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March 2010

Relative Strength and Asset Class Rotation

Numerous academic and practitioner studies have shown relative strength—also known in academia as "momentum"—to be a robust factor that leads to outperformance. However, much of the academic research has been handicapped by testing methodologies that are not at all similar to the way that portfolios are managed in the real world. In a recent white paper, "Bringing Real-World Testing To Relative Strength," we outlined our relative strength testing protocol using a universe of mid and large-cap U.S. securities. In this paper we expand the concept by using the same testing process on an entirely different universe composed of Exchange Traded Funds (ETF's) representing global asset classes.

Part I: Background

Relative Strength and momentum strategies have been used by market technicians for stock selection for many years. All the way back in the 1950's, George Chestnutt was publishing market letters with stocks and industry groups ranked based on relative strength. Chestnutt also used his research to manage the very successful no-load mutual fund, American Investors Fund.

In the 1960's, Roberty Levy published a book devoted to using relative strength in the investment process. Academics began to heavily research the topic of momentum in the early 1990's. They have continued to research the topic over the years, and have found momentum to hold up under many different conditions.

The majority of research has focused on U.S. common stocks. As more research has been done, it has expanded to include other asset classes. As with U.S. equities, relative strength is an effective factor at intermediate-term time horizons.

Part II: Universe Construction

The proliferation of ETF's has opened access to a number of asset classes. Retail investors can now access commodity markets, for example, without the added complexity of investing in futures markets. International markets can also be accessed without having to trade on international exchanges. Most major asset classes, some which were only available to large institutional investors, are now available to retail investors.

In an asset allocation strategy, construction of the universe is extremely important. You need to make sure there is enough variation in assets to be able to allocate wherever the strength is around the globe. You also need to be able to concentrate the portfolio in certain areas during narrow markets.

Universe Composition		
• Domestic Sectors	• International Equity	• Currency
• Domestic Style	• Inverse Equity	• Government Bonds
• Alpha Generating	• Real Estate	• Specialty Fixed Income
• Global Equity	• Commodities	• Inverse

The universe we have constructed spans a number of different asset classes (see Table). It contains nearly 100 ETF's from a variety of ETF sponsors. The portfolio can invest both domestically and abroad. The asset classes range from traditional assets, such as equities and fixed income, to alternative assets like commodities, currencies, and real estate. We have also included several inverse ETF's that are designed to go up when the markets they track decline. The universe we have constructed allows the portfolio to be a go-anywhere tactical asset allocation portfolio that can thrive under a number of different market conditions.

Part II: Traditional Testing Methods

Testing relative strength and momentum strategies on asset class rotation models has traditionally involved holding a small number of securities in a portfolio. Very broad indexes are normally used as representatives of a market of asset class. This small sample size increases the risk of data-snooping bias. Under these conditions, a large percentage of the test's return can come from a very small number of securities. You can never be sure if that will continue in the future. If the same global dynamics that existed in the past cease to exist in the future, your model may or may not continue to deliver superior performance.

Another drawback of traditional testing methods is that they often rely on a fixed rebalance period. When the portfolio is formed, qualifying asset classes are included in the portfolio and then held until a pre-determined sale date. Sometimes portfolios are held 12 months, while other researchers rebalance more frequently. One problem with this method is that you don't know in advance what the optimal holding period should be. There are times when it would be advantageous to hold the asset class much longer than 12 months, while under different conditions it would be best to hold it well under 12 months. Another problem with a fixed rebalance schedule is sensitivity to calendar effects. Depending on the month the portfolios are rebalanced you can have a large variation in results. These effects are also magnified when a very small number of securities are included in the portfolio.

Part III: Improved Testing Process

In order to account for many of the deficiencies we have identified in existing testing protocols, we developed a unique testing process to quantify the impact of implementing different relative strength factors in real-world portfolio situations. We developed our continuous, Monte Carlo-based testing process from the ground up, and no part of it is commercially available. It is truly unique to us. When we developed the process, we wanted to move our testing from the realm of factor testing to real-world implementation. While no testing process is perfect, we feel our unique method allows us to get a better view of how different portfolios and factors perform over time in different markets than many of the more widely used processes.

