Internet Appendix for

"Short- and Long-Horizon Behavioral Factors"

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Table A1: Summary Statistics of Factor Portfolios – Subperiods

This table reports the mean and standard deviations of monthly traded factor returns over the subsample periods of 1972-1990 (Panel A) and 1991-2014 (Panel B), respectively. In addition, we report the t-statistic testing whether the mean return is different from zero, the corresponding monthly Sharpe ratio, and the sample period for each return factor. These factors include the Mkt-Rf, SMB, HML, MOM factors proposed by Fama and French (1993) and Carhart (1997), and modified versions of these factors proposed by Novy-Marx (2013, NM4), Fama and French (2015, FF5), Hou, Xue, and Zhang (2015, HXZ4), and Stambaugh and Yuan (2017, SY4). In addition we include: the investment factors CMA and IVA of Fama and French (2015) and Hou, Xue, and Zhang (2015), the profitability factors PMU, RMW, and ROE of Novy-Marx (2013), Fama and French (2015), and Hou, Xue, and Zhang (2015), and the two mispricing factors MGMT and PERF of Stambaugh and Yuan (2017). Monthly factor returns are either from Kenneth French's web page or provided by corresponding authors. FIN and PEAD are our behavioral factors. FIN is the financing-based misvaluation factor constructed based upon two financing characteristics, net share issuance and composite issuance. PEAD is the post-earnings announcement drift factor, constructed based upon earnings surprises (measured as the four-day cumulative abnormal returns around quarterly earnings announcements).

Panel A: 1972-1990 period

	Mean	Std	t-value	SR	N	Sample period
MKT	0.32	4.95	0.97	0.07	222	1972:07 – 1990:12
SMB	0.09	2.86	0.48	0.03	222	1972:07 – 1990:12
SMB(HXZ4)	0.22	2.97	1.09	0.07	222	1972:07 – 1990:12
SMB(SY4)	0.40	2.87	2.06	0.14	222	1972:07 – 1990:12
HML	0.56	2.77	3.02	0.20	222	1972:07 – 1990:12
HML(NM4)	0.51	1.47	5.12	0.34	222	1972:07 – 1990:12
MOM	0.90	3.67	3.65	0.24	222	1972:07 – 1990:12
MOM(NM4)	0.75	2.29	4.86	0.33	222	1972:07 – 1990:12
CMA	0.47	1.81	3.86	0.26	222	1972:07 – 1990:12
IVA	0.58	1.63	5.34	0.36	222	1972:07 – 1990:12
PMU	0.16	0.87	2.83	0.19	222	1972:07 – 1990:12
RMW	0.18	1.56	1.72	0.12	222	1972:07 – 1990:12
ROE	0.70	2.26	4.61	0.31	222	1972:07 – 1990:12
MGMT	0.84	2.58	4.85	0.33	222	1972:07 – 1990:12
PERF	0.61	2.97	3.04	0.20	222	1972:07 – 1990:12
FIN	1.12	2.91	5.75	0.39	222	1972:07 – 1990:12
PEAD	0.77	1.58	7.32	0.49	222	1972:07 – 1990:12

Panel B: 1991-2014 period

	Mean	Std	t-value	SR	N	Sample period
MKT	0.69	4.30	2.74	0.16	288	1991:01 – 2014:12
SMB	0.22	3.33	1.13	0.07	288	1991:01 – 2014:12
SMB(HXZ4)	0.34	3.27	1.76	0.10	288	1991:01 – 2014:12
SMB(SY4)	0.43	2.77	2.55	0.15	276	1991:01 – 2013:12
HML	0.29	3.08	1.61	0.09	288	1991:01 – 2014:12
HML(NM4)	0.38	1.51	4.05	0.25	264	1991:01 – 2012:12
MOM	0.51	4.96	1.74	0.10	288	1991:01 – 2014:12
MOM(NM4)	0.49	3.33	2.37	0.15	264	1991:01 – 2012:12
CMA	0.29	2.05	2.41	0.14	288	1991:01 – 2014:12
IVA	0.31	2.02	2.64	0.16	288	1991:01 – 2014:12
PMU	0.36	1.39	4.22	0.26	264	1991:01 – 2012:12
RMW	0.46	2.64	2.99	0.18	288	1991:01 – 2014:12
ROE	0.45	2.81	2.72	0.16	288	1991:01 – 2014:12
MGMT	0.54	3.09	2.92	0.18	276	1991:01 – 2013:12
PERF	0.69	4.51	2.53	0.15	276	1991:01 – 2013:12
FIN	0.56	4.53	2.09	0.12	288	1991:01 – 2014:12
PEAD	0.55	2.03	4.59	0.27	288	1991:01 – 2014:12

