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MOMENTUM INVESTING & ASSET ALLOCATION

A primer on relative strength investing and the evolution
of modern portfolio theory and asset allocation policy

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Abstract

This paper highlights the use of a new strategic approach within a quantitative investment methodology in the context of making prudent asset allocation decisions. Three asset classes will frame the dynamic asset allocation discussion: Equities, Fixed Income, and Hedge Funds. The quantitative methodology used is an evolution of J. Welles Wilder's Relative Strength Index (RSI) first published in *New Concepts in Technical Trading Systems*¹. The sample portfolio that was analyzed over several market cycles has demonstrated greater compound returns with less volatility. The result is a set of strategies that yield better risk-adjusted returns to the broad equity markets, broad bond markets, and broad returns of hedge funds. In fact, the portfolios we analyzed delivered significantly higher risk adjusted returns across multiple market cycles.

Background

Momentum based investment strategies have been researched, written about, and used in portfolio management for decades. Christopher Geczy and Mikhail Samonov even conducted a 212 year backtest² detailing the statistical significance of price momentum strategies. Clifford Asness and his research colleagues have simplified the definition of momentum investing for us: "momentum is the phenomenon that securities which have performed well relative to peers (winners) on average continue to outperform, and securities that have performed relatively poor (losers)

¹ Wilder, J. Welles. *New Concepts in Technical Trading Systems*. Winston-Salem: Hunter, 1978

² Geczy., Christopher and Samonov, Mikhail, 212 Years of Price Momentum (The World's Longest Backtest: 1801-2012) (August 1, 2013)

tend to continue to underperform.”³ We encourage readers to review the work of the aforementioned research greats.

Many Relative Strength systems, such as those detailed by Jim O’Shaughnessy⁴ or Mebane Faber⁵, look at the price return of a stock or index. There is no doubt that strategies such as O’Shaughnessy and Faber’s assist investors to build better portfolios versus indexing alone. The strong performance from each author’s research speaks for itself! We believe, however, that relative price return (strength) strategies can be improved upon as pure price return strategies ignore the volatility of price movements. As such, we look to build upon the research completed by some of the best writers and thinkers in our industry. J. Welles Wilder, who first published his Relative Strength Index (RSI) methodology in the 1970’s, developed a system that brings into consideration the magnitude of gains and the magnitude of losses. While Wilder’s initial research looks at overbought or oversold territory for a single stock, this paper analyzes an evolution of Wilder’s original concept as it considers investment selection based on peer ranking the RSI values (taking volatility under consideration) for the constituents of each asset class in its entirety.

Relative Strength Index

As detailed by Wilder, the Relative Strength Index (RSI) is a momentum-oscillating indicator that compares the magnitude of recent gains to recent losses in an effort to determine the condition of a particular asset. Thus, RSI is a volatility adjusted momentum model.

$$RSI = 100 - \left(\frac{100}{1 + RS} \right)$$
$$RS = \frac{\text{Average of 14 days' closes UP}}{\text{Average of 14 days' closes DOWN}}$$

The methodology employed by the author of this paper adapts this formula in an effort to discern a larger, macro trend in the asset class to make better capital allocation decisions. To accomplish this, we adjust the tenor from the prior 14 days’ closes to the prior 12 months’ closes. Within each asset class, the RSIs are then ranked among each other. In the event of a tie, i.e. more than one index has a RSI score equal to 100, the tiebreaker will be to allocate capital to whichever index registers the highest return per unit of risk.⁶

The time period of our study spans returns from 1991-2014 and the baseline of returns is derived from the following benchmark returns:

- Equities: The Standard & Poor’s 500 Total Return Index (SPTR)

³ Assness, Clifford S. and Frazzini, Andrea and Israel, Ronen, and Moskowitz, Tobias J., Fact, Fiction and Momentum Investing (May 9, 2014) Journal of Portfolio Management, Fall 2014 (40th Anniversary Issue); Fama-Miller Working Paper.

⁴ O’Shaughnessy, James P. *What Works On Wall Street*. New York: McGraw-Hill, 1998

⁵ Faber, Mebane T., *Relative Strength Strategies for Investing* (April 1, 2010).

⁶ Return per unit of risk = Compound Annual Return / Annualized Standard Deviation

- Fixed Income: The Barclays U.S. Aggregate Index (AGG)
- Hedge Funds: The HFRI Fund Weighted Composite (HFRI FWC)

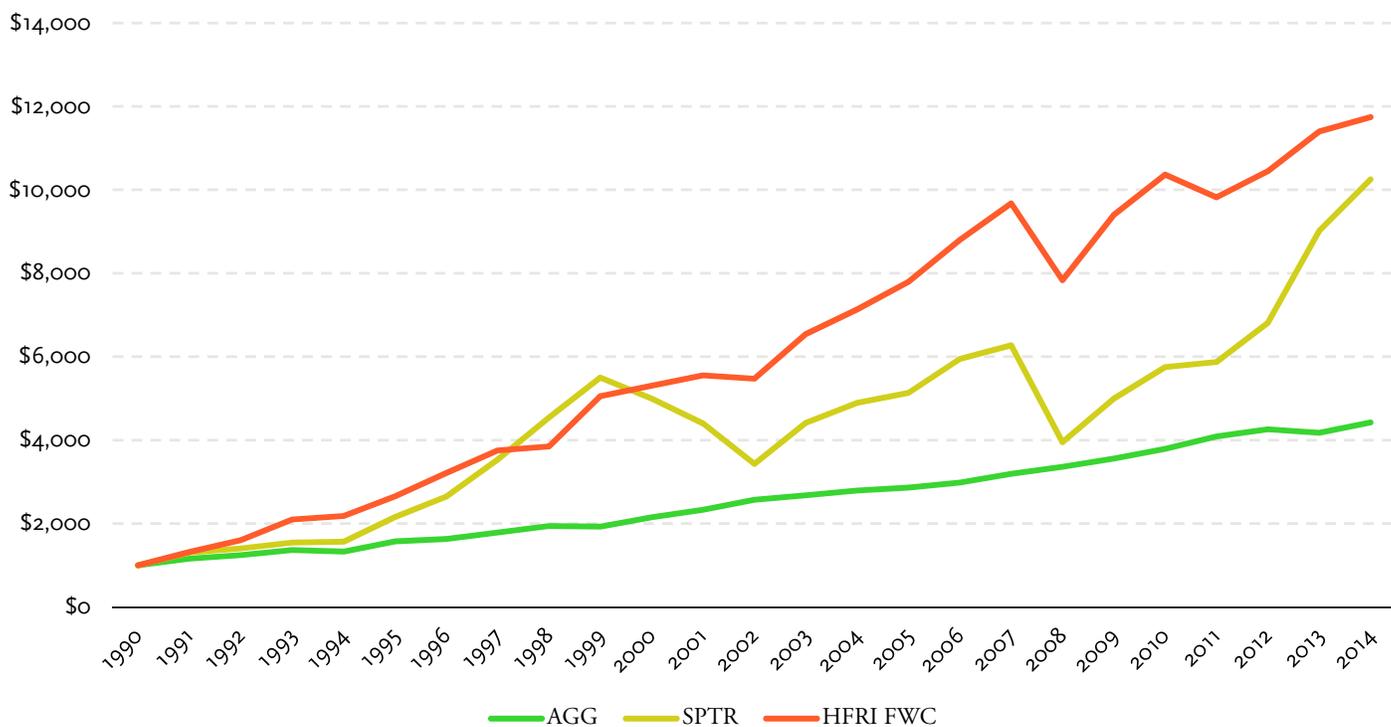
Full index descriptions in Appendix B.

