

## Appendix

**Table A1: Correlations of Factors**

Reported are the monthly correlation of returns of the Market (in excess of the T-bill rate), SMB, HML, UMD, QMJ, RMW, CMA, BAB, and CRED (which is a portfolio that is long the equities of firms with A+ rated debt or higher minus the returns of equities with B- rated debt or lower). The bottom matrix reports the correlation of the quality factors (QMJ, RMW, CMA, BAB, and CRED) after controlling for size or hedging out SMB.

<b>MKT</b>	0.31	-0.29	-0.14	-0.52	-0.21	-0.40	-0.75	-0.32
<b>SMB</b>		-0.22	-0.02	-0.54	-0.40	-0.18	-0.51	-0.46
<b>HML</b>			-0.17	0.00	0.08	0.70	0.41	0.11
<b>UMD</b>				0.24	0.10	-0.01	0.23	0.17
<b>QMJ</b>					0.74	0.07	0.64	0.53
<b>RMW</b>						-0.11	0.36	0.40
<b>CMA</b>							0.47	0.05
<b>BAB</b>								0.44
<b>CRED</b>								

**Correlation of Quality factors after hedging out size (SMB)**

<b>QMJ</b>	0.68	-0.03	0.51	0.38
<b>RMW</b>		-0.20	0.19	0.19
<b>CMA</b>			0.45	-0.02
<b>BAB</b>				0.28
<b>CRED</b>				

**Table A2: Optimal Portfolio Weights of Factors**

Reported are the mean-variance optimal portfolio weights of the various factor portfolios, focusing on the weights of SMB with and without including quality (using QMJ) in the investment opportunity set. Optimal portfolio weights are calculated from a simple mean-variance optimization using the in-sample mean and covariance matrix estimated from the full sample of returns for these factors from July 1957 to December 2012. Also reported in the final two right-most columns are the correlations of the resulting portfolios with the SMB factor as well as the in-sample Sharpe ratios of the optimal portfolios with those weights.

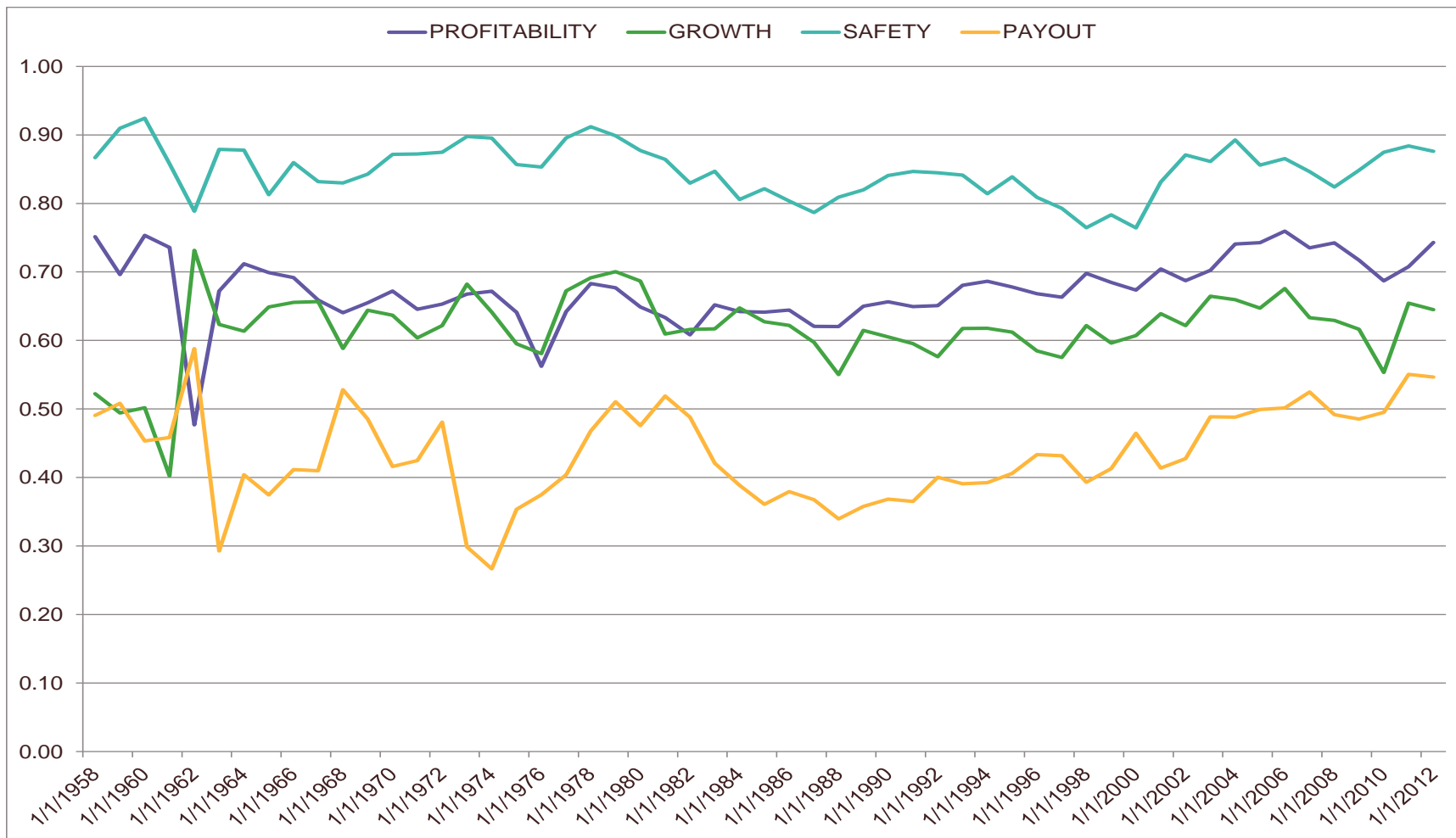
RMRF	SMB	QMJ	Corr with	
			SMB	SR
1.00			0.31	0.38
0.32		0.68	-0.28	0.91
0.59	0.41		0.64	0.40
0.19	0.24	0.57	0.24	1.09

