

Consumption I

Graduate Macroeconomics I
ECON 309 -- Cunningham

Empirical Verification?

- **Keynes' followers estimated the consumption function for the U.S. using the data from 1929-1941:**
 - $C = 26.5 + 0.75Y_d$
- **$C_0 = 26.5$ billion > 0**
 - **APC $>$ MPC**
- **Increases in consumer spending seemed to be less than increases in disposable income, supporting MPC < 1 .**

Kuznets' Consumption Data

Kuznets, Simon. *Uses of National Income in Peace and War*, Occasional Paper 6. NY: NBER, 1942.

- Time series estimates of consumption and national income
- Overlapping decades 1879-1938, 5 year steps
- Each estimate is a decade average

Kuznets, Simon. *National Product Since 1869*. NY: NBER, 1946.

- Extended data backward to 1869.

Kuznets' Study (1)

- **Assumptions:**

- **Personal taxes and transfer payments are small (in this period)**
- **Therefore, it is reasonable to use total income (GNP) as a proxy for disposable income.**
- **If a relationship between consumption and disposable income exists, there should also be a relationship between consumption and GNP.**

Kuznets' Study (2)

Results:

- (1946 study) Between 1869-1938, real income expanded to seven (7) times its 1869 level (\$9.3 billion to \$69 billion)
- But the *average* propensity to consume ranged between 0.838 and 0.898.
- That is, APC did not vary significantly in the face of vastly expanding income.



Problem!

Kuznets' Study (3)

Years	Y	C	C/Y
1869-78	9.3	8.1	0.87
1874-83	13.6	11.6	0.85
1879-88	17.9	15.3	0.85
1884-93	21.0	17.7	0.84
1889-98	24.2	20.2	0.83
1894-1903	29.8	25.4	0.85
1899-1908	37.3	32.3	0.87
1904-13	45.0	39.1	0.87
1909-18	50.6	44.0	0.87
1914-23	57.3	50.7	0.88
1919-28	69.0	62.0	0.90
1924-33	73.3	68.9	0.94
1929-38	72.0	71.0	0.99

Second Failure

Predictions of post-WWII period are grossly wrong

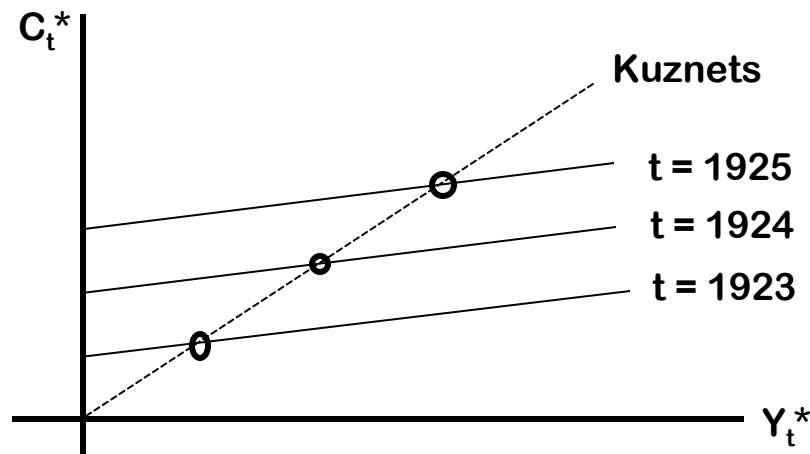
- Keynesian Theory argues that the average propensity to save (APS) rises with income ($S = S_0 + sY$).
- Higher post-war incomes should imply excess saving.
- Excess saving is more than can be absorbed by investment.
- Therefore the excess saving will result over-investment or hoarding, and therefore in unemployment.
- Will we go straight back to the Depression?
- Comparison of the forecasts with the actual results suggest that:
 - consumption was “under”-predicted
 - saving was “over”-predicted

IMPLICATION: major determinants in the behavioral equations must be missing!

