
Real Earnings Management and Subsequent Stock Returns and Quality Stock Investing

Xi Li

Boston College & HKUST

Earnings Management

- Managers often use two ways to smooth earnings
 - Graham, Harvey, and Rajgopal (JAE 2005) report that 78% of CFOs would sacrifice economic value to smooth earnings
- Accrual Earnings Management (AEM)
 - Accounting choices under GAAP
 - Timing asset write-offs and provisioning for bad debt expenses to affect current period earnings

Earnings Management

- Real Earnings Management (REM)
 - Changes in the timing or structuring of operations, investments, and/or financing transactions
 - Have nothing to do with accounting statement manipulation
 - Have cash flow consequences
 - More difficult to detect and sue
 - Abnormal production to affect costs of goods sold expenses
 - Timing sales, R&D and advertising spending, and gains and losses on asset sales

Related Literature: REM

- Graham, Harvey, and Rajgopal (JAE 2005)
 - Survey of CFOs shows that managers prefer REM to AEM
- Roychowdhury (JAE 2006)
 - Firms that are more likely to manage earnings have higher levels of REM proxies.
- Cohen, Dey, Lys (TAR 2008)
 - A typical Compustat firms use AEM and REM as substitutes to manage earnings
 - Firms have shifted from using more AEM toward using more REM after the passage of the Sarbanes-Oxley Act

Earnings Management

- Why managers may prefer REM?
 - More difficult to detect or sue
 - Managers can only do AEM after the fiscal period and do REM during the fiscal period.
 - Have to do REM since it is uncertain whether AEM can meet the total need of EM
 - Current AEM is restricted by prior AEM

Related Literature: AEM

- Sloan (TAR 1996)
 - Earnings fixation hypothesis
 - Investors fail to fully understand the less persistent nature of accruals in comparison to cash flows.
 - Total current accruals have a negative relation with future stock returns.

 - Xie (TAR 2001)
 - Abnormal accruals predict subsequent stock returns, whereas normal accruals do not.
 - Markets misprice the AEM that is due to managerial discretion, but it does not misprice the normal accruals.
 - Further confirm that the results of Sloan 1996 are due to earnings management.
-

Hypothesis

- If investors fail to fully detect these REM activities or fully recognize the implications of these REM measures and react to earnings relatively uniformly, they are likely to overprice (underprice) stocks of firms with high (low) levels of REM activities.
- As they gradually detect and recognize the implication of these REM measures, firms with relatively high (low) levels of REM activities should experience negative (positive) subsequent abnormal stock returns.

Measures of Earnings Management

- AEM: For each 2-digit SIC year grouping
 - Estimate the modified cross-sectional Jones model [Jones (JAR 1991)] as described in Dechow et al. (TAR 1995)
 - Discretionary accruals is the difference between total accruals and the fitted normal accruals

$$\frac{\text{Total Accruals}_{i,t}}{\text{Total Assets}_{i,t-1}} = a_{1,t} \frac{1}{\text{Total Assets}_{i,t-1}} + a_2 \frac{\Delta \text{Sales}_{i,t}}{\text{Total Assets}_{i,t-1}} + a_3 \frac{\text{PPE}_{i,t}}{\text{Total Assets}_{i,t-1}} + \varepsilon_{i,t}$$

$$\text{NA}_{i,t} = \hat{a}_{1,t} \frac{1}{\text{Total Assets}_{i,t-1}} + \hat{a}_2 \frac{\Delta \text{Sales}_{i,t} - \Delta \text{AR}_{i,t}}{\text{Total Assets}_{i,t-1}} + \hat{a}_3 \frac{\text{PPE}_{i,t}}{\text{Total Assets}_{i,t-1}}$$

Measures of Earnings Management

- REM: For each 2-digit SIC year grouping, following Dechow, Kothari, and Watts (JAE 1998) and Roychowdhury (JAE 2006)
 - Abnormal operating cash flows (ACFO): 45% Adj. R2

$$\frac{CFO_{i,t}}{Total\ Assets_{i,t-1}} = a_{1,t} \frac{1}{Total\ Assets_{i,t-1}} + a_2 \frac{Sales_{i,t}}{Total\ Assets_{i,t-1}} + a_3 \frac{\Delta Sales_{i,t}}{Total\ Assets_{i,t-1}} + \varepsilon_{i,t}$$

- Abnormal production costs (APDC): 90% Adj. R2

$$\begin{aligned} \frac{Production\ Cost_{i,t}}{Total\ Assets_{i,t-1}} &= a_{1,t} \frac{1}{Total\ Assets_{i,t-1}} + a_2 \frac{Sales_{i,t}}{Total\ Assets_{i,t-1}} + a_3 \frac{\Delta Sales_{i,t}}{Total\ Assets_{i,t-1}} \\ &+ a_4 \frac{\Delta Sales_{i,t-1}}{Total\ Assets_{i,t-1}} + \varepsilon_{i,t} = \frac{Cost\ of\ Goods\ Sold_{i,t} + \Delta Inventory_{i,t}}{Total\ Assets_{i,t-1}} \end{aligned}$$

Specific Hypothesis

- Stocks of firms with abnormally low (high) levels of operating cash flows underperform (outperform) subsequently, whereas stocks of firms with abnormally low (high) levels of production costs outperform (underperform) subsequently.

Specific Hypothesis

- APDC / Overproduction
 - Managers can reduce COGS through overproduction if lower fixed cost per unit is not offset by
 - Any increase in marginal costs per unit
 - Holding costs of additional inventory
 - However, increased earnings are not sustainable →
 - A negative relation between APDC and future earnings / CFs
- Roychowdhury (2006) shows that firms more likely to REM to increase earnings tend to have lower ACFO
 - His results suggest a positive relation between ACFO and future earnings / CFs

Specific Hypothesis

- Suppose a firm can sell 100 units in the current period, with \$1 constant marginal costs and \$100 fixed costs.
 - If the firm produces 100 units, cost of goods per unit would be \$2.
 - If the firm overproduces 100 units and put them in inventory for an additional cost of \$0.1 per unit,
 - The reduction in cost of goods sold would be \$0.5 ($\$2 - \1.5), which $>$ the extra inventory costs.
 - Operating margin would increase

