Supplemental Appendix to:

Realized Semibetas: Signs of Things to Come

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- Section S1 provides descriptive statistics for realized semibetas estimated using high-frequency data at the weekly and monthly frequency.
- Section S2 provides additional information pertaining to the betting on semibeta portfolios' industry allocations.
- Section S3 contains additional descriptives regarding the betting on and against against semibeta portfolios. We report factor exposures to Frazzini and Pedersen's Betting Against Beta factor, as well as 'downside' semivariances of the portfolios.
- Section S4 reports conditional alpha estimates of the betting on and against semibeta portfolios.
- Section S5 discusses and evaluates the performance of alternative portfolios designed to jointly capture the risk premia on $\beta^{\mathcal{N}}$ and $\beta^{\mathcal{M}^-}$.
- Section S6 provides additional results regarding transaction costs and alternative partial adjustment schemes.

S1. Weekly and Monthly Realized Semibetas

Table S.1: Panel A reports the time series averages of the cross-sectional means, medians and standard deviations of the weekly ($h = 5$) and monthly ($h = 20$) realized semibetas, constructed from high-frequency fifteen minute returns. Panel B reports the time series averages of the cross-sectional correlations. The estimates are based on all of the S&P 500 constituent stocks and days in the January 1993 to December 2014 sample.

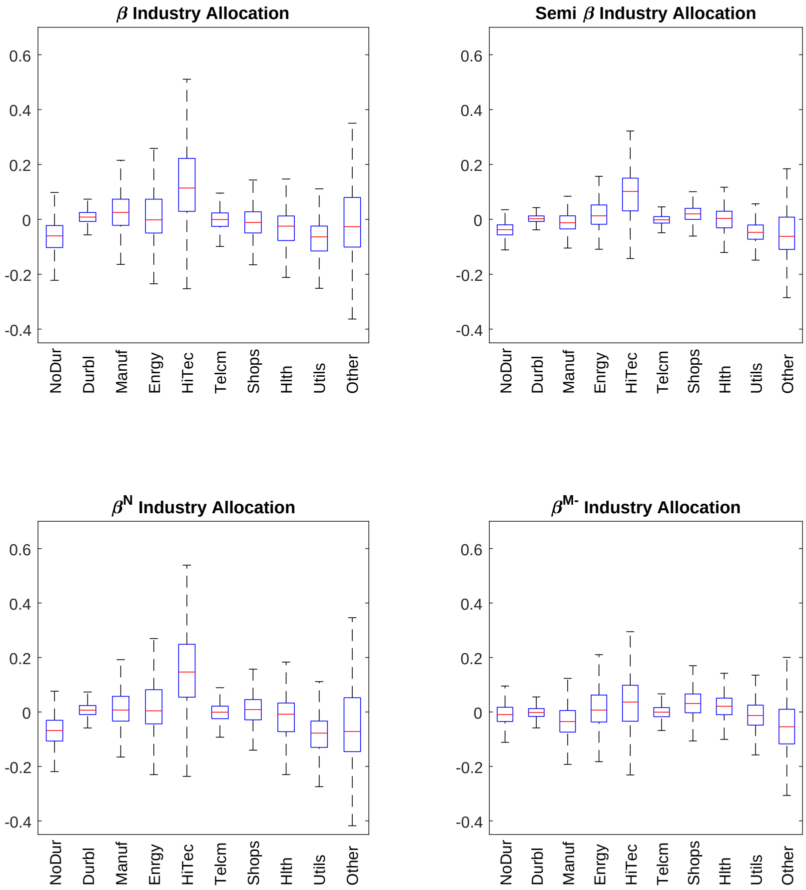
	$h = 5$					$h = 20$				
	β	$\beta^{\mathcal{P}}$	$\beta^{\mathcal{N}}$	$\beta^{\mathcal{M}^+}$	$\beta^{\mathcal{M}^-}$	β	$\beta^{\mathcal{P}}$	$\beta^{\mathcal{N}}$	$\beta^{\mathcal{M}^+}$	$\beta^{\mathcal{M}^-}$
Panel A: Cross-Sectional Summary Statistics										
Mean	0.92	0.68	0.68	-0.23	-0.21	0.92	0.65	0.67	-0.20	-0.20
Median	0.85	0.61	0.60	-0.16	-0.16	0.85	0.59	0.60	-0.16	-0.15
StDev	0.69	0.38	0.43	0.23	0.21	0.53	0.30	0.34	0.17	0.16
Panel B: Cross-Sectional Correlations										
β	1.00	0.73	0.77	0.14	0.13	1.00	0.79	0.82	0.03	0.03
$\beta^{\mathcal{P}}$		1.00	0.68	-0.30	-0.35		1.00	0.83	-0.42	-0.44
$\beta^{\mathcal{N}}$			1.00	-0.34	-0.28			1.00	-0.43	-0.40
$\beta^{\mathcal{M}^+}$				1.00	0.63				1.00	0.81
$\beta^{\mathcal{M}^-}$					1.00					1.00

S2. Industry Concentrations of Semibeta Portfolios

In an effort to help better understand the composition of the different portfolios, we compute their allocations across industries according to Kenneth French's 10-Industry classification scheme based on SIC codes. Since we consider long-short portfolios, the portfolio weights add up to zero. However, they need not sum to zero within different industries.

