Breaking Bad Trends

Ashish Garg
Research Affiliates, LLC, Newport Beach, CA 92660 USA

Christian L. Goulding
Research Affiliates, LLC, Newport Beach, CA 92660 USA

Campbell R. Harvey*
Duke University, Durham, NC 27708 USA
National Bureau of Economic Research, Cambridge, MA 02138 USA

Michele G. Mazzoleni
Research Affiliates, LLC, Newport Beach, CA 92660 USA

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Presented by:
Helder Palaro

Literature Review (1)

Key papers about trend-following

- **Fung and Hsieh (2001)** – The risk in hedge fund strategies: Theory and evidence from trend followers.

  Write trend-following strategies as lookback straddles. Show that trend-following funds have a non-linear relationship with the market. Trend-following strategies are good diversifiers of tail risk.

- **Moskowitz, Ooi and Pedersen (2012)** – Time series momentum.

  Find time series momentum in all 58 markets studied (equity indices, bonds, FX and commodities). Diversified portfolio produces abnormal returns, which performs best during extreme markets.

- **Asness, Moskowitz, Pedersen (2013)** – Value and momentum everywhere.

  Find significant value and momentum for individual stocks, equity indices, bonds, FX and commodities. Value and momentum are negatively correlated across asset classes.

Literature Review (2)

-**Hurst, Ooi and Pedersen (2013)** – Demystifying managed futures.

Show that returns of Managed Futures funds and CTAs can be explained by (1, 3 and 12-month) time series momentum strategies.

- **Hurst, Ooi and Pedersen (2017)** – A century of evidence on trend-following investing.

Transcribing CBOT annual reports, they apply the method of their 2013 paper to a sample in the 1880-2016 period for 67 markets. Portfolio Sharpe is positive in all decades, and correlation to equity and bond markets are very low. Strategy performed best in low correlation environments.

-**Babu, Levine, Ooi, Pedersen and Stamelos (2020)** – Trends everywhere.

Expand to 156 markets, including 82 "alternative assets" (futures/forwards/swaps), and 16 "factors". The Sharpe ratio for trend-following strategies in these alternative markets is even higher.

Literature Review (3)

Related to this paper

- **Kim, Tse and Wald (2016)** – Time series momentum and volatility scaling.

  Using the same markets as Moskowitz et al (2012), the authors conclude that volatility scaling is the only responsible feature for outperformance of trend-following. A vol-scaled trend following strategy doesn't outperform a vol-scaled buy-and-hold strategy.

- **Huang, Li, Wang, Zhou (2020)** – Time-series momentum: Is it there?

  Also using the same markets as Moskowitz et al (2012), they show that 12-month momentum strategy (TSM) doesn't outperform a simple TSH strategy, where you go long if the historical mean is positive and short otherwise.

Literature Review (4)

Related to this paper

- **Garg, Goulding, Harvey and Mazzoleni (2019)** – Momentum turning points.

For US and international equity markets, they study the combination of 1-month and 12-month momentum indicators in a static and dynamic strategy. The dynamic strategy gives more weight to the fast 1-month indicator at market turning points, and outperforms both indicator and also the static blend.

-**Babu, Hoffman, Levine, Ooi, Schroeder and Stamelos (2020)** – You can't always trend when you want.

The authors use the same 67 markets as Hurst et al (2017). They decompose the trend-following performance into three components: (1) magnitude of market moves, (2) the efficacy of the trend-following strategies and (3) the degree of diversification across trends. They show that the performance of trend-followers deteriorated in the past decade because of component (1), i.e., markets moved less than normal this decade.

Data

55 markets (futures, forwards and swaps) in the 1971-2019 period.