Data Sources

- Financial statement data and stock returns
 - Compustat annual and CRSP monthly stock returns
 - Merging by assuming a four-month lag after the end of the fiscal year
 - Adjust for delisting returns, dividends and splits
 - Sample period
 - ACFO 1987-2008 (CF statement data), APDC 1962-2008
 - Restrictions
 - Nonfinancial firms with available data and in the 2-digit SIC groups with at least 15 observations
 - Firms with December fiscal year end
-

Summary Statistics

Variable	Mean	Std. Dev.	25%	Median	75%
Abnormal Operating Cash Flows	-0.011	0.457	-0.067	0.016	0.082
Abnormal Production Costs	-0.012	0.386	-0.143	-0.027	0.100
Discretionary Accruals	-0.001	0.205	-0.053	0.001	0.055
Market Capitalization (\$Billion)	1.517	9.168	0.028	0.121	0.592
Book-to-market	2.507	46.744	0.317	0.608	1.085
Prior Six-Month Return	0.070	0.424	-0.131	0.032	0.203

Summary Statistics – Correlations in %

	Abnormal Production Costs	Discret- ionary Accruals	Market Cap	Book- to- market	Prior Six- Month Return
Abnormal Operating Cash Flows	-25.49	-4.68	4.70	0.91	0.48
Abnormal Production Costs		-5.90	-4.06	0.24	-1.79
Discretionary Accruals			0.37	0.42	-0.10
Market Capitalization				-1.44	-0.38
Book-to-market					0.32

Fama-French (1993) Factor-Adjusted Returns in %

Rank	Abnormal Operating Cash Flows	Abnormal Production Costs	Discretionary Accruals	Abnormal Operating Cash Flows	Abnormal Production Costs	Discretionary Accruals
	Equal-Weighted Portfolios			Value-Weighted Portfolios		
	(1)	(2)	(3)	(4)	(5)	(6)
1	-0.29 (-1.06)	0.34 *** (3.65)	0.10 (0.43)	-0.54 *** (-2.49)	0.28 *** (3.42)	-0.29 * (-1.68)
2	-0.08 (-0.47)	0.14 * (1.91)	0.19 (1.50)	-0.33 *** (-2.42)	0.02 (0.35)	0.10 (0.92)
3	0.09 (0.69)	0.00 (0.01)	0.12 (1.11)	0.00 (0.02)	-0.04 (-0.61)	0.13 (1.58)
4	0.23 ** (2.30)	-0.04 (-0.51)	0.12 (0.98)	0.11 (1.20)	-0.17 ** (-2.25)	-0.05 (-0.41)
5	0.32 * (1.87)	-0.20 * (-1.81)	-0.20 (-1.02)	0.09 (0.70)	-0.16 * (-1.76)	-0.22 (-1.35)
1-5	-0.61 *** (-3.18)	0.53 *** (6.92)	0.30 ** (2.21)	-0.62 *** (-2.73)	0.44 *** (3.51)	-0.07 (-0.38)

Fama-French (1993) Factor-Adjusted Returns

- The abnormal returns on quintile portfolios change monotonically with portfolio rank determined in the prior period
- Abnormal returns are statistically significant for both the top and bottom quintile portfolios: useful for both long-short and long only managers
- The quintile spread portfolio based on ACFO and APDC generates annualized abnormal returns of 7.57% and 6.55%, respectively.
- Value- and equal-weighted portfolios show similar results

Fama-MacBeth (1973) regressions

$$r_{t+1} = a_{0,t} + a_{1,t}REM_t + a_{2,t}AEM_t + a_{3,t}Size_t + a_{4,t}BM_t + a_{5,t}MOM_t + \varepsilon_{i,t+1}$$

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Abnormal Operating Cash Flows	0.72*** (3.13)					
Abnormal Production Costs		-0.52*** (-6.57)				
Discretionary Accruals			-0.09 (-0.33)			
Normal Operating Cash Flows				0.27 (1.23)		
Normal Production Costs					-0.01 (-0.44)	
Nondiscretionary Accruals						-0.16 (-0.42)

Fama-MacBeth (1973) regressions

with Kraft et al. (JAR 2007) variables and SUE

$$r_{t+1} = a_{0,t} + a_{1,t}REM_t + a_{2,t}AEM_t + a_{3,t}Size_t + a_{4,t}BM_t + a_{5,t}MOM_t + a_{6,t}Sales_t + a_{7,t}\Delta Sales_t \\ + a_{8,t}Capex_t + a_{9,t}\Delta Capex_t + a_{10,t}NOA_t + a_{11,t}SUE_t + \varepsilon_{i,t+1}$$

Variable	(1)	(2)	(3)
Abnormal Operating Cash Flows	0.83 *** (4.25)		0.67 *** (3.01)
Abnormal Production Costs		-0.55 *** (-6.87)	-0.41 *** (-3.62)

Fama-MacBeth (1973) regressions

$$r_{t+1} = a_{0,t} + a_{1,t}REM_t + a_{2,t}AEM_t + a_{3,t}Size_t + a_{4,t}BM_t + a_{5,t}MOM_t + a_{6,t}Sales_t + a_{7,t}\Delta Sales_t + a_{8,t}Capex_t + a_{9,t}\Delta Capex_t + a_{10,t}NOA_t + a_{11,t}SUE_t + \varepsilon_{i,t+1}$$

Abnormal Operating Cash Flows			Abnormal Production Costs		
(1)	(2)	(3)	(4)	(5)	(6)
Large	Medium	Small	Large	Medium	Small
0.83 ***	0.85 ***	1.19	-0.60 ***	-0.58 ***	-0.57 *
(2.83)	(3.66)	(1.53)	(-6.16)	(-4.49)	(-1.73)
1987-1997	1998-2008		1962-1987	1988-2008	
1.25 ***	0.56 ***		-0.53 ***	-0.57 ***	
(3.61)	(2.45)		(-5.71)	(-4.48)	

Fama-MacBeth (1973) regressions

$$r_{t+1} = a_{0,t} + a_{1,t}REM_t + a_{2,t}AEM_t + a_{3,t}Size_t + a_{4,t}BM_t + a_{5,t}MOM_t + a_{6,t}Sales_t + a_{7,t}\Delta Sales_t + a_{8,t}Capex_t + a_{9,t}\Delta Capex_t + a_{10,t}NOA_t + a_{11,t}SUE_t + \varepsilon_{i,t+1}$$