Figure S.1 presents the resulting box-plots of the distributions. The top row reveals that the semibeta portfolio industry allocations are more concentrated around zero than those of the traditional beta portfolio, suggesting greater diversification along that dimension. The bottom row of the figure shows that the industry concentrations of the β and $\beta^{\mathcal{N}}$ portfolios are similar, while the $\beta^{\mathcal{M}^-}$ portfolios are noticeably different. The combination of the $\beta^{\mathcal{N}}$ and $\beta^{\mathcal{M}^-}$ portfolios in turn generates comparatively low industry allocations for the semibeta portfolio, as shown in the upper-right panel.

Figure S.1: **Industry Concentration:** The figure presents box-plots of the time-series variation in industry allocation of the β, Semi β, $\beta^{\mathcal{N}}$ and $\beta^{\mathcal{M}^-}$ long-short portfolios, based on Kenneth French's 10-Industry classification.



S3. Robustness on Risk Exposures

This section provides factor exposures and alphas for the 3-factor Fama and French model plus the Betting against Beta (BAB) factor. Since our portfolios bet *on* $\beta^{\mathcal{N}}$ and *against* $\beta^{\mathcal{M}^-}$, BAB factor loadings are typically negative, resulting in higher alphas compared to the FFC4 and FF5 factor models considered in the main paper. We also report semi standard deviations, computed based on the sample mean of the squared demeaned negative daily returns, and corresponding semi Sharpe ratios.

Table S.2: **Betting On and Against Semibetas.** This table provides additional information on the portfolios studies in Table 8 in the main paper. The top panel reports annualized descriptive statistics of the betting on and against (semi)beta strategies. All of the portfolios are self-financing based on value-weighted long-short positions rebalanced daily. The bottom panel reports the time-series regression estimates and Newey-West robust t-statistics for the FF3 + BAB factor model, along with the corresponding alphas in annualized percentage terms. The estimates are based on all of the S&P 500 constituent stocks and days in the 1993-2014 sample.

	β	Semi β	β^N	β^{M-}
Avg ret	4.98	9.76	10.98	7.66
Std dev	16.57	9.30	16.89	8.00
Sharpe	0.30	1.05	0.65	0.96
Semi Std dev	16.54	9.80	17.28	8.43
Semi Sharpe	0.30	1.00	0.64	0.91
α	6.79	10.39	12.21	7.67
	3.31	8.44	6.07	4.04
β_{MKT}	0.44	0.23	0.47	-0.02
	50.92	44.31	56.16	-2.05
β_{SMB}	0.15	0.22	0.26	0.18
	11.15	26.76	19.38	14.29
β_{HML}	0.09	0.05	0.03	0.08
	6.83	6.70	2.01	6.51
β_{BAB}	-0.55	-0.27	-0.50	-0.04
	-40.74	-33.33	-37.88	-2.98
R^2	64.73	59.56	65.74	5.77

Table S.3: **Betting On and Against Semibetas with Transaction Costs.** This table provides additional information on the portfolios studies in Table 12 in the main paper. The top panel reports annualized descriptive statistics for the semibeta portfolios. The bottom panel reports the time-series regression estimates and Newey-West robust t-statistics for the FF3 + BAB factor model, along with the corresponding alphas in annualized percentage terms. All of the portfolios are self-financing based on value-weighted long-short positions determined by the combined semibeta strategy rebalanced monthly. T-cost refers to the roundtrip transaction costs. The left panel is identical to the second panel in Table 11 and fully adjusted portfolio weights. The right three panels report the results based on partially-adjusted portfolio weights, as discussed in the main text. The estimates are based on all of the S&P 500 constituent stocks and days in the 1993-2014 sample.

T-cost	0%	0%	0.5%	1.0%
Adjustment	Full	Partial	Partial	Partial
Avg ret	4.04	4.62	4.32	4.02
Std dev	8.39	7.77	7.77	7.77
Sharpe	0.48	0.59	0.56	0.52
Semi Std dev	8.83	8.32	8.31	8.30
Semi Sharpe	0.46	0.56	0.52	0.48
α	4.82	5.18	4.88	4.58
	3.83	5.51	5.19	4.87
β_{MKT}	0.17	0.18	0.18	0.18
	32.22	46.17	46.20	46.20
β_{SMB}	0.25	0.24	0.24	0.24
	29.13	37.29	37.29	37.28
β_{HML}	-0.01	-0.13	-0.13	-0.13
	-1.07	-22.39	-22.38	-22.36
β_{BAB}	-0.23	-0.17	-0.17	-0.17
	-27.41	-26.99	-26.99	-26.98
R^2	50.90	56.37	56.36	56.33

S4. Conditional Alphas

To guard against potential biases in the unconditional alphas arising from temporal variation in conditional betas (see, e.g., Jagannathan and Wang (1996) and Lewellen and Nagel (2006)), we calculate conditional alphas following the approach of Cederburgh and O'Doherty (2016) (cf. Section II.B).

Specifically, we cumulate the daily portfolio returns to a quarterly window of 60 days, indexed by τ, and run regressions of the form:

$$r_\tau = \alpha + \sum_{k=1}^{K} (\lambda_{0,k} + \lambda'_{1,k} Z_{\tau-1}) f_{k,\tau} + \epsilon_\tau,$$

where $f_{k,\tau}$ denote quarterly factors stemming from the FFC4 or FF5 model, and $Z_{\tau-1}$ denotes a set of instruments measured before the return window.[1] In parallel to Cederburgh and O'Doherty (2016), we consider four different sets of instruments Z_τ.