Benchmark Returns

Exhibit: 1991-2014 - Benchmark Index Returns, Risk, and Return per Unit of Risk

Benchmark Indices			
Performance Metric	S&P 500 TR	Barclays Agg	HFRI FWC
Cumulative Return	925.33%	342.45%	1074.21%
Compound Annual Growth Rate	10.18%	6.39%	10.81%
Annualized Standard Deviation	18.39%	4.97%	12.11%
Return per Unit of Risk	0.55	1.29	0.89

Exhibit: 1991-2014 – Benchmark Indices, Growth of \$1000

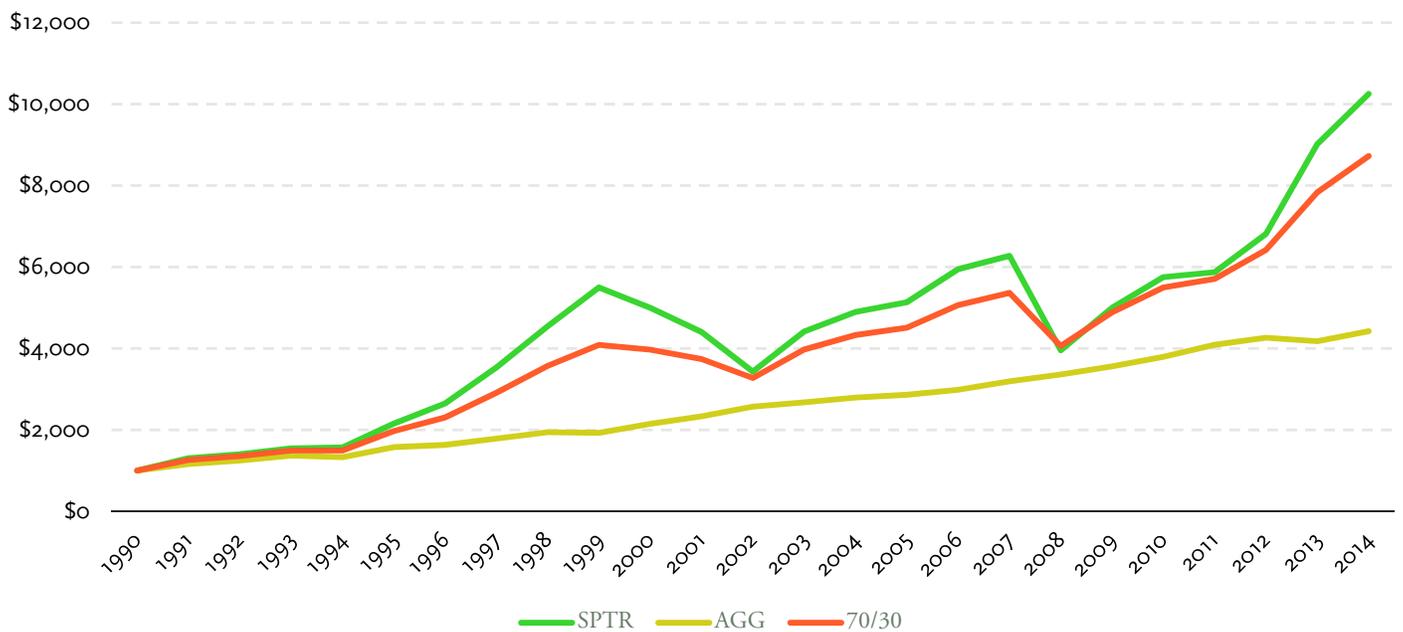


Our goal was to evolve from a passive asset allocation model to active management of passive indices to increase returns and reduce risk as identified by a peer ranked relative strength index model.

Benchmark Asset Allocation

Conventional asset allocation, at times, may call for a 70% weighting for equities and a 30% fixed income weighting. This traditional asset allocation framework yields a higher (better) return per unit of risk than equities alone.

Benchmark Asset Allocation			
Performance Metric	SPTR	AGG	70/30
Cumulative Return	925.33%	342.45%	772.45%
Compound Annual Growth Rate	10.18%	6.39%	9.45%
Annualized Standard Deviation	18.39%	4.97%	13.05%
Return per Unit of Risk	0.55	1.29	0.72



A 70/30 mix of equities to fixed income (vs. the S&P 500) reduces risk by 29% and return by just 7%. This leads to an increase in return per unit of risk of 31%, i.e. investors are compensated with higher investment returns per unit of risk. Modern Portfolio Theory believes that this can be improved upon by adding additional asset classes that are, in general, uncorrelated to existing portfolio components.

The addition of hedge funds into the asset allocation framework may be able to unlock further value for investors. Our tactical asset allocation framework will reduce equities to 50%, fixed income will remain unchanged at 30%, and hedge funds will comprise 20% of the sample portfolio.

Benchmark Asset Allocation with Alternatives				
Performance Metric	SPTR	AGG	70/30	50/30/20
Cumulative Return	925.33%	342.45%	772.45%	798.76%
Compound Annual Growth Rate	10.18%	6.39%	9.45%	9.58%
Annualized Standard Deviation	18.39%	4.97%	13.05%	11.22%
Return per Unit of Risk	0.55	1.29	0.72	0.85

The Addition of Alternatives



The 50/30/20 asset allocation mix improves upon the 70/30 mix. The return increases modestly while volatility is dampened by over 14%. This yields a return per unit of risk that is more than 18% higher than the 70/30 mix. Modern Portfolio Theory, as first written about by Harry Markowitz posits that “expected return is a desirable thing *and* variance of return an undesirable thing.”⁷ We believe that a rational investor would choose the 50/30/20 portfolio with essentially the same expected return but with less variance over the standard 70/30 asset allocation mix.

We also believe, however, that the 50/30/20 tactical asset allocation mix of equities, fixed income, and hedge funds can be improved upon. By utilizing a relative strength index (RSI) ranking methodology and choosing to allocate capital to the highest RSI values in each benchmark universe, portfolio returns should theoretically further increase

⁷ Markowitz, H.M. (March 1952). “Portfolio Selection”. The Journal of Finance 7 (1): 77-91

with reduced volatility. This is because a hypothetical portfolio will own what is favorable instead of what is unfavorable, thereby reducing drag from what is not performing well.

Universe Constituents

In order to build better portfolios within each benchmark asset class we compiled the following universes that are derived from each benchmark:

For Equities:

The Standard & Poor’s 500 Total Return Index (S&P) started tracking 500 stocks in 1957 and is comprised of 10 Global Industry Classification Standards Sectors or GICS Sectors. The 500 public companies that comprise the index are classified into one of 10 GICS sectors.

The universe for the peer-ranking model includes the 10 S&P 500 GICS sectors:

- Energy Sector Total Return
- Materials Sector Total Return
- Industrials Sector Total Return
- Consumer Discretionary Sector Total Return
- Consumer Staples Sector Total Return
- Health Care Sector Total Return
- Financials Sector Total Return
- Information Technology Sector Total Return

- Telecommunication Services Sector Total Return
- Utilities Sector Total Return

Full index descriptions in Appendix B.