Abnormal Operating Cash Flows				Abnormal Production Costs			
All	Large	Medium	Small	All	Large	Medium	Small
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year $t+2$							
0.51 **	0.09	0.95 ***	0.41	-0.42 ***	-0.33 ***	-0.60 ***	-0.63 **
(2.25)	(0.22)	(3.22)	(0.61)	(-4.42)	(-2.66)	(-4.23)	(-2.24)
Year $t+3$							
0.27	0.15	-0.07	1.25	-0.41 ***	-0.33 ***	-0.49 ***	-0.55
(1.00)	(0.39)	(-0.18)	(0.95)	(-4.61)	(-2.97)	(-3.30)	(-1.56)

Relation between Return Predictive Power and Earnings Management

- Is the return predictive power stronger among firms more likely to manage earnings.
 - For both REM measures
 - Firm-years with return on assets (ROA, or net income / total assets) less than 0.005
 - Firms with above median debt outstanding
 - Firms with below median percentage institutional ownership from 13F filings
 - For abnormal production costs
 - Firms in manufacturing industries (SIC between 20 and 39)
 - Firms with above median inventory

Fama-French (1993) Factor-Adjusted Quintile Spread

Earnings Management	Net Income (1)	Debt Outstanding (2)	Institutional Ownership (3)	Manufac- turing Firm (4)	Inventory (5)
Abnormal Operating Cash Flows					
More likely	0<ROA<0.005 -0.68* (-1.68)	High -0.60*** (-3.48)	Low -0.61** (-1.97)		
Less likely	Other ROAs -0.60*** (-3.37)	Low -0.42 (-1.17)	High -0.57*** (-3.55)		
Abnormal Production Costs					
More likely	0<ROA<0.005 0.52 (1.44)	High 0.47*** (6.84)	Low 0.78*** (3.46)	Yes 0.53*** (6.23)	High 0.54*** (7.67)
Less likely	Other ROAs 0.45*** (5.98)	Low 0.12 (0.66)	High 0.48*** (6.90)	No 0.28*** (2.74)	Low 0.39*** (3.77)

Risk or Mispricing

- The return predictive power is due to mispricing
 - More than 40% of which being realized over the subsequent four earnings announcements.
 - 68% and 44% for ACFO and APDC on 12/252 trading days
 - Loadings on REM-based factors cannot explain the cross-section variations of stock returns after controlling for REM characteristics
 - Firms practicing REM experience weaker subsequent operating performance
 - Industry adjusted ROAs and CFOs for 3 years
 - The predictive power is somewhat greater among stocks with higher arbitrage costs.
 - Idiosyncratic volatility, Lesmond measure, Amihud measure, dollar volume

Risk or Mispricing:

Subsequent Earnings Announcement Returns

Rank	Abnormal Operating Cash Flow		Abnormal Production Cost	
	Total Period Return	Announcement Period Return	Total Period Return	Announcement Period Return
1	-2.86	0.75	3.46	3.38
2	1.12	1.40	3.29	1.89
3	2.19	1.73	1.30	1.13
4	2.75	2.30	0.38	0.91
5	1.58	3.76	-2.29	0.85
1-5	-4.44	-3.01	5.75	2.53

Risk or Mispricing: Factor Loadings and Characteristics

Fama-MacBeth (1973) Regressions

- Obtain the two REM-based factors
- Obtain the pre-sorting firm-level monthly factor loadings with rolling regressions
- Obtain the value-weighted monthly returns on the 64 size / REM-characteristic / REM-factor-loading portfolios
- Obtain the factor loadings for these 64 portfolios with rolling regressions
- Assign to each stock the loadings on REM-based factor of the 64 size / REM-characteristic / REM-factor-loading portfolio it belongs to

Risk or Mispricing: Factor Loadings and Characteristics

Fama-MacBeth (1973) Regressions

Variable	Abnormal Operating Cash Flows		Abnormal Production Costs	
	(1)	(2)	(3)	(4)
Loadings on the REM-Based Factors	0.01 (0.26)	0.05 (0.98)	0.01 (0.87)	0.01 (0.09)
REM Characteristics		0.93 *** (4.57)		-0.65 *** (-4.90)

Risk or Mispricing: Factor Loadings and Characteristics

Double Sorting

		Abnormal Operating Cash Flows Characteristic Quintiles					
		1	2	3	4	5	1-5
Factor	1	-0.69 ***	-0.34 *	0.02	0.22	0.20	-0.88 ***
	Loading	(-2.66)	(-1.78)	(0.09)	(1.29)	(0.99)	(-3.67)
Quintiles	2	-0.59 **	0.06	-0.16	0.24 **	0.33 *	-0.92 ***
		(-2.19)	(0.35)	(-1.41)	(2.14)	(1.79)	(-3.32)
	3	-0.52 **	-0.13	-0.01	0.30 ***	0.27 *	-0.79 ***
		(-1.97)	(-0.70)	(-0.08)	(2.84)	(1.67)	(-2.93)
	4	-0.31	-0.18	0.09	0.44 ***	0.30 *	-0.61 ***
		(-1.28)	(-1.12)	(0.54)	(3.17)	(1.66)	(-2.88)
	5	-0.28 **	-0.15	0.28	0.20	0.40	-0.68 ***
		(-0.92)	(-0.63)	(1.18)	(0.87)	(1.61)	(-2.84)
	1-5	-0.41 *	-0.19	-0.26	0.02	-0.21	
		(-1.72)	(-0.87)	(-1.02)	(0.06)	(-0.84)	

Risk or Mispricing: Factor Loadings and Characteristics

Double Sorting

		Abnormal Production Costs					
		Characteristic Quintiles					
		1	2	3	4	5	1-5
Factor Loading Quintiles	1	0.42 *** (2.78)	0.11 (0.84)	0.10 (0.68)	0.09 (0.62)	0.04 (0.26)	0.37 *** (2.39)
	2	0.34 *** (3.37)	0.18 ** (1.97)	0.19 ** (2.09)	0.06 (0.57)	-0.13 (-1.06)	0.47 *** (3.60)
	3	0.34 *** (3.82)	0.25 *** (2.48)	0.04 (0.48)	0.02 (0.15)	0.03 (0.20)	0.32 *** (2.40)
	4	0.42 *** (3.81)	0.15 (1.61)	0.06 (0.65)	0.10 (0.97)	0.11 (0.96)	0.30 ** (2.22)
	5	0.35 *** (2.41)	0.29 * (1.75)	0.05 (0.31)	0.11 (0.70)	0.07 (0.40)	0.28 ** (2.10)
	1-5	0.07 (0.50)	-0.17 (-1.14)	0.06 (0.35)	-0.02 (-0.15)	-0.02 (-0.16)	