Table A2: Factor Regressions of Behavioral Factors on Other Factors – Subperiods

This table reports the results of time-series regressions of behavioral factors on the sets of factors incorporated in other factor models: (1) the Fama-French three-factor model (FF3), (2) the Carhart four-factor model (Carhart4), (3) the profitability-based model of Novy-Marx (2013, NM4), (4) the five-factor model of Fama and French (2015, FF5), (5) the q-factor model of Hou, Xue, and Zhang (2015, HXZ4), (6) the four-factor mispricing model of Stambaugh and Yuan (2017, SY4), and (7) the "kitchen sink" model with all factors. The asterisk after factors SMB, HML and MOM means that these factors have modified versions and the asterisk after models NM4, FF5, HXZ4 and SY4 means these models use modified factors. The subsample period in Panel A is from 1972:07 to 1990:12, and the subperiod in Panel B is 1991:01 to 2014:12, depending on data availability. Newey-West corrected t-statistics (with 6 lags) are shown in parentheses.

Panel A: 1972-1990 period

	Mean		α	MKT	SMB*	HML*	MOM*	PMU	RMW	CMA	IVA	ROE	MGMT	PERF	Adj. R^2
FIN	1.12***	(1) FF3	0.84***	-0.11***	-0.19**	0.60***									51.6%
	(5.75)		(6.76)	(-2.84)	(-2.07)	(9.81)									
		(2) Carhart4	0.59***	-0.11***	-0.14**	0.66***	0.24***								60.1%
			(4.29)	(-4.04)	(-2.50)	(11.28)	(5.02)								
		(3) NM4*	0.26**	-0.17***		1.22***	0.40***	0.03							59.2%
			(1.98)	(-5.67)		(11.52)	(5.05)	(0.18)							
		(4) FF5*	0.50***	-0.07**	-0.14	0.55***			0.59***	0.55***					59.5%
			(3.79)	(-2.06)	(-1.40)	(8.18)			(4.63)	(4.94)					
		(5) HXZ4*	0.78***	-0.13***	-0.14						0.87***	-0.13			45.8%
			(4.06)	(-2.96)	(-1.37)						(7.61)	(-1.18)			
		(6) SY4*	0.17	0.02	0.04								0.98***	0.19***	64.5%
			(1.21)	(0.82)	(0.53)								(12.46)	(3.70)	
		(7) All factors	0.18	-0.00	-0.03	0.37***	0.16***	-0.16	0.40***	-0.01	0.09	-0.07	0.59***	0.08	70.1%
			(1.41)	(-0.15)	(-0.43)	(5.94)	(2.90)	(-0.92)	(4.15)	(-0.07)	(0.46)	(-0.82)	(6.03)	(1.21)	
PEAD	0.77***	(1) FF3	0.79***	-0.01	-0.07	-0.01									0.7%
	(7.32)		(7.26)	(-0.26)	(-1.13)	(-0.08)									
		(2) Carhart4	0.61***	-0.01	-0.04	0.04	0.17***								15.1%
			(6.26)	(-0.30)	(-0.73)	(0.63)	(3.59)								
		(3) NM4*	0.64***	-0.02		-0.05	0.29***	-0.29**							17.5%
			(5.56)	(-0.71)		(-0.54)	(4.83)	(-1.98)							
		(4) FF5*	0.76***	0.00	-0.08	-0.19***			-0.12	0.33***					8.8%
			(7.21)	(0.16)	(-1.39)	(-2.70)			(-1.36)	(3.58)					
		(5) HXZ4*	0.44***	0.00	-0.00						0.30***	0.23***			14.0%
			(3.97)	(0.13)	(-0.05)						(4.69)	(2.84)			
		(6) SY4*	0.50***	0.04	-0.00								0.19***	0.17***	10.7%
			(4.07)	(1.40)	(-0.02)								(3.21)	(3.54)	
		(7) All factors	0.43***	0.01	0.01	-0.09	0.08	-0.08	-0.29***	0.32*	-0.19	0.27***	0.15	0.06	26.6%
			(3.85)	(0.60)	(0.13)	(-1.41)	(1.61)	(-0.72)	(-3.54)	(1.82)	(-1.09)	(4.67)	(1.25)	(0.97)	

