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Not for publication

The Effects of the Tax Cut[1/]

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Revised version of a paper prepared for the System Committee on Business Analysis, Cleveland, Ohio, April 23-24, 1964

There are, I think, four different points that must be considered in attempting to assess the likely effects of the recently enacted tax cut: (1) the amount and timing of the reductions; (2) the likely "initial" response by consumers to the extra take-home pay; (3) the probable size of the multiplier that will multiply the initial response into its total effect on GNP; and (4) the possibility of accelerator effects. This paper attempts to deal with each of these questions in turn. Its most significant contribution, however, I think is the presentation in section 2 of a statistically estimated consumption function that is both rather simple and yet apparently quite stable and thus perhaps reliable for forecasting purposes.

The amount and timing of the reductions. One of the interesting aspects of the tax bill is that no one seems to have any very precise idea as to just how much extra income was given to consumers. According to Treasury estimates, the 1964 and scheduled 1965 rate reductions together amount to a cut in personal tax liabilities of $9.5 billion, $400 million of which is offset by revenue reform measures. The net cut of $9.1 billion is a shade less than 2 per cent of the 1963 fourth quarter personal income figure that was used as a base for the calculation. In terms of 1964 or 1965 income levels, the cut is, of course, somewhat larger than $9.1 billion. Indeed, my own projections imply that at the 1965 income level the cut in tax liabilities will amount to about $10.6 billion. The calculations presented in this paper, however, make use of the estimates based on the lower 1963-IV income level.

A question that is even more crucial than the size of the over-all tax cut is its allocation between calendar years 1964 and 1965. On a liability

1/ The views expressed in this paper are not necessarily those of the Federal Reserve Bank of New York.

basis, the answer is not too difficult. It appears that about \$6.1 billion of the total is applicable to calendar year 1964, and the additional \$3.0 billion is applicable to 1965 (see Table I). As has been well publicized, however, the reduction in the withholding rate to 14 per cent on March 5, 1964 somewhat overshot the cut in tax liabilities for the current year. There is a need, therefore, to estimate the size of the 1964 cut on a cash basis, and it is this calculation that presents the problem. The difficulty, of course, is that the calculation involves some assumption as to what extent individuals will take it upon themselves to adjust their withholding rate so as not to be caught with the need for making a substantial final settlement next April.

Table I

Estimated Allocation of 1964 and 1965 Tax Cuts
(Billions of dollars)

	Cumulative Cut, in Full-Year Terms Liability Basis	Cash Basis
1964	6.1	7.2
1965 first half	9.1	8.0
1965 second half	9.1	9.1

If all individuals do take steps to change their withholding rates so as to avoid the final payment burden in 1965, then quite obviously the extra cash available in 1964 will be the same as the cut in tax liabilities--namely \$6.1 billion. On the other hand, to the extent that such adjustments in the withholding rate are not made, the effect of lowering the withholding rate to 14 per cent will, according to my estimates, provide about \$7.2 billion in extra cash in consumer pockets in 1964.[2/] So far as I know, there has been no broad

2/ As in the other calculations, this estimate is based on the level of personal income in the fourth quarter of 1963. The Treasury's estimate that the lower withholding rate freed \$800 million a month apparently was based on an assumed 1964 income level.

study as to what individuals are doing with their withholding rates. A "survey" of two New York City employers indicated that about 10 per cent of their employees had asked to have their withholding stepped up somewhat. If this "sample" is representative of the country at large, then the amount of the 1964 tax cut will in fact probably be closer to the $7.2 billion cut in withholding than to the smaller reduction in liabilities. The calculations presented below are based on a $7.2 billion figure for 1964.

It should be pointed out that a tax cut of $7.2 billion on a cash basis for 1964 implies that extra final payments next year will amount to $1.1 billion dollars. Thus, even with the second stage cut in tax liabilities at the start of 1965, the net tax cut on a cash basis for the first half of next year will amount to only $8.0 billion, rather than the full rate reduction of $9.1 billion (see Table I). Once the final payments and refunds are out of the way, the size of the over-all cut should move up to the total $9.1 billion annual rate level.