Equity	Bonds	Commodities		FX
Australia SPI 200	Australia 10Y	Aluminium	Live Cattle	AUD
Canada TSX 60	Canada 10Y	Brent Crude	Natural Gas	CAD
France CAC40	France OAT	Cocoa	Nickel	CHF
Germany DAX	Germany Bund	Coffee	Silver	EUR
Hong Kong Hang Seng	Italy BTP	Copper	Soybeans	GBP
Italy FTSE MIB	Japan 10Y	Corn	Sugar	JPY
Japan Nikkei 225	New Zealand 10Y	Cotton	Wheat	NOK
Netherlands AEX	Switzerland 10Y	Feeder Cattle	WTI Crude	NZD
Spain IBEX 35	UK Gilt	Gasoil	Zinc	SEK
Sweden OMXS30	US 10Y	Gasoline		
UK FTSE 100		Gold		
USA S&P 500		Heating Oil		
		Kansas Wheat		
		Lead		
		Lean Hogs		

Momentum and Turning Points

Momentum:

$$x_m^{i,\mathrm{SLOW}} = \frac{1}{k^i_{\mathrm{SLOW}}} \sum_{m'=m-1}^{m-k^i_{\mathrm{SLOW}}} r^i_{m'},$$

$$x_m^{i,\mathrm{FAST}} = \frac{1}{k^i_{\mathrm{FAST}}} \sum_{m'=m-1}^{m-k^i_{\mathrm{FAST}}} r^i_{m'},$$

SLOW k: 12 months

FAST k: 1 or 2 months

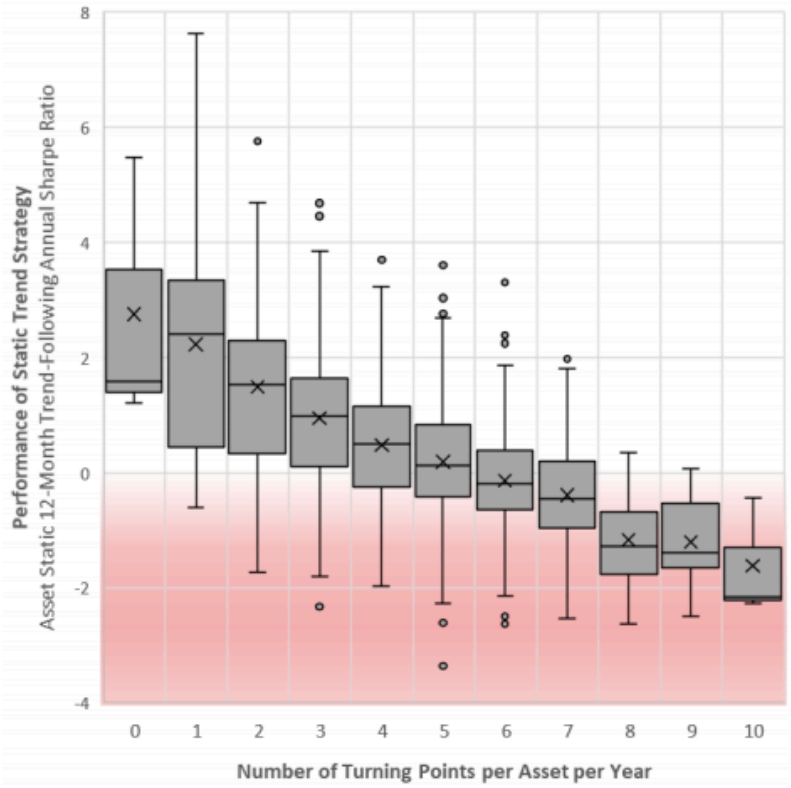
Turning points:

$$\mathrm{TP}^i_y := \text{number of months } m \text{ in year } y \text{ such that } \mathrm{sign}(x_m^{i,\mathrm{SLOW}}) \neq \mathrm{sign}(x_m^{i,\mathrm{FAST}}).$$

TP $\in$ {0, 1, 2, …, 12}

Trend Performance vs Turning Points

Exhibit 1: Static Trend Performance vs. Number of Turning Points per Asset per Year (1990-01 to 2019-12)



