MOMENTUM OF RELATIVE STRENGTH (MoRS): AN ADDITIONAL TOOL FOR RELATIVE STRENGTH INVESTORS

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By

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ABSTRACT

Relative strength in various forms is commonly utilized in a cross market rank and rotation format. Yet the MoRS indicator is presented as an additional tool that provides the ability to measure acceleration and deceleration of relative strength between two securities in a more precise manner. MoRS can facilitate the timing of entries and exits and also offers a targeted approach to dynamic asset allocation and portfolio construction. MACD offers the ability to measure momentum and trend in one indicator. MACD expressed as a ratio standardizes the distance between two moving averages and enables comparative analysis between two or more securities. MoRS replaces price with price divided the S&P 500 in a MACD ratio construct. Consequently MoRS offers the opportunity to measure when relative strength leaders are beginning to lag and conversely when relative strength laggards are beginning to lead. The utility of MoRS is demonstrated in a Russell 2000 versus S&P 500 switching strategy, Sector ETF portfolios as well as a sector ETF and individual stock buy signal. It is expected that this study will be appealing to financial advisors, portfolio managers and analysts and traders who are interested in utilizing a unique indicator that offers additional ways to utilize relative strength in a variety of targeted applications.

ACKNOWLEDGMENTS

A special thank you to Mike Moody, CMT who reviewed

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INTRODUCTION

Analysts are pressed to recommend their best ideas while portfolio managers are expected to select securities that will outperform. Relative strength in various forms offers the ability to identify and rank relative strength leaders across a universe of securities yet few relative strength methods offer the ability to measure in a more precise manner when relative strength leaders are beginning to lag or when relative strength laggards are beginning to lead. By substituting price with price divided by an index, MoRS (Momentum of Relative Strength) converts a MACD ratio into an indicator that measures acceleration and deceleration of relative strength. Consequently, from a relative strength standpoint MoRS offers a more precise way to determine when to buy a relative strength laggard or sell a relative strength leader. Additionally MoRS offers the opportunity to develop targeted approaches to dynamic asset allocation and portfolio construction.

1.1 Background of Relevant Indicators

MACD (Moving Average Convergence Divergence) was developed by Gerald Appel in the late 1970s. MACD utilizes moving averages to measure trend and by subtracting a longer term moving average by a shorter term moving average it also measures momentum**.** (Appel 2005)

MoCS (Momentum of Comparative Relative Strength), developed by Christopher Hendrix, CMT is an indicator identical to MACD with the exception that price is replaced by price divided by and index, sector or other security. (Carr, 2008 p 70-71).