The likely "initial" response by consumers. There have been several econometric studies attempting to estimate the lag in consumer response to changes in income. Each of these studies, however, seems to have some serious defect that precludes its application to the question raised here.[3/] For this reason I have estimated some equations of my own, and from the fair range of alternatives presented in the appendix have chosen what seems to be the best of the lot to discuss in detail. The equation, estimated from quarterly data at seasonally

3/ One such article is that by Albert Ando and E. Cary Brown, "Lags in Fiscal Policy," which appeared in the CMC volume of study papers entitled Stabilization Policies, pages 97-163. Unfortunately the figures for disposable income used in this study for some reason do not agree with the total published by the Commerce Department.

adjusted annual rates for the period from the first quarter of 1952 through the fourth quarter of 1963,[4] is as follows:

$$C_t = 0.167 + \underset{(0.100)}{0.248}\, Y_t + \underset{(0.126)}{0.334}\, (Y_t - Y_{t-1}) + \underset{(0.103)}{0.215}\, (Y_{t-1} - Y_{t-2}) + \underset{(0.107)}{0.733}\, C_{t-1}$$

$R^2 = .99907$ $\qquad S_e = 1.55$ $\qquad DW = 1.91$

where C is personal consumption expenditures and Y is disposable personal income.

As is quite evident, each of the coefficients in this equation is statistically significant at least at a 5 per cent level of confidence, the standard error of estimate is small by most relevant comparisons, and the Durbin-Watson ratio is quite good. To be sure, even with the high Durbin-Watson ratio, the residuals do show some cyclical pattern, with the equation exhibiting a tendency to over-estimate consumption slightly during recession periods (see Chart I).[5] In none of the other equations tried, however, was the Durbin-Watson ratio any higher than in the one above, and in all other cases the standard error of estimate was slightly larger and the R^2 slightly smaller than for this equation.

One of the significant implications of this and every other equation that was estimated is that after a sufficient amount of time has elapsed somewhere between 93 and 94 per cent of any change in disposable income is spent

4/ Data from the 1946-51 period were not included in the regression because of the extreme erraticness of the consumption-disposable income ratio in those years. Only after the working off of some of the excessive liquidity that had been stored up during World War II and the ending of the scare buying that accompanied the start of the Korean War did the consumption function settle down to its standard textbook form. I find it difficult to believe that the experience of those immediate postwar years can be very helpful at all in estimating consumer behavior in the current period.

5/ Curiously, there is also a persistent tendency to overestimate consumption in third quarters, suggesting either a shifting marginal propensity to consume during each year, or more plausibly a difference in the seasonal adjustment factors for income and consumption.

for personal consumption. In particular, the long-run marginal propensity to consume estimated from the above equation is 93.1 per cent. The immediate response is not this large, however, and the above equation implies that only 58.3 per cent of any income change will be spent in the same quarter that the change occurs (see Table II). By the second quarter the response implied by the above equation is up to 89.1 per cent and it rises gradually from that point on until reaching the long-run level of 93.1 per cent.

Table II

Amount of Extra Consumption in Successive Quarters following a Permanent Rise in Disposable Income, expressed as a percentage of the income change
(figures derived from equation cited in text)

Quarters After the Income Change	Extra Consumption as a per cent of income change
1	58.3
2	89.1
3	90.2
4	91.0
5	91.6
6	92.0
7	92.3
8	92.5
Long-run MPC	93.1

I might add a word or two more about this implied response pattern. All of the better equations that were estimated--i.e., those with high values for R^2 and for the Durbin-Watson ratio--implied a first-quarter response of about 60 per cent of the change in income. Thus, I think the 58.3 per cent figure cited can be used with a fair degree of confidence. For the second quarter, however, the evidence is not so unanimous, with some equations implying an 80 per cent response and others a response that is closer to 90 per cent. By the third quarter, there is agreement once again at around a 90 per cent response rate.

One other question might be asked relative to the above equation--namely, how did it perform in the period following the 1954 tax cut? That cut went into effect on January 1, 1954 and amounted to $1.3 billion, or a little less than 0.5 per cent of fourth-quarter 1953 personal income. By and large, the residuals from the above regression equation during the 1954-55 period do not seem overly large (see Chart I). In the first quarter of 1954 the equation very slightly over-estimates consumption, but after that consumption in each of the following six quarters is somewhat underestimated. The excess of actual consumption over the predicted amount from 1954-II to 1955-III seems to be related largely to the rapid rise in consumer credit during that period--a variable that was not included in the regression equation. This rise in consumer credit could, of course, have been related directly to the effects of the tax cut, in which case the above estimates of a response to the tax cut might be judged somewhat too conservative. Alternatively and I think more plausibly, however, the rise in consumer credit probably reflected the over-all improvement in consumer sentiment as the economy emerged from the recession, in which case the estimates of the direct response to the tax cut would not be in serious error.

In any event, for purposes here, I assume that the response implied by the above equation is not in serious error, and thus have applied the response rates shown in Table II to the actual 1964 and scheduled 1965 tax cuts (measured on a cash basis) to obtain a predicted increase in consumption stemming from the tax cut. The responses for the successive three-month periods following the March 5 effective date of the tax cut were allocated into calendar quarters on a pro rata basis. I estimate that the "initial" (or first round) response to the tax cut in the first quarter of 1964 should have resulted in a $1.2 billion increase in the seasonally adjusted annual rate of consumption, and that for the current quarter the initial response should amount to $4.8 billion (see Table III).

