

Momentum and Asset Class Selection within Sigma401k Dynamic Asset Allocation Portfolios.



Introduction

There are numerous long term investment strategies available to retirement plan participants, including traditional fixed allocation, buy-hold-rebalance, target date funds, and benchmarking. In most cases, 401(k) plans default investors into a target date fund – a preset combination of fixed income and equity investments and leaves it alone into perpetuity. In slightly more exotic cases, one can seek returns with strategic management, whose managers may realign portfolios slightly (usually no more than 5-10% on any given period). Strategies can be based on a market risk ‘factor’, region, country, sector, calendar dates, etc. A strategy less frequently available to most retirement accounts involves combining one of these factors with rules based risk management, or Dynamic Asset Allocation (DAA). This process involves constructing a portfolio that tracks a return factor (i.e. value, size, or momentum), sector (energy, health care), or combination thereof, in conjunction with periodically (i.e. quarterly) re-evaluating that portfolio’s overall risk level. With DAA, the risk level, or exposure to equity investments, depends on short and medium term market trend direction estimates. In other words, it means devoting a maximum acceptable allocation to the chosen factor(s) during what are determined to be positive market trends, and reversing to minimum allocation (more bond, less stock) during periods with a negative market outlook. Sigma401k has developed a DAA strategy, flexible enough to meet most retirement goals, at a cost lower than traditional managed account options.

Our strategy boils down to two general steps, following the DAA principles above. First, maximum equity and fixed income weights are set on a quarterly basis; weights within our five portfolios vary by risk tolerance and asset class type. Our white paper “Market Trend Estimation within Sigma401k’s Dynamic Asset Allocation Strategy” discusses how we construct the market trend indicator, which determines quarterly maximum equity weights. This paper outlines the second major step: why and how Sigma401k’s DAA Portfolios are organized using momentum and relative strength with asset classes. Momentum is a relatively young and less understood phenomena in financial theory, but similar in systematic scope as the value and size premiums that many high end investment managers implement for clients. The most important difference is that as a general factor tracking strategy, momentum has outperformed value, size and the S&P 500, on a risk adjusted basis, by significant margins over long term investment horizons. Short and intermediate (1-5 year) periods may see other factors doing better, but on the retirement time horizon scale, this is less important. The key is to minimize behavioral traps which undermine its benefits, which is why it must be carried out in a systematic and disciplined manner. This is why we have developed an automated process for its implementation. We discuss our simulated historical testing results later in the second half of the paper.

What is Momentum and Why Should I Care?

First brought to light in historical financial data by Jegadeesh and Titman¹ in 1993, momentum (MoM) describes the observation that tradable assets (individual stocks, asset class ETFs, etc.) that have outperformed their peers over recent (2-12-month) periods tend to continue outperforming over the short term (2-12 month). Peers can be any group of financial assets – it doesn’t have to be large cap stock A vs. large cap stock B or C – momentum only cares about price and performance. Empirical research has shown that by holding the stronger performers, then readjusting on a regular basis (monthly, or in Sigma401k’s case, quarterly for 401(k) accounts), better risk adjusted returns have been obtained, seemingly in defiance of the efficient market hypothesis. When compared to other risk factors (overall market, size and value), however, there is no doubt that it has performed well, as shown in Figure 1. Using the last 89 years of monthly returns from Kenneth French’s widely used data library², Figure 1 shows annualized return, volatility, and risk/return adjusted (Sharpe Ratio) results for the market, size, value and momentum risk factors. Figure 2 displays those returns in the growth of \$1 over that 89 year period.

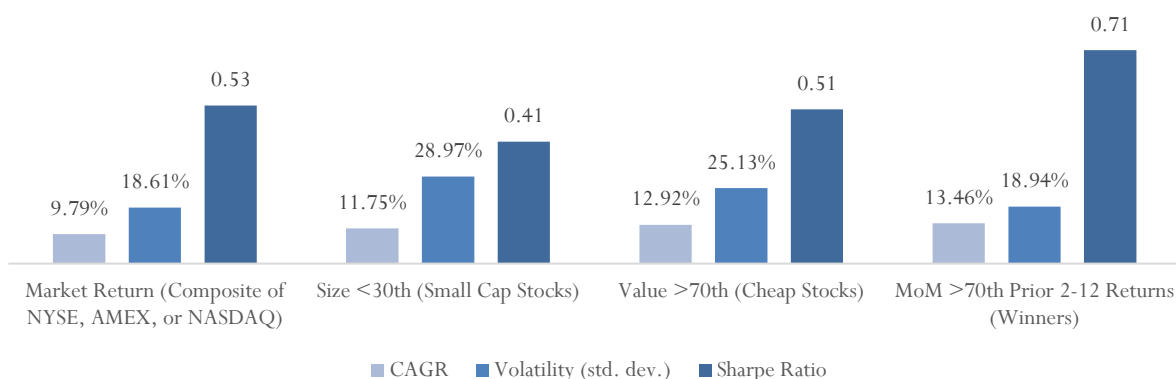
The returns used in these figures come from Fama-French portfolios weighted by value (rather than equally weighting stocks), or market cap, much like a stock market index weights its stocks. Momentum returns are constructed with the average return of the top 3 decile (>70th percentile) 2-12 month prior return groups each month. For value performance we use the average return of

¹ Jegadeesh, N. and S. Titman (1993). “Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency.” Journal of Finance, vol. 48, pp. 65-91.