Risk or Mispricing: Annual Operating Performance

$$\left(\begin{array}{l} \text{Adjusted } ROA_{t+1} \\ \text{or } CFO_{t+1} \end{array} \right) = \left(\begin{array}{l} a_{0,t} + a_{1,t}REM_t + a_{2,t}ROA_t + a_{3,t}MOM_t + a_{4,t}Sales + a_{5,t}\Delta Sales_t \\ + a_{6,t}Capex_t + a_{7,t}\Delta Capex_t + a_{8,t}NOA_t + a_{9,t}REM_{t-1} + \varepsilon_{i,t+1} \end{array} \right)$$

Variable	Industry Adjusted ROA		Industry Adjusted CFO	
	(1)	(2)	(3)	(4)
Year $t+1$				
Abnormal Operating Cash Flows	6.03 *** (2.41)		10.20 *** (3.60)	
Abnormal Production Costs		-1.80 *** (-3.60)		-3.40 *** (-3.65)
Year $t+2$				
Abnormal Operating Cash Flows	8.55 *** (3.89)		10.59 *** (4.28)	
Abnormal Production Costs		-1.57 *** (-3.12)		-3.36 *** (-3.70)
Year $t+3$				
Abnormal Operating Cash Flows	4.55 * (1.81)		8.69 *** (3.25)	
Abnormal Production Costs		-1.47 *** (-4.85)		-1.84 *** (-2.36)

Risk or Mispricing: Limit of Arbitrage, FM regressions

- Idiosyncratic volatility
 - Residual standard deviation of a regression of daily returns on the Fama-French (1992) factors.
- Lesmond measure
 - Percentage of zero-return trading days.
- Amihud measure
 - Average daily ratio of the absolute value of returns to dollar volume.
- Dollar volume
 - Sum of the daily product of closing prices and share volume.

Risk or Mispricing: Limit of Arbitrage, FM regressions

Abnormal Operating Cash Flows			Abnormal Production Costs		
Large	Medium	Small	Large	Medium	Small
(1)	(2)	(3)	(4)	(5)	(6)
Idiosyncratic Volatility					
0.89 ***	1.50 ***	1.15 ***	-0.70 ***	-0.69 ***	-0.44 ***
(3.19)	(9.68)	(5.94)	(-4.73)	(-8.41)	(-5.77)
Lesmond Measure					
0.19	1.81 ***	1.50 ***	-0.49 ***	-0.51 ***	-0.64 ***
(0.71)	(3.28)	(4.92)	(-4.10)	(-4.25)	(-4.72)
Aminud Measure					
1.53 ***	1.00 ***	0.97 ***	-0.73 ***	-0.54 ***	-0.43 ***
(7.72)	(5.30)	(4.32)	(-4.51)	(-5.65)	(-5.13)
Dollar Volume					
-0.29	2.23 ***	1.85 ***	-0.37 ***	-0.59 ***	-0.66 ***
(-0.81)	(7.91)	(6.32)	(-2.68)	(-5.19)	(-5.43)

Robustness Tests

- Including firms without December fiscal year end
- Use annual instead of monthly returns
- Censor accounting variables
- Use Fama-French (1997) industry definition
- Other control variables such as P/E ratio, industry indicators, credit ratings, distress risk measure
- Alternative measures of accruals including Sloan's current accruals
- Four-factor (with momentum) instead of three-factor models
- Examining the relation between the return predictive power and earnings management incentives in year $t+2$ and $t+3$ and by trimming firms with extreme ROAs

Conclusions

- REM practices are related to subsequent stock returns
 - Quintile spread portfolios based on either REM measures yield factor-adjusted annual abnormal returns of about 6%
- This relation is
 - Stronger among firms with greater likelihood of earnings management
 - Does not exist for the normal levels of operating cash flows and production costs.
 - Further support their usage of by the prior literature to measure REM
 - Due to mispricing rather than risks
- More disclosure to help investors to assess REM activities

