Online Appendix
Twin Momentum: Fundamental Trends Matter

This appendix provides the complete results for the robustness checks discussed in the paper. Below, we briefly describe the contents of the appendix tables.

- **Table A1:** Single sort on fundamental implied return (FIR) within each industry: value-weighted.
- **Table A2:** Loadings of fundamental momentum: value-weighted.
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- **Table A5:** Summary statistics of price, fundamental, and twin momentum returns: equally-weighted.
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- **Table A11:** Momentums in good and bad times: value-weighted.

Table A1 Single sort on fundamental implied return (FIR) within each industry: value-weighted

This table reports the average monthly returns of FIR quintile portfolios in excess of the one-month T-bill rate as well as the difference between the highest and lowest FIR quintile portfolios. Within each industry, we sort stocks into five groups at the beginning of each month based on their fundamental implied returns (FIRs), which is based on seven earnings- and profitability-related variables and constructed as in Section 2.3. Newey-West t-statistics with 12 lags are reported in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	No. of firms	Low FIR	2	3	4	High FIR	High-Low
Consumer	466	0.48*	0.53**	0.75***	0.88***	0.95***	0.47**
		(1.82)	(2.25)	(3.29)	(4.12)	(3.52)	(2.29)
Manufacturing	399	0.29	0.60***	0.49**	0.55**	0.80***	0.51**
		(1.08)	(2.74)	(2.28)	(2.38)	(3.54)	(2.37)
High Tech	412	0.29	0.61*	0.66**	0.50	1.23***	0.95***
		(0.78)	(1.69)	(2.10)	(1.48)	(3.38)	(3.60)
Health	342	0.61	0.90***	0.67**	0.99	1.24***	0.63
		(1.58)	(2.66)	(2.30)	(2.79)	(3.06)	(1.33)
Others	422	0.49*	0.66***	0.69***	0.80***	0.74**	0.25
		(1.66)	(2.74)	(2.91)	(3.13)	(2.59)	(1.49)
Average		0.41*	0.60**	0.65***	0.75***	0.97***	0.56***
		(1.67)	(2.01)	(2.66)	(3.05)	(2.74)	(2.75)

Table A2 Loadings of fundamental momentum: value-weighted

This table reports the loadings of fundamental momentum on the risk factors of the CAPM, Fama and French (FF3, 1993) three-factor model, FF3 plus a price momentum factor model (FF3M), Hou, Xue, and Zhang (HXZ, 2015) four-factor model, and Fama and French (FF5, 2015) five-factor model, respectively. Newey-West t-values are reported in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	CAPM	FF3	FF3M	HXZ	FF5
Alpha (%)	0.95***	0.98***	0.81***	0.72**	0.85***
	(4.24)	(4.15)	(3.79)	(2.22)	(3.00)
MKT	−0.10	−0.13	−0.10	−0.08	−0.08
	(−1.29)	(−1.47)	(−1.24)	(−0.78)	(−0.91)
SMB		0.08	0.07	0.14	0.02
		(0.35)	(0.30)	(0.54)	(0.13)
HML		−0.11	−0.05		−0.41*
		(−0.60)	(−0.32)		(−1.94)
MOM			0.17		
			(1.21)		
I/A				0.12	
				(0.45)	
ROE				0.17	
				(0.72)	
RMW					−0.05
					(−0.18)
CMA					0.70**
					(2.48)
R^2 (%)	0.64	1.22	2.98	1.69	4.57