² http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html - Data Sets used:
http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ftp/Portfolios_Formed_on_ME_CSV.zip
http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ftp/Portfolios_Formed_on_BE-ME_CSV.zip
http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ftp/10_Portfolios_Prior_12_2_CSV.zip

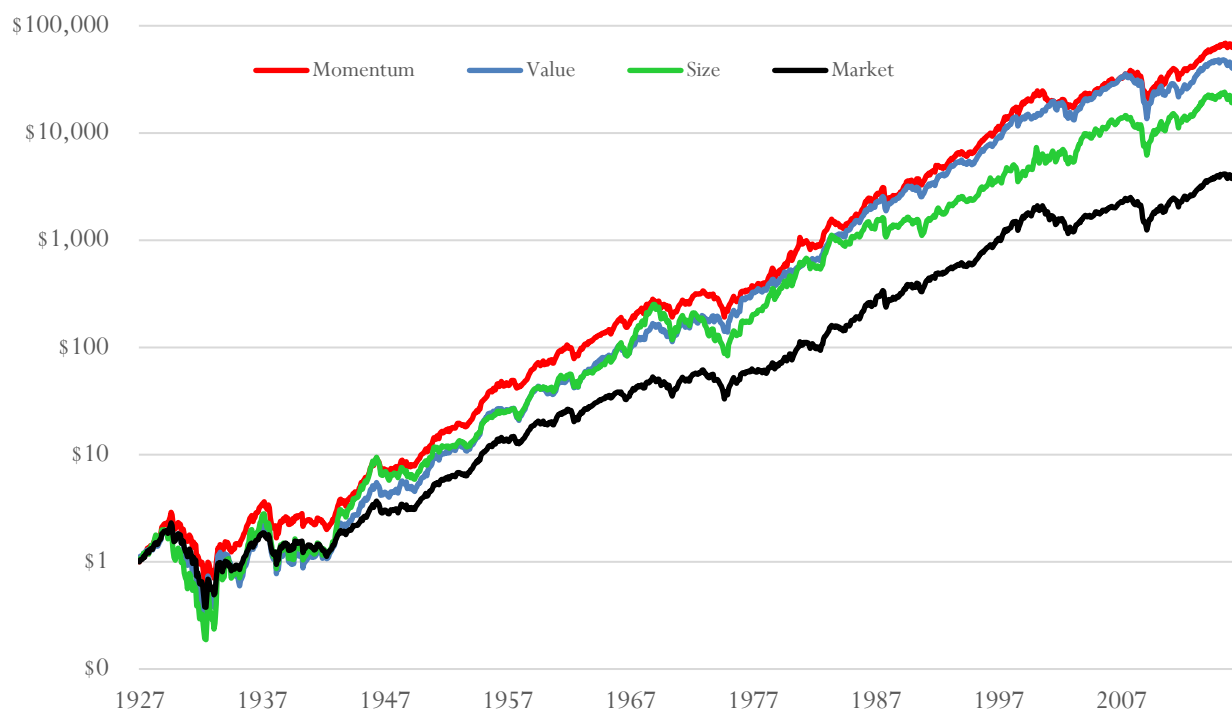
the top 3 book-to-market deciles. For size, we use the bottom 3 deciles (<30th percentile in market cap).

Why Investors Use Momentum, Value and Size: Annualized Returns, Volatility, Sharpe Ratios 1927-2016



In fact, momentum premiums can be found over 200 years of dating back to the Victorian age in U.K equity data^{3,4}. Anyone with the inclination to dive further would see that momentum is not a trick. Like any other strategy, this one involves a risk/return profile with ups and downs, but as a starting point, this is as reputable a factor to track as any, including with long term, stay-the-course (i.e. 401(k)) investors.

Growth of \$1 Using Major Risk Factors, 1927-2016



How does Momentum get away with this? Doesn't it violate the Efficient Market Hypothesis?

By now, academics and practitioners have thoroughly tested, implemented, vetted and re-vetted the momentum effect. For better or worse (we think better) it is an empirical truth. The question is not is it there, but why is it there, and will it continue? There is an open debate in as to what behavioral or structural factors can explain momentum's higher risk adjusted excess return. We believe that markets are mostly 'weak form' efficient; that is, asset prices almost always reflect all public available information, and past price trends offer little benefit to any individual stock⁵. But we are not convinced that markets are perfect, and that people are always rational economic optimizers. There are numerous effects and biases studied in behavioral finance that suggest market

³For a detailed, accessible look at the long term performance of momentum across time, samples and countries, see Clifford S. Asness, Andrea Frazzini, and Ronen Israel: Fact, Fiction and Momentum Investing: University of Chicago Booth School of Business and National Bureau of Economic Research. Journal of Portfolio Management. Fall 2014.