Estimated equation†	Sample period	Year to which the forecast error applies			
		1947	1948	1949	1950
(1) $C = 10.69 + .80Y$	1929-1940	-12.9	-8.8	-12.9	-11.9
(2) $C^* = 11.45 + .78Y^*$	1929-1940	-11.9	-7.5	-11.0	-9.6
(3) $pC = 7.77 + .85pY$	1929-1940	-13.8	-10.0	-14.0	-12.2
(4) $S = -10.68 + .20Y$	1929-1940	-13.0	-8.5	-10.8	-9.1
(5) $S^* = -95.27 + .22Y^*$	1929-1940	-12.0	-7.4	-9.2	-7.6
(6) $pS = -7.89 + .15pY$	1929-1940	-13.9	-9.8	-12.0	-9.7
(7) $S = -6.61 + .14Y$	1923-1940	-9.7	-4.6	-6.9	-4.6
(8) $S^* = -85.66 + .21Y^*$	1923-1940	-11.7	-7.1	-8.8	-7.2
(9) $pS = -6.77 + .14pY$	1923-1940	-12.4	-7.9	-10.1	-7.7
<i>Addendum</i>					
(1) Actual nominal consumption		165.6	177.5	178.8	184.2

Reconciliation with Keynes' Theory? (1)

- Arthur Smithies, *Econometrica*, 1954.
- Uses per capita Y_d and C , and a time trend.
- Argues that the Cons. Function is really Keynesian, but just looks Kuznetsian because of the shifts in the function.
- Says the data points just “happen” to line up to fit Kuznets' consumption function.



Smithies Result

Smithies estimates yielded the equation:

$$C_t^* = 76.58 + 0.76Y_t^* + 1.15(t-1922)$$

Or equivalently,

$$C_t^* = [76.58 + 1.15(t-1922)] + 0.76Y_t^*$$

Which is of the form $C = C_0 + cY$, the equation of a line.

Reconciliation (2)

Reasons for shifts:

- Migration of people from farms to cities (must buy goods)
- Shift in distribution toward greater equality (poorer save less)
- Rise in the perceived “standard” of living (luxuries become necessities)
- For these reasons each agent (per capita) should increase his or her consumption.

Modigliani gets involved

Modigliani, Franco. "Fluctuations in the saving-income ratio: a problem in economic forecasting," in *Studies in Income and Wealth* vol. 11, Conference on Research in Income and Wealth. NY: NBER, 1949, pp. 373-378.

- **When Franco Modigliani (1949) estimates Smithies' relation over a different time period, the analysis completely breaks down.**
- **But, Modigliani is hooked...**

More Problems

Year	Consumption	Personal disposable income	Year	Consumption	Personal disposable income
1929	215.1	229.5	1945	270.9	338.1*
1930	199.5*	210.6*	1946	301.0	332.7*
1931	191.8*	201.9*	1947	305.8	318.8*
1932	173.9*	174.4*	1948	312.2	335.8
1933	170.5*	169.6*	1949	319.3	336.8
1934	176.9	179.8	1950	337.3	362.8
1935	187.7	196.8	1971	696.8†	779.2†
1936	206.2	220.5	1972	737.1	810.3
1937	213.8	227.7	1973	768.5	865.3
1938	208.8*	212.6*	1974	763.6*	858.4*
1939	219.8	229.8	1975	780.2	875.8
1940	229.9	244.0	1976	823.7	907.4
1941	243.6	277.9	1977	863.9	939.8
1942	241.1*	317.5	1978	904.8	981.5
1943	248.2	332.1	1979	930.9	1011.5
1944	255.2	343.6	1980	935.1	1018.4

*Entry represents a decrease in a series.

†Entry is not chronologically contiguous with its predecessor.

Source: Rebenchmarked data furnished to the author by the U.S. Department of Commerce during the first quarter of 1981.

