

# The Management of Systematic Risk (and Reward)

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March 20, 2023

## Abstract

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The performance of an investment portfolio is primarily determined by market returns, not by the investment decisions of the portfolio management team. Returns delivered to clients are only marginally influenced by the manager's choice of individual investments. It's all about the market.

The investment management profession doesn't see it that way. Their focus is essentially reversed — most research budgets are directed to the analysis of economic conditions and to the evaluation of individual companies. Almost nothing goes to the analysis of market influences.

As a result, portfolio managers operate fully invested day-in / day-out, giving no consideration to market conditions. Their portfolios predictably offer no protection from market (i.e., systematic) risk.

The annual surveys of "active" managers by Standard & Poor's (SPIVA) and Morningstar have therefore become a scorecard for active portfolio management (not for active market risk management), since the "active" mandate of these funds only applies to portfolio construction and industry emphasis.

For decades now, these surveys have concluded that active investment (as they define it) adds little, if any, value. As a group, portfolios of active mutual funds tend to slightly underperform a passive benchmark, notwithstanding Wall Street's huge investment in research.

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*This research paper was submitted to the National Association of Active Investment Managers (NAAIM) for their 2023 Founders Award competition.*

Using a sample of well-known active funds and a simplified process, we structured our own investigation to demonstrate that, as a group, a sample of five established “active” funds did indeed deliver benchmark returns and very little in the way of alpha over the 23 years since the beginning of the century.

The main purpose of creating our own fund sample was an attempt to address the elephant in the room — Wall Street’s disregard of market influences — with an entry-level trend management process: the well-known 200/50-day moving average crossovers of the Standard & Poor’s 500 Total Return Index.

This pair of moving averages was a comfortable choice since it has been in the public domain for decades. No data fitting. A second attractive feature is that the study requires very low maintenance: it is easily monitored and averages less than one change of direction a year.

Remarkably, even applying such a simple set of rules to our portfolio of five funds resulted in significant performance improvement for the investor: the annual return was about 1% higher than the buy/hold portfolio, risk-adjusted returns nearly doubled, and maximum drawdown was reduced by half. All of this has taken place over the past 23 years, a predominantly positive interval for the S&P-TR.

Time series momentum, the factor phenomenon that explains the success of such basic trend analysis approaches is very powerful and, unlike many other factors, highly reliable.

*Technical Factors* is the label we attach to data series generated by financial markets (as opposed to data series generated by public companies or economic time series), and we present a survey and discussion of these.

Several of the non-price technical factors such as trading volume and option statistics can be shown to have considerable information content for trend analysis.

Such qualitatively “different” tools can be combined synergistically with more conventional price-based trend studies to create complex systems of trend signals that significantly enhance the performance metrics of an otherwise passive investment.

**Active Management.** The active management of equity portfolios has two priorities: (1) managing volatility, especially negative volatility (drawdown in portfolio value), and (2) adding value with individual investment selection and the determination of sector emphasis.

Since market (systematic) returns are, by far, the largest determinant of portfolio performance, we find it interesting that the professional investment management process continues to be driven by huge budgets for fundamental and economic research, with very few resources directed toward understanding markets or attempting to predict their trends. When Wall Street firms publish their analyses of market conditions, equity strategists anchor their outlooks around economic projections.

The performance of so-called “active” mutual funds provides an interesting window on this imbalance. For business reasons, which we understand, mutual fund managers have no interest in modifying the market exposure of their portfolios in response to anticipated market conditions. They essentially operate fully invested at all times.

Accordingly, the “active” fund category refers only to the active research and selection process that determines what’s in the portfolio.

It follows that, since there is no equity exposure management by these funds, the annual SPIVA (S&P) and Morningstar surveys of “active” funds in effect answer the question: “How much value (*alpha*) is added by Wall Street’s active selection and portfolio construction process?” Over the years and once again last year, their conclusion has been “not very much.”