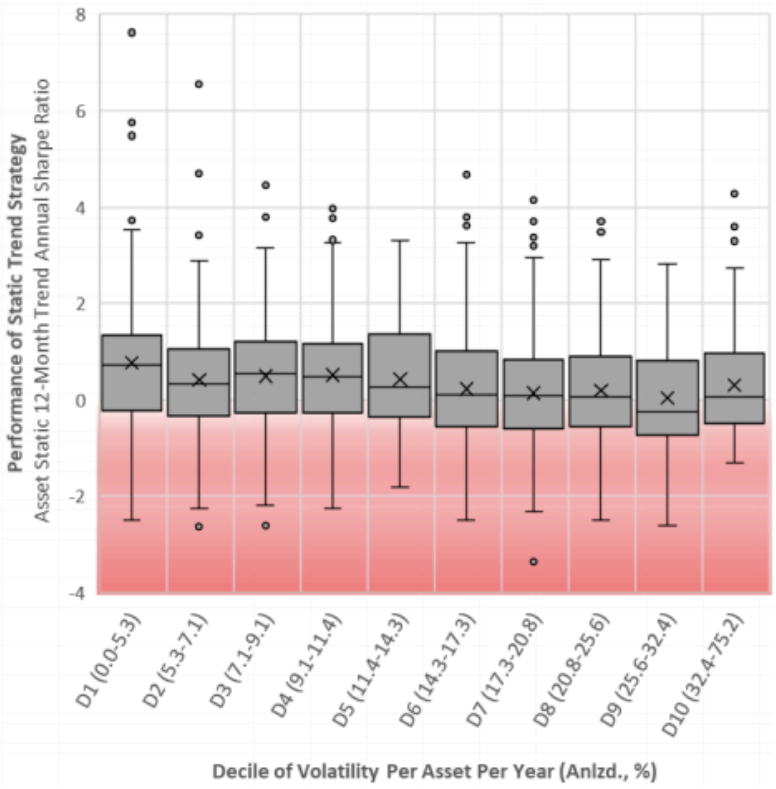
-Pooled markets.

-More than 6 TPs, performance is negative.

- Measure on a risk-adjusted basis.

Trend Performance vs Volatility

Exhibit B.1: Static Trend Performance vs. Volatility Decile per Asset per Year (1990-01 to 2019-12)

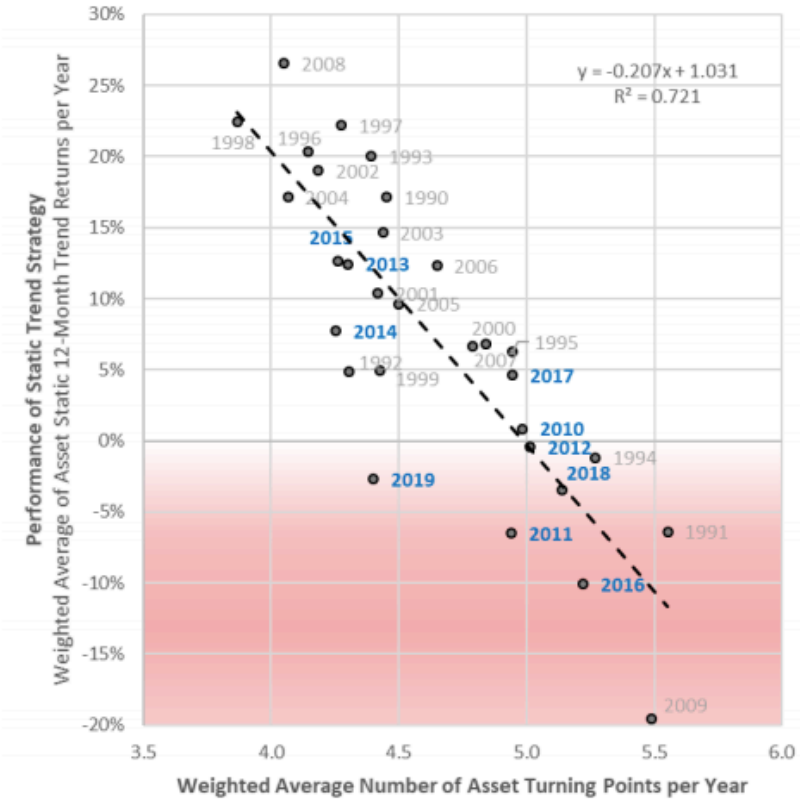


-Pooled markets.

