\bar{R}^2 = 0.718$
SEE = 0.137
COV = 2.14
D/W = .23

(Attach between pages 52 and 53 using gummed edge of reverse side, page 52B)

37. Estimated Logarithm of Investment in Residential Construction, 1Q53 - 4Q65

$$\begin{array}{lllll} LIRE = 5.879 & - 0.3660\ Q1 & - 0.1029\ Q2 & - 0.0076\ Q3 & + 0.0027\ T \\ \quad (93.34) & (8.22) & (2.31) & (.17) & (2.55) \end{array}$$

O.L.S. $\bar{R}^2 = 0.65$
SEE = 0.113
COV = 1.92
D/W = .63

38. Chartered Banks' Loans to Persons, 3Q56 - 4Q65

$$\begin{array}{lllll} LP - LP_{t-1} = -533.8 & + 0.0342\ TBA & - 0.0124\ Q1(LP_{t-1}) & + 0.0313\ Q2(LP_{t-1}) & \\ \quad (7.99) & (4.62) & (2.92) & (6.37) & \end{array}$$

$$\begin{array}{lll} + 0.0377\ Q3(LP_{t-1}) & - 0.0626\ LP_{t-1} & + 752.7\ (\frac{ELA}{TBA})_{t-1} \\ (9.63) & (1.96) & (3.80) \end{array}$$

$$\begin{array}{l} - 11.88\ (RLC - R03)_{t-1} \\ (1.77) \end{array}$$

O.L.S. $\bar{R}^2 = 0.890$
SEE = 16.11
D/W = .99
$\rho = 0.480$

39. Net Long Term Capital Inflow, 1Q53 - 4Q65

$$\begin{array}{lllll} LTK = - 632.8 & + 108.2\ Q1 & - 77.32\ Q2 & - 92.02\ Q3 & - 0.00556\ (T-24)(IME + INRC)\ PGNE \\ \quad (5.40) & (2.88) & (2.17) & (2.35) & (3.76) \\ \quad - 653.2 & 113.3 & - 79.80 & - 96.25 & - 0.00548 \\ \quad (5.21) & (2.98) & (2.22) & (2.43) & (3.48) \end{array}$$

$$\begin{array}{llll} + 0.7430\ (IME + INRC)\ PGNE & - 193.0\ DLK1 & - 140.3\ DLK4 & + 0.3000\ PMB \\ (6.64) & (3.77) & (1.40) & (2.36) \\ 0.7624 & - 201.4 & - 153.4 & 0.2857 \\ (6.32) & (3.92) & (1.53) & (2.24) \end{array}$$

$$\begin{array}{l} + 177.0\ (RLC - RLUS) \\ (2.74) \\ 167.0 \\ (2.37) \end{array}$$

$$+ \underset{(1.32)}{0.0000247}\left[\frac{YGPK}{POP} - \left(\frac{YGPK}{POP}\right)_{t-1}\right] - \underset{(6.35)}{0.6389}\left[\frac{SP}{POP} - \left(\frac{SP}{POP}\right)_{t-1}\right]$$

$$\underset{(.47)}{0.0000255} \qquad - \underset{(6.24)}{0.6401}$$

O.L.S. $\bar{R}^2 = 0.982$
SEE = 0.0017
D/W = 1.88

T.S.F. $\bar{R}^2 = 0.982$
SEE = 0.0017
D/W = 1.88

46. Total Number of Taxable Persons

$$NT = \underset{}{-0.3053} + \underset{(66.86)}{0.7930}\,(NEP + NEUP) + \underset{(14.35)}{0.02544}\,T$$

O.L.S. $\bar{R}^2 = 0.987$
SEE = 0.108
COV = 1.98
D/W = .55

47. Number of Taxable Persons, Assessed Incomes between 0 and $3,000

NT03 = N03 (NT)

48. Number of Taxable Persons, Assessed Incomes between $3,000 and $5,000

NT35 = N35 (NT)

49. Number of Taxable Persons, Assessed Incomes between $5,000 and $10,000

NT51 = N51 (NT)

50. Number of Taxable Persons, Incomes over $10,000

NT10 = NT - NT03 - NT35 - NT51

51. Total Unemployed

NU = NL - NEPP - NEUP - NEPG

52. Corporate Profits, 1Q53 - 4Q65

$$PC = \underset{(1.86)}{-1133.}\,Q1 - \underset{(2.00)}{1169.}\,Q2 - \underset{(2.40)}{1348.}\,Q3 - \underset{(2.04)}{1190.}\,Q4 + \underset{(5.68)}{0.1745}\,[YGNE - INV(PGNE)]$$

$$\underset{(1.36)}{-904.6}\,Q1 - \underset{(1.52)}{970.1}\,Q2 - \underset{(1.90)}{1164.}\,Q3 - \underset{(1.54)}{985.2}\,Q4 + \underset{(5.72)}{0.1941}$$

(Attach between pages 54 and 55 using gummed edge of blank reverse side)

$$- 1341.\ WPH + 1.768\ (\tfrac{1}{4})\ \sum_{i=0}^{i=3}\ \left(\frac{Y}{NEPP}\right)_{t-i}$$
$$(5.62)\qquad (3.94)$$

$$- 1496. \qquad 1.702$$
$$(5.71)\qquad (3.50)$$

O.L.S. $\bar{R}^2 = 0.949$
SEE = 51.49
COV = 5.87
D/W = 1.38

T.S.F. $\bar{R}^2 = 0.948$
SEE = 51.76
COV = 5.90
D/W = 1.45

53. Undistributed Corporation Profits

PCRT = PC - DIVF - DIVC - TCA - CCB

54. Taxable Corporate Profits, 1Q50 - 4Q65

PCT = 125.1362 + 7.8163 T3 + 0.7591 PC
(6.85) (8.00) (24.32)

O.L.S. $\bar{R}^2 = 0.997$
SEE = 6.91
COV = 0.89
D/W = 1.98

55. Implicit Price Deflator, Consumer Durable Expenditure, 2Q52 - 4Q65

$$PD - PD_{t-1} = 0.0008\ Q1 - 0.0090\ Q2 - 0.0162\ Q3 + 0.0093\ Q4$$
$$(.27)\qquad (3.03)\qquad (4.92)\qquad (3.34)$$

$$0.00038 \quad - 0.0100 \quad - 0.0181 \quad 0.0091$$
$$(.13)\qquad (2.45)\qquad (3.39)\qquad (3.50)$$

$$+ 0.7603\ (PGNE - PGNE_{t-1})$$
$$(3.57)$$

$$0.9966$$
$$(1.59)$$

O.L.S. $\bar{R}^2 = 0.416$
SEE = 0.0104
D/W = 1.73

T.S.F. $\bar{R}^2 = 0.401$
SEE = 0.011
D/W = 1.77

56. Implicit Price Deflator, Gross National Private Expenditure, 1Q55 - 4Q65

$$PGNE = 0.1537 - 0.01096\ Q1 - 0.008114\ Q2 - 0.005894\ Q3 + 0.00009716\ WP$$
$$(3.48)\quad (3.26)\qquad (1.97)\qquad (1.30)\qquad (1.46)$$