First, we compute 'Lagged-Component' (LC) betas estimated on 3- and 36-month windows. These are calculated as the portfolio-weighted average of the lagged beta estimates for the constituent firms included in the portfolio. The constituent betas are estimated with daily data, where we require at least 36 and 450 daily observations to compute the 3- and 36-month betas, respectively. In addition, we use the default spread (DS) and dividend yield (DY). The default spread is computed as the difference between Moody's BAA and AAA-rated bonds, available from the Federal Reserve Bank of St.Louis' website. For the dividend yield, we compute the quarterly cumulated difference between the CRSP value-weighted return including and excluding dividends and distributions.

The resulting average conditional alpha estimates for the different portfolios and various combinations of instruments are summarized in Table S.4. The complete regression results are reported in Tables S.5 to S.7. Consistent with the unconditional alpha estimates reported in the main part of the paper, we find that the conditional alphas for

[1] The quarterly factors were constructed from daily data retrieved from Kenneth French's website, by cumulating the long- and short sides of each factor separately and then computing the difference.

the semibeta portfolios are significantly positive across all of the different specifications, while the conditional alphas for the standard β portfolio are always insignificant.[2] The magnitudes of the average conditional alphas for the Semi-β and $\beta^{\mathcal{N}}$ portfolios are also very similar to the unconditional alpha estimates reported in Table 7, while those for the $\beta^{\mathcal{M}^-}$ portfolio are marginally lower.

Table S.4: **Conditional Alphas - Summary.** The return regression is given by $r_\tau = \alpha + \sum_{k=1}^{K}(\lambda_{0,k} + \lambda'_{1,k} Z_{\tau-1}) f_{k,\tau} + \epsilon_\tau$, where $f_{k,\tau}$ denote quarterly factors stemming from the four-factor model of Fama-French-Carhart (1997) and the five-factor model of Fama and French (1993, 2015), and $Z_{\tau-1}$ is a set of instruments. Specification I uses 3- and 36- month lagged component betas as instruments. Specification II uses Dividend Yield and Default Spread as instruments. Specification III uses all four instruments. We report estimates of α along with Newey-West robust t-statistics for both the FFC4 and FF5 factor models. The alpha is reported in annualized percentage terms.

	FFC4				FF5			
	β	Semi β	$\beta^{\mathcal{N}}$	$\beta^{\mathcal{M}^-}$	β	Semi β	$\beta^{\mathcal{N}}$	$\beta^{\mathcal{M}^-}$
I	3.01	6.35	7.48	2.00	3.25	8.07	9.61	4.83
	1.02	2.65	2.42	1.05	0.85	3.08	2.60	1.95
II	3.87	7.72	10.09	4.25	3.18	7.59	9.32	4.91
	1.27	3.56	3.38	1.86	1.01	4.15	2.90	2.36
III	3.58	6.75	8.57	4.21	2.87	7.57	8.88	4.91
	1.24	3.34	3.28	2.18	0.92	3.77	3.23	2.13

[2] The only exception is the $\beta^{\mathcal{M}^-}$ portfolio when we only use the LC betas as instruments, in which case the alpha is positive but statistically insignificant.

Table S.5: **Conditional Alphas - Specification I.** The return regression is given by $r_\tau = \alpha + \sum_{k=1}^{K}(\lambda_{0,k} + \lambda'_{1,k} Z_{\tau-1}) f_{k,\tau} + \epsilon_\tau$, where $f_{k,\tau}$ denote quarterly factors stemming from the four-factor model of Fama-French-Carhart (1997) and the five-factor model of Fama and French (1993, 2015), and $Z_{\tau-1}$ is a set of instruments. This specification uses 3- and 36- month lagged component betas as instruments. We report parameter estimates along with Newey-West robust t-statistics for both the FFC4 and FF5 factor models. The alpha is reported in annualized percentage terms.

		$f_{MKT,\tau}\times$			$f_{SMB,\tau}\times$			$f_{HML,\tau}\times$			$f_{MOM,\tau}\times$			R^2
	α	1	β^{LC3}	β^{LC36}	1	β^{LC3}	β^{LC36}	1	β^{LC3}	β^{LC36}	1	β^{LC3}	β^{LC36}	
β	3.0	0.3	0.2	0.0	0.1	-0.7	0.1	-0.6	0.4	0.7	0.8	1.3	0.1	58.0
	1.0	1.2	1.3	0.3	0.9	-1.3	0.2	-1.1	1.2	0.9	0.8	2.5	0.1	
Semi β	6.4	0.1	-0.2	0.1	0.0	-0.7	0.1	-0.1	0.2	1.1	1.3	0.4	-0.3	66.4
	2.7	0.4	-0.7	0.9	-0.2	-1.0	0.2	-0.3	1.1	1.2	1.5	1.0	-0.6	
$\beta^{\mathcal{N}}$	7.5	0.4	-0.1	0.0	0.0	-0.9	-0.3	-0.4	0.7	0.5	1.6	0.8	-0.6	64.8
	2.4	1.8	-0.4	-0.1	0.4	-1.6	-0.4	-1.2	2.5	0.6	1.4	1.9	-1.1	
$\beta^{\mathcal{M}^-}$	2.0	0.1	0.0	0.4	0.0	0.6	-0.2	0.0	0.0	1.1	1.1	-0.4	0.4	43.5
	1.1	1.1	0.1	3.7	0.2	1.3	-0.7	-0.1	-0.1	1.2	1.5	-0.5	0.7	

