Twitter Thread by Darren ■

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1/ Trend Factor: Any Economic Gains from Using Information over Investment Horizons? (Han, Zhou, Zhu)

"A trend factor using multiple time lengths outperforms ST reversal, momentum, and LT reversal, which are based on the three price trends separately."

https://t.co/udkvsdw2Lz

To predict the monthly expected stock returns cross-sectionally, we use a two-step procedure. In the first step, we run in each month t a cross-section regression of stock returns on observed normalized MA signals to obtain the time-series of the coefficients on the signals,

$$r_{j,t} = \beta_{0,t} + \sum_i \beta_{i,t} \tilde{A}_{jt-1,L_i} + \epsilon_{j,t}, \quad j = 1, \cdots, n, \tag{3}$$

where

$$\begin{aligned} r_{j,t} &= \text{rate of return on stock } j \text{ in month } t, \\ \tilde{A}_{jt-1,L_i} &= \text{trend signal at the end of month } t-1 \text{ on stock } j \text{ with lag } L_i, \\ \beta_{i,t} &= \text{coefficient of the trend signal with lag } L_i \text{ in month } t, \\ \beta_{0,t} &= \text{intercept in month } t, \end{aligned}$$

and n is the number of stocks.[4] It should be noted that only information in month t or prior is used above to regress returns in month t.

Following, for example, Brock, Lakonishok, and LeBaron (1992), we consider in the above regressions using MAs of lag lengths 3-, 5-, 10-, 20-, 50-, 100-, and 200-days. In addition, we include 400-, 600-, 800-, and 1,000-days. These MA signals indicate the daily, weekly, monthly, quarterly, 1-year, 2-year, 3-year, and 4-year price trends of the underlying

[3] Keim and Stambaugh (1986) use a similar strategy to make the S&P 500 index stationary.

[4] Jegadeesh (1990) also uses similar cross-sectional regressions to predict individual stock returns, but he uses past returns instead of MA signals.

2/ This resembles combining multiple measures of ST reversal, momentum, and LT reversal (forecasts determined by walking forward rather than using signs from the full sample).

Unlike normal moving average signals, these are *cross-sectional.* More below:
https://t.co/wkIFLg9jtK

2.1. Data

We use the *daily* stock prices from January 2, 1926 through December 31, 2014 obtained from the Center for Research in Security Prices (CRSP) to calculate the moving average price signals at the end of each month (where the prices are adjusted for splits and dividends when necessary). Based on the month-end moving average signals, we form our portfolios and factors, and rebalance them at the usual *monthly* frequency. We include all domestic common stocks listed on the NYSE, AMEX, and Nasdaq stock markets, and exclude closed-end funds, real estate investment trusts (REITs), unit trusts, American depository receipts (ADRs), and foreign stocks (or stocks that do not have a CRSP share code of 10 or 11). In addition, at the end of each month, we exclude stocks with prices below \$5 (price filter) and stocks that are in the smallest decile sorted with NYSE breakpoints (size filter). Jegadeesh and Titman (1993) use the same price and size filters when constructing the momentum strategy. A relaxation of either or both of the filters and other alternative procedures will be examined in Section 3.

2.2. Methodology

To construct the trend factor, we first calculate the MA prices on the last trading day of each month. The MA on the last trading day of month t of lag L is defined as

$$A_{jt,L} = \frac{P^t_{j,d-L+1} + P^t_{j,d-L+2} + \cdots + P^t_{j,d-1} + P^t_{j,d}}{L}, \tag{1}$$

where P^t_{jd} is the closing price for stock j on the last trading day d of month t, and L is the lag length. Then, we normalize the moving average prices by the closing price on the last trading day of the month,

$$\tilde{A}_{jt,L} = \frac{A_{jt,L}}{P^t_{jd}}. \tag{2}$$

There are three reasons for this normalization. First, according to our simple model to be presented in the next subsection, it is this normalized average that predicts the future stock returns. Second, econometrically, the normalization makes the MA signals stationary.[3] Third, the normalization can also mitigate the undue impact of high priced stocks.

1/ Cross-Sectional and Time-Series Tests of Return Predictability: What Is the Difference? (Goyal, Jegadeesh)

"The difference between the performances of TS and CS strategies is largely due to a time-varying net-long investment in risky assets."https://t.co/CSIn3ujN2R pic.twitter.com/XHnVmIart4

— Darren \U0001f95a (@ReformedTrader) June 18, 2019

3/ Unsurprisingly, the Trend factor formed by this approach outperforms benchmarks in terms of both Sharpe ratio and tail metrics. It's combining momentum with two factors that are negatively correlated to it AND using multiple specifications.

More here:
https://t.co/x8Tloz3iyL

Table 1
The trend factor and other factors: Summary statistics

This table reports the summary statistics for the trend factor (*Trend*), the short-term reversal factor (*SREV*), the momentum factor (*MOM*), the long-term reversal factor (*LREV*), and the Fama-French three factors including the market portfolio (*Market*), *SMB*, and *HML* factors. For each factor, we report sample mean in percentage, sample standard deviation in percentage, Sharpe ratio, skewness, and excess kurtosis. The *t*-statistics are in parentheses and significance at the 1% level is given by ***. The sample period is from June 1930 through December 2014.

Factor	Mean(%)	Std dev(%)	Sharpe ratio	Skewness	Excess kurtosis
Trend	1.63*** (15.0)	3.45	0.47	1.47	11.3
SREV	0.79*** (7.21)	3.49	0.23	0.99	8.22
MOM	0.79*** (3.29)	7.69	0.10	-4.43	40.7
LREV	0.34*** (3.09)	3.50	0.10	2.93	24.8
Market	0.62*** (3.69)	5.40	0.12	0.27	8.03
SMB	0.27*** (2.63)	3.24	0.08	2.04	19.9
HML	0.41*** (3.64)	3.58	0.11	2.15	18.9

1/ An Executive Summary (in Tweet form) of our new paper

Dual Momentum \u2013 A Craftsman\u2019s Perspective

Download here: https://t.co/Y9GlGNohBg

Everything that follows in this thread is based on HYPOTHETICAL AND SIMULATED RESULTS.
pic.twitter.com/9m5YJnTdtq

— Adam Butler (@GestaltU) March 27, 2019

4/ "Average return and volatility of the trend factor are both higher in recession periods. However, the Sharpe ratio is virtually the same.

