Supplemental material for

On Cross-Sectional Dispersions of Market Betas in Multifactor Models

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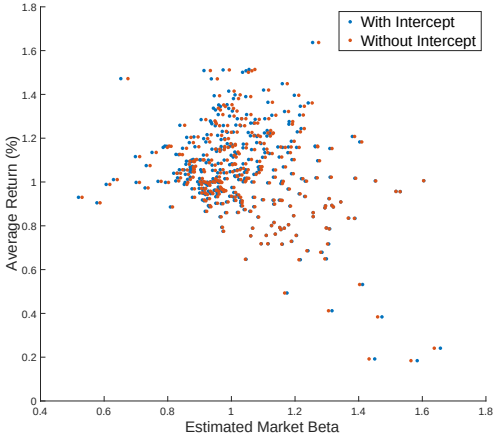
This document contains an additional figure and three tables whose results are discussed in the paper but are not part of it.

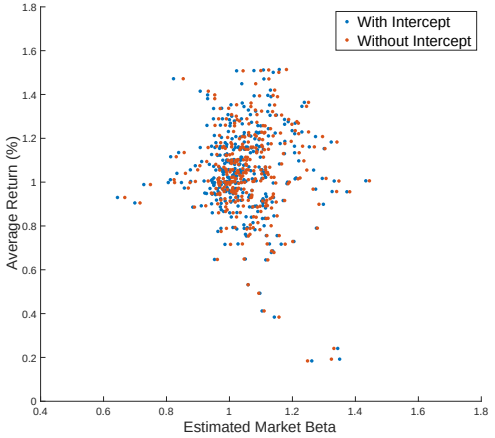
Figure A1: Distributions of Estimated MKT Betas from Regressions With and Without Intercept

The market (MKT) betas are estimated using 330 portfolio returns over the one-month treasury bill rate (RF-excess returns) from January 1970 to December 2013. The value-weighted portfolio returns, the one-month treasury bill rate, the five factors of Fama and French (2015), and the 330 test portfolio returns are from Kenneth French's webpage. The 330 portfolios are 25 Size and Book to Market, 25 Size and Investment, 25 Size and Operating Profitability, 25 Book to Market and Investment, 25 Book to Market and Operating Profitability, 25 Investment and Operating Profitability, 30 Industry, 10 Residual Variance, 10 Variance, 10 Net Share Issues, 10 Market Beta, 10 Accruals, 10 Long-term Reversal, 10 Short-term Reversal, 10 Momentum, 10 Dividend Yield, 10 Cash Flow to Price, 10 Earnings to Price, 10 Size, 10 Book to Market, 10 Investment, and 10 Operating Profitability. The five VW-PC factors are obtained from the VW-excess returns on these 330 portfolios. The market betas (the betas of the RF-excess return on the VWP "With Intercept" and the raw return on the VWP "Without Intercept") are estimated by three different factor models: the CAPM, the CAPM augmented with four of the five factors from the Fama and French's five-factor model (2015) the Market, and the CAPM augmented with the five VW-PC factors.

(a) CAPM



(b) CAPM with four of the FF5 factors



(c) CAPM with five VW-PC factors

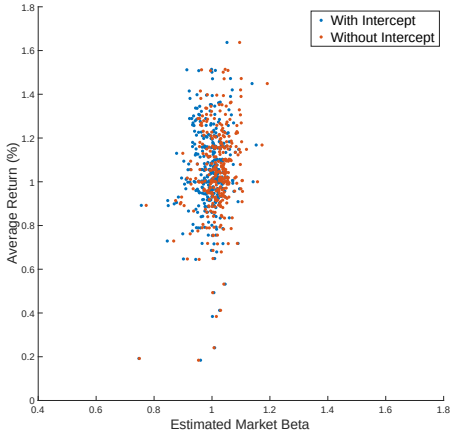
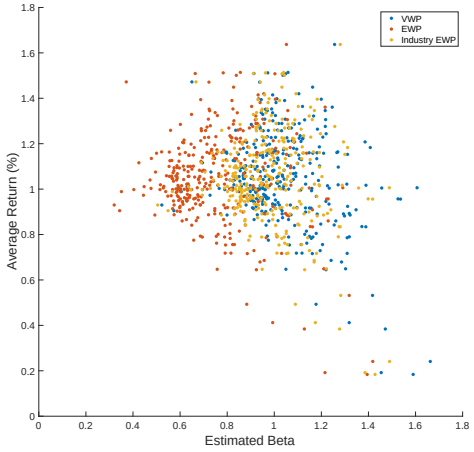