Equity Sector Index Returns

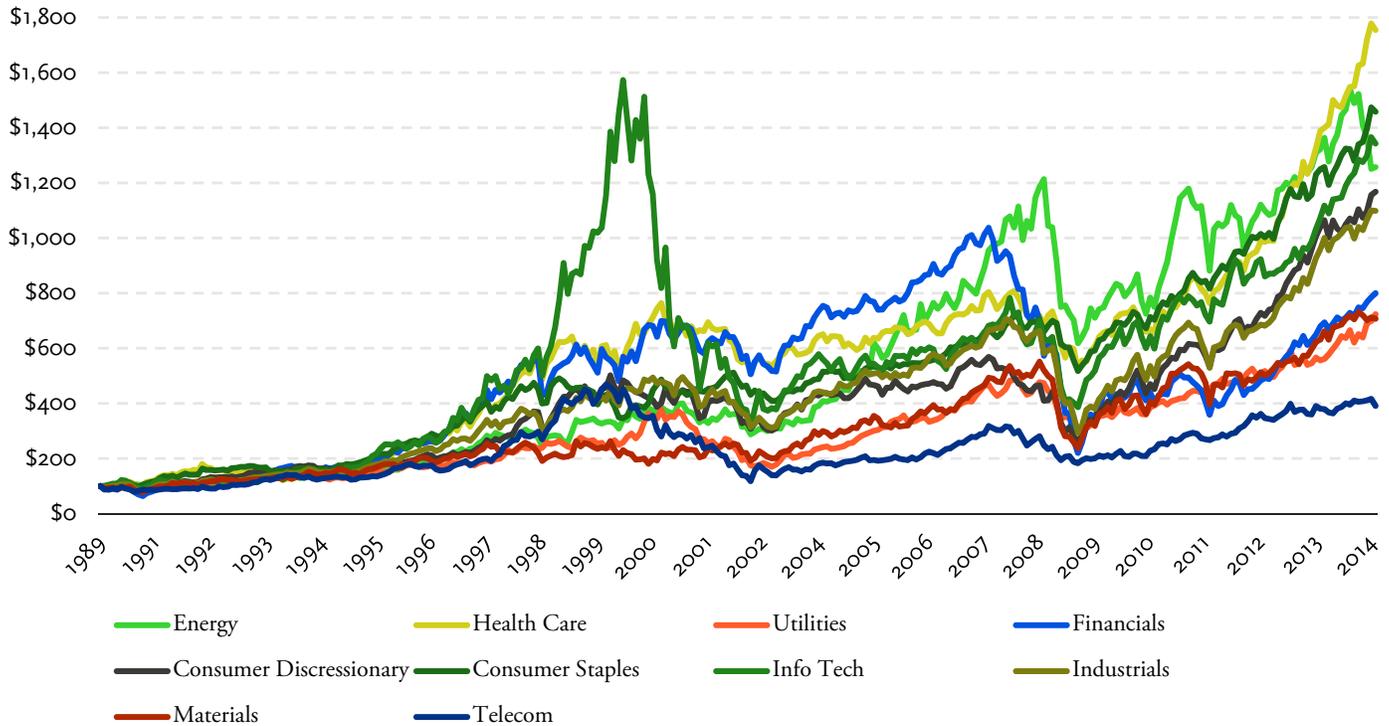
From December 31, 1990 to December 31, 2014 a “buy and hold” investor in the 10 GICS sectors (which are investable through ETFs or Swaps) experienced the following returns and risk profiles.

Exhibit 3: 1991-2014 – S&P GICS Sector Index Returns, Risk, and Return per Unit of Risk

S&P 500 GICS Sectors Total Return Indices					
Performance Metric	Energy	Health Care	Utilities	Financials	Consumer Disc.
Cumulative Return	1157.14%	1654.72%	623.54%	699.44%	1067.49%
Compound Annual Growth Rate	11.12%	12.68%	8.60%	9.05%	10.78%
Annualized Standard Deviation	16.80%	22.68%	20.63%	25.39%	22.26%
Return per Unit of Risk	0.66	0.56	0.42	0.36	0.48

S&P 500 GICS Sectors Total Return Indices

Performance Metric	Consumer Staples	Info Tech	Industrials	Materials	Telecom
Cumulative Return	1358.21%	1242.46%	998.46%	607.10%	290.70%
Compound Annual Growth Rate	11.81%	11.43%	10.50%	8.49%	5.84%
Annualized Standard Deviation	14.49%	32.26%	18.85%	19.09%	22.83%
Return per Unit of Risk	0.82	0.35	0.56	0.44	0.26



For Fixed Income:

The universe for the peer-ranking model includes seven fixed income strategy styles:

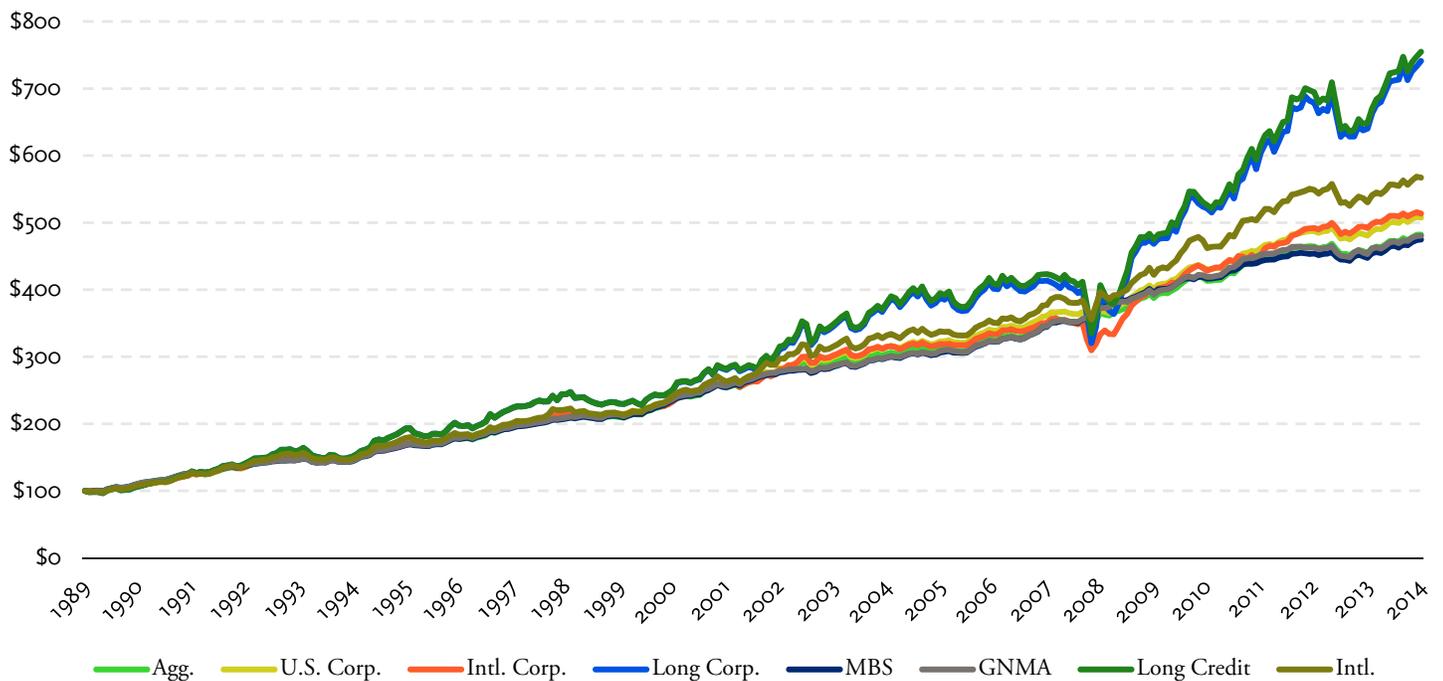
- Barclays U.S. Corporate Investment Grade Total Return Index
- Barclays Intermediate Corporate Total Return Index
- Barclays Long U.S. Corporate Total Return Index
- Barclays U.S. MBS Total Return Index
- Barclays GNMA Total Return Index
- Barclays U.S. Long Credit Total Return Index
- Barclays U.S. Aggregate Government/Credit Total Return Index

Full index descriptions in Appendix B.