-Relationship vanishes.

Trend Performance vs Turning Points (2)

Exhibit 2: Multi-Asset Static Trend Portfolio Performance vs. Weighted Average Number of Asset Turning Points per Year (1990-01 to 2019-12)

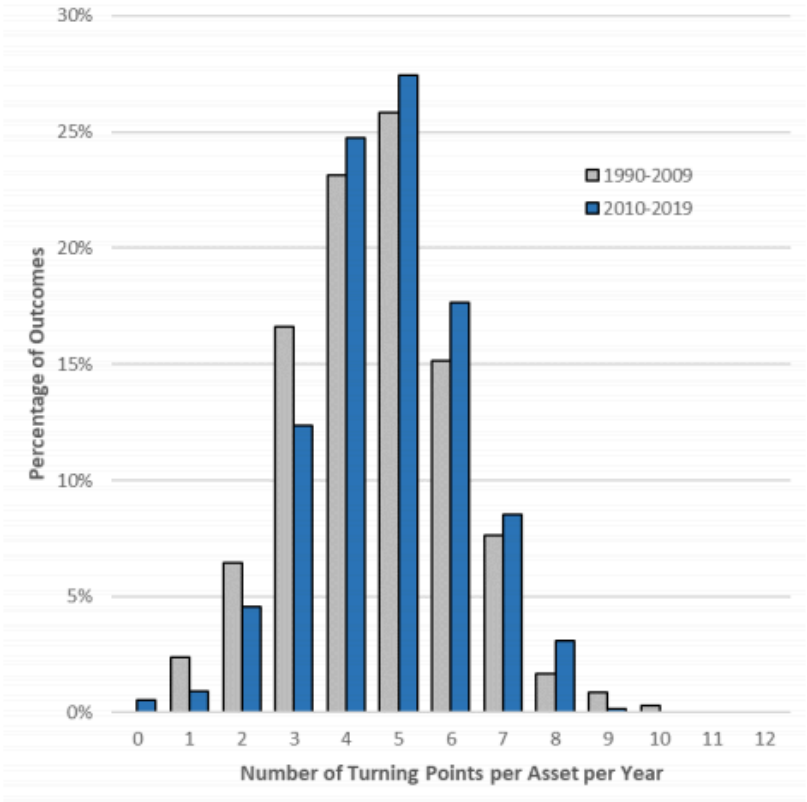


-Equal weight to each asset class, and each market within asset class.

-One std in turning points (0.45) translates to -9.2 percentage points lower return.

Occurrence of Turning Points

Exhibit 3: Asset Turning Points Have Been More Frequent in Recent Years: Empirical Distribution of Number of Asset Turning Points per Year (1990-01 to 2019-12)



Static and Dynamic strategies

Static strategies:

$$r_m^{i,\mathrm{SLOW}} = \begin{cases} r_m^i, & \text{if } x_m^{i,\mathrm{SLOW}} \geq 0, \\ -r_m^i, & \text{if } x_m^{i,\mathrm{SLOW}} < 0, \end{cases}$$

$$r_m^{i,\mathrm{FAST}} - \begin{cases} r_m^i, & \text{if } x_m^{i,\mathrm{FAST}} \geq 0, \\ -r_m^i, & \text{if } x_m^{i,\mathrm{FAST}} < 0. \end{cases}$$

Market states:

$$s_m^i = \begin{cases} \text{Bull}, & \text{if } x_m^{i,\mathrm{SLOW}} \geq 0 \text{ and } x_m^{i,\mathrm{FAST}} \geq 0, \\ \text{Correction}, & \text{if } x_m^{i,\mathrm{SLOW}} \geq 0 \text{ and } x_m^{i,\mathrm{FAST}} < 0, \\ \text{Bear}, & \text{if } x_m^{i,\mathrm{SLOW}} < 0 \text{ and } x_m^{i,\mathrm{FAST}} < 0, \\ \text{Rebound}, & \text{if } x_m^{i,\mathrm{SLOW}} < 0 \text{ and } x_m^{i,\mathrm{FAST}} \geq 0. \end{cases}$$