Meanwhile, the public domain has provided us with a handful of basic market trend analysis tools<sup>1</sup> that promise to actively manage systematic risk/reward. Perhaps surprisingly, many of them work quite well and, as we shall see, can help deliver a very respectable return pattern to the client. These tools almost always produce a significant reduction of portfolio drawdown, and, often, an improvement in return (CAGR) as well. As we

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<sup>1</sup> One of my former colleagues labeled them “naïve.”

have all learned, control of drawdown improves Sharpe Ratios which are the key metric for evaluating active management.

These rules-based approaches rely exclusively on data generated directly by the securities markets, a category of information that we label *Technical Factors*, to separate them from the better-known and more widely implemented *Fundamental Factors*.

**A Look at “Active” Mutual Funds.** We structured our own version of the SPIVA exercise, first to evaluate the long-term *alpha* generated by Wall Street research and, secondly, to overlay one of those basic (market-driven) trend analysis tools on the portfolio.

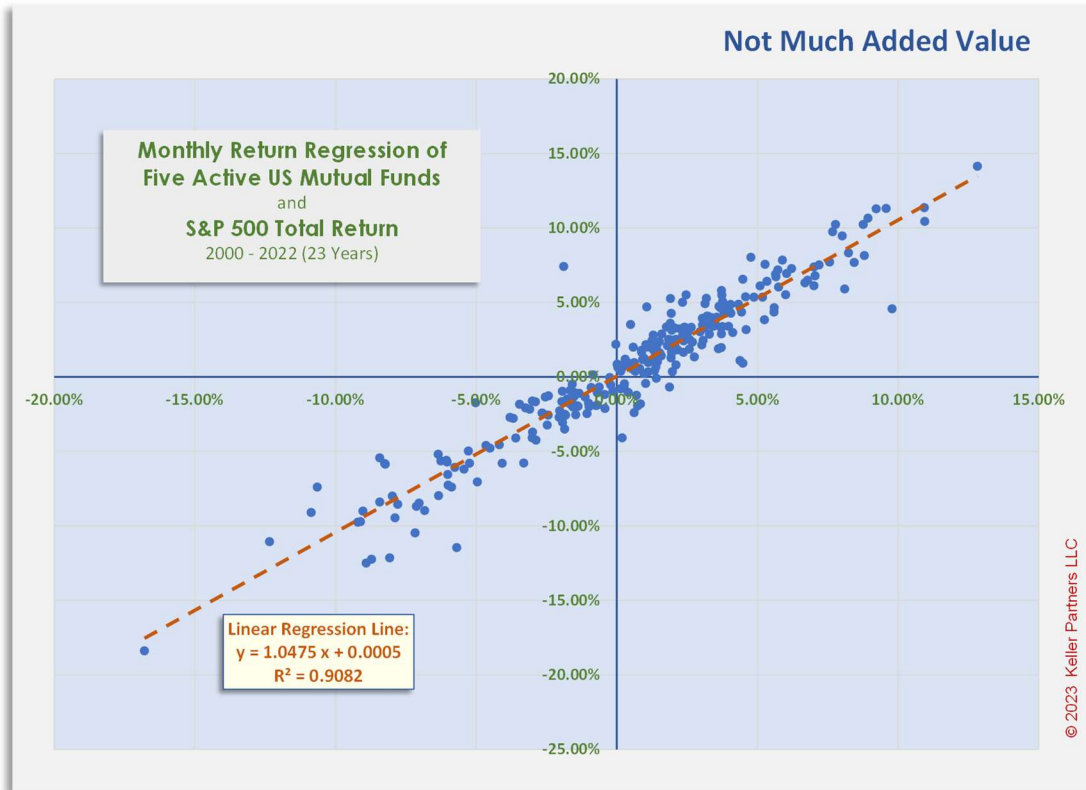
Accordingly, we assembled five well-known mutual funds, all with active mandates,<sup>2</sup> all well represented in 401(k) portfolios. Since the SPIVA survey recently celebrated its 20-year anniversary, we looked for large, “active” funds that had been in business at least since the end of 1999. This slightly longer lookback allowed us to evaluate the “21<sup>st</sup> Century-to-date” interval because we considered it important to include the full 2000-2002 bear market event in the analysis.