$$0.1638 - 0.01027 \quad - 0.006954 \quad - 0.004147 \quad 0.0001164$$
$$(3.23)\quad (2.20)\qquad (1.10)\qquad (0.59)\qquad (1.49)$$

$$+ \underset{(4.24)}{0.3745}\ ULC + \underset{(8.50)}{0.3556}\ ULC_{t-1} + \underset{(6.46)}{0.3088}\ ULC_{t-2} + \underset{(4.28)}{0.2339}\ ULC_{t-3}$$

$$\underset{(2.18)}{0.3302} \qquad \underset{(6.48)}{0.3376} \qquad \underset{(4.50)}{0.3083} \qquad \underset{(2.72)}{0.2423}$$

$$+ \underset{(3.29)}{0.1310}\ ULC_{t-4} + \underset{(1.52)}{0.03089}\ PMG_{t-2} + \underset{(1.52)}{0.02270}\ PMG_{t-3} + \underset{(1.52)}{0.01576}\ PMG_{t-4}$$

$$\underset{(2.07)}{0.1395} \qquad \underset{(1.32)}{0.02917} \qquad \underset{(1.32)}{0.02143} \qquad \underset{(1.32)}{0.01488}$$

$$+ \underset{(1.52)}{0.01009}\ PMG_{t-5} + \underset{(1.52)}{0.00567}\ PMG_{t-6} + \underset{(1.52)}{0.00252}\ PMG_{t-7} + \underset{(1.52)}{0.00063}\ PMG_{t-8}$$

$$\underset{(1.32)}{0.00952} \qquad \underset{(1.32)}{0.00536} \qquad \underset{(1.32)}{0.00238} \qquad \underset{(1.32)}{0.00060}$$

$$- \underset{(4.11)}{0.1472}\left[\tfrac{1}{4}\sum_{i=0}^{3}(HSL - HSLT)_{t-i}\right] - \underset{(4.11)}{0.0828}\left[\tfrac{1}{4}\sum_{i=0}^{3}(HSL - HSLT)_{t-i}\right]_{t-1}$$

$$\underset{(2.68)}{-0.1200} \qquad \underset{(2.68)}{-0.0675}$$

$$- \underset{(4.11)}{0.0368}\left[\tfrac{1}{4}\sum_{i=0}^{3}(HSL - HSLT)_{t-i}\right]_{t-2} - \underset{(4.11)}{0.0092}\left[\tfrac{1}{4}\sum_{i=0}^{3}(HSL - HSLT)_{t-i}\right]_{t-3}$$

$$\underset{(2.68)}{-0.0300} \qquad \underset{(2.68)}{-0.0075}$$

O.L.S. $\bar{R}^2 = 0.988$, SEE = 0.0061, COV = 0.58, D/W = 1.19

T.S.F. $\bar{R}^2 = 0.988$, SEE = 0.0063, COV = 0.60, D/W = 1.19

57. Price of Houses, 1Q57 - 4Q65

$$PH = \underset{(1.80)}{72.20} + \underset{(1.44)}{1.406}\ Q1 + \underset{(3.92)}{4.003}\ Q2 + \underset{(2.18)}{2.036}\ Q3 - \underset{(2.85)}{199.3}\frac{STH}{HH} + \underset{(4.74)}{170.2}\ PGNE_{t-1}$$

$$\underset{(1.95)}{79.14} \qquad \underset{(1.49)}{1.467} \qquad \underset{(3.98)}{4.083} \qquad \underset{(2.22)}{2.075} \qquad \underset{(2.99)}{-212.3} \qquad \underset{(4.82)}{174.0}$$

$$+ \underset{(2.94)}{53.20}\left(\frac{YDP}{HH}\right)_{t-1}$$

$$\underset{(3.05)}{55.62}$$

O.L.S.	T.S.F.
$\bar{R}^2$ = 0.914	$\bar{R}^2$ = .914
SEE = 1.92	SEE = 1.92
COV = 1.77	COV = 1.77
D/W = 1.11	D/W = 1.14

58. Implicit Price Deflator, Consumer Non-durable Expenditure, 1Q55 - 4Q65

$$PND = \underset{(12.11)}{0.3573} - \underset{(4.89)}{0.01077}\,Q1 - \underset{(3.77)}{0.008508}\,Q2 - \underset{(1.74)}{0.004421}\,Q3 + \underset{(2.24)}{0.00009876}\,WP$$

$$\underset{(11.07)}{0.3502} - \underset{(4.96)}{0.01102} - \underset{(3.88)}{0.008837} - \underset{(1.91)}{0.005033} \underset{(1.82)}{0.00008730}$$

$$+ \underset{(7.80)}{0.2744}\,ULC + \underset{(7.80)}{0.1756}\,ULC_{t-1} + \underset{(7.80)}{0.0988}\,ULC_{t-2} + \underset{(7.80)}{0.0439}\,ULC_{t-3}$$

$$\underset{(7.42)}{0.2907} \quad \underset{(7.42)}{0.1861} \quad \underset{(7.42)}{0.1047} \quad \underset{(7.42)}{0.04652}$$

$$+ \underset{(7.80)}{0.01098}\,ULC_{t-4} + \underset{(5.94)}{0.09629}\,PMG_{t-2} + \underset{(5.94)}{0.07074}\,PMG_{t-3} + \underset{(5.94)}{0.04913}\,PMG_{t-4}$$

$$\underset{(7.42)}{0.01163} \quad \underset{(5.75)}{0.09614} \quad \underset{(5.75)}{0.07063} \quad \underset{(5.75)}{0.04905}$$

$$+ \underset{(5.94)}{0.03144}\,PMG_{t-5} + \underset{(5.94)}{0.01769}\,PMG_{t-6} + \underset{(5.94)}{0.00786}\,PMG_{t-7} + \underset{(5.94)}{0.00197}\,PMG_{t-8}$$

$$\underset{(5.75)}{0.03139} \quad \underset{(5.75)}{0.01766} \quad \underset{(5.75)}{0.00785} \quad \underset{(5.75)}{0.00196}$$

O.L.S.	T.S.F.
$\bar{R}^2$ = 0.987	$\bar{R}^2$ = 0.987
SEE = 0.0050	SEE = 0.0050
COV = 0.48	COV = 0.48
D/W = 1.48	D/W = 1.46

59. Chartered Banks' Personal Savings and Non-Personal Term Deposits

$$PNPS = TD - DD - DG$$

60. Implicit Price Deflator, Goods Exports, 1Q53 - 4Q65

$$PXG = \underset{(9.53)}{0.3154} + \underset{(8.28)}{0.2846}\,PGNE + \underset{(9.31)}{0.4018}\,PWXG$$

$$\underset{(9.55)}{0.3158} \quad \underset{(8.15)}{0.2822} \quad \underset{(9.33)}{0.4038}$$