Table A3 Single sort on fundamental implied return (FIR): equally-weighted

At the end of each month t, we sort stocks into five groups based on their fundamental implied returns (FIRs) and construct the fundamental momentum by buying the highest FIR quintile portfolio and selling the lowest FIR quintile portfolio, where all portfolios are equally-weighted and monthly rebalanced. This table reports the average returns and alphas from the CAPM, Fama and French (FF3, 1993) three-factor model, FF3 plus a price momentum factor model (FF3M), Hou, Xue, and Zhang (HXZ, 2015) four-factor model, and Fama and French (FF5, 2015) five-factor model, respectively. Newey-West t-values are in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Low FIR	2	3	4	High FIR	High-Low
Average return	0.23	0.66**	0.94***	1.23***	1.69***	1.47***
	(0.68)	(2.40)	(3.53)	(4.47)	(4.70)	(5.70)
CAPM alpha	−0.51***	0.00	0.31**	0.61***	1.01***	1.52***
	(−2.65)	(0.02)	(2.36)	(4.30)	(4.48)	(5.85)
FF3 alpha	−0.63***	−0.16*	0.13*	0.42***	0.86***	1.48***
	(−3.65)	(−1.68)	(1.89)	(5.13)	(4.67)	(5.20)
FF3M alpha	−0.27	0.03	0.27***	0.55***	0.97***	1.24***
	(−1.25)	(0.29)	(3.84)	(5.80)	(5.09)	(3.81)
HXZ alpha	0.02	0.13	0.30***	0.58***	1.08***	1.05**
	(0.06)	(0.67)	(2.77)	(6.47)	(4.79)	(1.96)
FF5 alpha	−0.36	−0.09	0.14*	0.44***	0.98***	1.34***
	(−1.39)	(−0.67)	(1.74)	(5.00)	(4.87)	(3.46)

Table A4 Double sort on past return and fundamental implied return: equally-weighted

This table reports the average returns of portfolios sorted by past return and fundamental implied return (FIR), where past return is the cumulative return from month $t-12$ to month $t-1$. All portfolios are equally-weighted and monthly rebalanced. Newey-West t-values are reported in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Fundamental MOM					
Price MOM	Low FIR	2	3	4	High FIR	High-Low
Low past return	0.08	0.37	0.63*	0.91**	1.34***	1.25***
	(0.18)	(0.94)	(1.66)	(2.22)	(2.73)	(4.09)
2	0.00	0.41	0.77***	1.10***	1.41***	1.41***
	(0.00)	(1.41)	(2.71)	(3.81)	(4.18)	(6.31)
3	0.08	0.68***	0.90***	1.17***	1.60***	1.52***
	(0.26)	(2.75)	(3.73)	(4.86)	(5.15)	(6.53)
4	0.32	0.86***	1.04***	1.26***	1.73***	1.41***
	(1.09)	(3.52)	(4.36)	(5.15)	(5.48)	(5.62)
High past return	0.91***	1.19***	1.41***	1.54***	1.93***	1.02***
	(2.68)	(4.01)	(4.67)	(5.20)	(5.29)	(4.65)
High-Low	0.83**	0.82***	0.78***	0.63**	0.59*	
	(2.37)	(3.14)	(2.85)	(2.08)	(1.90)	

Table A5 Summary statistics of price, fundamental, and twin momentum returns: equally-weighted

This table reports summary statistics of the price, fundamental, and twin momentum portfolio returns over the full sample period 1976:04–2015:09. At the end of each month t, we independently sort stocks into quintile portfolios by past return and FIR. Price, fundamental, and twin momentum portfolios are respectively formed by buying stocks in the top quintile of past return or FIR or both, and selling stocks in the corresponding bottom quintile. All portfolios are equally-weighted and monthly rebalanced. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

						Correlation	
	Average return	t-value	Volatility	Skewness	Kurtosis	P-MOM	F-MOM
Price MOM	0.81	2.68	6.30	−3.23	27.25		0.28***
Fundamental MOM	1.47	5.65	5.63	−0.63	37.76		
Twin MOM	1.82	4.52	8.23	−2.35	32.02	0.70***	0.68***

Table A6 Average returns and alphas of long- and short-legs: equally-weighted

This table report the average returns of the long- and short-leg portfolios of price, fundamental, and twin momentums, and their alphas of the CAPM, Fama and French (FF3, 1993) three-factor model, FF3 plus a price momentum factor model (FF3M), Hou, Xue, and Zhang (HXZ, 2015) four-factor model, and Fama and French (FF5, 2015) five-factor model. All portfolios are equally-weighted and rebalanced monthly. Newey-West t-values are reported in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Average	Alphas				
	return	CAPM	FF3	FF3M	HXZ	FF5
Panel A: Long-leg						
Price MOM	1.44***	0.72***	0.65***	0.36***	0.54***	0.65***
	(4.54)	(4.07)	(6.53)	(4.31)	(4.03)	(5.97)
Fundamental MOM	1.69***	1.01***	0.85***	0.97***	1.08***	0.98***
	(4.69)	(4.47)	(4.66)	(5.07)	(4.79)	(4.85)
Twin MOM	1.92***	1.21***	1.17***	0.86***	1.06***	1.20***
	(5.28)	(5.18)	(6.44)	(5.87)	(4.24)	(5.69)
Panel B: Short-leg						
Price MOM	0.63	−0.5**	−0.62***	−0.26	0.02	−0.36
	(1.49)	(−2.60)	(−3.60)	(−1.23)	(0.06)	(−1.36)
Fundamental MOM	0.22	−0.16	−0.36	0.46**	0.82**	0.11
	(0.71)	(−0.61)	(−1.57)	(2.18)	(2.01)	(0.34)
Twin MOM	0.10	−0.72**	−0.89***	−0.02	−0.44	−0.35
	(0.21)	(−2.25)	(−3.00)	(−0.07)	(−0.76)	(−0.79)

