How Predictable are Components of the Aggregate Market Portfolio?

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Introduction

- Voluminous literature on stock return predictability
- In-sample tests $\Rightarrow$ returns contain significant predictable component (Campbell, 2000, *JF*)
- Out-of-sample evidence more elusive (Goyal & Welch, 2008, *RFS*)
- Some recent studies provide stronger evidence of out-of-sample predictability
  - Theoretically motivated restrictions (Campbell & Thompson, 2008, *RFS*)
  - Forecast combination (Rapach et al., forthcoming, *RFS*)

Introduction

- Literature focuses primarily on aggregate market predictability
- We focus on return predictability for component portfolios
  - Industry
  - Size
  - Book-to-market
- Important implications
  - Asset-pricing tests (Ferson & Harvey, 1999, *JF*)
  - Cost of capital (Fama & French, 1997, *JFE*)
  - Asset allocation (rotation strategies)
  - Benchmarks for mutual funds
  - Understanding predictability
    - Time-varying macro risk premiums
    - Equity market frictions

Introduction

- Relatively few papers analyze component predictability
  - Ferson and Harvey (1999, *JF*)
  - Cooper, Gulen, & Vassalou (2002)
  - Avramov (2002, *JFE*)
- We consider
  - Large number of component portfolios
    - 33 industries
    - 10 size
    - 10 book-to-market
  - Large number of potential predictors
    - 14 economic variables from Goyal & Welch (2008, *RFS*)
    - 33 lagged industry returns from Hong et al. (2007, *JFE*)
  - Forecast combination (Rapach et al., forthcoming, *RFS*)
  - Economic explanations

In-sample tests

- Predictive regression model
  - $r_{i,t} = a_i + b_{i,j} x_{j,t-1} + e_{i,t}$
    - $r_{i,t}$: return on component i − risk-free rate
    - $x_{j,t}$: potential predictor
  - Well-known small-sample bias (Stambaugh, 1999, *JFE*)
  - Base inference on bootstrap procedure
- Data
  - Component portfolios from French's data library
    - 33 industries
    - S1,...,S10
    - BM1,...,BM10
  - 14 economic variables from Goyal & Welch (2008, *RFS*)
    - Popular aggregate market predictors
  - 1946:01–2004:12 sample period

In-sample results, predictors = economic variables

Industry portfolios, average R^2 (%) across predictors

Return	R^2	Return	R^2	Return	R^2
MKT	0.48	PAPER	0.44	CARS	0.61
AGRIC	0.20	PRINT	0.50	INSTR	0.30
MINES	0.30	CHEMS	0.34	MANUF	0.38
OIL	0.28	PTRLM	0.30	TRANS	0.43
STONE	0.23	RUBBER	0.49	PHONE	0.28
CNSTR	0.41	LETHR	0.48	TV	0.36
FOOD	0.46	GLASS	0.52	UTILS	0.39
SMOKE	0.28	METAL	0.24	WHLSL	0.37
TXTLS	0.53	MTLPR	0.47	RTAIL	0.42
APPRL	0.56	MACHIN	0.34	MONEY	0.42
WOOD	0.28	ELCTR	0.28	SRVC	0.34
CHAIR	0.55				

In-sample results, predictors = economic variables

Size and book-to-market portfolios, average R^2 (%) across predictors

Return	R^2	Return	R^2
S1	0.46	BM1	0.36
S2	0.39	BM2	0.39
S3	0.41	BM3	0.44
S4	0.45	BM4	0.45
S5	0.45	BM5	0.49
S6	0.50	BM6	0.49
S7	0.45	BM7	0.40
S8	0.41	BM8	0.39
S9	0.45	BM9	0.43
S10	0.43	BM10	0.39

In-sample results, predictors = lagged industry rets.

Industry portfolios, average R^2 (%) across predictors

Return	R^2	Return	R^2	Return	R^2
MKT	0.63	PAPER	0.20	CARS	1.97
AGRIC	0.98	PRINT	2.34	INSTR	0.41
MINES	0.45	CHEMS	0.14	MANUF	2.51
OIL	0.06	PTRLM	0.03	TRANS	0.98
STONE	0.84	RUBBER	0.37	PHONE	0.21
CNSTR	2.32	LETHR	1.71	TV	0.91
FOOD	0.39	GLASS	1.05	UTILS	0.06
SMOKE	0.24	METAL	0.31	WHLSL	1.45
TXTLS	2.58	MTLPR	1.64	RTAIL	1.04
APPRL	1.70	MACHIN	0.74	MONEY	0.63
WOOD	1.00	ELCTR	0.36	SRVC	0.94
CHAIR	2.65				

In-sample results, predictors = lagged industry rets.

Size and book-to-market portfolios, average R^2 (%) across predictors

Return	R^2	Return	R^2
S1	5.08	BM1	0.45
S2	3.07	BM2	0.59
S3	2.42	BM3	0.87
S4	2.24	BM4	0.60
S5	1.64	BM5	0.58
S6	1.42	BM6	0.33
S7	1.21	BM7	0.36
S8	0.58	BM8	0.47
S9	0.48	BM9	1.11
S10	0.23	BM10	1.62

Out-of-sample tests

- Generate recursive out-of-sample forecasts
  - Focus on combination forecasts
    - Simple combining method: average of individual forecasts
    - Improves forecasting in environments with model uncertainty/instability (Rapach et al., forthcoming, *RFS*)
- 1966:01–2004:12 forecast evaluation period
  - 6 NBER-dated recessions
  - Long 1990s expansion
- Benchmark model: historical average
  - Constant expected excess return
- R^2_{OS} statistic (Campbell & Thompson, 2008, *RFS*)
  - % $\downarrow$ in MSFE relative to historical average
  - Assess significance using *MSFE-adjusted* statistic (Clark & West, 2007, *JMetrics*)

Out-of-sample results, predictors = economic variables

Industry portfolios, combination forecast R^2_{OS} (%)