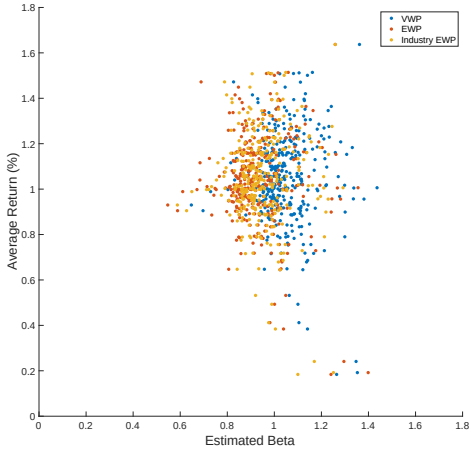
Figure A2: Distributions of VWP Betas, EWP Betas, and Industry EWP Betas (raw returns)

The portfolios' betas are estimated using 330 portfolio returns from January 1970 to December 2013. The value-weighted portfolio (VWP) returns and the equally-weighted portfolio (EWP) returns are computed using the data from the CRSP database. The Industry EWP returns are computed using the 30 Industry Fama-French portfolios. The five factors of Fama and French (2015), and the 330 test portfolio returns are from Kenneth French's webpage. The 330 portfolios are 25 Size and Book to Market, 25 Size and Investment, 25 Size and Operating Profitability, 25 Book to Market and Investment, 25 Book to Market and Operating Profitability, 25 Investment and Operating Profitability, 30 Industry, 10 Residual Variance, 10 Variance, 10 Net Share Issues, 10 Market Beta, 10 Accruals, 10 Long-term Reversal, 10 Short-term Reversal, 10 Momentum, 10 Dividend Yield, 10 Cash Flow to Price, 10 Earnings to Price, 10 Size, 10 Book to Market, 10 Investment, and 10 Operating Profitability portfolios. The five VW-PC factors are obtained from the VW-excess returns on these 330 portfolios. For each case in which either the VWP, EWP, and Industry EWP is used as factor. the betas are estimated from three different factor models: a single-factor model using each portfolio alone, each portfolio augmented with four of the five factors from the Fama and French's five-factor model (2015) excluding the Market, and each portfolio augmented with the five VW-PC factors.

(a) CAPM alone



(b) CAPM with four of the FF5 factors



(c) CAPM with five VW-PC factors

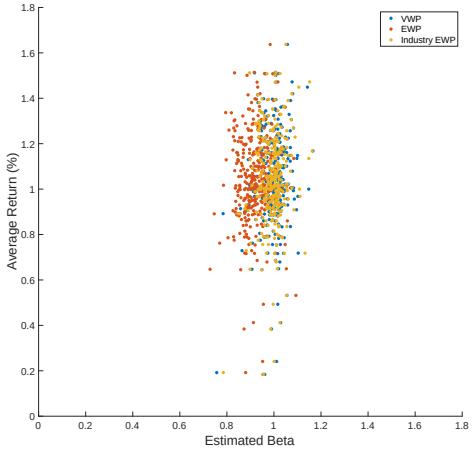
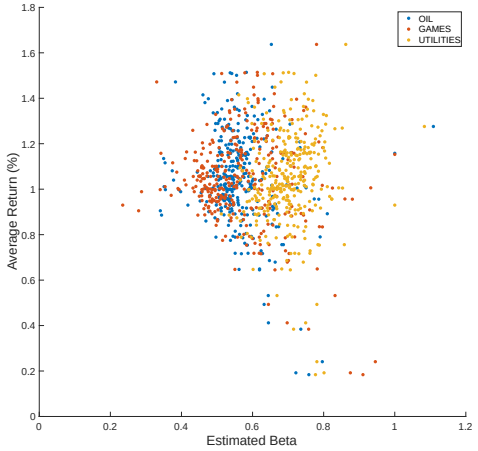


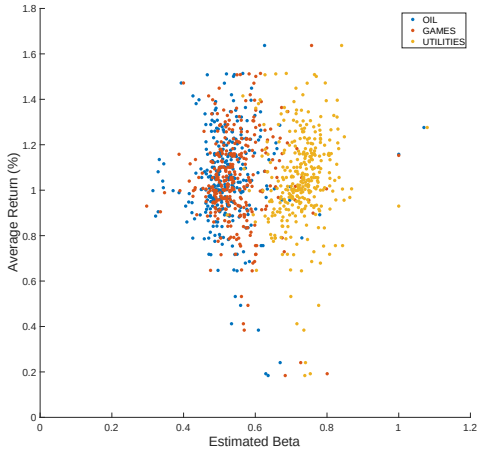
Figure A3: Distributions of Estimated VWP Betas Using Industry-Specific Portfolios as Proxy VWP (raw returns)

