

Internet Appendix to

Non-myopic betas

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This document contains a number of tables that show the results of additional analyses and robustness checks that are discussed in Section 8 but not included in the paper.

Online Appendix. Robustness tables and figures

Table OA1

Non-myopic beta-sorted quintile portfolios

This table shows the statistics for quintile portfolios created from sorting by non-myopic betas with respect to the efficient portfolios from four [Fama and French \(1993\)](#) and [Carhart \(1997\)](#) underlying factors, namely the equal-weighted one (EWP) shown on Panel A, and the maximum Sharpe ratio (MSRP) shown in Panel B, computed for monthly and annual investment horizons (see Section 7.2 for details). The return for each quintile portfolio, and its mean pre-sort and post-sort non-myopic betas are computed using equal (EW), or value weights (VW). Column “Q5-Q1” contains the difference for the respective variables between top and bottom quintiles. The characteristics (market value and market-to-book ratio) are equally weighted in each quintile. Market values are given in millions of US Dollars.

Panel A: Equal-Weighted (EWP) Efficient Portfolio

Monthly Horizon	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Mean return, VW	5.97%	6.21%	6.44%	7.00%	9.05%	3.07%
Mean return, EW	8.92%	9.30%	9.66%	9.99%	11.40%	2.48%
<i>Non-myopic betas</i>						
Pre-sort betas, VW	-0.2783	0.1444	0.4216	0.7249	1.2928	1.571
Post-sort betas, VW	0.0862	0.2267	0.3237	0.5152	0.7500	0.664
Pre-sort betas, EW	-0.3679	0.1464	0.4242	0.7337	1.4043	1.772
Post-sort betas, EW	0.1126	0.2578	0.3759	0.5088	0.7613	0.649
<i>Factor betas, VW quintiles</i>						
β_M	0.9672	0.9355	0.9707	1.0372	1.1877	0.220
β_{SMB}	-0.1727	-0.1972	-0.1283	0.0181	0.3209	0.494
β_{HML}	0.0382	0.1274	0.0956	-0.0071	-0.1188	-0.157
β_{UMD}	0.0237	0.0226	-0.0564	-0.0190	-0.0733	-0.097
<i>Company characteristics</i>						
Market value	2,326	2,907	2,790	2,516	1,326	
Market-to-book	2.73	2.15	2.19	2.25	3.07	
Annual Horizon	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Mean return, VW	6.22%	7.02%	6.49%	6.83%	8.96%	2.74%
Mean return, EW	9.35%	9.82%	9.87%	10.19%	11.47%	2.12%
<i>Non-myopic betas</i>						
Pre-sort betas, VW	-2.3025	-1.1126	-0.4504	0.1863	1.4036	3.706
Post-sort betas, VW	-0.8424	-0.5161	-0.3723	-0.3515	-0.1259	0.717
Pre-sort betas, EW	-2.5525	-1.1193	-0.4585	0.2083	1.5603	4.113
Post-sort betas, EW	-1.1702	-0.7169	-0.5237	-0.3728	-0.1921	0.978
<i>Factor betas, VW quintiles</i>						
β_M	1.0333	0.9892	1.0195	1.0455	1.1342	0.101
β_{SMB}	0.2063	-0.1332	-0.2137	-0.0301	0.0617	-0.145
β_{HML}	0.0091	0.0646	0.1409	0.1648	0.0193	0.010
β_{UMD}	-0.0205	-0.0238	-0.0364	0.0143	0.0621	0.083
<i>Company characteristics</i>						
Market value	1,741	2,711	2,855	3,026	2,751	
Market-to-book	2.67	2.21	2.11	2.16	2.76	