Panel B: 1991-2014 period

	Mean		α	MKT	SMB*	HML*	MOM*	PMU	RMW	CMA	IVA	ROE	MGMT	PERF	Adj. R^2
FIN	0.56**	(1) FF3	0.73***	-0.40***	-0.47***	0.71***									71.7%
	(2.09)		(4.38)	(-8.32)	(-6.62)	(8.85)									
		(2) Carhart4	0.68***	-0.38***	-0.48***	0.74***	0.07								72.4%
			(4.06)	(-9.53)	(-6.38)	(9.45)	(1.55)								
		(3) NM4*	-0.21	-0.34***		1.39***	-0.16	1.55***							62.6%
			(-0.89)	(-9.36)		(10.36)	(-0.97)	(4.88)							
		(4) FF5*	0.25**	-0.18***	-0.25***	0.39***			0.70***	0.54***					80.7%
			(2.10)	(-6.49)	(-4.61)	(6.12)			(8.28)	(5.41)					
		(5) HXZ4*	0.26	-0.21***	-0.35***						1.18***	0.43***			69.2%
			(1.63)	(-3.78)	(-3.69)						(9.41)	(4.09)			
		(6) SY4*	0.25*	-0.19***	-0.30*								1.00***	0.04	72.8%
			(1.76)	(-4.08)	(-1.85)								(13.69)	(0.73)	
		(7) All factors	0.02	-0.18***	-0.21***	0.37***	-0.08	0.45***	0.11	-0.58***	0.77***	0.13	0.49***	0.05	85.4%
			(0.21)	(-5.12)	(-3.77)	(4.92)	(-1.51)	(3.00)	(0.73)	(-2.99)	(4.93)	(1.53)	(7.32)	(0.75)	
PEAD	0.55***	(1) FF3	0.65***	-0.08**	0.05	-0.17***									6.0%
	(4.59)		(5.35)	(-2.57)	(0.84)	(-3.19)									
		(2) Carhart4	0.50***	-0.02	0.02	-0.12**	0.18***								22.0%
			(4.62)	(-0.61)	(0.53)	(-2.31)	(5.97)								
		(3) NM4*	0.46***	0.00		-0.14	0.31***	-0.01							23.0%
			(3.73)	(0.08)		(-1.50)	(4.78)	(-0.06)							
		(4) FF5*	0.62***	-0.08**	-0.02	-0.13**			0.02	-0.04					5.3%
			(5.08)	(-2.38)	(-0.43)	(-2.58)			(0.29)	(-0.44)					
		(5) HXZ4*	0.55***	-0.06	0.10						-0.25***	0.18**			10.1%
			(3.95)	(-1.36)	(1.23)						(-2.99)	(2.34)			
		(6) SY4*	0.43***	0.01	0.03								-0.08	0.21***	19.4%
			(3.42)	(0.32)	(0.45)								(-1.54)	(5.73)	
		(7) All factors	0.49***	-0.01	-0.01	-0.04	0.16***	-0.01	0.08	0.13	-0.26*	-0.10	-0.01	0.07	25.3%
			(4.51)	(-0.20)	(-0.23)	(-0.56)	(3.43)	(-0.04)	(0.69)	(0.76)	(-1.67)	(-0.80)	(-0.20)	(1.25)	

Table A3: Factor Regressions of Other Factors on Behavioral Factors – Subperiods

This table reports the results of time-series regressions of other factors on behavioral factors. SMB, HML, and MOM are the standard size, value, and momentum factors. PMU is the profitability factor of Novy-Marx (2013). RMW and CMA are the investment and profitability factors of Fama and French (2015). IVA and ROE are the investment and profitability factors of Hou, Xue, and Zhang (2015). MGMT and PERF are the two composite mispricing factors of Stambaugh and Yuan (2017). The subsample period in Panel A is from 1972:07 to 1990:12, and the subperiod in Panel B is 1991:01 to 2014:12, depending on data availability. Newey-West corrected t-statistics (with 6 lags) are shown in parentheses.