Fixed Income Index Returns

From December 31, 1990 to December 31, 2014 a “buy and hold” investor in the seven fixed income indices (which are investable through ETFs or Swaps) experienced the following returns and risk profiles.

Fixed Income Total Return Indices							
Performance Metric	US Corp	Int. Corp	Long Corp	MBS	GNMA	Long Credit	Gov. Cred.
Cumulative Return	407.59%	413.61%	641.03%	374.77%	380.40%	654.89%	386.35%
Compound Annual Growth Rate	7.00%	7.06%	8.70%	6.71%	6.76%	8.79%	6.81%
Annualized Standard Deviation	4.80%	5.82%	8.63%	4.34%	4.44%	8.53%	5.26%
Return per Unit of Risk	1.46	1.21	1.01	1.54	1.52	1.03	1.29



For Hedge Funds:

Hedge Fund Research, Inc., founded in 1989, is the longest running hedge fund index provider. The data herein is from HFRI Hedge Fund Indices and is based on the month-end net asset value of the index. Since December 31, 1989 HFR has collected data from self-selecting hedge funds that represent a specific strategy style.

The universe for the peer-ranking model includes eight hedge fund strategy styles:

- HFRI ED: Merger Arbitrage Index
- HFRI EH: Equity Market Neutral Index
- HFRI EH: Short Bias Index
- HFRI Emerging Markets (Total) Index
- HFRI Equity Hedge (Total) Index
- HFRI Event-Driven (Total) Index
- HFRI Fund of Funds Composite Index
- HFRI Macro (Total) Index

Full index descriptions in Appendix B.

Due to the need for a minimum 12 months closes to calculate the first RSI score we calculate returns starting December 31, 1990.

Hedge Fund Index Returns

From December 31, 1990 to December 31, 2014 a “buy and hold” investor in the eight hedge fund indices (which are not investable) experienced the following returns and risk profiles.

Exhibit 1: 1991- 2014 - Hedge Fund Index Returns, Risk, and Return per Unit of Risk

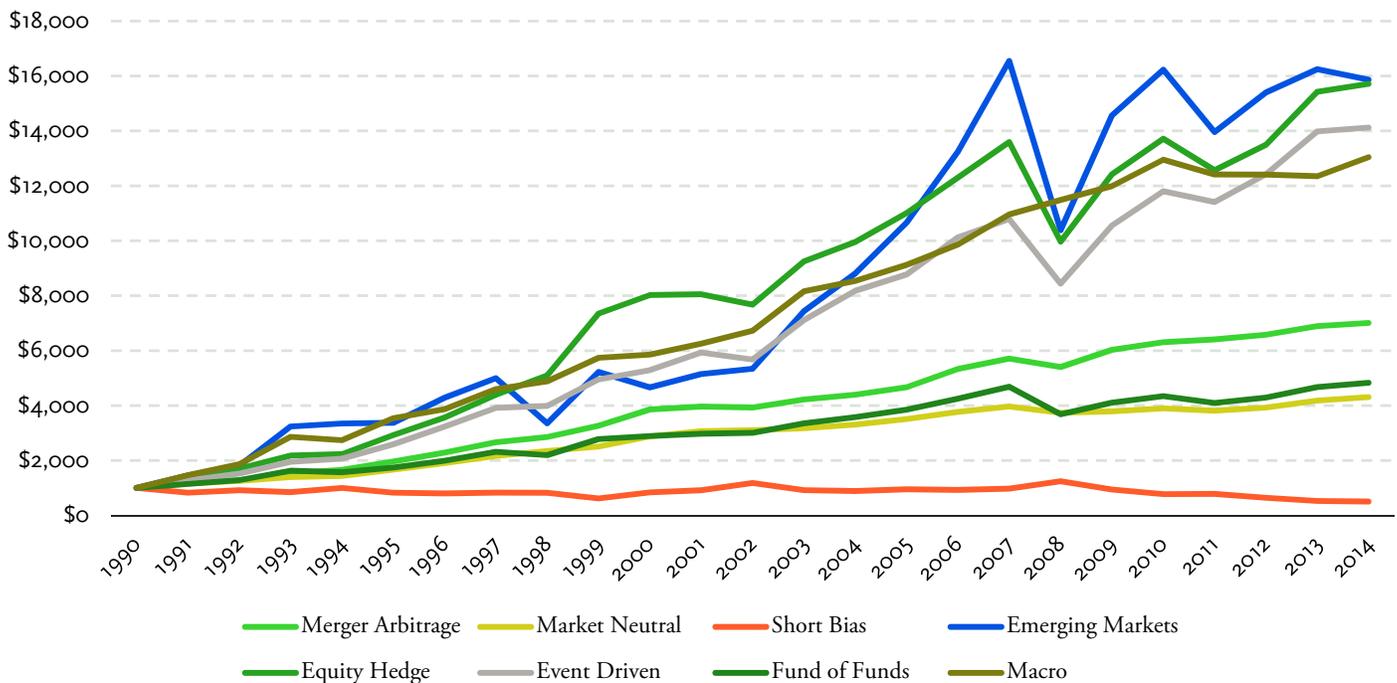
Hedge Fund Index Strategies				
Performance Metric	Merger Arbitrage	Market Neutral	Short Bias	Emerging Markets
Cumulative Return	600.83%	330.86%	-49.67%	1486.36%
Compound Annual Growth Rate	8.45%	6.27%	-2.82%	12.21%
Annualized Standard Deviation	7.08%	5.80%	17.43%	26.77%
Return per Unit of Risk	1.19	1.08	-0.16	0.46

Hedge Fund Index Strategies

Performance Metric	Event Driven	Fund of Funds	Macro	Equity Hedge
Cumulative Return	1312.18%	383.15%	1204.55%	1471.31%
Compound Annual Growth Rate	11.66%	6.78%	11.30%	12.16%
Annualized Standard Deviation	12.55%	10.33%	14.85%	15.82%
Return per Unit of Risk	0.93	0.66	0.76	0.77

The eight hedge fund strategy styles differ in objective and portfolio composition. Due to this, each index performs differently in a given market environment.

