Appendix A

Table A1 Descriptive statistics of the 49 industry portfolios and the benchmark CRSP market portfolio

SIC	Mean	Std Dev	Skew	Kurt	Autocorr	ARCH	JB test	SIC	Mean	Std Dev	Skew	Kurt	Autocorr	ARCH	JB test
Agric	0.048	1.39	0.35	16.78	0.000	0.000	0.001	Guns	0.057	1.37	-0.06	10.99	0.001	0.000	0.001
Food	0.048	0.89	-0.41	17.96	0.000	0.000	0.001	Gold	0.047	2.26	0.41	9.99	0.057	0.000	0.001
Soda	0.055	1.37	-0.29	14.30	0.000	0.000	0.001	Mines	0.048	1.58	0.02	14.37	0.000	0.000	0.001
Beer	0.054	1.11	-0.06	10.01	0.000	0.000	0.001	Coal	0.046	2.29	0.00	11.28	0.000	0.000	0.001
Smoke	0.064	1.36	-0.07	13.34	0.000	0.000	0.001	Oil	0.047	1.30	-0.17	17.22	0.000	0.000	0.001
Toys	0.039	1.50	-0.27	9.47	0.000	0.000	0.001	Util	0.040	0.83	-0.01	25.23	0.000	0.000	0.001
Fun	0.064	1.62	-0.28	13.63	0.000	0.000	0.001	Telcm	0.041	1.08	-0.07	16.64	0.000	0.000	0.001
Books	0.042	1.17	-0.07	21.55	0.000	0.000	0.001	PerSv	0.033	1.30	-0.38	8.85	0.000	0.000	0.001
Hshld	0.043	1.07	-0.80	25.41	0.000	0.000	0.001	BusSv	0.047	1.09	-0.52	12.05	0.000	0.000	0.001
Clths	0.050	1.22	-0.27	13.08	0.000	0.000	0.001	Hardw	0.047	1.60	0.19	13.18	0.000	0.000	0.001
Hlth	0.044	1.51	-0.20	12.87	0.000	0.000	0.001	Softw	0.046	2.33	0.64	14.22	0.000	0.000	0.001
MedEq	0.055	1.16	-0.28	9.43	0.000	0.000	0.001	Chips	0.051	1.55	0.09	10.37	0.000	0.000	0.001
Drugs	0.052	1.11	-0.33	13.73	0.000	0.000	0.001	LabEq	0.052	1.39	-0.20	9.47	0.000	0.000	0.001
Chems	0.044	1.20	-0.38	13.86	0.000	0.000	0.001	Paper	0.043	1.08	-0.58	17.30	0.000	0.000	0.001
Rubbr	0.049	1.14	-0.40	11.50	0.000	0.000	0.001	Boxes	0.047	1.23	-0.49	14.37	0.000	0.000	0.001
Txtls	0.043	1.34	-0.11	22.71	0.000	0.000	0.001	Trans	0.044	1.21	-0.34	11.15	0.000	0.000	0.001
BldMt	0.047	1.18	-0.33	13.48	0.000	0.000	0.001	Whlsl	0.047	1.05	-0.30	9.82	0.000	0.000	0.001
Cnstr	0.049	1.53	-0.13	10.36	0.000	0.000	0.001	Rtail	0.051	1.12	-0.20	13.76	0.000	0.000	0.001
Steel	0.033	1.57	-0.30	17.55	0.000	0.000	0.001	Meals	0.057	1.23	-0.19	9.90	0.000	0.000	0.001
FabPr	0.035	1.50	-0.13	8.77	0.000	0.000	0.001	Banks	0.047	1.37	0.32	24.88	0.000	0.000	0.001
Mach	0.046	1.26	-0.32	14.07	0.000	0.000	0.001	Insur	0.048	1.14	-0.01	18.99	0.000	0.000	0.001
ElcEq	0.055	1.35	-0.24	12.07	0.000	0.000	0.001	RlEst	0.029	1.47	0.27	19.91	0.000	0.000	0.001
Autos	0.038	1.41	-0.19	11.70	0.000	0.000	0.001	Fin	0.053	1.40	0.20	19.71	0.000	0.000	0.001
Aero	0.056	1.32	-0.35	12.07	0.000	0.000	0.001	Other	0.026	1.42	-0.14	13.68	0.000	0.000	0.001
Ships	0.049	1.46	-0.13	7.08	0.000	0.000	0.001	Bench	0.044	0.98	-0.52	18.33	0.000	0.000	0.001

The table shows the descriptive statistics for the 49 industry indices and CRSP all stocks index (Bench). The data sample includes all daily return observations starting from the first trading day in January 1964 to the last trading day in December 2019. The statistics include the first four moments, mean return, standard deviation (std dev), skewness (skew), and kurtosis (kurt). Autocorr and ARCH columns show the p-values of the Ljung–Box one-lag autocorrelation test applied to returns and squared returns, respectively. The normality hypothesis is rejected for all assets using the Jarque-Bera test with 99% confidence, with p-values shown in the column JB test.