Our testing methodology allows us to do continuous portfolio testing rather than being limited to the fixed holding period testing used in other protocols. Actively managed portfolios are not necessarily rebalanced on a fixed schedule. We designed our process to trade the portfolios on an "as needed" basis. Each holding's relative strength rank is examined weekly (or whatever time period we specify – it can be as frequently as daily), and if it needs to be sold that one holding is sold. Everything that still qualifies for inclusion remains in the portfolio. Sometimes a test will go weeks (and occasionally, months) without a trade. Other weeks, there will be a flurry of trades. But the main thing to remember is that the portfolios are being traded exactly like an actual account would be traded. We feel this is a dramatic improvement on the fixed holding period models that are used in almost all of the research we have seen. Our continuous process allows us to eliminate the calendar problems associated with fixed time period rebalancing, while also allowing turnover to remain at an acceptable level.

Advantages Of Our Testing Methods

- Not sensitive to start date or calendar effects
- Continuous portfolio testing
- Realistic number of holdings
- More optimal holding periods
- Monte Carlo process to ensure robustness

The portfolios in these tests are designed to own 10 ETF's. Because we don't hold every highly ranked security, and we trade on an "as needed" basis, we designed our testing process to determine if our models were robust over time. Normally when you take a sub-set of highly ranked securities you just take, for example, the top 10 out of the top 75. The problem with this is that you never know if your back-tested results are the result of luck. What if just a handful of securities are driving the return? Going forward, what if you don't select one of those securities? Your actual results will never match the historical results. You can't be sure if your historical results are the result of a superior investment process or simply the good luck of picking a couple of stocks that are substantial winners.

Our Monte Carlo process was developed to answer all of these questions and solve the problems we identified in traditional testing methods. The goal of the process is simple: to create multiple portfolios and run them through time to identify superior RS factors and also test the robustness of those factors. The process is very simple in theory (not so simple to program and implement however!). We define portfolio parameters before the test is run. These parameters include: the RS calculation method, number of holdings in the portfolio, buy rank threshold, and sell rank threshold. For this example, assume the number of portfolio holdings is 10, the buy threshold is the top quartile of our ranks, and securities are sold when they fall out of the top quartile of our ranks. On the first day, there might be 15-20 securities in the top quartile of ranks, but we only need 10. Our process selects 10 ETF's at random from the top quartile and adds them to the portfolio. As the program moves to the next trading day it looks to see if any of the asset classes in the portfolio has a rank below the top quartile. If so, that one ETF is sold, and another one is drawn at random from the top quartile of ranks. This process is

repeated on each trading day through the end of the test. Once we reach the end of the test, we archive all of the portfolio information and run another test with the exact same parameters. We generally run 100 simulations over the entire test period.

What we wind up with are 100 different return streams using the exact same parameters. Some of the portfolios perform better than others—that is simply the luck of the draw. What we can determine is the probability of outperforming a benchmark over time. Over short time periods such as a quarter or even a year, the returns can exhibit large variation. But after a 10-year simulation we can see how many of the 100 trials outperform. If 100% of the trials outperform, we know we have a robust process that isn't reliant on just a small number of lucky trades. It really speaks to the power of relative strength when we can draw ETF's at random for a portfolio and have 100% of the trials outperform over time.

Part IV: Example Of The Process

The following example uses a simple 9-month price return to rank securities over the period 12/31/99-12/31/09. The investment universe is the global asset class universe discussed in Section II. To be eligible for inclusion in the portfolio, an ETF's rank must be in top quartile. Securities are sold when their rank falls out of the top quartile of ranks. Ten ETF's are held in the portfolio. A summary of the return data for all 100 trials is shown in Table 1. Over the test period the lowest return of the 100 trials was 106.6% versus the return of the broad equity market (S&P 500) of –24.1%, the broad fixed income market (Barclays Aggregate) of 84.0%, and a 60/40 mix of stocks and bonds of 48.2% So even drawing securities at random out of the top quartile produces outperformance in 100% of the trials over the entire test period versus several major asset class benchmarks.