The estimates for this first-round response rise somewhat further over the balance of this year and next, and eventually reach $8.5 billion--i.e., 93.1 per cent of the $9.1 billion tax cut.

Table III

"Initial" Consumption Response to 1964 and 1965 Tax Cuts
(Seasonally adjusted annual rates in billions of dollars)

Quarter		Extra Amount of Consumption	
1964	I	1.2	
	II	4.8	
	III	6.4	
	IV	6.5	1964 Average = 4.8
1965	I	7.0	
	II	7.3	
	III	8.0	
	IV	8.4	1965 Average = 7.7
Long-run		8.5	

The probable size of the multiplier. The numbers presented thus far represent only the first-round response to the extra income provided directly by the tax cut. They do not take account of the multiple effects on income and consumption that will occur once these initial round expenditures work their way around the economy. An estimate of the total effect on the economy requires some assumption about the size of the multiplier.

For the purposes here, I have assumed simply that the long-run multiplier is 2.5. This seems to be well within the range of current opinion, and has been confirmed in some of my own work. For example, one very simple quarterly model that I have estimated relating GNP to the total of GNP minus consumption expenditures implies a multiplier for an exogenous shift in expenditures of 2.65. I have also examined Lawrence Klein's quarterly econometric model and found that it implies an average multiplier of 2.68 for the full year following an exogenous expenditure change--quite close to the estimate derived from the simple model. Just for the record, I might point out that a somewhat lower estimate of the expenditure multiplier seems to be implied in the revised version of the Michigan Universtiy econometric model that Daniel Suits presented last October in which he estimated that a $6.3 billion tax cut would produce an extra $12.0 billion rise in GNP.

By the same token that there is a lag in the attainment of the long-run marginal propensity to consume, so too is there a lag in the attainment of the long-run expenditure multiplier.[6/] If the long-run expenditure multiplier, defined in terms of a simple Keynesian system as $\frac{1}{\text{1-MPC out of GNP}}$, is assumed to be 2.5 and the long-run marginal propensity to consume out of disposable income is .931, then the "leakage" between GNP and disposable income must amount to about 64.4 per cent of GNP. With this amount of "other" leakages, each of the short-run marginal propensities to consume shown in Table II imply short-run multipliers as shown in Table IV.

Table IV

GNP Multipliers in Successive Quarters following an Exogenous Rise in Expenditures, based on a long-run multiplier of 2.5 and short-run marginal propensities to consume out of disposable income as shown in Table II

Quarters after Expenditure Increase	Multiplier
1	1.60
2	2.35
3	2.39
4	2.42
5	2.44
6	2.45
7	2.46
8	2.48
Long-run multiplier	2.5

6/ In an earlier version of this paper I had rejected this point of view on the belief that I had already taken account of all of the necessary lags in my estimates of the initial response by consumers. I am grateful for the persistence of several of my collegues in the System for pointing out what I should have seen from the beginning as an obvious logical error in my ways.

Applying the multipliers shown in Table IV to the initial round increases in consumption shown in Table III gives an estimate that $2.0 billion of the rise in GNP in the first quarter was due to the tax cut, and that the cut will add $8.7 billion to GNP in the current quarter (see Table V). For 1964 as a whole, I estimate that the cut plus the multiplier will add $10.0 billion to GNP, and that in 1965 it will add $18.3 billion. Just for purposes of comparison, Table V also shows the extra amount of GNP that would result if the multiplier were considered to be a constant 2.5.

Table V

Effect on GNP Stemming from the Tax Cut, assuming multipliers as shown in Table IV, and also assuming a constant multiplier of 2.5*
(Seasonally adjusted annual rates in billions of dollars)

	Quarter	Extra Amount of GNP with Varying Multiplier		Extra Amount of GNP with Constant Multiplier	
1964	I	2.0		3.1	
	II	8.7		12.1	
	III	14.0	1964 Average = 10.0	16.1	1964 Average = 11.9
	IV	15.5		16.3	
1965	I	16.6		17.6	
	II	17.6		18.3	
	III	19.0	1965 Average = 18.3	20.0	1965 Average = 19.2
	IV	20.1		20.9	
Long-run		21.2		21.2	

* Estimates do not include possible accelerator effects.

