Online Appendix

Industry Concentration of Short Sellers: Cash Flow or Distress News?

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Abstract

In this study, we provide new empirical evidence that concentrated short sales convey both industry information and firm-specific information. We report significant negative (positive) abnormal returns of -0.6% (+0.6%) over one month and -2.9% (2.0%) over six months on stocks with a high (low) SIR within highly shorted industries. The relatively symmetric returns on long-short portfolios within industries suggest that short sellers are informed on both the long and the short side within specific industries. We show that short sellers target heterogeneous industries with price run-ups where superior information processing skills can be best used to maximize profits. Our analyses also reveal that short sellers convey future negative industry cash flow news, they do not ex-post react to industry distress. Overall our findings alleviate regulatory concerns that short sellers ride on industry distress.

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APPENDIX : Industry classification

Table 1. GICS Industry classification: 24 industry groups

GICS is the official Standard & Poor's industry classification system. Most Standard & Poor's products that include an industry classification system use the GICS structure.

The GICS methodology has been widely accepted as an industry analysis framework for investment research, portfolio management and asset allocation. Its universal approach to industries worldwide has contributed to transparency and efficiency in the investment process, and the GICS methodology supports the trend towards sector-based investing. GICS defines peer groups tightly and avoids grouping unlike companies together. Four classification levels allow for more customization and targeting in portfolio, index and derivative product construction. While there are regular changes at the finer level, at the 6 and 8 digit level, the 4 digit specification has been stable in the last decade.

The four digit GICS codes establish 24 GICS industry groups that accurately captures similar firm in today's global investment environment, yet is flexible enough to capture tomorrow's developments.

1010 Energy
1510 Materials
2010 Capital Goods (including building materials, construction)
2020 Commercial Services & Supplies
2030 Transportation
2510 Automobiles & Components
2520 Consumer Durables & Apparel (including home building, furnishing)
2530 Consumer Services (including entertainment)
2540 Media
2550 Retailing
3010 Food & Staples
3020 Food, Beverage & Tobacco
3030 Household & Personal Products
3510 Health Care Equipment & Services
3520 Pharmaceuticals, Biotechnology & Life Sciences
4010 Banks
4020 Diversified Financials
4030 Insurance
4040 Financials-Real Estate
4510 Software & Services
4520 Technology Hardware & Equipment
4530 Semiconductors & Semiconductor Equipment
5010 Telecommunication Services
5510 Utilities

Source: MSCI Global Industry Classification Standard (GICS®)
http://www.msci.com/products/indexes/sector/gics/gics_structure.html

Appendix: Robustness analysis

Appendix Table 2.

Future one-month and six-month abnormal returns on double-sorted portfolios, using GICS 20 industries (excluding the regulated industries)

The table summarizes portfolio abnormal returns, from the Fama-French-Carhart four factor model, where the portfolio excess returns are the future one-month (in Panels A and B) and six-months (in Panels C and D) equal or value-weighted excess returns in percentage on double-sorted portfolios since portfolio creation. In establishing the double-sorted portfolios, at the end of each month, industries (20 GIC industry groups, 4 regulated industries excluded) are ranked based on the industry aggregate shorted value (*IndSV*). Then, within each industry quintile group, stock portfolios established based on the individual firm level SIR, where SIR is the number of shares shorted relative to the total number of shares outstanding in the previous month. To save space only the portfolio abnormal returns (the intercepts from the portfolio return regressions) are reported with the relevant *p*-values (in italics). For each portfolio 281 months of data used from January 1990 to May 2013.

Panel A. Future one-month abnormal returns on equal-weighted double-sorted portfolios, excluding regulated industries

Eq1mRet	**Low IndSV Q=1**	**2**	**Mid IndSV Q=3**	**4**	**High IndSV Q=5**	**Across Industries Hedge Portf**
Low firmSIR	0.443	0.120	0.365	0.437	0.583	-0.140
Q=1	*0.021*	*0.569*	*0.043*	*0.010*	*0.002*	*0.519*
Low firmSIR	0.072	0.080	0.291	0.265	0.262	-0.190
Q=2	*0.673*	*0.602*	*0.045*	*0.065*	*0.086*	*0.334*
Med-low firmSIR	0.166	0.123	0.306	0.150	0.040	0.125
Q=3	*0.306*	*0.404*	*0.033*	*0.267*	*0.790*	*0.521*
Med-high firmSIR	-0.097	0.103	0.079	0.179	-0.255	0.159
Q=4	*0.574*	*0.497*	*0.658*	*0.243*	*0.118*	*0.461*
High firmSIR	-0.223	-0.308	-0.390	-0.110	-0.590	0.367
Q=5	*0.241*	*0.075*	*0.034*	*0.526*	*0.000*	*0.128*
Long-Short Portf	0.666	0.428	0.755	0.547	1.173	
within industry	*0.004*	*0.085*	*0.001*	*0.004*	*0.000*	

Panel B. Future one-month abnormal returns on value-weighted double-sorted portfolios, excluding regulated industries

Vw1mRet	**Low IndSV Q=1**	**2**	**Mid IndSV Q=3**	**4**	**High IndSV Q=5**	**Across Industries Hedge Portf**
Low firmSIR	0.332	0.227	0.329	0.353	0.512	-0.180
Q=1	*0.062*	*0.239*	*0.042*	*0.021*	*0.004*	*0.389*
Low firmSIR	0.089	0.127	0.296	0.259	0.252	-0.164
Q=2	*0.568*	*0.384*	*0.029*	*0.052*	*0.077*	*0.380*
Med-low firmSIR	0.182	0.170	0.308	0.176	0.021	0.161
Q=3	*0.234*	*0.227*	*0.024*	*0.175*	*0.886*	*0.371*
Med-high firmSIR	-0.073	0.053	0.104	0.169	-0.245	0.172
Q=4	*0.662*	*0.725*	*0.537*	*0.268*	*0.122*	*0.412*
High firmSIR	-0.138	-0.308	-0.351	-0.091	-0.584	0.447
Q=5	*0.470*	*0.075*	*0.047*	*0.590*	*0.000*	*0.062*
Long-Short Portf	0.470	0.535	0.680	0.444	1.097	
within industry	*0.033*	*0.021*	*0.001*	*0.010*	*0.000*	

Appendix Table 2 continued

Panel C. Future six-month abnormal returns on equal-weighted double-sorted portfolios, excluding regulated industries

Eq1mRet	**Low IndSV Q=1**	**2**	**Mid IndSV Q=3**	**4**	**High IndSV Q=5**	**Across Industries Hedge Portf**
Low firmSIR	3.571	0.634	1.848	1.608	1.652	1.919
Q=1	*0.000*	*0.283*	*0.001*	*0.002*	*0.003*	*0.003*
Low firmSIR	1.877	0.726	1.337	2.062	0.957	0.919
Q=2	*0.000*	*0.118*	*0.021*	*0.000*	*0.044*	*0.114*
Med-low firmSIR	2.366	0.905	1.560	1.996	-0.212	2.578
Q=3	*0.000*	*0.039*	*0.004*	*0.000*	*0.614*	*0.000*
Med-high firmSIR	2.218	0.618	0.272	1.237	-0.836	3.054
Q=4	*0.000*	*0.191*	*0.660*	*0.004*	*0.053*	*0.000*
High firmSIR	0.555	-1.048	-1.515	-0.256	-2.395	2.950
Q=5	*0.384*	*0.046*	*0.012*	*0.587*	*0.000*	*0.000*
Long-Short Portf	3.016	1.683	3.363	1.865	4.047	
within industry	*0.000*	*0.008*	*0.000*	*0.000*	*0.000*	

Panel D. Future six-month abnormal returns on value-weighted double-sorted portfolios, excluding regulated industries

Vw1mRet	**Low IndSV Q=1**	**2**	**Mid IndSV Q=3**	**4**	**High IndSV Q=5**	**Across Industries Hedge Portf**
Low firmSIR	3.342	1.208	1.880	1.476	1.619	1.723
Q=1	*0.000*	*0.027*	*0.000*	*0.002*	*0.003*	*0.006*
Low firmSIR	2.182	0.994	1.574	2.199	0.808	1.375
Q=2	*0.000*	*0.021*	*0.002*	*0.000*	*0.059*	*0.010*
Med-low firmSIR	2.124	1.025	1.440	2.143	-0.087	2.210
Q=3	*0.000*	*0.013*	*0.002*	*0.000*	*0.829*	*0.000*
Med-high firmSIR	2.018	0.389	0.286	1.281	-0.555	2.572
Q=4	*0.000*	*0.354*	*0.605*	*0.002*	*0.183*	*0.000*
High firmSIR	0.993	-1.114	-1.265	-0.124	-2.211	3.204
Q=5	*0.122*	*0.021*	*0.030*	*0.785*	*0.000*	*0.000*
Long-Short Portf	2.349	2.322	3.145	1.599	3.830	
within industry	*0.000*	*0.000*	*0.000*	*0.001*	*0.000*	

Appendix Table 3.

Future one-month and six-month abnormal returns on double sorted portfolios, excluding illiquid stocks

The table summarizes portfolio abnormal returns, from the Fama-French-Carhart four factor model, where the portfolio excess returns are the future one-month (in Panels A and B) and six-months (in Panels C and D) equal or value-weighted excess returns in percentage on double-sorted portfolios since portfolio creation. In establishing the double-sorted portfolios, at the end of each month first the least liquid 20% of the stocks excluded based on turnover. Then the industries are ranked based on the industry aggregate shorted value (*IndSV*). Then, within each industry (sextile) group, stock portfolios established based on the individual firm level SIR, where SIR is the number of shares shorted relative to the total number of shares outstanding in the previous month. To save space only the portfolio abnormal returns (the intercepts from the portfolio return regressions) are reported with the relevant *p*-values (in italics). For each portfolio 281 months of data used from January 1990 to May 2013.