⁴For More on Dynamic Momentum Hedging (or Dynamic Asset Allocation), see Geczy, Christopher and Mikhail Smonov. 2013. 212 Years of Price Momentum (The World's Longest Backtest:1801-2012). Available at <http://www.cmgwealth.com/wp-content/uploads/2013/07/212-Yrs-of-Price-Momentum-Geczy.pdf>

⁵ Though we do believe it can be some help to broad, longer term risk environment trends – hence our trend indicator.

participants do not make efficient decisions, such as:

- Bad information processing – making the wrong trade based on the right data;
- Forecasting errors – a perennial source of misallocation, which interacts with overconfidence;
- Overconfidence – investors believe they are better stock pickers than results would indicate;
- Framing effects – would you rather have an 80% chance of avoiding cancer, or a 20% chance of getting cancer? Depending on how the situation is framed, even if it's the same result, can influence decisions.
- Anchoring – investors that are too slow to update their beliefs with new evidence – holding on to losers (the 'disposition effect'), waiting for the rebound, and not buying, waiting for the price drop.

Ask yourself, do you always make the right decision with your portfolio, based perfectly and objectively on the information available, and do you act firmly? It would be difficult to say most average investors do, let alone everyone.

Even with these behavioral factors, one might expect savvier, more objective investors to arbitrage those opportunities away. Yet the momentum premium has endured. We do not claim to be experts in understanding how momentum persists; the experts themselves have not settled this. We have simply looked over the historical evidence, and the evidence says either 1) there are not yet fully explained anomalies which allow a factor like momentum to work or 2) all of the risk/reward of momentum has been accounted for, but some investors are simply not taking advantage of it; the arbitrage opportunity is not black and white. Even Eugene Fama, the Nobel Prize winning economist and father of EMH cannot fully explain the momentum effect, meaning whether it is due to risk or irrationality (i.e. mispriced assets)⁶. The [debate continues between its champions and skeptics](#). In the meantime, we will take advantage of the 200+ year 'anomaly'.

Does momentum help explain returns of risky assets? Where does it fit in?

Before explaining how Sigma401 utilizes and focuses on momentum, it is important to note that the academic and practitioner's understanding of explaining returns to risky assets usually begins with the capital asset pricing model (CAPM). The CAPM is an equilibrium model that describes the relationship expected return of an asset (say, Apple stock) to the return of the overall market, less the return of the risk free asset (RMRF). It's principle message is that investors are rewarded for accepting 'systematic risk' only – the risks of investing in a single company can be diversified away, and thus are risks that an investor need not bear. The CAPM is set in a linear framework (stock x vs. market (y)), and generates the well-known beta and alpha parameters for performance reporting. It is a simple model that has its benefits and flaws, but is still in heavy use to this day in asset management and corporate finance.

Models have extended beyond CAPM, perhaps most famously to the Fama-French (FF) 3-factor model (and more recent 5-factor). The FF model is a richer explanation of returns, essentially adding two factors, firm size and book-to-market value, to the CAPM. The model parameters are:

- 1) The market risk premium (RMRF), minus the risk free rate. This is a composite of stock market indices (i.e. NYSE, AMEX, NASDAQ) returns minus the 3-month Treasury bill – the "Equity Risk Premium". It is not a spread factor – it essentially represents being long equities, minus the return on cash.
- 2) The spread return between buying high and selling low book to market stocks (HML) – the "Value" factor
- 3) The spread return between holding small size firm minus big firm [10th – 1st decile] stocks (SMB) – the "Size" factor

These model parameters measure the overall spread constructed in a "pure" fashion. This means returns are generated in a monthly portfolio of hundreds or thousands long and short positions. The purpose is for demonstration of return that could be obtained with zero net investment. The model has consistently shown return premiums for smaller cap stocks and high book-to-market stocks, relative to their large cap and low book-to-market stock counter parts. Value and small cap stocks are generally seen as riskier and thus require a higher return from investors.

So the market, size and value premiums are used to explain returns. What about momentum? It's not part of any FF model (yet), but Kenneth French's data library contains several datasets illustrating the momentum effect (MoM). The library includes a spread factor for momentum, 'winners minus losers' (WML), similar to the value, size and market spread factors. The average return on the two high prior return portfolios (big prior and small prior stocks) minus the average return on the two low prior return portfolios (low prior big and small cap stocks):

$$WML = \frac{1}{2} (High-Big + High-Small) - \frac{1}{2} (Low-Big + Low-Small)$$

⁶ Fama, E. and K. French, 2008, [Dissecting Anomalies](#), *The Journal of Finance*, 63, pg. 1653-1678.

Table 1 shows annualized compounded returns, volatility (standard deviation), and the standard risk adjusted metric (Sharpe Ratio) for Mkt-RF, SMB, HML and WML.