We calculated daily total returns for the portfolio, averaged (i.e., equally weighted) the five funds’ monthly total returns for the 23 years ending 2022 and compared them statistically to monthly total returns of the *Standard & Poor’s 500 Total Return Index*. The sample exhibited a slightly higher beta than the benchmark (1.05), a slightly positive alpha (0.6%), virtually identical portfolio drawdowns, and essentially identical risk-adjusted metrics for the 23-year period. The graphic on the next page summarizes these calculations.

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<sup>2</sup> The five funds in our active sample were:

American Funds - Growth Fund of America (AGTHX)  
Clearbridge (Legg Mason) Large Cap. Growth (SBLGX)  
T. Rowe Price New Horizons (PRNHX)  
Franklin Growth (FCGAX)  
Fidelity Magellan (FMAGX)

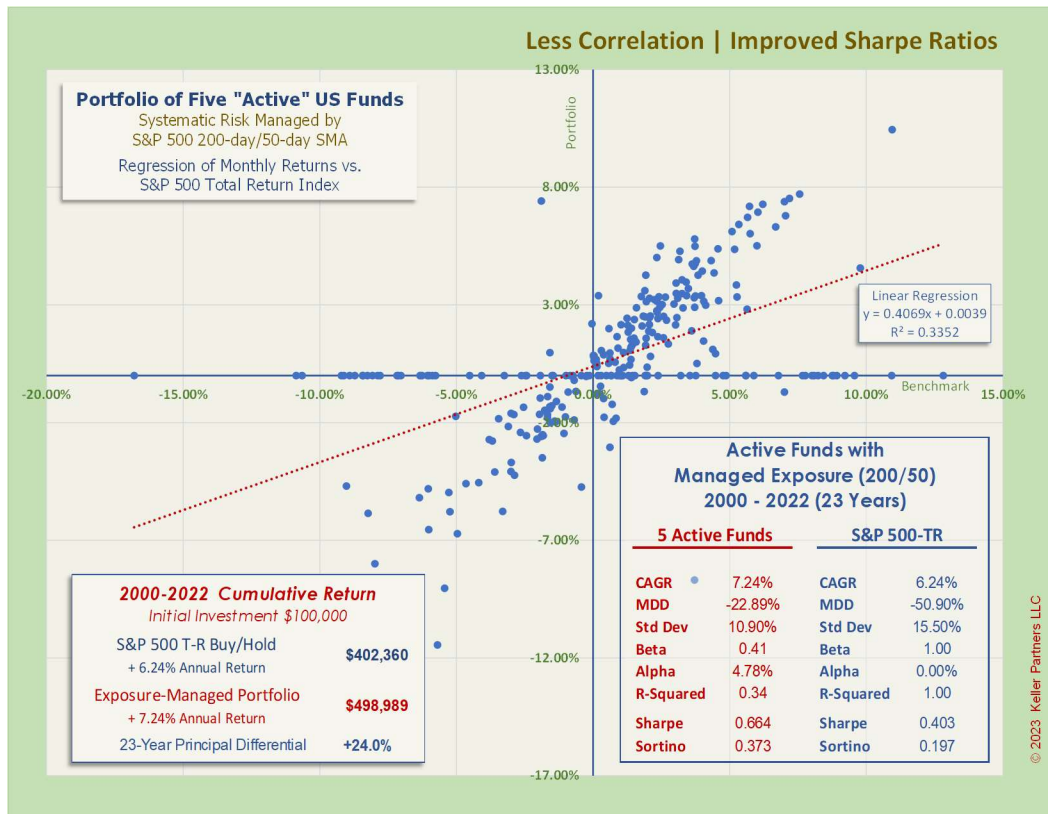


**“Active” Mutual Funds Deliver 100% Market Exposure.** We selected five large, well-established mutual funds with active mandates. That category implies that their portfolios may deviate from the benchmark as they modify sector emphasis and emphasize, or eliminate, individual investments. However, there is no implication of market judgment — these funds run essentially fully invested all the time. The scatter chart above suggests that they deliver market returns and, of course, convenience.