"Interestingly, all of the factors still have positive average returns.

"Momentum experiences the greatest increase in volatility."

Table 2
The trend factor and other factors: Recession periods

This table reports the summary statistics for the trend factor (*Trend*), the short-term reversal factor (*SREV*), the momentum factor (*MOM*), the long-term reversal factor (*LREV*), and the Fama-French three factors including the market portfolio (*Market*), *SMB*, and *HML* factors. For each factor, we report sample mean in percentage, sample standard deviation in percentage, Sharpe ratio, skewness, and excess kurtosis for the recession periods in Panel A, and for the most recent financial crisis period identified by the NBER in Panel B. The t-statistics are in parentheses and significance at the 1% level is given by ***. The sample period is from June 1930 through December 2014.

Factor	Mean(%)	Std dev(%)	Sharpe ratio	Skewness	Excess kurtosis
	Panel A: Recession periods				
Trend	2.34***	5.05	0.46	1.02	5.73
	(6.38)				
SREV	1.20***	5.40	0.22	0.85	3.35
	(3.05)				
MOM	0.20	11.5	0.02	-3.20	17.6
	(0.25)				
LREV	0.49	4.15	0.12	1.25	6.22
	(1.59)				
Market	-0.67	8.24	-0.08	0.50	3.90
	(-1.13)				
SMB	0.02	3.32	0.01	0.54	2.01
	(0.08)				
HML	0.18	5.11	0.03	2.99	19.9
	(0.48)				
	Panel B: Financial crisis (12/2007 - 06/2009)				
Trend	0.75	5.06	0.15	0.83	0.28
	(0.65)				
SREV	-0.82	5.66	-0.14	-0.11	-1.11
	(-0.63)				
MOM	-3.88	13.4	-0.29	-1.42	1.77
	(-1.26)				
LREV	0.03	3.73	0.01	0.19	-0.12
	(0.03)				
Market	-2.03	7.07	-0.29	-0.21	-0.24
	(-1.25)				
SMB	0.63	2.50	0.25	0.25	-0.79
	(1.10)				
HML	-0.44	3.83	-0.11	-0.83	0.87
	(-0.50)				

5/ "In terms of maximum drawdown and the Calmar ratio, the trend factor performs the best.

"The trend factor is correlated with the short-term reversal factor (35%), long-term reversal factor (14%), and the market (20%) but is virtually uncorrelated with the momentum factor."

Table 3
The trend factor and other factors: Extreme values and correlation matrix

This table reports the maximum drawdown (*MDD*), Calmar ratio, and number of big losses of the trend factor (*Trend*), short-term reversal factor (*SREV*), momentum factor (*MOM*), long-term reversal factor (*LREV*), and the market portfolio (*Market*) in Panel A and the correlation matrix of the factors in Panel B, respectively. The sample period is from June 1930 through December 2014.

Panel A: Extreme values

Factor	MDD(%)	Calmar(%)	n($R < -10\%$)	n($R < -20\%$)	n($R < -30\%$)	n($R < -50\%$)
Trend	20.0	97.8	4	0	0	0
SREV	33.4	28.4	6	0	0	0
MOM	99.3	9.59	49	18	6	4
LREV	46.8	8.75	3	0	0	0
Market	76.5	9.80	30	5	0	0

Panel B: Correlation matrix

	Trend	SREV	MOM	LREV	Market
Trend	1.00	0.35	0.03	0.14	0.20
SREV		1.00	-0.19	0.04	0.20
MOM			1.00	-0.30	-0.32
LREV				1.00	0.26
Market					1.00

6/ "The trend factor has a higher return during recessions, while momentum earns a small positive return b/c the short leg is a bit more negative than the long leg. Similar conclusions hold for expansions. This is why the two factors are not correlated over the entire sample."

Table 4
Comparison of trend and momentum

This table compares the long and short portfolios of the trend factor and momentum factor, respectively. The summary statistics are reported for each of the long and short portfolios over the whole sample period (Panel A), the recession periods (Panel B), and the expansion periods (Panel C) identified by the NBER. A one-sided test of equal mean between the long (short) portfolios of the trend factor and momentum factor is reported in the table labeled as *Differ*. For the long portfolio, the test is $H_0 : \mu^l_{trd} = \mu^l_{mom}$; $H_1 : \mu^l_{trd} > \mu^l_{mom}$; for the short portfolio, the test is $H_0 : \mu^s_{trd} = \mu^s_{mom}$; $H_1 : \mu^s_{trd} < \mu^s_{mom}$, where the subscripts *trd* and *mom* denote the trend and momentum factors, respectively; superscripts l and s denote the long and short portfolios, respectively. The last column (*Corr*) reports the correlation between the long (short) portfolios of the trend factor and momentum factor. Significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The sample period is from June 1930 through December 2014.

Portfolio	Mean(%)	Std Dev(%)	Skewness	Excess Kurtosis	Differ (%)	Corr
	Panel A: Whole sample period					
Trend long	1.93	7.52	0.58	10.3	0.12	0.88
Momentum long	1.81	7.37	0.18	8.87		
Trend short	0.31	6.86	0.56	13.8	-0.71***	0.84
Momentum short	1.02	11.2	2.92	25.9		
	Panel B: Recession periods					
Trend long	0.75	11.3	0.52	5.78	0.80**	0.87
Momentum long	-0.05	8.53	-0.33	3.87		
Trend short	-1.59	10.2	1.14	11.3	-1.33**	0.91
Momentum short	-0.26	16.6	2.31	15.3		
	Panel C: Expansion periods					
Trend long	2.21	6.30	0.81	12.2	-0.04	0.91
Momentum long	2.24	7.01	0.48	11.0		
Trend short	0.74	5.74	0.22	10.3	-0.57***	0.80
Momentum short	1.32	9.52	3.24	29.8		

7/ "The trend factor outperforms the momentum factor not only in terms of average returns, but also in terms of downside risks during months when the momentum factor performs poorly."

Table 5
Crash months

This table reports the performance of the trend factor for the crash months, periods when the momentum factor performs poorly, i.e., when the Winners-Losers portfolio experiences losses over −25%. We report the returns for the Losers, Winners, and Winners-Losers for the momentum factor, and similarly the Low, High, and High-Low for the trend factor, respectively. Returns are in percentage. The sample period is from June 1930 through December 2014.