Table 1: Summary Data (Cumulative Returns)	
12/31/99—12/31/09	
# of Trials	100
Average Return	158.1%
Median Return	158.6%
Max Return	211.2%
Top Quartile	171.2%
Bottom Quartile	143.3%
Min Return	106.6%
S&P 500 Return Return	-24.1%
% Trials Outperforming S&P 500	100%
60/40 Balanced Index Return	29.2%
% Trials Outperform 60/40 Balanced Index	100%
Barclays Aggregate Bond Return	84.0%
% Trials Outperform Barclays Agg Bond	100%

Figure 1: Trial Returns By Year

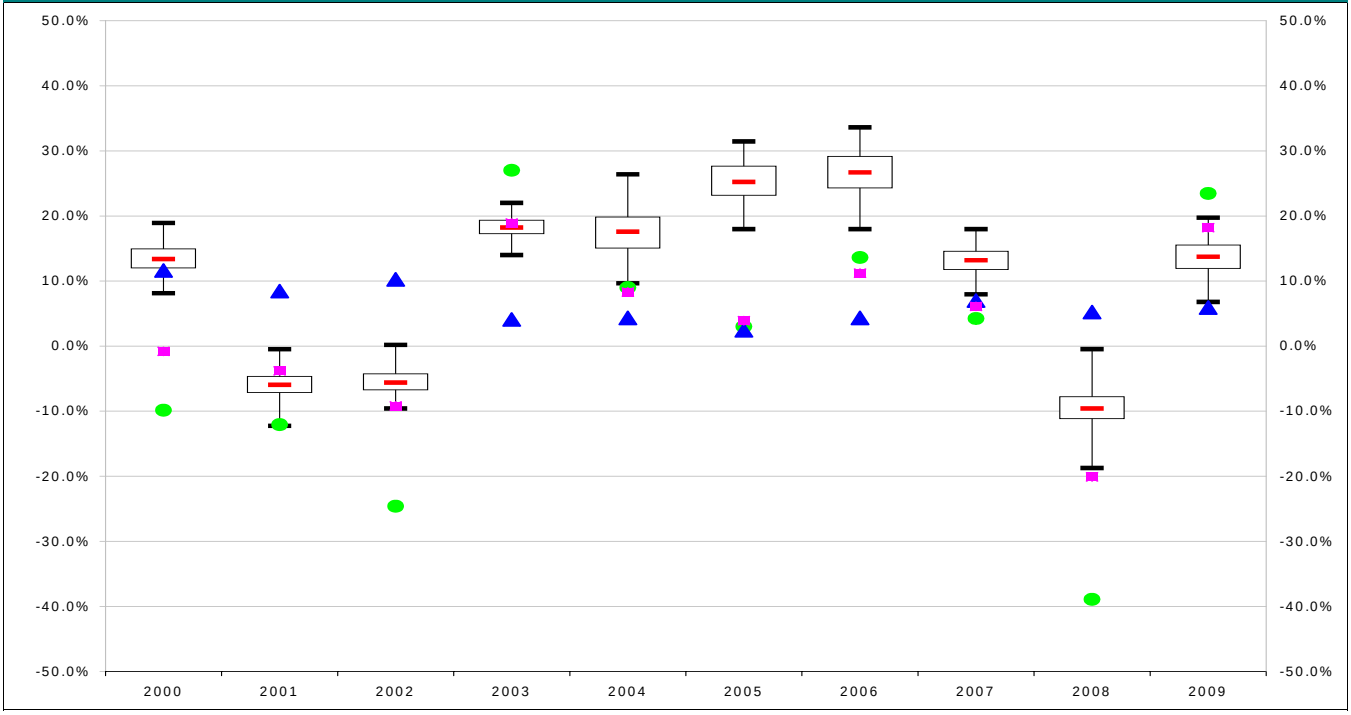


Figure 1 shows a breakdown of returns year by year over the test period. The green dot represents the return of the S&P 500, the blue triangle represents the return of the Barclays Aggregate Bond index, the pink square is a 60/40 mix of equities and bonds , and the red line represents the average return of all 100 trials. Some years, such as 2005 and 2006, relative strength performs so well that all of the trials perform better than all of the benchmarks. Other years, such as 2009, relative strength performs poorly and all 100 trials underperform all the benchmarks except bonds. The most common scenario is to have some trials performing better than the market and some trials performing below the market. The large dispersion in returns within each individual year is also evident. Each of the 100 trials uses the same investment factor applied exactly the same way, but there is random chance involved when each security is selected. That element of chance can result in some trials outperforming and