O.L.S. $\bar{R}^2 = 0.902$
SEE = 0.012
COV = 1.20
D/W = 0.63

T.S.F. $\bar{R}^2 = 0.902$
SEE = 0.012
COV = 1.20
D/W = 0.63

61. Implicit Price Deflator, Service Exports, 1Q53 - 4Q65

$$PXS = -1.085 - 0.0198\ Q3 + 0.5105\ PXG + 1.593\ PGNE$$
$$\quad (10.73)\quad (2.52)\quad\ (2.97)\quad\ (15.93)$$

$$-1.179 - 0.0197\quad 0.6614\quad\ 1.535$$
$$(10.67)\quad (2.48)\quad\ (3.42)\quad\ (13.97)$$

O.L.S. $\bar{R}^2 = 0.963$
SEE = 0.024
COV = 2.29
D/W = 1.55

T.S.F. $\bar{R}^2 = 0.962$
SEE = 0.025
COV = 2.31
D/W = 1.56

62. Short-Term Interest Rate, 3Q53 - 4Q65

$$R03 = 3.180 + 0.5756\ RTUS + 0.00060\ [(IME + INV + INRC)PGNE - CCA - PCRT - GBAL]$$
$$\quad (4.71)\quad\ (6.74)\quad\ (4.08)$$

$$3.214\quad 0.5655\quad\ 0.00059$$
$$(4.54)\quad (6.30)\quad\ (3.74)$$

$$+ 0.00050\ [(IME + INRC + INV)PGNE - CCA - PCRT - GBAL]_{t-1}$$
$$(4.08)$$

$$0.00049$$
$$(3.74)$$

$$+ 0.00040\ [(IME + INRC + INV)PGNE - CCA - PCRT - GBAL]_{t-2}$$
$$(4.08)$$

$$0.00040$$
$$(3.74)$$

$$+ 0.00030\ [(IME + INRC + INV)PGNE - CCA - PCRT - GBAL]_{t-3}$$
$$(4.08)$$

$$0.00030$$
$$(3.74)$$

$$+ 0.00020\ [(IME + INRC + INV)PGNE - CCA - PCRT - GBAL]_{t-4}$$
$$(4.08)$$

$$0.00020$$
$$(3.74)$$

(Place over page 58 by wetting reverse side)

$$+ \underset{(4.08)}{0.00010}\ [(IME + INRC + INV)PGNE - CCA - PCRT - GBAL]_{t-5}$$

$$\underset{(3.74)}{0.00010}$$

$$- \underset{(5.74)}{9.580}\ \frac{ELA}{TBAT} - \underset{(3.43)}{1.558}\ \left(\frac{ELA}{TBAT}\right)_{t-1} + \underset{(4.18)}{2.713}\ \left(\frac{ELA}{TBAT}\right)_{t-2} + \underset{(4.98)}{3.232}\ \left(\frac{ELA}{TBAT}\right)_{t-3}$$

$$\underset{(4.98)}{-10.27} \qquad \underset{(3.31)}{- 1.569} \qquad \underset{(3.79)}{3.041} \qquad \underset{(4.35)}{3.564}$$

O.L.S. $\bar{R}^2 = 0.876$, SEE = 0.338, COV = 9.31, D/W = 1.40

T.S.F. $\bar{R}^2 = 0.875$, SEE = 0.339, COV = 9.33, D/W = 1.38

63. Conventional Mortgage Rate, 2Q54 - 4Q65

$$RC = \underset{(3.16)}{10.67} + \underset{(3.32)}{0.2508}\ RLC_{t-1} + \underset{(5.43)}{0.4871}\ RNHA - \underset{(7.84)}{0.003741}\ ALTM + \underset{(7.09)}{0.005457}\ MLTM_{t-1}$$

$$\underset{(3.30)}{11.28} \quad \underset{(3.46)}{0.2667} \qquad \underset{(5.30)}{0.4784} \qquad \underset{(7.84)}{- 0.003753} \qquad \underset{(7.19)}{0.005665}$$

$$+ \underset{(3.84)}{3.9927}\ \frac{YDP}{HH} - \underset{(3.25)}{10.6980}\ \left(\frac{STH}{HH}\right)_{t-1}$$

$$\underset{(2.85)}{3.3279} \qquad \underset{(3.20)}{- 10.5470}$$

O.L.S. $\bar{R}^2 = 0.949$, SEE = 0.097, COV = 1.44, D/W = 1.25

T.S.F. $\bar{R}^2 = 0.948$, SEE = 0.098, COV = 1.45, D/W = 1.26

64. Long-Term Interest Rate, 1Q53 - 4Q65

$$RLC = \underset{(4.71)}{0.1321}\ R03 + \underset{(3.18)}{0.2163}\ RLUS + \underset{(11.28)}{0.6969}\ (RLC)_{t-1}$$

$$\underset{(3.80)}{0.1195} \qquad \underset{(3.05)}{0.2164} \qquad \underset{(10.90)}{0.7071}$$

O.L.S. $\bar{R}^2 = 0.975$, SEE = 0.125, COV = 2.81, D/W = 1.42

T.S.F. $\bar{R}^2 = 0.975$, SEE = 0.125, COV = 2.81, D/W = 1.47

(Attach between pages 57A
and 59 using gummed edge of
reverse side, the new page 58)

65. Long-Term Interest Rate, Index

$$RLCI = 0.06 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-2} + 0.11 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-3}$$

$$+ 0.16 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-4} + 0.17 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-5}$$

$$+ 0.16 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-6} + 0.13 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-7}$$

$$+ 0.11 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-8} + 0.07 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-9}$$

$$+ 0.04 \left(\frac{\sum_{i=1}^{i=12} RLC_{t-i}/12}{RLC}\right)_{t-10}$$

66. Mortgage Rate

$$RM = (RC + RNHA)/2$$

67. Change in Official Reserves of Gold and U.S. Dollars

$$RSR = XG(PXG) + XS - MS - MG(PMG) + LTK + STK$$

68. Stock of Houses, 2Q54 - 4Q65

$$STH = \underset{(680.79)}{0.9997}\ STH_{t-1} + \underset{(2.85)}{0.2240}\ HST + \underset{(5.07)}{0.3723}\ HST_{t-1} + \underset{(4.69)}{0.2750}\ HST_{t-2} + \underset{(4.44)}{0.0961}\ HST_{t-3}$$

$$\underset{(651.6)}{0.9993} \qquad \underset{(2.49)}{0.2015} \qquad \underset{(5.25)}{0.4056} \qquad \underset{(4.99)}{0.3101} \qquad \underset{(4.78)}{0.1100}$$