Exhibit: 1991-2014 – Cumulative Hedge Fund Index Returns



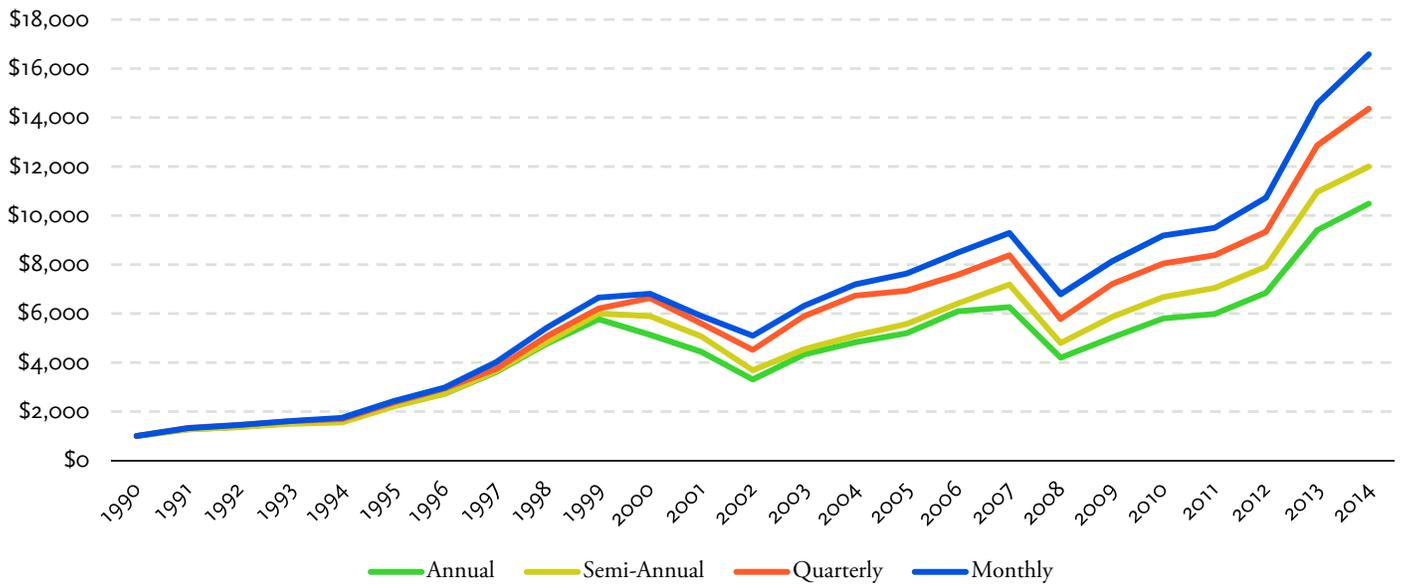
Relative Strength Index Ranking Model

The Relative Strength Index will be calculated using the prior 12 months index closing values as described earlier. Scores are between zero and 100. In the event of a tie score of 100, a tie-breaker will be implemented. The tie-breaker is calculated from the prior 12 months return per unit of risk value. The highest value wins. The “Top 5” by RSI score will comprise the sample portfolio. We studied four rebalancing periods: Annual, Semi-Annual, Quarterly, and Monthly. Trading costs and taxes are not considered in this simulation.

For Equities:

Top 5 Portfolio – Rebalance Frequency

Performance Metric	Annual	Semi-Annual	Quarterly	Monthly
Cumulative Return	948.28%	1099.42%	1335.87%	1558.24%
Compound Annual Growth Rate	10.29%	10.91%	11.74%	12.41%
Annualized Standard Deviation	18.51%	18.43%	17.77%	16.41%
Return per Unit of Risk	0.56	0.59	0.66	0.76



Benchmark vs. Monthly Rebalance

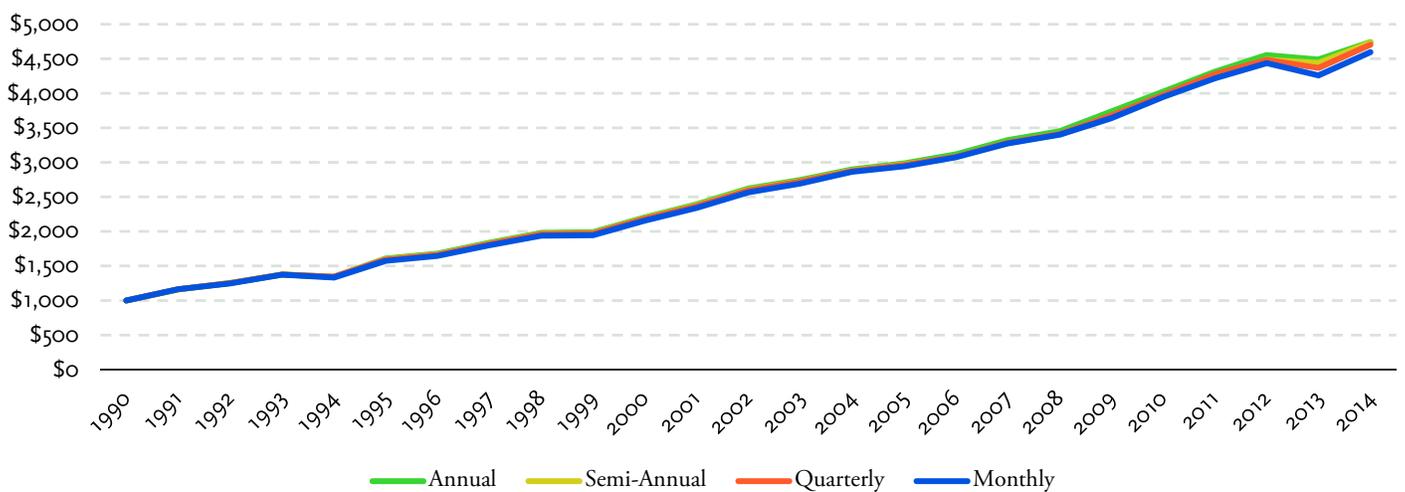


By increasing the rebalancing frequency, the sample portfolio increases turnover but also increases the cumulative return, the compound return, and decreases volatility. Thus, all of the above RSI momentum based strategies deliver more return with less risk than the S&P 500 alone, but Monthly rebalancing yields the most attractive risk to return profile.

Benchmark vs. Monthly Rebalance		
Performance Metric	S&P 500 TR	Monthly Rebalance
Cumulative Return	925.33%	1558.24%
Compound Annual Growth Rate	10.18%	12.41%
Annualized Standard Deviation	18.39%	16.41%
Return per Unit of Risk	0.55	0.76

For Fixed Income:

Top 5 Portfolio – Rebalance Frequency				
Performance Metric	Annual	Semi-Annual	Quarterly	Monthly
Cumulative Return	374.02%	373.19%	370.21%	359.41%
Compound Annual Growth Rate	6.70%	6.69%	6.66%	6.56%
Annualized Standard Deviation	4.86%	4.77%	4.84%	4.98%
Return per Unit of Risk	1.38	1.40	1.38	1.32



The fixed income markets move slowly compared to the equity markets. By increasing the rebalancing frequency, the sample portfolio does not significantly increase the compound return, and decrease volatility.

The difference between the four rebalancing frequencies is de minimis. As the Annual rebalance frequency is the simplest and yields one of the most attractive risk to return profiles for bonds, we will select it for our models going forward.

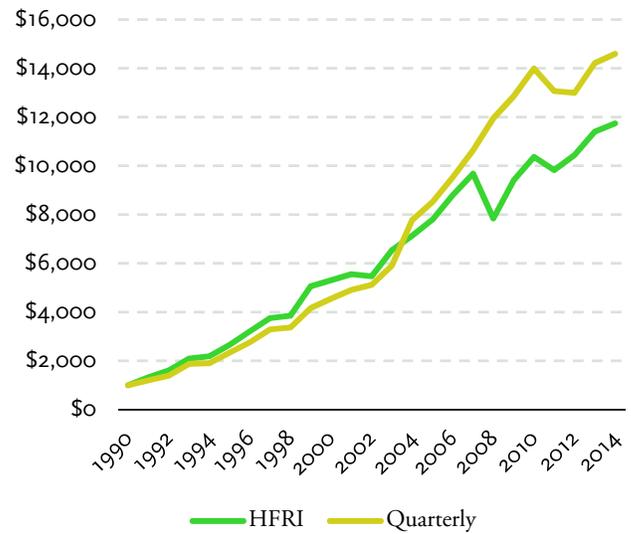


For Hedge Funds:

Top 5 Portfolio – Rebalance Frequency				
Performance Metric	Annual	Semi-Annual	Quarterly	Monthly
Cumulative Return	647.20%	764.71%	1359.39%	1055.94%
Compound Annual Growth Rate	8.74%	9.40%	11.82%	10.74%
Annualized Standard Deviation	9.21%	9.15%	9.91%	9.59%
Return per Unit of Risk	0.95	1.03	1.19	1.12

Hedge Funds are known to move quickly and react to changing market conditions quickly. By dynamically reallocating capital amongst hedge fund strategy styles based on the RSI ranking methodology, the result is a portfolio with a higher cumulative return, a higher geometric return and lower volatility.