		$f_{MKT,\tau}\times$			$f_{SMB,\tau}\times$			$f_{HML,\tau}\times$			$f_{RMW,\tau}\times$			$f_{CMA,\tau}\times$			
	α	1	β^{LC3}	β^{LC36}	1	β^{LC3}	β^{LC36}	1	β^{LC3}	β^{LC36}	1	β^{LC3}	β^{LC36}	1	β^{LC3}	β^{LC36}	
β	3.3	0.4	0.0	0.1	-0.3	0.1	0.1	-0.4	-0.8	-0.5	-0.4	1.8	1.1	1.8	1.6	2.4	52.1
	0.9	2.8	0.2	0.3	-1.1	0.5	0.2	-0.8	-1.8	-1.3	-0.7	0.8	0.6	1.0	1.2	1.7	
Semi β	8.1	0.2	0.2	0.1	-0.2	-0.1	0.0	-0.3	-0.3	-0.1	0.0	-0.1	1.6	-1.0	1.5	0.1	64.9
	3.1	2.1	2.0	1.0	-1.3	-0.5	0.0	-0.6	-0.7	-0.2	0.0	-0.1	1.0	-0.6	1.5	0.1	
$\beta^{\mathcal{N}}$	9.6	0.3	0.3	0.0	-0.4	0.0	0.8	-0.9	-0.3	-0.2	-0.1	-0.7	3.1	-0.9	1.6	0.8	53.1
	2.6	2.3	1.5	0.0	-1.8	-0.1	1.2	-1.5	-0.7	-0.5	-0.1	-0.3	1.6	-0.5	1.2	0.6	
$\beta^{\mathcal{M}^-}$	4.8	0.0	0.3	0.3	-0.2	0.0	-0.7	-0.5	0.7	-0.6	-0.2	2.4	3.9	0.6	3.4	2.6	51.6
	2.0	0.3	3.2	2.0	-1.1	-0.2	-1.2	-0.8	1.6	-1.0	-0.3	1.6	2.0	0.3	2.4	1.2	

Table S.6: **Conditional Alphas - Specification II.** The return regression is given by $r_\tau = \alpha + \sum_{k=1}^{K}(\lambda_{0,k} + \lambda'_{1,k} Z_{\tau-1}) f_{k,\tau} + \epsilon_\tau$, where $f_{k,\tau}$ denote quarterly factors stemming from the four-factor model of Fama-French-Carhart (1997) and the five-factor model of Fama and French (1993, 2015), and $Z_{\tau-1}$ is a set of instruments. This specification uses Dividend Yield and Default Spread as instruments. We report parameter estimates along with Newey-West robust t-statistics for both the FFC4 and FF5 factor models. The alpha is reported in annualized percentage terms.

		$f_{MKT,\tau}\times$			$f_{SMB,\tau}\times$			$f_{HML,\tau}\times$			$f_{MOM,\tau}\times$						R^2
	α	1	DY	DS	1	DY	DS	1	DY	DS	1	DY	DS				
β	3.9	1.1	0.2	-1.1	0.3	-1.7	1.0	2.3	-0.5	-0.1	-0.6	0.2	-0.1				54.1
	1.3	2.5	0.3	-2.3	1.2	-1.6	0.7	1.6	-0.5	-0.4	-1.2	0.5	-0.5				
Semi β	7.7	0.9	-0.3	-0.3	0.0	-1.7	1.8	0.7	0.0	0.1	-0.2	0.1	-0.1				67.6
	3.6	2.7	-0.9	-0.9	0.2	-2.2	1.8	0.7	0.1	0.4	-0.5	0.4	-0.4				
$\beta^{\mathcal{N}}$	10.1	1.5	-0.1	-0.8	0.6	-2.9	2.3	1.8	-1.5	0.1	-0.9	0.1	0.0				62.6
	3.4	3.4	-0.1	-1.7	2.2	-2.8	1.7	1.3	-1.4	0.3	-1.8	0.2	0.1				
$\beta^{\mathcal{M}^-}$	4.3	0.2	-0.6	0.1	-0.5	-0.4	1.3	-0.1	1.6	0.1	0.5	0.1	-0.2				55.7
	1.9	0.6	-1.6	0.4	-2.6	-0.5	1.2	-0.1	2.1	0.4	1.3	0.4	-0.9				
		$f_{MKT,\tau}\times$			$f_{SMB,\tau}\times$			$f_{HML,\tau}\times$			$f_{RMW,\tau}\times$			$f_{CMA,\tau}\times$			
	α	1	DY	DS	1	DY	DS	1	DY	DS	1	DY	DS	1	DY	DS	
β	3.2	0.9	-0.2	-2.5	0.3	2.2	-1.0	1.9	5.5	-0.8	-3.4	-0.1	-0.7	0.0	0.0	-0.4	54.3
	1.0	2.0	-0.4	-3.0	0.3	2.1	-0.9	1.2	2.7	-0.3	-1.6	-0.4	-1.3	0.1	0.0	-0.6	
Semi β	7.6	1.0	-0.5	-0.6	-0.2	1.3	-1.7	2.0	1.6	-0.4	-2.7	0.0	-0.2	0.1	0.2	-0.1	71.0
	4.2	3.6	-1.7	-1.4	-0.3	2.2	-2.6	2.2	1.4	-0.3	-2.2	0.2	-0.5	0.3	0.5	-0.2	
$\beta^{\mathcal{N}}$	9.3	1.0	-0.7	-2.0	-0.5	2.2	-1.9	3.2	5.5	-0.7	-4.6	0.2	-0.7	-0.3	0.7	0.0	60.9
	2.9	2.2	-1.2	-2.4	-0.5	2.1	-1.7	2.0	2.6	-0.3	-2.1	0.7	-1.3	-0.8	1.0	0.0	
$\beta^{\mathcal{M}^-}$	4.9	0.9	-0.4	0.7	0.1	0.3	-1.4	0.8	-2.1	-0.2	-0.7	-0.1	0.3	0.4	-0.3	-0.1	51.2
	2.4	2.9	-1.0	1.3	0.2	0.5	-1.9	0.8	-1.6	-0.1	-0.5	-0.6	1.0	1.6	-0.7	-0.3	