O.L.S. $\bar{R}^2 = 0.9998$
SEE = 6.62
COV = 0.15
D/W = 2.02

T.S.F. $\bar{R}^2 = 0.9998$
SEE = 6.66
COV = 0.15
D/W = 2.02

69. Net Private Short-Term Capital Inflow, 1Q53 - 4Q65

$$STK = \underset{\substack{(.23)\\ 34.88}}{10.54} - \underset{\substack{(2.48)\\ -86.14}}{96.26\ Q3} + \underset{\substack{(1.35)\\ 3251}}{3144\ DRS} - \underset{\substack{(2.97)\\ -9729}}{9944\ DRSU} + \underset{\substack{(1.75)\\ 28074}}{21705\ DRSF} + \underset{\substack{(2.44)\\ 118.1}}{152.2\ DSK2}$$

$$+ \underset{\substack{(2.88)\\ 42.93}}{102.2\ (R03 - RTUS)} - \underset{\substack{(1.90)\\ -0.1210}}{0.2826\ LTK}$$
$$(.90) \qquad (.55)$$

O.L.S. $\bar{R}^2 = 0.382$
SEE = 112.9
D/W = 1.72

T.S.F. $\bar{R}^2 = 0.336$
SEE = 116.96
D/W = 1.78

70. Chartered Banks' Total Loan Authorizations over $100,000, 3Q56 - 4Q65

$$\frac{TA - TA_{t-1}}{TBA} = \underset{\substack{(0.29)\\ -0.0143}}{-0.00507} + \underset{\substack{(4.26)\\ 0.1312}}{0.1330\ \frac{ELA}{TBA}} + \underset{\substack{(6.88)\\ 0.0172}}{0.0193\ (RPR - RLC)} - \underset{\substack{(4.76)\\ -0.00659}}{0.00790\ (RLC - R03)}$$
$$(.73) \qquad (4.01) \qquad (5.45) \qquad (3.19)$$

$$- \underset{\substack{(5.58)\\ -0.3008}}{0.3567\ \frac{TA_{t-1}}{TBA}} + \underset{\substack{(8.49)\\ 0.00166}}{0.00186T}$$
$$(3.81) \qquad (6.11)$$

O.L.S. $\bar{R}^2 = 0.729$
SEE = 0.0033
D/W = 1.73

T.S.F. $\bar{R}^2 = 0.721$
SEE = 0.0034
D/W = 1.73

71. Chartered Banks' Total Major Assets

$$TBA = DD + PNPS + DG + CA + OTHL - OTHA$$

72. Chartered Banks' Trended Total Major Assets, 1Q52 - 4Q65

$$TBAT = \underset{(16.68)}{3611} + \underset{(34.31)}{170.2\ T(Q1)} + \underset{(35.12)}{171.2\ T(Q2)} + \underset{(35.97)}{172.4\ T(Q3)} + \underset{(36.78)}{173.3\ T(Q4)}$$

O.L.S. $\bar{R}^2 = 0.968$
SEE = 512.0
COV = 4.29
D/W = .18

73. Corporate Income Tax Accruals, 1Q52 - 4Q65

$$TCA = 0.9794\ RPC(PCT) + PLMT$$
$$(166.8)$$

$$0.9794$$
$$(166.6)$$

O.L.S. $\bar{R}^2 = 0.962$
SEE = 17.46
COV = 4.6
D/W = 1.38

T.S.F. $\bar{R}^2 = 0.962$
SEE = 17.46
COV = 4.60
D/W = 1.38

74. Customs Duties, 1Q52 - 4Q65

$$TCUS = 0.1201\ PMG(MG) - 0.0000189\ [PMG(MG)]^2 + 0.9876\ MG(SUR)PMG$$
$$(61.17) \qquad (16.20) \qquad (10.78)$$

$$0.1209 \qquad -0.0000195 \qquad 0.9857$$
$$(60.28) \qquad (16.25) \qquad (10.74)$$

$$-0.00461\ Q1\ (MG)PMG$$
$$(4.10)$$

$$-0.00473$$
$$(4.20)$$

O.L.S. $\bar{R}^2 = 0.963$
SEE = 4.69
COV = 3.64
D/W = 1.04

T.S.F. $\bar{R}^2 = 0.963$
SEE = 4.70
COV = 3.64
D/W = 1.05

75. Chartered Banks' Total Deposits

$$TD = \frac{BCD + BCN - ERL}{DCR} - FLO$$

76. Excise Duties, 1Q52 - 4Q65

$$TEX = 0.02299\ [CD(PD) + CND(PND)]$$
$$(109.2)$$

$$0.02299$$
$$(109.2)$$

O.L.S. $\bar{R}^2 = 0.920$
SEE = 5.60
COV = 7.04
D/W = 1.78

T.S.F. $\bar{R}^2 = 0.920$
SEE = 5.60
COV = 7.04
D/W = 1.78

77. Total Indirect Taxes

$$TI = TS + TCUS + TEX + TMIS$$

78. Chartered Banks' Total Loans

$$TL = LB + LBS + LF + LP + LMUN + LPRV + LH + LM$$

79. Total Personal Taxes, 1Q52 - 4Q65

$$TP = \underset{(97.31)}{1.105}\ (1/3\ AY_{t-1} + 2/3\ AY) - \underset{(1.20)}{0.006558}\ Q1 \sum_{i=1}^{i=4} AY_{t-i} + \underset{(7.41)}{0.04106}\ Q2 \sum_{i=2}^{i=5} AY_{t-i}$$

$$\underset{(97.35)}{1.106} \qquad - \underset{(1.24)}{0.006793} \qquad \underset{(7.37)}{0.04081}$$

O.L.S. $\bar{R}^2 = 0.972$
SEE = 27.91
COV = 5.84
D/W = 1.77

T.S.F. $\bar{R}^2 = 0.972$
SEE = 27.92
COV = 5.84
D/W = 1.77

80. Federal Sales Tax, 1Q55 - 4Q65

$$TS = \underset{(74.01)}{0.6326}\ PGNE[CND + CD]\ RSC + \underset{(9.90)}{.5504}\ PGNE[(RSIM)(IME) + .42\ (RSIR)(INRC + IRC)]$$

$$\underset{(73.93)}{0.6329} \qquad \underset{(9.81)}{0.5478}$$

O.L.S. $\bar{R}^2 = 0.943$
SEE = 19.30
COV = 7.03
D/W = 1.66

T.S.F. $\bar{R}^2 = 0.943$
SEE = 19.30
COV = 7.04
D/W = 1.66

81. Unemployment Insurance Benefits, 1Q52 - 4Q65

$$UIB = \underset{(.49)}{-1.657} - \underset{(1.78)}{.5816}\ Q1(S)(WR)CL + \underset{(2.32)}{.8562}\ Q2(S)(WR)CL$$

$$\underset{(1.12)}{-4.104} - \underset{(2.26)}{.7778} \qquad \underset{(2.06)}{.7758}$$

$$- \underset{(2.68)}{1.6359}\ Q3(S)(WR)CL - \underset{(9.72)}{3.5823}\ Q4(S)(WR)CL + \underset{(22.04)}{8.7352}\ (WR)CL$$

$$\underset{(2.45)}{-1.5587} \qquad - \underset{(9.84)}{3.7021} \qquad \underset{(21.05)}{9.0461}$$

