Wealth Accumulation, Credit Card Borrowing, and Consumption-Income Comovement

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Current Draft: March 2002

Self-reports about saving.

- ² Consumers report a preference for °at or rising consumption paths.
- ² Baby boomers report median target savings rate of 15%.
- ² Actual median savings rate is 5%.
- ² 76% of household's believe they should be saving more for retirement (Public Agenda, 1997).
- ² Of those who feel that they are at a point in their lives when they \should be seriously saving already," only 6% report being \ahead" in their saving, while 55% report being \behind."

Further evidence: Normative value of commitment.

- \Use whatever means possible to remove a set amount of money from your bank account each month before you have a chance to spend it."
- Choose excess withholding.
- Cut up credit cards, put them in a safe deposit box, or freeze them in a block of ice.
- \Sixty percent of Americans say it is better to keep, rather than loosen legal restrictions on retirement plans so that people don't use the money for other things."
- Social Security and Roscas.
- Christmas Clubs (10 mil. accounts).

1 Consumption-Savings Behavior

- Substantial retirement wealth accumulation (SCF)

- Extensive credit card borrowing (SCF, Fed, Gross and Souleles 2000, Laibson, Repetto, and Tobacman 2000)

- Consumption-income comovement (Hall and Mishkin 1982, many others)

- Anomalous retirement consumption drop (Banks et al 1998, Bernheim, Skinner, and Weinberg 1997)

2 Data

Statistic	m_e	se_{m_e}
% borrowing on `Visa'? (% Visa)	0.68	0.015
borrowing / mean income (mean Visa)	0.12	0.01
C-Y comovement (CY)	0.23	0.11
retirement C drop (C drop)	0.09	0.07
median 50-59 $\frac{\text{wealth}}{\text{income}}$	3.88	0.25
weighted mean 50-59 $\frac{\text{wealth}}{\text{income}}$ (wealth)	2.60	0.13

- Three moments on previous slide (wealth, % Visa, mean Visa) from SCF data. Correct for cohort, household demographic, and business cycle effects, so simulated and empirical hh's are analogous. Compute covariances directly.

- C-Y from PSID:

$$\Delta \ln(C_{it}) = \alpha E_{t-1} \Delta \ln(Y_{it}) + X_{it}\beta + \varepsilon_{it} \quad (1)$$

- C drop from PSID

$$\Delta \ln(C_{it}) = I_{it}^{RETIRE}\gamma + X_{it}\beta + \varepsilon_{it} \quad (2)$$

- "A Debt Puzzle": only "% Visa" and "wealth"

- "JEP paper": add "liquid share" and "% low liquid wealth"

Table 1. Credit Card Debt[a,b]

		Conditional on Having a Credit Card		
			Balance	
	% with Card	% with Debt	Mean	Median
All categories				
20-29	0.72	0.77	1668	746
30-39	0.77	0.76	2114	772
40-49	0.85	0.72	2487	760
50-59	0.84	0.60	1603	343
60-69	0.83	0.43	980	0
70+	0.80	0.27	250	0
All ages	0.80	0.63	1715	343
No high school diploma				
20-29	0.68	0.83	1823	849
30-39	0.66	0.77	2559	943
40-49	0.77	0.84	2988	815
50-59	0.73	0.71	1910	549
60-69	0.71	0.55	1115	129
70+	0.76	0.35	285	0
All ages	0.72	0.68	1832	429
High school graduates				
20-29	0.60	0.84	1885	935
30-39	0.74	0.86	1673	858
40-49	0.81	0.73	2274	772
50-59	0.84	0.72	1424	515
60-69	0.85	0.44	722	0
70+	0.75	0.28	265	0
All ages	0.77	0.70	1537	472
College graduates				
20-29	0.89	0.65	1364	600
30-39	0.92	0.65	2213	532
40-49	0.93	0.64	2340	497
50-59	0.96	0.40	1545	0
60-69	1.00	0.26	1143	0
70+	0.93	0.13	180	0
All ages	0.93	0.53	1767	94

Source: Authors' calculations based on the 1995 SCF.

[a] Includes traditional cards such as Visa, Mastercard, Discover and Optima, and other credit or charge cards such as Diners Club, American Express, store cards, airline cards, car rental cards, and gasoline cards. Excludes business and company cards.

[b] The total credit card debt is constructed on the basis of the responses to the following SCF question: "After the last payments were made on this (these) account(s), roughly what was the balance still owed on this (these) account(s)?"