Table S.7: **Conditional Alphas - Specification III.** The return regression is given by $r_\tau = \alpha + \sum_{k=1}^{K}(\lambda_{0,k} + \lambda'_{1,k} Z_{\tau-1}) f_{k,\tau} + \epsilon_\tau$, where $f_{k,\tau}$ denote quarterly factors stemming from the four-factor model of Fama-French-Carhart (1997) and the five-factor model of Fama and French (1993, 2015), and $Z_{\tau-1}$ is a set of instruments. This specification uses 3- and 36- month lagged component betas, as well as Dividend Yield and Default Spread as instruments. We report parameter estimates along with Newey-West robust t-statistics for both the FFC4 and FF5 factor models. The alpha is reported in annualized percentage terms.

		$f_{MKT,\tau}\times$					$f_{SMB,\tau}\times$					$f_{HML,\tau}\times$					$f_{MOM,\tau}\times$					
	α	1	β^3	β^{36}	DY	DS	1	β^3	β^{36}	DY	DS	1	β^3	β^{36}	DY	DS	1	β^3	β^{36}	DY	DS	R^2
β	3.6	0.6	1.2	-0.5	0.3	-0.8	0.1	-0.3	0.4	1.3	1.3	0.7	-0.1	-0.5	-1.4	0.9	-0.7	-0.3	-0.6	0.2	0.0	66.2
	1.2	1.3	2.0	-0.6	1.2	-1.4	0.3	-0.6	1.3	1.5	1.5	1.0	-0.2	-0.4	-0.9	0.5	-0.7	-1.1	-1.3	0.7	0.0	
Semi β	6.8	0.6	-0.9	-0.3	0.0	-0.8	0.2	-0.3	0.3	1.3	0.7	0.4	0.3	-0.9	2.3	1.1	-0.5	-0.1	0.0	0.0	0.2	76.4
	3.3	1.5	-2.3	-0.7	0.1	-1.5	0.4	-1.1	1.2	1.6	1.1	0.8	0.6	-1.0	2.3	1.0	-0.8	-0.6	0.0	0.1	1.0	
$\beta^{\mathcal{N}}$	8.6	1.3	-0.4	-0.4	0.5	-0.9	-0.4	-0.5	0.6	1.0	1.4	0.6	-0.5	-2.0	2.0	1.2	-1.7	-0.1	-0.5	0.0	0.2	71.3
	3.3	2.8	-0.7	-0.6	2.1	-2.0	-0.5	-1.4	2.1	1.4	1.6	1.1	-0.8	-2.0	1.5	0.7	-1.8	-0.4	-1.1	0.1	0.7	
$\beta^{\mathcal{M}^-}$	4.2	0.3	-1.1	0.2	-0.5	0.7	0.0	-0.5	0.0	1.3	1.0	0.8	0.6	-1.1	1.6	-0.2	1.7	0.2	0.6	0.1	-0.2	64.8
	2.2	0.9	-2.3	0.8	-3.0	1.6	-0.1	-1.5	0.1	1.4	1.6	1.2	1.2	-1.5	1.7	-0.2	2.7	1.0	1.8	0.5	-1.2	