Benchmark vs. Quarterly Rebalance		
Performance Metric	HFRI FWC	Quarterly
Cumulative Return	1074.21%	1359.39%
Compound Annual Growth Rate	10.81%	11.82%
Annualized Standard Deviation	12.11%	9.91%
Return per Unit of Risk	0.89	1.19



In summary, each of the three asset classes benefits from utilizing the RSI ranking methodology. By owning the Top 5 indices and avoiding the rest of the universe constituents, the sample portfolio is improved upon. In essence, by avoiding the bottom of each peer group, drag from poor returns is reduced in the portfolio.

Base Asset Allocation Benchmark vs. Dynamic Asset Allocation Portfolio:

Benchmark vs. Dynamic		
Performance Metric	50/30/20	50/30/20
Cumulative Return	798.76%	1103.56%
Compound Annual Growth Rate	9.58%	10.92%
Annualized Standard Deviation	11.22%	9.39%
Return per Unit of Risk	0.85	1.16

When the dynamic version of each asset classes’ universe are combined using the same weightings as our studies’ base benchmark, the result speaks for itself. The dynamic portfolio has a greater cumulative return with a higher geometric return and less volatility. The higher return per unit of risk indicates that investors would benefit from the dynamic portfolio versus a traditional buy and hold 50/30/20 asset allocation model.

Again, we believe, however that this model can be improved upon. As the dynamic hedge fund portfolio exhibits much better risk adjusted returns, if an investor were to over-allocate to hedge funds versus equities, she may benefit in excess of current results. The new portfolio weightings are 20% to dynamic equities, 30% to dynamic fixed income and 50% to dynamic hedge funds.

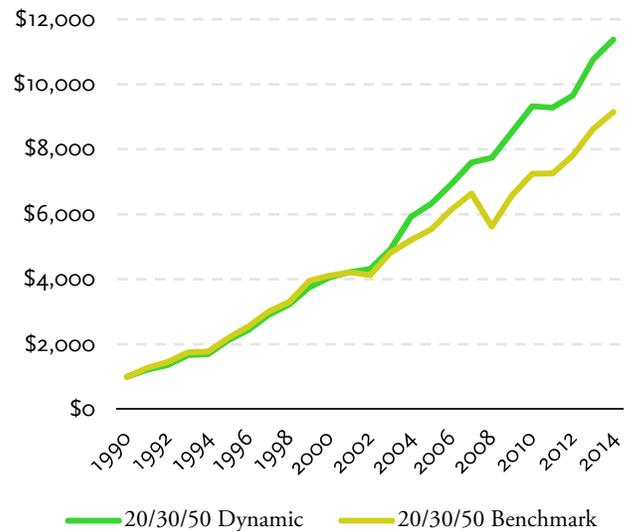
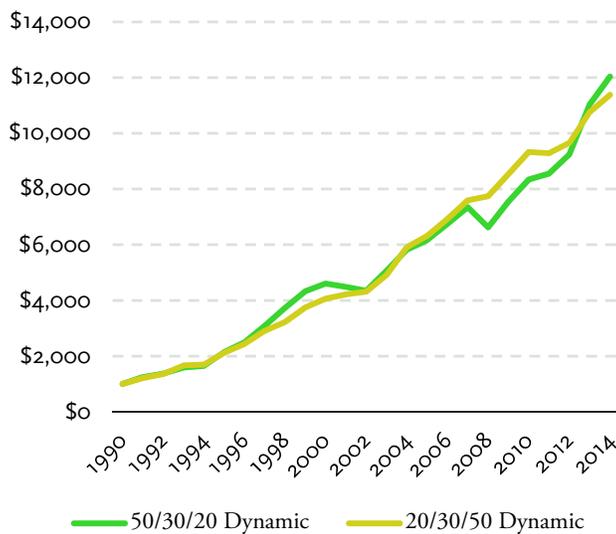
A dynamic portfolio that is overweight hedge funds and underweight equities greatly outperforms the comparable standard benchmark; on both a total return basis and a risk adjusted basis. The 1.48 return per unit of risk of the 20/30/50 portfolio is 74% better than the 0.85 return per unit of risk of the Benchmark 50/30/20 portfolio.

Dynamic vs. Dynamic

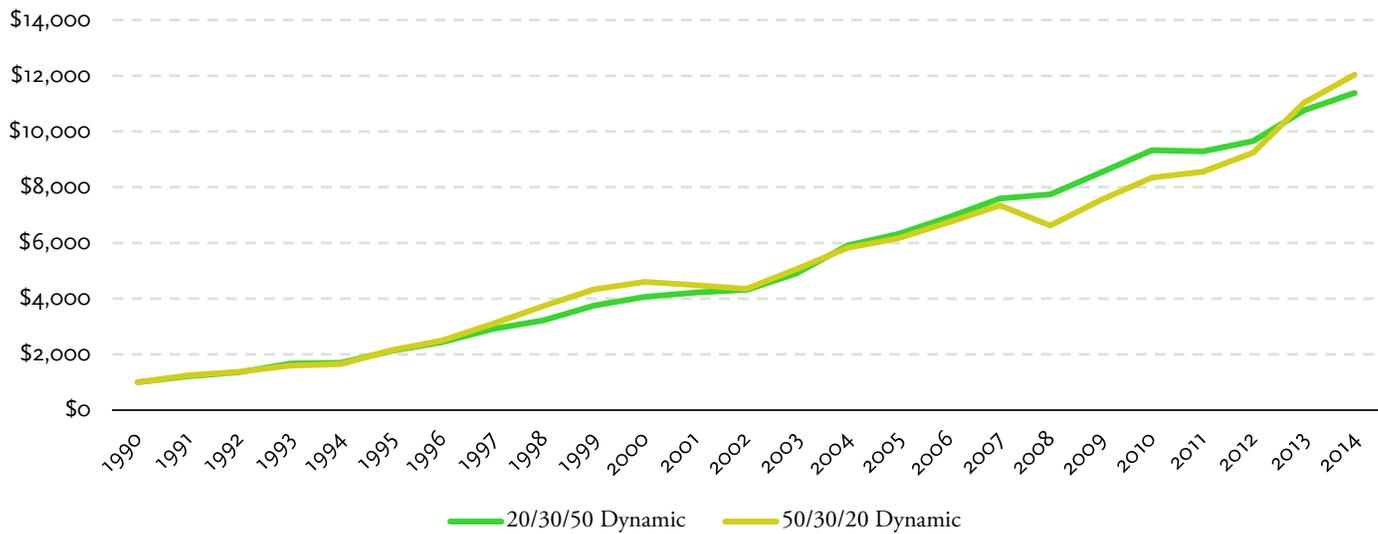
Performance Metric	50/30/20	20/30/50
Cumulative Return	1103.56%	1037.78%
Compound Annual Growth Rate	10.92%	10.66%
Annualized Standard Deviation	9.39%	7.19%
Return per Unit of Risk	1.16	1.48

Benchmark vs. Dynamic

Performance Metric	20/30/50	20/30/50
Cumulative Return	814.20%	1037.78%
Compound Annual Growth Rate	9.66%	10.66%
Annualized Standard Deviation	9.30%	7.19%
Return per Unit of Risk	1.04	1.48



The result of the new weightings is a portfolio with nearly the same cumulative return but a return per unit of risk that is 28% higher. The chart below shows that it is possible to smooth out the returns over the duration of the study.



Challenging Equity Environments

Despite the long term outperformance of our dynamic portfolio versions of classic asset allocation models, we wanted to check on performance during periods of market stress to ensure that our dynamic models continued to outperform in both good times and bad.