Possible accelerator effects. The estimates given in Table V reflect simply the multiplier effects of the likely increase in consumption stemming from the tax cut. They do not include any accelerator response on plant and equipment spending, which of course would be further enlarged by the multiplier. While I feel sure that such accelerator effects in principle do operate, estimation of their magnitude is certainly a highly tenuous undertaking. Moreover, the lags that are involved clearly would preclude any significant accelerator response stemming from the actual introduction of the tax cut at least for the current year. It, of course, is possible--and indeed quite probable--that some of the currently planned capital outlays in some sense represent an anticipated accelerator response as businessmen placed their bets before enactment of the bill became a certainty. I do not, however, want even to guess how much of the 12.4 per cent gain in plant and equipment spending suggested by the McGraw-Hill survey can actually be related to the tax cut. Thus, I leave it that even if the accelerator does exist, the estimates for 1964 as presented in Table V probably can be taken as a pretty fair indication of the extra amount of GNP attained this year (over and above the amount attributable to other factors) in response to the introduction of the tax cut.

I might for a moment, however, venture into the realm of the unknown and look beyond 1964. Some earlier work that I have done suggested that the "ultimate" accelerator response of plant and equipment expenditures stemming from a $1 billion cut in individual income taxes might amount to about $0.3 billion--which implies a $2.7 billion increase in capital spending stemming from the actual 1964-65 tax cut of $9.1 billion. With a long-run multiplier of 2.5, this increase in capital spending will raise GNP by an additional $6.8 billion, which together with the $21.2 billion increase stemming from consumption brings the total rise in GNP from the individual tax cut to $28.0 billion. To go even further out on a limb and add in a possible $11 billion increase in GNP stemming from plant and equipment expenditures induced by the corporate tax cut[7/] gives a total increase in GNP of some $39 billion. Fortunately from my point of view the accelerator

7/ This is based on some earlier work that suggested that the ultimate multiplier-accelerator effect on GNP might amount to 4.6 times the size of the cut in corporate income taxes.

response to the individual tax cut and the response to the corporate tax cut will stretch out over such a long period of time that no one can ever really say whether I am right or wrong. From a less glib point of view, however, the economy is probably also fortunate that these responses operate only with a long lag, for otherwise there might be even more concern than there is about the prospects of maintaining price stability.

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May 7, 1964

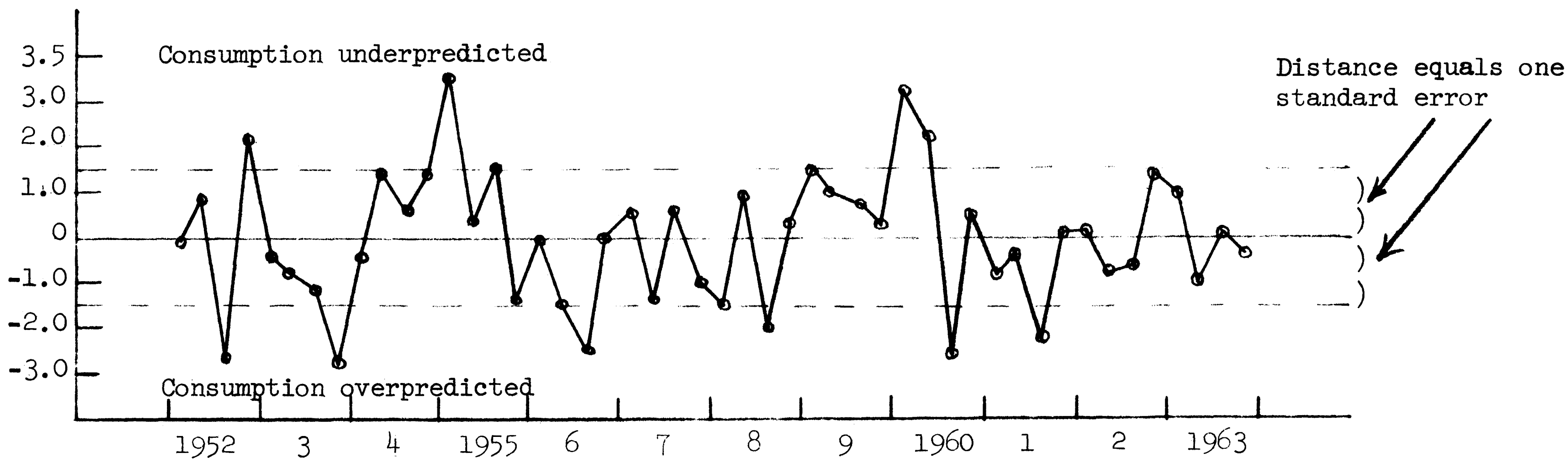
Chart I

Estimated residuals from equation

$$C_t = 0.167 + \underset{(0.100)}{0.248}\, Y_t + \underset{(0.126)}{0.334}\, (Y_t - Y_{t-1}) + \underset{(0.103)}{0.215}\, (Y_{t-1} - Y_{t-2}) + \underset{(0.107)}{0.733}\, C_{t-1}$$