Dynamic strategies:

$$r_m^{i,\mathrm{DYN}} = \begin{cases} r_m^i, & \text{if } s_m^i = \text{Bull}, \\ -r_m^i, & \text{if } s_m^i = \text{Bear}, \\ (1 - a_{\mathrm{Co}}^i) r_m^{i,\mathrm{SLOW}} + a_{\mathrm{Co}}^i r_m^{i,\mathrm{FAST}}, & \text{if } s_m^i = \text{Correction}, \\ (1 - a_{\mathrm{Re}}^i) r_m^{i,\mathrm{SLOW}} + a_{\mathrm{Re}}^i r_m^{i,\mathrm{FAST}}, & \text{if } s_m^i = \text{Rebound}. \end{cases}$$

Dynamic strategy

Following Garg et al (2019), optimal parameters are estimated by:

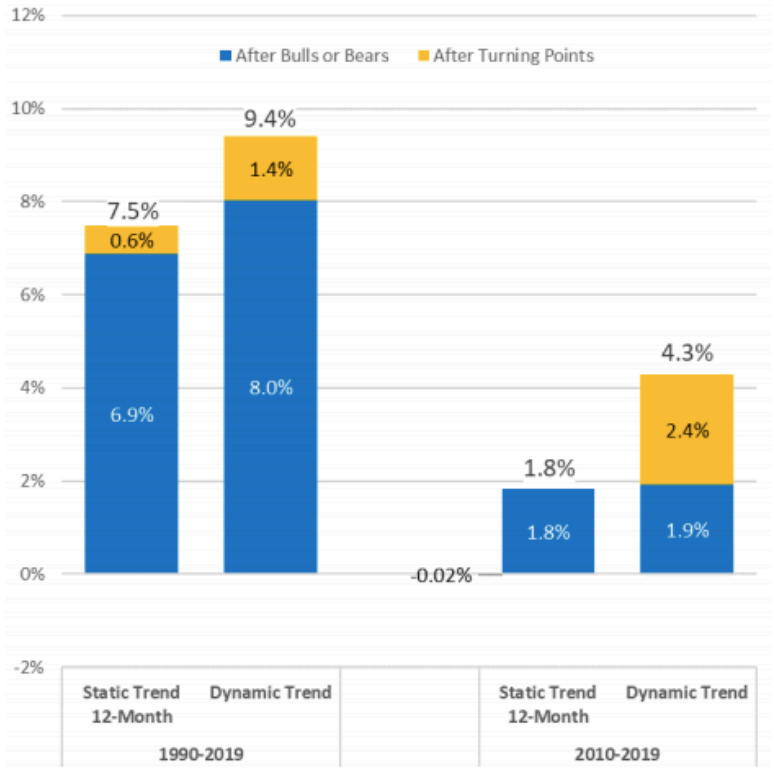
$$a^i_{\text{Co}} = \frac{1}{2}\left(1 - \frac{1}{C^i}\frac{\underset{\substack{m'<m \\ s^i_{m'}=\text{Co}}}{\text{AVG}}\, r^i_{m'}}{\underset{\substack{m'<m \\ s^i_{m'}=\text{Co}}}{\text{AVG}}\, (r^i_{m'})^2}\right),$$

$$a^i_{\text{Re}} = \frac{1}{2}\left(1 + \frac{1}{C^i}\frac{\underset{\substack{m'<m \\ s^i_{m'}=\text{Re}}}{\text{AVG}}\, r^i_{m'}}{\underset{\substack{m'<m \\ s^i_{m'}=\text{Re}}}{\text{AVG}}\, (r^i_{m'})^2}\right),$$