Panel A. Future one-month abnormal returns on equal-weighted double-sorted portfolios excluding illiquid stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.508	0.672	0.552	0.533	0.646	0.812	-0.304
	0.016	*0.001*	*0.007*	*0.003*	*0.000*	*0.000*	*0.126*
Low Firm SIR=2	0.432	0.240	0.507	0.574	0.211	0.263	0.169
	0.014	*0.127*	*0.002*	*0.000*	*0.151*	*0.136*	*0.305*
Mid-Low Firm SIR=3	-0.019	0.137	0.362	0.321	0.177	-0.043	0.024
	0.922	*0.411*	*0.027*	*0.038*	*0.237*	*0.807*	*0.883*
Mid-High Firm SIR=4	0.097	0.310	0.379	-0.067	0.291	-0.294	0.392
	0.598	*0.067*	*0.029*	*0.664*	*0.099*	*0.111*	*0.021*
High Firm SIR =5	-0.304	0.112	-0.072	0.202	-0.150	-0.309	0.005
	0.143	*0.557*	*0.670*	*0.272*	*0.373*	*0.110*	*0.979*
High Firm SIR =6	-0.232	-0.285	-0.325	-0.564	-0.319	-0.653	0.421
	0.326	*0.124*	*0.112*	*0.001*	*0.086*	*0.001*	*0.050*
Hedge portfolios	0.740	0.957	0.877	1.096	0.964	1.465	
within industry	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

Panel B. Future one-month abnormal returns on value-weighted double-sorted portfolios excluding illiquid stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.393	0.615	0.471	0.524	0.532	0.718	-0.325
	0.026	*0.000*	*0.009*	*0.001*	*0.002*	*0.000*	*0.074*
Low Firm SIR=2	0.402	0.282	0.535	0.466	0.225	0.226	0.176
	0.014	*0.053*	*0.001*	*0.001*	*0.106*	*0.163*	*0.249*
Mid-Low Firm SIR=3	0.017	0.176	0.296	0.290	0.196	-0.050	0.067
	0.926	*0.259*	*0.047*	*0.051*	*0.173*	*0.769*	*0.667*
Mid-High Firm SIR=4	0.117	0.274	0.333	-0.044	0.233	-0.286	0.402
	0.507	*0.104*	*0.044*	*0.769*	*0.166*	*0.105*	*0.014*
High Firm SIR =5	-0.285	0.100	-0.050	0.161	-0.165	-0.286	0.001
	0.162	*0.587*	*0.755*	*0.349*	*0.306*	*0.130*	*0.996*
High Firm SIR =6	-0.137	-0.295	-0.296	-0.478	-0.303	-0.651	0.514
	0.558	*0.107*	*0.131*	*0.008*	*0.095*	*0.001*	*0.016*
Hedge portfolios	0.531	0.910	0.768	1.002	0.834	1.369	
within industry	*0.004*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

Appendix Table 3 continued

Panel C. Future six-month abnormal returns on equal-weighted double-sorted portfolios excluding illiquid stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	2.763	1.564	2.377	3.136	1.426	1.825	0.938
	0.000	*0.003*	*0.000*	*0.000*	*0.011*	*0.006*	*0.104*
Low Firm SIR=2	2.900	1.155	1.731	2.295	1.698	1.177	1.723
	0.000	*0.017*	*0.014*	*0.000*	*0.000*	*0.037*	*0.000*
Mid-Low Firm SIR=3	2.320	1.482	1.941	2.227	1.307	-0.387	2.707
	0.000	*0.002*	*0.001*	*0.000*	*0.003*	*0.459*	*0.000*
Mid-High Firm SIR=4	2.762	1.575	1.296	1.590	1.313	-0.631	3.393
	0.000	*0.001*	*0.013*	*0.001*	*0.004*	*0.211*	*0.000*
High Firm SIR =5	0.368	1.187	0.536	0.886	0.144	-0.956	1.324
	0.600	*0.032*	*0.401*	*0.075*	*0.744*	*0.093*	*0.044*
High Firm SIR =6	0.271	-1.940	-0.782	-0.786	-1.692	-3.167	3.438
	0.731	*0.003*	*0.183*	*0.155*	*0.001*	*0.000*	*0.000*
Hedge portfolios	2.492	3.504	3.159	3.922	3.118	4.992	
within industry	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

Panel D. Future six-month abnormal returns on value-weighted double-sorted portfolios excluding illiquid stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	2.604	1.724	2.331	3.023	1.430	1.625	0.979
	0.000	*0.001*	*0.000*	*0.000*	*0.005*	*0.010*	*0.066*
Low Firm SIR=2	2.479	1.282	1.850	2.062	1.817	0.904	1.575
	0.000	*0.004*	*0.003*	*0.000*	*0.000*	*0.073*	*0.000*
Mid-Low Firm SIR=3	2.144	1.376	1.697	2.060	1.476	-0.260	2.404
	0.000	*0.002*	*0.000*	*0.000*	*0.000*	*0.597*	*0.000*
Mid-High Firm SIR=4	2.472	1.429	1.304	1.574	1.273	-0.386	2.858
	0.000	*0.002*	*0.006*	*0.000*	*0.003*	*0.414*	*0.000*
High Firm SIR =5	0.477	1.079	0.620	0.868	0.183	-0.819	1.296
	0.494	*0.037*	*0.299*	*0.066*	*0.661*	*0.138*	*0.050*
High Firm SIR =6	0.671	-1.811	-0.879	-0.438	-1.419	-3.002	3.673
	0.397	*0.003*	*0.114*	*0.426*	*0.003*	*0.000*	*0.000*
Hedge portfolios	1.933	3.535	3.210	3.461	2.848	4.628	
within industry	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

Appendix Table 4.

Future one-month and six-month abnormal returns on double sorted portfolios, excluding penny stocks

The table summarizes portfolio abnormal returns, from the Fama-French-Carhart four factor model, where the portfolio excess returns are the future one-month (in Panels A and B) and six-months (in Panels C and D) equal or value-weighted excess returns in percentage on double-sorted portfolios since portfolio creation. In establishing the double-sorted portfolios, first we exclude at the end of each month all penny stocks (stcokc with share price less than $5) then the industries are ranked based on the industry aggregate shorted value (*IndSV*). Then, within each industry (sextile) group, stock portfolios established based on the individual firm level SIR, where SIR is the number of shares shorted relative to the total number of shares outstanding in the previous month. To save space only the portfolio abnormal returns (the intercepts from the portfolio return regressions) are reported with the relevant *p*-values (in italics). For each portfolio 281 months of data used from January 1990 to May 2013.

Panel A. Future one-month abnormal returns on equal-weighted double-sorted portfolios excluding penny stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.230	0.296	0.210	0.336	0.294	0.431	-0.201
	0.182	*0.065*	*0.156*	*0.015*	*0.039*	*0.010*	*0.328*
Low Firm SIR=2	0.193	0.056	0.191	0.411	0.086	0.355	-0.162
	0.210	*0.700*	*0.214*	*0.003*	*0.506*	*0.022*	*0.424*
Mid-Low Firm SIR=3	0.073	0.211	0.163	0.160	0.245	-0.097	0.170
	0.640	*0.181*	*0.293*	*0.246*	*0.081*	*0.555*	*0.409*
Mid-High Firm SIR=4	0.003	0.051	0.350	0.013	0.127	-0.203	0.206
	0.988	*0.758*	*0.028*	*0.931*	*0.417*	*0.240*	*0.338*
High Firm SIR =5	-0.165	0.035	0.081	0.096	-0.142	-0.310	0.145
	0.377	*0.842*	*0.623*	*0.555*	*0.363*	*0.099*	*0.580*
High Firm SIR =6	-0.280	-0.159	-0.296	-0.441	-0.362	-0.691	0.411
	0.173	*0.368*	*0.105*	*0.012*	*0.036*	*0.000*	*0.140*
Hedge portfolios	0.509	0.455	0.506	0.777	0.656	1.122	
within industry	*0.030*	*0.033*	*0.017*	*0.000*	*0.000*	*0.000*	

Panel B. Future one-month abnormal returns on value-weighted double-sorted portfolios excluding penny stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.116	0.306	0.182	0.332	0.242	0.404	-0.289
	0.488	*0.049*	*0.210*	*0.014*	*0.085*	*0.015*	*0.168*
Low Firm SIR=2	0.244	0.110	0.272	0.378	0.119	0.308	-0.064
	0.098	*0.430*	*0.078*	*0.005*	*0.352*	*0.040*	*0.743*
Mid-Low Firm SIR=3	0.066	0.243	0.162	0.147	0.242	-0.094	0.160
	0.662	*0.108*	*0.279*	*0.270*	*0.078*	*0.559*	*0.426*
Mid-High Firm SIR=4	0.000	0.066	0.347	0.015	0.130	-0.208	0.207
	0.998	*0.684*	*0.025*	*0.920*	*0.397*	*0.213*	*0.313*
High Firm SIR =5	-0.141	0.040	0.095	0.093	-0.154	-0.277	0.136
	0.457	*0.817*	*0.550*	*0.550*	*0.315*	*0.137*	*0.606*
High Firm SIR =6	-0.233	-0.176	-0.267	-0.412	-0.338	-0.667	0.434
	0.259	*0.318*	*0.149*	*0.022*	*0.050*	*0.000*	*0.121*
Hedge portfolios	0.348	0.482	0.449	0.744	0.580	1.071	
within industry	*0.132*	*0.019*	*0.035*	*0.000*	*0.001*	*0.000*	

Appendix Table 4 continued

Panel C. Future six-month abnormal returns on equal-weighted double-sorted portfolios excluding penny stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	2.433	1.750	1.201	2.044	1.354	1.958	0.475
	0.000	*0.000*	*0.015*	*0.000*	*0.003*	*0.000*	*0.426*
Low Firm SIR=2	1.605	0.875	0.558	1.906	1.388	1.128	0.477
	0.000	*0.056*	*0.389*	*0.000*	*0.001*	*0.030*	*0.421*
Mid-Low Firm SIR=3	1.485	1.164	1.474	1.514	1.352	0.147	1.338
	0.001	*0.011*	*0.003*	*0.000*	*0.001*	*0.758*	*0.024*
Mid-High Firm SIR=4	1.508	0.771	1.154	1.306	0.798	-0.518	2.025
	0.003	*0.071*	*0.010*	*0.002*	*0.053*	*0.264*	*0.002*
High Firm SIR =5	0.561	0.523	0.094	0.717	-0.047	-0.856	1.417
	0.348	*0.264*	*0.858*	*0.130*	*0.910*	*0.124*	*0.092*
High Firm SIR =6	-0.316	-1.590	-1.224	-0.493	-1.738	-3.161	2.845
	0.645	*0.005*	*0.029*	*0.330*	*0.000*	*0.000*	*0.001*
Hedge portfolios	2.748	3.339	2.426	2.538	3.092	5.118	
within industry	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

Panel D. Future six-month abnormal returns on value-weighted double-sorted portfolios excluding penny stocks

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	2.018	1.842	1.282	2.005	1.344	1.852	0.166
	0.000	*0.000*	*0.006*	*0.000*	*0.002*	*0.000*	*0.783*
Low Firm SIR=2	1.766	1.000	0.865	1.998	1.545	0.908	0.858
	0.000	*0.022*	*0.137*	*0.000*	*0.000*	*0.057*	*0.117*
Mid-Low Firm SIR=3	1.329	1.161	1.476	1.420	1.475	0.156	1.173
	0.002	*0.007*	*0.001*	*0.000*	*0.000*	*0.730*	*0.034*
Mid-High Firm SIR=4	1.424	0.781	1.218	1.260	0.890	-0.346	1.770
	0.003	*0.063*	*0.005*	*0.002*	*0.026*	*0.442*	*0.005*
High Firm SIR =5	0.494	0.579	0.337	0.759	0.004	-0.740	1.233
	0.404	*0.209*	*0.525*	*0.097*	*0.992*	*0.170*	*0.141*
High Firm SIR =6	-0.048	-1.537	-1.163	-0.341	-1.480	-3.012	2.964
	0.944	*0.006*	*0.038*	*0.501*	*0.001*	*0.000*	*0.001*
Hedge portfolios	2.067	3.379	2.445	2.346	2.824	4.865	
within industry	*0.004*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	

Appendix Table 5.