$R^2 = .99907$ $\qquad S_e = 1.55$ $\qquad DW = 1.91$

Residuals defined as actual consumption minus predicted consumption



Appendix I

Regression Equations Estimated Using Seasonally Adjusted Quarterly Data on Annual Rates from First Quarter of 1952 through Fourth Quarter of 1963

1a. $$C_t = -1.339 + \underset{\substack{(.006)\\151.49}}{.931}\, Y_t$$

$R^2 = .99799$ $S_e = 2.21$ $DW = .73$

L-R MPC: 93.1 / Quarterly MPC: 93.1 93.1 93.1 93.1

1b. $$\frac{C_t}{Y_t} = .927$$

L-R MPC: 92.7 / Quarterly MPC: 92.7 92.7 92.7 92.7

1c. $$\Delta C_t = 1.362 + \underset{\substack{(.106)\\5.49}}{.571}\, \Delta Y_t$$

$R^2 = .388$ $S_e = 1.72$ DW - 2.17

2a. $$C_t = -1.446 + \underset{\substack{(.139)\\5.42}}{.755} Y_t + \underset{\substack{(.141)\\1.27}}{.178} Y_{t-1}$$

$R^2 = .99806$ $S_e = 2.19$ $DW = .60$

L-R MPC: 94.2 / Quarterly MPC: 75.5 94.2 94.2 94.2

2b. $$\frac{C_t}{Y_t} = .827 + \underset{\substack{(.137)\\.73}}{.100} \frac{Y_{t-1}}{Y_t}$$

$R^2 = .012$ $S_e = .007$ $DW = .67$

L-R MPC: 92.8 / Quarterly MPC: 82.7 92.8 92.8 92.8

2c. $$\Delta C_t = .566 + \underset{\substack{(.101)\\5.13}}{.520}\, \Delta Y_t + \underset{\substack{(.103)\\2.63}}{.271}\, \Delta Y_{t-1}$$

$R^2 = .470$ $S_e = 1.62$ $DW = 2.13$

3a. $$C_t = \underset{}{-1.446} + \underset{\substack{(.006)\\145.85}}{.933Y_t} - \underset{\substack{(.141)\\-1.27}}{.179\Delta Y_t}$$

$R^2 = .99806$ $S_e = 2.19$ $DW = .60$

L-R MPC: 93.3 / Quarterly MPC: 74.5 93.3 93.3 93.3

3b. $$\frac{C_t}{Y_t} = .928 - \underset{\substack{(.137)\\-.73}}{.100}\frac{\Delta Y_t}{Y_t}$$

$R^2 = .012$ $S_e = .007$ $DW = .67$

L-R MPC: 92.8 / Quarterly MPC: 82.7 92.8 92.8 92.8

3c. $$\Delta C_t = .566 + \underset{\substack{(.130)\\6.09}}{.790\Delta Y_t} - \underset{\substack{(.103)\\-2.63}}{.271\Delta(\Delta Y)_t}$$

$R^2 = .470$ $S_e = 1.62$ $DW = 2.13$

4a. $$C_t = -1.451 + \underset{\substack{(.007)\\141.09}}{.933Y_t} - \underset{\substack{(.143)\\-1.29}}{.185\Delta Y_t} + \underset{\substack{(.144)\\.38}}{.055\Delta Y_{t-1}}$$

$R^2 = .99807$ $S_e = 2.21$ $DW = .60$

L-R MPC: 93.3 / Quarterly MPC: 74.7 98.7 93.3 93.3

4b. $$\frac{C_t}{Y_t} = .927 - \underset{\substack{(.139)\\-.83}}{.115}\frac{\Delta Y_t}{Y_t} + \underset{\substack{(.140)\\.69}}{.097}\frac{\Delta Y_{t-1}}{Y_t}$$

$R^2 = .022$ $S_e = .007$ $DW = .66$

L-R MPC: 92.7 / Quarterly MPC: 81.1 102.4 92.7 92.7

5a. $$C_t = -1.452 + \underset{\substack{(.007)\\136.29}}{.932Y_t} - \underset{\substack{(.145)\\1.28}}{.185\Delta Y_t} + \underset{\substack{(.147)\\.35}}{.051\Delta Y_{t-1}} + \underset{\substack{(.145)\\.17}}{.024\Delta Y_{t-2}}$$