Series	Year	Quarter				Quarter				Year
		1	2	3	4	1	2	3	4	
Consumption	1947	302.3	307.0	307.2	306.8*	308.8	312.1	312.6	315.4	1948
Income	1947	321.5	314.6*	321.6	317.6*	324.8	334.6	341.2	342.7	1948
Consumption	1949	315.8	319.8	319.3*	322.5	327.7	333.6	348.0	339.9*	1950
Income	1949	336.2*	336.2*	336.5	338.2	361.5	359.4*	362.2	368.2	1950
Consumption	1951	345.7	337.8*	340.7	342.1	342.7	348.6	350.2	358.8	1952
Income	1951	365.7*	373.7	375.6	375.6*	375.1*	379.0	387.3	391.2	1952
Consumption	1953	362.8	364.6	363.6*	362.6*	363.5	366.2	371.8	378.6	1954
Income	1953	395.5	401.2	399.7*	400.1	399.8*	397.5*	403.9	411.7	1954
Consumption	1955	385.2	392.2	396.4	402.6	403.2	403.9	405.1	409.3	1956
Income	1955	414.8	423.7	430.8	437.8	441.0	444.5	446.9	452.5	1956
Consumption	1957	411.7	412.4	415.2	416.0	411.0*	414.7	420.9	425.4	1958
Income	1957	452.7	455.5	457.7	456.2*	452.2*	454.9	464.7	471.0	1958
Consumption	1959	434.1	439.7	443.3	444.6	448.1	454.1	452.7*	453.2	1960
Income	1959	474.4	482.2	479.2*	483.0	488.2	490.9	490.9*	489.0*	1960
Consumption	1961	454.0	459.9	461.4	470.3	667.4†	670.5	676.5	673.9*	1970
Income	1961	493.6	500.6	505.8	515.0	737.4†	752.5	760.1	756.2*	1970
Consumption	1971	687.0	693.3	698.2	708.6	718.6	731.1	741.3	757.1	1972
Income	1971	771.1	779.9	780.7	785.2	792.0	798.7	812.4	838.1	1972
Consumption	1973	769.0	766.8*	770.5	767.4*	762.1*	764.9	770.1	757.3*	1974
Income	1973	855.6	862.9	868.8	874.1	861.2*	860.6*	860.1*	851.8*	1974
Consumption	1975	764.0	776.3	786.3	794.2	810.6	817.7	827.1	839.4	1976
Income	1975	845.8*	892.2	879.2*	886.1	900.3	904.7	909.5	915.1	1976
Consumption	1977	851.9	856.0	866.4	881.3	884.1	900.6	911.2	923.4	1978
Income	1977	918.7	931.6	948.1	960.9	966.8	975.5	985.9	998.0	1978
Consumption	1979	925.5	922.8*	933.4	941.6	943.4	919.3*	930.8	946.8	1980
Income	1979	1005.7	1006.9	1015.7	1017.7	1021.0	1008.2*	1018.5	1025.8	1980

*Entry represents a decrease or a constancy in a series.

†Entry is not chronologically contiguous with its predecessor.

Source: See Table 5.4.

Habit Persistence Theory

- **Note: Duesenberry and Modigliani both presented similar results at the Econometric Society Meeting of 1947.**
- **Duesenberry (1947) noted that in 1935 dissaving grew as a percentage of income.**
 - **Dissaving was greater in 1935 than in the relatively prosperous year 1941.**
 - **Why? Households must sacrifice saving to “defend” (attempt to maintain) their standard of living.**
- **Duesenberry and Modigliani can reconcile the short-run and long-run consumption functions, but cannot explain the negative relationship between current income and consumption that sometimes occurs.**

Duesenberry's Habit Persistence

Duesenberry assumes that the consumers defend their highest level of consumption. Thus:

$$\frac{S_t}{Y_t} = F\left[\frac{Y_t}{Y_{peak}}\right]$$

For no other reason than simplicity, he assumes linearity.