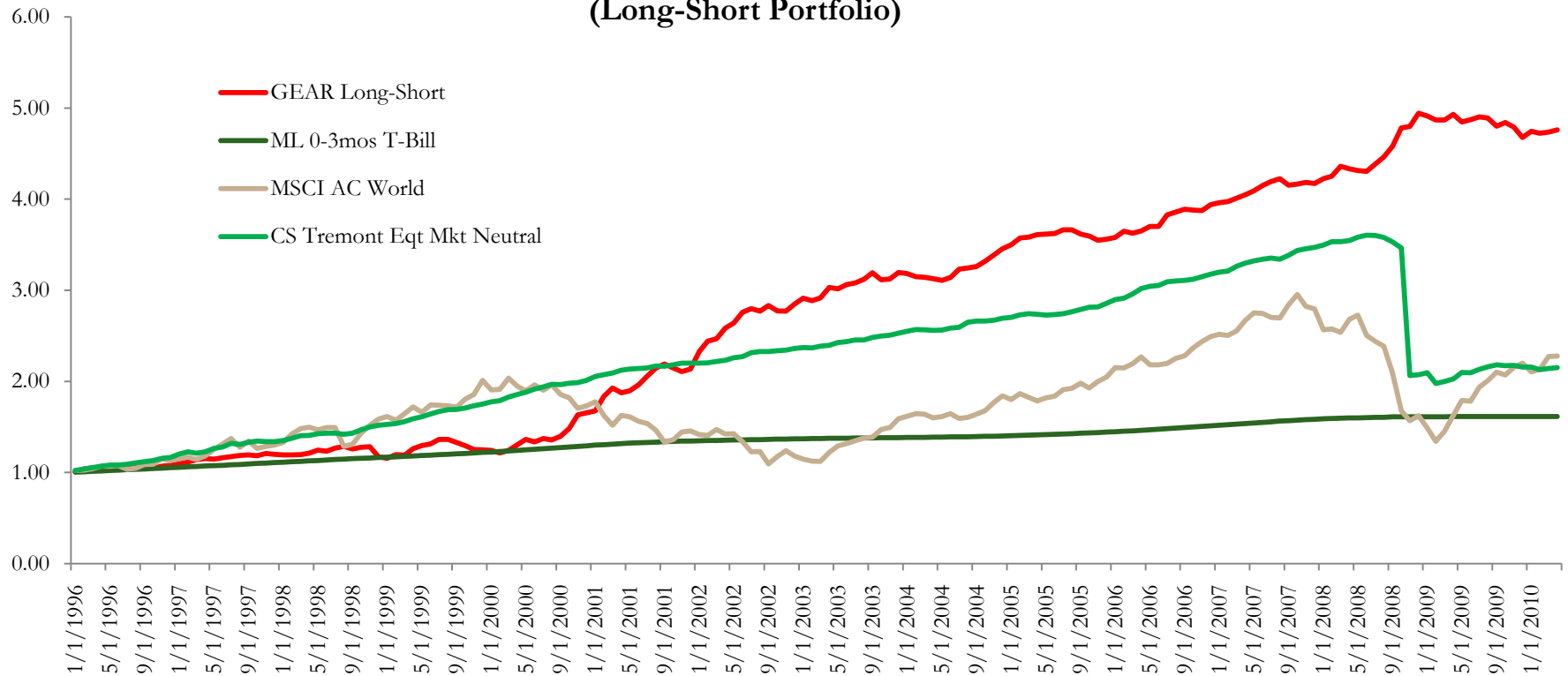
Quality Stock Investing

- Quality focus in the MSCI ACWI universe
 - Accounting fundamental driven and avoids herding
 - Low turnover
 - Limit drawdown
 - Breadth

Bottom-Up Model Back Test Summary

GEAR significantly outperforms all the benchmarks in long term returns. Note that all results are based on market cap weighted portfolios (limited turnover). Need patience for quality stock to work out, especially in the long term.

**Bottom-Up Model Cumulative Returns
(Long-Short Portfolio)**



Bottom-Up Model Back Test Summary

GEAR outperform all benchmarks in both risk and returns by a wide margin

	CS			GEAR Long-Short	CS			GEAR Long-Short
	MSCI AC World	T-Bill	Tremont Mkt Neutral		MSCI AC WORLD 10-Years	T-Bill	Tremont Mkt Neutral	
Feb 1995-April 2010								
Total Return	177.55%	70.04%	114.95%	431.03%	16.95%	30.03%	15.88%	264.74%
Annual Return (geometric)	6.92%	3.54%	5.48%	11.57%	1.58%	2.66%	1.48%	13.81%
Annualized Stdev of Returns	15.98%	0.57%	11.08%	7.58%	16.97%	0.56%	13.36%	7.99%
Excess Return	3.38%		1.94%	8.03%	-1.08%		-1.18%	11.15%
Sharpe Ratio	0.21		0.18	1.06	-0.06		-0.09	1.40
Max Drawdown	-54.57%	-0.01%	-45.10%	-11.05%				
Best Month	11.90%	0.60%	3.63%	9.99%				
Worst Month	-19.79%	-0.01%	-40.45%	-8.80%				
5-Years					3-Years			
Total Return	27.51%	14.39%	-21.43%	31.85%	-14.72%	5.02%	-34.82%	17.63%
Annual Return (geometric)	4.98%	2.72%	-4.71%	5.69%	-5.17%	1.65%	-13.29%	5.56%
Annualized Stdev of Returns	18.56%	0.58%	18.75%	4.42%	19.41%	0.61%	19.76%	4.53%
Excess Return	2.26%		-19.41%	2.96%	-6.82%		-4.92%	3.92%
Sharpe Ratio	0.12		-1.04	0.67	-0.35		-0.25	0.86

Bottom-Up Model Back Test Summary

- By-Month Performance: Even at the height of financial crisis or Internet bubble, the cumulative drawdown is relatively tolerable. There are only two full years with negative returns. Have low correlation with traditional quants.

Monthly Performance Breakdown - Bottom-Up (Long-Short)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Q1	Q2	Q3	Q4	YTD
2010	1.5%	-0.4%	0.3%	0.5%	0.8%	0.2%							1.32%	1.47%			2.81%
2009	-0.7%	-0.8%	0.0%	1.2%	-1.7%	0.5%	0.7%	-0.3%	-1.8%	0.8%	-1.0%	-2.4%	-1.50%	0.00%	-1.42%	-2.63%	-5.44%
2008	1.3%	0.7%	2.5%	-0.6%	-0.4%	-0.2%	1.9%	1.8%	2.6%	4.4%	0.3%	3.1%	4.51%	-1.29%	6.40%	7.95%	18.50%
2007	0.5%	0.4%	0.9%	1.0%	1.0%	1.5%	1.0%	0.8%	-1.7%	0.3%	0.5%	-0.3%	1.78%	3.51%	0.06%	0.49%	5.92%
2006	1.3%	2.1%	0.3%	0.8%	0.1%	0.2%	1.1%	0.0%	-1.3%	-0.7%	-1.2%	0.3%	3.67%	1.07%	-0.10%	-1.55%	3.05%
2005	1.3%	2.1%	0.3%	0.8%	0.1%	0.2%	1.1%	0.0%	-1.3%	-0.7%	-1.2%	0.3%	3.67%	1.07%	-0.10%	-1.55%	3.05%
2004	-0.3%	-1.1%	-0.2%	-0.5%	-0.6%	1.0%	3.0%	0.4%	0.5%	1.8%	2.1%	2.0%	-1.59%	-0.14%	3.85%	6.04%	8.23%
2003	2.3%	-1.0%	1.1%	3.9%	-0.6%	1.6%	0.6%	1.3%	2.3%	-2.5%	0.4%	2.2%	2.42%	4.97%	4.28%	0.02%	12.13%
2002	9.1%	4.9%	1.0%	4.8%	2.1%	4.5%	1.5%	-1.0%	2.2%	-2.0%	-0.2%	2.8%	15.56%	11.82%	2.67%	0.59%	33.45%
2001	1.3%	9.5%	5.1%	-2.7%	1.2%	3.5%	4.9%	4.2%	2.1%	-2.0%	-1.9%	1.2%	16.50%	1.88%	11.62%	-2.59%	29.05%
2000	-0.6%	-2.2%	2.4%	5.1%	4.4%	-2.0%	2.8%	-1.1%	2.9%	6.2%	10.0%	1.3%	-0.48%	7.56%	4.66%	18.30%	32.53%
1999	-1.1%	3.3%	-0.3%	5.9%	2.8%	1.4%	3.8%	-0.1%	-2.4%	-2.8%	-3.2%	-0.3%	1.79%	10.40%	1.20%	-6.19%	6.68%
1998	-0.4%	-0.1%	0.2%	1.4%	2.9%	-1.2%	2.9%	1.4%	-2.1%	1.3%	0.5%	-8.8%	-0.28%	3.11%	2.18%	-7.09%	-2.39%
1997	1.8%	1.7%	2.3%	1.0%	-0.5%	1.4%	0.8%	1.1%	0.5%	-0.7%	2.1%	-0.8%	5.81%	1.90%	2.41%	0.58%	11.06%
1996	1.1%	2.7%	1.1%	-0.1%	-0.7%	0.9%	1.0%	-0.2%	-0.3%	-0.8%	2.0%	0.9%	5.02%	0.10%	0.46%	2.17%	7.90%
1995		1.1%	0.2%	3.2%	0.9%	1.0%	0.0%	0.9%	2.3%	2.0%	-0.8%	0.3%	1.32%	5.17%	3.16%	1.46%	11.54%