Future one-month and six-month abnormal returns on double sorted portfolios, excluding stocks with low institutional ownership

The table summarizes portfolio abnormal returns, from the Fama-French-Carhart four factor model, where the portfolio excess returns are the future one-month (in Panels A and B) and six-months (in Panels C and D) equal or value-weighted excess returns in percentage on double-sorted portfolios since portfolio creation. In establishing the double-sorted portfolios, first we exclude stock with no or low institutional ownership, that is stocks with institutional ownership (IO) less than the 20th percentile (the cutoffs are established monthly as we establish the portfolios). Then at the end of each month, industries are ranked based on the industry aggregate shorted value (*IndSV*). Then, within each industry (sextile) group, stock portfolios established based on the individual firm level SIR, where SIR is the number of shares shorted relative to the total number of shares outstanding in the previous month. To save space only the portfolio abnormal returns (the intercepts from the portfolio return regressions) are reported with the relevant *p*-values (in italics). For each portfolio 281 months of data used from January 1990 to May 2013.

Panel A. Future one-month abnormal returns on equal-weighted double-sorted portfolios excluding stocks with low IO

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.422	0.643	0.426	0.567	0.560	0.823	-0.401
	0.037	*0.004*	*0.035*	*0.004*	*0.002*	*0.000*	*0.111*
Low Firm SIR=2	0.015	0.021	0.261	0.478	0.207	0.446	-0.431
	0.935	*0.899*	*0.101*	*0.002*	*0.170*	*0.012*	*0.055*
Mid-Low Firm SIR=3	0.393	0.251	0.354	0.157	0.122	0.010	0.383
	0.020	*0.115*	*0.040*	*0.291*	*0.414*	*0.954*	*0.076*
Mid-High Firm SIR=4	0.129	0.142	0.427	0.132	0.233	-0.100	0.230
	0.516	*0.413*	*0.008*	*0.413*	*0.157*	*0.590*	*0.334*
High Firm SIR =5	0.063	0.054	0.128	0.033	-0.057	-0.262	0.325
	0.746	*0.774*	*0.453*	*0.837*	*0.745*	*0.184*	*0.214*
High Firm SIR =6	-0.338	-0.177	-0.171	-0.429	-0.228	-0.594	0.256
	0.140	*0.365*	*0.394*	*0.024*	*0.241*	*0.003*	*0.410*
Hedge portfolios	0.760	0.820	0.597	0.996	0.788	1.417	
within industry	*0.006*	*0.003*	*0.021*	*0.000*	*0.001*	*0.000*	

Panel B. Future one-month abnormal returns on value-weighted double-sorted portfolios excluding stocks with low IO

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.275	0.562	0.375	0.513	0.452	0.714	-0.439
	0.139	*0.004*	*0.038*	*0.006*	*0.008*	*0.000*	*0.060*
Low Firm SIR=2	0.089	0.099	0.254	0.398	0.198	0.402	-0.313
	0.589	*0.524*	*0.100*	*0.005*	*0.174*	*0.017*	*0.138*
Mid-Low Firm SIR=3	0.373	0.285	0.344	0.160	0.157	-0.015	0.387
	0.021	*0.051*	*0.031*	*0.254*	*0.266*	*0.930*	*0.060*
Mid-High Firm SIR=4	0.118	0.132	0.394	0.134	0.203	-0.147	0.265
	0.522	*0.429*	*0.010*	*0.391*	*0.215*	*0.411*	*0.226*
High Firm SIR =5	0.048	0.048	0.169	0.065	-0.087	-0.255	0.303
	0.802	*0.798*	*0.297*	*0.673*	*0.606*	*0.189*	*0.238*
High Firm SIR =6	-0.288	-0.207	-0.138	-0.382	-0.231	-0.584	0.296
	0.210	*0.286*	*0.487*	*0.046*	*0.223*	*0.003*	*0.334*
Hedge portfolios	0.562	0.769	0.514	0.895	0.683	1.298	
within industry	*0.034*	*0.003*	*0.035*	*0.000*	*0.002*	*0.000*	

Appendix Table 5 continued

Panel C. Future six-month abnormal returns on equal-weighted double-sorted portfolios excluding stocks with low IO

	Low IndSV=1	Low IndSV=2	Mid-low IndSV=3	Mid-high IndSV=4	High IndSV=5	High IndSV=6	Hedge portfolios
Low Firm SIR=1	2.832	2.315	1.668	2.782	1.905	2.767	0.065
	0.000	*0.000*	*0.007*	*0.000*	*0.001*	*0.000*	*0.929*
Low Firm SIR=2	1.643	0.902	1.127	2.924	1.543	1.679	-0.035
	0.004	*0.078*	*0.170*	*0.000*	*0.002*	*0.003*	*0.958*
Mid-Low Firm SIR=3	2.734	1.233	2.527	1.947	1.515	0.498	2.237
	0.000	*0.009*	*0.000*	*0.000*	*0.001*	*0.349*	*0.001*
Mid-High Firm SIR=4	3.340	1.678	1.969	2.095	1.753	-0.089	3.428
	0.000	*0.001*	*0.000*	*0.000*	*0.000*	*0.853*	*0.000*
High Firm SIR =5	1.332	1.195	1.260	1.222	0.552	-0.519	1.850
	0.023	*0.033*	*0.050*	*0.017*	*0.230*	*0.345*	*0.012*
High Firm SIR =6	-0.436	-1.519	-0.009	-0.528	-1.215	-2.509	2.073
	0.577	*0.021*	*0.989*	*0.342*	*0.015*	*0.000*	*0.029*
Hedge portfolios	3.268	3.834	1.677	3.310	3.120	5.276	
within industry	*0.000*	*0.000*	*0.030*	*0.000*	*0.000*	*0.000*	

Panel D. Future six-month abnormal returns on value-weighted double-sorted portfolios excluding stocks with low IO

	Low IndSV=1	Low IndSV=2	Mid-low IndSV=3	Mid-high IndSV=4	High IndSV=5	High IndSV=6	Hedge portfolios
Low Firm SIR=1	2.323	2.276	1.853	2.553	1.698	2.640	-0.317
	0.000	*0.000*	*0.001*	*0.000*	*0.002*	*0.000*	*0.644*
Low Firm SIR=2	1.961	1.052	1.028	2.851	1.764	1.445	0.517
	0.000	*0.028*	*0.169*	*0.000*	*0.000*	*0.005*	*0.381*
Mid-Low Firm SIR=3	2.517	1.528	2.330	1.766	1.681	0.384	2.133
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.441*	*0.001*
Mid-High Firm SIR=4	3.026	1.381	1.786	1.982	1.612	-0.045	3.070
	0.000	*0.003*	*0.000*	*0.000*	*0.000*	*0.923*	*0.000*
High Firm SIR =5	1.086	1.027	1.333	1.259	0.507	-0.399	1.485
	0.051	*0.053*	*0.028*	*0.011*	*0.248*	*0.450*	*0.038*
High Firm SIR =6	-0.185	-1.492	-0.153	-0.249	-1.055	-2.386	2.201
	0.811	*0.019*	*0.805*	*0.648*	*0.029*	*0.000*	*0.019*
Hedge portfolios	2.508	3.767	2.005	2.802	2.753	5.026	
within industry	*0.002*	*0.000*	*0.005*	*0.000*	*0.000*	*0.000*	

Appendix Table 6.

Future one-month and six-month abnormal returns on double sorted portfolios, excluding family firms

The table summarizes portfolio abnormal returns, from the Fama-French-Carhart four factor model, where the portfolio excess returns are the future one-month (in Panels A and B) and six-months (in Panels C and D) equal or value-weighted excess returns in percentage on double-sorted portfolios since portfolio creation. In establishing the double-sorted portfolios, first we exclude all family firms based on Anderson (2010) at the end of each month then industries are ranked based on the industry aggregate shorted value (*IndSV*).[2] Then, within each industry (sextile) group, stock portfolios established based on the individual firm level SIR, where SIR is the number of shares shorted relative to the total number of shares outstanding in the previous month. To save space only the portfolio abnormal returns (the intercepts from the portfolio return regressions) are reported with the relevant *p*-values (in italics). For each portfolio 281 months of data used from January 1990 to May 2013.

Panel A. Future one-month abnormal returns on equal-weighted double-sorted portfolios excluding family firms

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.399	0.342	0.312	0.300	0.445	0.700	-0.301
	0.055	*0.105*	*0.130*	*0.097*	*0.020*	*0.002*	*0.264*
Low Firm SIR=2	0.299	0.119	0.159	0.595	0.102	0.289	0.011
	0.101	*0.460*	*0.332*	*0.001*	*0.530*	*0.124*	*0.962*
Mid-Low Firm SIR=3	0.066	0.155	0.346	0.164	0.038	-0.075	0.141
	0.701	*0.335*	*0.032*	*0.268*	*0.796*	*0.662*	*0.539*
Mid-High Firm SIR=4	-0.011	0.247	0.388	0.046	0.211	-0.123	0.112
	0.953	*0.149*	*0.015*	*0.770*	*0.213*	*0.501*	*0.627*
High Firm SIR =5	-0.107	0.178	0.036	0.118	-0.141	-0.417	0.310
	0.590	*0.305*	*0.849*	*0.495*	*0.415*	*0.031*	*0.270*
High Firm SIR =6	-0.539	-0.310	-0.219	-0.551	-0.459	-0.615	0.075
	0.016	*0.110*	*0.269*	*0.002*	*0.015*	*0.002*	*0.800*
Hedge portfolios	0.938	0.652	0.531	0.851	0.904	1.315	
within industry	*0.001*	*0.016*	*0.029*	*0.000*	*0.000*	*0.000*	

Panel B. Future one-month abnormal returns on value-weighted double-sorted portfolios excluding family firms

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.012	-0.506	-0.299	-0.198	-0.475	-0.436	-0.609
	0.964	*0.021*	*0.119*	*0.292*	*0.008*	*0.019*	*0.001*
Low Firm SIR=2	0.248	0.340	0.251	0.286	0.355	0.635	-0.387
	0.199	*0.083*	*0.166*	*0.084*	*0.043*	*0.003*	*0.125*
Mid-Low Firm SIR=3	0.256	0.140	0.180	0.558	0.127	0.272	-0.015
	0.119	*0.344*	*0.247*	*0.000*	*0.420*	*0.119*	*0.942*
Mid-High Firm SIR=4	0.095	0.192	0.325	0.192	0.115	-0.085	0.180
	0.537	*0.181*	*0.035*	*0.162*	*0.408*	*0.606*	*0.409*
High Firm SIR =5	0.003	0.254	0.347	0.083	0.209	-0.139	0.142
	0.984	*0.121*	*0.019*	*0.586*	*0.200*	*0.429*	*0.512*
High Firm SIR =6	-0.049	0.156	0.076	0.100	-0.163	-0.386	0.337
	0.797	*0.369*	*0.665*	*0.539*	*0.330*	*0.045*	*0.226*
Hedge portfolios	0.103	0.754	0.640	0.448	0.761	0.790	
within industry	*0.725*	*0.003*	*0.013*	*0.048*	*0.000*	*0.000*	

[2] Anderson (Anderson et al. 2012) defines family firms based on ownership structure within major U.S. companies, such as S&P500 and the largest 2000 firms for 1992 to 2010. For the years 1990 and 1991 in our sample, we assume that the firms which are family firms in 1992 are family firms in the two prior years. Similarly, we assume that firms that are identified as family firms 2010 are family firms in 2011, 2012 and 2013 as well.