Table A7 Fundamental momentum: gross-return-weighted

At the end of each month t, we sort stocks into five groups based on their fundamental implied returns (FIRs) and construct the fundamental momentum by buying the highest FIR quintile portfolio and selling the lowest FIR quintile portfolio, where all portfolios are weighted with lagged 1-month gross return (Asparouhova, Bessembinder, and Kalcheva, 2013) and monthly rebalanced. This table reports the average returns and alphas of the CAPM, Fama and French (FF3, 1993) three-factor model, FF3 plus a price momentum factor model (FF3M), Hou, Xue, and Zhang (HXZ, 2015) four-factor model, and Fama and French (FF5, 2015) five-factor model, respectively. Newey-West t-values are in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Low FIR	2	3	4	High FIR	High-Low
Average return	0.08	0.56**	0.87***	1.15***	1.57***	1.50***
	(0.23)	(2.05)	(3.27)	(4.21)	(4.36)	(5.84)
CAPM alpha	−0.64***	−0.08	0.24*	0.53***	0.89***	1.53***
	(−3.54)	(−0.64)	(1.88)	(3.84)	(3.93)	(5.91)
FF3 alpha	−0.77***	−0.25***	0.07	0.36***	0.74***	1.52***
	(−5.01)	(−2.85)	(1.05)	(4.46)	(4.01)	(5.40)
FF3M alpha	−0.47***	−0.08	0.19***	0.47***	0.86***	1.32***
	(−2.65)	(−1.00)	(2.84)	(5.15)	(4.49)	(4.45)
HXZ alpha	−0.21	0.00	0.22**	0.50***	0.97***	1.18**
	(−0.63)	(0.02)	(2.34)	(5.85)	(4.17)	(2.39)
FF5 alpha	−0.55***	−0.19	0.08	0.37***	0.88***	1.43***
	(−2.42)	(−1.63)	(1.03)	(4.37)	(4.30)	(3.87)

Table A8 Double sort on past return and fundamental implied return: gross-return-weighted

This table reports the average returns of gross-return-weighted portfolios sorted by past return and fundamental implied return (FIR), where past return is the cumulative return from month $t-12$ to month $t-1$. All portfolios are weighted with lagged 1-month gross return (Asparouhova, Bessembinder, and Kalcheva, 2013) and monthly rebalanced. Newey-West t-values are reported in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Fundamental MOM					
Price MOM	Low FIR	2	3	4	High FIR	High-Low
Low past return	0.08	0.37	0.63*	0.91**	1.34***	1.25***
	(0.18)	(0.94)	(1.66)	(2.22)	(2.73)	(4.09)
2	0.00	0.41	0.77***	1.10***	1.41***	1.41***
	(0.00)	(1.41)	(2.71)	(3.81)	(4.18)	(6.31)
3	0.08	0.68***	0.90***	1.17***	1.60***	1.52***
	(0.26)	(2.75)	(3.73)	(4.86)	(5.15)	(6.53)
4	0.32	0.86***	1.04***	1.26***	1.73***	1.41***
	(1.09)	(3.52)	(4.36)	(5.15)	(5.48)	(5.62)
High	0.91***	1.19***	1.41***	1.54***	1.93***	1.02***
	(2.68)	(4.01)	(4.67)	(5.20)	(5.29)	(4.65)
High-Low	0.83**	0.82***	0.78***	0.63**	0.59*	
	(2.37)	(3.14)	(2.85)	(2.08)	(1.90)	

Table A9 Summary statistics of price, fundamental, and twin momentum returns: gross-return-weighted