$$C^i = \frac{\underset{\substack{m'<m \\ s^i_m=\text{Bu}}}{\text{FREQ}}}{\underset{\substack{m'<m \\ s^i_m=\text{Bu or Be}}}{\text{FREQ}}} \frac{\underset{\substack{m'<m \\ s^i_{m'}=\text{Bu}}}{\text{AVG}}\, r^i_{m'}}{\underset{\substack{m'<m \\ s^i_{m'}=\text{Bu or Be}}}{\text{AVG}}\, (r^i_{m'})^2} - \frac{\underset{\substack{m'<m \\ s^i_m=\text{Be}}}{\text{FREQ}}}{\underset{\substack{m'<m \\ s^i_m=\text{Bu or Be}}}{\text{FREQ}}} \frac{\underset{\substack{m'<m \\ s^i_{m'}=\text{Be}}}{\text{AVG}}\, r^i_{m'}}{\underset{\substack{m'<m \\ s^i_{m'}=\text{Bu or Be}}}{\text{AVG}}\, (r^i_{m'})^2},$$

Comparing performances

Exhibit 4: Average Annualized Return Decomposition for Multi-Asset Trend-Following Portfolios using Static (12-Month) or Dynamic Trend Strategies for Each Asset: Last 30 Years and Most Recent Decade (1990-01 to 2019-12 and 2010-01 to 2019-12)



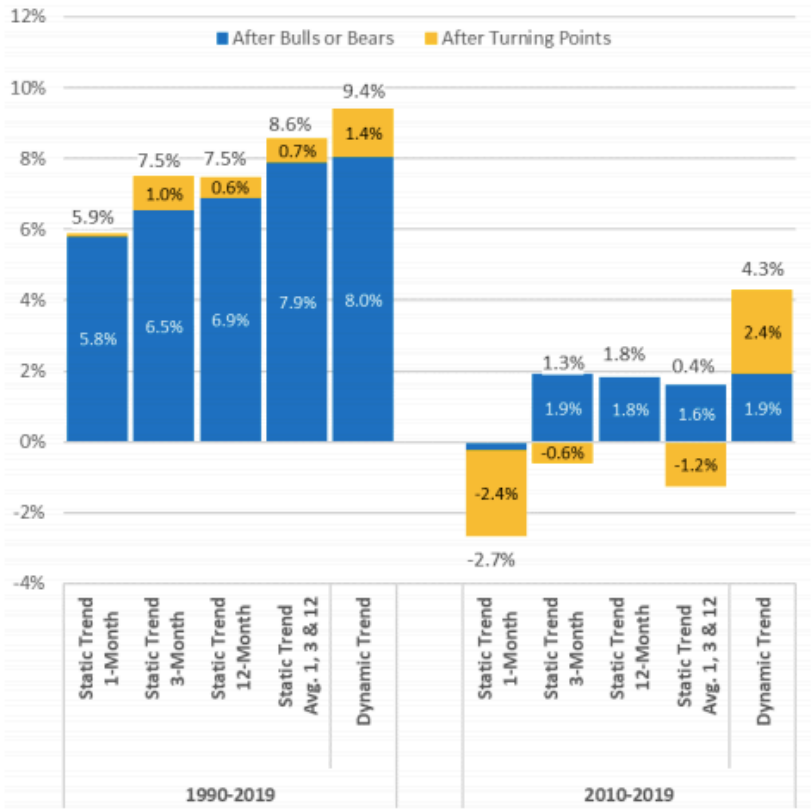
Performance degraded in the last decade.

Performance of the static strategies mostly generated in bull and bear states.

Dynamic strategy is able to generate positive returns in the correction and rebound states.

Comparing performances (2)

Exhibit 5: Average Annualized Return Decomposition for Multi-Asset Trend-Following Portfolios using Static Trend or Dynamic Trend Strategies for Each Asset: Last 30 Years and Most Recent Decade (1990-01 to 2019-12 and 2010-01 to 2019-12)



Static strategies or blend of static strategies have not been able to generate positive returns after turning points in the last decade.

The dynamic strategy is able to capture these returns.

Conclusion

- The increase in the number of turning points in the trajectory of asset price trends in the most recent decade can help explain the weak performance of trend-following strategies.

- Observed market corrections and rebounds carry predictive information about subsequent returns.

-A dynamic strategy exploiting this fact is able to harvest returns which would be lost under static strategies.