Panel A: 1972-1990 period

	Mean	α	FIN	PEAD	Adj. R^2	α	MKT	FIN	PEAD	Adj. R^2
SMB	0.09	0.54**	-0.27***	-0.19	8.53%	0.36	0.14**	-0.15	-0.19	12.75%
	(0.48)	(2.10)	(-2.80)	(-0.87)		(1.37)	(2.14)	(-1.22)	(-0.93)	
HML	0.56***	-0.04	0.64***	-0.14	43.68%	0.05	-0.07	0.58***	-0.14	44.75%
	(3.02)	(-0.20)	(9.17)	(-1.10)		(0.24)	(-1.60)	(7.23)	(-1.04)	
MOM	0.90***	0.01	0.20	0.86***	17.04%	-0.14	0.12	0.29**	0.86***	18.51%
	(3.65)	(0.02)	(1.26)	(3.52)		(-0.37)	(1.63)	(1.97)	(3.44)	
PMU	0.16***	0.25***	-0.06***	-0.02	3.96%	0.28***	-0.02	-0.08***	-0.02	4.61%
	(2.83)	(3.63)	(-3.46)	(-0.43)		(4.12)	(-1.48)	(-3.45)	(-0.44)	
RMW	0.18*	0.34***	-0.06	-0.11	2.14%	0.31**	0.02	-0.04	-0.12	2.06%
	(1.72)	(2.75)	(-1.42)	(-1.56)		(2.54)	(0.87)	(-0.95)	(-1.55)	
CMA	0.47***	-0.06	0.37***	0.14*	38.99%	0.02	-0.06***	0.32***	0.14*	40.99%
	(3.86)	(-0.37)	(7.28)	(1.86)		(0.17)	(-2.76)	(7.06)	(1.97)	
IVA	0.58***	0.09	0.34***	0.15**	40.64%	0.16	-0.06***	0.29***	0.15***	42.81%
	(5.34)	(0.90)	(9.58)	(2.53)		(1.62)	(-2.87)	(8.28)	(2.82)	
ROE	0.70***	0.60**	-0.21***	0.42**	12.74%	0.55**	0.04	-0.17*	0.42**	13.03%
	(4.61)	(2.54)	(-2.69)	(2.32)		(2.45)	(0.96)	(-1.85)	(2.26)	
MGMT	0.84***	0.00	0.69***	0.08	61.75%	0.21	-0.17***	0.55***	0.08	69.49%
	(4.85)	(0.00)	(15.61)	(1.02)		(1.58)	(-6.18)	(12.38)	(1.15)	
PERF	0.61***	0.30	-0.07	0.49***	5.79%	0.28	0.01	-0.05	0.49***	5.41%
	(3.04)	(1.06)	(-0.70)	(2.68)		(1.02)	(0.29)	(-0.53)	(2.67)	

Panel B: 1991-2014 period

	Mean	α	FIN	PEAD	Adj. R^2	α	MKT	FIN	PEAD	Adj. R^2
SMB	0.22	0.41***	-0.42***	0.08	33.36%	0.54***	-0.10	-0.48***	0.04	34.30%
	(1.13)	(2.67)	(-4.10)	(0.58)		(3.17)	(-1.25)	(-3.71)	(0.31)	
HML	0.29	0.19	0.43***	-0.26***	46.05%	0.00	0.16**	0.52***	-0.20***	49.26%
	(1.61)	(1.24)	(9.04)	(-4.45)		(0.00)	(2.23)	(8.88)	(-3.40)	
MOM	0.51*	-0.23	0.12	1.23***	24.56%	0.03	-0.22**	0.00	1.14***	26.72%
	(1.74)	(-0.65)	(0.73)	(4.51)		(0.10)	(-2.02)	(0.01)	(4.75)	
PMU	0.36***	0.17**	0.17***	0.16***	33.99%	0.26***	-0.07**	0.13***	0.13***	37.41%
	(4.22)	(2.14)	(9.19)	(3.04)		(3.20)	(-2.21)	(4.48)	(2.70)	
RMW	0.46***	0.14	0.30***	0.29*	28.79%	0.25**	-0.09**	0.26***	0.25	30.05%
	(2.99)	(1.19)	(4.34)	(1.67)		(2.13)	(-2.50)	(3.44)	(1.54)	
CMA	0.29**	0.17	0.26***	-0.04	32.80%	0.22*	-0.04	0.23***	-0.06	33.13%
	(2.41)	(1.62)	(4.39)	(-0.55)		(1.83)	(-0.84)	(3.38)	(-0.87)	
IVA	0.31***	0.20**	0.29***	-0.10**	45.84%	0.18*	0.02	0.30***	-0.09**	45.72%
	(2.64)	(2.15)	(6.98)	(-2.20)		(1.88)	(0.43)	(6.53)	(-2.15)	
ROE	0.45***	0.04	0.36***	0.37***	36.74%	0.17	-0.11*	0.30***	0.33***	38.31%
	(2.72)	(0.26)	(7.37)	(2.85)		(1.26)	(-1.78)	(5.25)	(2.84)	
MGMT	0.54***	0.22*	0.55***	0.02	65.96%	0.25*	-0.03	0.53***	0.01	65.94%
	(2.92)	(1.94)	(9.07)	(0.32)		(1.78)	(-0.54)	(7.06)	(0.18)	
PERF	0.69**	-0.04	0.27**	1.05***	26.15%	0.42*	-0.38***	0.07	0.89***	34.87%
	(2.53)	(-0.17)	(2.15)	(6.68)		(1.82)	(-4.11)	(0.50)	(6.69)	