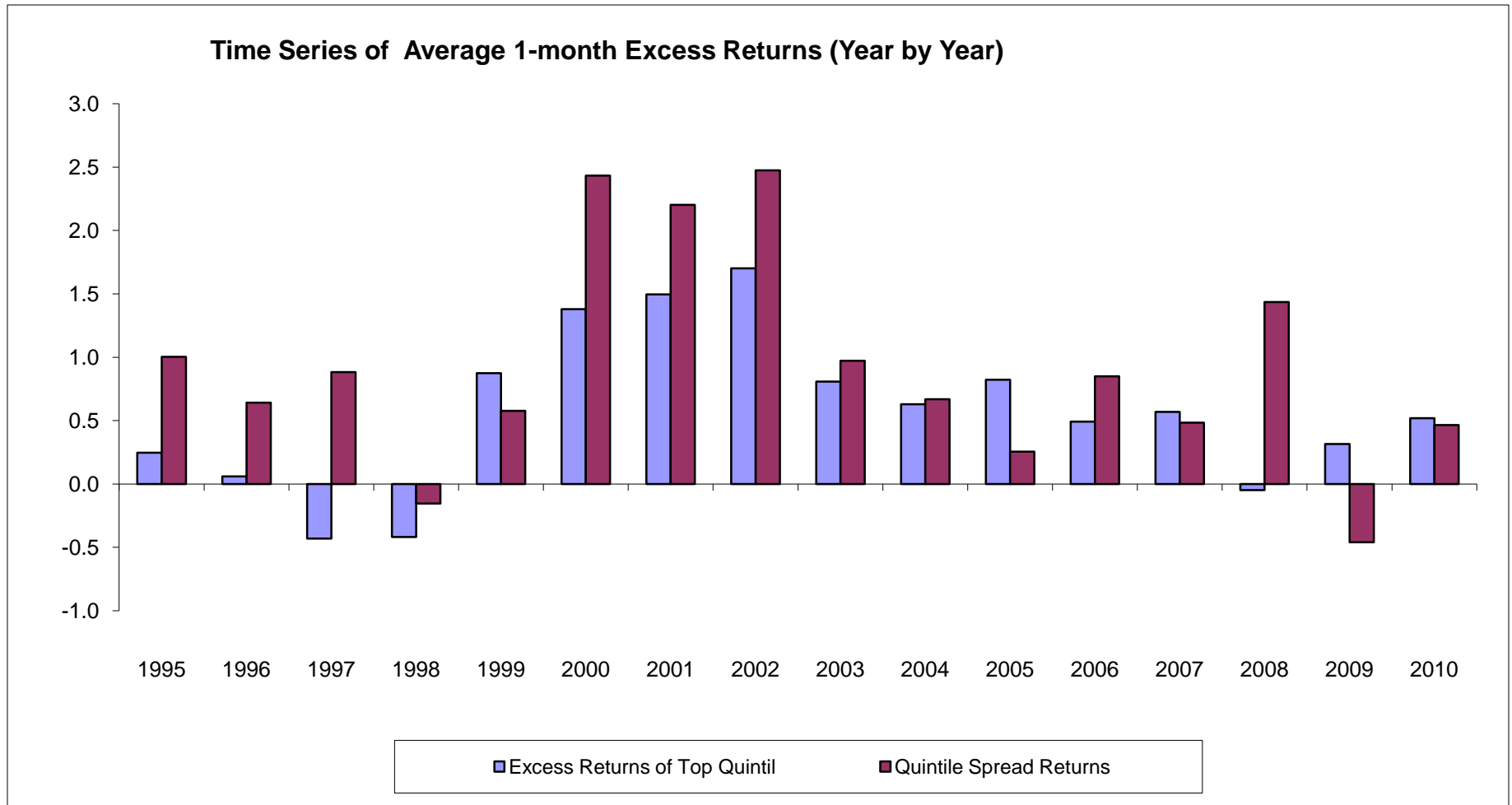
Bottom-Up Model Back Test Summary

Quintile Portfolio Performance: 69% of months have positive returns; Long-short information ratio of 1.49; average monthly spread 0.93%.

year	nMon	High	2	3	4	Low	Sprd1m	StdSprd	StdTop	TOTop	Tolow	HitRate	IR_Is	IR_lo
1995	11	0.24	0.37	-0.16	0.12	-0.76	1.00	1.12	0.79	18%	18%	91%	3.10	1.07
1996	12	0.13	0.03	0.35	-0.21	-0.52	0.64	1.07	1.01	11%	11%	58%	2.07	0.43
1997	12	-0.33	0.31	0.77	-0.47	-1.22	0.88	1.07	1.00	12%	12%	75%	2.87	-1.16
1998	12	-0.83	0.25	0.35	-0.18	-0.68	-0.16	3.10	1.99	9%	10%	58%	-0.17	-1.45
1999	12	0.52	-0.31	0.01	0.22	-0.06	0.58	2.87	3.39	10%	11%	42%	0.70	0.53
2000	12	1.83	0.73	-0.15	-0.29	-0.60	2.43	3.65	3.22	10%	10%	67%	2.31	1.97
2001	12	1.28	1.19	0.04	-0.78	-0.92	2.20	3.50	2.49	10%	11%	75%	2.18	1.78
2002	12	1.74	0.80	-0.34	-0.20	-0.74	2.47	3.04	2.61	11%	10%	75%	2.82	2.30
2003	12	0.99	0.00	-0.18	0.03	0.02	0.97	1.73	1.25	12%	12%	75%	1.95	2.75
2004	12	0.58	0.10	-0.08	-0.15	-0.08	0.67	1.30	0.98	9%	9%	58%	1.78	2.06
2005	12	0.81	-0.31	-0.25	0.24	0.55	0.26	1.00	0.99	9%	9%	75%	0.89	2.83
2006	12	0.61	0.21	-0.07	-0.41	-0.24	0.85	1.12	0.78	9%	9%	75%	2.63	2.69
2007	12	0.75	-0.36	0.00	-0.08	0.27	0.48	0.83	1.18	9%	9%	83%	2.02	2.21
2008	12	0.07	0.72	-0.15	-0.26	-1.37	1.44	1.56	1.76	10%	10%	75%	3.19	0.14
2009	12	0.71	-0.28	-0.35	0.03	1.17	-0.46	1.16	1.64	9%	9%	42%	-1.37	1.50
2010	6	0.47	-0.22	-0.04	0.10	0.00	0.46	0.65	0.45	14%	16%	83%	2.49	3.64
95-10	185	0.60	0.21	-0.01	-0.15	-0.33	0.93	2.18	1.90	11%	11%	69%	1.49	1.10