MATERIALS AND METHODS

2.1 Calculation of MoRS

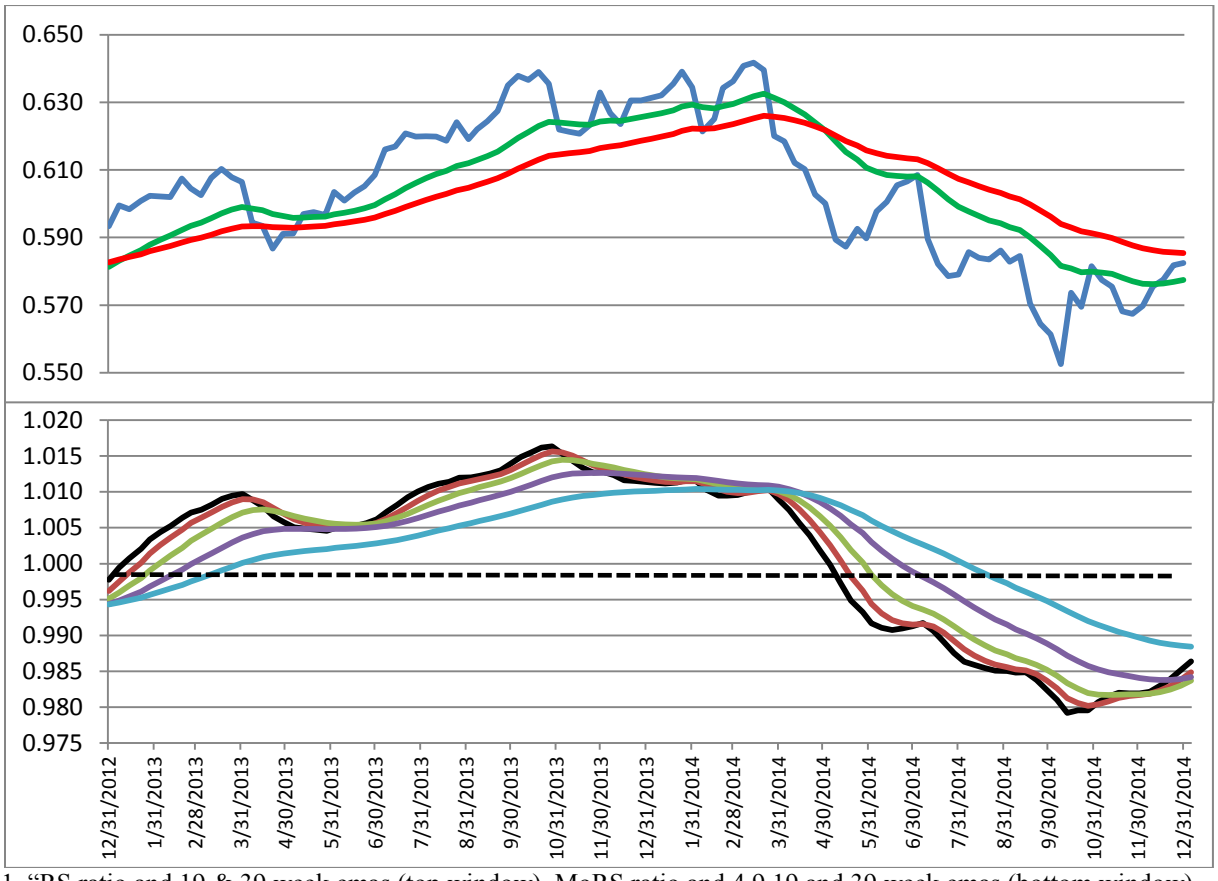
The Russell 2000 (RUT) and S&P 500 index (SPX) are utilized in providing an example of the calculation of MoRS. For purposes of this study a 19 and 39 week exponential moving average (ema) are selected as the short and longer term moving average lengths. The steps to calculating MoRS are:

Step 1: Create the relative strength (RS) ratio line. This is done by dividing the weekly price of RUT by the weekly price of SPX. (blue line in top window of Figure 1)

Step 2: Create a 19 & 39 week ema of the RS ratio line. (red and green lines in top window Figure 1)

Step 3: Create the MoRS ratio by dividing the 19 week ema of the RS ratio line by the 39 week ema of the RS ratio line. (black line in bottom window of Figure 1)

Step 4: Calculate a 4, 9, 19 and 39 week ema signal lines of the MoRS ratio (bottom of Figure 1)