$$\frac{S_t}{Y_t} = a + b\left[\frac{Y_t}{Y_{peak}}\right]$$

More Duesenberry

$$\frac{C_t}{Y_t} = (1-a) - b \left[\frac{Y_t}{Y_{peak}} \right]$$

So that

$$C_t = \left\{ 1 - a - b \left[\frac{Y_t}{Y_{peak}} \right] \right\} Y_t$$

If Y grows steadily, then

$$\frac{Y_t}{Y_{peak}} = \frac{Y_t}{Y_{t-1}} = k, \text{ and}$$

$$C_t = (1 - a - bk) Y_t, \text{ or}$$

$$C_t = I Y_t, \text{ with } I = (1 - a - bk)$$

Note: $Y_t = S_t + C_t$

so

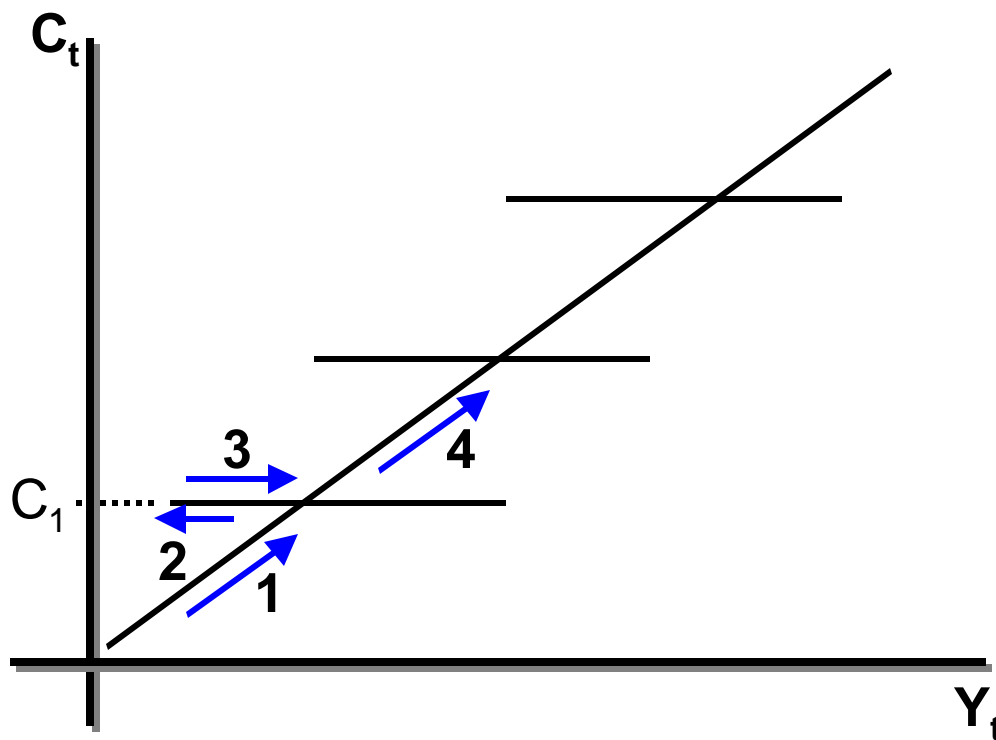
$$1 = \frac{S_t}{Y_t} + \frac{C_t}{Y_t}$$

and

$$\frac{S_t}{Y_t} = 1 - \frac{C_t}{Y_t}$$

Kuznet's Result

Dusesenberry's "Ratchet Effect"



Brown's Habit Persistence

Brown. "Habit Persistence and Lags in Consumer Behavior,"
Econometrica 20 (July 1952).

Brown tries: $C_t = a_0 + a_1 Y_t + a_2 C_{peak}$

and

$$C_t = a_0 + a_1 Y_t + a_2 C_{t-1}$$

He finds the second specification slightly superior and more easily consistent with the downward shifts. (Econometric tests.)