Our exercise came to the same conclusion as S&P and Morningstar — not much in the way of added value (*alpha*), and, given that portfolios are fully invested (as advertised), the investor is fully exposed to systematic risk.

Next, we wondered whether a basic trend identification tool such as the 200/50-day moving average crossovers of the S&P 500<sup>3</sup>, might improve the

<sup>3</sup> The concept of the 200-day moving average goes back over 100 years and has survived the test of time because it generally “works,” at least much of the time. We have analyzed almost a century of S&P data to support that. Our long-term study monitored crossovers between the 200-day and a 50-day moving average, a time series momentum study that appears every day in *Investor’s Business Daily*. Since the beginning of the 21st century, these crossovers have taken place with a signal frequency of 0.73 / year since 1998 — less than one change of direction a year.



**Simple Strategy — Attractive Outcome.** This chart illustrates performance metrics generated by overlaying crossover signals from the 200/50-day moving average study of the S&P 500 on the portfolio of our five active funds. Over the last 23-years, that strategy produced 21 signals (changes of direction) and, despite the generally rising market environment, delivered a superior return and was in cash approximately 29% of all market days. The performance calculations above assume no return on these cash balances.

performance metrics of an investment in these five funds, by how much, and, finally, at what transaction frequency? After completing the calculations for the chart above, we felt that the extent of the improvement of the active versus the passive case was quite remarkable.

The chart shows predictably less correlation among the monthly return pairs, reflecting the significant number of zero-performance months when the 200/50 study was in “cash.” The regression line is a marginal fit ( $r^2 = 0.33$ ), suggesting that the calculated alpha and beta values are unreliable. However, the performance and risk-adjusted numbers in the graphic are accurate, as they come directly from the daily/monthly calculations.

Remarkably, even after two decades of excellent returns for US equities, our hypothetical active mutual fund portfolio, funded at the beginning of 2000, would have provided the client with roughly a 1% improvement in annual return for these 23 years. More important, the exercise would have delivered a return pattern with less than half the maximum drawdown (MDD) of the original buy/hold investment in these same funds. Predictably, this generated a significant improvement in Sharpe and Sortino Ratios.

Given the low frequency of signals (less than one per year) we assume that a disciplined individual investor could, in fact, have been able to overlay this widely available trend-identifying discipline to a 401(k) portfolio holding these five funds.



**Daily Update of the 200-day and 50-day moving averages of the S&P 500.** This chart has appeared for over three and a half decades in *Investor's Business Daily*, founded by William O'Neill. This image was clipped from a recent electronic edition. Note the infrequent crossovers.

Why wouldn't everyone do this?

A few reasons. First, the use of a rules-based quantitative discipline is counterintuitive to a client's general understanding of how markets work. Markets should reflect the economic realities of the day, which moving averages do not.



Secondly, the 200/50-day moving average is a very blunt tool. At the time its signals occur, they often feel clumsy and late. Still, with the benefit of hindsight, roughly half the signals are quite productive – the other half result in small losses, or opportunity losses.

Over time, however, it will be seen that some of the productive signals cause the portfolio to participate in a significant rise in prices or avoid an equally significant decline. Loss avoidance is critical – the possibility of escaping those recurring, yet unpredictable, -50% (or more) drawdowns turns out to be the key to success.

**Sharpe Ratios.** Over 10 years ago, Jeremy Grantham published an excellent piece commenting on the irrational volatility of securities markets, as well as the importance of risk-adjusted returns to the final client.<sup>4</sup> Both are relevant to this discussion.

On the volatility of markets:

“The central truth of the investment business is that investment behavior is driven by career risk. The prime directive, as Keynes knew so well, is first and last to keep your job.

Professional investors pay ruthless attention to what other investors in general are doing. The great majority “go with the flow,” either completely or partially. This creates herding, or momentum, which drives prices far above or far below fair price. There are many other inefficiencies in market pricing, but this is by far the largest. It explains the discrepancy between a remarkably volatile stock market and a remarkably stable GDP growth together with an equally stable growth in “fair value” for the stock market. This difference is massive . . .