$R^2 = .99807$ $S_e = 2.24$ $DW = .59$

L-R MPC: 93.2 / Quarterly MPC: 74.7 98.4 95.7 93.2

6a. $$C_t = .977 + \underset{\substack{(.005)\\183.88}}{1.001C_{t-1}} + \underset{\substack{(.111)\\5.09}}{.563\Delta Y_t}$$

$R^2 = .99878$ $S_e = 1.74$ DW = 2.16

Quarterly MPC: 56.3 56.3 56.3 56.3

6c. $$\Delta C_t = 2.162 + \underset{\substack{(.141)\\2.65}}{.345\Delta C_{t-1}} + \underset{\substack{(.102)\\1.95}}{.200\Delta\Delta Y_t}$$

$R^2 = .164$ $S_e = 2.04$ DW = 2.17

7a. $$C_t = .901 + \underset{\substack{(.005)\\190.78}}{.999C_{t-1}} + \underset{\substack{(.105)\\5.00}}{.526\Delta Y_t} + \underset{\substack{(.106)\\2.60}}{.276\Delta Y_{t-1}}$$

$R^2 = .99894$ $S_e = 1.64$ DW = 2.13

Quarterly MPC: 52.6 90.2 90.2 90.2

7c. $$\Delta C_t = 2.246 + \underset{\substack{(.132)\\2.61}}{.347\Delta C_{t-1}} + \underset{\substack{(.104)\\3.00}}{.314\Delta\Delta Y_t} + \underset{\substack{(.103)\\2.70}}{.279\Delta\Delta Y_{t-1}}$$

$R^2 = .282$ $S_e = 1.91$ DW = 2.36

8a. $$C_t\ .901 + \underset{\substack{(.005)\\184.33}}{.999C_{t-1}} + \underset{\substack{(.106)\\4.94}}{.526\Delta Y_t} + \underset{\substack{(.108)\\2.58}}{.279\Delta Y_{t-1}} - \underset{\substack{(.108)\\-.22}}{.023\Delta Y_{t-2}}$$

$R^2 = .99894$ $S_e = 1.66$ DW = 2.14

Quarterly MPC: 52.6 90.5 92.8 92.8

9a. $$C_t = .852 + \underset{\substack{(.122)\\9.26}}{1.133C_{t-1}} - \underset{\substack{(.123)\\-1.07}}{.132C_{t-2}} + \underset{\substack{(.114)\\4.65}}{.532\Delta Y_t}$$

$R^2 = .99881$ $S_e = 1.74$ DW = 2.39

Quarterly MPC: 53.2 60.3 61.3 61.5

9c. $\Delta C_t = 2.158 + \underset{\substack{(.148)\\2.53}}{.374}\Delta C_{t-1} + \underset{\substack{(.146)\\.01}}{.002}\Delta C_{t-2} + \underset{\substack{(.104)\\1.92}}{.200}\Delta\Delta Y_t$

$R^2 = .164$ $S_e = 2.06$ DW = 2.17

10a. $C_t = .957 + \underset{\substack{(.145)\\6.40}}{.928}C_{t-1} + \underset{\substack{(.145)\\.49}}{.071}C_{t-2} + \underset{\substack{(.109)\\4.94}}{.573}\Delta Y_t + \underset{\substack{(.132)\\2.37}}{.314}\Delta Y_{t-1}$

$R^2 = .99895$ $S_e = 1.65$ DW = 2.01

Quarterly MPC: 57.3 84.6 82.6 82.6

10c. $\Delta C_t = 1.775 + \underset{\substack{(.138)\\2.08}}{.289}\Delta C_{t-1} + \underset{\substack{(.149)\\1.30}}{.194}\Delta C_{t-2} + \underset{\substack{(.109)\\3.28}}{.359}\Delta\Delta Y_t + \underset{\substack{(.113)\\3.02}}{.342}\Delta\Delta Y_{t-1}$

$R^2 = .310$ $S_e = 1.89$ DW = 2.29

11a. $C_t = .955 + \underset{\substack{(.158)\\5.89}}{.931}C_{t-1} + \underset{\substack{(.157)\\.43}}{.068}C_{t-2} + \underset{\substack{(.110)\\4.86}}{.537}\Delta Y_{t-1} + \underset{\substack{(.135)\\2.32}}{.313}\Delta Y_{t-1} - \underset{\substack{(.117)\\-.04}}{.005}\Delta Y_{t-2}$

$R^2 = .99895$ $S_e = 1.67$ DW = 2.01

Quarterly MPC: 53.7 81.3 79.1 79.2

12a. $C_t = -.410 + \underset{\substack{(.084)\\5.43}}{.453}Y_t + \underset{\substack{(.091)\\5.73}}{.518}C_{t-1}$