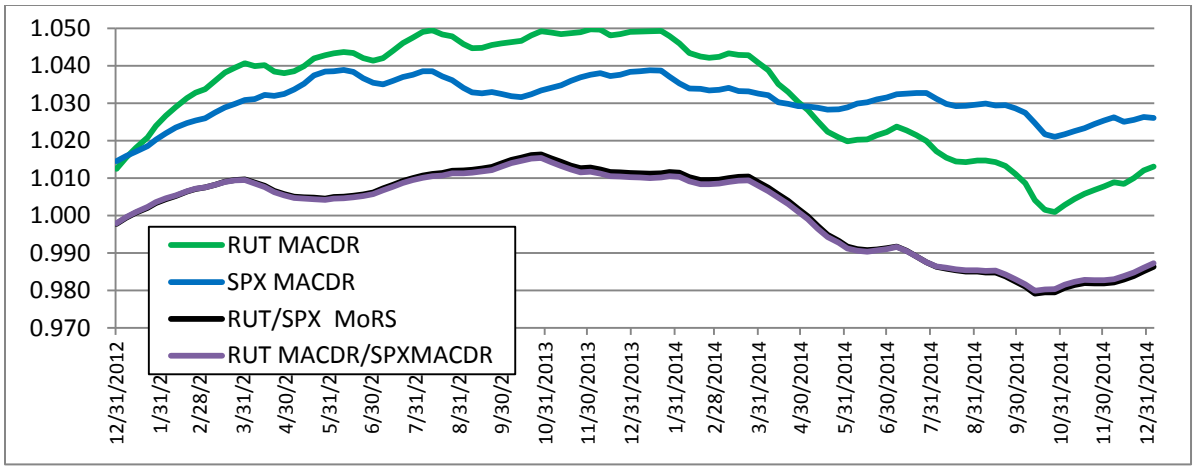


1 "RS ratio and 19 & 39 week emas (top window), MoRS ratio and 4,9,19 and 39 week emas (bottom window)

The top window of Figure 1 allows us to view the relative strength trend of RUT versus SPX. When the 19 week ema crosses above the 39 week ema the relative strength trend is positive. When the 19 week ema crosses below the 39 week ema the relative strength trend of RUT versus SPX is negative. 19 and 39 week ema crossovers result in the MoRS ratio crossing above and below the 1.0 level which can be viewed in the bottom window of Figure 1. Additionally the bottom window in Figure 1 allows us to view the momentum of relative strength between RUT and SPX. When the MoRS ratio (black line) is trending upward the relative strength of RUT versus SPX is accelerating. Conversely when the MoRS ratio is trending downward the relative strength is decelerating. Notice in the top window of Figure 1 the RS ratio began to trade sideways in late 2013 and early 2014. This was a sign of waning momentum of relative strength. The identification of this development was more evident by viewing the October 2013 MoRS ratio peak and subsequent downturn in momentum which preceded the RS ratio line peak. The 4, 9, 19 and 39 week ema signal lines (red, green, blue and purple) offer the opportunity to assess the relative attractiveness of RUT versus SPX over various time frames. Appendix A illustrates in more detail the steps in calculating the RS line and MoRS ratio.

2.2 Alternative Calculation of MoRS

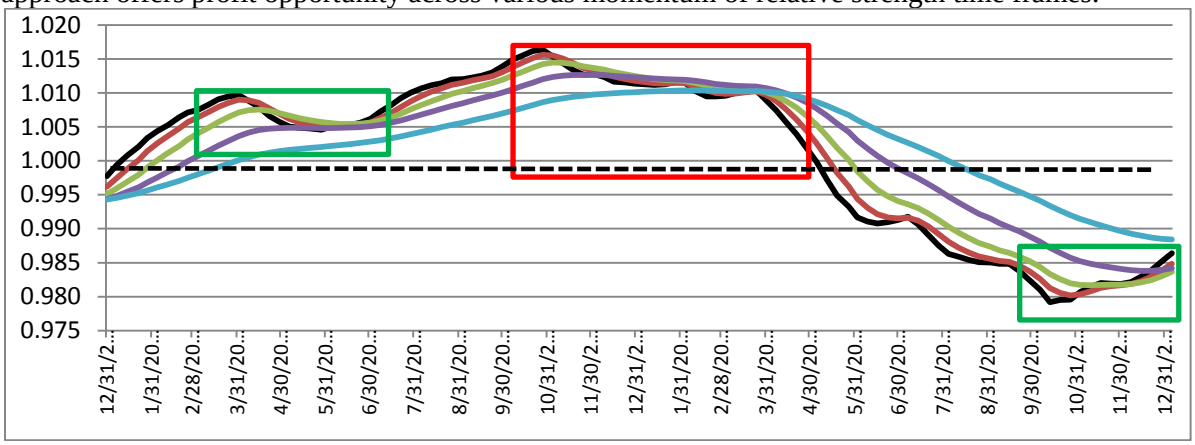
A secondary contribution is the fact that MoRS can be approximately derived by dividing the MACD ratio of one security by another. The 19 and 39 week MACD ratios of RUT and SPX are depicted in Figure 2. A MACD ratio is created by dividing rather than subtracting the short term moving average by the longer term moving average. This standardizes the distance between the two by expressing this difference as a ratio. MACD ratio crosses above and below 1.0 are identical to MACD crosses above and below 0. MACD ratios can facilitate comparative analysis of momentum and trend by assessing the slope and level of one security versus another. Yet if MoRS can be derived by dividing the MACD ratio of one security by another then MACD ratios can also facilitate the comparative analysis of momentum and trend of relative strength. This analysis is made easier by converting the MACD ratios into MoRS by dividing the MACD ratio of one security by another.



