

Supplemental Online Appendix

Conditional Volatility Targeting

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Table S1. Performance of Conditional Volatility Targeting on the *Original* Fama–French U.S. Factors and Global Momentum Factors

	Original Portfolio			Conventional Volatility Targeting Portfolio				
	Sharpe Ratio	Max Drawdown	Expected Shortfall Reduction	Sharpe Ratio Increase	Max Drawdown Reduction	Expected Shortfall Reduction	Realized Vol / Target	Annual Turnover
Panel A: U.S. Equity Factors (1973–2019)								
Size	0.17	60.1%	−9.1%	−0.04	−2.8%	−1.9%	0.84	0.7
Value	0.27	41.4%	−9.7%	0.00	−1.8%	−3.1%	0.85	1.2
Profitability	0.32	41.4%	−9.2%	0.04	−17.1%	−4.5%	0.73	1.1
Investment	0.45	21.1%	−5.7%	−0.12	12.2%	−1.5%	0.90	1.2
Momentum	0.36	57.7%	−19.0%	0.28 (**)	−31.9%	−8.9%	0.74	1.1
Panel B: Global Momentum Factors (1995–2019)								
Global	0.36	43.9%	−16.9%	0.23 (**)	−18.9%	−8.0%	0.71	1.2
Global ex U.S.	0.57	41.1%	−14.6%	0.36 (**)	−18.6%	−7.1%	0.77	1.3
Europe	0.62	46.0%	−17.4%	0.49 (**)	−20.0%	−8.9%	0.72	1.2
Japan	0.02	48.6%	−16.9%	0.08	−15.2%	−6.8%	0.81	1.2
Pacific ex Japan	0.45	54.1%	−25.6%	0.49 (**)	−13.4%	−12.2%	0.87	1.6

Notes: The table is complementary to Table 3 where we use reconstructed investable factors. It shows the performance of the conventional strategy using the *original* Fama-French factors, relative to that of the original portfolio and net of transaction costs. Expected Shortfall (99%) is the mean of monthly returns below the 1st percentile. Realized Vol/Target is the ratio of the realized volatility of the strategy over that of the original portfolio. Turnover is annualized one-way turnover. Performance results that violate the objectives of the strategy are highlighted in red. (*) and (**) indicate Sharpe ratio increases that are significant (Lo, 2002) at the 5% and 1% level respectively.

**Table S2. Sensitivity Analysis for Conditional Volatility Targeting:
Defining Volatility States Using Quartile Bands Instead of Quintile Bands**

	Conditional Volatility Targeting Portfolio					Volatility Adjusted	
	Sharpe Ratio	Max Drawdown	Expected Shortfall	Realized Vol / Target	Annual Turnover	Max Drawdown Reduction	Expected Shortfall Reduction
	Increase	Reduction	Reduction				
Panel A: Global Equity Markets (1982–2019)							
United States	0.17 (*)	-8.5%	-1.7%	1.00	1.79	-8.5%	-1.7%
Japan	0.13	-9.1%	-4.9%	0.85	1.07	-2.5%	-2.8%
United Kingdom	0.04	2.7%	-1.0%	1.12	1.68	-1.4%	-2.5%
France	0.02	-5.7%	-0.5%	0.93	1.42	-2.8%	0.8%
Canada	0.04	-7.3%	-1.4%	0.98	1.49	-6.7%	-1.2%
Germany	0.08	-10.9%	-2.3%	0.88	1.27	-5.8%	0.2%
Switzerland	0.07	-7.1%	-1.5%	0.95	1.46	-5.4%	-0.8%
Australia	0.05	-7.8%	3.1%	1.15	1.66	-13.2%	0.3%
Netherlands	0.03	-10.4%	-1.7%	0.98	1.75	-9.7%	-1.4%
Hong Kong SAR	0.13	-0.5%	5.4%	1.18	1.60	-8.2%	0.3%
Average	0.08	-6.4%	-0.7%	1.00	1.52	-6.4%	-0.9%
Panel B: U.S. Equity Factors (1973–2019)							
Size	-0.13 (*)	-1.1%	-0.7%	0.89	1.15	2.9%	-0.1%
Value	-0.08	9.2%	-2.6%	0.84	1.31	15.7%	-1.2%
Profitability	-0.06	-2.4%	-0.8%	0.87	1.28	1.9%	0.2%
Investment	-0.16 (**)	4.9%	-2.4%	0.89	1.50	9.6%	-1.6%
Momentum	0.18 (**)	-8.0%	-6.8%	0.80	1.23	0.7%	-3.9%
Panel C: Global Momentum Factors (1995–2019)							
Global	0.17 (*)	-21.0%	-8.6%	0.75	1.17	-12.5%	-5.4%
U.S.	0.22 (**)	-17.4%	-12.1%	0.75	1.42	-8.3%	-8.5%
Global ex U.S.	0.26 (**)	-20.9%	-7.0%	0.79	1.20	-15.1%	-4.7%
Europe	0.30 (**)	-21.2%	-9.0%	0.75	1.20	-13.2%	-5.7%
Japan	0.07	-21.5%	-7.5%	0.80	1.23	-11.8%	-4.6%
Pacific ex Japan	0.32 (**)	-17.9%	-12.1%	0.97	1.68	-17.0%	-11.6%
Average (Momentum)	0.22	-20.0%	-9.4%	0.80	1.32	-13.0%	-6.8%

Notes: The table is complementary to Table 3 as a sensitivity test. It shows the performance of the conventional strategy using volatility quartile bands, relative to that of the original portfolio and net of transaction costs. Expected Shortfall (99%) is the mean of monthly returns below the 1st percentile. Realized Vol/Target is the ratio of the realized volatility of the strategy over that of the original portfolio. Turnover is annualized one-way turnover. Performance results that violate the objectives of the strategy are highlighted in red. (*) and (**) indicate Sharpe ratio increases that are significant (Lo, 2002) at the 5% and 1% level respectively. The Volatility Adjusted statistics show the drawdown and shortfall reduction for a hypothetical conditional strategy with the same ex-post realized volatility as the original portfolio.