Table 1. Average Annual Systematic Risk Factor (Fama-French 3-Factor Model) and Momentum Spreads, 1927-2016.				
Factor	Mkt-Rf	SMB	HML	WML
Annualized Return	6.20%	2.04%	4.17%	6.60%
Annualized Volatility	18.65%	11.16%	12.16%	16.40%
Annualized Sharpe Ratio	0.33	0.18	0.34	0.40

Why isn't momentum part of, say a 6-factor model? It may someday. Regardless, the takeaway here is that first we showed momentum returns when compared to value, size and market (figures 1 and 2). Now we have shown that momentum is also the best performer in a zero net investment, or 'pure' setting. In other words, the effect does not disappear when held to empirical research standards. It's a robust effect.

Momentum Return Characteristics and Recent Performance

Looking at the graph of cumulative returns above, it is clear that momentum has had some major down periods. No more was this apparent in 2008. In the Fama-French annual data, momentum lost 45%. In fact, relative to the low-prior return portfolio, momentum was 82% lower! Momentum as a pure strategy has underperformed its historical average since 2008. With a relatively sluggish economic recovery, momentum has not returned with gusto. In addition, momentum, like other risky asset returns, tends to have a negatively skewed distribution of returns. That is, there are more large losses than large gains. So is the 'fad' finally over as some of the skeptics might hope? First, it might be useful to provide some perspective on where 2008 lies on the distribution of annual return spreads – it is quite the outlier. As a basic statistical measure, 2008 is a 3.6 standard deviation observation, which puts it in the 99.98th percentile, assuming an approximately normal distribution of returns. It is literally *the outlier*. Of course the assumption of normality is always a tepid one in finance, but the point stands on at least a non-rigorous level; 2008 was not a normal year, and nothing close to it. But with relatively anemic annual returns post-2008, the challenge to investors is, do they trust the strategy in lackluster periods? Why not just stick with a vanilla market index strategy?

In fact, on an annual basis, momentum returns have been relatively stable in comparison to the "market". Figures 3 and 4 plot the distribution of annual and monthly returns for the Momentum and Market spread returns.

Figure 2. Distribution of Annual Returns, Momentum and Market Pure Spreads, 1927-2016

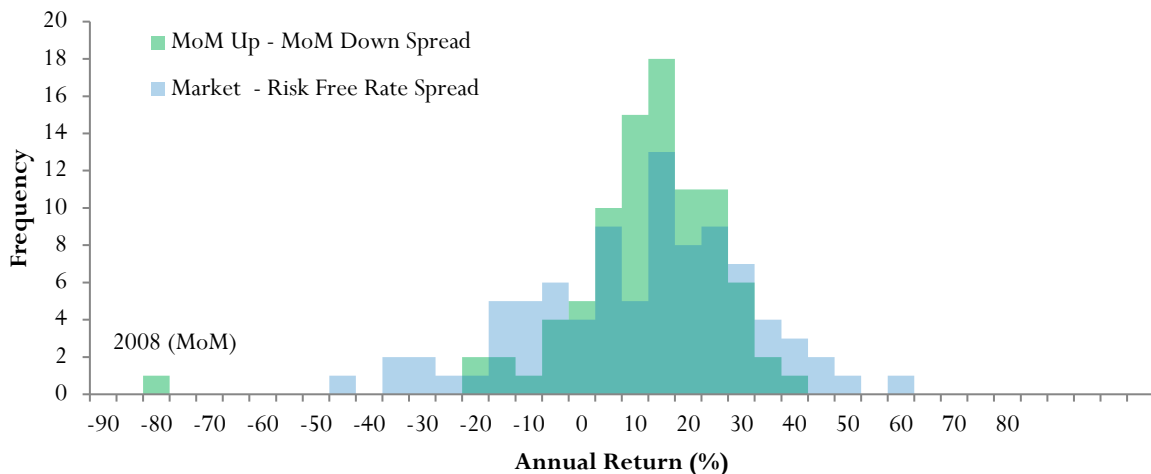
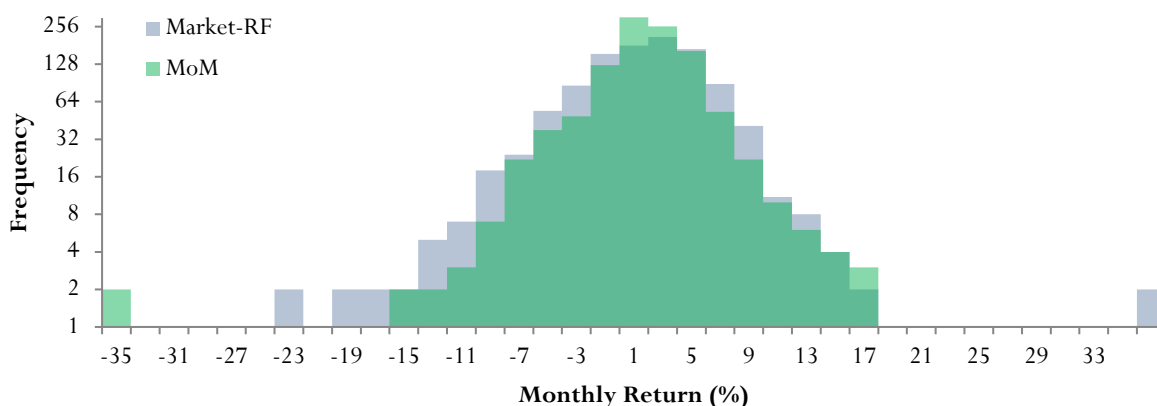