2 "19 39 MACD ratio of RUT and SPX, MoRS and derivation of MoRS"

2.3 Multiple Signal Line Approach

Buying and selling a security based on a signal line crossover is a common approach. The idea is to capture the sweet spot or momentum in a trend. Yet these strategies can be prone to whipsaw trades and may also cut profits short. Conversely a decision can be made to buy on a signal line cross over and hold a security when the indicator is above 1.0. This offers the ability to let winners run. Yet selling after MoRS has crossed below the 1.0 line may result in a sale that occurs after a substantial decline from a peak. A multiple signal line approach is introduced and tested against a traditional signal line approach. It is expected that a MoRS multiple signal line approach will reduce whipsaw trades and also deliver better returns as a result of allowing relative strength winners to run. These scenarios are identified in the boxes located in Figure 2. Essentially a multiple signal line approach offers profit opportunity across various momentum of relative strength time frames.



3 "RUT/SPX MoRS multiple signal lines and whipsaw periods"

For purposes of this study a 19 39 MoRS and 9 week ema crossover will be compared against a MoRS multiple signal line approach. The rules of the crossover and the multiple signal line approach are outlined in table 1. There are two distinctions between each of these. Rule set 2 waits until the 4 ema signal line crosses above the 9 ema signal line whereas rule set 1 buys when the MoRS ratio crosses above the 9 ema signal line. This is a minor distinction yet it is expected that rule set 2 will result in fewer whipsaw trades . The second distinction is that rule set 1 sells when the MoRS ratio crosses below the 9 signal line whereas rule set 2 does not signal a sell until the 4 ema signal line crosses below the 39 ema signal line.

Rule set 1 = MoRS 9 crossover = Buy security when MoRS is > 9 ema signal line, Sell when MoRS is < 9 ema signal.
Rule set 2 = MoRS 4,9,19,39 = Buy security when MoRS 4 ema signal line is > 9 or 19 or 39 ema signal line, Sell when MoRS 4 EMA is < 39 ema signal line

1 "Trading rules"