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<sup>4</sup> Jeremy Grantham, *My Sister's Pension Assets and Agency Problems*, GMO Research, April 2012



## On the importance of Sharpe Ratios:

I believe the concept of the Sharpe Ratio is one of the few aspects of “modern portfolio management” that is useful at the level of a balanced portfolio. The Sharpe Ratio is a measure of how many units of price volatility an investor has received in the past per unit of return. It is a reasonable, although short-term, measure of the chance of real loss of money.

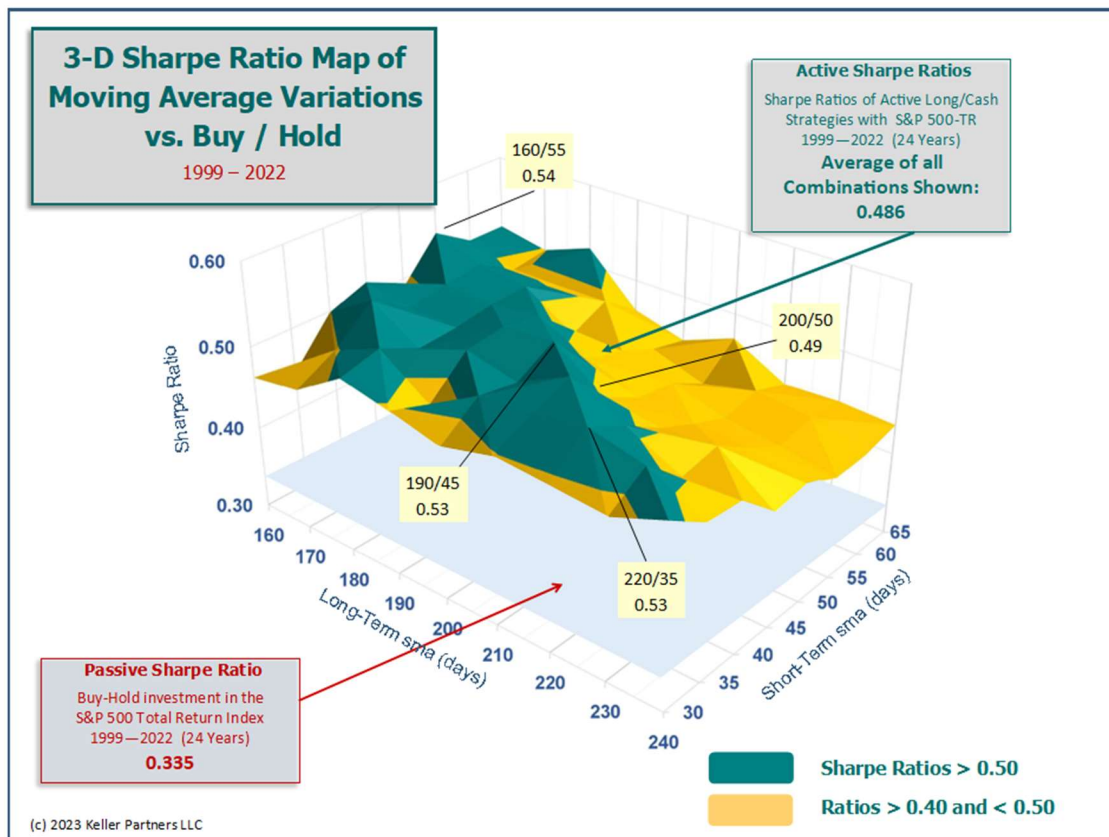
“Information Ratio” or “benchmark risk” is, in contrast, very widely used. These measure how much you deviate from the benchmark per unit of extra return. In other words, it measures career risk: the risk of embarrassing your boss and losing your job. It is no wonder, perhaps, that the Sharpe Ratio – the risk to the ultimate beneficiary, the pensioner, say – is more or less ignored.