$R^2 = .99884$ $S_e = 1.70$ DW = 1.25

L-R MPC: 94.1 / Quarterly MPC: 45.3 68.8 81.0 87.3

12b. $\frac{C_t}{Y_t} = .463 + \underset{\substack{(.098)\\5.18}}{.506}\frac{C_{t-1}}{Y_t}$

$R^2 = .368$ $S_e = .006$ DW = 1.22

L-R MPC: 93.8 / Quarterly MPC: 46.3 69.7 81.6 87.6

12c. $\Delta C_t = 1.030 + \underset{\substack{(.110)\\4.86}}{.535}\Delta Y_t + \underset{\substack{(.121)\\1.11}}{.134}\Delta C_{t-1}$

$R^2 = .405$ $S_e = 1.72$ DW = 2.40

13a. $C_t = -.593 + \underset{\substack{(.081)\\5.48}}{.442}Y_t + \underset{\substack{(.146)\\5.23}}{.764}C_{t-1} - \underset{\substack{(.112)\\-.210}}{.236}C_{t-2}$

$R^2 = .99894$ $S_e = 1.64$ DW = 1.76

L-R MPC: 93.7 / Quarterly MPC: 44.2 78.0 93.4 97.2

13b. $\frac{C_t}{Y_t} = .452 + \underset{\substack{(.151)\\5.08}}{.764}\frac{C_{t-1}}{Y_t} - \underset{\substack{(.114)\\-2.18}}{.249}\frac{C_{t-2}}{Y_t}$

$R^2 = .429$ $S_e = .006$ DW = 1.73

L-R MPC: 93.2 / Quarterly MPC: 45.2 79.8 91.9 95.6

13c. $\Delta C_t = 1.026 + \underset{\substack{(.112)\\4.79}}{.535}\Delta Y_t + \underset{\substack{(.128)\\1.04}}{.133}\Delta C_{t-1} + \underset{\substack{(.123)\\.02}}{.002}\Delta C_{t-2}$

$R^2 = .405$ $S_e = 1.74$ DW = 2.13

14a. $C_t = -.660 + \underset{\substack{(.083)\\5.43}}{.450}Y_t + \underset{\substack{(.156)\\4.73}}{.738}C_{t-1} - \underset{\substack{(.191)\\-.82}}{.156}C_{t-2} - \underset{\substack{(.120)\\-.52}}{.062}C_{t-3}$

$R^2 = .99895$ $S_e = 1.65$ DW = 1.71

L-R MPC: 93.6 / Quarterly MPC: 45.0 78.2 95.7 100.6

14b. $\frac{C_t}{Y_t} = .460 + \underset{\substack{(.160)\\4.61}}{.738}\frac{C_{t-1}}{Y_t} - \underset{\substack{(.194)\\-.86}}{.167}\frac{C_{t-2}}{Y_t} - \underset{\substack{(.122)\\-.52}}{.064}\frac{C_{t-3}}{Y_t}$

$R^2 = .433$ $S_e = .006$ DW = 1.67

L-R MPC: 93.1 / Quarterly MPC: 46.0 79.9 97.2 101.4

15a. $C_t = -.607 + .460Y_t + .733C_{t-1} - .176C_{t-2} + .011C_{t-3} - .059C_{t-4}$

(.085) (.157) (.196) (.177) (.104)

5.39 4.65 -.90 .06 -.57

$R^2 = .99896$ $S_e = 1.66$ DW = 1.69

L-R MPC: 93.5 / Quarterly MPC: 46.0 79.7 96.3 103.1

16a. $C_t = -.467 + .434Y_t + .761C_{t-1} - .182C_{t-2} + .003C_{t-3} - .139C_{t-4} + .094C_{t-5}$

(.089) (.160) (.195) (.177) (.130) (.091)

4.90 4.77 -.93 .02 -1.07 1.04

$R^2 = .99898$ $S_e = 1.66$ DW = 1.75

L-R MPC: 93.7 / Quarterly MPC: 43.4 76.4 93.6 100.9

17a. $C_t = -.077 + .298Y_t + .682C_{t-1} + .324\Delta Y_t$

(.101) (.108) (.131)

2.95 6.30 2.48

$R^2 = .99898$ $S_e = 1.61$ DW = 1.86

L-R MPC: 93.8 / Quarterly MPC: 62.2 72.2 79.0 83.7

17b. $\frac{C_t}{Y_t} = .297 + .683\frac{C_{t-1}}{Y_t} + .324\frac{\Delta Y_t}{Y_t}$

(.112) (.126)

6.08 2.72

$R^2 = .45771$ $S_e = .005$ DW = 1.90

L-R MPC: 93.8 / Quarterly MPC: 63.9 73.3 79.8 84.2

17c. $\Delta C_t = .628 + .840\Delta Y_t - .071\Delta C_{t-1} - .309\Delta(\Delta Y)_t$