Table 2. Fraction of Households Borrowing on Credit Cards Across the Distribution of Wealth[a,b]

	Wealth Distribution Percentile			
Age group	Less than 25	25-50	50-75	Over 75
All categories				
20-29	0.87	0.77	0.70	0.65
30-39	0.86	0.80	0.69	0.51
40-49	0.79	0.76	0.56	0.41
50-59	0.75	0.65	0.40	0.27
60-69	0.55	0.40	0.25	0.18
70+	0.48	0.26	0.11	0.05
Incomplete High School				
20-29	0.91	0.83	0.67	0.82
30-39	0.73	0.82	0.78	0.70
40-49	0.84	0.85	0.80	0.60
50-59	0.83	0.67	0.75	0.45
60-69	0.60	0.51	0.39	0.25
70+	0.57	0.30	0.24	0.10
High School Graduates				
20-29	0.89	0.78	0.82	0.73
30-39	0.90	0.83	0.83	0.66
40-49	0.86	0.79	0.74	0.50
50-59	0.79	0.72	0.55	0.40
60-69	0.60	0.42	0.31	0.24
70+	0.47	0.29	0.09	0.14
College Graduates				
20-29	0.81	0.65	0.51	0.56
30-39	0.82	0.61	0.55	0.39
40-49	0.71	0.53	0.44	0.20
50-59	0.63	0.38	0.24	0.22
60-69	0.41	0.20	0.09	0.10
70+	0.28	0.07	0.06	0.03

Source: Authors' calculations based on the 1983-1995 SCFs.

[a] Conditional on having a credit card.

[b] We calculated the fraction of households who are borrowing in each quartile of the wealth distribution contingent on age and education group, for every SCF year. The table reports the weighted average across the 4 SCF years, using the proportion of households with credit cards in a given year/category as weights.

Table 3. Wealth-Income Ratios

	Means					Medians				
Age Group	1983[a]	1989	1992	1995	Average	1983[a]	1989	1992	1995	Average
All categories										
20-29	1.26	3.29	1.07	1.42	1.76	0.45	0.41	0.42	0.52	0.45
30-39	2.97	2.70	2.59	2.38	2.66	1.32	1.27	1.03	1.14	1.19
40-49	5.16	6.69	4.78	4.98	5.40	2.07	2.45	1.87	1.84	2.06
50-59	8.00	8.06	8.82	8.03	8.23	2.91	3.90	3.87	3.34	3.50
60-69	11.82	19.56	15.30	14.43	15.28	4.07	5.73	5.14	5.13	5.02
70+	13.06	24.08	21.35	24.91	20.85	4.67	7.02	10.13	8.30	7.53
Incomplete High School										
20-29	0.54	1.49	0.78	0.93	0.94	0.22	0.32	0.31	0.42	0.32
30-39	1.87	2.26	1.71	1.65	1.87	0.52	1.27	0.58	0.76	0.78
40-49	3.13	6.64	3.43	4.22	4.35	1.07	2.02	1.53	1.30	1.48
50-59	3.67	6.21	4.44	5.82	5.03	2.29	3.41	2.19	2.16	2.51
60-69	7.19	14.25	9.59	9.73	10.19	2.98	5.00	3.73	3.30	3.75
70+	9.67	24.81	16.56	18.42	17.37	3.75	5.97	9.05	6.95	6.43
High School Graduate										
20-29	1.40	2.63	1.10	1.44	1.64	0.46	0.40	0.37	0.47	0.42
30-39	3.08	1.97	2.59	2.22	2.47	1.22	0.86	0.94	1.17	1.05
40-49	3.72	4.11	2.32	3.94	3.52	2.20	2.33	1.22	1.69	1.86
50-59	11.39	7.53	9.18	6.51	8.65	2.78	3.69	3.75	2.74	3.24
60-69	13.10	18.06	15.80	15.35	15.57	4.31	6.53	5.44	6.55	5.71
70+	18.55	21.74	21.79	23.46	21.39	6.08	7.85	10.90	9.25	8.52
College Graduate										
20-29	1.31	5.91	1.31	1.97	2.63	0.63	0.82	0.46	0.92	0.71
30-39	3.20	3.72	3.23	3.23	3.34	1.75	1.58	1.44	1.35	1.53
40-49	9.49	8.85	7.34	6.22	7.97	2.33	3.28	2.69	2.42	2.68
50-59	7.90	11.19	12.39	12.12	10.90	3.57	4.78	4.71	4.32	4.34
60-69	21.89	34.40	23.15	21.73	25.29	7.98	8.38	8.49	9.05	8.48
70+	18.08	24.34	32.09	39.35	28.47	11.03	9.85	12.89	14.09	11.97

Sources: SCF, Social Security Administration, Congressional Budget Office and Pechman (1989).
Income is after tax non-asset income, plus bequests. Taxes include Social Security deductions, and Federal income taxes. Social Security deductions were imputed using OASDI-HI tax rates and maximum taxable earnings. Federal income taxes were imputed using effective tax rates as reported by the CBO and Pechman.
[a] Bequests are imputed using Laibson, Repetto and Tobacman (1998) calculations.