Figure 3. Distribution of Monthly Returns, Momentum and Market Spreads, 1927-2016



Momentum holds up with the market, and even shows more ‘normal’ characteristics⁷. That said, the assumption of normality in returns is widely discussed in finance and portfolio management, as the behavior of returns can exhibit fat tail distribution characteristics – seemingly normally distributed data with clustering of observations near the mean and with outliers. While momentum also shows a negative skew, it’s no more so than the other factors; negatively skewed distributions are common across asset return data. The result of Sigma401k’s DAA strategy over the 2007-2016 period was lower volatility and a more normally distributed set of returns.

How Do Sigma401k’s Portfolios Use Momentum?

For this paper, we demonstrate the momentum effect using FF data and their >70th percentile prior return portfolio performance⁸. We also show the spread of the high and low prior (>70th - <30th) returns in comparison to the FF 3-factor model spread results. However, this is an academic exercise; as we mentioned above, the portfolios in the FF datasets are large and complex. How is momentum implemented in the real world, let alone in your average 401(k) plan account? The good news is that long-only portfolios in momentum also achieve better risk adjusted performance than the other traditional factors, including short only versions of momentum, as demonstrated in many academic empirical tests^{9,10}. Secondly, momentum is a relative measure that simply looks at price/level and return, so it can be applied to individual stocks, major asset class groups, country GDP, and anything in between. It can work with any retirement account with access to the major macro and style box asset classes, allowing an investor to take advantage of momentum using mutual funds and ETFs. Sigma401k does the legwork on maintaining the strategy, executing quarterly trades in literally a robotic fashion. This prevents some of the behavioral biases that lead many investors astray from the strategy, damaging the long term benefits.

Asset Class Selection Process

Sigma401k determines asset class selection using a fairly simple momentum method at the asset class level. A subset of asset classes (filtered from the larger asset class universe shown in Table 3 below) are ranked each month by their 2-12 month performance against the total market (we use the Russell 3000). 2-12 month performance is a composite, exponentially weighted moving average, computed as follows:

⁷ Normality in data is commonly checked with the Shapiro-Wilk test statistic, with the null hypothesis being that the data are normally distributed. This can be done with any statistical computing software (R, STATA, etc.). With a simple test of annual and monthly returns shown above, the ‘pure’ momentum monthly and annual returns reject the null hypothesis (annual: n=89, 1 degree of freedom, p-value = 0.02, monthly n=1080, 1 degree of freedom, p-value = 0.006). Put differently, we cannot say returns are normal and cannot reasonably use momentum to project portfolio values into the future. P-values for the 10-year monthly data discussed below are 0.004, 0.099 and 0.004 for DAA without asset class selection, DAA with trend indicator, and the ‘pure’ momentum factor, respectively. The DAA with trend indicator result indicates data closer to a normal distribution. Other tests for ARIMA model fit, correcting for trend, heteroskedasticity, and autocorrelation (Ljung-Box) are beyond the scope of this white paper.

⁸ Data are actually broken down by decile, so the >70th percentile portfolio would mean the >70th, >80th, and >90th percentile groups.

⁹ Israel, R. and T. Moskowitz (2013). “The Role of Shorting, Firm Size, and Time on Market Anomalies.” *Journal of Financial Economics* 108(2), 275-301.

¹⁰ Asness, Et. al 2014.

Table 2. Asset Class Returns Weighting	
Performance from:	Weight
2 months prior	40%
2-4 months prior	30%
2-6 months prior	20%
2-12 months prior	10%

Exponential weighting simply means more recent data are given higher weights, in recognition that newer information is more influential, though not entirely. The filtered asset class list shown in Table 4 are most commonly found in 401(k)s. We track the subset's monthly performance and reallocate based on the weighted relative performance at the beginning of each quarter. Asset classes which outperform the benchmark are included in the DAA portfolio for the next quarter (Table 5). Most asset classes are either not suitable or typically found in 401(k) plan fund lineups.

Portfolio weights are first split into total equity/bond, depending on overall risk tolerance and return goals. Within equities there are two asset class types: A and B. Class A equities are less volatile than class B (i.e. Large Cap vs. Technology), and we weight As much more heavily than B, between 65% to 90% of the total equity share, depending on the portfolio used.