Panel B: Maximum Sharpe Ratio (MSRP) Efficient Portfolio

Monthly Horizon	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Mean return, VW	6.13%	6.46%	5.91%	7.88%	8.19%	2.07%
Mean return, EW	8.91%	9.04%	9.66%	10.17%	11.50%	2.58%
<i>Non-myopic betas</i>						
Pre-sort betas, VW	-0.2237	0.2793	0.6225	0.9980	1.6972	1.921
Post-sort betas, VW	0.2330	0.3624	0.5467	0.7493	1.0670	0.834
Pre-sort betas, EW	-0.3224	0.2812	0.6267	1.0121	1.8396	2.162
Post-sort betas, EW	0.2649	0.4247	0.5927	0.7741	1.0673	0.802
<i>Factor betas, VW quintiles</i>						
β_M	0.9323	0.9187	0.9885	1.0699	1.2151	0.283
β_{SMB}	-0.1766	-0.2375	-0.0722	0.0407	0.3493	0.526
β_{HML}	0.0743	0.0903	0.1088	-0.0178	-0.0997	-0.174
β_{UMD}	0.0213	0.0171	-0.0303	-0.0533	-0.0854	-0.107
<i>Company characteristics</i>						
Market value	2,474	3,218	2,627	2,146	1,399	
Market-to-book	2.73	2.25	2.28	2.22	2.90	
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Annual Horizon	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Mean return, VW	5.36%	6.38%	6.60%	7.60%	8.80%	3.44%
Mean return, EW	9.80%	9.43%	9.63%	10.25%	11.60%	1.80%
<i>Non-myopic betas</i>						
Pre-sort betas, VW	-2.2034	-0.8923	-0.1863	0.5270	2.0043	4.208
Post-sort betas, VW	-0.9046	-0.6940	-0.5155	-0.3727	-0.2536	0.651
Pre-sort betas, EW	-2.5296	-0.9063	-0.1816	0.5539	2.2231	4.753
Post-sort betas, EW	-1.3520	-0.8484	-0.6686	-0.5521	-0.2664	1.086
<i>Factor betas, VW quintiles</i>						
β_M	0.9602	0.9902	0.9600	1.1037	1.1710	0.211
β_{SMB}	0.0601	-0.1543	-0.2111	-0.0330	0.0919	0.032
β_{HML}	0.0058	0.1147	0.1274	0.0905	-0.0411	-0.047
β_{UMD}	-0.0502	-0.0201	0.0267	0.0090	0.0396	0.090
<i>Company characteristics</i>						
Market value	2,155	3,231	3,265	2,794	1,638	
Market-to-book	2.59	2.20	2.15	2.29	2.67	

Table OA2

Double beta-sorted quintile portfolios: market and non-myopic exposure

This table shows the statistics for double-sorted quintile portfolios created from sorting by market betas β_M (in rows) and by non-myopic betas (in columns) with respect to the equal-weighted portfolio (EWP)–Panel A,–and the maximum Sharpe ratio portfolio (MSRP)–Panel B–from four [Fama and French \(1993\)](#) and [Carhart \(1997\)](#) underlying factors (see Section 7.2 for details), computed for monthly and annual investment horizons. The table contains “Average returns,” average “Market betas,” and average “Non-myopic betas” for each portfolio; averages are computed using market capitalization (value) weights of the portfolio components. Column and row “Q5-Q1” contains the difference for the respective variables between top and bottom quintiles.