Table A4: Comparative Model Performance – Subperiods

This table reports statistics that capture the ability of various factor models to explain sets of anomalies. We compare three sets of factor models. The first set includes standard factor models: the CAPM, Fama-French three-factor model (FF3), and Carhart four-factor model (Carhart4). The second set includes four recent models: the five-factor model of Fama and French (2015, FF5), the profitability-based model of Novy-Marx (2013, NM4), the q-factor model of Hou, Xue, and Zhang (2015, HXZ4), and the four-factor mispricing model of Stambaugh and Yuan (2017, SY4). The last one is our three-factor risk-and-behavioral composite model (BF3). As comparative statistics, we summarize the number of significant alphas at 5% level, the average absolute alphas and t-values, and the F-statistics and p-values that test whether the average t^2 of alphas under a given model is significantly larger than the average t^2 of our BF3 model alphas. The subsample period in Panel A is from 1972:07 to 1990:12, and the subperiod in Panel B is 1991:01 to 2014:12, depending on data availability.

Panel A: 1972-1990 period

		H-L Ret	CAPM	FF3	Carhart4	FF5	NM4	HXZ4	SY4	BF3
Short-horizon anomalies (12)	N. significant α at 5%	9	10	12	8	12	5	2	7	0
	Average $\lvert\alpha\rvert$	0.72	0.73	0.98	0.50	0.88	0.48	0.24	0.44	0.30
	Average $\lvert t\rvert$	2.92	3.00	4.50	2.68	3.97	2.08	1.11	1.89	0.78
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	9.68***	10.15***	21.59***	9.51***	17.46***	5.71***	1.93	5.03***	
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.13)	(0.00)	
Long-horizon anomalies (22)	N. significant α at 5%	13	16	6	3	2	1	6	2	0
	Average $\lvert\alpha\rvert$	0.56	0.59	0.33	0.25	0.17	0.16	0.30	0.19	0.16
	Average $\lvert t\rvert$	2.26	2.52	1.71	1.27	0.91	0.61	1.28	0.85	0.51
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	13.19***	16.87***	9.45***	5.86***	3.30***	1.63	5.33***	2.33**	
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.13)	(0.00)	(0.03)	
All anomalies (34)	N. significant α at 5%	22	26	18	11	14	6	8	9	0
	Average $\lvert\alpha\rvert$	0.62	0.64	0.56	0.34	0.43	0.28	0.28	0.28	0.21
	Average $\lvert t\rvert$	2.49	2.69	2.69	1.77	1.99	1.13	1.22	1.21	0.60
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	11.28***	13.23***	16.03***	7.84***	10.98***	3.85***	3.48***	3.80***	
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

Panel B: 1991-2014 period

		H-L Ret	CAPM	FF3	Carhart4	FF5	NM4	HXZ4	SY4	BF3
Short-horizon anomalies (12)	N. significant α at 5%	3	8	9	5	4	2	1	1	0
	Average $\lvert\alpha\rvert$	0.49	0.68	0.75	0.35	0.43	0.27	0.16	0.24	0.10
	Average $\lvert t\rvert$	1.80	2.78	3.18	1.69	1.78	1.01	0.71	0.94	0.42
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	13.36***	29.72***	39.06***	14.88***	13.74***	5.84***	4.05**	4.63**	
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	
Long-horizon anomalies (22)	N. significant α at 5%	6	14	7	7	4	3	6	1	4
	Average $\lvert\alpha\rvert$	0.41	0.50	0.36	0.32	0.24	0.25	0.24	0.17	0.25
	Average $\lvert t\rvert$	1.64	2.03	1.77	1.60	1.20	0.93	1.04	0.77	1.06
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	1.78*	2.75**	2.58**	2.09*	1.17	0.90	1.09	0.54	
	p-value	(0.09)	(0.01)	(0.02)	(0.05)	(0.36)	(0.60)	(0.42)	(0.92)	
All anomalies (34)	N. significant α at 5%	9	22	16	12	8	5	7	2	4
	Average $\lvert\alpha\rvert$	0.44	0.57	0.50	0.33	0.31	0.26	0.21	0.19	0.20
	Average $\lvert t\rvert$	1.69	2.30	2.26	1.63	1.40	0.96	0.93	0.83	0.83
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	2.75***	5.03***	5.67***	3.17***	2.24**	1.31	1.34	0.88	
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.22)	(0.20)	(0.64)	