Table 2: Factor Summary

RS Factor	Hldgs	Avg *	Max *	Min *	% Trials Outperf Stocks	% Trials Outperf 60/40	% Trials Outperf Bonds	Est Annual Turnover
1 Mo Price Return	10	89.4%	139.7%	50.6%	100%	100%	59%	1654.4%
3 Mo Price Return	10	100.6%	162.2%	60.5%	100%	100%	82%	811.7%
6 Mo Price Return	10	203.8%	277.8%	139.0%	100%	100%	100%	438.7%
9 Mo Price Return	10	158.1%	211.2%	106.6%	100%	100%	100%	321.1%
12 Mo Price Return	10	136.9%	189.3%	96.0%	100%	100%	100%	256.0%
18 Mo Price Return	10	85.9&	125.2%	52.2%	100%	100%	52%	156.5%
2 Year Price Return	10	74.9%	127.4%	34.8%	100%	100%	23%	121.9%

** Annualized Returns*

some trials underperforming over short time periods. We have found this is very common when testing relative strength strategies.

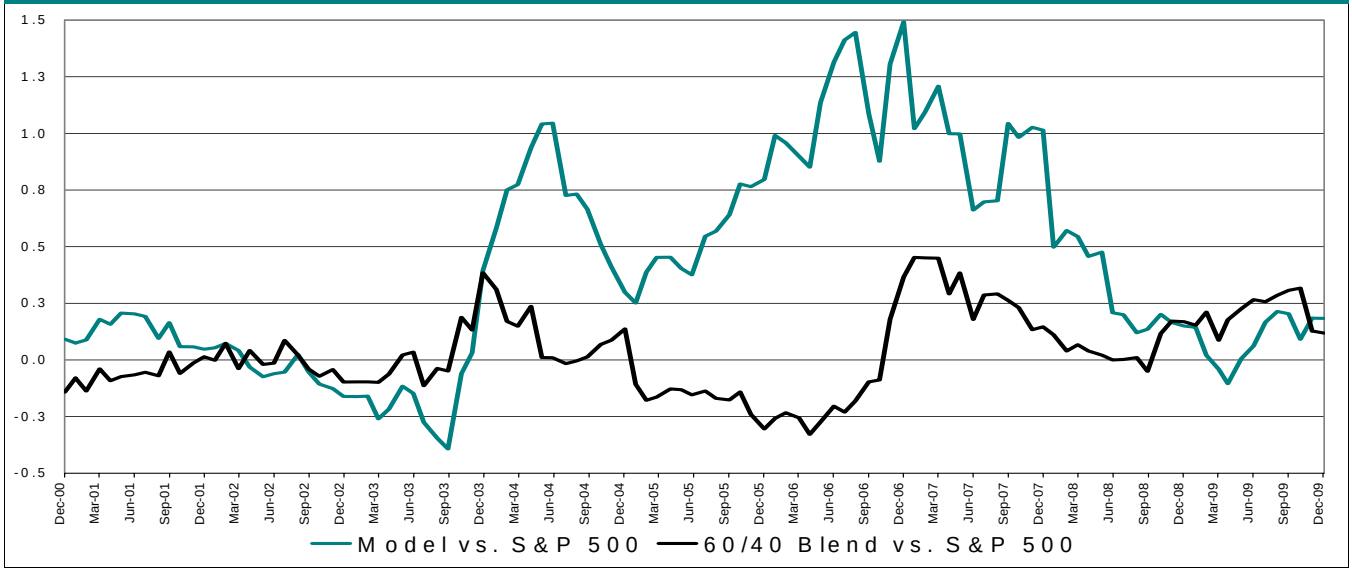
Even with all of the short-term variation, it's important not to lose sight of the big picture. Looking back to Table 1, all 100 trials outperformed the major asset class benchmarks over the entire 10-year period. This illustrates the need for patience when using relative strength. Investors are generally their own worst enemies. Research has shown that when choosing investments, investors place too much emphasis on recent performance and actually wind up performing, in aggregate, worse than inflation (not just worse than a benchmark).