Table 3. Asset Class Universe			
Allocation 15 to 30% Equity	Europe Stock	Long-Short Credit	Specialty Financial
Allocation 30 to 50% Equity	Foreign Large Blend	Long-Term Bond	Specialty Global Real Estate
Allocation 50 to 70% Equity	Foreign Large Growth	Market Neutral	Specialty Health
Allocation 70 to 85% Equity	Foreign Large Value	Mid-Cap Blend	Specialty Natural Resources
Allocation 85%+ Equity	Foreign Small Mid Blend	Mid-Cap Growth	Specialty Real Estate
Bear Market	High Yield Bond	Mid-Cap Value	Specialty Technology
China Region	India Equity	Miscellaneous Region	Specialty Utilities
Commodities Agriculture	Industrials	Money Market Stable Value	Target Date 2005
Commodities Energy	Inflation-Protected Bond	Multisector Bond	Target Date 2015
Commodities Precious Metals	Infrastructure	Option Writing	Target Date 2020
Consumer Discretionary	Intermediate Government	Pacific Asia ex-Japan Stock	Target Date 2025
Consumer Staples	Intermediate Term Bond	Preferred Stock	Target Date 2030
Convertibles	Japan Stock	Short Government	Target Date 2035
Corporate Bond	Large Blend	Short-Term Bond	Target Date 2040
Diversified Emerging Markets	Large Growth	Small Blend	Target Date 2045
Diversified Pacific Asia	Large Value	Small Growth	Target Date 2050
Emerging Markets Bond	Latin America Stock	Small Value	Target Date 2055
Energy Limited Partnership	Long Government	Specialty Communications	Target Date 2060+



Table 4. Asset Classes for Use in 401(k) Plans		
Asset Classes For 401(k) Use	Asset Class Index	Sigma401kAsset Class Type
Small Cap Value	KWXG	A
Small Cap Growth	RWLP	A
Small Cap Blend	CHTB	A
Mid Cap Value	KGJK	A
Mid Cap Growth	ZFLP	A
Mid Cap Blend	ZVBK	A
Large Cap Value	WSBZ	A

Large Cap Growth	WCMD	A
Large Cap Blend	WNVR	A
Technology	MDNW	B
Real Estate	NPWJ	B
Precious Metals	TSCS	B
Intermediate Term Bond	BFQR	B
Health Care	LBRF	B
Global Developed Markets	CLMT	B
Basic Materials	FLSY	B
Emerging Markets Diversified	SBFZ	B
Intermediate Term Bond	BFQR	BOND