Table A5: Comparative Model Performance – Excluding Microcaps

This table reports statistics that capture the ability of various factor models to explain sets of anomalies when the stocks of microcaps (firms with size below the 20^{th} percentile of NYSE firms) are excluded from the test assets (anomaly portfolios). We compare three sets of factor models. The first set includes standard factor models: the CAPM, Fama-French three-factor model (FF3), and Carhart four-factor model (Carhart4). The second set includes four recent models: the five-factor model of Fama and French (2015, FF5), the profitability-based model of Novy-Marx (2013, NM4), the q-factor model of Hou, Xue, and Zhang (2015, HXZ4), and the four-factor mispricing model of Stambaugh and Yuan (2017, SY4). The last set includes our three-factor risk-and-behavioral composite model (BF3) and an alternative BF3 model (BF3 alt.) in which we exclude microcaps from the FIN and PEAD factors. As comparative statistics, we summarize the number of significant alphas at 5% level, the average absolute alphas and t-values, and the F-statistics and p-values that test whether the average t^2 of alphas under a given model is significantly larger than the average t^2 of our BF3 model alphas.

		H-L Ret	CAPM	FF3	Carhart4	FF5	NM4	HXZ4	SY4	BF3	BF3 (alt.)
Short-horizon anomalies (12)	N. significant α at 5%	10	12	12	6	10	3	1	2	0	0
	Average $\lvert\alpha\rvert$	0.48	0.55	0.70	0.28	0.48	0.27	0.18	0.19	0.10	0.11
	Average $\lvert t\rvert$	2.76	3.25	4.15	1.95	2.75	1.48	1.00	1.26	0.67	0.64
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	9.33***	12.43***	19.73***	5.92***	9.52***	3.81**	2.11	2.76*		0.55
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.11)	(0.05)		(0.84)
Long-horizon anomalies (22)	N. significant α at 5%	15	18	11	8	5	3	5	1	3	3
	Average $\lvert\alpha\rvert$	0.40	0.48	0.28	0.24	0.16	0.17	0.19	0.10	0.19	0.24
	Average $\lvert t\rvert$	2.31	2.81	1.92	1.62	1.13	0.92	1.16	0.60	1.05	1.43
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	3.62***	5.54***	3.18***	2.23**	1.36	0.99	1.31	0.45		1.50
	p-value	(0.00)	(0.00)	(0.00)	(0.03)	(0.24)	(0.51)	(0.27)	(0.97)		(0.17)
All anomalies (34)	N. significant α at 5%	25	30	23	14	15	6	6	3	3	3
	Average $\lvert\alpha\rvert$	0.43	0.51	0.43	0.25	0.27	0.21	0.19	0.13	0.16	0.20
	Average $\lvert t\rvert$	2.47	2.96	2.70	1.74	1.70	1.12	1.11	0.83	0.92	1.15
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	4.99***	7.20***	7.16***	3.12***	3.33***	1.67*	1.50	1.01		1.27
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.07)	(0.12)	(0.49)		(0.24)

Table A6: Comparative Model Performance – Excluding Stocks Below $5

This table reports statistics that capture the ability of various factor models to explain sets of anomalies, when excluding all stocks with prices < $5 from the test assets (anomaly portfolios). We compare three sets of factor models. The first set includes standard factor models: the CAPM, Fama-French three-factor model (FF3), and Carhart four-factor model (Carhart4). The second set includes four recent models: the five-factor model of Fama and French (2015, FF5), the profitability-based model of Novy-Marx (2013, NM4), the q-factor model of Hou, Xue, and Zhang (2015, HXZ4), and the four-factor mispricing model of Stambaugh and Yuan (2017, SY4). The last set includes our three-factor risk-and-behavioral composite model (BF3) and an alternative BF3 model (BF3 alt.) in which we impose the prices < $5 condition in the construction of the FIN and PEAD factors. As comparative statistics, we summarize the number of significant alphas at 5% level, the average absolute alphas and t-values, and the F-statistics and p-values that test whether the average t^2 of alphas under a given model is significantly larger than the average t^2 of our BF3 model alphas.