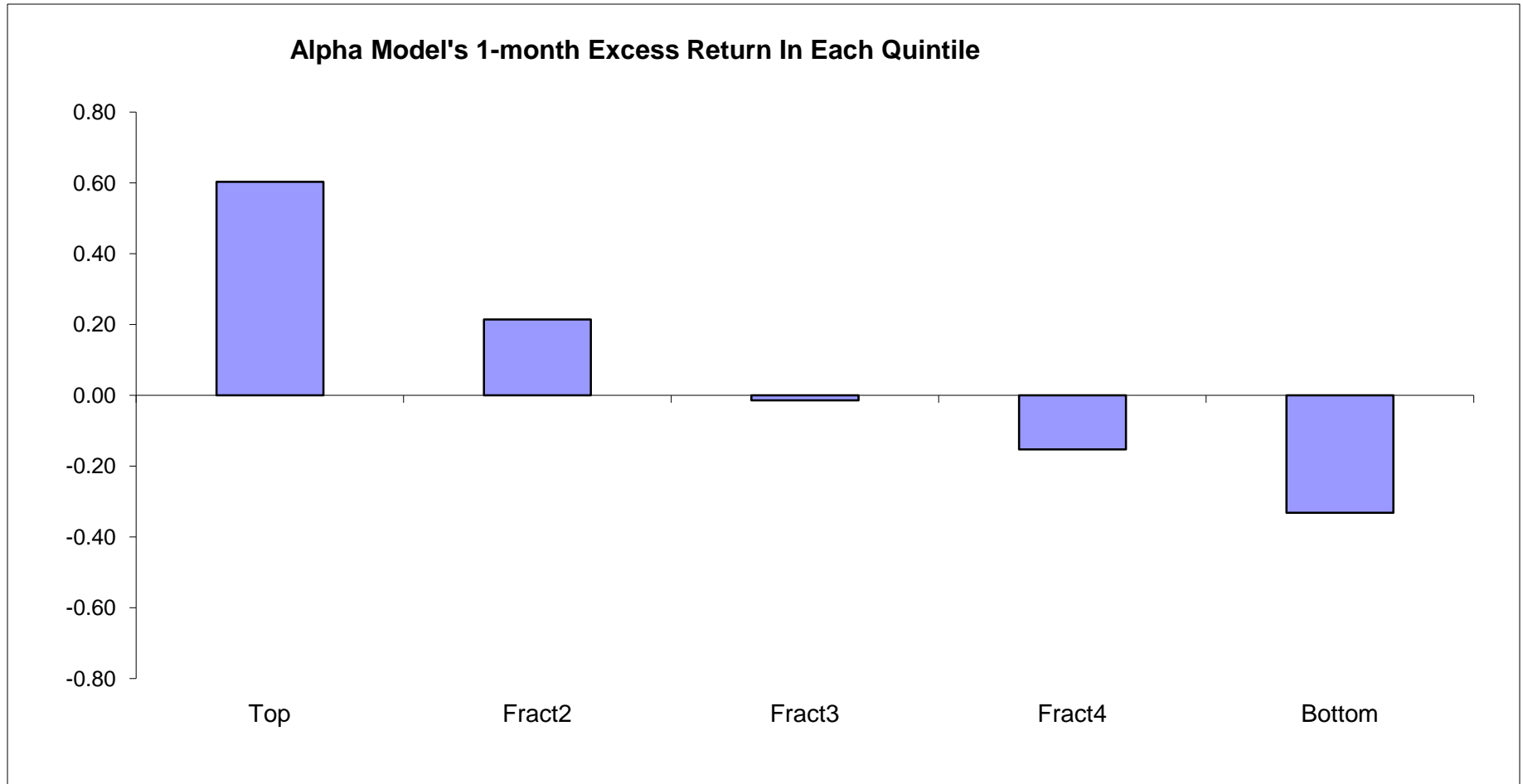
Bottom-Up Model Back Test Summary

- 1-Month Quintile Return By Year Graph (%): top quintile and long-short spread only have two negative years each.



