Practical Uses Of Relative Strength

Can Relative Strength Be Used In Portfolio Management?

The concept of relative strength is part of the foundation of technical analysis, but can it be used successfully when it comes to portfolio management?

In its simplest form, relative strength is the measurement of the performance of one item versus another over a period of time. Dozens of formulations of relative strength have been proposed by technicians, as well as others, over the years. One of the early mentions of relative strength is from one of the masters of technical analysis, Richard Wyckoff:

> As your trend charts are made on transparent paper they may be laid over other charts of groups or individual stocks to show which groups and which stocks are stronger or weaker than the general market, as represented by the averages. One of the best indications of the future course of a group or a stock is its comparative strength when the rest of the market is weak, or its comparative weakness in a strong market.

THE EARLY YEARS

Numerous other technicians including George Chestnutt and Sedge Coppock made their own inquiries into relative strength. These technical analysts were aware of how useful it could be, but their published works on the topic generally lacked statistical detail. (Chestnutt may have preferred the pudding to the proof; he was the manager of one of the best-performing mutual funds of the 1960s.)

One of the first looks at relative strength in the early computer era came from Robert Levy in his seminal work *The Relative Strength Concept Of Common Stock Forecasting.* Levy used a moving average formulation of relative strength and found that returns were far superior to the returns of the universe of stocks. Seen as an assault on the efficient market theory of the era, Levy's work was criticized in academic circles. Perhaps as a result, few academic papers were published on the topic for years afterward.

More recently, relative strength has gotten coverage for a broader audience, most notably in James O'Shaughnessy's *What Works On Wall Street.* O'Shaughnessy gained access to the Compustat database and tested all sorts of strategies, both value and relative strength, over a period from 1951 to 1996. Of his rather conclusive results, O'Shaughnessy noted that, "relative strength is one of the criteria in all 10 of the top-performing strategies, proving the maxim that you should never fight the tape." He pointed out that the worst strategy he tested was the anti-relative strength strategy of bottom fishing and buying the 50 stocks with the worst one-year price performance.

PORTFOLIO MANAGEMENT

Much of the quantification of relative strength has not been directly applicable to portfolio management. Usually, the stocks get divided into segments (tiling) and the results of the various segments are broken out. Often, these segments are the most extreme examples of relative strength and have commensurate volatility, or the segments are of such size that it would be difficult to construct a portfolio with so many stocks. Other times, small capitalizations,

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extreme industry concentration, or a constantly variable number of qualifying stocks would make it impractical to construct a portfolio.

This generally results in a portfolio manager treating relative strength as a "screen," or starting point from which to pursue further analysis. The purpose of any screen is to determine a pool of securities that, on average, outperforms the benchmark. However, once you select a subset of securities, your portfolio returns will be greatly influenced by the return dispersion of the stocks within the screen.

For example, many investors select stocks that are rated #1 by Value Line. The Value Line ranking system has a very good long-term track record, but that record assumes an investor buys every top-ranked stock. If most superior performance comes from a subset of the universe, your chances of capturing outperformance diminish as you select a smaller number of securities. This is a problem with any screening methodology, and it is often responsible for a manager's failure to translate the results of a model into actual portfolio performance. As a result, it is imperative to test the return dispersion characteristics of stocks within the ranking system to determine whether the model returns can be translated into actual results.

APPLYING RELATIVE STRENGTH

In this study, we will show how relative strength can be used and how robust the concept is when adapted for the portfolio process.

There are several requirements for the sake of practicality. First, the universe of possible relative strength selections to include in a portfolio must be broad enough to meet various portfolio objectives. Second, the performance characteristics of relative strength must be dispersed throughout a sample to allow a portfolio subsection — say, 25 or 50 stocks — to retain performance characteristics similar to the entire sample. Third, it must perform well on a consistent basis. If a portfolio outperforms on a five-year basis, but all of the outperformance comes from *one* year, it is unlikely to work well with clients in the real world. Finally, we will demonstrate the robustness of the relative strength concept by using two different formulations and show how each succeeds in these difficult tasks.

METHOD

The stocks of the Standard & Poor's 900 index were used to form our universe of securities. Since these stocks are heavily traded, it helps to avoid the problem of buying illiquid stocks in the portfolio. In order to overcome the problem of survivor bias, we constructed an equal weighted return index of the stocks in our universe. The portfolio returns were then compared to this benchmark rather than to the returns of the S&P 900. The test period makes up the 14 years from December 28, 1990–December 31, 2004.

We tested two formulations of relative strength; both relied on nonproprietary public information. The first model was a simple 52-week return to determine the strength of each security. This model has tested well in a number of other studies, including the O'Shaughnessy work. We calculated the 52-week return for all the stocks in the universe on a weekly basis and then ranked the returns from largest to smallest.

The second relative strength formulation we tested was a deviation from a moving average model. The security's closing price was compared to its own six-month simple moving average of closing prices. The deviations were sorted from largest to smallest, so those stocks whose current prices were significantly above their moving average were considered to have the highest relative strength. In both models, the ranks were then assigned a percentile score so the stocks with the highest relative strength were ranked 100 and the stocks with the lowest returns were ranked zero.

Several tests were run to test the effectiveness of both relative strength models. In each, we defined a target number of holdings for the portfolio, a buy threshold, and a sell threshold. The buy threshold was the minimum percentile score a stock would need to make it eligible for inclusion in the portfolio. If we set this parameter at 90, for example, only stocks in the top decile (or those with a percentile rank above 90) were eligible for inclusion in the portfolio. The sell threshold was the level at which a stock was automatically sold out of the portfolio and replaced with a stronger stock.