Return	R^2_{OS}	Return	R^2_{OS}	Return	R^2_{OS}
MKT	1.09	PAPER	0.77	CARS	1.83
AGRIC	0.20	PRINT	1.06	INSTR	0.36
MINES	0.12	CHEMS	0.63	MANUF	0.86
OIL	0.18	PTRLM	0.45	TRANS	0.77
STONE	0.11	RUBBER	1.23	PHONE	0.22
CNSTR	0.70	LETHR	0.87	TV	0.85
FOOD	0.70	GLASS	1.02	UTILS	0.88
SMOKE	0.03	METAL	0.31	WHLSL	0.61
TXTLS	1.09	MTLPR	0.88	RTAIL	0.81
APPRL	1.39	MACHIN	0.58	MONEY	0.82
WOOD	0.36	ELCTR	0.54	SRVC	0.61
CHAIR	0.97				

Out-of-sample results, predictors = economic variables

Size and book-to-market portfolios, combination forecast R^2_{OS} (%)

Return	R^2_{OS}	Return	R^2_{OS}
S1	0.83	BM1	0.63
S2	0.73	BM2	0.83
S3	0.74	BM3	1.01
S4	0.91	BM4	1.05
S5	0.93	BM5	1.34
S6	1.08	BM6	1.01
S7	0.96	BM7	0.84
S8	0.81	BM8	1.09
S9	0.94	BM9	1.03
S10	1.01	BM10	0.83

Out-of-sample results, predictors = lagged ind. rets.

Industry portfolios, combination forecast R^2_{OS} (%)

Return	R^2_{OS}	Return	R^2_{OS}	Return	R^2_{OS}
MKT	0.21	PAPER	−0.10	CARS	1.83
AGRIC	0.97	PRINT	2.15	INSTR	0.12
MINES	0.24	CHEMS	−0.24	MANUF	2.56
OIL	−0.20	PTRLM	−0.41	TRANS	0.57
STONE	1.02	RUBBER	0.16	PHONE	−0.30
CNSTR	2.20	LETHR	1.19	TV	0.95
FOOD	−0.06	GLASS	0.97	UTILS	−0.10
SMOKE	−0.08	METAL	0.01	WHLSL	1.11
TXTLS	2.54	MTLPR	1.13	RTAIL	0.69
APPRL	1.73	MACHIN	0.46	MONEY	0.07
WOOD	0.72	ELCTR	0.14	SRVC	0.61
CHAIR	2.10				

Out-of-sample results, predictors = lagged ind. rets.

Size and book-to-market portfolios, combination forecast R^2_{OS} (%)

Return	R^2_{OS}	Return	R^2_{OS}
S1	5.85	BM1	0.05
S2	3.13	BM2	0.18
S3	2.34	BM3	0.38
S4	2.10	BM4	0.21
S5	1.42	BM5	0.05
S6	1.16	BM6	−0.13
S7	0.91	BM7	0.06
S8	0.21	BM8	0.14
S9	0.13	BM9	0.78
S10	−0.24	BM10	1.47

Economic explanation—business cycles

- Fama & French (1998, *JFE*) and Campbell & Cochrane (1999, *JPE*)
  - Business-cycle fluctuations $\longrightarrow$ changes in risk aversion $\longrightarrow$ time-varying macroeconomic risk premiums $\longrightarrow$ return predictability
- We compute R^2_{OS} statistics over NBER-dated recessions/expansions
- Predictability often considerably amplified during recessions

Recession vs. expansion, preds. = economic variables

Industry portfolios, combination forecast R^2_{OS} (%)

Return	REC	EXP	Return	REC	EXP	Return	REC	EXP
MKT	2.40	0.60	PAPER	2.11	0.36	CARS	3.07	1.42
AGRIC	0.40	0.15	PRINT	3.00	0.34	INSTR	1.33	0.03
MINES	0.22	0.10	CHEMS	1.84	0.25	MANUF	1.70	0.59
OIL	0.86	−0.07	PTRLM	0.76	0.35	TRANS	1.45	0.51
STONE	−1.36	0.37	RUBBER	2.02	1.02	PHONE	0.93	0.12
CNSTR	1.57	0.33	LETHR	2.78	0.26	TV	2.12	0.44
FOOD	2.08	0.26	GLASS	2.47	0.59	UTILS	1.66	0.62
SMOKE	0.84	−0.09	METAL	0.88	0.18	WHLSL	1.68	0.24
TXTLS	1.82	0.89	MTLPR	2.35	0.42	RTAIL	2.16	0.32
APPRL	2.08	1.13	MACHIN	1.97	0.12	MONEY	2.26	0.29
WOOD	0.92	0.17	ELCTR	2.27	0.03	SRVC	1.68	0.26
CHAIR	2.08	0.58						
AVG	1.64	0.38						

Recession vs. expansion, preds. = economic variables

Size and book-to-market portfolios, combination forecast R^2_{OS} (%)

Return	REC	EXP	Return	REC	EXP
S1	1.71	0.57	BM1	1.91	0.13
S2	1.74	0.40	BM2	2.46	0.30
S3	1.66	0.43	BM3	2.51	0.52
S4	1.96	0.55	BM4	2.42	0.61
S5	2.01	0.53	BM5	2.72	0.94
S6	2.35	0.64	BM6	2.22	0.64
S7	2.28	0.47	BM7	1.86	0.46
S8	1.99	0.38	BM8	1.85	0.83
S9	2.07	0.52	BM9	1.81	0.81
S10	2.33	0.57	BM10	1.29	0.67
AVG	2.01	0.51	AVG	2.10	0.59

Recession vs. expansion, predictors = lagged ind. rets.