Hamburger and Wealth Theories

- **Hamburger (1951, 1954, 1955)**
- **Argues an alternative explanation for sluggishness ties consumer response formally to intertemporal utility maximization.**
- **Household ties current consumption to a lifetime plan of consumption:**

$$U_t = U_t(c_t, c_{t+1}, c_{t+2}, \dots, c_{t+i})$$

- **Wealth arises from property wealth and human wealth (investments and income).**
- **Households consume less under an estate motive.**
- **Explains habit persistence rigorously.**

Life Cycle Hypothesis (LCH)

- **Franco Modigliani, Albert Ando, and Richard Bloomberg**
- **Assumes that each representative agent will die, and knows:**
 - when he/she will die, how many periods T he/she will live, and
 - How much his/her life-time income will be.
- **The consumer smooths consumption expenditure over his/her life, spending $1/T$ of his/her life-time income each period.**

LCH (2)

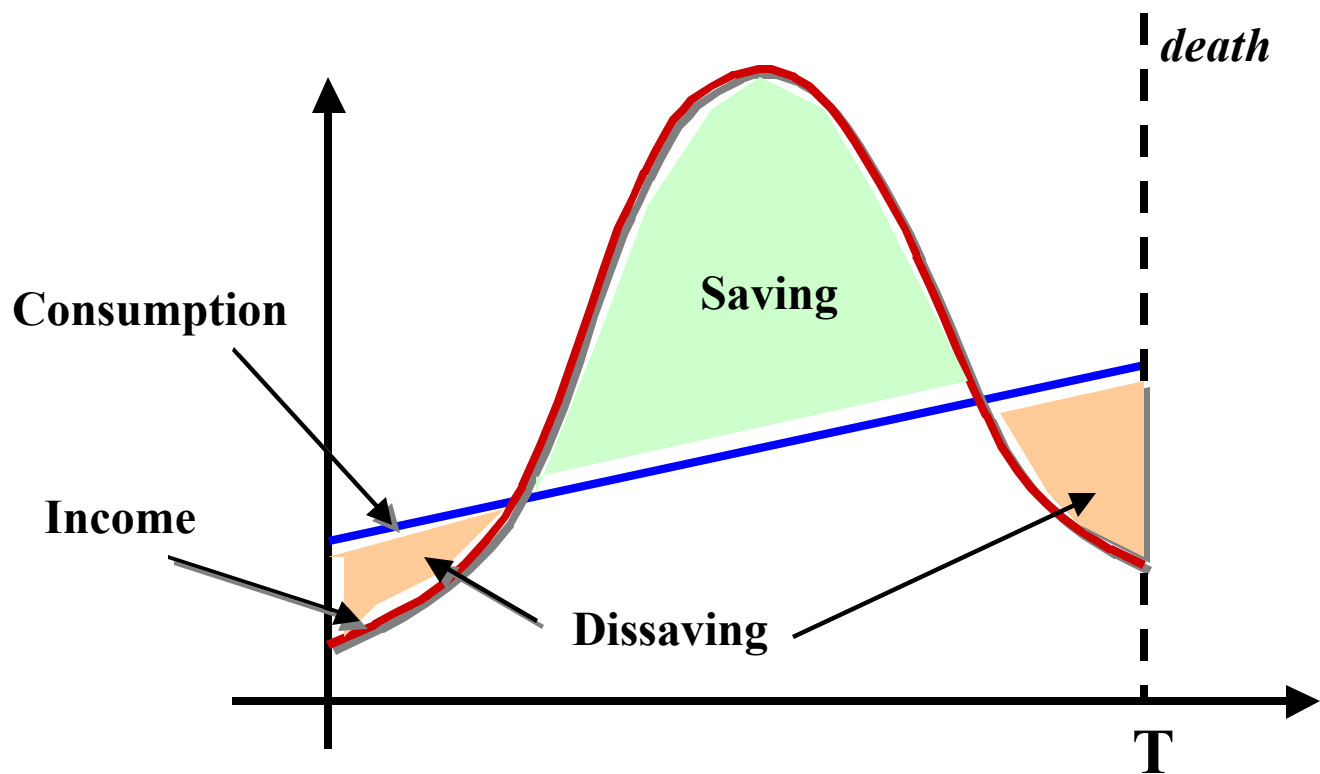
- **The consumption function implied by this logic is:**