3 Digression: Model-building

3.1 Why do people save?

3.2 Why do people borrow on credit cards?

4 Model

- Recent consumption papers use simulations

- Rich environments, eg with income uncertainty and liquidity constraints

- Literature pioneered by Carroll (1992, 1997), Deaton (1991), and Zeldes (1989)

- Gourinchas and Parker (2001) use method of simulated moments (MSM) to estimate a structural model of life-cycle consumption

4.1 Demographics

- Mortality, Retirement (PSID), Dependents (PSID), HS educational group

4.2 Income from transfers and wages

- Y_t = after-tax labor and bequest income plus govt transfers (assumed exog., calibrated from PSID)

- $y_t \equiv \ln(Y_t)$: During working life:

$$y_t = f^W(t) + u_t + \varepsilon_t^W \tag{3}$$

- During retirement:

$$y_t = f^R(t) + \varepsilon_t^R \tag{4}$$

4.3 Liquid assets and non-collateralized debt

- $X_t + Y_t$ represents liquid asset holdings at the beginning of period t.

- Credit limit: $X_t \geq -\lambda \cdot \bar{Y}_t$

- $\lambda = .30$, so average credit limit is approximately $8,000 (SCF).

- Liquid asset aftertax interest rate: 2%,3%,3.75%

- Credit card interest rate: 9%,10%,11.75%

4.4 Illiquid assets

- Z_t represents illiquid asset holdings at age t:
- Z bounded below by zero.
- Z generates consumption °ows each period of °Z; set ° = 5%,6%,7%
- Conceive of Z as having some of the properties of home equity.
- Disallow withdrawals from Z; Z is perfectly illiquid.
- Z stylized to preserve computational tractability.

Z is perfectly illiquid; withdrawals from Z are disallowed.

1. House of value H, mortgage of size M.

2. Consumption flow of γH; minus interest cost of ηM; where $\eta = i \cdot (1 - \tau) - \gamma$:

3. $\gamma \approx \eta \Rightarrow$ net consumption flow of $\gamma H - \eta M \approx \gamma(H - M) = \gamma Z$: We've explored different possibilities for withdrawals from Z before..

4.5 Time Preferences

- Discount function:

$$\{1, \beta\delta, \beta\delta^2, \beta\delta^3, \ldots\}$$

- $\beta = 1$: standard exponential discounting case

- $\beta < 1$: preferences are qualitatively hyperbolic

- Null hypothesis: $\beta = 1$

$$U_t(\{C_\tau\}_{\tau=t}^{T}) = u(C_t) + \beta \sum_{\tau=t+1}^{T} \delta^{\tau} u(C_\tau) \qquad (5)$$

In full detail, self t has instantaneous payoff function

$$u(C_t, Z_t, n_t) = n_t \cdot \frac{\left(\frac{C_t + \gamma Z_t}{n_t}\right)^{1-\gamma} - 1}{1 - \gamma}$$

and continuation payoffs given by:

$$\beta \sum_{i=1}^{T+N-t} \delta^i \left(\prod_{j=1}^{i-1} s_{t+j} \right) (s_{t+i}) \cdot u(C_{t+i}, Z_{t+i}, n_{t+i}) \ldots$$

$$+ \beta \sum_{i=1}^{T+N-t} \delta^i \left(\prod_{j=1}^{i-1} s_{t+j} \right) (1 - s_{t+i}) \cdot B(X_{t+i}, Z_{t+i})$$

- n_t is effective household size: adults+(.4)(kids)
- γZ_t represents real after-tax net consumption flow
- s_{t+1} is survival probability
- $B(\cdot)$ represents the payoff in the death state

4.6 Computation

- Dynamic problem:

$$\max_{I_t^X, I_t^Z} \; u(C_t; Z_t; n_t) + \beta\delta E_t V_{t;t+1}(\Omega_{t+1})$$
$$s.t.\ \text{Budget constraints}$$

- $\Omega_t = (X_t + Y_t; Z_t; u_t)$ (state variables)

- Functional Equation:

$$V_{t-1;t}(\Omega_t) =$$
$$\{s_t[u(C_t; Z_t; n_t) + \delta E_t V_{t;t+1}(\Omega_{t+1})] + (1 - s_t)E_t B(\Omega_t)$$

- Solve for eq strategies using backwards induction

- Simulate behavior

- Calculate descriptive moments of consumer behavior

5 Estimation

Estimate parameter vector θ and evaluate models wrt data.