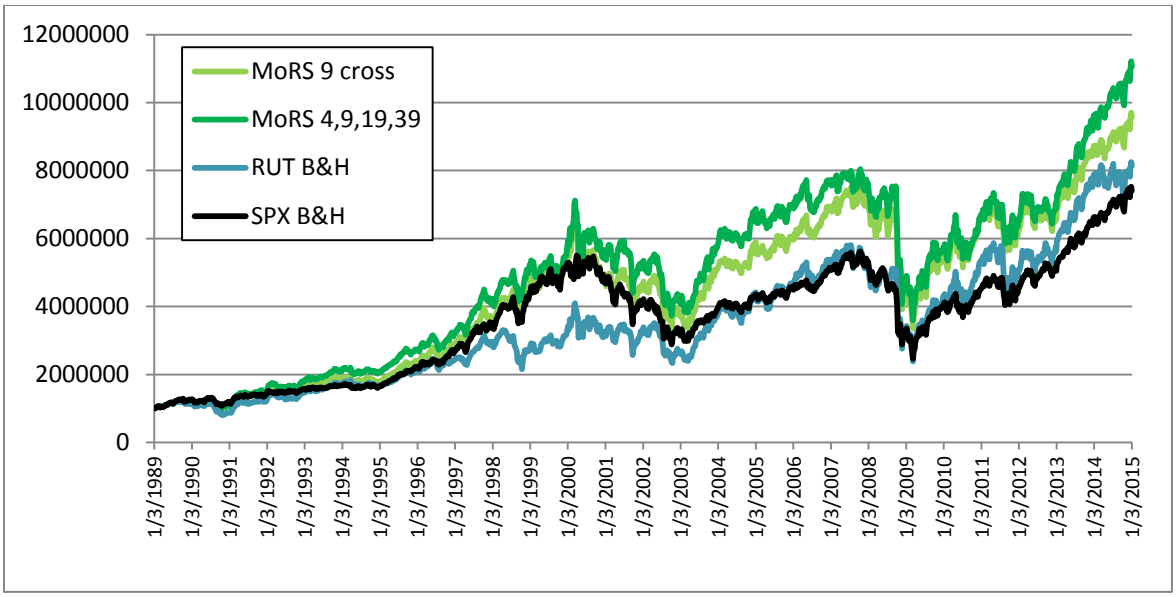
RESULTS

3.1 Russell 2000 and S&P 500 Switching Strategy

The 19 39 MoRS ratio indicator is applied to the Russell 2000 and S&P 500. [1] When MoRS is positive the strategy buys RUT and when MoRS turns negative the strategy buys SPX. In Table 2 it can be seen that rule set 2 outperformed rule set 1 and also resulted in fewer total trades. Both rule sets outperformed the buy and hold returns of the Russell 2000 and S&P 500.

rule set	MoRS 9 cross	MoRS 4,9,19,39	RUT B&H	SPX B&H
Total Return	857.96%	1005.98%	713.46%	641.11%
Avg. Annual '89-'14	10.81%	11.43%	10.17%	9.54%
Annualized	9.08%	9.68%	8.40%	8.01%
Std. Dev. '89-'14	18.96%	19.17%	19.37%	17.50%
Coeff. Of Variation	1.75	1.68	190.51%	183.46%
Max Drawdown	-49.25%	-45.96%	-42.37%	-45.83%
# of trades (round trip)	77	56		

2 "RUT versus SPX switching strategy returns, volatility and number of trades"



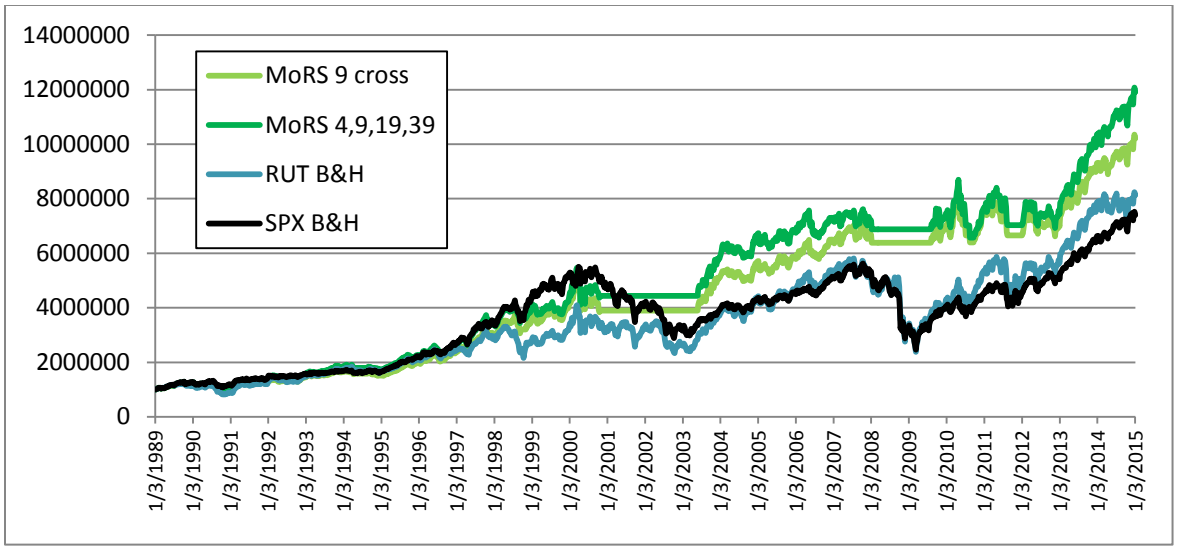
4 "Equity curves of the RUT versus SPX switching strategy"