O.L.S.		T.S.F.	
$\bar{R}^2$	0.966	$\bar{R}^2$	0.965
SEE	9.80	SEE	9.86
COV	11.94	COV	12.02
D/W	1.62	D/W	1.64

82. Unemployment Insurance Receipts, 1Q52 - 4Q65

$$UIR = \underset{(2.82)}{7.990} + \underset{(12.31)}{10.77}\ EMPS + \underset{(20.80)}{6.400}\ EMPS(D6) + \underset{(3.83)}{1.321}\ Q1(EMPS)S - \underset{(4.90)}{1.703}\ Q2(EMPS)S$$

$$\underset{(2.53)}{7.223} \quad \underset{(12.45)}{11.01} \quad \underset{(20.78)}{6.393} \quad \underset{(3.78)}{1.304} \quad - \underset{(4.97)}{1.729}$$

$$- \underset{(0.40)}{0.1407}\ Q3(EMPS)S + \underset{(0.15)}{0.0585}\ Q4(EMPS)S$$

$$- \underset{(.50)}{0.1770} \quad \underset{(0.09)}{0.0352}$$

O.L.S.		T.S.F.	
$\bar{R}^2$	0.987	$\bar{R}^2$	0.987
SEE	1.79	SEE	1.79
COV	3.17	COV	3.17
D/W	2.04	D/W	2.04

83. Private Unit Labor Cost

$$ULC = \frac{(WP)(NEPP)(1/12 \sum_{i=0}^{11} (\frac{YGPK}{YGPK + GNW/PGNE})_{t-i})}{YGPK}$$

84. Quarterly Compensation per Employee, Private Sector

$$WP = (WPH)(HAW)(13)$$

85. Compensation per Man-Hour, Private Sector, 1Q55 - 4Q65

$$\frac{WPH - WPH_{t-4}}{WPH_{t-4}} \times 100 = \underset{(2.02)}{-4.830} + \underset{(3.92)}{0.9383} [\tfrac{1}{4} \sum_{i=0}^{3} (\frac{PND - PND_{t-4}}{PND_{t-4}} \times 100)_{t-i}]$$

$$\underset{(1.98)}{-4.953} \quad \underset{(3.68)}{0.9308}$$

$$+ \underset{(4.55)}{0.005172} [\tfrac{1}{4} \sum_{i=0}^{3} (\frac{NU}{NL})_{t-i}]^{-2} + \underset{(2.41)}{88.64} [\tfrac{1}{4} \sum_{i=0}^{3} (\frac{PC - TCA}{YGPK})_{t-i}]$$

$$\underset{(4.42)}{0.005173} \quad \underset{(2.35)}{90.36}$$

$$- 0.2238 \left(\frac{WPH_{t-4} - WPH_{t-8}}{WPH_{t-8}} \times 100\right)$$
$$(1.63)$$

$$- 0.2208$$
$$(1.57)$$

O.L.S. $\bar{R}^2 = 0.655$
SEE = 1.13
D/W = 1.76

T.S.F. $\bar{R}^2 = 0.655$
SEE = 1.13
D/W = 1.77

86. Wages, Salaries and Supplementary Labor Income

WSSL = WP(NEPP) + WG(NEPG)

87. Exports of Goods, 1Q53 - 4Q65

$$XG = \underset{(3.60)}{1921} - \underset{(10.27)}{294.8}\,Q1 - \underset{(3.53)}{83.08}\,Q2 - \underset{(3.15)}{74.73}\,Q3 + \underset{(35.47)}{1455}\,AWI - \underset{(1.89)}{736.2}\left(Y - XG - \frac{XS}{PXS}\right)/YC$$

$$\underset{(3.23)}{2033} - \underset{(9.39)}{294.5} - \underset{(3.52)}{83.22} - \underset{(3.13)}{74.68} \quad \underset{(35.12)}{1453} - \underset{(1.47)}{721.2}$$

$$- \underset{(4.11)}{331.3}\frac{PXG}{PWXG} - \underset{(4.11)}{289.9}\left(\frac{PXG}{PWXG}\right)_{t-1} - \underset{(4.11)}{248.5}\left(\frac{PXG}{PWXG}\right)_{t-2} - \underset{(4.11)}{207.1}\left(\frac{PXG}{PWXG}\right)_{t-3}$$

$$\underset{(4.14)}{- 358.1} \quad \underset{(4.14)}{- 313.3} \quad \underset{(4.14)}{- 268.5} \quad \underset{(4.14)}{- 223.8}$$

$$- \underset{(4.11)}{165.6}\left(\frac{PXG}{PWXG}\right)_{t-4} - \underset{(4.11)}{124.2}\left(\frac{PXG}{PWXG}\right)_{t-5} - \underset{(4.11)}{82.82}\left(\frac{PXG}{PWXG}\right)_{t-6} - \underset{(4.11)}{41.41}\left(\frac{PXG}{PWXG}\right)_{t-7}$$

$$\underset{(4.14)}{- 179.0} \quad \underset{(4.14)}{- 134.3} \quad \underset{(4.14)}{- 89.51} \quad \underset{(4.14)}{- 44.76}$$

O.L.S. $\bar{R}^2 = 0.967$
SEE = 59.97
COV = 4.31
D/W = 1.33

T.S.F. $\bar{R}^2 = 0.967$
SEE = 60.05
COV = 4.33
D/W = 1.33

88. Exports of Services, 1Q52 - 4Q65

$$XS = \underset{(4.41)}{-107.8} - \underset{(8.22)}{97.33}\,Q1 - \underset{(1.58)}{18.66}\,Q2 + \underset{(10.41)}{123.2}\,Q3 + \underset{(22.95)}{487.9}\,AWS$$