Appendix Table 6 continued

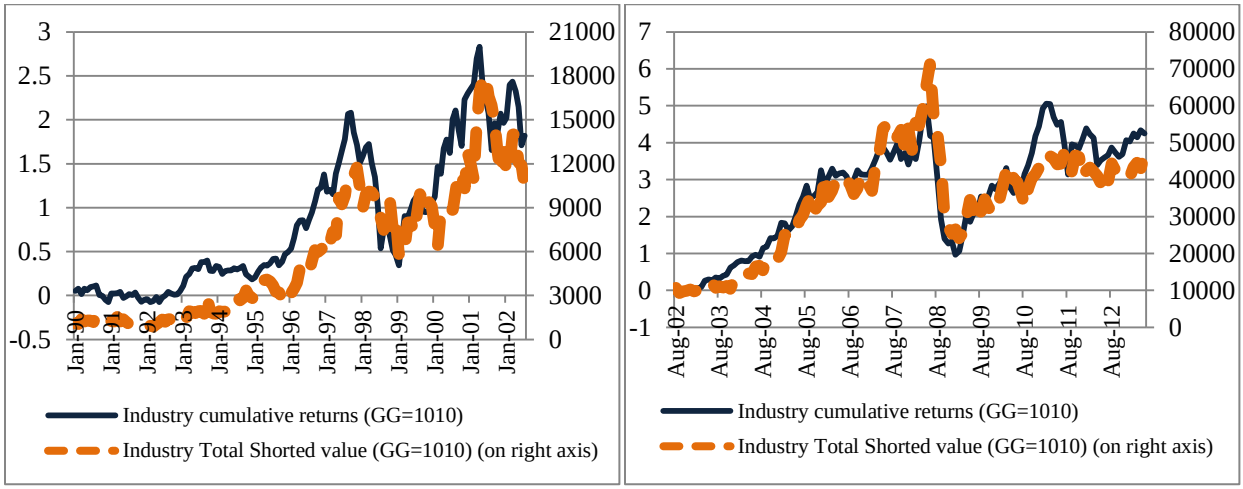
Panel C. Future six-month abnormal returns on equal-weighted double-sorted portfolios excluding family firms

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	2.658	2.042	0.900	1.670	1.097	1.994	0.664
	0.000	*0.000*	*0.125*	*0.001*	*0.066*	*0.005*	*0.425*
Low Firm SIR=2	2.628	0.787	0.741	2.928	0.716	1.086	1.541
	0.000	*0.138*	*0.330*	*0.000*	*0.143*	*0.074*	*0.022*
Mid-Low Firm SIR=3	1.797	0.445	1.962	1.612	1.202	0.203	1.594
	0.001	*0.357*	*0.000*	*0.000*	*0.012*	*0.708*	*0.022*
Mid-High Firm SIR=4	1.932	1.488	1.265	1.893	0.941	-0.763	2.694
	0.001	*0.003*	*0.016*	*0.000*	*0.038*	*0.136*	*0.000*
High Firm SIR =5	1.785	0.981	1.167	0.783	0.013	-1.539	3.323
	0.013	*0.056*	*0.072*	*0.128*	*0.976*	*0.008*	*0.000*
High Firm SIR =6	-1.713	-1.467	-0.120	-0.637	-2.338	-3.138	1.425
	0.018	*0.030*	*0.845*	*0.253*	*0.000*	*0.000*	*0.108*
Hedge portfolios	4.371	3.510	1.021	2.307	3.435	5.131	
within industry	*0.000*	*0.000*	*0.169*	*0.000*	*0.000*	*0.000*	

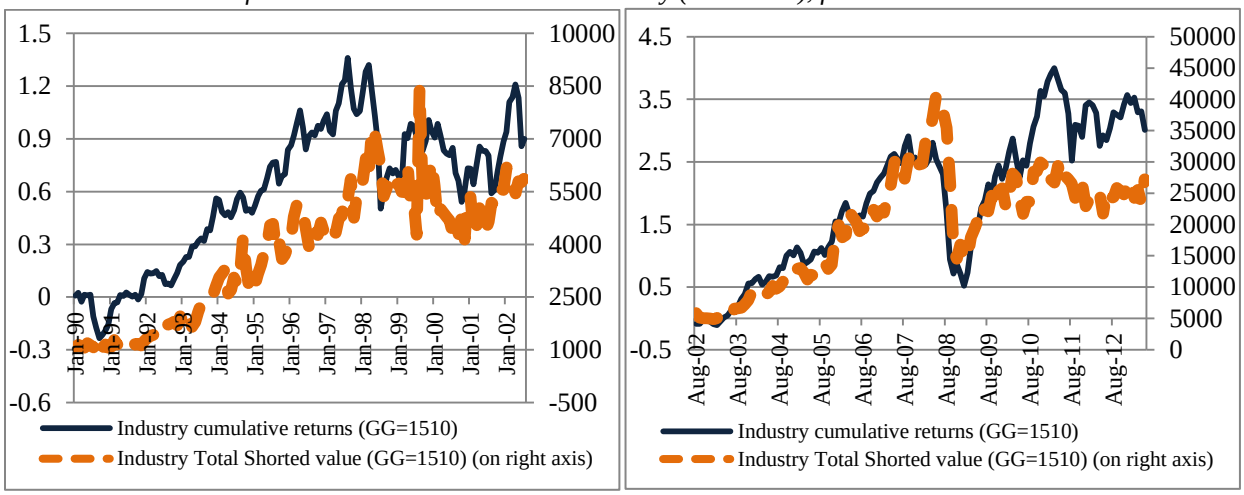
Panel D. Future six-month abnormal returns on value-weighted double-sorted portfolios excluding family firms

	Low IndSV=1	**Low IndSV=2**	**Mid-low IndSV=3**	**Mid-high IndSV=4**	**High IndSV=5**	**High IndSV=6**	**Hedge portfolios**
Low Firm SIR=1	0.543	-1.352	-1.336	-0.232	-0.297	-1.977	-2.905
	0.517	*0.062*	*0.038*	*0.685*	*0.590*	*0.000*	*0.000*
Low Firm SIR=2	2.303	2.365	1.253	1.557	0.999	1.925	0.378
	0.000	*0.000*	*0.021*	*0.001*	*0.080*	*0.004*	*0.633*
Mid-Low Firm SIR=3	2.649	1.094	0.800	3.040	1.140	0.937	1.712
	0.000	*0.029*	*0.249*	*0.000*	*0.013*	*0.090*	*0.005*
Mid-High Firm SIR=4	1.675	0.788	1.895	1.557	1.659	0.196	1.479
	0.000	*0.070*	*0.000*	*0.000*	*0.000*	*0.686*	*0.015*
High Firm SIR =5	1.780	1.467	1.239	1.826	1.100	-0.518	2.298
	0.001	*0.001*	*0.005*	*0.000*	*0.010*	*0.287*	*0.000*
High Firm SIR =6	1.546	0.831	1.448	0.909	0.073	-1.306	2.853
	0.014	*0.081*	*0.017*	*0.063*	*0.863*	*0.019*	*0.001*
Hedge portfolios	1.552	3.656	3.701	1.485	1.853	2.977	
within industry	*0.082*	*0.000*	*0.000*	*0.034*	*0.002*	*0.000*	

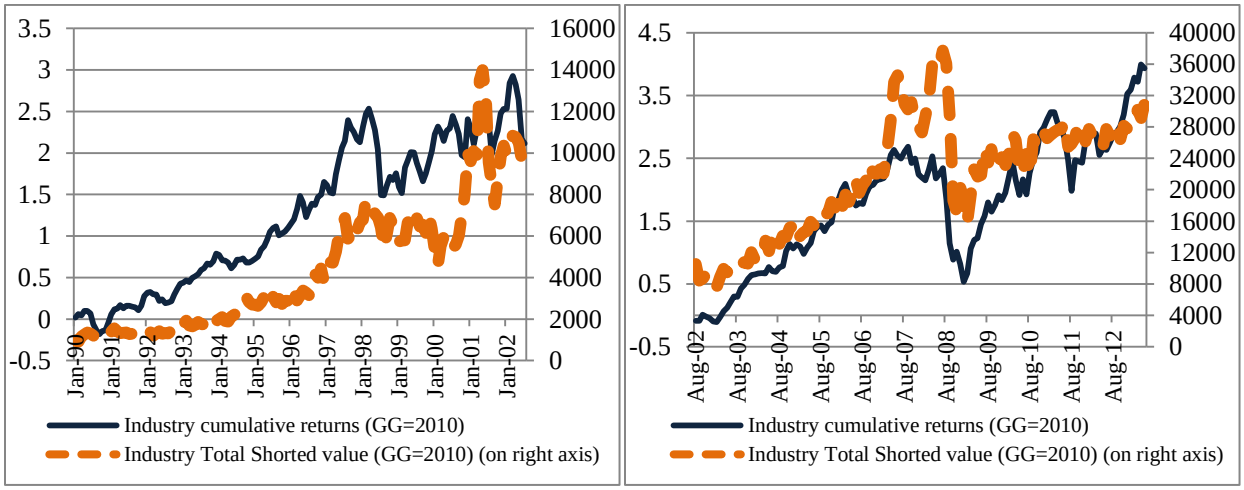
Panel A. Time series of shorted value in the energy industry (GG=1010), for 1990-2002 and 2002-2013