3.2 RUT And SPX Switching Strategy With SPX Long Term Trend

In this strategy test a long term trend filter and a rule is added that the strategy will only trade if the long term trend of the S&P 500 is positive (9 week ema > 39 Week ema). Conversely if the long term trend of SPX is negative (9 week ema < 39 week ema) the strategy does not trade or sells the current position and defaults to cash or a money market fund (MMF). As can be seen in Table 3 and Figure 4 this strategy yielded similar returns and the draw down was reduced to 20%,

rule set	MoRS 9 cross	MoRS 4,9,19,39	RUT B&H	SPX B&H
Total Return	921.22%	1091.52%	713.46%	641.11%
Avg. Annual '89-'14	10.24%	10.91%	10.17%	9.54%
Annualized	9.35%	10.00%	8.40%	8.01%
Std. Dev. '89-'14	14.17%	14.48%	19.37%	17.50%
Coeff. Of Variation	1.38	1.33	190.51%	183.46%
Max Drawdown	24.05%	20.55%	42.37%	45.83%
# of trades (round trip)	65	50		

3 "RUT/SPX switching strategy with SPX long term trend filter"



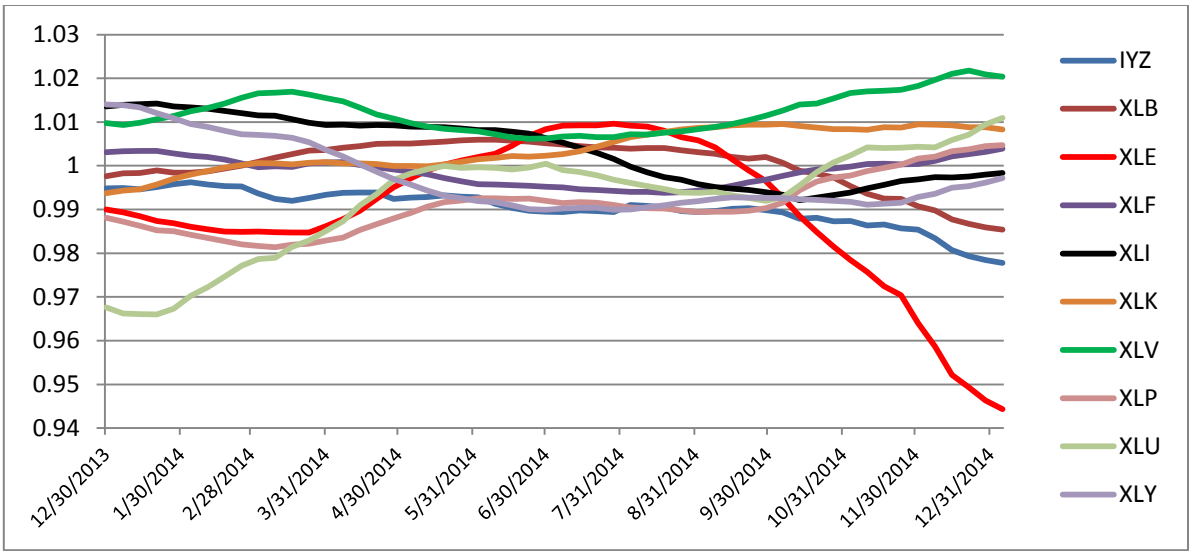
5 "RUT/SPX MoRS switching strategy with SPX long term trend filter"