Date	Losers(%)	Winners(%)	Winners-Losers(%)	Low(%)	High(%)	High-Low(%)
	Panel A: Momentum			**Panel B: Trend**		
09/1939	104.78	15.08	-89.70	30.09	26.48	-3.61
08/1932	113.98	30.73	-83.25	63.76	43.79	-19.96
01/2001	64.74	4.75	-59.99	17.82	2.76	-15.06
07/1932	68.76	13.02	-55.74	30.20	47.07	16.87
04/2009	45.91	5.46	-40.45	12.90	25.18	12.28
11/1935	40.98	10.69	-30.29	7.16	11.01	3.85
01/1932	31.32	3.18	-28.14	-0.97	13.71	14.68
01/1975	45.85	18.16	-27.69	18.82	28.30	9.48
11/2002	32.73	5.25	-27.48	11.03	6.70	-4.32
06/1938	36.99	10.37	-26.62	16.66	39.27	22.61

8/ "The hypothesis is strongly rejected that the trend factor is inside the mean-variance frontier of the short-term reversal, momentum, and long-term reversal factors for all three periods."

Table 6
Mean-variance spanning tests

This table reports the results of testing whether the trend factor can be spanned by the short-term reversal, momentum, and long-term reversal factors. W is the Wald test under conditional homoskedasticity, W_e is the Wald test under the IID elliptical, W_a is the Wald test under the conditional heteroskedasticity, J_1 is the Bekaert-Urias test with the Errors-in-Variables (EIV) adjustment, J_2 is the Bekaert-Urias test without the EIV adjustment, and J_3 is the DeSantis test. All six tests have an asymptotic chi-squared distribution with $2N(N=1)$ degrees of freedom. The p-values are in brackets. The tests are conducted for the whole sample period, recession periods, and the most recent financial crisis period. The sample period is from June 1930 through December 2014.

Period	W	W_e	W_a	J_1	J_2	J_3
Whole sample period	166.86	106.95	95.45	62.14	67.45	78.63
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Recession periods	35.51	22.96	26.68	22.50	25.51	29.30
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Financial crisis	28.18	25.42	28.17	17.66	17.65	35.58
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

9/ "Overall, the trend factor, which utilizes price information across all the investment horizons, seems to place more emphasis on short-term price patterns than on the intermediate and long-term ones."

Table 7
Sharpe style regressions

This table reports the Sharpe style regression results regressing the returns of the trend factor on the returns of the short-term reversal factor (*SREV*), momentum factor (*MOM*), and long-term reversal factor (*LREV*). The slope coefficients are restricted to be positive and their sum is equal to 100%. Regression results are reported for the whole sample period, recession periods, and expansion periods. Newey and West (1987) robust t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The sample period is from June 1930 through December 2014.

	Whole sample	Recession	Expansion
SREV	52.2***	69.9***	40.6***
	(5.77)	(8.18)	(4.57)
MOM	13.4***	5.0**	19.0***
	(9.11)	(2.06)	(18.95)
LREV	34.4***	25.1***	40.4***
	(4.43)	(3.57)	(5.05)

10/ Table 9: "While the market beta and SMB beta are U-shaped, the HML beta is hump-shaped across the quintiles. Hence, the trend factor has a small loading on the market and insignificant SMB and HML betas in the Fama-French three factor model."

Table 8

Average returns and other characteristics of the trend quintile portfolios

This table reports the average return and other characteristics of the five trend quintile portfolios. Market size is in millions of dollars. $R_{-1}(\%)$, $R_{-6,-2}(\%)$, and $R_{-60,-25}(\%)$ are prior month return, past six-month cumulative return skipping the last month, past 60-month cumulative return skipping the last 24 months, respectively. IVol(%) is the idiosyncratic volatility relative to the Fama-French three-factor model estimated from the daily returns of each month. %Zero is the percentage of zero returns in a month. Turnover(%) is the monthly turnover rate of the stocks. E/P and S/P are earnings-price ratio and sales-price ratio, respectively. Newey and West (1987) robust t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The sample period is from June 1930 through December 2014.

Rank	Return(%)	Market size	*log*B/M	$R_{-1}(\%)$	$R_{-6,-2}(\%)$	$R_{-60,-25}(\%)$	IVol(%)	%Zero	Turnover(%)	E/P	S/P
Low	0.31	1,244.8***	-1.11***	7.50***	6.67***	61.5***	2.17***	15.5***	31.6***	1.66***	77.6***
	(1.34)	(8.31)	(-9.89)	(16.0)	(5.49)	(18.7)	(31.9)	(25.0)	(13.5)	(5.15)	(11.6)
2	0.87***	1,843.1***	-1.06***	3.29***	6.89***	53.7***	1.76***	15.8***	24.7***	4.16***	88.9***
	(4.20)	(8.36)	(-8.60)	(13.0)	(7.20)	(18.5)	(40.8)	(25.3)	(13.0)	(10.9)	(13.5)
3	1.12***	2,057.7***	-1.03***	1.38***	7.59***	51.1***	1.68***	16.2***	23.0***	4.82***	93.1***
	(5.62)	(8.24)	(-8.40)	(7.06)	(8.49)	(17.8)	(41.5)	(25.2)	(12.7)	(11.1)	(13.8)
4	1.40***	2,046.2***	-1.04***	-0.41**	8.47***	51.4***	1.75***	16.0***	23.6***	4.73***	97.9***
	(6.86)	(7.98)	(-8.51)	(-2.11)	(9.32)	(17.2)	(40.0)	(25.0)	(12.8)	(11.1)	(13.5)
High	1.93***	1,498.7***	-1.09***	-3.45***	10.5***	57.5***	2.17***	15.8***	29.6***	2.28***	91.8***
	(8.18)	(7.98)	(-9.35)	(-12.5)	(9.50)	(17.3)	(34.3)	(25.2)	(12.8)	(5.25)	(13.3)

11/ "The results suggest that small stocks and low priced stocks are more trending. This may be intuitively true: large stocks have more analyst following and more investors, and hence more information transparency and faster price movements to reflect available information."