Benchmarks:

Challenging Equity Environments			
	SPTR	AGG	HFRI
7.1.98 – 8.31.98	-15.37%	1.84%	-9.42%
9.1.00 – 9.30.02	-44.73%	23.43%	-3.90%
11.1-07 – 2.28.09	-50.95%	6.08%	-21.42%

During poor equity environments such as the summer of 1998, the Tech Wreck, or the Great Recession, the Agg performed best with hedge funds easily beating equities as well. An investor would have preserved more capital by allocating to hedge funds during these time periods or increased portfolio values by allocating to bonds.

Dynamic RSI:

Challenging Equity Environments			
	Monthly Sectors	Ann Bonds	Qtrly HFRI
7.1.98 – 8.31.98	-11.49%	1.20%	-5.87%
9.1.00 – 9.30.02	-29.52%	22.10%	12.73%
11.1-07 – 2.28.09	-40.63%	4.01%	11.84%

The dynamic sector rotation performs better than the S&P in each of the three drawdown periods. The Agg, on the other hand, performs better than the bond rotation portfolio in each drawdown but is within an acceptable variance. Dynamic hedge funds turned two negative periods into positive periods and experienced a lower drawdown in 1998 than if an investor owned broad hedge funds alone.

Asset Allocation Frameworks:

Challenging Equity Environments			
	Benchmark 50/30/20	Dynamic 50/30/20	Dynamic 20/30/50
7.1.98 – 8.31.98	-9.41%	-6.88%	-5.06%
9.1.00 – 9.30.02	-19.34%	-7.14%	6.15%
11.1-07 – 2.28.09	-30.02%	-18.56%	-2.21%

During the three time periods, both the dynamic 50/30/20 asset allocation mix and the dynamic 20/30/50 asset allocation mix handily outperform the benchmark 50/30/20 mix. Investors would experience the lowest drawdown or the best performance with the dynamic 20/30/50 mix.

Challenging Fixed Income Environments

Benchmarks:

Challenging Fixed Income Environments			
	SPTR	AGG	HFRI
10.1.93 – 10.31.94	6.01%	-3.31%	13.31%
11.1.96 – 3.31.97	8.25%	0.20%	6.05%
10.1.98 – 12.31.99	46.82%	-0.49%	41.67%
6.1.03 – 4.30.06	43.26%	5.96%	43.51%
12.1.08 – 12.31.09	27.81%	9.88%	20.17%
4.1.13 – 8.31.13	5.01%	-2.69%	0.22%

The S&P and the HFRI both performed best during rising interest rate environments. The Agg still performed moderately well but had three negative returns while both the S&P and HFRI were positive in all six scenarios.

Dynamic RSI:

Challenging Fixed Income Environments			
	Monthly Sectors	Ann Bonds	Qtrly HFRI
10.1.93 – 10.31.94	6.32%	-2.53%	14.31%
11.1.96 – 3.31.97	8.11%	0.55%	7.13%
10.1.98 – 12.31.99	49.02%	1.00%	25.48%
6.1.03 – 4.30.06	43.42%	8.03%	73.59%
12.1.08 – 12.31.09	18.95%	11.72%	6.72%
4.1.13 – 8.31.13	4.16%	-2.60%	1.53%

In contrast to challenging equity environments, during challenging fixed income environments, the dynamic bond portfolio outperforms the Agg in each of the six time periods. Reallocating capital to more favorable bond holdings during challenging fixed income environments is accretive to portfolio returns. The dynamic sectors and the S&P are near identical while dynamic hedge funds add value in four of six scenarios.

Asset Allocation Frameworks:

Challenging Fixed Income Environments			
	Benchmark 50/30/20	Dynamic 50/30/20	Dynamic 20/30/50
10.1.93 – 10.31.94	4.71%	5.51%	7.92%
11.1.96 – 3.31.97	5.48%	5.72%	5.40%
10.1.98 – 12.31.99	30.92%	29.59%	22.85%
6.1.03 – 4.30.06	31.56%	37.71%	46.04%
12.1.08 – 12.31.09	21.29%	14.57%	10.68%
4.1.13 – 8.31.13	1.90%	1.76%	0.91%

The dynamic asset allocation frameworks perform in line with expectations. As evidenced by the charts and tables above, the combination of RSI and asset allocation policy yields superior long term results. This is largely due to how well the portfolios hold up during periods of stress, whether it be in the equity or fixed income markets.

Conclusion

A modern approach to asset allocation combined with a dynamic rebalancing component yields more attractive returns with less risk.

RSI is a simple, volatility adjusted momentum indicator. By using a RSI ranking model in conjunction with classic asset allocation techniques, according to our research, investors can expect to generate better returns with less risk than investing in the benchmarks at the same allocations alone. The 20/30/50 Dynamic Portfolio adds another 1.21% per annum over the Classic 70/30 Benchmark (10.66% vs. 9.45%) with 5.86% less risk per year (7.19% vs. 13.05%). This difference is highlighted by the fact that the return per unit of risk is more than *twice* that of the Classic 70/30 Benchmark (higher is better; 1.48 vs. 0.72).

Benefits of the 20/30/50 Dynamic Portfolio, compared to the Classic 70/30 Benchmark

11.35%

more return per year

44.90%

less risk per year

2X

return per unit of risk

An investor who invested \$1,000 in the 20/30/50 Dynamic Portfolio at inception in 1991 finished with \$11,377, whereas an investor that chose the Classic 70/30 Benchmark ended with \$8,724. The difference of \$2,653 – **or 30% more capital** – is achieved with far less risk.

Having a portfolio biased to the top performing segments of broad based indices, investors avoid the worst performing segments of those same indices. Due to our conviction in our research, we believe that investors who avoid the worst performing segments of the markets will experience less drag on overall portfolio returns. Essentially, a portfolio wins by not losing.

Appendix

Sources: Standard & Poor's, Barclays, Hedge Fund Research

Standard & Poor's 500 Total Return Index (SPTR):

The S&P 500[®] is widely regarded as the best single gauge of large-cap U.S. equities. There is over USD 7 trillion benchmarked to the index, with index assets comprising approximately USD 1.9 trillion of this total. The index includes 500 leading companies and captures approximately 80% coverage of available market capitalization.

The Barclays U.S. Aggregate Index (LBUSTRUU):

The Barclays U.S. Aggregate Index (Agg) represents securities that are SEC-registered, taxable, and dollar denominated. The index covers the U.S. investment grade fixed rate bond market, with index components for government and corporate securities, mortgage pass-through securities, and asset-backed securities. These major sectors are subdivided into more specific indices that are calculated and reported on a regular basis. The Agg went live in 1986 but has data dating to 1976.

HFRI Fund Weighted Composite (HFRIFWI):

Includes over 2,200 constituent funds, both domestic and offshore funds. It is an equal-weighted index and all funds report assets in U.S. dollars. No Fund of Funds is included in the Index. All funds report Net of All Fees returns on a monthly basis. Have at least \$50 million under management of have been actively trading for at least twelve (12) months.

Global Industry Classification Standard (GICS[®])

Energy Sector Total Return (SPTRENRS):

The Energy Sector comprises companies engaged in exploration & production, refining & marketing and storage & transportation of oil & gas and coal & consumable fuels. It also includes companies that offer oil & gas equipment and services.

Materials Sector Total Return (SPTRMATR):

The Materials Sector includes companies that manufacture chemicals, construction materials, glass, paper, forest products and related packaging products, and metals, minerals and mining companies, including producers of steel.

Industrials Sector Total Return (SPTRINDU):

The Industrials Sector includes manufacturers and distributors of capital goods such as aerospace & defense, building products, electrical equipment and machinery and companies that offer construction & engineering services. It also includes providers of commercial & professional services including printing, environmental and facilities services, office services & supplies, security & alarm services, human resource & employment services, research & consulting services. It also includes companies that provide transportation services.