Relative strength is an intermediate-term factor. Most research has found that relative strength is a viable strategy over a 3-to 12-month formation period. At shorter and longer time periods there is significant mean reversion. Our testing process is also flexible enough to test random portfolios using different relative strength factors. Table 2 shows a summary of returns using different lookback periods for various relative strength ranking factors. Once again, the robust nature of relative strength is shown by the ability of multiple random trials to outperform using a variety of factors. Some of the intermediate-term factors work better than others, but they all exhibit a significant ability to outperform over time. At very short lookback periods, such as 1 month, the performance is not as good as at longer periods. Relative strength models are not designed to catch every small wiggle, and investors need to allow positions to ebb and flow over time. It is also clear from Table 2 that as you begin to lengthen your lookback period, returns begin to degrade. While a long-term buy and hold approach to a relative strength strategy is necessary, the investments *within* the strategy are best rotated on an intermediate-term time horizon.

Part V: Changing Volatility

One interesting benefit of an asset class rotation strategy based on relative strength is how it manages volatility. As investment themes come in and out of favor, an RS strategy rotates to the themes that are currently in favor. When volatile assets, such as stocks, are declining, an RS strat-

Figure 2: Trailing 12 Month Betas vs. S&P 500



egy might rotate into a much less volatile asset class, like bonds or currencies, that is holding up better. This rotation helps make the portfolio more volatile when volatile assets are performing well, and less volatile when risky assets are out of favor.

Figure 2 shows the trailing 12-month beta of a relative strength strategy and a 60/40 equity/bond portfolio compared to the S&P 500. In order to calculate the beta for the RS strategy we selected the one portfolio's return stream out of the 100 trials that was closest to the average return. We then calculated the beta versus the S&P 500 over rolling 12 month periods.

The beta of a 60/40 strategy remains very stable over the testing period. The beta of an RS strategy, however, changes dramatically. In the equity bear market of 2001-2002, the portfolio had very little correlation with the S&P 500, and even dipped to a negative beta near the end. As markets improved in 2003, the RS rotation strategy increased it's correlation to the S&P 500. Looking back to Figure 1 shows why the portfolio had such a high beta from 2004-2007. The strategy dramatically outperformed the benchmarks during these years. When the strategy is outperforming, it finds the most volatile assets that are appreciating more than the broad benchmarks. As the markets began to favor less risky assets in late 2007 & 2008, the relative strength process began to cut back the volatility of the overall portfolio and the correlation to equities.

Managing the overall volatility of the portfolio was not considered in our testing process. The adaptive nature of a relative strength ranking system forces the portfolio to hold assets that are holding up well relative to other assets. During periods when risky assets are rewarded, the portfolio will be more volatile. When risky assets falter, a relative strength process forces them out of the portfolio in favor of less volatile assets.

Part V: Conclusion

Relative strength strategies have a long history of delivering market-beating returns. A great deal of research in this area has been devoted to models using common stocks. While some studies show that RS works well using asset class data, the body of research is not as large.

Our research shows that relative strength is a very valuable factor for selecting asset classes. When looking at the relative performance of various asset classes over an intermediate-term time horizon it is certainly possible to achieve returns better than standard, broad-based benchmarks. Achieving these returns often requires patience because relative strength strategies can get out of synch with the market. However, the adaptive nature of relative strength allows the process to adapt to the changing leadership over time.

Our Monte Carlo testing process also shows that the disciplined application of the relative strength process is more important than actual security selection. We were able to draw ETF's at random out of a sub-set of highly ranked securities. Over time it was not important which ETF's were actually selected. When using a proper time horizon to measure relative strength, all 100 trials outperformed the broad-based benchmarks even picking securities at random. This indicated investors would be wise to focus on a disciplined application of the process rather than spending all of their time on individual asset class selection.

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