This table reports summary statistics of the gross-return-weighted price, fundamental, and twin momentum portfolio returns over the full sample period 1976:04–2015:09. At the end of each month t, we independently sort stocks into quintile portfolios by past return and FIR. Price, fundamental, and twin momentum portfolios are respectively formed by buying stocks in the top quintile of past return or FIR or both, and selling stocks in the corresponding bottom quintile. All portfolios are weighted with lagged 1-month gross return (Asparouhova, Bessembinder, and Kalcheva, 2013) and monthly rebalanced. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

						Correlation	
	Average return	t-value	Volatility	Skewness	Kurtosis	P-MOM	F-MOM
Price MOM	1.10	3.99	5.48	−2.72	21.51		0.21***
Fundamental MOM	1.50	5.93	6.00	0.64	28.55		
Twin MOM	2.20	6.18	7.74	−1.30	25.49	0.72***	0.67***

Table A10 Average returns and alphas of long- and short-legs: gross-return-weighted

This table report the average returns of the long- and short-leg portfolios of gross-return-weighted price, fundamental, and twin momentums, and their alphas from the CAPM, Fama and French (FF3, 1993) three-factor model, FF3 plus a price momentum factor model (FF3M), Hou, Xue, and Zhang (HXZ, 2015) four-factor model, and Fama and French (FF5, 2015) five-factor model. Newey-West t-values are reported in parentheses. The sample period is 1976:04–2015:09. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Average	Alphas				
	return	CAPM	FF3	FF3M	HXZ	FF5
Panel A: Long-leg						
Price MOM	1.80***	0.69***	0.63***	0.33***	0.51***	0.64***
	(5.64)	(3.87)	(6.15)	(3.90)	(3.56)	(5.48)
Fundamental MOM	1.96***	0.89***	0.74***	0.85***	0.97***	0.88***
	(5.46)	(3.92)	(3.99)	(4.46)	(4.17)	(4.29)
Twin MOM	2.30**	1.19***	1.15***	0.84***	1.04***	1.19***
	(6.27)	(5.07)	(6.33)	(5.69)	(4.04)	(5.54)
Panel B: Short-leg						
Price MOM	0.71**	−0.46*	−0.66***	0.10	0.42	−0.22
	(1.73)	(−1.84)	(−3.29)	(0.55)	(1.28)	(−0.79)
Fundamental MOM	0.47	−0.63***	−0.77***	−0.46***	−0.21	−0.54**
	(1.47)	(−3.49)	(−4.96)	(−2.64)	(−0.63)	(−2.39)
Twin MOM	0.10	−1.07**	−1.25***	−0.47*	−0.06	−0.76**
	(0.28)	(−3.58)	(−4.76)	(−1.95)	(−0.13)	(−1.99)

Table A11 Momentums in good and bad times: value-weighted

This table reports the average returns and alphas of value-weighted price, fundamental, and twin momentums across high and low sentiment periods, which are calculate from $R_{i,t} = a_g d_{g,t} + a_b d_{b,t} + BF_t + \varepsilon_t$, where $d_{H,t}$ and $d_{L,t}$ are dummy variables indicating good and bad time periods, F_t is the returns of one factor model (e.g., Fama and French (2015) five-factor returns), and $R_{i,t}$ is the excess return in month t. A month is defined as a good (bad) month if the cumulative returns of the market portfolio in the previous three months is nonnegative (negative). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Sentiment	Average	Alphas				
		return	CAPM	FF3	FF3M	HXZ	FF5
Price MOM	Good	1.14***	1.09***	1.30***	−0.00	0.12	1.08***
		(3.28)	(2.97)	(3.72)	(−0.04)	(0.27)	(3.11)
	Bad	0.57	0.94*	1.05*	0.01	−0.57	0.37
		(0.96)	(1.74)	(1.84)	(0.05)	(−0.93)	(0.49)
Fundamental MOM	Good	0.85***	0.76***	0.87***	0.60**	0.84**	0.97***
		(3.36)	(2.95)	(3.33)	(2.45)	(2.61)	(3.62)
	Bad	0.94**	1.18***	1.02***	1.11***	0.72*	0.93*
		(2.35)	(2.99)	(2.75)	(2.96)	(1.69)	(1.65)
Twin MOM	Good	2.22***	2.14***	2.42***	1.12***	1.43**	2.30***
		(5.37)	(5.24)	(5.50)	(3.30)	(2.08)	(4.83)
	Bad	2.12***	2.55***	2.54***	1.82***	1.32*	1.84**
		(3.24)	(4.07)	(4.08)	(3.70)	(1.65)	(2.55)

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