Table 10
Alternative specifications of the trend factor

This table reports the summary statistics for the various specifications of the trend factor. *Price filter*: stocks whose prices are less than $5 at the end of the last month are excluded. *Size filter*: stocks in the smallest decile based on the NYSE size breakpoints at the end of the last month are excluded. *No filter*: No size restriction nor price restriction is imposed. *Fama-French*: the trend factor is constructed following the Fama and French (1993) approach; stocks are first independently sorted into two size groups and then three trend groups using NYSE breakpoints, and then averaged across the two size groups. The summary statistics are sample mean in percentage, sample standard deviation in percentage, Sharpe ratio, skewness, and excess kurtosis. The t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The sample period is from June 1930 through December 2014.

Specification	Mean(%)	Std dev(%)	Sharpe ratio	Skewness	Excess kurtosis
No filter	2.89***	4.53	0.64	2.07	16.4
	(20.3)				
Price filter	1.78***	3.37	0.53	1.46	11.2
	(16.9)				
Size filter	1.85***	3.78	0.49	1.90	12.1
	(15.6)				
Fama-French	1.89***	3.19	0.59	2.45	15.1
	(18.8)				

12/ "A certain smoothing of the betas is necessary to maintain the out-of-sample performance of the trend factor.

"The betas do change substantially over time, varying from positive values to negative ones."

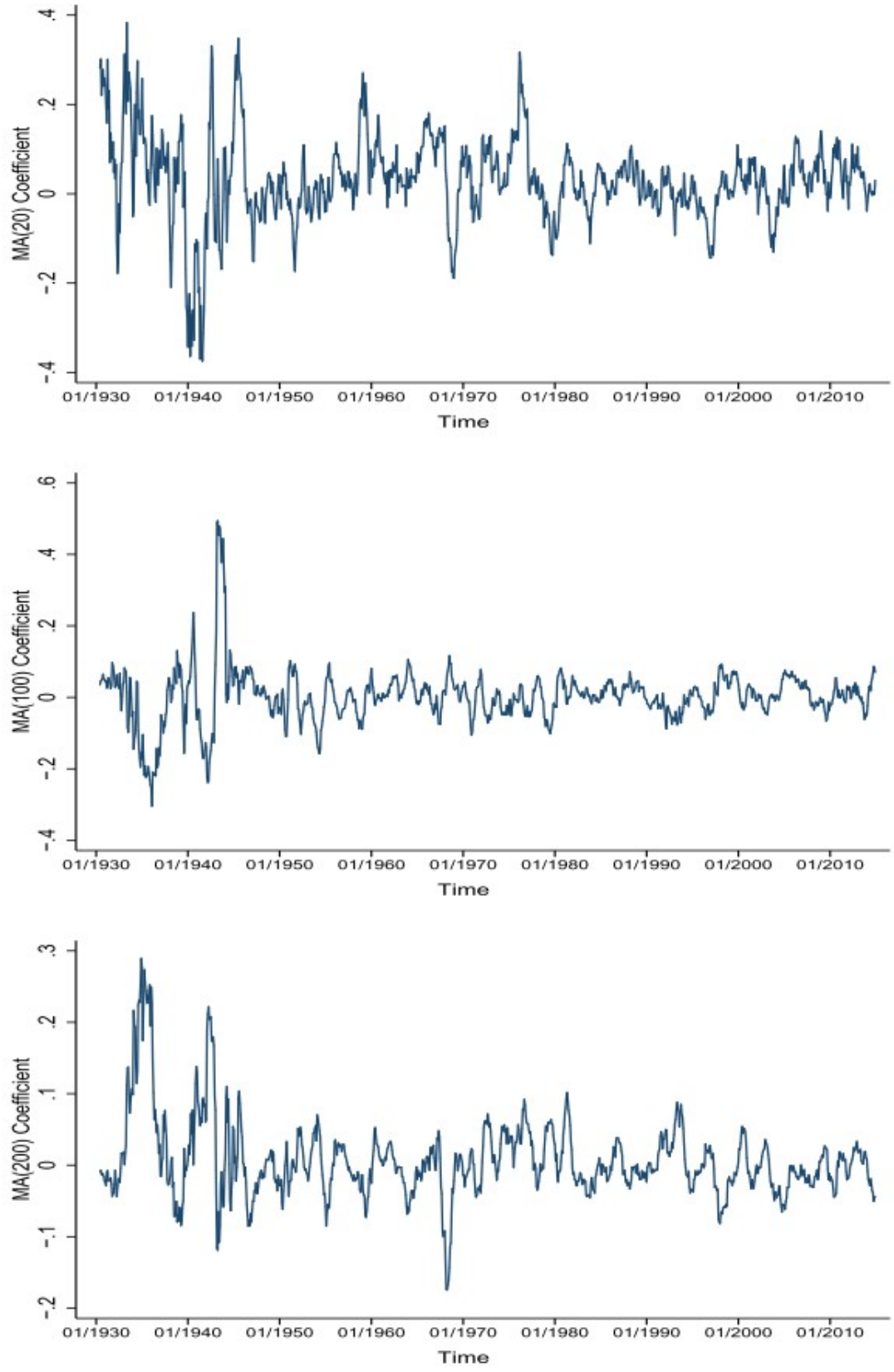

Fig. 1. Times-series of selected MA coefficients. This figure plots the smoothed coefficients of MA(20), MA(100), and MA(200) over the sample period estimated from Equation (5).

13/ "Performance decreases as the market size increases. However, even for the largest stocks, the superior performance of the High-Low spread portfolio is stat. & economically significant.

"Performance remains largely unchanged after controlling for other firm characteristics."

Table 11
Performance after controlling for firm characteristics

This table reports the sort results of controlling for various firm characteristics. Stocks are first sorted by one of the control variables into five quintile groups, and then in each quintile stocks are further sorted to construct five trend quintile portfolios. We then average the resulting 5×5 trend quintile portfolios across the five quintiles of the control variable to form five new trend quintile portfolios, all of which should have similar levels of the control variable. In Panel A, we report the performance of the 5×5 quintile portfolios and the five new trend quintile portfolios after controlling for the market size. In Panel B, we report the performance of only the new trend quintile portfolios after controlling for one of the firm characteristics. The performance is measured by the Fama-French alpha in percentage. Newey and West (1987) robust t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The sample period is from June 1930 through December 2014.