Due to the large number of transactions required, it is difficult to buy an entire quartile or decile of strong relative strength stocks. It is also difficult to buy the strongest stocks because of industry concentration limitations and risk management parameters. To account for these limitations, we used the buy threshold to define a basket of eligible stocks and then picked one stock at random from the basket. Actual purchases and sales were tracked in each test. Each security was reviewed weekly and not sold unless its rank fell below the predefined sell threshold.

In addition, the model would sell a partial position in a security if its market value became more than 10% of the total portfolio value. We felt this would add to the realism of the test because few professional managers would be able to hold such a concentrated position in one security. Because the model remained fully invested over the entire test period, a new purchase was only initiated if there was a corresponding sale.

We used this methodology to run 100 simulations for each model with the given parameters. These Monte Carlo† simulations also demonstrate the robustness of relative strength because they show the returns are not clustered in a small number of stocks.

RESULTS AND DISCUSSION

The results support our contention that there are practical ways to implement the relative strength concept in portfolio management. Figures 1 and 2 summarize the performance of all 100 trials for each model with the various parameters. The average annualized excess performance for each test is positive. This means that each model, on average, performed better than the universe over the test period. In six of the models, all 100 trials outperformed the universe. In each case, no fewer than 83 trials of 100 outperformed the universe. Using relative strength in the investment process is also extremely robust,

since there were very few instances in which a single trial underperformed the benchmark.

The results also give insight into how to best construct portfolios using relative strength. Increasing the number of holdings in the portfolio lowers the dispersion of the returns in each test. However, the highest returns come from a more concentrated portfolio. It is also clear that relative strength works best at the extremes. All the models that restrict the pool of eligible securities to those above 90 perform better than those that restrict the universe to the top quartile. The tradeoff for this improved performance from the more extreme relative strength models is increased turnover. Depending on the transaction costs and tax situation, it may be more advantageous to use less extreme parameters.

The amount of turnover is important in any investment strategy. For each model, we calculate the total number of "sell" transactions over the 14-year trial period. We then come up with an estimate of annual turnover by converting the total number of sales into an annual number and dividing that by the number of holdings in the portfolio.

Figure 3 illustrates the turnover from the trailing 12-month return model. In each case, the trading activity is at an acceptable level. For comparison purposes, William Harding, who is an analyst for Morningstar, estimates the average annual turnover for actively managed domestic stock funds is 130%. As you can see from Figure 4, the trading activity in the Levy-style moving average models is very high. This type of model would only be appropriate for very active investors, and taxes and transaction costs would be important considerations in using this type of relative strength model.

Trials	Holdings	Buy Level	Sell Level	Avg*	Max*	Min*	%Outper
100	25	90	74	9.71	17.17	3.04	100%
100	25	90	49	7.18	14.01	-1.16	98
100	25	75	49	3.39	10.99	-2.00	88
100	50	90	74	9.46	14.33	5.39	100
100	50	90	49	7.71	12.99	3.20	100
100	50	75	49	3.64	9.88	-2.02	93

*Performance is shown as an annualized return plus or minus the benchmark.

FIGURE 1: 12-MONTH RETURN MODEL. As you can see, the excess performance for each test is positive.

Trials	Holdings	Buy Level	Sell Level	Avg*	Max*	Min*	%Outper
100	25	90	74	5.56	13.15	-0.68	98%
100	25	90	49	9.07	17.38	2.21	100
100	25	75	49	2.95	10.76	-6.36	83
100	50	90	74	5.40	9.54	1.41	100
100	50	90	49	8.74	12.58	4.02	100
100	50	75	49	2.78	6.89	-2.42	91

*Performance is shown as an annualized return plus or minus the benchmark.

FIGURE 2: PRICE VS. SIX-MONTH MOVING AVERAGE MODEL. The results were very positive using the deviation from a moving average method.

Holdings	Buy Level	Sell Level	Avg Total Sells	Avg Sales Per Year	Est. Turnover
25	90	74	486	34.68	138.7%
25	90	49	306	21.84	87.4
25	75	49	348	24.84	99.4
50	90	74	886	63.25	126.5
50	90	49	534	38.14	76.3
50	75	49	631	45.11	90.2

FIGURE 3: TURNOVER SUMMARY FOR 12-MONTH RETURN MODEL. The average turnover is similar to the average equity mutual fund, but this is typical when it comes to managing a portfolio.

Holdings	Buy Level	Sell Level	Avg Total Sells	Avg Sales Per Year	Est. Turnover
25	90	74	1,405	100.34	401.4%
25	90	49	841	60.06	240.2
25	75	49	971	69.38	277.5
50	90	74	2,735	195.33	390.7
50	90	49	1,608	114.84	229.7
50	75	49	1,873	133.78	267.6

FIGURE 4: TURNOVER SUMMARY FOR PRICE VS. SIX-MONTH MODEL. In this case, the trading activity is much higher than in the first model and would only be beneficial for active traders.

IN SUMMARY

These are results that could be achieved in practical portfolio management. First, the S&P 900 is an investable universe and has adequate liquidity for all but the largest asset managers. Second, the portfolio size was limited to 25 or 50 holdings. Third, the process is replicable, as explicit buy and sell rules were used. Finally, the Monte Carlo methodology is evidence of robustness of the process, since most of the trials showed outperformance versus the investment universe.

By picking securities at random from the deciles, it is clear that strong performance characteristics were distributed throughout the sample. There is no way of knowing which stocks will perform the best. It's reassuring to know, however, that even if 25 or 50 are picked randomly, the portfolio has a strong chance of outperforming. The results support the contention that the technical concept of relative strength is robust and can be used to run actual investment management accounts.

The average annual turnover for actively managed domestic stock funds is 130%.

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