		H-L Ret	CAPM	FF3	Carhart4	FF5	NM4	HXZ4	SY4	BF3	BF3 (alt.)
Short-horizon anomalies (12)	N. significant α at 5%	11	12	12	7	11	4	2	5	0	0
	Average $\lvert\alpha\rvert$	0.58	0.65	0.80	0.36	0.58	0.25	0.23	0.24	0.11	0.12
	Average $\lvert t\rvert$	3.30	3.79	4.72	2.48	3.35	1.47	1.30	1.56	0.55	0.62
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	31.00***	39.77***	60.57***	22.36***	31.92***	8.72***	7.89***	10.54***		1.30
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.33)
Long-horizon anomalies (22)	N. significant α at 5%	18	20	13	9	7	3	5	2	3	4
	Average $\lvert\alpha\rvert$	0.44	0.52	0.30	0.26	0.17	0.18	0.20	0.10	0.21	0.24
	Average $\lvert t\rvert$	2.55	3.03	2.10	1.76	1.20	0.96	1.21	0.62	1.21	1.42
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	3.28***	4.77***	2.83**	1.97*	1.23	0.74	1.14	0.40		1.19
	p-value	(0.00)	(0.00)	(0.01)	(0.06)	(0.32)	(0.76)	(0.38)	(0.98)		(0.34)
All anomalies (34)	N. significant α at 5%	29	32	25	16	18	7	7	7	3	4
	Average $\lvert\alpha\rvert$	0.49	0.56	0.48	0.29	0.31	0.20	0.21	0.15	0.18	0.20
	Average $\lvert t\rvert$	2.81	3.30	3.02	2.01	1.96	1.14	1.24	0.95	0.98	1.14
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	5.81***	7.97***	8.10***	3.83***	4.03***	1.47	1.75*	1.32		1.20
	p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.13)	(0.05)	(0.21)		(0.30)

Table A7: Comparative Model Performance – Adding SMB, HML, or PMU Factor

This table reports statistics that capture the ability of various factor models to explain sets of anomalies. We compare our three-factor risk-and-behavioral composite model (BF3) with alternative four-factor models, which supplement the BF3 model with the size factor (SMB), the value factor (HML), and the profitability factor (PMU) of Novy-Marx (2013), respectively. As comparative statistics, we summarize the number of significant alphas at 5% level, the average absolute alphas and t-values, and the F-statistics and p-values that test whether the average t^2 of alphas under a given model is significantly larger than the average t^2 of our BF3 model alphas.

Panel A: Short-horizon anomalies

	List of Anomalies		H-L Ret	BF3	BF3 + SMB	BF3 + HML	BF3 + PMU
Earnings momentum (5)	Standardized unexpected earnings	SUE-1	0.40***	0.08	0.09	0.09	-0.01
		SUE-6	0.19*	-0.01	0.01	0.01	-0.07
	CAR around earnings announcements	ABR-1	0.79***	-0.04	-0.02	-0.05	-0.07
		ABR-6	0.28***	-0.06	-0.05	-0.05	-0.09
	Revisions in analysts' earnings forecasts	RE-1	0.60***	0.18	0.26	0.19	0.08
Return momentum (3)	Past returns	R6-6	0.72***	-0.08	-0.13	-0.04	-0.17
		R11-1	1.18***	0.10	0.01	0.15	-0.06
	Industry momentum	I-MOM	0.62***	-0.26	-0.36	-0.23	-0.35
Profitability (4)	Quarterly ROE	ROEQ	0.75***	0.12	0.42*	0.20	-0.25
	Quarterly ROA	ROAQ	0.53**	-0.07	0.22	0.02	-0.41*
	N. consecutive qtrs with earnings increases	NEI	0.34***	0.04	0.17	0.10	-0.11
	Failure probability	FP	-0.58*	0.20	-0.13	0.16	0.69**
Short-horizon anomalies (12)	N. significant α at 5%		10	0	0	0	1
	Average $\lvert\alpha\rvert$		0.58	0.10	0.16	0.11	0.20
	Average $\lvert t\rvert$		3.11	0.49	0.76	0.54	0.89
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$		34.84***		2.76**	1.22	4.09**
	p-value		(0.00)		(0.05)	(0.37)	(0.01)