The VWP betas are estimated using 330 portfolio returns from January 1970 to December 2013. The single-factor model is constructed with three different industry specific portfolios from the Fama-French 30 Industry portfolios: Oil, Games and Recreation, and Utilities. The five factors of Fama and French (2015), and the 330 test portfolio returns are from Kenneth French's webpage. The 330 portfolios are 25 Size and Book to Market, 25 Size and Investment, 25 Size and Operating Profitability, 25 Book to Market and Investment, 25 Book to Market and Operating Profitability, 25 Investment and Operating Profitability, 30 Industry, 10 Residual Variance, 10 Variance, 10 Net Share Issues, 10 Market Beta, 10 Accruals, 10 Long-term Reversal, 10 Short-term Reversal, 10 Momentum, 10 Dividend Yield, 10 Cash Flow to Price, 10 Earnings to Price, 10 Size, 10 Book to Market, 10 Investment, and 10 Operating Profitability portfolios. The five VW-PC factors are obtained from the VW-excess returns on these 330 portfolios. For each case in which one of the three industry specific portfolios is used as factor. the betas are estimated from three different factor models: a single-factor model using each industry portfolio alone, each industry portfolio augmented with four of the five factors from the Fama and French's five-factor model (2015) excluding the Market, and each industry portfolio augmented with the five VW-PC factors.

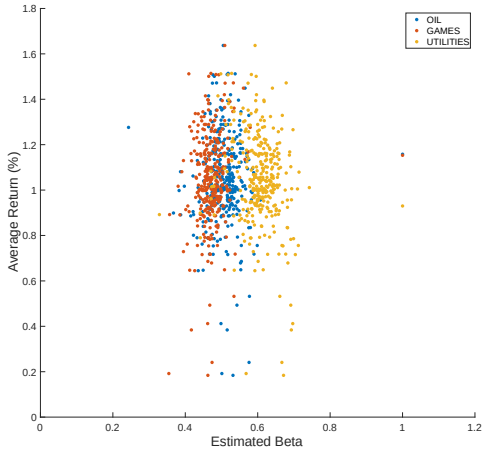
(a) CAPM



(b) CAPM with four of the FF5 factors



(c) CAPM with five VW-PC factors



Alternative Table 2: Summary Statistics from Estimated Market Betas using Raw Returns and No-Intercept

The market betas (the betas of the MKT factor) are estimated from three different models without intercept: the CAPM (one factor model with the MKT factor), the five-factor model of Fama and French (2015, FF5), and the CAPM augmented with the five VW-PC factors (CAPM plus VW-PC5). The data used for this table are the same as those used for Table 2 in the main body of the paper. For each model, the response variables are raw returns on individual stocks or the 180 tests portfolios. The five VW-PC factors are extracted from the 150 base portfolios as in Table 2 in the main body of the paper. Four different sample periods are considered. Panel (a) reports the rejection frequencies of the hypothesis that the market beta equals one ($\beta_{VW,i}=1$) for an individual asset *i* at a 5% significance level. The t-statistics are computed with the White heteroskedasticity robust OLS standard errors. Panels (b) and (c) report the magnitude of the dispersions (cross-sectional standard deviations) of the estimated market betas and the root mean square errors that are computed by $\sqrt{N^{-1}\Sigma_{i=1}^{N}(\hat{\beta}_{VW,i}-\bar{b}_{VW})^2}$ and $\sqrt{N^{-1}\Sigma_{i=1}^{N}(\hat{\beta}_{VW,i}-1)^2}$, respectively, where $\bar{b}_{VW}=N^{-1}\Sigma_{i=1}^{N}\hat{\beta}_{VW,i}$.