Appendix B

Table B2 Sector Weights of ES portfolio

	Stpls	Discr	Hlth	Mtrls	Indstrls	Energy	Util	Telcm	Techn	Fin	RlEst	Trans	Sale	Other
Non robust	20.90	9.29	4.47	8.27	4.55	1.81	37.33	4.45	0.97	2.09	3.95	0.56	0.99	0.88
Probability Uncertainty														
0.9	23.17	9.48	2.98	9.20	4.35	1.96	33.68	4.78	1.39	2.08	4.09	0.80	1.63	1.20
0.8	22.97	9.51	2.19	10.17	5.17	2.14	31.26	5.16	1.75	2.47	4.09	1.21	1.32	1.79
0.7	23.70	9.22	1.87	10.58	5.58	2.13	29.79	5.31	1.94	2.68	4.08	1.48	1.02	2.09
0.6	23.43	9.58	1.84	10.70	5.54	2.15	29.43	5.46	2.02	2.75	4.07	1.49	0.96	2.07
Joint uncertainty														
0.9	23.56	9.94	5.22	9.36	6.24	2.27	28.68	3.88	1.46	2.42	3.64	0.52	1.82	1.45
0.8	26.60	10.52	6.09	10.61	8.19	3.07	19.37	3.86	2.01	3.28	2.68	1.01	2.29	1.20
0.7	25.82	11.97	7.74	11.42	9.93	4.50	13.16	4.09	2.75	3.53	2.21	1.39	1.99	0.71
0.6	24.35	13.63	8.15	11.69	11.24	5.64	9.28	3.99	3.40	4.12	1.91	1.54	1.54	0.79

The table presents the average sector weights of the ES portfolios over the period from January 1965 to December 2019. The portfolios and investment strategies are detailed in Table 1 and Subsection 2.4 of the main text. The analysis includes 14 sectors categorized based on SIC codes: Staples, Discretionary, Health Care, Materials, Industrials, Energy, Utilities, Telecommunications, Technology, Financials, Real Estate, Transport, Sales, and Others.

Table B3 Sector Weights of OR portfolio

	Stpls	Discr	Hlth	Mtrls	Indstrls	Energy	Util	Telcm	Techn	Fin	RlEst	Trans	Sale	Other
Non robust	23.67	14.87	9.98	12.32	11.69	5.48	3.73	2.70	6.32	3.60	3.43	2.11	1.09	0.29
Probability Uncertainty														
0.9	23.34	11.34	4.37	12.64	9.04	6.33	15.36	5.56	2.48	3.30	2.82	1.45	1.90	1.46
0.8	22.15	11.57	2.84	12.29	7.86	2.66	23.33	6.38	2.25	2.84	3.34	1.63	0.64	1.81
0.7	23.04	10.80	2.01	11.17	7.18	2.52	26.08	6.76	2.01	2.99	3.15	1.52	0.56	1.70
0.6	23.90	10.22	2.26	11.26	6.67	2.58	25.85	6.76	1.88	2.88	3.10	1.63	0.74	1.88
Joint Uncertainty														
0.9	13.86	12.86	8.23	8.07	12.80	7.31	3.59	5.26	10.47	10.45	1.31	2.37	3.98	0.96
0.8	9.63	9.10	8.35	7.90	10.35	8.89	6.09	5.98	12.58	11.78	0.53	2.57	6.01	1.49
0.7	7.76	8.46	8.34	7.53	10.22	9.27	7.32	6.13	12.70	12.02	0.49	2.36	6.65	1.67
0.6	7.45	8.24	8.11	7.51	10.41	9.25	7.76	6.15	12.55	12.14	0.39	2.47	6.50	1.93

The table presents the average sector weights of the OR portfolios over the period from January 1965 to December 2019. The portfolios and investment strategies are detailed in Table 1 and Subsection 2.4 of the main text. The analysis includes 14 sectors categorized based on SIC codes: Staples, Discretionary, Health Care, Materials, Industrials, Energy, Utilities, Telecommunications, Technology, Financials, Real Estate, Transport, Sales, and Others.

