

Empirical Asset Pricing

Class 2: Consumption-Based Asset-Pricing Models

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Hansen and Singleton (1984), ERRATA

TABLE III
INSTRUMENTAL VARIABLES ESTIMATION WITH MULTIPLE RETURNS

Equally- and Value-Weighted Aggregate Returns 1959:2–1978:12								
Cons	<i>NLAG</i>	$\hat{\alpha}$	$\widehat{SE}(\hat{\alpha})$	$\hat{\beta}$	$\widehat{SE}(\hat{\beta})$	χ^2	DF	Prob.
NDS	1	-0.5901	1.7331	.9989	.0041	18.309	6	.9945
NDS	2	1.0945	1.4907	.9961	.0040	24.412	12	.9821
NDS	4	0.3835	1.4208	.9975	.0039	40.234	24	.9798
ND	1	-0.6494	0.6838	.9982	.0025	19.976	6	.9972
ND	2	-0.0200	0.6071	.9982	.0025	27.089	12	.9925
ND	4	-0.1793	0.5928	.9986	.0025	42.005	24	.9871

Value-Weighted Aggregate Stock Returns and Risk-Free Bonds Returns 1959:2–1978:12								
Cons	<i>NLAG</i>	$\hat{\alpha}$	$\widehat{SE}(\hat{\alpha})$	$\hat{\beta}$	$\widehat{SE}(\hat{\beta})$	χ^2	DF	Prob.
NDS	1	-.1405	.0420	.9998	.0001	31.800	8	.9999
NDS	2	-.1472	.0376	.9998	.0001	44.083	16	.9998
NDS	4	-.1405	.0320	.9996	.0001	65.250	32	.9995
ND	1	-.0962	.0461	.9995	.0001	25.623	8	.9988
ND	2	-.1150	.0377	.9995	.0001	39.874	16	.9991
ND	4	-.1611	.0364	.9994	.0001	60.846	32	.9985

Three Industry-Average Stock Returns 1959:2–1977:12								
Cons	<i>NLAG</i>	$\hat{\alpha}$	$\widehat{SE}(\hat{\alpha})$	$\hat{\beta}$	$\widehat{SE}(\hat{\beta})$	χ^2	DF	Prob.
NDS	1	1.5517	1.8006	.9906	.0046	13.840	13	.6147
NDS	4	0.6713	1.2466	.9940	.0035	88.211	49	.9995
ND	1	0.7555	0.7899	.9924	.0029	13.580	13	.5959
ND	4	0.5312	0.5512	.9939	.0024	89.501	49	.9996

Campbell (2003), Table 1

Table 1
International stock and bill returns

Country	Sample period	\bar{r}_e	$\sigma(r_e)$	$\rho(r_e)$	\bar{r}_f	$\sigma(r_f)$	$\rho(r_f)$
USA	1947.2–1998.4	8.085	15.645	0.083	0.896	1.748	0.508
AUL	1970.1–1999.1	3.540	22.699	0.005	2.054	2.528	0.645
CAN	1970.1–1999.2	5.431	17.279	0.072	2.713	1.855	0.667
FR	1973.2–1998.4	9.023	23.425	0.048	2.715	1.837	0.710
GER	1978.4–1997.4	9.838	20.097	0.090	3.219	1.152	0.348
ITA	1971.2–1998.2	3.168	27.039	0.079	2.371	2.847	0.691
JAP	1970.2–1999.1	4.715	21.909	0.021	1.388	2.298	0.480
NTH	1977.2–1998.4	14.070	17.228	-0.030	3.377	1.591	-0.085
SWD	1970.1–1999.3	10.648	23.839	0.022	1.995	2.835	0.260
SWT	1982.2–1999.1	13.744	21.828	-0.128	1.393	1.498	0.243
UK	1970.1–1999.2	8.155	21.190	0.084	1.301	2.957	0.478
USA	1970.1–1998.4	6.929	17.556	0.051	1.494	1.687	0.571
SWD	1920–1998	7.084	18.641	0.096	2.209	5.800	0.710
UK	1919–1998	7.713	22.170	-0.023	1.255	5.319	0.589
USA	1891–1998	7.169	18.599	0.047	2.020	8.811	0.338