RMRF	SMB	HML	UMD	QMJ	Corr with	
					SMB	SR
0.25		0.44	0.31		0.03	1.08
0.23		0.28	0.14	0.35	-0.27	1.36
0.20	0.12	0.41	0.27		0.23	1.11
0.16	0.17	0.22	0.08	0.36	0.16	1.57

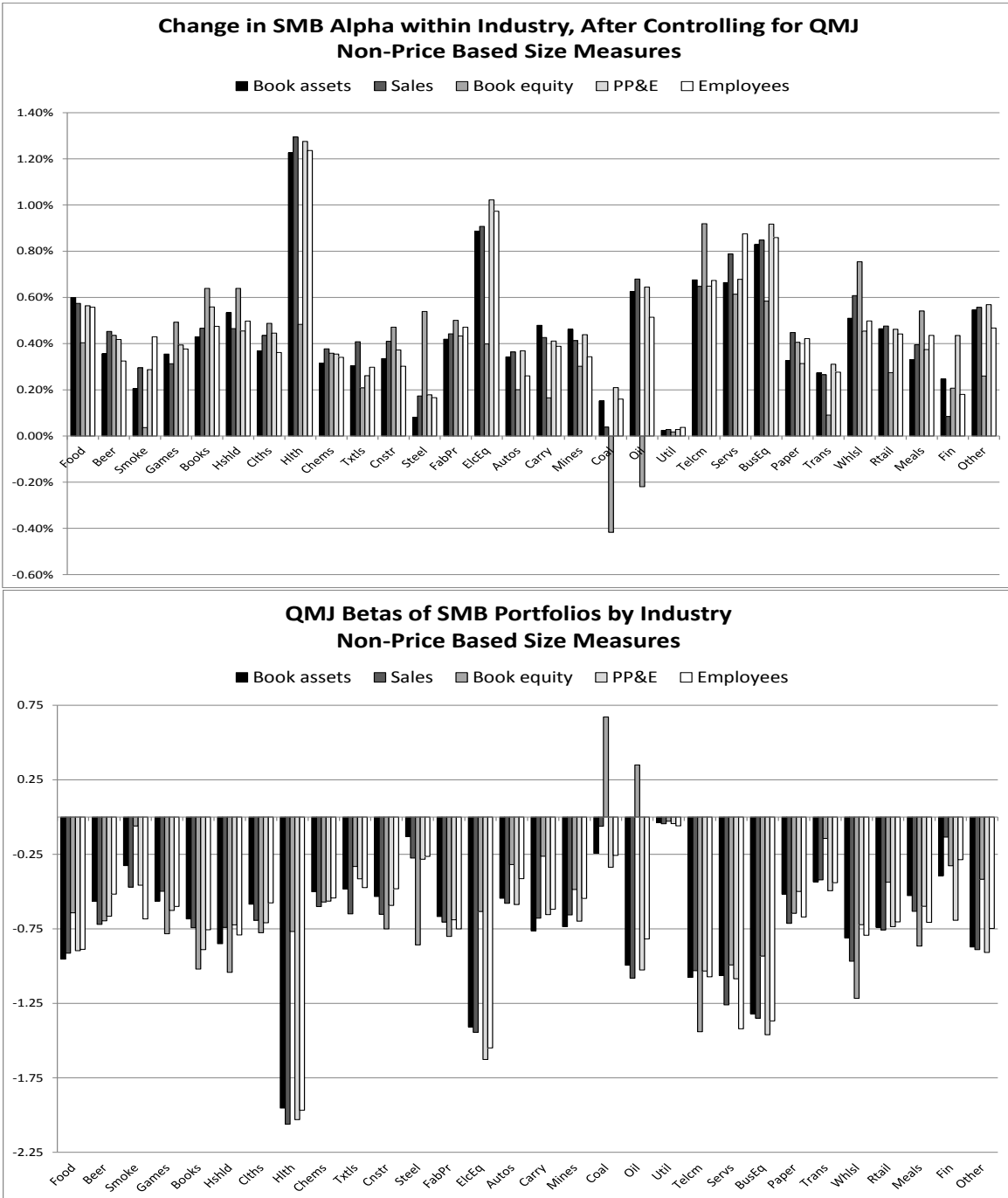
**Figure A1: Autocorrelation in Stock Quality Measures**

The figure plots the year-to-year autocorrelation of portfolio weights based on cross-sectional quality characteristics of stocks for four different measures of quality: profitability, growth, safety, and payout. Each year we take the set of stocks that exist at year  $t$  and  $t-1$  and compare the autocorrelation of their portfolio weights which are based on quality rankings from year  $t-1$  to  $t$ .