$$C_t = \frac{1}{T} [Y_t^1 + (N-1)\bar{Y}^{1e} + A_t]$$

with the aggregate estimable consumption function look like this:

$$C_t = b_1 Y_t^1 + b_2 \bar{Y}^{1e} + b_3 A_t$$

Income and Consumption—LCH



Testing the LCH

- If the function form looks like this:

$$C_t = b_1 Y_t^1 + b_2 \bar{Y}^{1e} + b_3 A_t$$

- Ando and Modigliani argue that expected future labor income is proportional to current income, so that the function can be reduced to:

$$C_t = (b_1 + b_2 \mathbf{b}) Y_t^1 + b_3 A_t$$

- When they estimate this function, they get:

$$C_t = 0.72 Y_t^1 + 0.06 A_t$$

Criticisms of LCH

- The households, at all times, have a definite, conscious vision of:
 - The family's future size and composition, including the life expectancy of each member,
 - The entire lifetime profile of the labor income of each member—after the applicable taxes,
 - The present and future extent and terms of any credit available, and
 - The future emergencies, opportunities, and social pressures which might affect its consumption spending.
- It does not take into account **liquidity constraints**.

Policy Implications of LCH

- **Changes in current income have a strong effect on current consumption **ONLY** if they affect expected lifetime income.**
- **In Q2 1975, a one-time tax rebate of \$8 billion was paid out to taxpayers to stimulate AD.**
 - The rebate had little effect.
- **Maybe George W. hadn't heard about this?**
- **The only way there can be a significant effect is if there is a strong liquidity constraint operating.**
- **This has implications for monetary policy.**

Permanent Income Hypothesis (PIH)

- **Milton Friedman (*A Theory of the Consumption Function*. Princeton Univ. Press, 1957)**
- **Assumptions:**
 - **Perfect certainty about:**
 - **Future receipts**
 - **Future interest rates**
 - **Future prices, etc.**
 - **People save to reduce fluctuations in expenditures**
 - **People are immortal (or leave bequests)**
- **Individual's utility function:**
$$u = u(c, c_1)$$

where **c** is current period consumption and **c₁** is next period consumption.

PIH, Continued

Assume positive but diminishing returns and positive cross partials. Also assume that u is homogeneous of degree one.

The budget constraint is:

$$c + \frac{1}{1+r} c_1 = q + \frac{1}{1+r} q = w_e$$

Where q, q_1 are planned real receipts from human and nonhuman wealth in each period, and w_e is expected wealth.

Optimization yields:

$$c = i_A(r)w_e$$
$$c_1 = i_B(r)w_e$$

PIH, Continued

This implies that consumption depends upon income only if the income affects expected wealth. Therefore, changes in income need not affect current consumption.

We may view $y_p = rw_e$ as **permanent income**—what really affects the consumption decision.

$$c = c_p + c_T$$

$$y = y_p + y_T$$

PIH, Continued

Where is has permanent (p) and transitory (T) components. For each individual agent:

$$c_p = k(r, v, x)y_p$$

Where

r = rate of return

v = the ratio of human to nonhuman wealth (permanent income)

x = demographics

By summing across individuals (aggregating), we have:

$C_p = kY_p$, that permanent consumption is proportional to permanent income.

PIH, Continued

When reduced to an estimable form, this becomes:

$$c_t = \alpha_0 Y_t + \beta c_{t-1} + \eta_t$$

Which looks remarkably like the Brown (1952) result.

The result can explain the unusual changes in MPC due to changes in income:

If income changes, individuals tend to decrease saving (or dissave) to maintain a more uniform spending pattern over their lives.

PIH (2)

- Individuals update adaptively their estimates of permanent income based on changes in current income. That is, *they learn*.

$$Y_t^p = Y_{t-1}^p + j(Y_t - Y_{t-1}^p), 0 < j < 1$$

- The result is that changes to current income have little effect on current consumption unless the individual believes that the changes has long-term consequences.