Industry portfolios, combination forecast R^2_{OS} (%)

Return	REC	EXP	Return	REC	EXP	Return	REC	EXP
MKT	1.74	−0.35	PAPER	1.05	−0.46	CARS	3.44	1.29
AGRIC	2.31	0.66	PRINT	8.23	−0.10	INSTR	1.65	−0.41
MINES	1.75	−0.16	CHEMS	0.51	−0.48	MANUF	5.90	1.46
OIL	−0.38	−0.14	PTRLM	−0.63	−0.34	TRANS	1.47	0.22
STONE	2.46	0.77	RUBBER	1.11	−0.09	PHONE	−0.68	−0.25
CNSTR	4.98	1.02	LETHR	3.29	0.50	TV	4.10	−0.08
FOOD	0.65	−0.29	GLASS	3.64	0.19	UTILS	0.03	−0.15
SMOKE	−0.44	−0.03	METAL	1.41	−0.33	WHLSL	3.59	0.25
TXTLS	3.33	2.32	MTLPR	3.93	0.25	RTAIL	2.16	0.15
APPRL	4.18	0.84	MACHIN	3.25	−0.45	MONEY	1.09	−0.30
WOOD	2.03	0.26	ELCTR	1.99	−0.42	SRVC	3.01	−0.17
CHAIR	4.06	1.40						
AVG	2.38	0.21						

Recession vs. expansion, predictors = lagged ind. rets.

Size and book-to-market portfolios, combination forecast R^2_{OS} (%)

Return	REC	EXP	Return	REC	EXP
S1	8.66	5.05	BM1	2.16	−0.80
S2	5.57	2.40	BM2	1.46	−0.26
S3	5.38	1.31	BM3	2.05	−0.19
S4	4.92	1.12	BM4	1.86	−0.33
S5	3.93	0.49	BM5	0.55	−0.10
S6	3.29	0.39	BM6	0.45	−0.32
S7	2.72	0.20	BM7	0.31	−0.05
S8	1.56	−0.31	BM8	0.84	−0.11
S9	1.18	−0.28	BM9	2.07	0.38
S10	0.69	−0.56	BM10	2.43	1.11
AVG	3.79	0.98	AVG	1.42	−0.07

Economic explanation—rational/alpha predictability

- Number of studies analyze implications of rational asset pricing for return predictability
- Following Avramov (2004, *RFS*), among others
  - $r_{i,t} = \alpha_i(x_{t-1}) + \beta_i' f_t + \epsilon_{i,t}$
    - x_{t-1}: M-vector of lagged state variables
    - f_t: K-vector of systematic risk factors
  - $f_t = \lambda(x_{t-1}) + u_t$
    - Allows for time-varying risk premiums
  - Conditional rational asset-pricing model $\Rightarrow$ $E(r_{i,t}|x_{t-1}) = \beta_i' E(f_t|x_{t-1}) = \beta_i' \lambda(x_{t-1})$
  - $\alpha_i(x_{t-1}) \neq 0 \forall t \Rightarrow$ alpha predictability
- Under conditional CAPM, f_t = market excess return
- Under conditional FF 3-factor model, f_t comprised of FF market, size, and value factors

Economic explanation—rational/alpha predictability

- We calculate rational pricing-restricted combination forecasts of $r_{i,t}$
- Consider conditional CAPM
  - We already have combination forecast of aggregate market return based on economic variables or lagged industry returns (call it $\hat{f}_t^C$)
    - $\hat{f}_t^C$ = real-time estimate of $\lambda(x_{t-1})$
  - Generate real-time estimate of β_i (call it $\hat{\beta}_{i,t}$)
    - Regress component i excess return on aggregate market excess return using data through $t-1$
  - Rational pricing-restricted combination forecast: $\hat{r}_{i,t}^C = \hat{\beta}_{i,t}\hat{f}_t^C$
- We can similarly calculate rational pricing-restricted combination forecast based on FF 3-factor model
  - Compute combination forecasts of FF factors
  - Compute real-time estimates of FF factor betas

Economic explanation—rational/alpha predictability

- NB: component combination forecast considered earlier (call it $\hat{r}^{C}_{i,t}$) does not impose asset-pricing restriction
  - Unrestricted combination forecasts that allows for both rational and alpha predictability
- We define $R^2_{OS,R}$: reduction in MSPE for rational pricing-restricted combination forecast relative to historical average forecast
- We also define $R^2_{OS,\alpha}$: reduction in MSPE for unrestricted combination forecast relative to rational pricing-restricted combination forecast
- For "small" $R^2_{OS,R}$ and $R^2_{OS,\alpha}$, $R^2_{OS} \approx R^2_{OS,R} + R^2_{OS,\alpha}$
  - We thus decompose total out-of-sample predictability into (i) predictability due to exposure to time-varying risk premiums and (ii) alpha predictability

Decomposition, predictors = economic variables

Industry portfolios, $R^2_{OS,R}$ and $R^2_{OS,\alpha}$ (%), conditional CAPM

Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$	Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$	Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$
AGRIC	0.52	−0.32	PAPER	1.25	−0.49	CARS	1.47	0.36
MINES	0.48	−0.35	PRINT	1.25	−0.19	INSTR	1.41	−1.06
OIL	0.66	−0.48	CHEMS	0.78	−0.15	MANUF	1.07	−0.21
STONE	0.48	−0.37	PTRLM	0.54	−0.09	TRANS	0.85	−0.08
CNSTR	0.90	−0.20	RUBBER	1.15	0.07	PHONE	0.24	−0.02
FOOD	0.39	0.32	LETHR	0.57	0.31	TV	0.82	0.03
SMOKE	−0.70	0.72	GLASS	0.94	0.08	UTILS	0.97	−0.09
TXTLS	1.02	0.07	METAL	0.43	−0.11	WHLSL	0.93	−0.32
APPRL	0.89	0.50	MTLPR	0.93	−0.06	RTAIL	0.80	0.01
WOOD	0.89	−0.53	MACHIN	1.01	−0.44	MONEY	0.75	0.07
CHAIR	0.90	0.07	ELCTR	0.71	−0.16	SRVC	0.66	−0.05