Panel A: Equal-weighted (EWP) Efficient Portfolio

Non-myopic β^{EWP} , Monthly Horizon							Non-myopic β^{EWP} , Annual Horizon					
<i>Average returns</i>												
β_M	Q1	Q2	Q3	Q4	Q5	Q5-Q1	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Q1	7.44%	6.19%	7.11%	7.40%	8.34%	0.90%	8.67%	8.85%	7.55%	7.87%	9.89%	1.22%
Q2	7.45%	6.45%	6.58%	8.91%	9.66%	2.21%	7.43%	7.64%	7.79%	8.11%	9.96%	2.53%
Q3	7.38%	5.80%	6.83%	7.33%	9.63%	2.25%	7.21%	7.57%	6.41%	7.12%	9.57%	2.36%
Q4	6.10%	5.99%	6.72%	5.10%	8.93%	2.83%	6.36%	7.36%	6.76%	6.66%	10.04%	3.68%
Q5	5.13%	3.87%	4.33%	6.40%	8.41%	3.28%	3.95%	4.68%	4.95%	7.22%	8.82%	4.87%
Q5-Q1	-2.30%	-2.32%	-2.78%	-1.01%	0.07%	-	-4.73%	-4.17%	-2.60%	-0.64%	-1.08%	-
<i>Market betas</i>												
β_M	Q1	Q2	Q3	Q4	Q5	Q5-Q1	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Q1	0.649	0.664	0.663	0.662	0.657	0.008	0.644	0.673	0.665	0.662	0.665	0.021
Q2	0.825	0.823	0.824	0.824	0.831	0.006	0.831	0.827	0.828	0.828	0.826	-0.005
Q3	0.972	0.970	0.972	0.974	0.975	0.003	0.975	0.975	0.971	0.971	0.971	-0.005
Q4	1.130	1.127	1.129	1.133	1.140	0.010	1.132	1.129	1.125	1.129	1.132	0.001
Q5	1.407	1.401	1.403	1.416	1.465	0.057	1.439	1.398	1.403	1.400	1.425	-0.014
Q5-Q1	0.758	0.737	0.741	0.754	0.808	-	0.794	0.725	0.738	0.738	0.759	-
<i>Non-myopic betas</i>												
β_M	Q1	Q2	Q3	Q4	Q5	Q5-Q1	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Q1	-0.236	0.142	0.408	0.718	1.198	1.434	-2.292	-1.115	-0.447	0.198	1.272	3.564
Q2	-0.245	0.144	0.416	0.719	1.216	1.462	-2.142	-1.094	-0.450	0.188	1.323	3.465
Q3	-0.284	0.142	0.421	0.727	1.223	1.507	-2.237	-1.112	-0.446	0.187	1.331	3.567
Q4	-0.284	0.145	0.424	0.725	1.270	1.553	-2.299	-1.113	-0.456	0.189	1.391	3.689
Q5	-0.336	0.143	0.431	0.740	1.377	1.713	-2.522	-1.122	-0.452	0.207	1.615	4.137
Q5-Q1	-0.100	0.001	0.023	0.022	0.179	-	-0.230	-0.007	-0.006	0.009	0.344	-