Table 2
International consumption and dividends

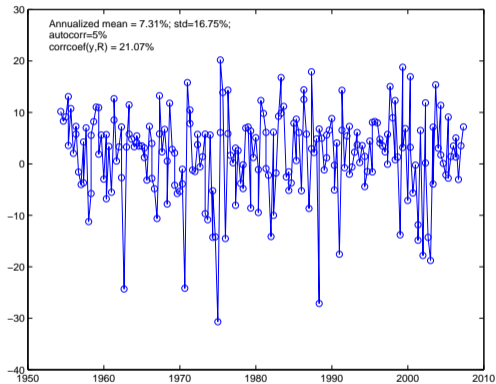
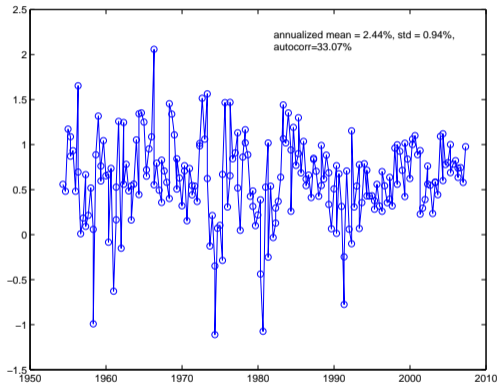
Country	Sample period	$\bar{\Delta c}$	$\sigma(\Delta c)$	$\rho(\Delta c)$	$\bar{\Delta d}$	$\sigma(\Delta d)$	$\rho(\Delta d)$
USA	1947.2–1998.4	1.964	1.073	0.216	2.159	28.291	-0.544
AUL	1970.1–1999.1	2.099	2.056	-0.324	0.656	34.584	-0.450
CAN	1970.1–1999.2	2.082	1.971	0.105	-0.488	5.604	0.522
FR	1973.2–1998.4	1.233	2.909	0.029	-0.255	13.108	-0.133
GER	1978.4–1997.4	1.681	2.431	-0.327	1.189	8.932	0.078
ITA	1971.2–1998.2	2.200	1.700	0.283	-3.100	19.092	0.298
JAP	1970.2–1999.1	3.205	2.554	-0.275	-2.350	4.351	0.354
NTH	1977.2–1998.4	1.841	2.619	-0.257	4.679	4.973	0.294
SWD	1970.1–1999.3	0.962	1.856	-0.266	4.977	14.050	0.386
SWT	1982.2–1999.1	0.524	2.112	-0.399	6.052	7.698	0.271
UK	1970.1–1999.2	2.203	2.507	-0.006	0.591	7.047	0.313
USA	1970.1–1998.4	1.812	0.907	0.374	0.612	16.803	-0.578
SWD	1920–1998	1.770	2.816	0.150	1.551	12.894	0.315
UK	1919–1998	1.551	2.886	0.294	1.990	7.824	0.233
USA	1891–1998	1.789	3.218	-0.116	1.516	14.019	-0.087

Campbell (2003), Table 3

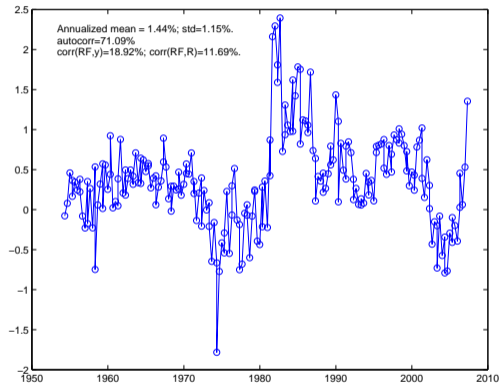
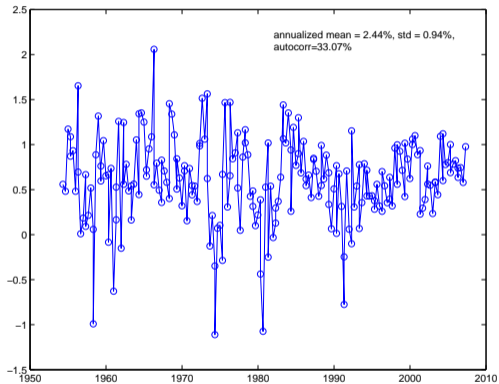
Table 3
Horizon effects on correlations of real consumption growth, dividend growth, and stock returns