It is not unusual for active strategies to generate somewhat lower returns than their benchmark, but it is also typical to have those strategies generate significantly lower drawdowns. Often, the maximum drawdown (MDD) number is reduced by 50% or more or more with an active strategy. Since smaller drawdowns are of such great importance to the individual client, all our strategies must pass through the lens of the Sharpe Ratio.<sup>5</sup>

Earlier this year, we investigated several logical variations of moving average lengths around the 200-day/50-day combination. Again, we quantified the value added by these various combinations by evaluating the simulation results with Sharpe Ratios. As it turned out, all variations around the 200/50 combination produced significantly higher Sharpe Ratios than a passive investment in the underlying index, suggesting that the concept of analyzing and managing trends with moving averages is robust across a wide variety of moving average parameters. Put another way, given the financial markets’ reliable tendency to trend, even marginal trend-following strategies can pay off, and good ones can pay off very well.

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<sup>5</sup> Whenever we make a statement about the importance of Sharpe Ratios to the evaluation of an active manager, someone in the room will note that the Sortino Ratio, a refinement of the Sharpe Ratio that incorporates only negative volatility, might be the more appropriate measure. We typically calculate both metrics but have found them to be highly correlated since most of the high volatility episodes are generated in periods of falling prices.

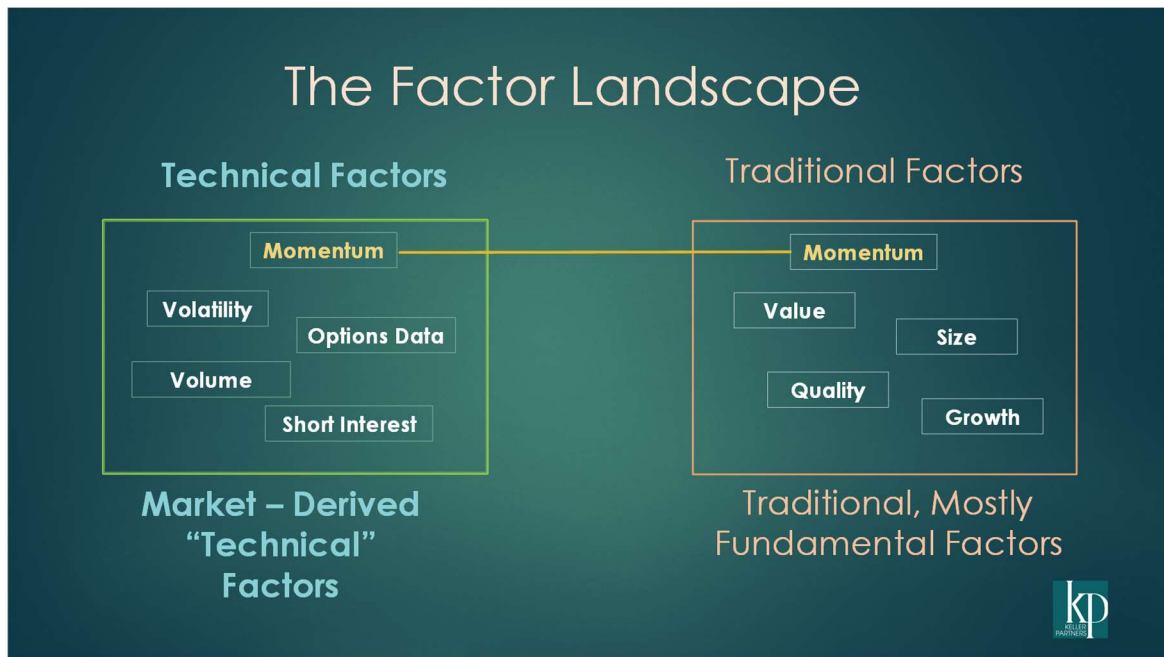


**Remarkably Robust.** This surface chart displays nearby variations of the 200/50 moving average, such as 210/40, 170/60, etc. Sharpe Ratios above 0.50 appear in green, floating significantly above the 0.335 Sharpe Ratio calculated for a passive investment in the benchmark. The fact that the area of high readings (green) is a relatively contiguous, broad plateau suggests that the success of the 200/50 approach is most likely not the result of fitting theory to data. The 200/50-day combination we explore in this study has a Sharpe Ratio of 0.49 and there is a suggestion in this graphic that shorter spans (e.g., 190/45) could improve results a bit.