		$f_{MKT,\tau}\times$					$f_{SMB,\tau}\times$					$f_{HML,\tau}\times$					$f_{RMW,\tau}\times$					$f_{CMA,\tau}\times$					
	α	1	β^3	β^{36}	DY	DS	1	β^3	β^{36}	DY	DS	1	β^3	β^{36}	DY	DS	1	β^3	β^{36}	DY	DS	1	β^3	β^{36}	DY	DS	R^2
β	2.9	0.8	0.5	-2.1	0.9	2.7	0.1	-0.2	-0.5	-0.4	0.1	0.7	1.3	3.7	2.0	2.5	-1.4	0.4	4.8	-2.7	-4.9	0.3	-0.7	-0.1	0.3	-0.4	63.0
	0.9	1.7	0.7	-2.4	0.8	2.8	0.2	-0.5	-1.3	-1.3	0.1	0.3	0.8	2.0	1.8	1.9	-1.3	0.3	2.3	-1.1	-2.4	0.8	-1.4	-0.3	0.4	-0.5	
Semi β	7.6	0.8	-0.3	-0.8	-0.2	1.2	0.1	-0.3	0.0	-0.1	0.0	-0.1	2.0	-1.2	1.5	-0.6	-1.1	2.0	2.5	-0.4	-3.6	-0.1	-0.3	-0.1	0.3	0.3	74.6
	3.8	2.7	-0.7	-1.4	-0.4	1.7	0.3	-0.8	-0.1	-0.2	0.0	-0.1	1.5	-0.9	1.9	-0.5	-1.4	1.8	1.8	-0.3	-2.5	-0.2	-0.9	-0.3	0.6	0.6	
$\beta^{\mathcal{N}}$	8.9	0.8	0.1	-1.7	-0.9	2.4	0.8	-0.7	0.0	-0.3	0.0	-1.3	4.0	-0.3	2.1	1.2	-2.0	1.6	5.4	-0.5	-6.3	0.5	-0.7	-0.6	1.0	0.4	67.2
	3.2	1.9	0.2	-2.0	-0.9	2.5	1.4	-1.4	-0.1	-1.0	0.1	-0.7	2.3	-0.2	2.1	1.0	-2.0	1.1	2.7	-0.2	-3.2	1.5	-1.4	-1.7	1.5	0.6	
$\beta^{\mathcal{M}^-}$	4.9	0.8	-0.2	0.3	0.2	0.9	-0.5	-0.1	0.7	-0.4	-0.2	3.5	2.6	0.4	1.3	1.6	-0.7	0.3	-1.8	0.1	-1.5	-0.4	0.4	0.7	-0.6	-0.4	59.7
	2.1	2.2	-0.4	0.5	0.3	1.2	-0.8	-0.2	1.8	-0.7	-0.3	2.7	1.4	0.2	0.8	0.7	-0.7	0.3	-1.2	0.1	-0.9	-1.5	0.9	2.2	-1.1	-0.8	

S5. Alternative Semibeta Portfolios

In the main part of the paper we consider the performance of a portfolio based on averages of long-short positions in both of the $\beta^{\mathcal{N}}$ and $\beta^{\mathcal{M}^-}$ semibetas. Alternative, long-short portfolios based on long and short positions in the opposing semibetas could also be constructed. The first such portfolio that we consider takes a value-weighted long position in the top quintile of $\beta^{\mathcal{N}}$ stocks and a short value-weighted position in the top quintile of $\beta^{\mathcal{M}^-}$ stocks. We refer to this portfolio as $\beta_H^{\mathcal{N}} - \beta_H^{\mathcal{M}^-}$. The second strategy we consider is similarly constructed by taking he opposite positions in the two bottom quintiles. We refer to this portfolio as $\beta_L^{\mathcal{M}^-} - \beta_L^{\mathcal{N}}$.

Table S.8 summarizes the performance of these two alternative semibeta portfolios. For comparison, we also include the results for the Semi β portfolio analyzed in the main part of the paper in the first panel of the table. The table shows that the long-short portfolio based on the top quintiles performs the best. That portfolio also outperforms the Semi β portfolio analyzed in the main part of the paper, with a Sharpe ratio of 1.15, and highly significant annualized FFC4 and FF5 alphas of 10.81 and 12.75%, respectively. Meanwhile, the portfolio based on the bottom quintiles result in a Sharpe ratio of 0.82, below that of the Semi β portfolio, and somewhat lower FFC4 and FF5 alphas of 5.80 and 6.53%, respectively. Nonetheless, all of the alphas are highly statistically significant with t-statistics in excess of 4.0.

Table S.8: **Betting On and Against Semibetas.** The top panel reports annualized descriptive statistics of the combined betting on and against semibeta strategies. All of the portfolios are self-financing based on value-weighted long-short positions rebalanced daily. The bottom panel reports the time-series regression estimates and Newey-West robust t-statistics for the FFC4 and FF5 factor models, along with the corresponding alphas in annualized percentage terms. The estimates are based on all of the S&P 500 constituent stocks and days in the 1993-2014 sample.

	Semi β		$\beta_H^{\mathcal{N}} - \beta_H^{\mathcal{M}^-}$		$\beta_L^{\mathcal{M}^-} - \beta_L^{\mathcal{N}}$	
Avg ret	9.76		12.04		7.39	
Std dev	9.30		10.46		9.02	
Sharpe	1.05		1.15		0.82	
α	8.35	9.68	10.81	12.75	5.80	6.53
	6.32	7.38	6.92	8.50	4.38	4.78
β_{MKT}	0.30	0.25	0.31	0.23	0.29	0.26
	64.70	47.90	56.59	39.96	62.35	48.08
β_{SMB}	0.30	0.21	0.33	0.21	0.27	0.22
	33.91	22.61	31.48	19.39	30.53	22.12
β_{HML}	-0.01	0.11	-0.07	0.08	0.04	0.13
	-1.61	11.10	-6.39	7.73	4.31	12.82
β_{MOM}	-0.14		-0.16		-0.12	
	-22.46		-21.48		-19.47	
β_{RMW}		-0.28		-0.38		-0.18
		-22.56		-26.65		-14.06
β_{CMA}		-0.28		-0.35		-0.22
		-19.09		-20.56		-14.06
R^2	55.92	59.55	49.79	55.83	53.10	54.06

S6. Additional Transaction Cost Analyses

In this section we report the net of transaction cost performance for the fully-adjusted monthly-rebalanced betting on and against semibeta portfolios. We also consider alternative values for λ used in smoothing the portfolio weights, as well as an alternative procedure to help reduce transaction costs based on smoothing the semibeta estimates themselves.