Country	Sample period	$\rho(\Delta c, \Delta d)$				$\rho(\Delta c, r_e)$				$\rho(\Delta d, r_e)$			
		1	4	8	16	1	4	8	16	1	4	8	16
USA	1947.3–1998.3	0.053	0.135	0.205	0.249	0.229	0.340	0.267	0.029	0.034	0.055	0.215	0.471
AUL	1970.2–1998.4	-0.058	-0.044	0.076	-0.039	0.162	0.282	0.261	0.422	0.091	-0.007	0.191	0.390
CAN	1970.2–1999.1	-0.107	-0.120	-0.057	-0.088	0.188	0.352	0.272	0.068	-0.046	0.176	0.414	0.476
FR	1973.2–1998.3	0.076	0.059	0.053	0.166	-0.099	-0.117	-0.320	-0.138	0.094	0.176	0.147	0.134
GER	1978.4–1997.3	0.029	0.118	0.291	0.278	0.027	-0.151	-0.091	-0.249	0.057	0.298	0.421	0.481
ITA	1971.2–1998.1	0.107	-0.106	-0.226	-0.193	-0.028	-0.033	-0.040	-0.201	0.080	0.296	0.382	0.716
JAP	1970.2–1998.4	-0.030	-0.147	-0.217	-0.230	0.112	0.398	0.400	0.235	0.029	0.103	0.120	0.317
NTH	1977.2–1998.3	0.087	0.211	0.331	0.348	0.024	0.174	0.238	0.183	0.122	0.285	0.466	0.624
SWD	1970.2–1999.2	0.074	0.201	0.285	0.370	0.027	0.092	0.114	0.082	0.099	0.090	0.294	0.575
SWT	1982.2–1998.4	-0.019	-0.009	0.138	0.237	-0.119	0.015	0.092	-0.087	0.173	0.218	0.556	0.732
UK	1970.2–1999.1	0.046	0.104	0.118	0.328	0.125	0.197	0.359	0.441	-0.100	0.007	0.284	0.650
USA	1970.2–1998.3	-0.029	0.131	0.256	0.420	0.286	0.359	0.324	0.144	0.015	-0.049	0.020	0.330
SWD	1920–1997	0.261	0.359	0.354	0.084	0.209	0.287	0.387	0.137	0.285	0.447	0.648	0.684
UK	1920–1997	0.083	0.335	0.516	0.422	0.422	0.467	0.458	0.390	0.161	0.442	0.594	0.782
USA	1891–1997	0.178	0.151	0.202	0.098	0.452	0.491	0.396	0.138	0.476	0.503	0.676	0.784

Data



Data



Equity minus RiskFree

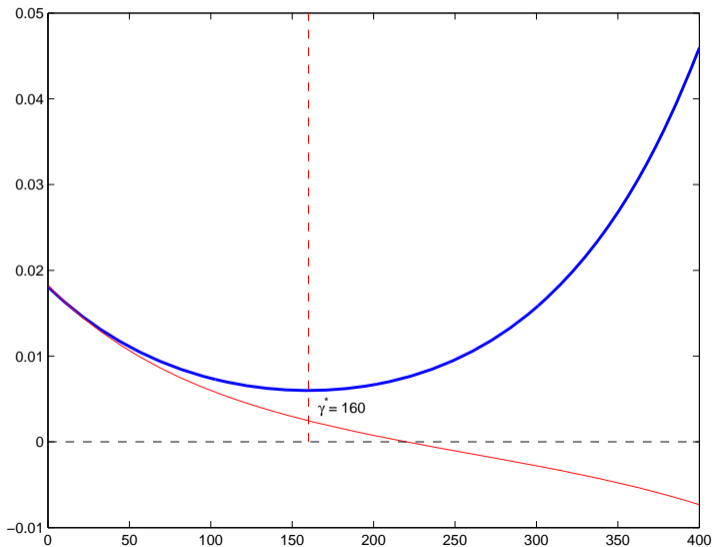


TABLE 5
SUMMARY OF MAXIMUM LIKELIHOOD RESULTS FOR NOMINAL
RISK-FREE AND VALUE-WEIGHTED RETURNS

Model	$\hat{\alpha}^*$	$\hat{\beta}^*$	CONS	NLAG	$\chi^2\dagger$	<i>df</i>
1	-30.58 (34.06)	1.001 (.0462)	ND	0	Just identified	Just identified
2	-.205	.999	ND	4	170.25 (.9999)	24
3	-58.25 (66.57)	1.088 (.0687)	NDS	0	Just identified	Just identified
4	-.209	1.000	NDS	4	366.22 (.9999)	24

* Standard errors are indicated in parentheses.