Quarterly Reallocation by
Momentum/Relative
Strength Ranking

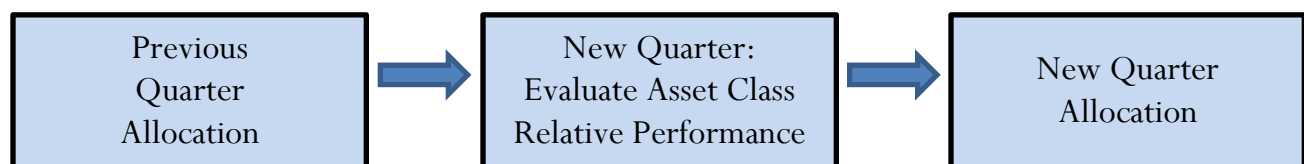


Table 5. Previous to New Quarter Allocations Based on Relative Performance

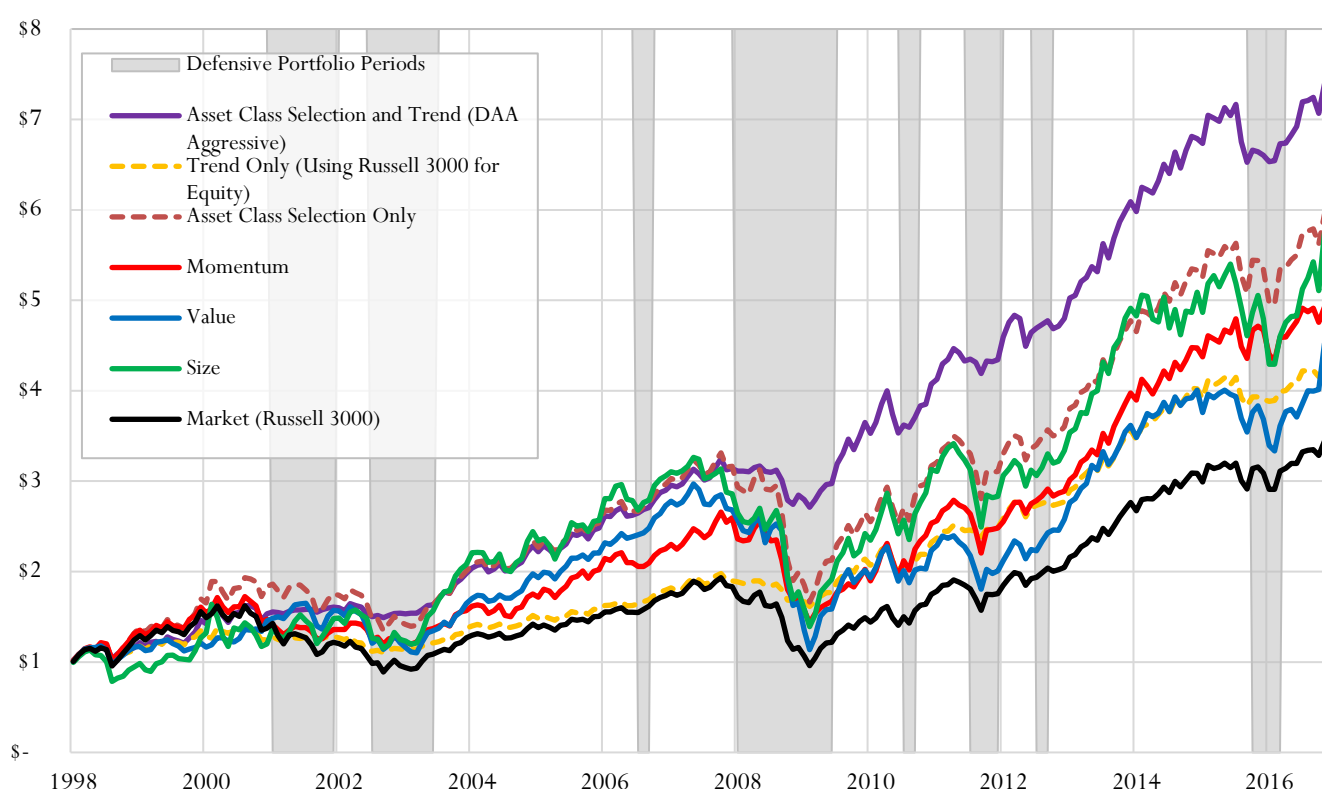
Previous Quarter Positions	Asset Class 2-12 Month Weighted Performance (Above Benchmark = New Position)			New Quarter Positions
Real Estate	Technology	9.50%	MDNW	Technology
Emerging Markets Diversified	Health Care	7.48%	LBRF	Health Care
Global Developed Markets	Basic Materials	7.35%	FLSY	Basic Materials
Small Cap Value	Large Cap Value	7.24%	WSBZ	Large Cap Value
Mid Cap Value	Large Cap Blend	6.99%	WNVR	Large Cap Blend
Small Cap Blend	Russell 3000	6.95%	RUA	BOND
Large Cap Value	Mid Cap Blend	6.81%	ZVBK	
Mid Cap Blend	Mid Cap Growth	6.75%	ZFLP	
Precious Metals	Large Cap Growth	6.68%	WCMD	
Large Cap Blend	Mid Cap Value	6.67%	KGJK	
BOND	Small Cap Blend	6.34%	CHTB	
	Small Cap Growth	6.03%	RWLP	
	Small Cap Value	5.62%	KWXG	
	Emerging Markets Diversified	5.08%	SBFZ	
	Real Estate	3.98%	NPWJ	
	Global Developed Markets	3.34%	CLMT	
	Precious Metals	3.02%	TSCS	

20-Year Back-tested Results for Sigma401k Asset Class Selection vs. Momentum, Value, Size and Market (Buy and Hold)

Using monthly return data from the 18 401k asset class indexes (Dow Jones¹¹), we compared performance from 1998-2016 between our quarterly asset class selection process, and the returns during the same period for the market, momentum, value and size factors. We illustrate Sigma401k portfolios under its component and combined scenarios:

- 1) A two asset portfolio test (Trend Only). The portfolio is 90%/10% stock/bond in positive trend quarters and 30/70 in negative trend quarters. Equities are represented by the Russell 3000, fixed income is the Dow Jones Intermediate Term Bond Index. See our concurrent paper on the trend model methodology.
- 2) A portfolio that allocates 100% of funds to the best performing equities in uptrends and 100% in downtrends, so we can see the effects only due to asset class momentum. Class A equities comprise 85% of the portfolio, Class B equities 15%.
- 3) Our complete DAA strategy, where asset class selection is combined with trend-based aggressive and defensive portfolio weights.

Growth of \$1, Factor Returns and Sigma401k DAA, 1998-2016



Over the 19-year period (1998-2016), the hypothetical portfolio with asset class selection only performed similar to the ‘pure’ momentum portfolio with respect to risk adjusted returns but with more volatility (Table 6). The DAA with trend portfolio beat all other portfolios in risk adjusted performance (11.19% annualized, 1.03 Sharpe ratio). In addition, skewness was similar for the component portfolios, and markedly closer to zero for the full DAA portfolio (-0.34) than all but the FF Size series. On the other hand, the DAA component and full DAA portfolios had relatively high kurtosis, meaning returns were concentrated and contained relatively more extreme values. All other risk parameter estimates (Maximum Drawdown, Value at Risk [VaR], Expected Shortfall [ES] for the full DAA model are more favorable than the factor only series.