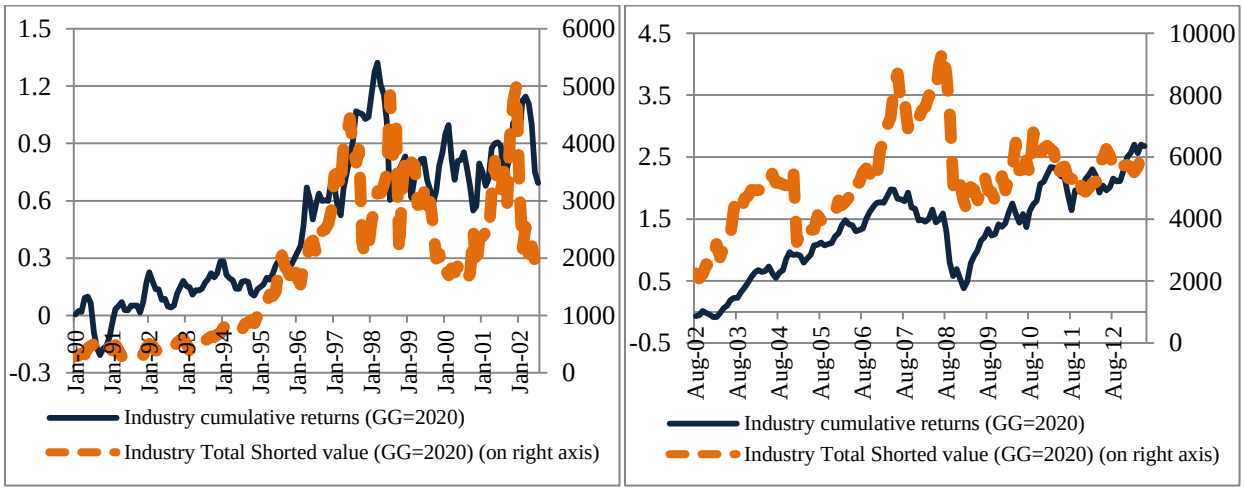
Panel B. Time series of shorted value in the materials industry (GG=1510), for 1990-2002 and 2002-2013



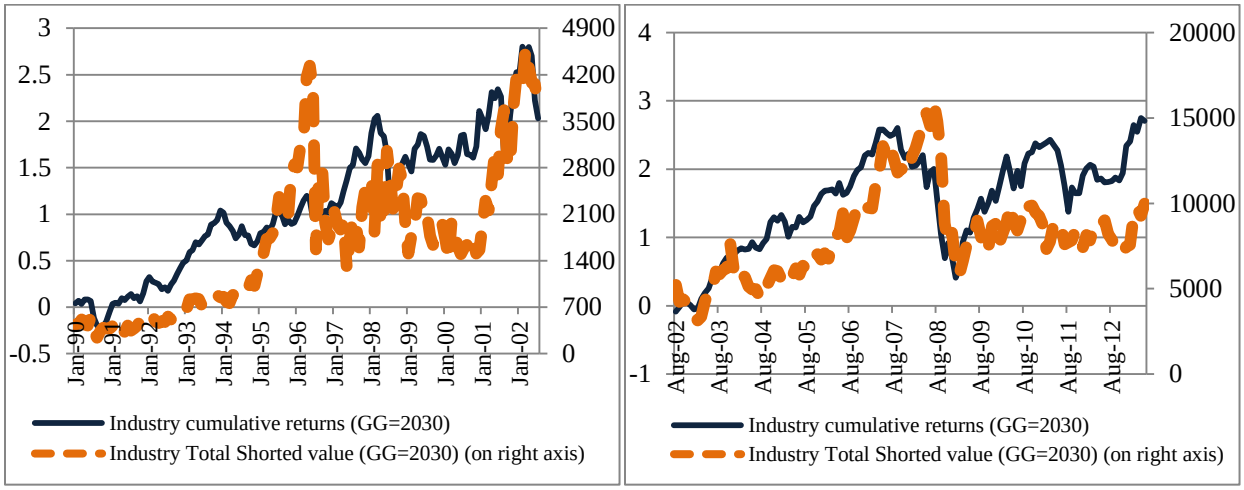
Panel C. Time series of shorted value in the capital goods industry (GG=2010), for 1990-2002 and 2002-2013



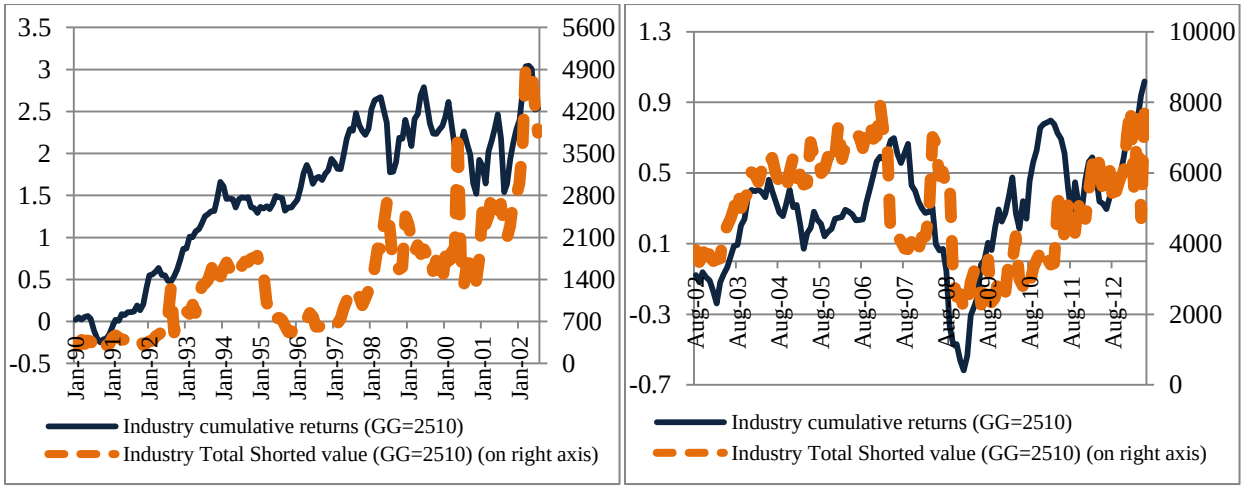
Panel D. Time series of shorted value in the commercial services & supplies industry (GG=2020), for 1990-2002 and 2002-2013



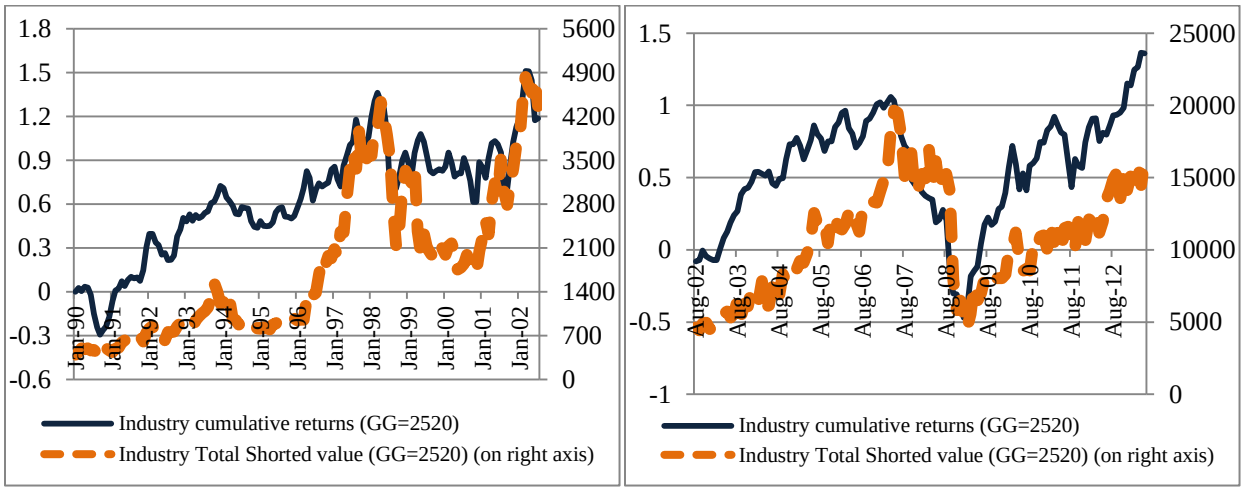
Panel E. Time series of shorted value in the transportation industry (GG=2030), for 1990-2002 and 2002-2013



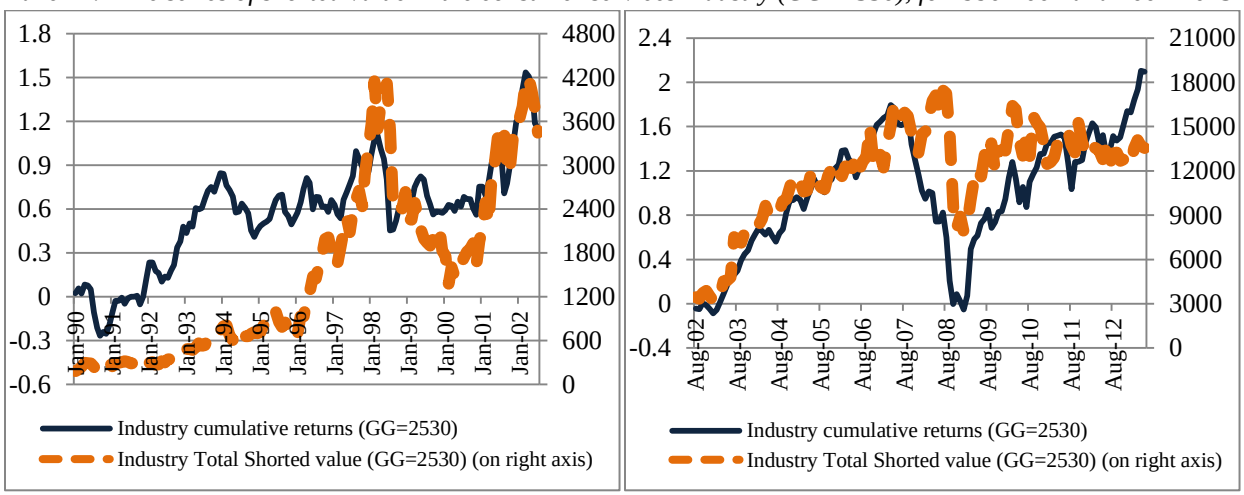
Panel F. Time series of shorted value in the automobiles & components industry (GG=2510) for 1990-2002 and 2002-2013



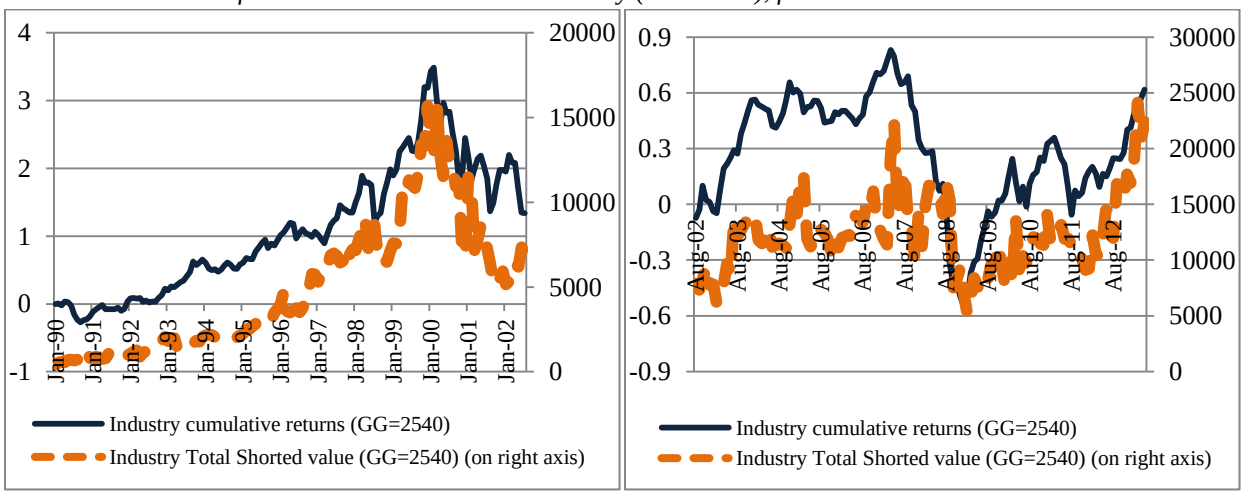
Panel G. Time series of shorted value in the consumer durables & apparel industry (GG=2520), for 1990-2002 and 2002-2013