† Probability values are indicated in parentheses.

Campbell (2003), Table 4

Table 4
The equity premium puzzle

Country	Sample period	\overline{aer}_e	$\sigma(er_e)$	$\sigma(m)$	$\sigma(\Delta c)$	$\rho(er_e, \Delta c)$	$cov(er_e, \Delta c)$	RRA(1)	RRA(2)
USA	1947.2–1998.3	8.071	15.271	52.853	1.071	0.205	3.354	240.647	49.326
AUL	1970.1–1998.4	3.885	22.403	17.342	2.059	0.144	6.640	58.511	8.421
CAN	1970.1–1999.1	3.968	17.266	22.979	1.920	0.202	6.694	59.266	11.966
FR	1973.2–1998.3	8.308	23.175	35.848	2.922	-0.093	-6.315	< 0	12.270
GER	1978.4–1997.3	8.669	20.196	42.922	2.447	0.029	1.446	599.468	17.542
ITA	1971.2–1998.1	4.687	27.068	17.314	1.665	-0.006	-0.252	< 0	10.400
JAP	1970.2–1998.4	5.098	21.498	23.715	2.561	0.112	6.171	82.620	9.260
NTH	1977.2–1998.3	11.421	16.901	67.576	2.510	0.032	1.344	849.991	26.918
SWD	1970.1–1999.2	11.539	23.518	49.066	1.851	0.015	0.674	1713.197	26.501
SWT	1982.2–1998.4	14.898	21.878	68.098	2.123	-0.112	-5.181	< 0	32.076
UK	1970.1–1999.1	9.169	21.198	43.253	2.511	0.093	4.930	185.977	17.222
USA	1970.1–1998.3	6.353	16.976	37.425	0.909	0.274	4.233	150.100	41.178
SWD	1920–1997	6.540	18.763	34.855	5.622	0.167	8.830	74.062	12.400
UK	1919–1997	8.674	21.277	40.767	5.630	0.351	21.042	41.223	14.483
USA	1891–1997	6.723	18.496	36.345	6.437	0.495	29.450	22.827	11.293