	Trend forecasts					
	Low	2	3	4	High	High-Low
Market size	*Panel A: Market size*					
Small	-1.28***	-0.38***	0.06	0.32***	1.03***	2.31***
	(-10.2)	(-4.93)	(0.99)	(4.49)	(8.55)	(10.3)
2	-0.98***	-0.23***	0.13**	0.36***	0.84***	1.82***
	(-9.85)	(-3.32)	(1.99)	(5.49)	(9.77)	(11.7)
3	-0.84***	-0.17***	0.13**	0.35***	0.66***	1.51***
	(-10.3)	(-2.93)	(2.01)	(5.58)	(8.70)	(11.4)
4	-0.62***	-0.18***	0.03	0.30***	0.60***	1.23***
	(-8.26)	(-3.03)	(0.50)	(4.95)	(8.04)	(10.1)
Large	-0.47***	-0.14***	0.11***	0.19***	0.36***	0.83***
	(-7.60)	(-3.28)	(2.65)	(4.52)	(6.54)	(8.94)
Average over market size	-0.84***	-0.22***	0.09**	0.30***	0.70***	1.54***
	(-12.1)	(-5.37)	(2.28)	(7.27)	(10.9)	(12.9)
	Panel B: Controlling for firm characteristics					
Average over B/M	-0.73***	-0.22***	0.01	0.25***	0.64***	1.37***
	(-9.78)	(-4.41)	(0.11)	(4.96)	(8.44)	(11.2)
Average over R_{-1}	-0.69***	-0.15***	0.02	0.27***	0.59***	1.27***
	(-10.3)	(-3.83)	(0.53)	(7.07)	(10.5)	(12.2)
Average over $R_{-6,-2}$	-0.82***	-0.21***	0.08**	0.28***	0.71***	1.53***
	(-11.9)	(-5.50)	(2.15)	(7.19)	(11.0)	(13.0)
Average over $R_{-60,-25}$	-0.82***	-0.23***	0.05	0.29***	0.74***	1.56***
	(-11.9)	(-5.59)	(1.07)	(6.93)	(11.1)	(13.1)
Average over %Zeros	-0.84***	-0.18***	0.09**	0.31***	0.73***	1.56***
	(-12.1)	(-4.34)	(2.11)	(7.19)	(11.2)	(13.4)

14/ "ER12trd has a significant and positive coefficient, indicating that the trend signals can predict future cross section returns independent of size and B/M. This is consistent with Table 11.

"Similar results are obtained when other variables are added to the regression."

Table 12
Fama-MacBeth regressions

This table reports the results of regressing monthly returns on the expected returns forecasted by the trend signals and other firm-specific variables. The regression is a modified Fama-MacBeth cross-sectional regression with weighted least squares (WLS) in the first step. The weights are the inverse of the stock variance estimated from the whole sample period. For robustness, the table reports three specifications of the forecasted expected returns, ER^{12}_{trd}, ER^{6}_{trd}, and ER^{60}_{trd} using rolling 12-month, 6-month, and 60-month averages, respectively, to estimate the true coefficients. Newey and West (1987) robust t-statistics are in parentheses and significance at the 1% level is given by ***. The sample period is from June 1930 through December 2014.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	-0.17***	-0.17***	-0.12***	-0.18***	-0.15***	-0.15***	-0.18***	-0.22***
	(-6.41)	(-3.35)	(-6.46)	(-13.06)	(-6.91)	(-11.76)	(-5.86)	(-15.30)
ER^{12}_{trd}	0.67***	0.61***	0.47***	0.58***				
	(7.84)	(4.22)	(7.87)	(17.15)				
ER^{6}_{trd}					0.54***	0.50***		
					(8.85)	(15.74)		
ER^{60}_{trd}							0.71***	0.69***
							(6.48)	(18.78)
Log(size)	-1.00**	-1.00**	-1.21***	-1.56***	-1.09**	-1.56***	-1.02**	-1.59***
	(-1.98)	(-2.19)	(-2.79)	(-3.58)	(-2.16)	(-3.59)	(-2.01)	(-3.54)
log(B/M)	1.52**	1.43**	1.39**	0.69	1.50**	0.68	1.50**	0.56
	(2.06)	(2.12)	(2.20)	(0.80)	(2.05)	(0.80)	(2.03)	(0.65)
R_{-1}		-0.24	-0.57***	-0.32***		-0.37***		-0.25***
		(-1.43)	(-7.57)	(-6.20)		(-6.57)		(-4.45)
$R_{-6,-2}$		0.61	0.76**	0.27		0.22		0.21
		(1.03)	(2.13)	(0.96)		(0.77)		(0.75)
$R_{-60,-25}$		-0.13	0.16	-1.38**		-1.39**		-1.31**
		(-0.08)	(0.11)	(-2.09)		(-2.17)		(-1.98)
IVol			-0.15	-0.10**		-0.11**		-0.12**
			(-1.39)	(-1.98)		(-2.03)		(-2.26)
Turnover			11.0*	9.91**		10.1***		10.1**
			(1.76)	(2.46)		(2.61)		(2.40)
%Zero			-0.39	-0.55*		-0.56*		-0.55*
			(-1.14)	(-1.73)		(-1.79)		(-1.66)
C/P				0.40***		0.40***		0.40***
				(3.84)		(3.99)		(3.72)
E/P				0.10		0.09		0.12
				(1.37)		(1.20)		(1.39)
S/P				-0.35		-0.32		-0.41*
				(-1.64)		(-1.56)		(-1.67)

15/ "It is not an easy matter to short all the stocks in the short leg.

"We have to have detailed information on which stocks can be shorted and then estimate the costs. While our evaluation based on the BETCs shows profitability potential, it is limited in scope."

Table 13

Turnover rates and break-even costs

This table reports the turnover rate of the trend factor and the corresponding break-even transaction costs (BETCs). Results are also reported for the corresponding (quintile) momentum factor (Panel B). *Zero return:* BETCs that would completely offset the returns or the risk-adjusted returns (Fama-French three-factor alpha); *5% Insignificance:* BETCs that make the returns or the risk-adjusted returns insignificant at the 5% level. Panel C reports the excess turnover rate of the trend factor relative to the momentum factor and the break-even costs to offset the extra returns (risk-adjusted returns) of the trend factor relative to the momentum factor. The sample period is from June 1930 through December 2014.