Decomposition, predictors = economic variables

Size and book-to-market portfolios,
$R^2_{OS,R}$ and $R^2_{OS,\alpha}$ (%), conditional CAPM

Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$	Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$
S1	1.04	−0.21	BM1	0.73	−0.10
S2	0.95	−0.23	BM2	0.84	0.00
S3	0.98	−0.24	BM3	0.84	0.17
S4	1.08	−0.17	BM4	0.83	0.22
S5	1.00	−0.07	BM5	1.53	−0.19
S6	1.12	−0.04	BM6	2.22	0.03
S7	1.00	−0.04	BM7	1.86	0.14
S8	0.91	−0.10	BM8	1.85	−0.18
S9	0.97	−0.03	BM9	1.81	0.11
S10	0.93	0.08	BM10	1.29	0.04

Decomposition, predictors = lagged ind. rets.

Industry portfolios, $R^2_{OS,R}$ and $R^2_{OS,\alpha}$ (%), conditional CAPM

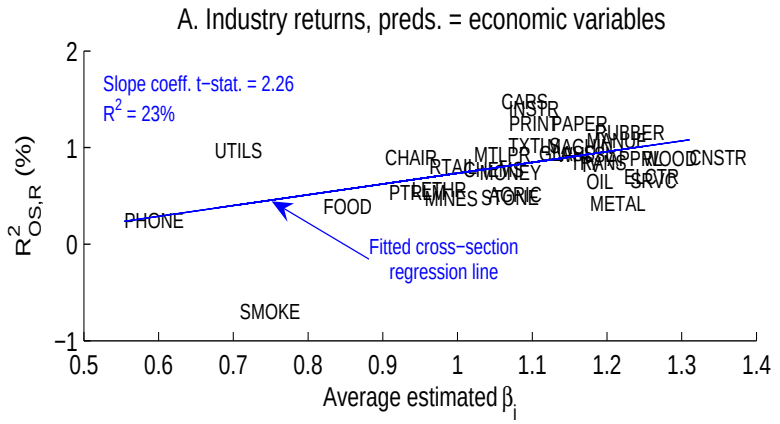
Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$	Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$	Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$
AGRIC	0.66	0.31	PAPER	0.16	−0.27	CARS	1.32	0.51
MINES	0.48	−0.24	PRINT	1.14	1.02	INSTR	1.28	−1.17
OIL	0.18	−0.38	CHEMS	−0.41	0.17	MANUF	1.40	1.17
STONE	0.84	0.19	PTRLM	−0.56	0.15	TRANS	0.36	0.21
CNSTR	1.17	1.04	RUBBER	0.25	−0.09	PHONE	−0.15	−0.15
FOOD	−0.34	0.28	LETHR	0.68	0.51	TV	0.87	0.08
SMOKE	−0.77	0.68	GLASS	0.73	0.24	UTILS	−0.45	0.35
TXTLS	1.18	1.38	METAL	−0.05	0.07	WHLSL	0.83	0.28
APPRL	0.85	0.89	MTLPR	0.74	0.39	RTAIL	0.64	0.05
WOOD	0.69	0.03	MACHIN	0.79	−0.33	MONEY	0.10	−0.03
CHAIR	1.26	0.84	ELCTR	0.20	−0.06	SRVC	0.48	0.14

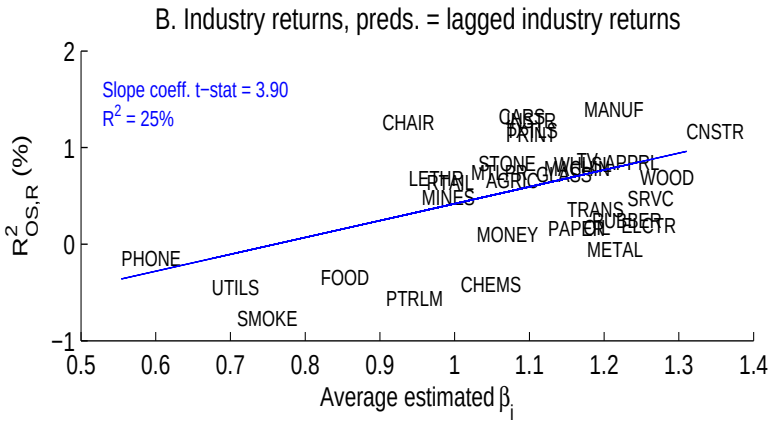
Decomposition, predictors = lagged ind. rets.

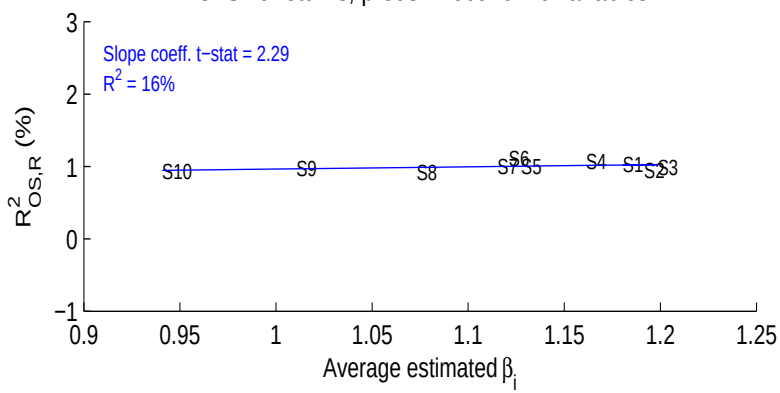
Size and book-to-market portfolios,
$R^2_{OS,R}$ and $R^2_{OS,\alpha}$ (%), conditional CAPM