	N	*T*	CAPM	FF5	CAPM plus VW-PC5
Panel (a) *Rejection frequency of the hypothesis that market beta equal* 1 (*at 5% level*)					
Individual Stock Returns 1970-1980	1224	132	37%	24%	22%
Individual Stock Returns 1981-1991	1856	132	35%	28%	18%
Individual Stock Returns 1992-2002	1877	132	50%	27%	21%
Individual Stock Returns 2003-2013	2062	132	42%	31%	22%
Test Portfolio Returns 1970-1980	180	132	49%	31%	25%
Test Portfolio Returns 1981-1991	180	132	58%	54%	39%
Test Portfolio Returns 1992-2002	180	132	69%	37%	23%
Test Portfolio Returns 2003-2013	180	132	67%	48%	25%
Panel (b) *Dispersion* (*standard deviation*) *of the estimated market betas*					
Individual Stock Returns 1970-1980	1224	132	0.39	0.32	0.31
Individual Stock Returns 1981-1991	1856	132	0.38	0.37	0.37
Individual Stock Returns 1992-2002	1877	132	0.58	0.53	0.47
Individual Stock Returns 2003-2013	2062	132	0.56	0.52	0.47
Test Portfolio Returns 1970-1980	180	132	0.18	0.11	0.09
Test Portfolio Returns 1981-1991	180	132	0.14	0.10	0.08
Test Portfolio Returns 1992-2002	180	132	0.29	0.16	0.11
Test Portfolio Returns 2003-2013	180	132	0.25	0.18	0.12
Panel (c) *Root Mean Square Error*					
Individual Stock Returns 1970-1980	1224	132	0.45	0.33	0.31
Individual Stock Returns 1981-1991	1856	132	0.38	0.37	0.37
Individual Stock Returns 1992-2002	1877	132	0.62	0.53	0.47
Individual Stock Returns 2003-2013	2062	132	0.61	0.52	0.47
Test Portfolio Returns 1970-1980	180	132	0.19	0.12	0.09
Test Portfolio Returns 1981-1991	180	132	0.15	0.12	0.09
Test Portfolio Returns 1992-2002	180	132	0.30	0.17	0.11
Test Portfolio Returns 2003-2013	180	132	0.27	0.20	0.12

Alternative Table 3 using EW-excess returns: Annualized Average Absolute Pricing Errors

This table reports the estimated annualized average absolute pricing error of each of the five different models considered in Table 4. All of the results are obtained using the same data that are used for Table 1.

	N	*T*	CAPM	FF5	EW-PC1	EW-PC5	CAPM plus EW-PC5
Individual Stocks Returns 1970-1980	1224	132	0.072	0.089	0.074	0.080	0.079
Individual Stocks Returns 1981-1991	1856	132	0.104	0.113	0.090	0.093	0.094
Individual Stocks Returns 1992-2002	1877	132	0.098	0.119	0.099	0.117	0.112
Individual Stocks Returns 2003-2013	2062	132	0.085	0.096	0.088	0.089	0.092
Test Portfolios Returns 1970-1980	180	132	0.052	0.023	0.025	0.021	0.020
Test Portfolios Returns 1981-1991	180	132	0.045	0.029	0.023	0.021	0.021
Test Portfolios Returns 1992-2002	180	132	0.036	0.045	0.033	0.032	0.028
Test Portfolios Returns 2003-2013	180	132	0.028	0.035	0.017	0.014	0.018

Alternative Table 4 using EW-excess returns: Correlations between Average and Predicted Expected Returns II

This table reports the correlations between average (*ex post*) returns and predicted expected returns on individual assets. The expected returns are predicted by the same five models that are used for Table 4. For each model, the predicted expected return on asset *i* is $\hat{\mu}_i = \overline{r}_{EW} + \hat{\beta}_i'\hat{\gamma}_f$, where $\overline{r}_{EW}$ is the mean return on the EW portfolio, $\hat{\beta}_i$ is the estimated factor beta, and $\hat{\gamma}_f$ is the estimated risk premium vector by the Fama-MacBeth (1973) cross-sectional regression. All of the results are obtained using the same data that are used for Table 1.

	N	*T*	CAPM	FF5	EW-PC1	EW-PC5	CAPM plus EW-PC5
Individual Stocks Returns 1970-1980	1224	132	0.271	0.424	0.095	0.489	0.495
Individual Stocks Returns 1981-1991	1856	132	0.103	0.324	0.259	0.411	0.425
Individual Stocks Returns 1992-2002	1877	132	0.400	0.416	0.314	0.409	0.414
Individual Stocks Returns 2003-2013	2062	132	0.323	0.433	0.336	0.411	0.442
Test Portfolios Returns 1970-1980	180	132	0.093	0.498	0.109	0.592	0.635
Test Portfolios Returns 1981-1991	180	132	0.325	0.675	0.630	0.744	0.746
Test Portfolios Returns 1992-2002	180	132	0.253	0.343	0.209	0.395	0.506
Test Portfolios Returns 2003-2013	180	132	0.357	0.585	0.443	0.637	0.639