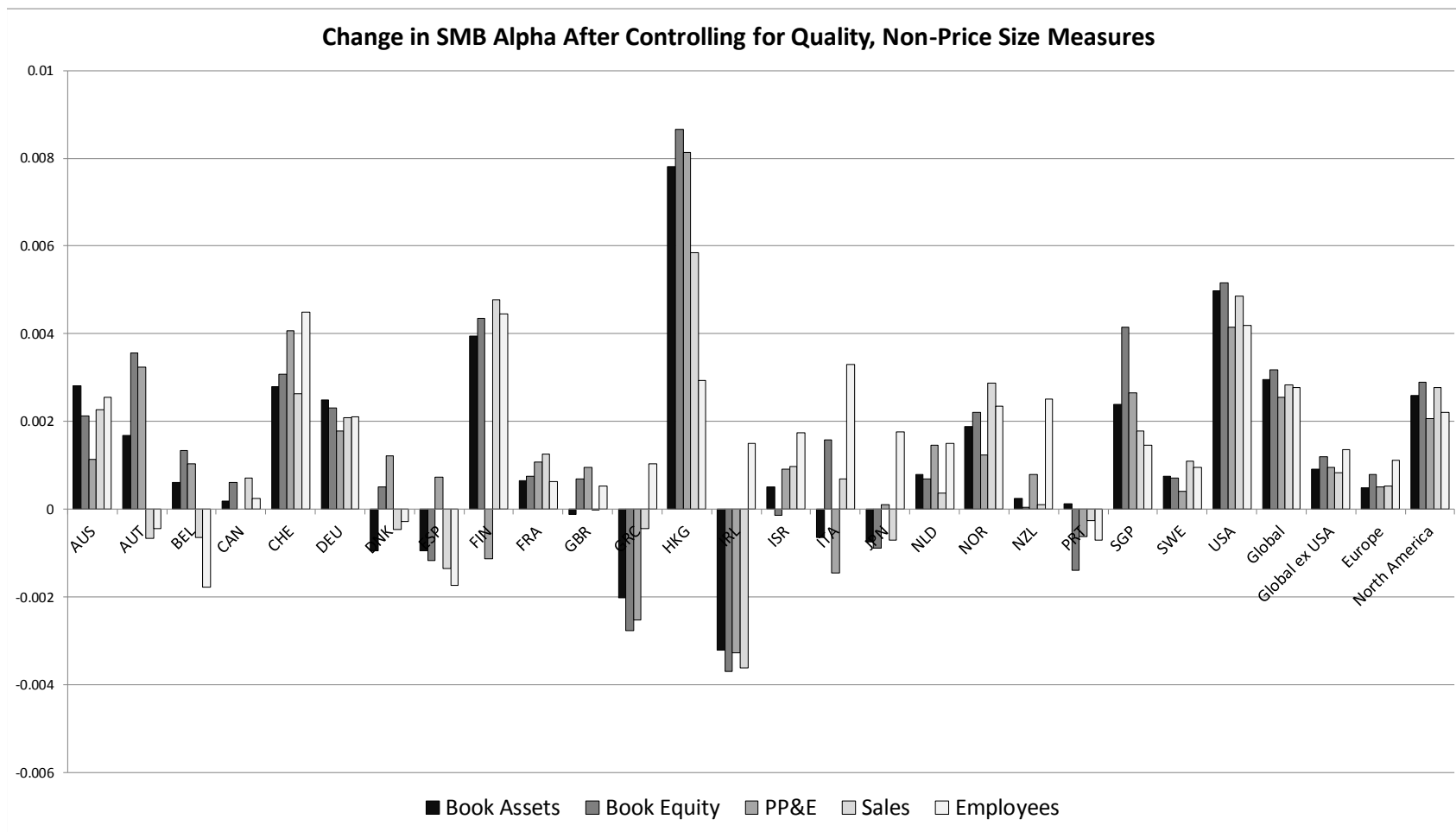
**Figure A2: Intra-Industry Evidence of Non-Price Size Premia, Controlling for Quality**

The first figure plots the improvement in SMB alphas (relative to the Fama and French factors RMRF, RMRF lagged a month, HML, and UMD) after controlling for quality within 30 industries as defined by Ken French's webpage, where SMB portfolios are formed using non-price based measures of size (book assets, book equity, PP&E, sales, and number of employees). Plotted is the difference in SMB alphas between the Fama and French factors versus the Fama and French factors augmented with the quality factor, by industry. The second figure plots the betas of each SMB portfolio on quality within each industry, using rolling five year beta estimates.