Appendix C

Table C4 OOS Upside and Downside Factor Loadings of ES portfolios

	$\alpha, \%$	β^-_{Mkt-Rf}	β^-_{SMB}	β^-_{HML}	β^-_{MOM}	β^+_{Mkt-Rf}	β^+_{SMB}	β^+_{HML}	β^+_{MOM}	Adj R^2
Non	1.88*	0.70*	0.31*	0.52*	-0.01	0.76*	-0.19	0.19*	0.12	0.70
robust	(0.05)	(0.00)	(0.02)	(0.01)	(0.56)	(0.00)	(0.94)	(0.03)	(0.15)	
Joint uncertainty (RESJU)										
0.9	1.81*	0.74*	0.34*	0.43*	0.09	0.76*	-0.08	0.13	0.18*	0.71
	(0.07)	(0.00)	(0.01)	(0.03)	(0.23)	(0.00)	(0.73)	(0.10)	(0.05)	
0.8	1.90*	0.82*	0.30*	0.50*	0.14	0.80*	0.12	0.02	0.29*	0.73
	(0.07	(0.00)	(0.02)	(0.02)	(0.18)	(0.00)	(0.17)	(0.42)	(0.01)	
0.7	2.57*	0.91*	0.35*	0.63*	0.15	0.81*	0.19*	-0.07	0.38*	0.75
	(0.02)	(0.00)	(0.01)	(0.00)	(0.15)	(0.00)	(0.07)	(0.81)	(0.00)	
0.6	2.41*	0.94*	0.43*	0.73*	0.10	0.89*	0.23*	-0.17	0.51*	0.76
	(0.03)	(0.00)	(0.01)	(0.00)	(0.25)	(0.00)	(0.04)	(0.98)	(0.00)	

The table shows the coefficients, their p-values (in brackets) and adjusted R^2 of out-of-sample Pettengill et al (1995) regression for ES portfolio annualized returns:

$$R_p = \alpha + \beta^-_{Mkt-Rf}[R_{Mkt-Rf} * I(R_{Mkt-Rf} < 0)] + \beta^-_{SMB}[R_{SMB} * I(R_{SMB} < 0)]$$
$$+\beta^-_{HML}[R_{HML} * I(R_{HML} < 0)] + \beta^-_{MOM}[R_{MOM} * I(R_{MOM} < 0)]$$
$$+\beta^+_{Mkt-Rf}[R_{Mkt-Rf} * I(R_{Mkt-Rf} > 0)] + \beta^+_{SMB}[R_{SMB} * I(R_{SMB} > 0)]$$
$$+\beta^+_{HML}[R_{HML} * I(R_{HML} > 0)] + \beta^+_{MOM}[R_{MOM} * I(R_{MOM} > 0)] + \varepsilon.$$

* denotes rejection of the null at the 10% level or less.

Table C5 OOS Upside and Downside Factor Loadings of OR portfolios

	$\alpha, \%$	β^-_{Mkt-Rf}	β^-_{SMB}	β^-_{HML}	β^-_{MOM}	β^+_{Mkt-Rf}	β^+_{SMB}	β^+_{HML}	β^+_{MOM}	Adj R^2
Non	2.06	1.29*	0.46*	0.75*	0.01	0.96*	0.34*	-0.31	0.69*	0.72
robust	(0.14)	(0.00)	(0.08)	(0.00)	(0.47)	(0.00)	(0.04)	(0.96)	(0.00)	
Joint uncertainty (RORJU)										
0.9	1.41*	1.12*	0.12*	0.23*	0.07	0.91*	0.11	-0.07	0.27*	0.92
	(0.04)	(0.00)	(0.07)	(0.02)	(0.16)	(0.00)	(0.14)	(0.97)	(0.00)	
0.8	1.26*	1.02*	0.03	0.17*	0.01	0.90*	0.03	-0.04	0.08*	0.97
	(0.00)	(0.00)	(0.28)	(0.01)	(0.410	(0.00)	(0.33)	(0.96)	(0.00)	
0.7	0.91*	1.01*	-0.04	0.12*	0.00	0.93*	0.01	-0.03	0.01	0.99
	(0.00)	(0.00)	(0.90)	(0.01)	(0.48)	(0.00)	(0.38)	(0.96)	(0.28)	
0.6	0.58*	0.99*	-0.03	0.08*	-0.01	0.95*	-0.01	-0.01	0.00	0.99
	(0.01)	(0.00)	(0.92)	(0.05)	(0.77)	(0.00)	(0.71)	(0.70)	(0.52)	

The table shows the coefficients, their p-values (in brackets) and adjusted R^2 of out-of-sample Pettengill et al (1995) regression for ES portfolio annualized returns:

$$R_p = \alpha + \beta^-_{Mkt-Rf}[R_{Mkt-Rf} * I(R_{Mkt-Rf} < 0)] + \beta^-_{SMB}[R_{SMB} * I(R_{SMB} < 0)]$$
$$+\beta^-_{HML}[R_{HML} * I(R_{HML} < 0)] + \beta^-_{MOM}[R_{MOM} * I(R_{MOM} < 0)]$$
$$+\beta^+_{Mkt-Rf}[R_{Mkt-Rf} * I(R_{Mkt-Rf} > 0)] + \beta^+_{SMB}[R_{SMB} * I(R_{SMB} > 0)]$$
$$+\beta^+_{HML}[R_{HML} * I(R_{HML} > 0)] + \beta^+_{MOM}[R_{MOM} * I(R_{MOM} > 0)] + \varepsilon.$$

* denotes rejection of the null at the 10% level or less.

References

Pettengill GN, Sundaram S, Mathur I (1995) The conditional relation between beta and returns. Journal of Financial and Quantitative Analysis 30(1):101–116