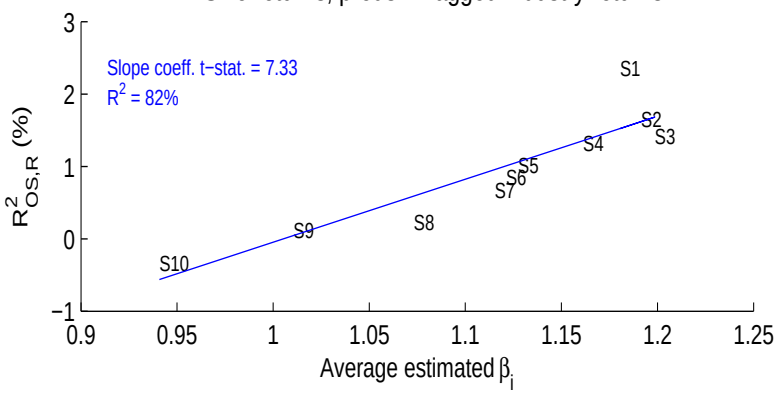
Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$	Return	$R^2_{OS,R}$	$R^2_{OS,\alpha}$
S1	2.35	3.58	BM1	0.08	−0.03
S2	1.66	1.50	BM2	0.07	0.11
S3	1.41	0.94	BM3	0.26	0.12
S4	1.32	0.79	BM4	0.07	0.13
S5	1.01	0.41	BM5	0.64	−0.59
S6	0.85	0.31	BM6	−0.12	−0.01
S7	0.66	0.24	BM7	−0.13	0.19
S8	0.23	−0.03	BM8	0.42	−0.28
S9	0.12	0.02	BM9	0.69	0.10
S10	−0.34	0.10	BM10	0.89	0.58

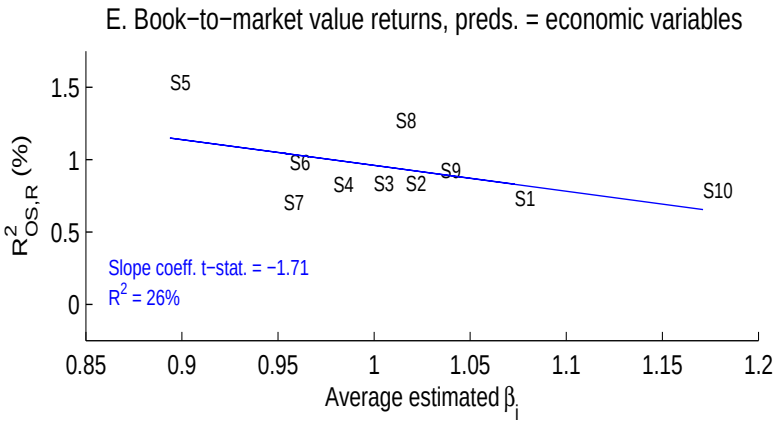
R^2_{OS} and average estimated betas, conditional CAPM

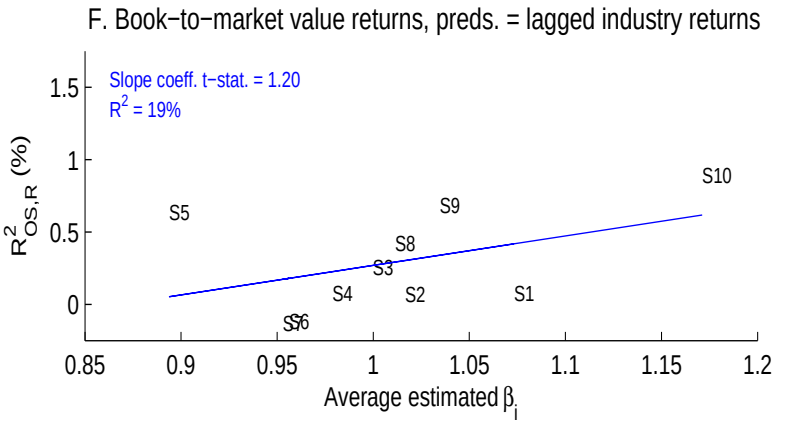












Economic explanation—rational/alpha predictability

- $\downarrow$ evidence of alpha predictability when predictors = lagged industry returns for conditional FF 3-factor model
- Cross-section regression for conditional FF 3-factor results, industry portfolios, predictors = lagged industry rets.
  - $R^2_{OS,R} = \underbrace{0.06}_{(0.09)}\bar{\hat{\beta}}_{MKT} + \underbrace{1.70}_{(5.83)}\bar{\hat{\beta}}_{SMB} - \underbrace{0.69}_{(-1.44)}\bar{\hat{\beta}}_{HML} + \underbrace{0.22}_{0.32}$,

    $R^2 = 55\%$
- Cross-section regression for conditional FF 3-factor results, size portfolios, predictors = lagged industry rets.
  - $R^2_{OS,R} = -\underbrace{17.15}_{(-4.83)}\bar{\hat{\beta}}_{MKT} + \underbrace{2.34}_{(4.99)}\bar{\hat{\beta}}_{SMB} + \underbrace{2.32}_{(1.32)}\bar{\hat{\beta}}_{HML} + \underbrace{17.20}_{4.70}$,