The “herding or momentum” characteristic of securities markets mentioned by Jeremy Grantham gives rise to long-lived trends that we can identify mathematically with the simple 200-day/50-day moving average algorithm. This exercise allows us to generate risk-on/risk-off signals for portfolios invested in US stocks. The ability to profitably implement these shifts, and to apply the process successfully in the future, requires that the momentum factor be robust and reliable. Our study of technical factors suggests it is.

**Technical Factors.** Factor investing is a principal driver of investment management today. It is one of two concepts, together with passive indexing, that are widely implemented by Wall Street firms and enjoy the endorsement of the academic community.

We begin with an overview of factors —



**Not all Factors are Alike.** Traditional (fundamental) factors have been widely implemented in portfolios, with varying success. Factor strategies often include Momentum as one of their factors, although we would say that since prices, the input for momentum calculations, are generated by markets, Momentum is a *technical factor*, and belongs in the box on the left.

Factors are attributes of individual stocks that have been associated with performance advantages over time. The most widely accepted and implemented factors are those listed in the “Traditional Factors” box to the right. The focus of Keller Partners, however, is exclusively on *Technical Factors*, all of which are data series generated by the securities markets themselves.

Momentum, based on prices and price change, is a technical factor under this definition but has been widely applied in multi-factor investment strategies, together with fundamental factors. Momentum is widely

acknowledged as the most robust of all factors and is supported by a significant body of academic literature.<sup>6</sup>

We also believe momentum to be very important — it is, after all, the underpinning of that magical 200-day/50-day moving average approach. However, we view it more as a gateway to many other market-generated time series, some of which we believe have significant value for both trend identification and individual investment selection. Here is a graphic summarizing how we organize these Technical Factors:

Survey of Technical Factors		
Connection to Securities or Index Prices		
Direct	Indirect	Loose / Subtle
Prices	Advances / Declines	Options Data [ P / C Ratios, O / I Ratios ]
Moving Averages [ Time-Series Momentum ]	New Highs / Lows	Advisory Sentiment [ AAI ]
Relative Performance [ Cross-Sectional Momentum ]	Adv. / Dec. Volume	Futures Positions [ COT ]
Price-Based Studies [ RSI, CCI, MACD ]	Hybrid Studies [ TRIN, OBV, Money Flow ]	Implied Volatility [ VIX, VXN ]
Information Content for Trend Analysis		
Good	Better	Best

**Momentum is the Beginning.** All our work is based on *technical factors*. We do not incorporate any fundamental information. The matrix above arranges the technical factors we have investigated by (1) the degree of information content (usefulness / value-added) and (2) the connection with price (at the end of the day, the metric most important to the client is price). Over the years, we have found that some of the data series listed in the middle column above significantly enhance the effectiveness of trend studies based on price only (such as this 200/50-day sma study).

<sup>6</sup> The 200/50-day moving average strategy is classified academically as "time series momentum." A very solid academic introduction to this corner of the momentum literature is: Time Series Momentum, Moskowitz, Ooi, and Pedersen, *Journal of Financial Economics*, 2012.

Separately, we wrote an early paper on what is now called Cross-Sectional Momentum, titled Relative Strength Does Persist, Akemann and Keller, *Journal of Portfolio Management*, Fall 1977.

The table above presents our perspective on the *Technical Factors* that interest us, categorized by their connection to securities prices on the one hand and the potential value of their information on the other. We see, for example, that the moving average studies we have been discussing have a direct connection to price, but that we rate their information content as only “good.” By contrast, some of the options data in the right column might have correctly identified an important turning point to the day but may not have shown itself capable of doing that reliably every time.

Momentum is a key trend analysis study for us but it is a gateway to a much wider array of market-generated information, much of it under-examined and poorly understood, and some of it (in our opinion) very valuable. We have found that trend analysis studies based on these more obscure time series have significantly strengthened our market trend work. Separately, we have been successful in having volume analysis support an investment selection process for individual stocks and ETFs.

**And Beyond . . .** Trend studies drawn from these more exotic data series look at the market from a completely different perspective, analogous perhaps to night vision technology. As a result, we believe we are able to enhance the effectiveness of the basic trend-following approaches we’ve discussed in this paper by blending price-based 200/50-day study with algorithms based on technical factors drawn from the second column, and, to a lesser extent with data series from the third column.