	Turnover(%)	Break-even costs(%)	
	Mean	Zero return	5% Insignificance
	Panel A: Trend factor		
Return	131.2	1.24	1.08
FF Alpha	131.2	1.18	1.00
	Panel B: Momentum factor		
Return	75.1	0.68	0.26
FF Alpha	75.1	1.03	0.64
	Panel C: Trend − Momentum		
Return	56.1	1.99	1.35
FF alpha	56.1	1.40	0.72

16/ "The performance of the trend factor is not driven by a few outliers but is remarkably stable over time.

"Our trend factor passes the higher bar given in Harvey, Liu, and Zhu (2016) easily with a t-statistic of 13.6 (the momentum has a value of 6.04)."

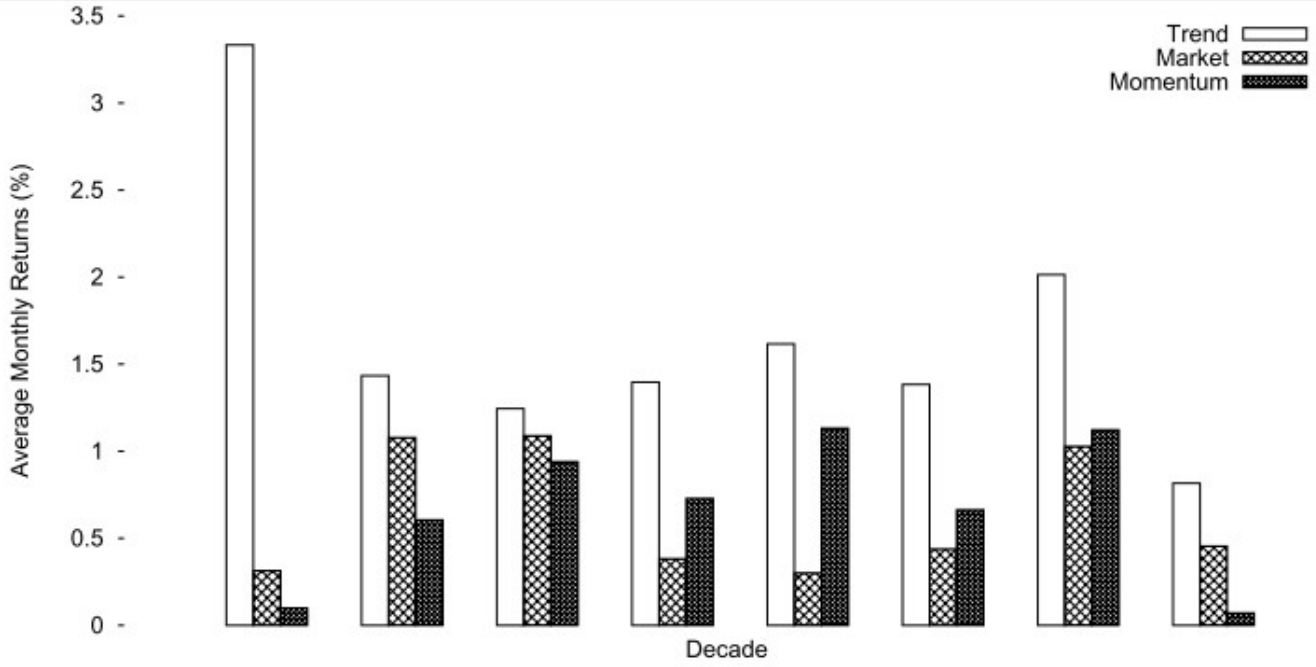

Fig. 2. Trend factor performance in subperiods. This figure plots the average monthly returns of the trend factor, the market, and the momentum factor over roughly each of the past eight decades. The first period is from June 1930 to December 1940, the second is from January 1941 to December 1950, and the last is from January 2000 to December 2014.

17/ "The trend factor is clearly valid internationally, yielding the best performance among all the three factors and the local market indexes."

Table 14
The trend factor in other G7 countries

This table reports the summary statistics for the trend factor (*Trend*), the short-term reversal factor (*SREV*), the momentum factor (*MOM*), the long-term reversal factor (*LREV*), and the local market portfolio (*Market*) in the remaining G7 countries. For each factor, we report sample mean in percentage, sample standard deviation in percentage, Sharpe ratio, skewness, minimum, maximum, and CAPM alpha with respect to the respective local market index. The t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The sample period is from January 1990 through December 2014.

G7 country	Mean(%)	StdDev(%)	Sharpe ratio	Skewness	Minimum	Maximum	Alpha(%)
			France				
Trend	1.52***	4.87	0.31	0.54	-18.6	31.6	1.57***
	(5.11)						(6.10)
SREV	1.25***	5.61	0.22	-0.08	-25.8	27.9	1.36***
	(3.55)						(4.12)
MOM	0.63*	5.28	0.12	0.14	-26.8	30.5	-0.57*
	(1.92)						(-1.83)
LREV	0.17	4.53	0.04	-0.24	-24.5	14.9	-0.23
	(0.53)						(-0.69)
Market	0.48	5.27	0.09	-0.36	-16.0	13.5	
	(1.49)						
			U.K.				
Trend	0.82***	3.76	0.22	0.18	-15.4	20.0	0.83***
	(3.56)						(4.26)
SREV	0.57**	4.36	0.13	0.13	-23.2	27.8	0.63**
	(2.09)						(2.30)
MOM	0.18	3.75	0.05	-0.18	-14.8	14.8	-0.13
	(0.76)						(-0.52)
LREV	0.22	3.02	0.07	0.64	-6.37	10.8	-0.25
	(1.05)						(-0.89)
Market	0.42*	4.17	0.10	-0.55	-14.8	10.7	
	(1.66)						
			Germany				
Trend	1.92***	4.57	0.42	0.36	-12.1	20.4	1.96***
	(6.88)						(7.41)
SREV	1.65***	5.93	0.28	0.03	-26.2	34.1	1.78***
	(4.46)						(5.49)
MOM	0.48	5.46	0.09	1.25	-22.9	34.5	-0.40
	(1.42)						(-1.42)
LREV	-0.36	4.35	-0.08	0.50	-12.8	17.5	0.30
	(-1.18)						(0.91)
Market	0.63*	5.83	0.11	-0.68	-20.9	16.2	
	(1.77)						

18/ "Table 15 reports the performance of the trend forecasts under different levels of information uncertainty.