Panel B: Maximum Sharpe Ratio (MSRP) Efficient Portfolio

Non-myopic β^{MSRP} , Monthly Horizon							Non-myopic β^{MSRP} , Annual Horizon					
Average return												
β_M	Q1	Q2	Q3	Q4	Q5	Q5-Q1	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Q1	7.27%	6.82%	6.50%	8.13%	9.39%	2.12%	8.80%	6.90%	7.52%	7.54%	11.55%	2.74%
Q2	7.08%	6.42%	7.09%	8.55%	9.38%	2.30%	7.08%	7.59%	6.59%	9.11%	10.91%	3.83%
Q3	6.68%	7.39%	5.81%	8.74%	9.94%	3.27%	6.60%	6.13%	6.45%	7.66%	10.11%	3.51%
Q4	4.16%	7.40%	5.99%	6.17%	8.95%	4.79%	5.49%	6.50%	7.12%	6.58%	10.35%	4.86%
Q5	5.55%	3.13%	4.50%	7.15%	7.96%	2.40%	2.22%	4.55%	6.76%	7.47%	7.94%	5.72%
Q5-Q1	-1.72%	-3.70%	-2.01%	-0.98%	-1.43%	-	-6.58%	-2.35%	-0.77%	-0.07%	-3.61%	-
Market betas												
β_M	Q1	Q2	Q3	Q4	Q5	Q5-Q1	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Q1	0.652	0.664	0.660	0.662	0.657	0.005	0.647	0.662	0.669	0.661	0.663	0.015
Q2	0.825	0.824	0.821	0.827	0.835	0.010	0.831	0.829	0.828	0.826	0.831	0.000
Q3	0.970	0.968	0.974	0.975	0.976	0.006	0.976	0.971	0.973	0.971	0.973	-0.003
Q4	1.128	1.126	1.130	1.135	1.142	0.015	1.132	1.124	1.125	1.131	1.133	0.001
Q5	1.411	1.396	1.399	1.419	1.461	0.050	1.426	1.393	1.394	1.408	1.436	0.009
Q5-Q1	0.759	0.731	0.739	0.757	0.804	-	0.779	0.731	0.724	0.747	0.773	-
Non-myopic betas												
β_M	Q1	Q2	Q3	Q4	Q5	Q5-Q1	Q1	Q2	Q3	Q4	Q5	Q5-Q1
Q1	-0.164	0.276	0.606	0.966	1.614	1.779	-2.049	-0.882	-0.188	0.508	1.768	3.817
Q2	-0.175	0.270	0.612	0.984	1.627	1.801	-2.076	-0.874	-0.178	0.527	1.882	3.958
Q3	-0.228	0.278	0.618	0.991	1.605	1.833	-2.060	-0.892	-0.191	0.522	1.884	3.944
Q4	-0.232	0.282	0.631	1.005	1.670	1.902	-2.212	-0.896	-0.176	0.523	2.000	4.212
Q5	-0.303	0.295	0.633	1.019	1.778	2.081	-2.591	-0.920	-0.180	0.553	2.226	4.817
Q5-Q1	-0.139	0.019	0.027	0.053	0.164	-	-0.542	-0.038	0.008	0.045	0.458	-

Table OA3

Non-myopic beta-sorted quintile portfolios: monotonicity relationship tests

This table shows the monotonicity relationship test statistics for quintile portfolios created from sorting by non-myopic betas with respect to the candidate efficient portfolios from four [Fama and French \(1993\)](#) and [Carhart \(1997\)](#) underlying factors, namely the equal-weighted one (EWP), and the maximum Sharpe ratio (MSRP) portfolios (see Section 7.2 for details), computed for one-month (Monthly) and one-year (Annual) investment horizons. The return for each quintile portfolio is computed using equal or value weights, for which each return is weighted inside a quintile by the market cap of the stock in the previous month. The last two columns provide the p-values for the monotonicity tests described in [Patton and Timmermann \(2010\)](#): *Decreasing* is the p-value for the null that returns are *monotonically decreasing*, and *Increasing* is the p-value for the null hypothesis that the returns are *monotonically increasing*. Simultaneously rejecting *Decreasing* and failing to reject *Increasing* indicates that we observe a monotonic increasing relation. The p-values for monotonicity tests are computed with blockwise bootstrap, using 100,000 simulated samples.

Portfolio	Horizon, weight	Decreasing	Increasing
EWP	Monthly, equal-weighted	0.06	0.96
	Annual, equal-weighted	0.07	0.91
	Monthly, value-weighted	0.13	0.95
	Annual, value-weighted	0.03	0.77
MSRP	Monthly, equal-weighted	0.10	0.93
	Annual, equal-weighted	0.04	0.76
	Monthly, value-weighted	0.18	0.75
	Annual, value-weighted	0.00	0.96

Table OA4
Risk premium estimation

Table shows the annualized risk premiums on exposure to a number of contemporaneous factors and to future efficient portfolio(s) constructed from standard [Fama and French \(1993\)](#) and [Carhart \(1997\)](#) factors as equal-weighted portfolio (EWP) or as a maximum Sharpe ratio portfolio (MSRP), always used jointly with the future market (FM) portfolio. We use either standard ordinary least squares procedure in Panel A, or weighted least squares procedure in Panel B, where each stock is weighted in a regression by market cap-based weight in the previous month. Regressions for two horizons (monthly and annual) are reported, where the returns either over the next month or over the next year are regressed in the cross-section on the non-myopic betas for the matching horizon. M, SMB, HML, and UMD are standard [Fama and French \(1993\)](#) and [Carhart \(1997\)](#) factors. Below each premium is the t-statistic for the null that the risk premium is not different from zero. The standard errors are adjusted for autocorrelation using [Newey and West \(1987\)](#) procedure.