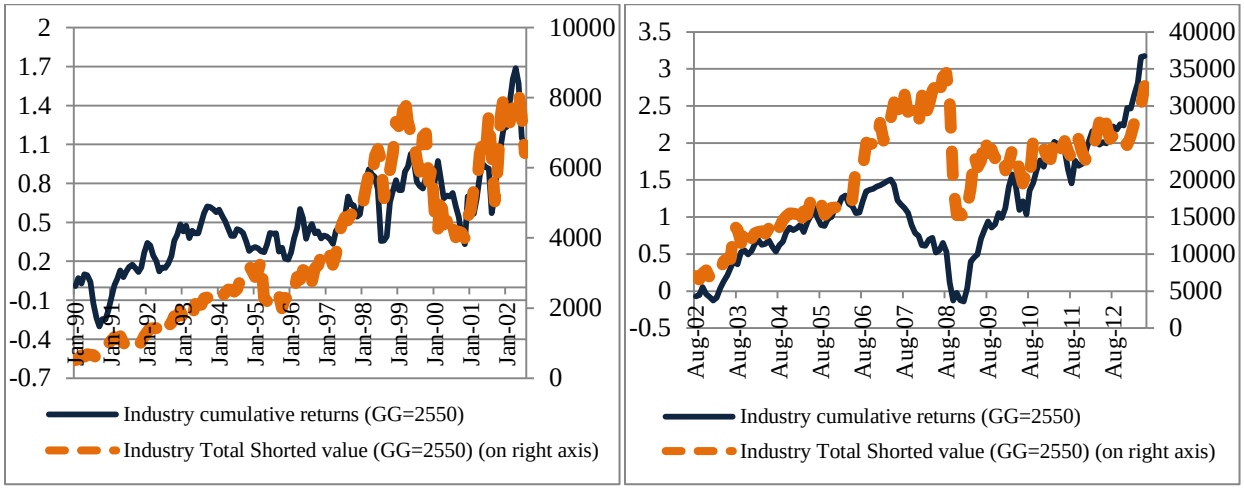
Panel H. Time series of shorted value in the consumer services industry (GG=2530), for1990-2002 and 2002-2013



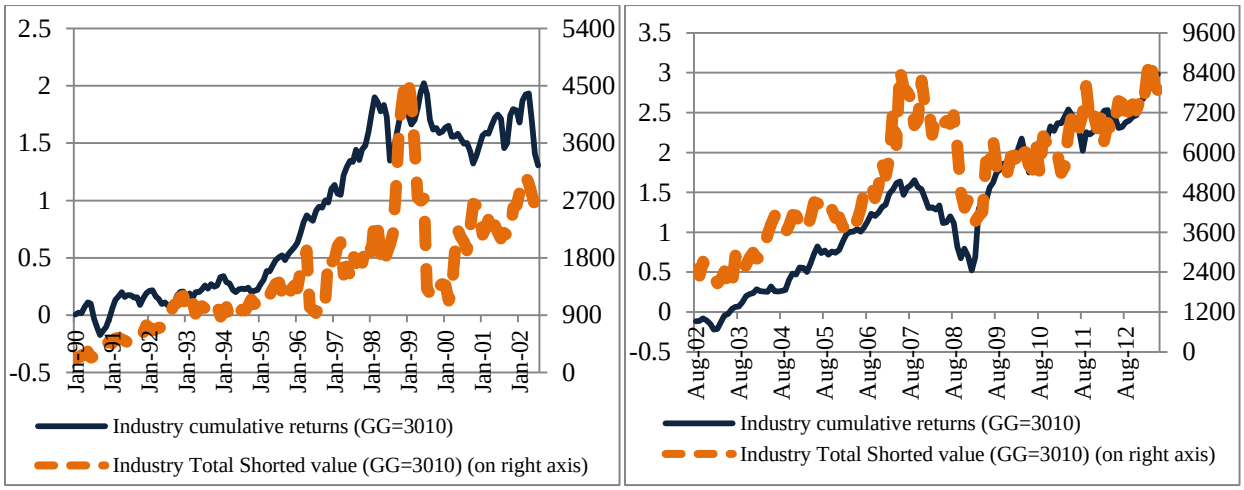
Panel I. Time series of shorted value in the media industry (GG=2540), for 1990-2002 and 2002-2013



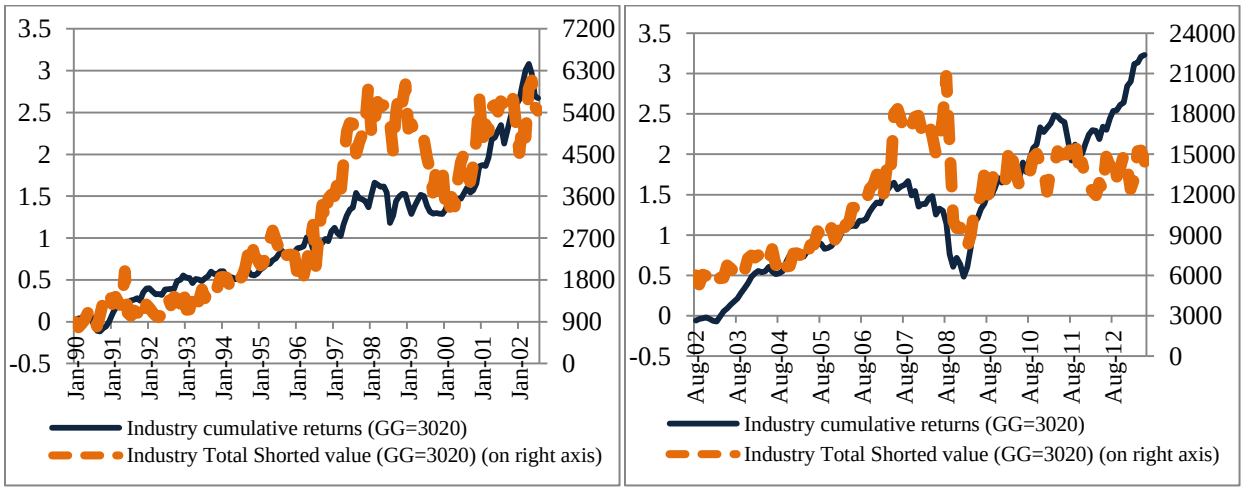
Panel J. Time series of shorted value in the retailing industry (GG=2550), for 1990-2002 and 2002-2013



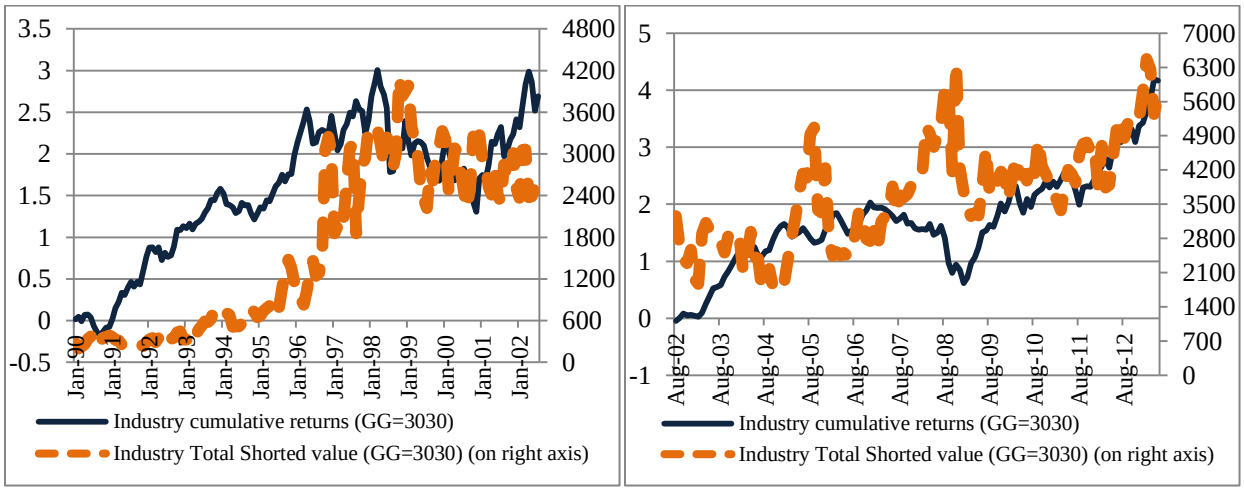
Panel K. Time series of shorted value in the food & staples industry (GG=3010), for 1990-2002 and 2002-2013



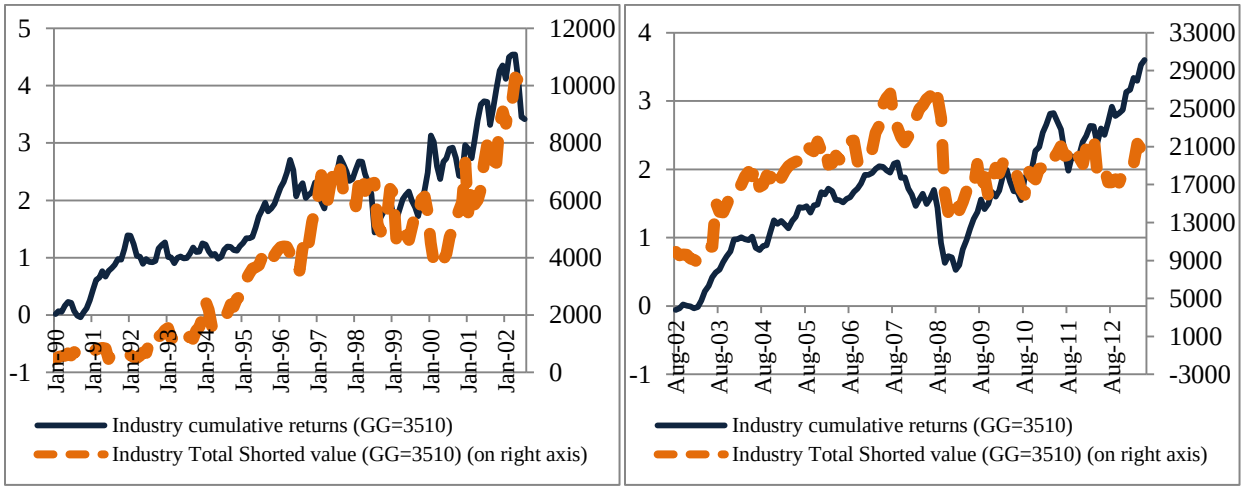
Panel L. Time series of shorted value in the food, beverage & tobacco industry (GG=3020), for 1990-2002 and 2002-2013