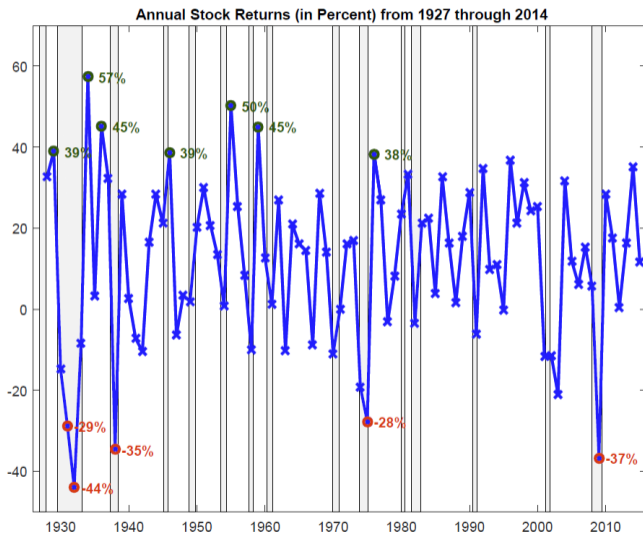
Table 5
The risk-free rate puzzle

Country	Sample period	\bar{r}_f	$\bar{\Delta c}$	$\sigma(\Delta c)$	RRA(1)	TPR(1)	RRA(2)	TPR(2)
USA	1947.2–1998.3	0.896	1.951	1.071	240.647	-136.270	49.326	-81.393
AUL	1970.1–1998.4	2.054	2.071	2.059	58.511	-46.512	8.421	-13.880
CAN	1970.1–1999.1	2.713	2.170	1.920	59.266	-61.154	11.966	-20.618
FR	1973.2–1998.3	2.715	1.212	2.922	< 0	N/A	12.270	-5.735
GER	1978.4–1997.3	3.219	1.673	2.447	599.468	9757.265	17.542	-16.910
ITA	1971.2–1998.1	2.371	2.273	1.665	< 0	N/A	10.400	-19.765
JAP	1970.2–1998.4	1.388	3.233	2.561	82.620	-41.841	9.260	-25.735
NTH	1977.2–1998.3	3.377	1.671	2.510	849.991	21349.249	26.918	-18.769
SWD	1970.1–1999.2	1.995	1.001	1.851	1713.197	48590.956	26.501	-12.506
SWT	1982.2–1998.4	1.393	0.559	2.123	< 0	N/A	32.076	6.636
UK	1970.1–1999.1	1.301	2.235	2.511	185.977	676.439	17.222	-27.838
USA	1970.1–1998.3	1.494	1.802	0.909	150.100	-175.916	41.178	-65.701
SWD	1920–1997	2.209	1.730	2.811	74.062	90.793	12.400	-13.165
UK	1919–1997	1.255	1.472	2.815	41.223	7.913	14.483	-11.749
USA	1891–1997	2.020	1.760	3.218	22.827	-11.162	11.293	-11.247

Other Consumption-Based Asset Pricing Models

- Power utility, one good with a low probability crash state, Rietz (1988).
- Models with durable goods, e.g., Dunn and Singleton (1986), Eichenbaum and Hansen (1990), Yogo (2006).
- Models with luxury goods, e.g., Ait-Sahalia, Parker, and Yogo (2004).
- Separating risk aversion and intertemporal substitution, e.g., Epstein and Zin (1989, 1991) and Weil (1989).
- Habit formation, e.g., Campbell and Cochrane (1999).
- Prospect theory, e.g., Barberis, Huang and Santos (2001).
- Uncertainty aversion, e.g., Maenhout (2004).
- Long run risks, e.g., Bansal and Yaron (2004), Parker and Julliard (2005), Jagannathan and Wang (2005), Hansen, Heaton, and Li (2006).
- Interactions of heterogeneous investors, e.g., Constantinides and Duffie (1996), Wang (1996), Chan and Kogan (2002); Micro-level studies, e.g., Zeldes (1991), Heaton and Lucas (1996), Parker (2001), Brunnermeier and Nagel (2006), Malloy, Moskowitz, and Vissing-Jorgensen (2006).

NBER Dated Recessions (shaded areas)



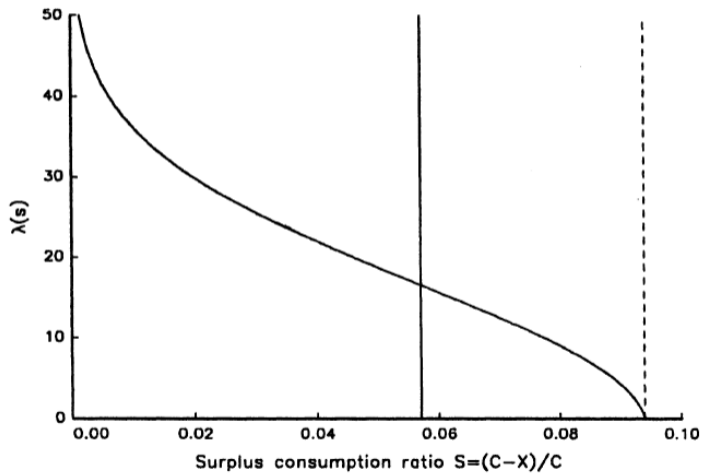
Campbell and Cochrane (1999), Parameter Choices

TABLE 1
PARAMETER CHOICES

Parameter	Variable	Value
Assumed:		
Mean consumption growth (%)*	g	1.89
Standard deviation of consumption growth (%)*	σ	1.50
Log risk-free rate (%)*	r^f	.94
Persistence coefficient*	ϕ	.87
Utility curvature	γ	2.00
Standard deviation of dividend growth (%)*	σ_w	11.2
Correlation between Δd and Δc	ρ	.2
Implied:		
Subjective discount factor*	δ	.89
Steady-state surplus consumption ratio	\bar{S}	.057
Maximum surplus consumption ratio	S_{\max}	.094

* Annualized values, e.g., $12g$, $\sqrt{12}\sigma$, $12r^f$, ϕ^{12} , and δ^{12} , since the model is simulated at a monthly frequency.