Panel A: OLS Regressions

Factors	Monthly horizon				Annual horizon			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
M	-0.0281 (-0.87)	-0.0319 (-0.82)	-0.0289 (-0.90)	-0.0337 (-0.87)	-0.0190 (-0.70)	-0.0215 (-0.64)	-0.0182 (-0.67)	-0.0189 (-0.56)
SMB	-	0.0168 (1.33)	-	0.0168 (1.33)	-	0.0260 (2.17)	-	0.0268 (2.22)
HML	-	0.0030 (0.2)	-	0.0031 (0.21)	-	0.0052 (0.31)	-	0.0058 (0.35)
UMD	-	-0.0340 (-1.79)	-	-0.0327 (-1.72)	-	-0.0271 (-1.89)	-	-0.0270 (-1.87)
<i>Non-myopic</i>								
FM	-0.0087 (-0.55)	0.0062 (0.49)	0.0077 (0.65)	0.0165 (1.72)	0.0016 (0.25)	-0.0013 (-0.23)	0.0066 (1.03)	0.0027 (0.49)
EWP	0.0140 (2.62)	0.0085 (2.08)	-	-	0.0026 (1.11)	0.0026 (1.29)	-	-
MSRP	-	-	0.0119 (3.21)	0.0066 (2.30)	-	-	0.0027 (1.54)	0.0028 (1.73)

Panel B: WLS Regressions

Factors	Monthly horizon				Annual horizon			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
M	-0.0349 (-0.93)	-0.0328 (-0.64)	-0.0337 (-0.90)	-0.0312 (-0.61)	-0.0253 (-0.76)	-0.0154 (-0.44)	-0.0263 (-0.79)	-0.0142 (-0.4)
SMB	-	0.0188 (1.3)	-	0.0190 (1.31)	-	0.0210 (1.58)	-	0.0212 (1.57)
HML	-	-0.0012 (-0.06)	-	-0.0012 (-0.07)	-	-0.0018 (-0.10)	-	-0.0020 (-0.11)
UMD	-	-0.0331 (-1.32)	-	-0.0330 (-1.31)	-	-0.0223 (-1.18)	-	-0.0221 (-1.19)
<i>Non-myopic</i>								
FM	-0.0007 (-0.03)	-0.0065 (-0.32)	0.0158 (0.81)	0.0085 (0.53)	-0.0053 (-0.36)	-0.0095 (-0.61)	0.0020 (0.24)	-0.0011 (-0.15)
EWP	0.0150 (1.44)	0.0114 (1.42)	-	-	0.0073 (1.61)	0.0094 (1.97)	-	-
MSRP	-	-	0.0120 (1.67)	0.0052 (0.96)	-	-	0.0086 (3.69)	0.0091 (4.39)

Fig. OA1: Tercile portfolio returns for non-myopic beta sorting

The Figure shows the tercile portfolio returns based on sorting individual stocks by non-myopic betas using equal-weighted (EWP) or maximum Sharpe ratio (MSRP) portfolios from four Fama and French (1993) and Carhart (1997) factors for monthly and annual investment horizons. Stocks are sorted by respective betas each month, and the equal- and value-weighted returns for the next month (for the monthly horizon) or for the next year (for the annual horizon) are computed. The y-axis shows the average annualized return, while the x-axis gives the average non-myopic beta of each portfolio. Construction of the alternative future efficient portfolios used for robustness is discussed in Section 8.