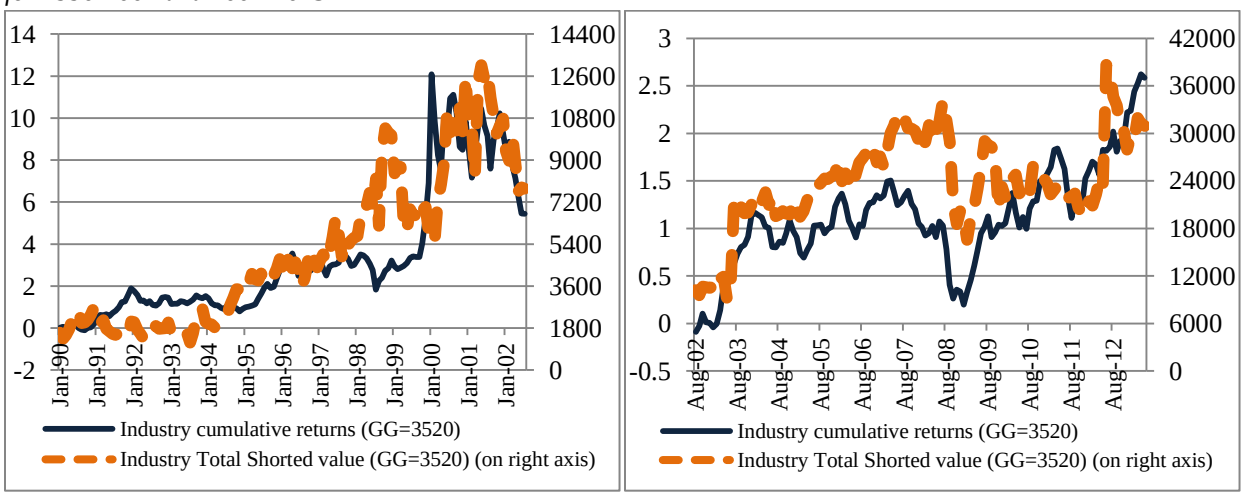
Panel M. Time series of shorted value in the household & personal products industry (GG=3030), for 1990-2002 and 2002-2013



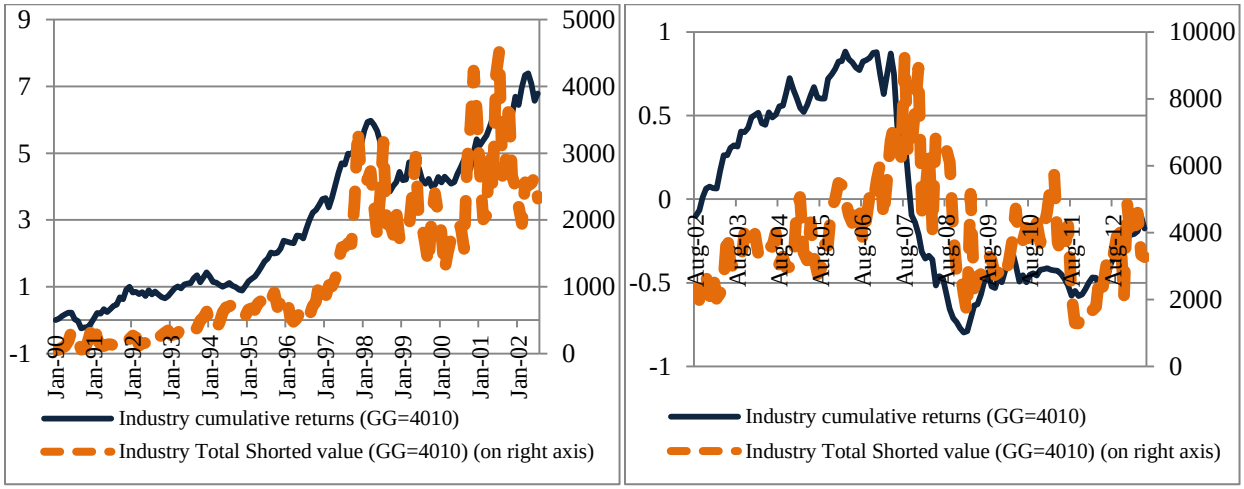
Panel N. Time series of shorted value in the health care equipment & services industry (GG=3510), for 1990-2002 and 2002-2013



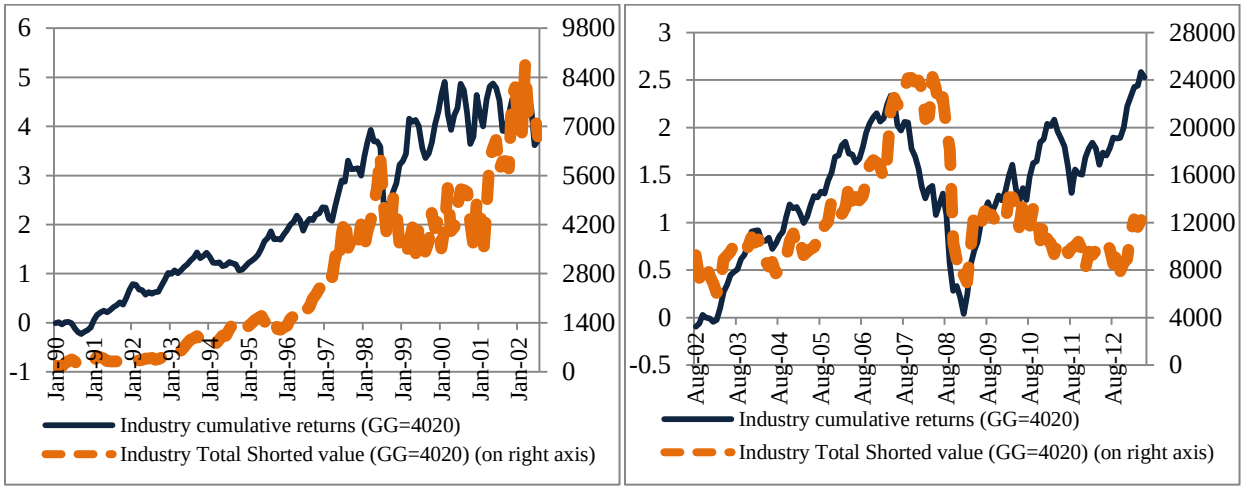
Panel O. Time series of shorted value in the pharmaceuticals, biotechnology & life sciences industry (GG=3520), for 1990-2002 and 2002-2013



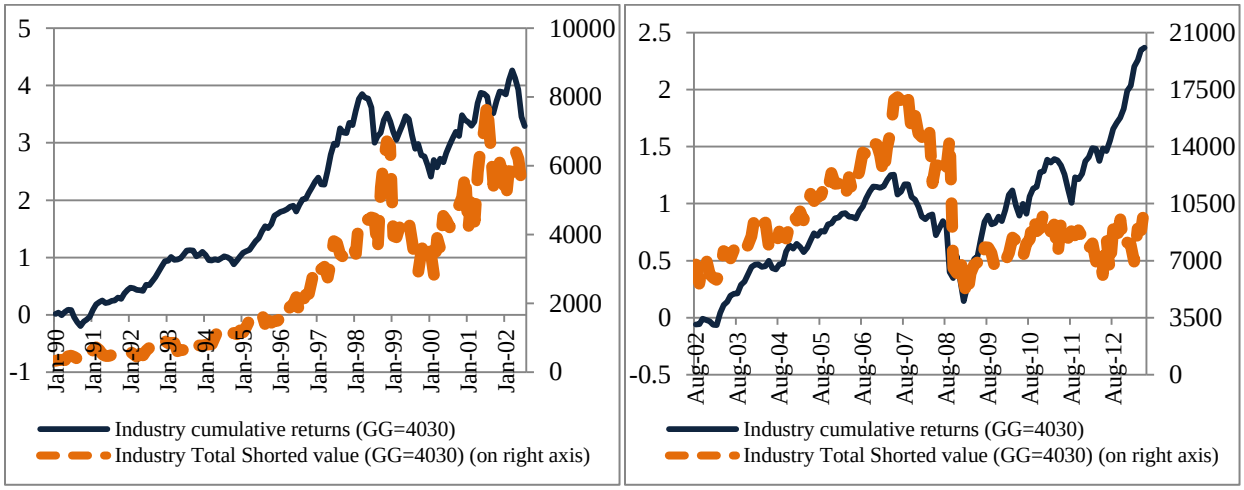
Panel P. Time series of shorted value in the banks industry (GG=4010), for 1990-2002 and 2002-2013



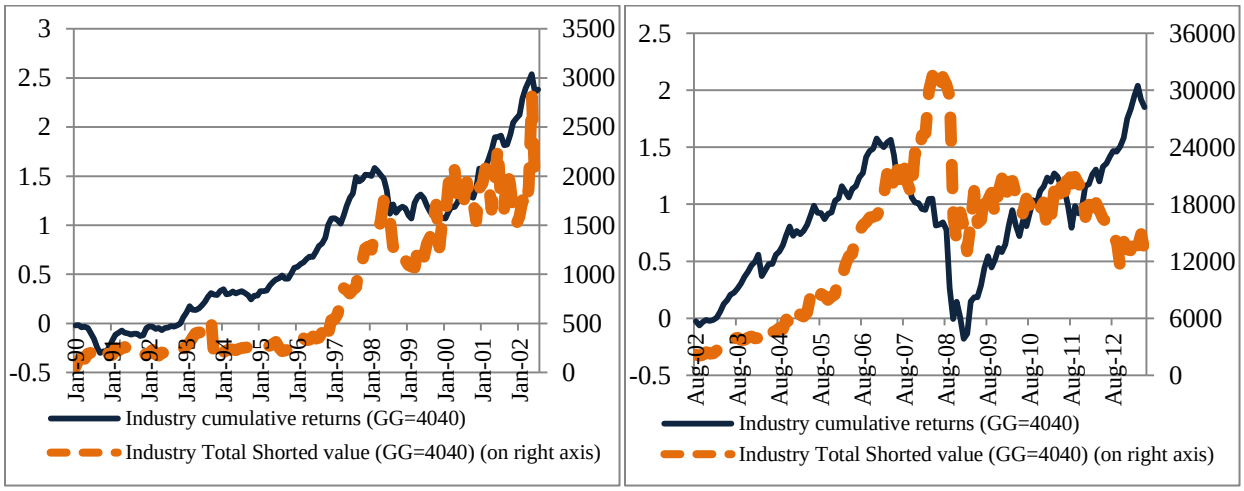
Panel Q. Time series of shorted value in the diversified financials industry (GG=4020), for 1990-2002 and 2002-2013