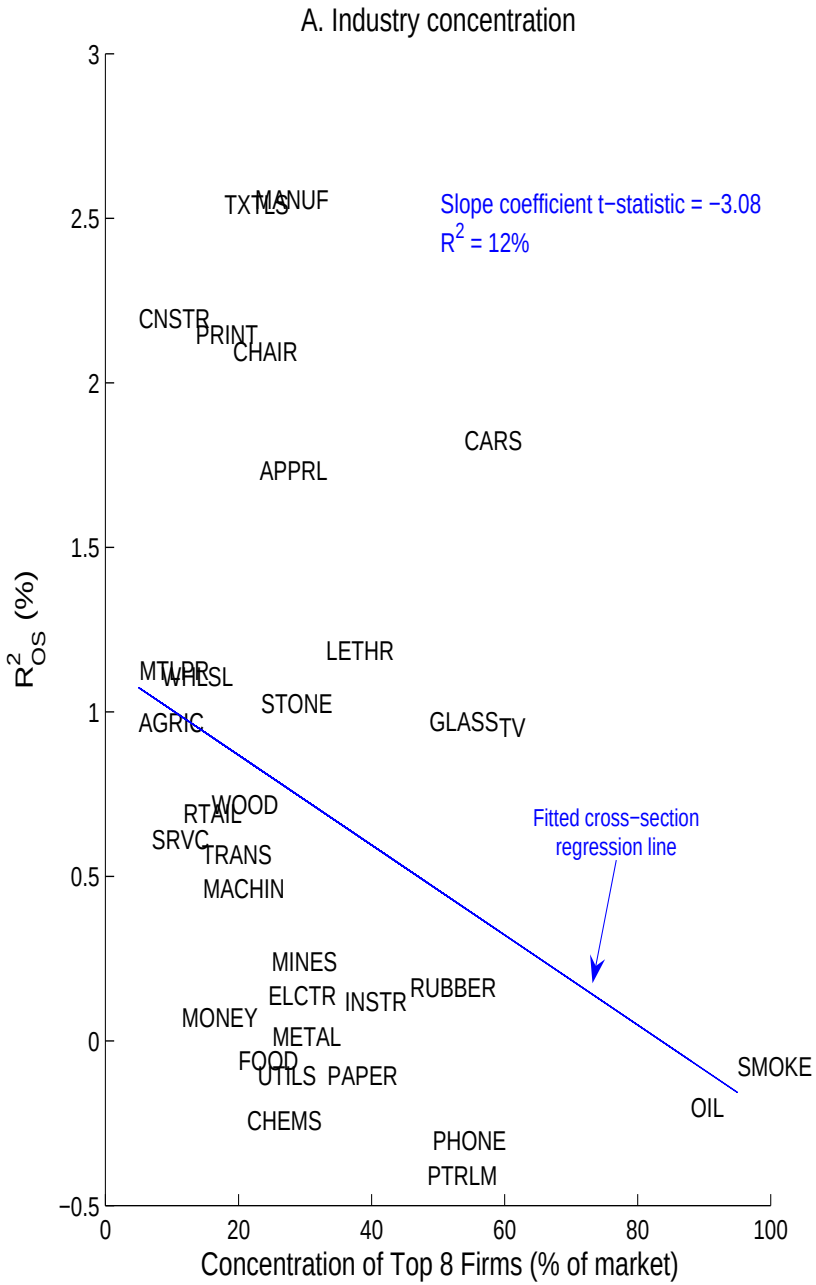
    $R^2 = 97\%$
- Cross-section regression for conditional FF 3-factor results, book-to-market portfolios, preds. = lagged ind. rets.
  - $R^2_{OS,R} = -\underbrace{0.19}_{(-0.08)}\bar{\hat{\beta}}_{MKT} + \underbrace{2.67}_{(4.25)}\bar{\hat{\beta}}_{SMB} - \underbrace{0.40}_{(-1.77)}\bar{\hat{\beta}}_{HML} + \underbrace{0.43}_{0.18}$,