Table S.9 reports the results for the fully-adjusted portfolio taking into account transaction costs. For comparison purposes, the first panel repeats the results in Table 11 that do not incorporate transaction costs. Despite only updating the portfolio once per month, the resulting transactions are still prohibitively expensive, resulting in average negative returns, underscoring the need for practical methods to help mitigate the cost of trading.

Table S.10 further analyzes the sensitivity of the results for the smoothed semibeta portfolio to the choice of smoothing parameter λ used in smoothing the portfolio weights, $\omega_t^P = \lambda\omega_{t-1}^P + (1-\lambda)\omega_t^F$. We present the results for $\lambda = \{0.5, 0.7, 0.9, 0.99\}$, both with and without transaction costs.[3] In parallel to the results reported in Table 12 in the main part of the paper, the table shows that partially adjustmenting the weights generally improves the portfolio performance, even without considering transaction costs. However, when λ becomes too high the signal becomes too muted, and the alphas decrease. On the other hand, higher values of λ help reduce transaction costs. The value of $\lambda = 0.95$ underlying the results in main part of the paper appears a reasonable choice for judiciously balancing the signal and the cost of trading.

Instead of partially updating the weights to counter transaction costs, it is possibly to only partially update the semibeta estimates themselves:

$$\tilde{\beta}_t^j = \lambda\tilde{\beta}_{t-1}^j + (1-\lambda)\beta_t^j, \qquad j \in \{\mathcal{N}, \mathcal{M}-\}.$$

[3]The standard errors on the estimated alphas in Table S.10 are numerically close to one in several cases, resulting in entries where the point estimate and the t-statistic are nearly identical. This is just a coincidence.

Similar exponentially weighted moving average filters are commonly used to extract the signal from noisy time series. Thus, portfolios based on the filtered semibetas may not only lead to more stable allocations, they may also entail more accurate stock selections. To facilitate comparison with the previous approach based on smoothing the weights, we use the same value of $\lambda = 0.95$. The results in the first panel of Table S.11 show that the smoothed semibetas do indeed improve on the signal, albeit only slightly, resulting in a marginally higher Sharpe ratio and marginally higher FFC4 and FF5 alphas compared to the unsmoothed results in Table 11. Taking into account transaction costs, the performance of the smoothed semibeta portfolios are also drastically improved compared to the results for the fully adjusted portfolios in Table S.9. However, partially adjusting the weights appears more effective in reducing trading costs, as manifest in much lower and mostly insignificant FFC4 and FF5 alphas in Table S.11 compared to the corresponding larger and significant alphas in Table 12 in the main part of the paper.

Going one step further, the weights defined by the smoothed semibetas could also be smoothed. Table S.12 reports the results from partially adjusting both the semibetas and the resulting weights, where we use the same $\lambda = 0.95$ for both of the filters. This partial adjustment of both the semibetas and the weights results in the best overall performance, both in terms of Sharpe ratio and FFC4 and FF5 alphas. Smoothing the betas improves the signal, while only partially adjusting the weights substantially reduces transaction costs with little to no detrimental impact on the overall portfolio performance. Even with roundtrip transaction costs of 1.0%, the Sharpe ratio is as high as 0.60, and the FFC4 and FF5 alphas equal 5.02% and 8.60%, respectively, both of which are statistically significant.

Table S.9: **Betting On and Against Semibetas with Transaction Costs: Fully Adjusted Portfolio Weights.** The top panel reports annualized descriptive statistics for the semibeta portfolios. The bottom panel reports the time-series regression estimates and Newey-West robust t-statistics for the FFC4 and FF5 factor models, along with the corresponding alphas in annualized percentage terms. All of the portfolios are self-financing based on value-weighted long-short positions determined by the combined semibeta strategy rebalanced monthly. T-cost refers to the roundtrip transaction costs. The table reports the results based on fully-adjusted portfolio weights, as discussed in the main text, with various levels of transaction costs. The estimates are based on all of the S&P 500 constituent stocks and days in the 1993-2014 sample.

T-cost	0%		0.5%		1.0%	
Weight Adj.	Full		Full		Full	
Avg ret	4.04		-2.17		-8.42	
Std dev	8.39		8.58		9.09	
Sharpe	0.48		-0.25		-0.93	
α	2.96	4.22	-3.28	-2.00	-9.56	-8.26
	2.30	3.24	-2.55	-1.54	-7.39	-6.30
β_{MKT}	0.23	0.19	0.24	0.19	0.24	0.19
	51.68	36.54	52.06	36.68	52.07	36.57
β_{SMB}	0.31	0.23	0.31	0.23	0.31	0.23
	36.10	24.59	36.31	24.65	36.26	24.53
β_{HML}	-0.06	0.01	-0.05	0.01	-0.05	0.02
	-6.46	1.06	-5.97	1.35	-5.44	1.62
β_{MOM}	-0.10		-0.10		-0.10	
	-16.43		-16.23		-15.91	
β_{RMW}		-0.26		-0.27		-0.27
		-21.10		-21.53		-21.81
β_{CMA}		-0.19		-0.19		-0.18
		-12.88		-12.67		-12.37
R^2	46.76	50.29	45.05	48.62	40.37	43.76

Table S.10: **Betting On and Against Semibetas with Transaction Costs: Choice of Smoothing Parameter.** The table reports the annualized alpha coefficients and Newey-West robust t-statistics based on the Fama-French-Carhart (1997) and the five-factor model of Fama and French (1993, 2015), for various levels of the smoothing parameter λ. The portfolios are self-financing value-weighted long-short portfolios based on and an equal-weighted combination of the $\beta^{\mathcal{N}}$ and $\beta^{\mathcal{M}^-}$ strategies, rebalanced monthly. TC is the cost of a roundtrip transaction. The sample covers 1993-2014.