O.L.S. $\bar{R}^2 = 0.942$
SEE = 31.31
COV = 7.47
D/W = 1.88

89. Real Domestic Product Less Agriculture

$$Y = \frac{YGNE + SUBS + INTF + DIVF - RES - TI - NRR - YFA + YX}{PGNE}$$

90. Assessed Taxable Income

$$YAS = \underset{(6.81)}{-493.8} + \underset{(71.99)}{0.8153}\ YP$$

O.L.S. $\bar{R}^2 = 0.997$
SEE = 0.324
COV = 1.80
D/W = 1.52

91. Assessed Taxable Income between 0 and $3,000

$$YAS1 = Y1(YAS)$$

92. Assessed Taxable Income between $3,000 and $5,000

$$YAS2 = Y2(YAS)$$

93. Assessed Taxable Income between $5,000 and $10,000

$$YAS3 = Y3(YAS)$$

94. Assessed Taxable Income over $10,000

$$YAS4 = YAS - YAS1 - YAS2 - YAS3$$

95. Capacity Real Domestic Product

$$YC = 0.5\left(\frac{KME}{KMEY} + \frac{KNR}{KNRY}\right)$$

96. Disposable Personal Income

$$YD = YP - TP - TOP$$

97. Permanent Real Disposable Income

$$YDP = 0.176 \sum_{i=0}^{i=7} \cdot 9^{i} \left(\frac{YD}{PGNE}\right)_{t-i}$$

98. Gross National Expenditure

$$YGNE = YGPK(PGNE) + GW + GNW + MP + INVF - RES - GX$$

99. Private Non-farm Real Gross National Expenditure

$$YGPK = CND + CD + CS + IME + INRC + IRC + INV + XG + \frac{XS}{PXS} - MG - \frac{MS}{PMS}$$

100. Personal Income

$$YP = WSSL + MP - SSPS - UIR + YF + YNFC + YI + DIVC + GINT + CCB - TW - GIM + GTR + UIB + YRES$$

101. Simulated Income - Expenditure Residual

$$YRES = YGNE + DIVF - WSSL - MP - YI - YNFC - IVA - YFA - TI - CCA + SUBS - PC - RES$$

A P P E N D I X C

LIST OF VARIABLES

APPENDIX C

LIST OF VARIABLES
(The 101 endogenous variables of the model are denoted by *)

	ALTM	Total assets (weighted) of trust and mortgage companies plus total assets less policy loans of twelve life insurance companies. Millions. (11240)
	ASST	Government capital assistance to industry. Millions. (11283)
	AWI	World activity index, 1957 = 1. (9863)
	AWS	World activity index for services, 1957 = 1. (8202)
*	AY	Personal income tax accruals. Millions. (11600)
	BCD	Chartered banks' Canadian dollar deposits at the Bank of Canada. Millions. (2795)
	BCN	Chartered banks' Canadian cash reserves, Bank of Canada notes. Millions. (399)
	CA	Chartered banks' capital account, shareholders' equity. Millions. (11208)
	CCA	Capital consumption allowances and miscellaneous valuation adjustments. Millions. (234)
	CCAC	Capital consumption allowances, corporations. Millions. (3711)
	CCB	Charitable contributions by corporations. Millions. (239)
*	CD	Personal expenditure on consumer durables. Millions of 1957 dollars. (141)
*	CFR	Cash flow ratio. The cash flow is the sum of corporate retained earnings (PCRT) and capital consumption allowances (CCAC) deflated by the implicit private GNE deflator (PGNE). CFR is the ratio of the cash flow to the trend value of the cash flow (CFRT). (11096)
*	CFRT	Trend value of the cash flow. (11310)
*	CL	Claimants on Unemployment Insurance Fund. Millions of persons. (11247)
*	CLC	Average cost of construction per square foot (including land) on new single detached NHA homes. (11369)
	CMHC	CMHC direct mortgage approvals. Millions. (11440)
*	CND	Personal expenditure on consumer non-durables. Millions of 1957 dollars. (140)
*	CS	Personal expenditure on consumer services. Millions of 1957 dollars. (139)
	D5	Dummy; equals 1 from first quarter 1952 to third quarter 1959, zero elsewhere. (11323)

	D6	Dummy; equals 1 from fourth quarter 1959, zero elsewhere. (11324)
	D7	Dummy; equals 1 from first quarter 1964, zero elsewhere. (11531)
	D8	Dummy; equals 1 from first quarter 1961, zero elsewhere. (11459)
	DCR	Required cash reserve ratio. (11527)
*	DD	Chartered banks' demand deposits less float. Millions. (699)
	DG	Chartered banks' Government of Canada deposits. Millions. (386)
*	DIVC	Dividends paid to Canadians by Canadian companies. Millions. (2406)
*	DIVF	Dividends paid to non-residents by Canadian companies. Millions. (227)
	DLK1	Dummy; equals 1 from third quarter 1963, zero elsewhere. (11108)
	DLK4	Dummy; equals 1 in fourth quarter 1965, zero elsewhere. (11109)
	DRS	First difference of the Canadian price of U.S. dollars. Canadian dollars per U.S. dollar. (5691)
	DRSF	Defined as DRS from third quarter 1962, zero elsewhere. (11243)
	DRSU	Defined as DRS from third quarter 1961 to second quarter 1962, zero elsewhere. (11242)
	DSK2	Dummy; equals 1 in each quarter of 1965, zero elsewhere. (11244)
	DVST	Dummy variable for sales tax on building materials; equals 1 from third quarter 1963 to second quarter 1966, zero elsewhere. (11027)
*	ELA	Chartered banks' more liquid assets (including foreign assets). Millions. (11296)
*	EMPS	Employed contributors to Unemployment Insurance Fund. Millions of persons. (11246)
	ERL	Chartered banks' excess legal reserves. Millions. (11297)
	FLO	Chartered banks' float, estimated net Canadian dollar items in transit. Millions. (11282)
*	GBAL	Total government national accounts surplus (if positive) or deficit (if negative). Millions. (1385)
	GIM	Total investment income, all levels of government. Millions. (1361)

	GINT	Interest on the public debt. Millions. (1375)
	GNW	Government nonwage expenditure. Millions. (11068)
	GTR	Government transfer payments to persons, excluding interest on the public debt and unemployment insurance benefits. Millions. (11287)
*	GW	Government wage payments, public administration. Millions. (11067)
	GWI	Government wage payments, institutional sector. Millions. (11379)
	GX	Correction for seasonality in quarterly series for government wage and non-wage expenditure. Millions. (11601)
*	H	Stock of non-farm inventories. Millions of 1957 dollars. (11636)
*	HAW	Average weekly hours worked by non-agricultural paid workers. (1205)
*	HAWT	Trend value of HAW. (11414)
	HH	Number of families in Canada. Thousands. (3054)
*	HSL	Inventory stock/sales ratio. (11637)
*	HSLT	Trend value of inventory stock/sales ratio. (11638)
*	HST	Total number of dwelling starts. Thousands. (3064)
*	IME	Investment in machinery and equipment. Millions of 1957 dollars. (11306)
*	INRC	Investment in non-residential construction. Millions of 1957 dollars. (11307)
*	INS	Average quarterly level of enrolment in Unemployment Insurance Fund. Millions of persons. (11257)
	INTF	Interest payments to non-residents. Millions. (11651)
*	INV	Change in non-farm business inventories. Millions of 1957 dollars. (150)
	INVF	Farm inventories and grain in commercial channels. Millions. (219)
*	IRC	Investment in new residential construction. Millions of 1957 dollars. (145)
	IVA	Inventory valuation adjustment. Millions. (231)
*	KME	Stock of machinery and equipment. Millions of 1957 dollars. (11309)
*	KMED	Desired stock of machinery and equipment. Millions of 1957 dollars. (11316)
*	KMEG	Gap between desired and actual stock of machinery and equipment. Millions of 1957 dollars. (11317)