(.165) (.143) (.129)

5.08 -.49 -2.39

$R^2 = .47297$ $S_e = 1.63$ DW = 2.00

18a. $C_t = .167 + .248Y_t + .733C_{t-1} + .334\Delta Y_t + .215\Delta Y_{t-1}$

(.100) (.107) (.126) (.103)

2.48 6.84 2.65 2.08

$R^2 = .99907$ $S_e = 1.55$ DW = 1.91

L-R MPC: 93.1 / Quarterly MPC: 58.3 89.1 90.2 91.0

18b. $$\frac{C_t}{Y_t} = .251 + .730\frac{C_{t-1}}{Y_t} + .338\frac{Y_t}{Y_t} + .228\frac{Y_{t-1}}{Y_t}$$

(.110)	(.120)	(.102)
6.66	2.81	2.23

$R^2 = .51281$ $S_e = .0052$ DW = 1.94

L-R MPC: 93.2 / Quarterly MPC: 58.9 91.0 91.6 92.0

18c. $$\Delta C_t = .654 + .828\Delta Y - .065\Delta C_t - .297\,(\Delta Y)_t + .011\,(\Delta Y)_{t-1}$$

(.210)	(.155)	(.180)	(.112)
3.94	-.42	-1.65	.10

$R^2 = .473$ $S_e = 1.65$ DW = 2.02

19a. $$C_t = .169 + .248Y_t + .734C_{t-1} + .335\Delta Y_t + .217\Delta Y_{t-1} - .013\Delta Y_{t-2}$$

(.101)	(.109)	(.127)	(.106)	(.102)
2.44	6.76	2.63	2.06	-.12

$R^2 = .99907$ $S_e = 1.57$ DW= 1.92

L-R MPC: 93.1 / Quarterly MPC: 58.3 89.2 89.0 90.1

20a. $$C_t = -.143 + .316Y_t + .836C_{t-1} - .174C_{t-2} + .268\Delta Y_t$$

(.100)	(.146)	(.113)	(.134)
3.16	5.73	-1.55	2.01

$R^2 = .99903$ $S_e = 1.58$ DW = 2.16

L-R MPC: 93.5 / Quarterly MPC: 58.4 80.4 88.7 91.8

20c. $$\Delta C_t = .713 + .844\Delta Y_t - .063\Delta C_{t-1} - .036\Delta C_{t-2} - .314\Delta(\Delta Y)_t$$

(.167)	(.147)	(.117)	(.132)
5.04	.43	-.31	-2.38

$R^2 = .47412$ $S_e = 1.65$ DW = 2.02

21a. $$C_t = .099 + .259Y_t + .767C_{t-1} - .045C_{t-2} + .318\Delta Y_t + .188\Delta Y_{t-1}$$

(.107)	(.152)	(.145)	(.137)	(.136)
2.42	5.02	-.31	2.32	1.38

$R^2 = .99907$ $S_e = 1.57$ DW = 1.98

L-R MPC: 93.1 / Quarterly MPC: 57.8 89.1 91.6 92.1

21b. $$\frac{C_t}{Y_t} = .258 + .753\frac{C_{t-1}}{Y_t} - .030\frac{C_{t-2}}{Y_t} + .328\frac{\Delta Y_t}{Y_t} + .210\frac{\Delta Y_{t-1}}{Y_t}$$

	(.154)	(.145)	(.131)	(.133)
	4.87	-.21	2.51	1.57

$R^2 = .513$ $S_e = .005$ DW = 1.98

L-R MPC: 93.1 / Quarterly MPC: 58.7 91.0 92.6 92.8

21c. $$\Delta C_t = .700 + .860\Delta Y_t - .068\Delta C_{t-1} - .045\Delta C_{t-2} - .331\Delta(\Delta Y)_t - .014\Delta(\Delta Y)_{t-1}$$

	(.237)	(.157)	(.147)	(.214)	(.140)
	3.62	-.43	-.30	-1.55	-.10

$R^2 = .47425$ $S_e = 1.67$ DW = 2.01

22a. $$C_t = .080 + .262Y_t + .780C_{t-1} - .061C_{t-2} + .314\Delta Y_t + .183\Delta Y_{t-1} - .028\Delta Y_{t-2}$$

	(.109)	(.162)	(.159)	(.140)	(.139)	(.111)
	2.41	4.80	-.38	2.25	1.32	-.26

$R^2 = .99908$ $S_e = 1.58$ DW = 2.02

L-R MPC: 93.2 / Quarterly MPC: 57.6 89.4 89.5 90.6