Table 6. Performance and Risk Summary for Sigma401k DAA and Factor Monthly Returns, 1998-2016

¹¹ Dow Jones Index monthly return data is retrieved through Scanalytics’ ICE: <http://www.advisoryworld.com/products-services-financial-analysis-tools/web-applications/ice/> - subscription is required. All returns for Sigma401kDAA and Dow Jones Indices, and subsequent statistical estimates shown, are time-weighted, compounded monthly. Index data returns are based on underlying stocks adjusted for splits and dividends.

Metric	Asset Class Selection Only	Trend Only	Selection and Trend (DAA)	FF Momentum	FF Value	FF Size	FF Market
Annualized Return	9.95%	8.06%	11.19%	8.82%	8.47%	9.84%	6.83%
Annualized Volatility	16.48%	9.77%	10.85%	15.29%	18.70%	22.41%	15.78%
Annualized Sharpe Ratio	0.60	0.83	1.03	0.58	0.45	0.44	0.43
Maximum Drawdown	49.8%	21.5%	16.5%	46.0%	61.8%	57.4%	50.4%
Historical VaR (95%)	-7.23%	-3.51%	-3.83%	-7.12%	-8.38%	-9.38%	-7.86%
Historical ES (95%)	-10.68%	-6.09%	-6.29%	-9.81%	-13.05%	-13.60%	-10.28%
Monthly Volatility	4.76%	2.82%	3.13%	4.41%	5.40%	6.47%	4.56%
Skewness	-0.68	-0.63	-0.34	-0.64	-0.76	-0.26	-0.67
Kurtosis	4.55	5.04	4.58	3.82	5.20	4.08	4.00

Concerns in Hypothetical Tests

Hypothetical or simulated testing is a useful but limited exercise, and we want to emphasize that the portfolios tested here do not represent actual investments, and are for illustrative purposes only. We attempt to illustrate what could have transpired in the portfolio, given the information that would have been available at the times of each quarterly reallocation. However, investing in pure indexes is not possible. One common drawback that could affect net returns in a DAA strategy is transaction costs. Trading or transaction fees for moving investments from one fund to another or buying new funds in your own account, can eat into returns, and can possibly negate the potential benefits of DAA. However, this cost does not exist within most 401(k) or retirement plans – if done on a quarterly basis, there are no additional transaction fees for reallocating within your plan’s existing universe of funds. Moreover, one of the benefits of momentum investing is its inherent tax efficiency: relatively poorer performing assets are dropped; if these assets are net losses, no capital gains taxes are applied. This benefit generally does not apply to tax deferred 401(k) accounts, however, as funds exchanged within accounts are not realized gains.

There are of course other limitations to the hypothetical shown above. We provide benchmarking comparisons to similar risk-adjusting funds in our model performance reports. Second, since it is hypothetical, the performance can be subject to data mining biases, including hindsight, survivorship, and look ahead bias. In testing the DAA models, we use existing “pure” indexes from Dow Jones with long return histories; no proxy replacements are used. Indexes are the best available approximation of representing an asset class or sector as a whole.

Hindsight bias suggests we could pick combinations of available funds today, or at the time of investment, to maximize the historical returns we end up with in testing. Using indexes mitigates the ‘selection bias’ that may result from this and is the most “neutral” way to show a hypothetical test, even though indexes will outperform many of the funds that track or deviate from it.

Survivorship bias simply means we are using funds that have survived the period, possibly because they had performed relatively well against their peers and were allowed to continue, thus biasing the performance upward. By using indexes, we minimize survivorship bias.

Look ahead bias would mean we are using data and information not available at the time the investment decisions would have been made. Our market trend and asset class scoring are all based only on past information available at the time of each reallocation. The strategy does not choose investments based on any forward looking metrics, as one would in a fundamental valuation context. The positions we determined hold no look ahead bias.

Summary

Momentum is an empirically proven risk factor that has outperformed other common investment strategies (value, size, market) on a risk adjusted basis over long term investment horizons. Momentum can be applied in a sophisticated manner even in rigid 401(k) accounts due to its robust effects across the spectrum of financial assets. Our asset class selection process follows a simple variant of 2-12 month momentum (relative performance). This type of DAA strategy is widely used by financial advisors, registered representatives and other investment firms for their clients worldwide. We examine 89 years of monthly return data to demonstrate the performance of momentum relative to the other factors, and look at our DAA strategy over a 20-year period (1998-2016). The combination of momentum exposure and downside risk management in the DAA portfolios resulted in outperformance of these other methods in hypothetical testing.

One of our goals in writing this and the market trend paper is to be as transparent about the strategy as possible; anyone can look into the data sources, test the empirical data, and anyone can implement a DAA strategy, if so inclined. We at Sigma401k believe this level of investment management can and should be available for any suitable 401(k) account at a low cost.

While nothing is guaranteed, looking forward over the longer term, we believe this strategy has the potential to preserve and grow wealth for individual clients and retirement plan participants. This is based on decades of empirical research and our disciplined approach to implementing the strategy. We will continue to follow the data, and when needed, develop new strategies as long term market and macroeconomic conditions dictate a change. Our focus on achieving long term objectives mean that we are flexible and we need to be.



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