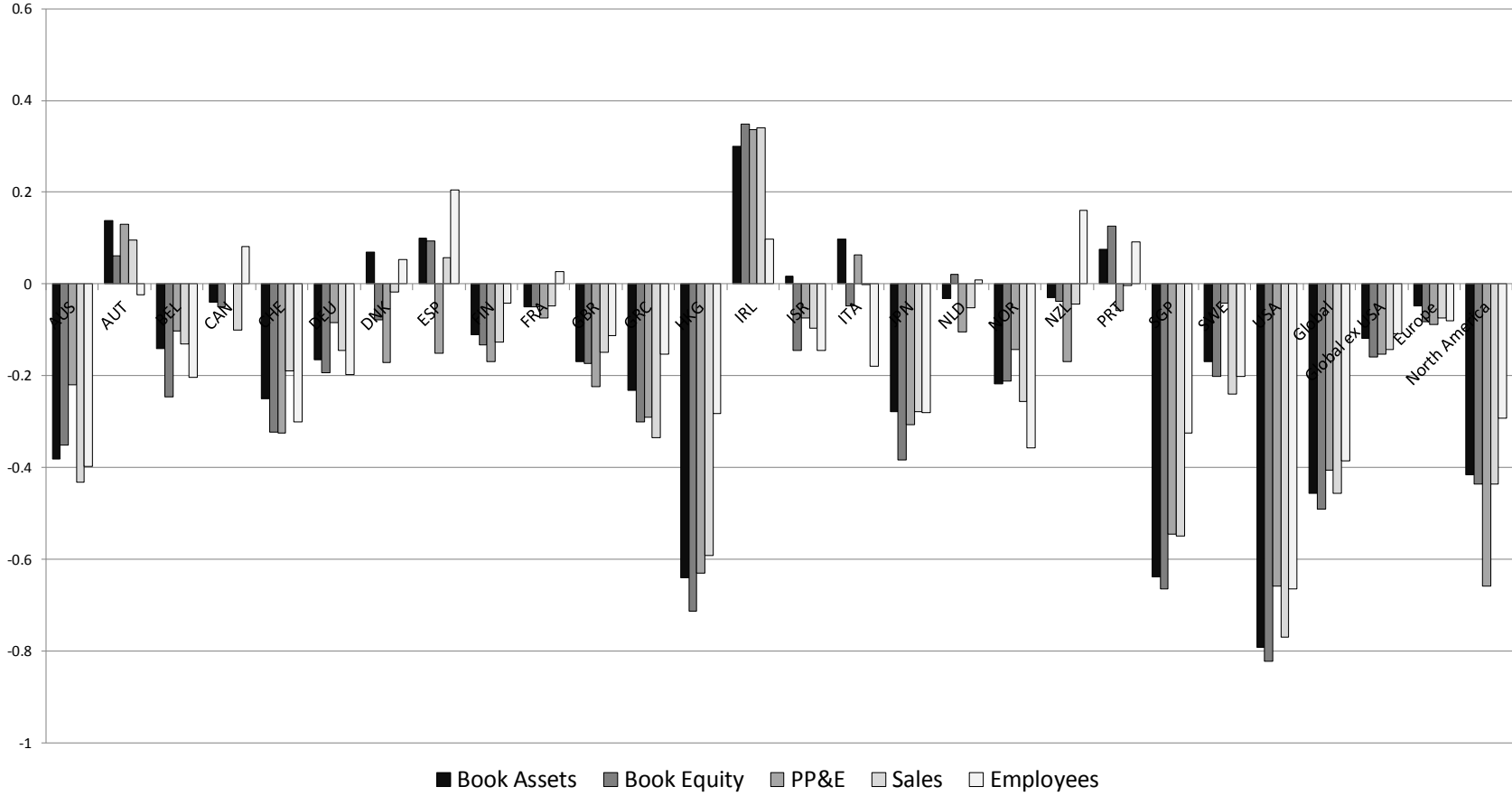


**Figure A3: International Evidence of Non-Price Size Premia, Controlling for Quality**

The first figure plots the difference in alphas between SMB regressed on the Fama and French factors and SMB regressed on the Fama and French factors plus a quality factor for each country and region, where SMB portfolios are formed using non-price based measures of size (book assets, book equity, PP&E, sales, and number of employees). The second figure plots the betas of each SMB portfolio on quality by country and region. The regressions are estimated using rolling five years of data for each country or region.



Beta of SMB on Quality, for Non-Price Size Measures



**Figure A4: Seasonal Patterns in the Size Premium Over Time, with and without Quality**

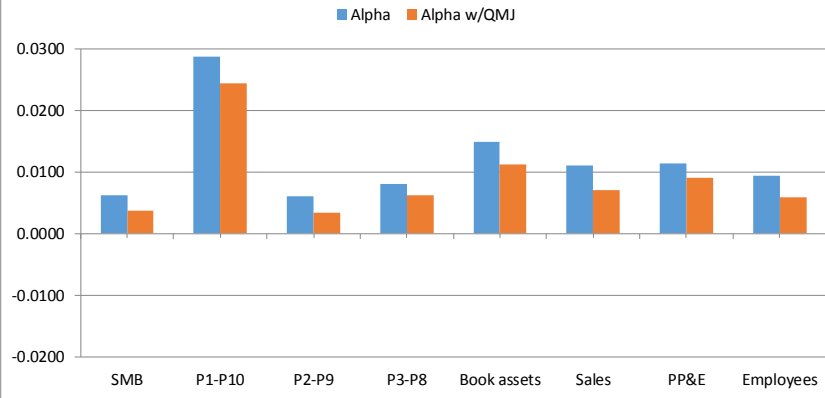
Panel A plots the alphas outside of January from February to December of various size portfolios with respect to the factors RMRF (and its lagged value), HML, and UMD both with and without quality, using Asness, Frazzini, and Pedersen's (2014) QMJ factor. Panel B plots the alphas in January only. The size portfolios include SMB, the spread in P1 – P10, P2 – P9, and P3 – P8 decile portfolios based on market cap sorts, as well as P1 – P10 spreads in decile portfolios based on sorts of book assets, sales, PP&E, and number of employees. Results are reported over four sample periods: the period over which quality is available (July 1957 to December 2012) and the sub periods for the golden age (July 1957 to December 1979), embarrassment (January 1980 to December 1999), and resurrection (January 2000 to December 2012) periods.