"The Fama-French alphas increases as information uncertainty increases."

Table 15
Performance under information uncertainty

This table reports the performance of the trend quintile portfolios and the trend factor (High-Low) under information uncertainty proxied by idiosyncratic volatility (*IVol*) (Panel A), share turnover rate (Panel B), analyst coverage (Panel C), and firm age (Panel D). Stocks are first sorted by one of the information-uncertainty proxies into three tercile groups, and then in each tercile stocks are further sorted to construct five trend quintile portfolios. For each of the information-uncertainty proxies, the sorted terciles are arranged in the order of increasing information uncertainty. We report the Fama-French alphas for the resulting 3×5 trend quintile portfolios and the average across the three terciles of the information-uncertainty proxy. The alphas are reported in percentage. Newey and West (1987) robust t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The sample period is from June 1930 through December 2014.

	Trend forecasts					
	Low	2	3	4	High	High-Low
IVol	*Panel A: Idiosyncratic volatility*					
Low	-0.24***	0.09	0.15***	0.33***	0.63***	0.87***
	(-3.79)	(1.56)	(2.90)	(5.95)	(9.64)	(9.57)
2	-0.53***	-0.17***	0.18***	0.40***	0.87***	1.40***
	(-7.99)	(-3.38)	(3.38)	(7.33)	(12.6)	(13.4)
High	-1.45***	-0.74***	-0.31***	0.13**	0.80***	2.25***
	(-12.1)	(-12.3)	(-5.60)	(2.43)	(6.57)	(10.3)
Average over IVol	-0.74***	-0.27***	0.01	0.29***	0.77***	1.51***
	(-11.1)	(-7.15)	(0.20)	(7.55)	(11.6)	(12.7)
Turnover	*Panel B: Turnover rate*					
High	-0.80***	-0.31***	-0.02	0.19***	0.38***	1.18***
	(-9.83)	(-4.75)	(-0.39)	(2.92)	(4.33)	(10.3)
2	-0.68***	-0.11**	0.08	0.37***	0.72***	1.40***
	(-10.7)	(-2.21)	(1.46)	(7.65)	(11.7)	(14.9)
Low	-0.95***	-0.12*	0.06	0.34***	0.95***	1.90***
	(-8.41)	(-1.71)	(0.93)	(5.75)	(10.4)	(10.9)
Average over turnover	-0.81***	-0.18***	0.04	0.30***	0.68***	1.49***
	(-12.5)	(-4.69)	(1.00)	(7.56)	(11.9)	(14.3)

	Trend forecasts					
	Low	2	3	4	High	High-Low
Analyst coverage	*Panel C: Analyst coverage*					
High	-0.54***	-0.13	0.03	0.22***	0.39***	0.93***
	(-5.08)	(-1.64)	(0.47)	(2.63)	(3.69)	(6.06)
2	-0.73***	-0.16**	0.16**	0.39***	0.63***	1.36***
	(-7.94)	(-2.28)	(2.10)	(5.10)	(7.14)	(10.2)
Low	-0.89***	-0.20***	0.05	0.30***	0.72***	1.61***
	(-11.6)	(-4.21)	(0.94)	(6.09)	(10.5)	(12.8)
Average over analyst coverage	-0.83***	-0.18***	0.07*	0.30***	0.70***	1.53***
	(-12.1)	(-4.51)	(1.68)	(6.86)	(10.8)	(12.9)
Firm age	*Panel D: Firm age*					
Old	-0.68***	-0.19***	0.02	0.21***	0.44***	1.11***
	(-10.2)	(-3.36)	(0.29)	(3.60)	(6.20)	(11.1)
2	-0.75***	-0.18***	0.03	0.29***	0.75***	1.50***
	(-11.0)	(-4.02)	(0.60)	(6.28)	(10.4)	(12.9)
Young	-0.91***	-0.23***	0.11**	0.32***	0.77***	1.68***
	(-11.4)	(-4.21)	(2.12)	(6.52)	(11.1)	(13.5)
Average over age	-0.84***	-0.19***	0.07*	0.31***	0.74***	1.57***
	(-12.2)	(-4.56)	(1.65)	(7.07)	(11.3)	(13.3)

19/ "The trend factor performs better in explaining the industry returns than the momentum factor.

"The trend factor improves performance in terms of explaining the cross-section returns of the six size and book-to-market portfolios."

Table 16
Explaining industry portfolios

This table compares the pricing ability of the trend factor and the momentum factor using ten industry portfolios (*Ind*). Panel A is the CAPM result; Panels B and C include the trend factor and the momentum factor, respectively. The intercept (α) is in percentage. β_{mkt}, β_{trd}, and β_{mom} are the risk loadings on the market portfolio, the trend factor, and the momentum factor, respectively. The t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The second to the last column is the aggregate pricing error $\Delta = \alpha'\Sigma^{-1}\alpha$. The last column is the GRS test statistics with their p-values in brackets. The sample period is from June 1930 through December 2014.