- m_e = N empirical moments, VCV matrix = Ω
- $m_s(\theta)$ = analogous simulated moments
- $q(\theta) \equiv (m_s(\theta) - m_e)\Omega^{-1}(m_s(\theta) - m_e)'$, a scalar-valued loss function
- Minimize loss function: $\hat{\theta} = \arg\min_{\theta} q(\theta)$
- $\hat{\theta}$ is the MSM estimator.
- Pakes and Pollard (1989) prove asymptotic consistency and normality.
- Specification tests: $q(\hat{\theta}) \sim \chi^2(N - \#\text{parameters})$

6 Results

- Exponential ($\beta = 1$) case:

$$\hat{\delta} = .857 \pm .005; \qquad q\left(\hat{\delta}, 1\right) = 512$$

- Hyperbolic case:

$$\begin{cases} \hat{\beta} = .661 \pm .012 \\ \hat{\delta} = .956 \pm .001 \end{cases} \qquad q\left(\hat{\delta}, \hat{\beta}\right) = 75$$

(Conservative case: $\left[R^{X}; \gamma; R^{CC}\right] = [1.0375;\ 0.05;\ 1.117$

Punchlines:

- β estimated significantly below 1.

- Reject $\beta = 1$ null hypothesis with a t-stat of 25.

- Specification tests reject both the exponential and the hyperbolic models.

Ã Statistic 3:75%; 5%; 11:75% !	$m_s(1; \hat{\pm})$ $\hat{\pm} = :857$	$m_s(\hat{-}; \hat{\pm})$ $\hat{-} = :661$ $\hat{\pm} = :956$	m_e	se_{m_e}
% V isa	0.62	0.65	0.68	0.015
mean V isa	0.14	0.17	0.12	0.01
CY	0.26	0.35	0.23	0.11
Cdrop	0.16	0.18	0.09	0.07
wealth	0.04	2.51	2.60	0.13
$q(\hat{\mu})$	512	75		

Robustness:

Aggressive: $\left[R^{X}, \gamma, R^{CC}\right] = [1.02,\ 0.07,\ 1.09]$

Intermediate: $\left[R^{X}, \gamma, R^{CC}\right] = [1.03,\ 0.06,\ 1.10]$

Conservative: $\left[R^{X}, \gamma, R^{CC}\right] = [1.0375,\ 0.05,\ 1.1175]$

	Aggressive	Intermediate	Conservative
$\hat{\delta}^{exp}$	.923 (.002)	.930 (.001)	.857 (.005)
$q\left(\hat{\delta}, 1\right)$	64	278	512
$\left[\hat{\delta}, \hat{\lambda}\right]^{hyp}$	[.932; .909] (.002) ; (.016)	[.944; .815] (.001) ; (.014)	[.956; .661] (.001) ; (.012)
$q\left(\hat{\delta}, \hat{\lambda}\right)$	33	45	75

Statistic (2%; 7%; 9%)	$m_S(1;\hat{\pm})$ $\hat{\pm} = :923$	$m_S(\hat{-};\hat{\pm})$ $\hat{-} = :909$ $\hat{\pm} = :932$	m_e	se_{m_e}
% Visa	0.58	0.65	0.68	0.015
mean Visa	0.12	0.15	0.12	0.01
CY	0.14	0.19	0.23	0.11
Cdrop	0.12	0.14	0.09	0.07
wealth	2.53	2.66	2.60	0.13
$q(\hat{\mu})$	64	33		

Statistic $(3\%; 6\%; 10\%)$	$m_s(1; \hat{\pm})$ $\hat{\pm} = :930$	$m_s(\hat{\ }; \hat{\pm})$ $\hat{\ } = :815$ $\hat{\pm} = :944$	m_e	se_{m_e}
% V isa	0.44	0.65	0.68	0.015
mean V isa	0.08	0.16	0.12	0.01
CY	0.10	0.22	0.23	0.11
Cdrop	0.08	0.14	0.09	0.07
wealth	2.50	2.61	2.60	0.13
$q(\hat{\mu})$	278	45		

7 Conclusion

- Structural test using the method of simulated moments rejects the exponential discounting null.

- Specification tests reject both the exponential and the hyperbolic models.

- Quantitative results are sensitive to interest rate assumptions.

- Hyperbolic discounting does a better job of matching the available empirical evidence on consumption and savings.