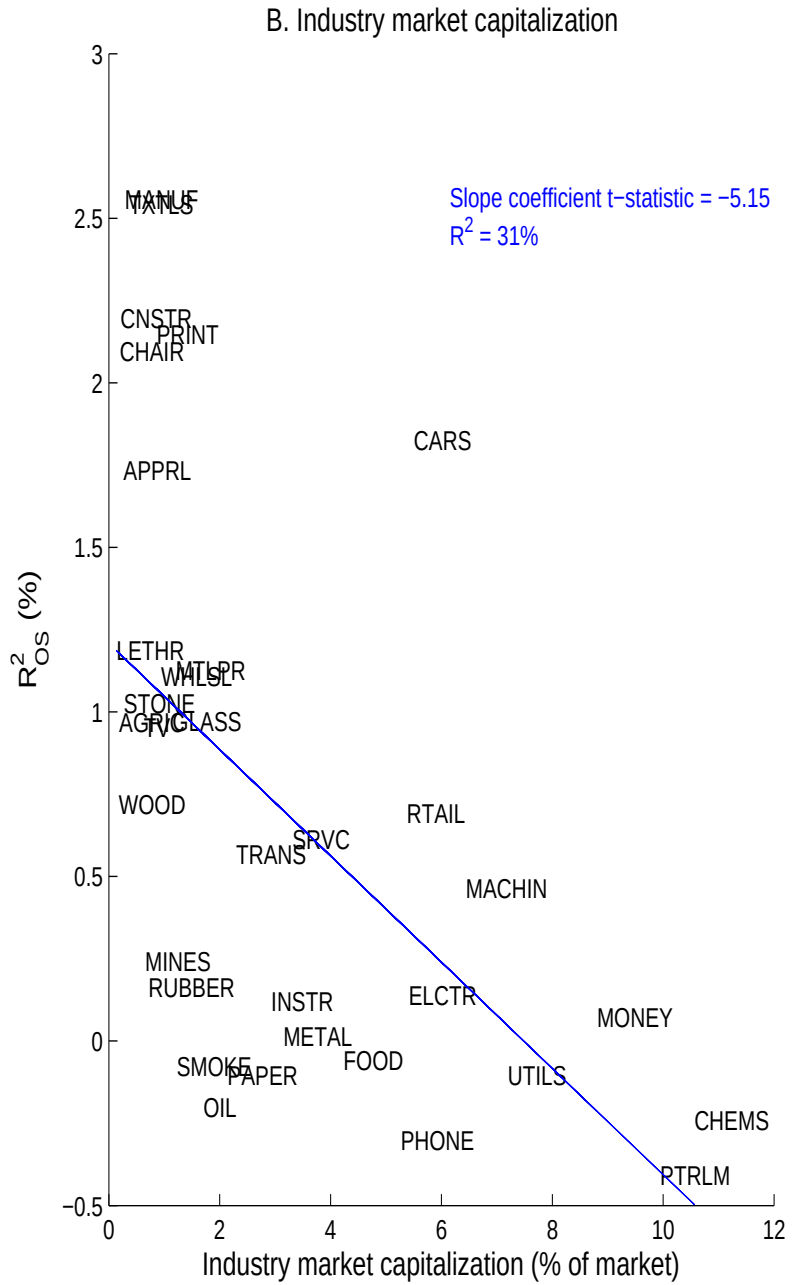
    $R^2 = 61\%$

Economic explanation—information-flow frictions

- Hong et al. (2007, *JFE*) emphasize information-flow frictions
- If information flows are pertinent, we expect
  - Stronger (weaker) predictability in less (more) concentrated industries
  - Stronger (weaker) predictability in industries with smaller (greater) share of market capitalization
- We estimate cross-section regressions relating combination forecast R^2_{OS} to industry concentration or industry market capitalization

Industry characteristics (preds. =lagged ind. rets.)





Component-rotation investment strategy

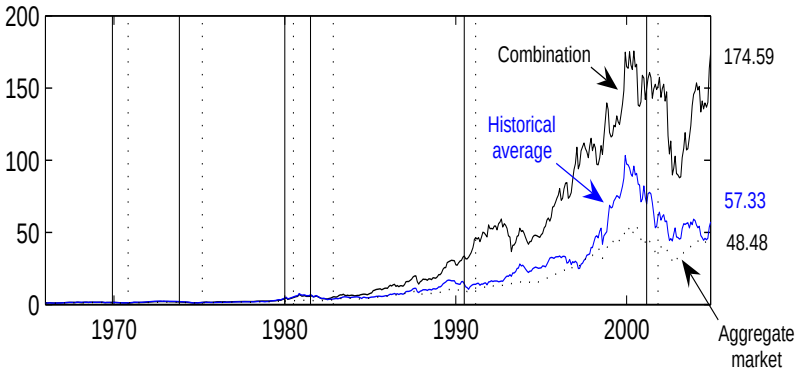
- Construct "maximum" portfolios
  - Maximum portfolio allocated entirely to component with highest forecasted return for next month
  - Compare allocations based on combination and historical average forecasts
- If combination forecasts "better" than historical average forecasts, portfolio performance should improve when we identify component to invest in next month using combination instead of historical average forecasts
- We compute relative Sharpe ratio
  - (Sharpe ratio for maximum portfolio based on combination forecasts)/(Sharpe ratio for maximum portfolio based on historical average forecasts)

Maximum portfolio performance

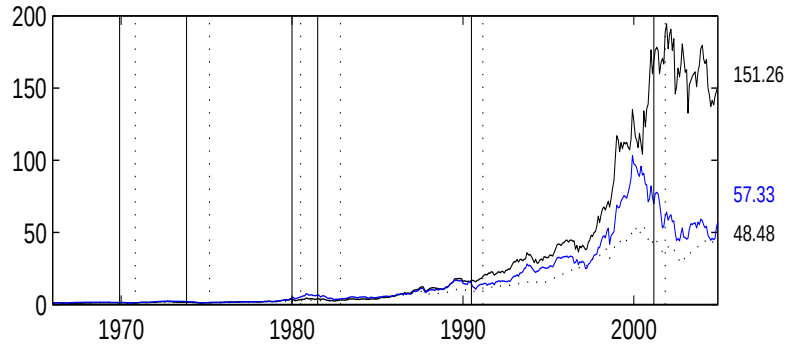
Component portfolios	Predictors	Relative Sharpe ratio
Industry	Economic variables	1.41
Industry	Lagged industry rets.	1.36
Size	Economic variables	1.12
Size	Lagged industry rets.	1.98
Book-to-market	Economic variables	0.97
Book-to-market	Lagged industry rets.	1.32

Cumulative returns for maximum portfolios

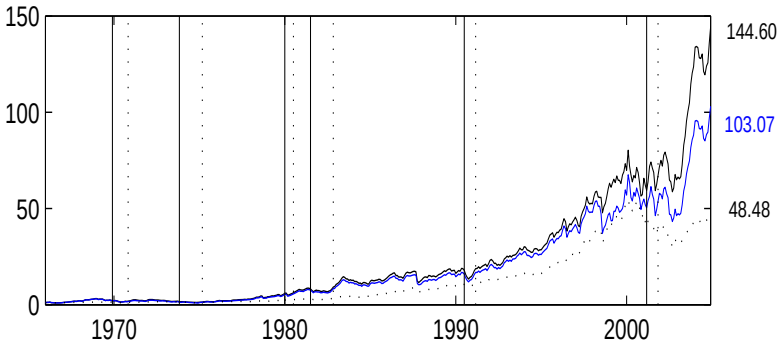
A. Max. industry return, preds. = economic variables



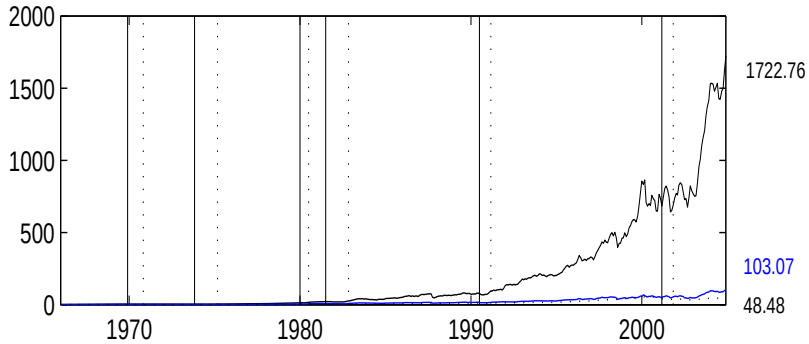
B. Max. industry return, preds. = lagged industry returns