T-cost	0%		0.5%		1.0%	
Weight Adj.	Partial		Partial		Partial	
λ	FFC4	FF5	FFC4	FF5	FFC4	FF5
0.50	2.83	4.12	0.05	1.35	-2.74	-1.42
	2.53	3.68	0.04	1.21	-2.44	-1.27
0.70	2.82	4.20	1.22	2.60	-0.39	1.00
	2.67	4.01	1.15	2.49	-0.37	0.96
0.90	2.92	4.73	2.37	4.19	1.82	3.64
	2.92	4.86	2.37	4.30	1.82	3.73
0.95	3.09	5.31	2.79	5.01	2.49	4.71
	3.05	5.33	2.76	5.03	2.46	4.72
0.99	2.76	4.70	2.64	4.59	2.53	4.47
	2.25	3.86	2.16	3.77	2.06	3.67

Table S.11: **Betting On and Against Semibetas with Transaction Costs: Semibeta Smoothing.** The top panel reports annualized descriptive statistics of the Betting on (Semi)Beta strategies, in a setting where semibetas are only partially adjusted each period. The bottom panel reports results from time-series regressions of the Fama-French-Carhart (1997) and the five-factor model of Fama and French (1993, 2015). The table reports the estimated regression coefficients and Newey-West robust t-statistics. Alphas are in percent, annualized. The portfolios are self-financing value-weighted long-short portfolios based on and an equal-weighted combination of the $\beta^{\mathcal{N}}$ and $\beta^{\mathcal{M}^-}$ strategies, rebalanced monthly. TC is the cost of a roundtrip transaction. The sample covers 1993-2014.

T-cost	0%		0.5%		1.0%	
Semibeta Adj.	Partial		Partial		Partial	
Weight Adj.	Full		Full		Full	
Avg ret	6.89		3.73		0.55	
Std dev	13.42		13.46		13.56	
Sharpe	0.51		0.28		0.04	
α	4.88	7.26	1.70	4.09	-1.50	0.91
	2.68	4.04	0.93	2.28	-0.82	0.51
β_{MKT}	0.37	0.29	0.37	0.29	0.38	0.29
	58.62	40.89	58.77	40.98	58.85	41.00
β_{SMB}	0.57	0.45	0.57	0.45	0.57	0.45
	47.51	34.97	47.58	35.00	47.58	34.98
β_{HML}	-0.08	0.01	-0.07	0.01	-0.07	0.01
	-6.26	0.50	-6.08	0.61	-5.88	0.72
β_{MOM}	-0.13		-0.13		-0.13	
	-15.25		-15.16		-15.05	
β_{RMW}		-0.43		-0.43		-0.43
		-24.96		-25.11		-25.23
β_{CMA}		-0.33		-0.33		-0.32
		-16.06		-15.98		-15.88
R^2	49.66	54.49	49.45	54.31	48.83	53.68

Table S.12: **Betting On and Against Semibetas with Transaction Costs: Semibeta and Weight Smoothing.** The top panel reports annualized descriptive statistics of the Betting on (Semi)Beta strategies, in a setting where both semibetas and the corresponding portfolio weights are only partially adjusted each period. The bottom panel reports results from time-series regressions of the Fama-French-Carhart (1997) and the five-factor model of Fama and French (1993, 2015). The table reports the estimated regression coefficients and Newey-West robust t-statistics. Alphas are in percent, annualized. The portfolios are self-financing value-weighted long-short portfolios based on and an equal-weighted combination of the $\beta^{\mathcal{N}}$ and $\beta^{\mathcal{M}^-}$ strategies, rebalanced monthly. TC is the cost of a roundtrip transaction. The sample covers 1993-2014.

T-cost	0%		0.5%		1.0%	
Semibeta Adj.	Partial		Partial		Partial	
Weight Adj.	Partial		Partial		Partial	
Avg ret	7.97		7.69		7.41	
Std dev	12.39		12.39		12.39	
Sharpe	0.64		0.62		0.60	
α	5.58	9.16	5.30	8.88	5.02	8.60
	3.46	5.86	3.29	5.68	3.11	5.50
β_{MKT}	0.37	0.26	0.37	0.26	0.37	0.26
	66.01	42.21	66.01	42.21	65.99	42.19
β_{SMB}	0.50	0.38	0.50	0.38	0.50	0.38
	46.63	34.14	46.61	34.12	46.59	34.10
β_{HML}	-0.19	-0.16	-0.19	-0.16	-0.19	-0.16
	-17.19	-13.73	-17.18	-13.72	-17.16	-13.70
β_{MOM}	0.01		0.01		0.01	
	1.80		1.80		1.80	
β_{RMW}		-0.42		-0.42		-0.42
		-28.03		-28.04		-28.03
β_{CMA}		-0.34		-0.34		-0.34
		-19.17		-19.16		-19.16
R^2	52.08	59.14	52.08	59.13	52.06	59.12