## Synergistic Combinations of Independent Trend Studies

S&P 500 Total Return Index 12/31/1998 – 12/30/2022 [24 years]

Benchmark S&P500 Total Return Index	Price-Based Trend Model <span style="color: red;">200 / 50 SMA</span>	Non-Price Trend Study <span style="color: red;">Volume + VIX</span>	Combination Two-Factor Trend Model	
CAGR	4.9%	6.6%	8.2%	7.6%
Std. Deviation (annl)	15.4%	11.3%	10.6%	9.7%
Maximum Drawdown	-52.6%	-27.5%	-24.4%	-16.5%
Sharpe Ratio	0.32	0.58	0.77	0.78
Sortino Ratio	0.16	0.26	0.40	0.39
Signal Frequency / year	0.00	0.71	5.23	6.00
Column	1	2	3	4

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**Multiple Trend Studies Are Often Synergistic.** We have seen that a relatively straightforward, price-based trend identification system that has been in the public domain for decades, can nevertheless significantly enhance Sharpe and Sortino Ratios of an investment portfolio (data in col. 2 versus benchmark in col. 1). However, when we journey into the world of the less-studied technical factors, we can develop studies (data in column 3) that add value to trend analysis in a different way. In combination, this more exotic work significantly enhances the performance of the original trend study (final column).

We have found these independent approaches to evaluating market trends synergistic, as the data in the table above suggest. As always, we evaluate the effectiveness of all this work by return, volatility, and of course, with Sharpe and Sortino Ratios.

**Finally.** Statistics developed in this paper strongly suggest, given the reliable and persistent tendency of financial markets to trend, that a simple price-based momentum study can make a far more meaningful positive impact on the return patterns experienced by the client than the mountain of analytical effort directed at generating alpha in a fully invested fund portfolio.



Market influences dominate portfolio returns, but the investment management profession directs very few resources toward market trend analysis. As a result, in a year such as 2022, everyone is fully invested and everyone participates fully in the negative market returns. Last year's drawdowns already exceeded most clients' comfort zones, and, in any event, these results were mathematically very damaging to long-term return averages. The industry can do better.

## **Appendix: Miscellaneous Observations**

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**Short Positions.** Short signals are not the inverse of long signals. Most trend-management systems (such as the ones discussed in this article) are binary — their recommendation is either “long” or “cash.” It does not follow, however, that greater returns (or Sharpe Ratios) automatically result when we substitute a short position for the cash position.

The internal characteristics (“the physics”) of declining markets are very different from those of advancing markets. They require a conceptually separate toolset, calibrated to issue independent “short” / “cash” signals.

**Moving Averages.** Interestingly, the “public domain,” where the 200-day moving average resides, remains firmly tied to the concept of simple moving averages (SMAs). SMAs have an awkward philosophical problem in that every day, the number dropping from the average (from 200 days ago) affects the average just as much as the new number being added. Nevertheless, we strictly applied this “traditional” SMA approach to the research for this paper.

In our practice, however, we lean toward “exponential” moving averages (so-called EMAs), an intuitively more satisfying approach to smoothing that gives more weight to the more recent data.

EMAs should more appropriately be called “percentage smoothing,” since the mathematics of their front-weighting is more subdued and quite distinct from those of a real “exponential” moving average. *Percentage*



*smoothing*, introduced by Peter Hauran in 1968, is an easily calculated, widely used smoothing alternative found in most charting applications, and the methodology is widely documented on the internet.

**Volatile Asset Classes.** When trend management techniques are applied to more volatile portfolios or to a volatile index, MDDs and standard deviations predictably go up and so does CAGR. But, in some cases, risk-adjusted returns also increase slightly as well, suggesting that the greater volatility of say, a managed index investment in the Nasdaq 100 (NDX) might theoretically be a slightly better investment than the same approach applied to the S&P 500-Total Return index, assuming that the client is comfortable with the expectation of more volatility and a greater MDD.