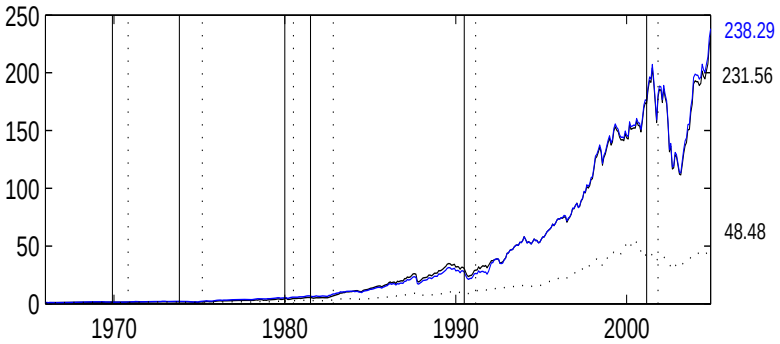
C. Max. size return, preds. = economic variables



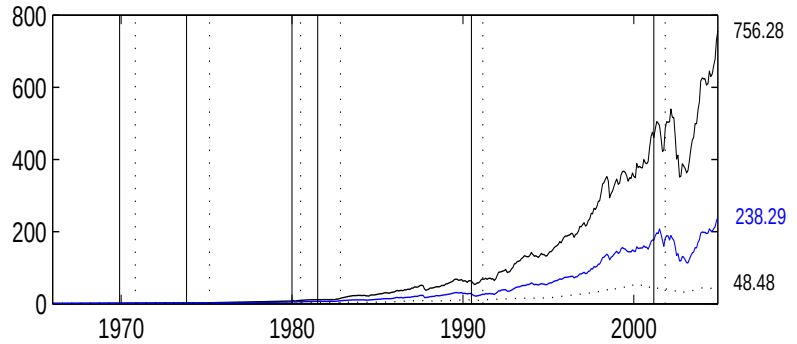
D. Max. size return, preds. = lagged industry returns



E. Max. book−to−market return, preds. = economic variables

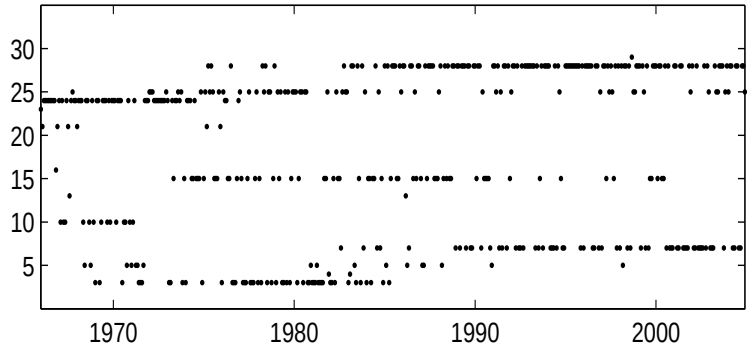


F. Max. book−to−market return, preds. = lagged industry returns



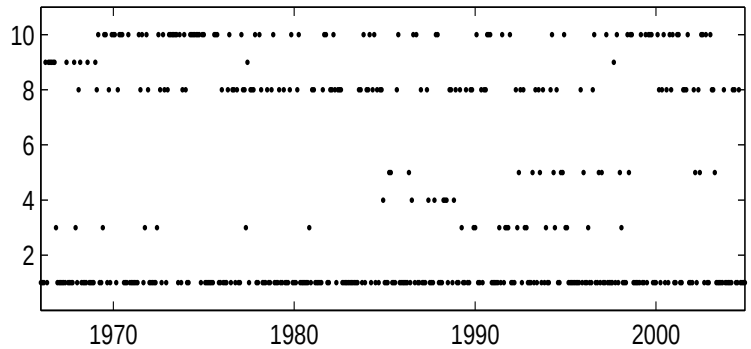
Component rotation for maximum portfolios

A. Max. industry return, combination forecasts

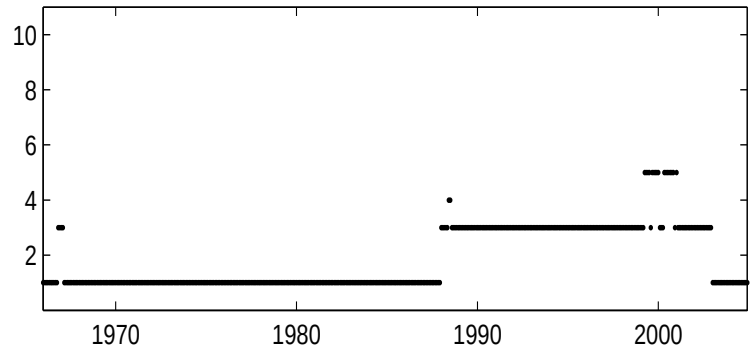


B. Max. industry return, historical average forecasts

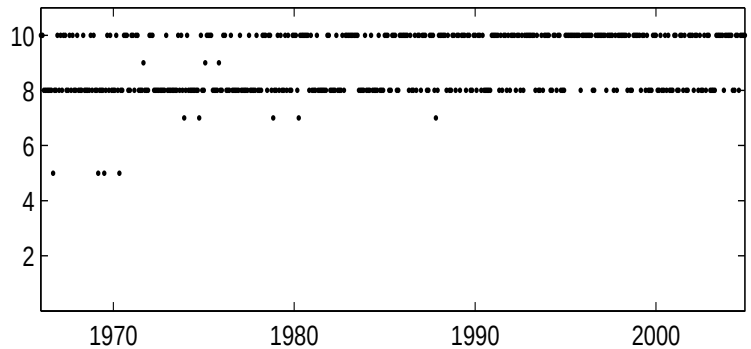
C. Max. size return, combination forecasts



D. Max. size return, historical average forecasts



E. Max. book−to−market return, combination forecasts



F. Max. book−to−market return, historical average forecasts