Sensitivity Function $\lambda(s)$



Price-Consumption Ratio and Expected Returns

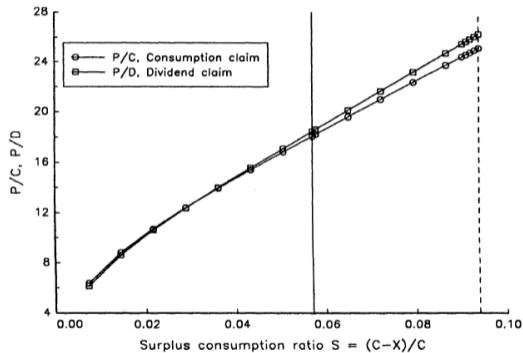


FIG. 3.—Price/dividend ratios as functions of the surplus consumption ratio

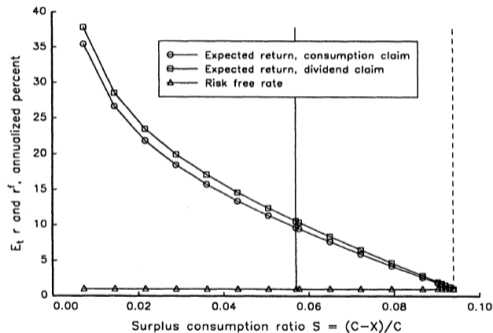


FIG. 4.—Expected returns and risk-free rate as functions of the surplus consumption ratio.

Return Volatility and Sharpe Ratio

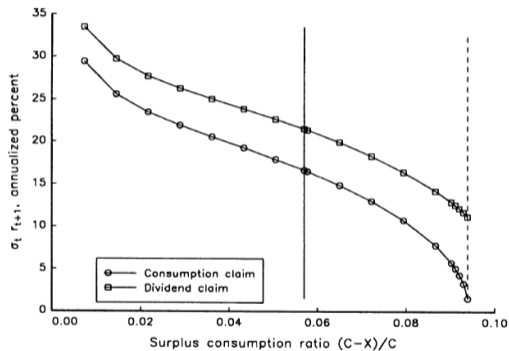


FIG. 5.—Conditional standard deviations of returns as functions of the surplus consumption ratio.

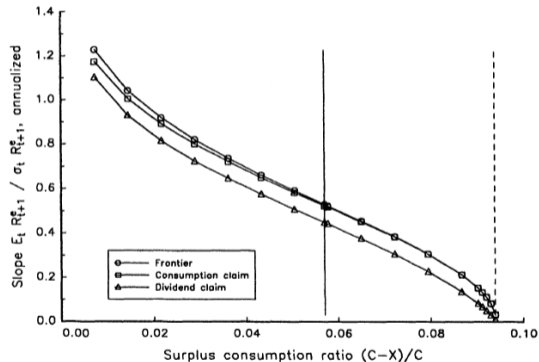


FIG. 6.—Sharpe ratios as functions of the surplus consumption ratio

Price-Dividend Ratio

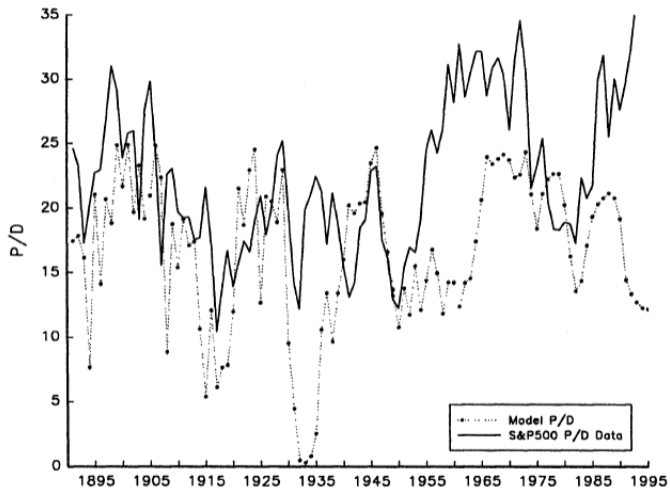


FIG. 9.—Historical price/dividend ratio and model predictions based on the history of consumption.