	Ind1	Ind2	Ind3	Ind4	Ind5	Ind6	Ind7	Ind8	Ind9	Ind10	Δ(%)	GRS
Panel A: CAPM												
α(%)	0.25**	0.07	0.21**	0.37**	0.23	0.30**	0.23*	0.42***	0.20	0.23*	2.40	2.38***
	(2.46)	(0.50)	(2.07)	(2.08)	(1.57)	(2.18)	(1.89)	(3.14)	(1.45)	(1.76)		[0.01]
β_{mkt}	1.07***	1.43***	1.31***	1.19***	1.43***	1.06***	1.16***	1.07***	0.91***	1.25***		
	(56.98)	(54.68)	(68.54)	(36.50)	(53.78)	(42.13)	(51.00)	(43.90)	(36.64)	(51.20)		
Panel B: CAPM plus trend factor												
α(%)	0.19*	-0.04	0.14	0.31	0.11	0.40***	0.29**	0.28*	0.22	0.29**	3.20	2.62***
	(1.68)	(-0.23)	(1.26)	(1.58)	(0.70)	(2.65)	(2.12)	(1.93)	(1.48)	(1.97)		[0.00]
β_{mkt}	1.06***	1.42***	1.30***	1.18***	1.42***	1.07***	1.17***	1.06***	0.91***	1.25***		
	(55.58)	(53.29)	(66.90)	(35.60)	(52.39)	(41.64)	(50.16)	(42.64)	(35.96)	(50.35)		
β_{trd}	0.04	0.07	0.05	0.04	0.08*	-0.06	-0.03	0.09**	-0.01	-0.04		
	(1.34)	(1.64)	(1.50)	(0.75)	(1.77)	(-1.59)	(-0.96)	(2.26)	(-0.37)	(-0.91)		
Panel C: CAPM plus momentum factor												
α(%)	0.47***	0.34***	0.44***	0.57***	0.43***	0.45***	0.45***	0.51***	0.30**	0.57***	4.30	4.17***
	(5.20)	(2.60)	(4.73)	(3.28)	(3.07)	(3.38)	(3.84)	(3.86)	(2.22)	(5.14)		[0.00]
β_{mkt}	0.98***	1.32***	1.22***	1.10***	1.34***	0.99***	1.07***	1.03***	0.87***	1.10***		
	(55.85)	(52.31)	(68.15)	(33.17)	(50.29)	(38.68)	(48.05)	(40.58)	(33.56)	(51.59)		
β_{mom}	-0.21***	-0.25***	-0.21***	-0.19***	-0.19***	-0.14***	-0.20***	-0.09***	-0.10***	-0.32***		
	(-16.90)	(-14.23)	(-16.72)	(-7.98)	(-9.92)	(-7.98)	(-12.66)	(-4.93)	(-5.29)	(-21.10)		

20/ "While the momentum factor together with the CAPM is far from sufficient in explaining the hedge fund returns, the trend factor performs still slightly better than the momentum factor in that task."

Table 18
Explaining hedge fund portfolios

This table compares the pricing ability of the trend factor and the momentum factor using 11 hedge fund style portfolios (*HF*). Panel A is the CAPM result; Panels B and C include the trend factor and the momentum factor, respectively. The intercept (α) is in percentage. β_{mkt}, β_{trd}, and β_{mom} are the risk loadings on the market portfolio, the trend factor, and the momentum factor, respectively. The t-statistics are in parentheses and significance at the 1%, 5%, and 10% levels is given by ***, **, and *, respectively. The second to the last column is the aggregate pricing error $\Delta = \alpha'\Sigma^{-1}\alpha$. The last column is the GRS test statistics with their p-values in brackets. The sample period is from January 1994 through December 2014.

	HF1	HF2	HF3	HF4	HF5	HF6	HF7	HF8	HF9	HF10	HF11	Δ(%)	GRS
Panel A: CAPM													
α(%)	0.23**	0.40***	0.37*	0.40***	0.42***	0.43***	0.17**	0.56***	0.53***	0.66***	0.65***	252.6	227.3***
	(2.08)	(2.61)	(1.84)	(8.83)	(6.00)	(6.79)	(2.33)	(5.94)	(5.84)	(3.72)	(13.54)		[0.00]
β_{mkt}	0.22***	-0.60***	0.59***	0.08***	0.26***	0.08***	0.19***	0.16***	0.44***	-0.06	0.14***		
	(8.94)	(-17.40)	(13.32)	(8.13)	(16.49)	(5.49)	(12.12)	(7.46)	(21.99)	(-1.44)	(13.62)		
Panel B: CAPM plus trend factor													
α(%)	0.19	0.46***	0.37*	0.38***	0.38***	0.44***	0.14*	0.51***	0.44***	0.64***	0.60***	234.5	174.6***
	(1.62)	(2.86)	(1.78)	(7.98)	(5.20)	(6.64)	(1.84)	(5.13)	(4.74)	(3.40)	(12.19)		[0.00]
β_{mkt}	0.22***	-0.60***	0.59***	0.08***	0.25***	0.08***	0.19***	0.15***	0.44***	-0.06	0.14***		
	(8.83)	(-17.29)	(13.28)	(8.01)	(16.39)	(5.52)	(12.01)	(7.33)	(22.04)	(-1.47)	(13.55)		
β_{trd}	0.03	-0.05	-0.00	0.02	0.03*	-0.01	0.02	0.04*	0.07***	0.02	0.04***		
	(1.17)	(-1.20)	(-0.08)	(1.48)	(1.74)	(-0.55)	(1.22)	(1.82)	(2.95)	(0.47)	(2.93)		
Panel C: CAPM plus momentum factor													
α(%)	0.27**	0.42***	0.40**	0.39***	0.44***	0.44***	0.15**	0.56***	0.51***	0.62***	0.65***	255.6	225.0***
	(2.54)	(2.71)	(1.99)	(8.61)	(6.37)	(6.88)	(2.13)	(5.86)	(5.66)	(3.49)	(13.47)		[0.00]
β_{mkt}	0.20***	-0.61***	0.58***	0.09***	0.25***	0.07***	0.20***	0.16***	0.45***	-0.04	0.14***		
	(8.22)	(-17.26)	(12.81)	(8.67)	(15.82)	(5.17)	(12.33)	(7.41)	(21.97)	(-0.95)	(13.32)		
β_{mom}	-0.05***	-0.02	-0.04	0.02***	-0.03***	-0.01	0.02*	0.01	0.02	0.05**	-0.00		
	(-3.86)	(-0.95)	(-1.40)	(2.86)	(-2.89)	(-1.05)	(1.89)	(0.50)	(1.62)	(2.31)	(-0.06)		

21/ "While our methodology here is focused on using price trends across investment horizons, it can also be applied to examine other economic fundamentals, such as firm earnings, profitability, growth, and investment patterns, over short and long terms."

22/ Related research:

Industry Long-Term Return Reversal
https://t.co/fuR5VsLB7l

> 1/ Industry Long-Term Return Reversal (Bornholt, Gharaibeh, Malin)
>
> Thread summary of the paper
>
> Long-term reversals (3-10 year formations): all U.S. stocks are grouped into 48 industries, and the industries are ranked and traded L/S against each other.https://t.co/X7ivU0b1C4 pic.twitter.com/g2c6D1nNuZ
>
> — Darren \U0001f95a (@ReformedTrader) April 12, 2019