**Panel A: Size Premium February to December**



**Panel B: Size Premium in January**

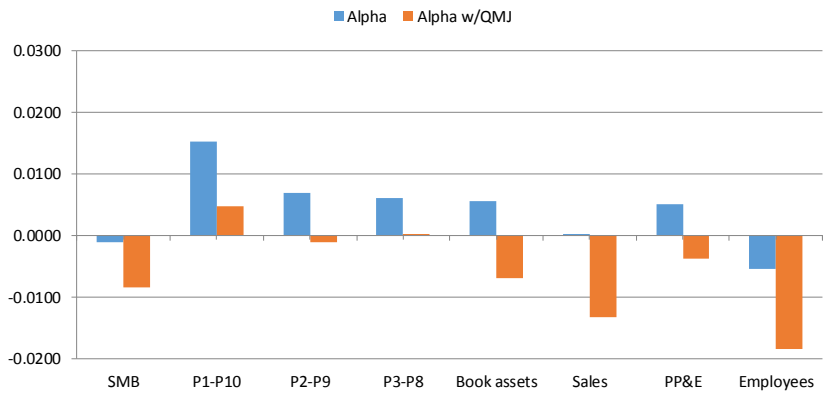
Size Premium January (Quality Sample)



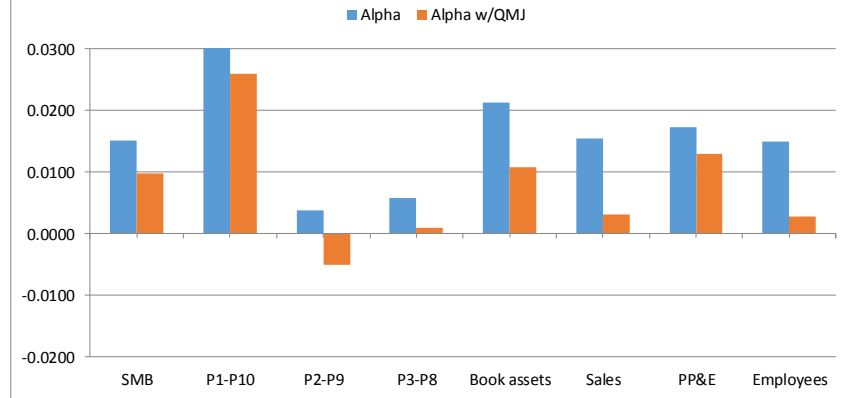
Size Premium January (Golden Age)



Size Premium January (Embarrassment)



Size Premium January (Resurrection)





**Figure A5: Seasonal Patterns in Quality and Junk Across Size**

Plotted are the  $t$ -statistics of alphas of portfolios sorted on quality and junk within small cap (smallest 20% of NYSE stocks), mid cap (middle 60% of NYSE stocks), and large cap (largest 20% of NYSE stocks) stocks. The top and bottom quintile of stocks based on sorts on quality (using Asness, Frazzini, and Pedersen's (2014) composite measure) are used to form the quality and junk portfolios, respectively, within each size group. The return spread between the quality and junk portfolios within each size group are also reported. The alphas of each portfolio are calculated with respect to the factors RMRF (and its lagged value), HML, and UMD. Results are reported for the month of January only and for February to December only over the entire sample period (1957 – 2012).