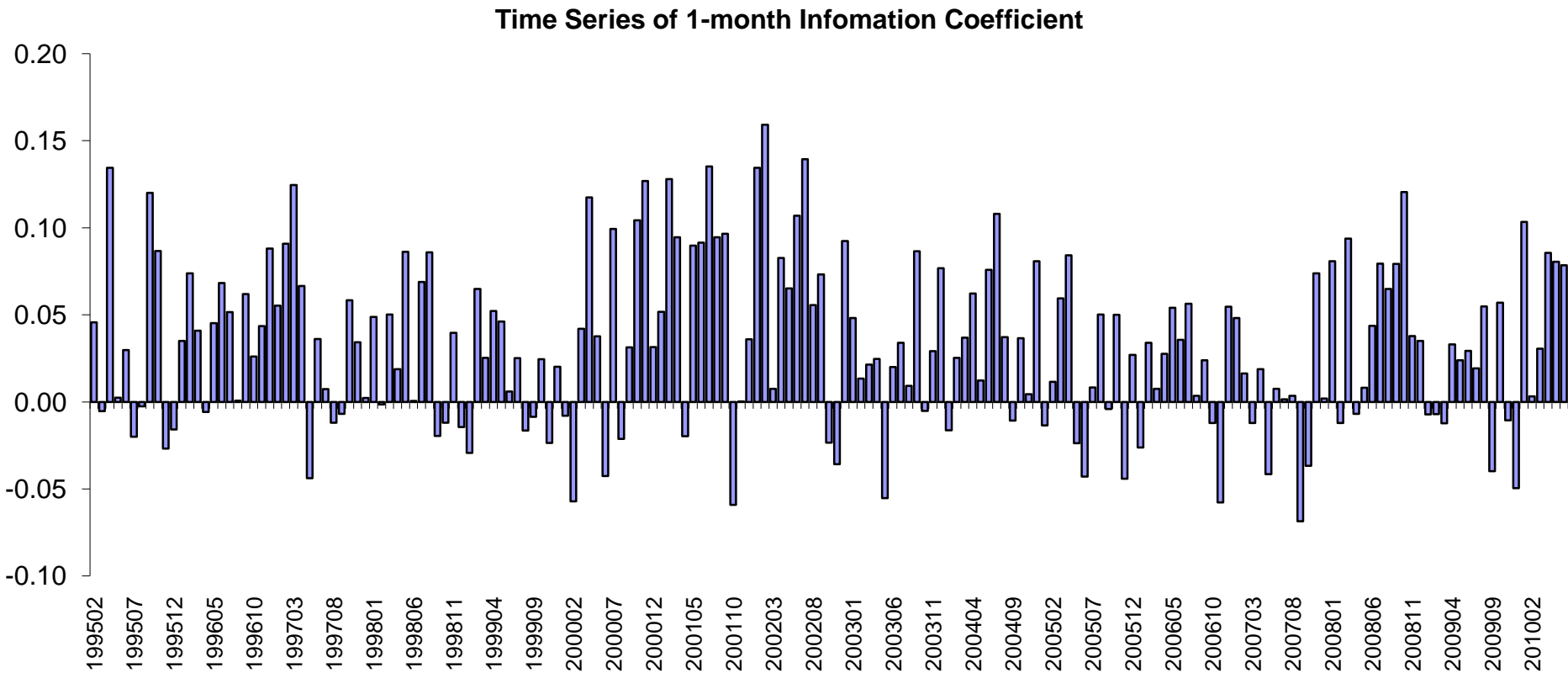
Bottom-Up Model Back Test Summary

- 1-Month Quintile Return Graph (%): Quintile returns are largely symmetric. Long side seems to be more informative than short side.



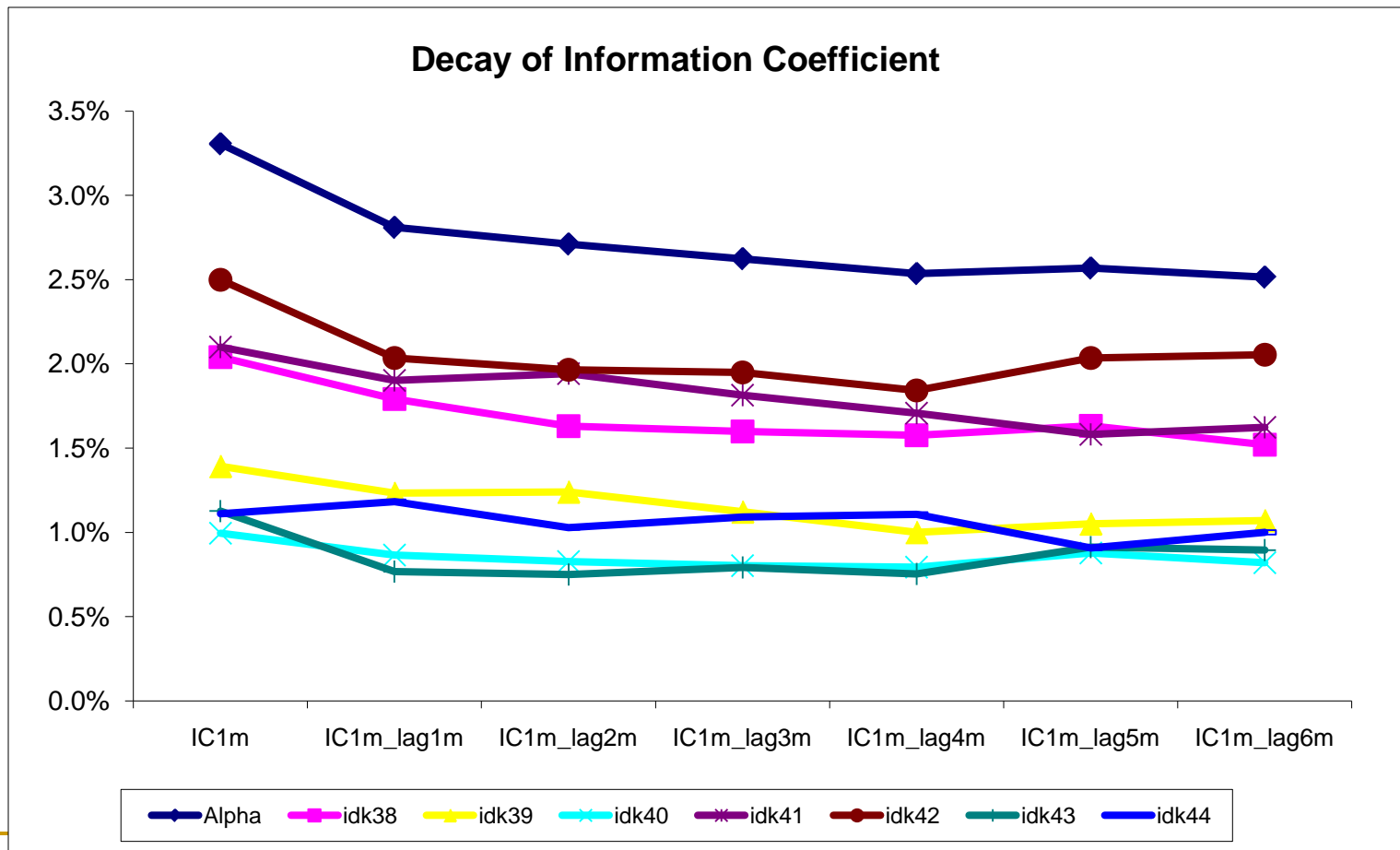
Bottom-Up Model Back Test Summary

- 1-Month Information Ratio By Month has been pretty stable over time



Bottom-Up Model Back Test Summary

Information Coefficient (IC) Persistence: Beyond one-month horizon, IC decays very slowly for all aggregate factors and alpha.



-
- Quality stock investing could be an attractive strategy with relatively low correlation with traditional strategies.