*	KMEY	Trend value of machinery and equipment capital/output ratio. (11315)
*	KNR	Stock of non-residential construction. Millions of 1957 dollars. (11314)
*	KNRD	Desired stock of non-residential construction. Millions of 1957 dollars. (11313)
*	KNRG	Gap between desired and actual stock of non-residential structures. Millions of 1957 dollars. (11090)
*	KNRY	Trend value of non-residential construction capital/output ratio. (11311)
	L	Index of land costs on new single detached NHA homes. 1957 = 100. (11372)
*	LB	Chartered banks' business loans over $100,000. Millions. (11271)
	LBS	Chartered banks' business loans under $100,000. Millions. (11272)
	LF	Chartered banks' loans to instalment finance companies. Millions. (693)
	LH	Chartered banks' insured mortgages. Millions. (3993)
*	LINE	Estimated trend value of ln INRC. (11449)
*	LIRE	Estimated trend value of ln IRC. (11450)
	LM	Chartered banks' farm, CSB, grain dealer and institution loans. Millions. (11290)
	LMUN	Chartered banks loans to municipalities. Millions. (692)
*	LP	Chartered banks' loans to persons. Millions. (11042)
	LPRV	Chartered banks' loans to provinces. Millions. (691)
*	LTK	Net long-term capital inflow. Millions. (9143)
*	MG	Imports of goods. Millions of 1957 dollars. (9147)
	MLTM	Weighted sum of total mortgage holdings of trust, mortgage and twelve life insurance companies. Millions. (11645)
	MP	Military pay and allowances. Millions. (225)
*	MS	Imports of services. Millions. (9149)
	N03	Proportion of total persons taxable with taxable incomes between 0 and $3,000. (11302)
	N35	Proportion of total persons taxable with taxable incomes between $3,000 and $5,000. (11303)

	N51	Proportion of total persons taxable with taxable incomes between $5,000 and $10,000. (11305)
	N10	Proportion of total persons taxable with taxable incomes over $10,000. (11304)
*	NEP	Total number of paid workers. Millions of persons. (11064)
	NEPG	Paid workers, public administration and defense. Millions of persons. (11060)
*	NEPP	Paid workers, private sector. Millions of persons. (11059)
*	NEUP	Employed, unpaid workers. Millions of persons. (11062)
*	NL	Total civilian labour force. Millions of persons. (11141)
	NRR	Income received from non-residents. Millions. (11322)
*	NT	Total number of persons taxable, calculated. Millions of persons. (11544)
*	NT03	Number of persons taxable with taxable incomes between 0 and $3,000, calculated. Millions of persons. (11545)
*	NT35	Number of persons taxable with taxable incomes between $3,000 and $5,000, calculated. Millions of persons. (11546)
*	NT51	Number of persons taxable with taxable incomes between $5,000 and $10,000, calculated. Millions of persons. (11547)
*	NT10	Number of persons taxable with taxable incomes over $10,000. Millions of persons. (11548)
*	NU	Total unemployed. Millions of persons. (11063)
	OCS	Chartered banks' other Canadian securities. Millions. (3950)
	OTHA	Chartered banks' all other assets. Millions. (11209)
	OTHL	Chartered banks' all other liabilities. Millions. (11038)
*	PC	Corporation profits before taxes and before dividends paid to non-residents. Millions. (226)
*	PCRT	Undistributed corporation profits. Millions. (1393)
*	PCT	Taxable corporation profits. Millions. (11647)
*	PD	Implicit price index of consumer durable expenditure. 1957 = 1. (11384)
*	PGNE	Deflator of gross national expenditure, less government expenditure and less farm inventories. 1957 = 1. (9153)
*	PH	Index of housing prices. 1957 = 100. (11070)

PLMT Provincial logging and mining taxes. Millions. (11626)

PMB Net new issues of provincial and municipal securities. Millions. (11465)

PMG Implicit price index of goods imports. 1957 = 1. (9145)

PMS Implicit price index of services imports. 1957 = 1. (9151)

* PND Implicit price index of personal expenditure on consumer non-durables. 1957 = 1. (11423)

* PNPS Chartered banks' personal savings and non-personal term and notice deposits. Millions. (11644)

POP Civilian, non-institutional population. Millions of persons. (11308)

POPT Total Canadian population. Millions of persons. (3032)

PWXG Price index of world exports in Canadian dollars. 1957 = 1. (9154)

* PXG Implicit price index of goods exports. 1957 = 1. (9144)

* PXS Implicit price index of services exports. 1957 = 1. (9150)

Q1 First-quarter seasonal dummy. 1 in first quarter, zero elsewhere. (11073)

Q2 Second-quarter seasonal dummy. 1 in second quarter, zero elsewhere. (11074)

Q3 Third-quarter seasonal dummy. 1 in third quarter, zero elsewhere. (11075)

Q4 Fourth-quarter seasonal dummy. 1 in fourth quarter, zero elsewhere. (11076)

* R03 Average yield on short-term Government of Canada bonds, zero to three years. (1365)

* RC Conventional mortgage rate. (1096)

RDC Rate of dividend tax credit. (11006)

RES Residual error of estimate. Millions. (235)

* RLC Average yield on long-term Government of Canada bonds, ten or more years to maturity. (2764)

* RLCI Twelve-quarter moving index of RLC. (11091)

RLUS U.S. corporation bond yield. (11466)

* RM Mortgage rate. (11318)

	RNHA	Maximum NHA mortgage rate. (245)
	RPC	Weighted marginal rate of corporation income tax. (11007)
	RPR	Chartered banks' prime loan rate. (397)
	RSC	Sales tax rate on consumption goods. (11025)
	RSIM	Sales tax rate on machinery and equipment. (11620)
	RSIR	Sales tax rate on non-residential construction. (11621)
*	RSR	Change in official foreign exchange reserves. Millions of Canadian dollars. (11289)
	RTUS	Market yield on U.S. Government three-month bills. (4255)
	RW1	Weighted tax rate for 0 to $3,000 class. (11019)
	RW2	Weighted tax rate for $3,000 to $5,000 class. (11020)
	RW3	Weighted tax rate for $5,000 to $10,000 class. (11021)
	RW4	Weighted tax rate for over $10,000 class. (11022)
	S	Dummy; equals 1 from first quarter 1959 to fourth quarter 1967, zero elsewhere. (11327)
	S2	Four-quarter moving variance of holding period yield on five-year rate. (2702)
	SP	Number of persons going to school. Millions of persons. (11396)
	SSPS	Social security and pension contributions net of employer and employee payments into Unemployment Insurance Fund. (11285)
*	STH	Stock of houses. Thousands of units. (3057)
*	STK	Net private short-term capital inflow. Millions. (9139)
	SUBS	Total subsidies from all levels of government. Millions. (1378)
	SUR	Amount of surcharge that would have been collected had the 1961 volume of goods imports been maintained through the surcharge period, second quarter 1962 to fourth quarter 1963. (11010)
	T	Time trend, equals 1 in first quarter 1947. (11142)
	T1	Time trend; equals 6 in first quarter 1952 increasing to third quarter 1959, zero elsewhere. (11325)
	T2	Time trend; equals 1 in first quarter 1959 increasing to fourth quarter 1967, zero elsewhere. (11326)