Panel B: Long-horizon anomalies

	List of Anomalies		H-L Ret	BF3	BF3 + SMB	BF3 + HML	BF3 + PMU
Profitability (2)	Gross profits-to-assets	GP/A	0.22	0.06	0.08	0.13	-0.18
	Cash-based operating profitability	CbOP	0.42**	0.14	0.44**	0.23	-0.13
Value (5)	Book-to-market	B/M	0.62***	0.36	0.03	0.21	0.61***
	Earnings-to-price	E/P	0.47**	0.22	0.03	0.10	0.40*
	Cash flow-to-price	CF/P	0.45**	0.21	0.05	0.09	0.41**
	Net payout yield	NPY	0.65***	0.11	0.15	0.08	0.10
	Equity duration	DUR	-0.64***	-0.38*	-0.12	-0.24	-0.60***
Investment and financing (11)	Asset growth	AG	-0.43**	-0.13	-0.01	-0.06	-0.27
	Net operating assets	NOA	-0.38**	-0.27*	-0.32**	-0.30**	-0.20
	Investment-to-assets	IVA	-0.50***	-0.27*	-0.16	-0.24	-0.39**
	Investment growth	IG	-0.38***	-0.22	-0.11	-0.19	-0.27**
	Inventory growth	IvG	-0.33**	-0.09	-0.08	-0.06	-0.23
	Inventory changes	IvC	-0.45***	-0.42**	-0.37**	-0.39**	-0.56***
	Operating accruals	OA	-0.24*	-0.29*	-0.38***	-0.29*	-0.44***
	Percent operating accruals	POA	-0.39***	-0.12	-0.16	-0.08	-0.21
	Percent total accruals	PTA	-0.40***	-0.05	-0.07	-0.03	-0.09
	Net share issuance	NSI	-0.69***	-0.11	-0.11	-0.13	-0.06
	Composite issuance	CSI	-0.56***	-0.04	-0.08	-0.01	-0.08
Intangibles (4)	Organizational capital-to-assets	OC/A	0.40**	0.47***	0.21	0.45***	0.60***
	Advertisement expense-to-market	AD/M	0.67***	0.52*	0.13	0.41*	0.78***
	R&D-to-market	RD/M	0.71***	0.83***	0.45*	0.75***	0.99***
	Operating leverage	OL	0.37*	0.08	-0.02	0.09	-0.15
Long-horizon anomalies (22)	N. significant α at 5%		19	3	4	4	10
	Average $\lvert\alpha\rvert$		0.47	0.25	0.16	0.21	0.35
	Average $\lvert t\rvert$		2.63	1.33	1.03	1.23	1.83
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$		3.00***		0.70	0.91	1.77*
	p-value		(0.01)		(0.80)	(0.59)	(0.09)

Panel C: All anomalies

		H-L Ret	BF3	BF3 + SMB	BF3 + HML	BF3 + PMU
All anomalies (34)	N. significant α at 5%	29	3	4	4	11
	Average $\lvert\alpha\rvert$	0.51	0.20	0.16	0.17	0.30
	Average $\lvert t\rvert$	2.80	1.03	0.93	0.99	1.50
	F-stat $= \frac{Average\ t^2}{Average\ t^2_{BF3}}$	5.08***		0.84	0.93	1.92**
	p-value	(0.00)		(0.69)	(0.58)	(0.03)

References

Carhart, M. M., 1997, "On Persistence in Mutual Fund Performance," *Journal of Finance*, 52(1), 57–82.

Fama, E. F., and K. R. French, 1993, "Common risk factors in the returns on stocks and bonds," *Journal of Financial Economics*, 33, 3–56.

——— , 2015, "A Five-Factor Asset Pricing Model," *Journal of Financial Economics*, 116(1), 1–22.

Hou, K., C. Xue, and L. Zhang, 2015, "Digesting Anomalies: An Investment Approach," *Review of Financial Studies*, 28(3), 650–705.

Novy-Marx, R., 2013, "The other side of value: The gross profitability premium," *Journal of Financial Economics*, 108(1), 1–28.

Stambaugh, R. F., and Y. Yuan, 2017, "Mispricing Factors," *Review of Financial Studies*, 30, 1270–1315.