Consumer Discretionary Sector Total Return (SPTRCOND):

The Consumer Discretionary Sector encompasses those businesses that tend to be the most sensitive to economic cycles. Its manufacturing segment includes automotive, household durable goods, leisure

equipment and textiles & apparel. The services segment includes hotels, restaurants and other leisure facilities, media production and services, and consumer retailing and services.

Consumer Staples Sector Total Return (SPTRCONS):

The Consumer Staples Sector comprises companies whose businesses are less sensitive to economic cycles. It includes manufacturers and distributors of food, beverages and tobacco and producers of non-durable household goods and personal products. It also includes food & drug retailing companies, hypermarkets and consumer super centers.

Health Care Sector Total Return (SPTRHLTH):

The Health Care Sector includes health care providers & services, companies that manufacture and distribute health care equipment & supplies and health care technology companies. It also includes companies involved in the research, development, production and marketing of pharmaceuticals and biotechnology products.

Financials Sector Total Return (SPTRFINL):

The Financials Sector contains companies involved in banking, thrifts & mortgage finance, specialized finance, consumer finance, asset management and custody banks, investment banking and brokerage and insurance. This Sector also includes real estate companies and REITs.

Information Technology Sector Total Return (SPTRINFT):

The Information Technology Sector comprises companies that offer software and information technology services, manufacturers and distributors of technology hardware & equipment such as communications equipment, cellular phones, computers & peripherals, electronic equipment and related instruments and semiconductors.

Telecommunication Services Sector Total Return (SPTRTELS):

The Telecommunication Services Sector contains companies that provide communications services primarily through a fixed-line, cellular or wireless, high bandwidth and/or fiber optic cable network.

Utilities (SPTRUTIL):

The Utilities Sector comprises utility companies such as electric, gas and water utilities. It also includes independent power producers & energy traders and companies that engage in generation and distribution of electricity using renewable sources.

Barclays U.S. Corporate Investment Grade Total Return Index (LUACTRUU)

Barclays Intermediate Corporate Total Return Index (LD06TRUU)

Barclays Long U.S. Corporate Total Return Index (LD07TRUU)

Barclays U.S. MBS Total Return Index (LUMSTRUU)

Barclays GNMA Total Return Index (LGNMTRUU)

Barclays U.S. Long Credit Total Return Index (LULCTRUU)

Barclays U.S. Aggregate Government/Credit Total Return Index (LUGCTRUU)

HFRI ED: Merger Arbitrage Index (HFRIMAI): Merger Arbitrage strategies which employ an investment process primarily focused on opportunities in equity and equity related instruments of companies which are currently engaged in a corporate transaction. Merger

Arbitrage involves primarily announced transactions, typically with limited or no exposure to situations which pre-, post-date or situations in which no formal announcement is expected to occur. Opportunities are frequently presented in cross border, collared and international transactions which incorporate multiple geographic regulatory institutions, with typically involve minimal exposure to corporate credits. Merger arbitrage strategies typically have over 75% of positions in announced transactions over a given market cycle.

HFRI EH: Equity Market Neutral Index (HFRIEMNI):

Equity Market Neutral strategies employ sophisticated quantitative techniques of analyzing price data to ascertain information about future price movement and relationships between securities, select securities for purchase and sale. These can include both Factor-based and Statistical Arbitrage/Trading strategies. Factor-based investment strategies include strategies in which the investment thesis is predicated on the systematic analysis of common relationships between securities. In many but not all cases, portfolios are constructed to be neutral to one or multiple variables, such as broader equity markets in dollar or beta terms, and leverage is frequently employed to enhance the return profile of the positions identified. Statistical Arbitrage/Trading strategies consist of strategies in which the investment thesis is predicated on exploiting pricing anomalies which may occur as a function of expected mean reversion inherent in security prices; high frequency techniques may be employed and trading strategies may also be employed on the basis on technical analysis or opportunistically to exploit new information the investment manager believes has not been fully, completely or accurately discounted into current security prices. Equity Market Neutral Strategies typically maintain characteristic net equity market exposure no greater than 10% long or short.

HFRI EH: Short Bias Index (HFRIHSE):

Short-Biased strategies employ analytical techniques in which the investment thesis is predicated on assessment of the valuation characteristics on the underlying companies with the goal of identifying overvalued companies. Short Biased strategies may vary the investment level or the level of short exposure over market cycles, but the primary distinguishing characteristic is that the manager maintains consistent short exposure and expects to outperform traditional equity managers in declining equity markets. Investment theses may be fundamental or technical and nature and manager has a particular focus, above that of a market generalist, on identification of overvalued companies and would expect to maintain a net short equity position over market cycles.

HFRI Emerging Markets (Total) Index (HFRIEM):

Emerging Markets funds invest, primarily long, in securities of companies or the sovereign debt of developing or 'emerging' countries. Emerging Markets regions include Africa, Asia ex-Japan, Latin America, the Middle East and Russia/Eastern Europe. Emerging Markets - Global funds will shift their weightings among these regions according to market conditions and manager perspectives.

HFRI Equity Hedge (Total) Index (HFRIEHI):

Equity Hedge: Investment Managers who maintain positions both long and short in primarily equity and equity derivative securities. A wide variety of investment processes can be employed to arrive at an investment decision, including both quantitative and fundamental techniques; strategies can be broadly diversified or narrowly focused on specific sectors and can range broadly in terms of levels of net exposure, leverage employed, holding period, concentrations of market capitalizations and valuation ranges of typical portfolios. EH managers would typically maintain at least 50% exposure to, and may in some cases be entirely invested in, equities, both long and short.

HFRI Event-Driven (Total) Index (HFRIEDI):

Event-Driven: Investment Managers who maintain positions in companies currently or prospectively involved in corporate transactions of a wide variety including but not limited to mergers, restructurings, financial distress, tender offers, shareholder buybacks, debt exchanges, security issuance or other capital structure adjustments. Security types can range from most senior in the capital structure to most junior or subordinated, and frequently involve additional derivative securities. Event Driven exposure includes a combination of sensitivities to equity markets, credit markets and idiosyncratic, company specific developments. Investment theses are typically predicated on fundamental characteristics (as opposed to quantitative), with the realization of the thesis predicated on a specific development exogenous to the existing capital structure.

HFRI Fund of Funds Composite Index (HFRIFOF):

The HFRI Fund Weighted Composite Index is a global, equal-weighted index of over 2,000 single-manager funds that report to HFR Database. Constituent funds report monthly net of all fees performance in US Dollar and have a minimum of \$50 Million under management or a twelve (12) month track record of active performance. The HFRI Fund Weighted Composite Index does not include Funds of Hedge Funds.

HFRI Macro (Total) Index (HFRIEMI):

Macro: Investment Managers which trade a broad range of strategies in which the investment process is predicated on movements in underlying economic variables and the impact these have on equity, fixed income, hard currency and commodity markets. Managers employ a variety of techniques, both discretionary and systematic analysis, combinations of top down and bottom up theses, quantitative and fundamental approaches and long and short term holding periods. Although some strategies employ RV techniques, Macro strategies are distinct from RV strategies in that the primary investment thesis is predicated on predicted or future movements in the underlying instruments, rather than realization of a valuation discrepancy between securities. In a similar way, while both Macro and equity hedge managers may hold equity securities, the overriding investment thesis is predicated on the impact movements in underlying macroeconomic variables may have on security prices, as opposes to EH, in which the fundamental characteristics on the company are the most significant are integral to investment thesis.