	T3	Time trend; a step function, equals 1 in each quarter of 1950, 2 in 1951, etc. (11625)
*	TA	Chartered banks' total business loan authorizations outstanding over $100,000. Millions. (11273)
*	TBA	Chartered banks' total major assets. Millions. (383)
*	TBAT	Time trend of chartered banks' total major assets. Millions. (11572)
*	TCA	Corporation income tax accruals. Millions. (1352)
*	TCUS	Customs import duties. Millions. (2157)
*	TD	Chartered banks' total Canadian deposits including government deposits. Millions. (384)
*	TEX	Excise duties. Millions. (2158)
*	TI	Total indirect taxes. Millions. (1358)
*	TL	Chartered banks' total loans. Millions. (11291)
	TMIS	Indirect taxes other than the federal sales tax, and customs and excise duties. Millions. (11288)
	TOP	Total personal direct taxes other than personal income taxes. Millions. (11321)
*	TP	Personal income tax collections. Millions. (11560)
*	TS	Federal sales tax collections. Millions. (11270)
	TW	Federal withholding taxes. Millions. (1357)
*	UIB	Federal transfers to persons, unemployment insurance benefits. Millions. (2167)
*	UIR	Employer and employee contributions to Unemployment Insurance Fund. Millions. (2178)
*	ULC	Unit labour costs in the private sector. (11649)
	VC	Bank of Canada notes at chartered banks. Millions. (389)
	WC	Average hourly earnings of hourly rated construction workers. (2486)
	WG	Average quarterly wage in the government sector. (11057)
*	WP	Average quarterly wage in the private sector. (11056)

*	WPH	Average hourly wage in the private sector. (11425)
	WR	Weighted maximum rate of unemployment insurance payments. (11248)
*	WSSL	Wages, salaries and supplementary labour income. Millions. (224)
	WW	Dummy winter works variable; equals 1 in fourth quarter 1963 and each fourth quarter thereafter, zero elsewhere. (11320)
*	XG	Exports of goods. Millions of 1957 dollars. (9146)
*	XS	Exports of services. Millions. (9148)
*	Y	Real domestic product less agriculture. Millions of 1957 dollars. (11312)
	Y1	Proportion of total assessed income in 0 to $3,000 class. (11393)
	Y2	Proportion of total assessed income in $3,000 to $5,000 class. (11394)
	Y3	Proportion of total assessed income in $5,000 to $10,000 class. (11395)
	Y4	Proportion of total assessed income in over $10,000 class. (11398)
*	YAS	Total assessed income, calculated. Millions. (11550)
*	YAS1	Total assessed income in 0 to $3,000 class. Millions. (11551)
*	YAS2	Total assessed income in $3,000 to $5,000 class. Millions. (11552)
*	YAS3	Total assessed income in $5,000 to $10,000 class. Millions. (11553)
*	YAS4	Total assessed income in over $10,000 class. Millions. (11554)
*	YC	Capacity real domestic product less agriculture. Millions of 1957 dollars. (11446)
*	YD	Personal disposable income. Millions. (1398)
*	YDP	Permanent real disposable income. Millions of 1957 dollars. (3052)
	YEX1	Average exemptions claimed by taxpayers with assessed incomes between 0 and $3,000. Dollars. (11556)
	YEX2	Average exemptions claimed by taxpayers with assessed incomes between $3,000 and $5,000. Dollars. (11557)
	YEX3	Average exemptions claimed by taxpayers with assessed incomes between $5,000 and $10,000. Dollars. (11558)
	YEX4	Average exemptions claimed by taxpayers with assessed incomes over $10,000. Dollars. (11559)

YF Income of farm operators excluding accruals. Millions. (11005)

YFA Accrued net income of farm operators from farm production. Millions. (229)

* YGNE Gross national expenditure at market prices. Millions. (223)

* YGPK Gross national expenditure less government expenditure and less farm inventories. Millions of 1957 dollars. (11069)

YI Rent, interest and miscellaneous investment income. Millions. (228)

YNFC Net income of non-farm unincorporated business. Millions. (230)

* YP Personal income. Millions. (240)

* YRES Simulation residual; defined to be zero over estimation period but equilibrating income and expenditure sides of national accounts under simulation. (11528)

YX Real domestic product less agriculture residual; defined to reconcile the national accounts definition with the figures published by the Dominion Bureau of Statistics in index form. Millions. (11650)

APPENDIX D

The Compleat RDX1

This flow chart, "The Compleat RDX1" (Chart 10), prepared by André Lemelin, provides the most compact description of the causal structure of RDX1. Every equation of the model is represented by a box. Each such box contains in the upper right part the number of the equation and the abbreviation for the name of the dependent variable explained by the equation. In the lower right part of each box are listed the names of the independent variables in that equation. In the left part of the box are listed the numbers of the equations into which the dependent variable enters as an independent variable. Arrows trace the routes of influence from each box to each other equation where that dependent variable appears as an independent variable. The one exception is provided by the basic price variable, PGNE, whose influences are so pervasive that they do not permit individual lines to be easily drawn. Therefore a line has been placed across the top of the chart originating at the box for the PGNE equation. This line contains a series of black triangles above the various equations that PGNE enters as an explanatory variable.

The schematic chart (Chart 9) on page 79 has labels for the sectors of RDX1 as they are laid out in the flow chart. In the larger chart (Chart 10) heavy black lines enclose the various sectors labelled in the smaller chart (Chart 9).

Chart 10 is worth some study, for it is the most convenient source of information about the causal structure of RDX1. Appendix B does give additional information about the nature and magnitude of the effects acting directly in each equation, but there is no way of telling how the dependent variable in each equation plays a role, in its turn, in other equations of the model. The flow chart does this for us by means of the arrows and also by means of the lists of equation numbers in the left part of each equation box.

One thing that the flow chart will not do is reveal anything about the dynamic behaviour of RDX1, except to indicate where the lagged value of a variable appears in its own equation. Since most of the lags in RDX1 are polynomial distributions involving several past periods, the dynamic behaviour of the whole system is too complicated to be captured in a flow chart. An understanding of the flow chart is thus only a first step towards an understanding of the dynamics of RDX1.

Chart 9

MAJOR SECTORS OF THE COMPLEAT RDX1