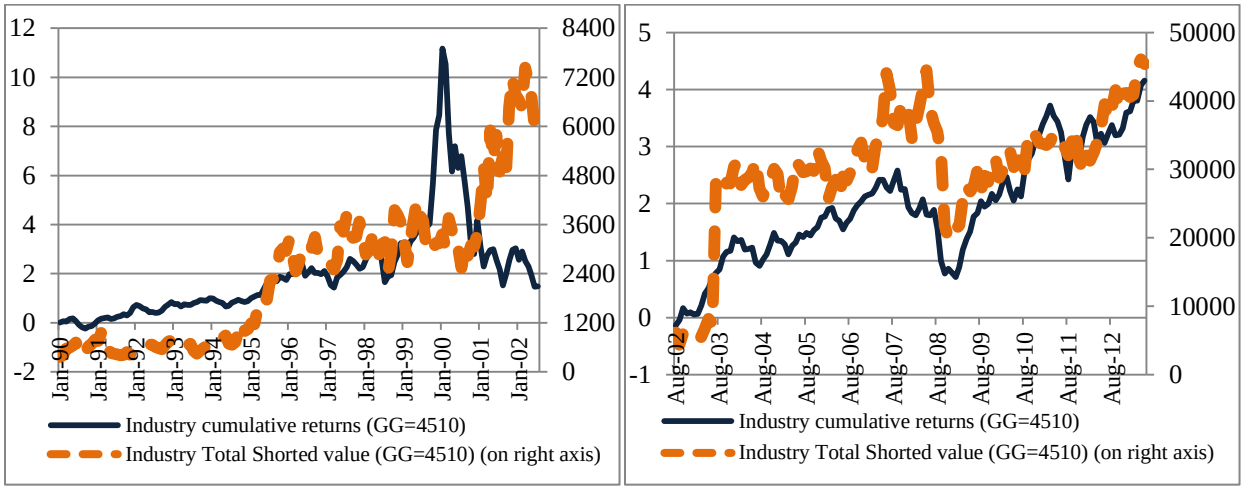
Panel R. Time series of shorted value in the insurance industry (GG=4030), for 1990-2002 July and 2002-2013



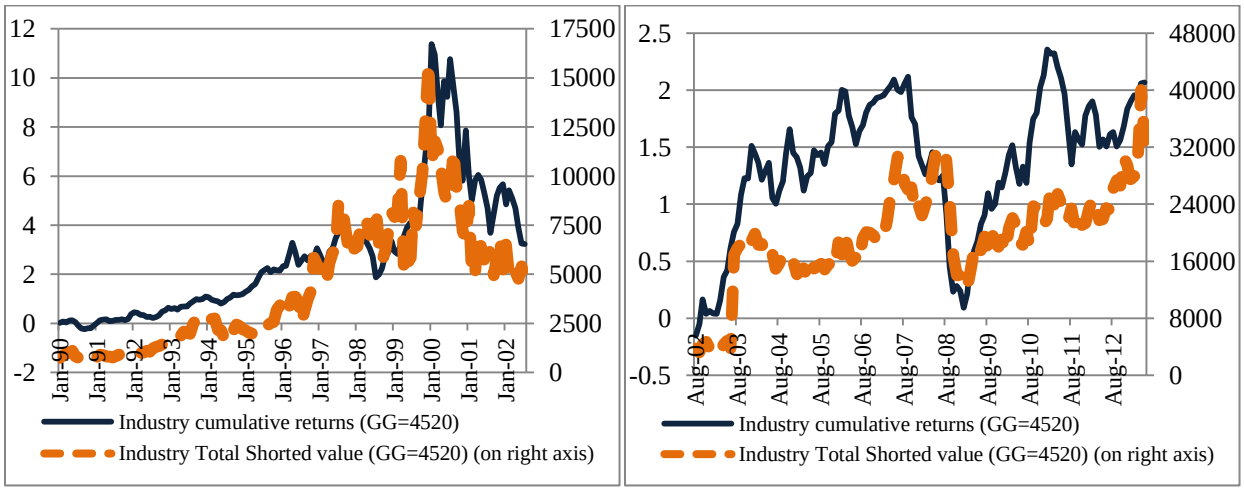
Panel S. Time series of shorted value in the financial-real estate industry (GG=4040), for 1990-2002 and 2002-2013



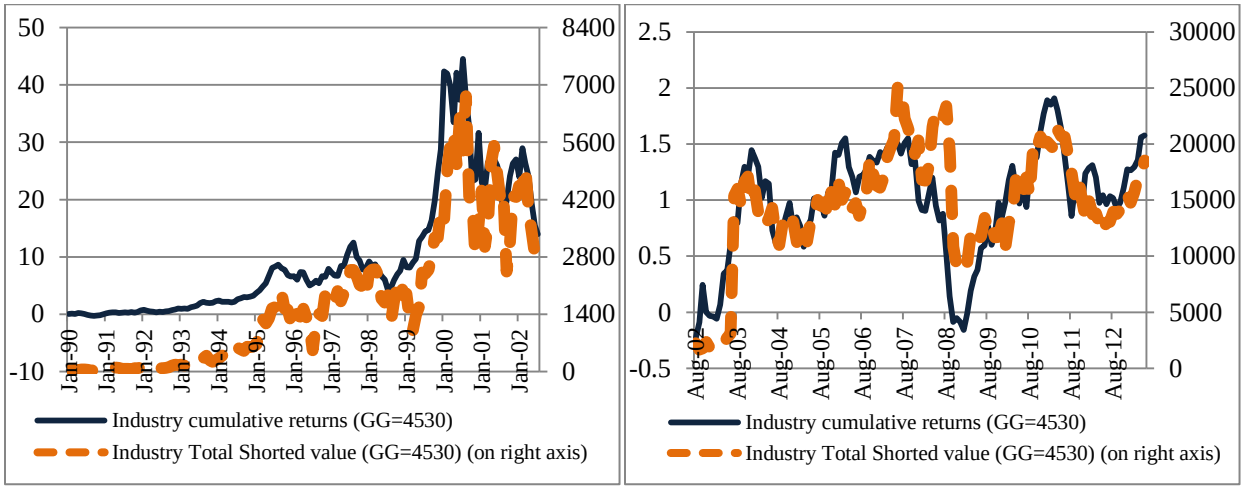
Panel T. Time series of shorted value in the software & services industry (GG=4510), for 1990-2002 and 2002-2013



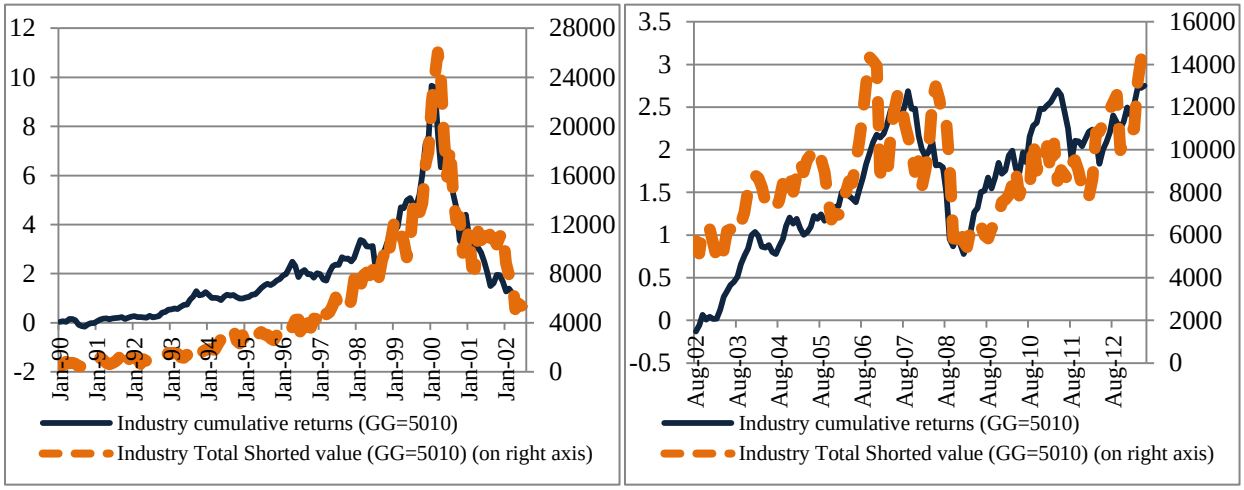
Panel U. Time series of shorted value in the technology hardware & equipment industry (GG=4520), for 1990-2002 and 2002-2013



Panel V. Time series of shorted value in the semiconductors industry (GG=4530), for 1990-2002 and 2002-2013



Panel W. Time series of shorted value in the telecommunication service industry (GG=5010), for 1990-2002 and 2002-2013



Panel X. Time series of shorted value in the utilities industry (GG=5510), for 1990-2002 and 2002-2013

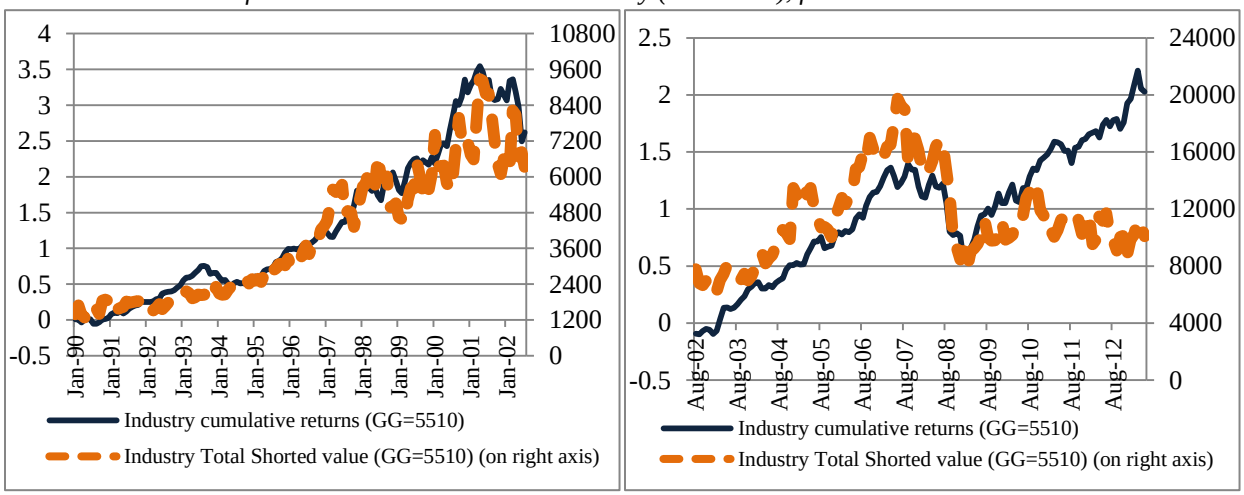


Figure 1. Time-series of shorted value and cumulative industry returns in the 24 GIC industry groups.