3.3 S&P Sector ETF MoRS Ratios

The MoRS ratios in Figure 6 are the result of dividing the weekly price of each sector by the weekly price of the S&P 500 ETF SPY. Notice the MoRS ratio line of XLE trended higher into a June peak which was followed by a sharp decline into the end of the year. Table 4 illustrates the 2014 first and second half performance of each sector ETF. XLE returned 14.36% in the first half of the year outperformed SPY's return of 7.49%. Conversely XLE lost 19.58% in the second half of 2014 and underperformed SPY's return of 5.98%. XLV's MoRS ratio bottomed on June 20th and continued to trend higher through the end of the year. In the second half of 2014 XLV gained 13.19% and outperformed SPY's return of 5.98%.

Dates/Symbol	IYZ	XLB	XLE	XLF	XLI	XLK	XLV	XLP	XLU	XLY	SPY
Jan.- June 2014	2.58%	8.40%	14.36%	5.23%	5.33%	8.73%	11.06%	5.48%	18.10%	1.39%	7.49%
July - Dec. 2014	-1.71%	-0.57%	-19.58%	9.67%	5.17%	8.66%	13.19%	9.74%	9.99%	8.09%	5.98%

4 "2014 1st and 2nd half total returns of S&P Sector ETFs"



6 "2014 MoRS ratios of the 10 S&P Sector ETFs"

3.4 Sector ETF Buy Signal

The objective of this test is to determine the utility of MoRS as buy signal in an oversold relative strength condition. [2] Three conditions must be present for the strategy to accept a buy signal:

One: 4 week ema signal line crosses above the 9 week ema signal line,

Two: MoRS ratio value is below the 1.0 line. Three: Long term trend of SPY is positive.

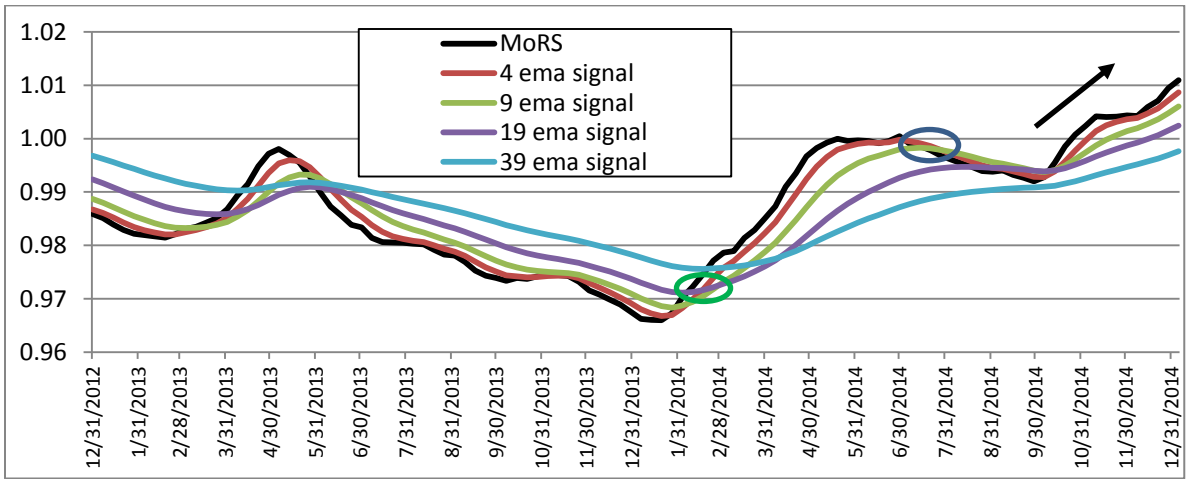
Sell Signal Condition: A sell signal is triggered when the 4 week ema signal line crosses below the 9 week ema signal line or after a position has been held for 26 consecutive weeks.

As can be seen in Table 4 the Sector universe generated 101 trades of which 65% were profitable. The average gain was 9.55% versus an average loss of -3.23%. Only 47.64% of the trades outperformed SPY. Yet the average level of outperformance was 5.85% versus and average level of under performance of -3.80%.

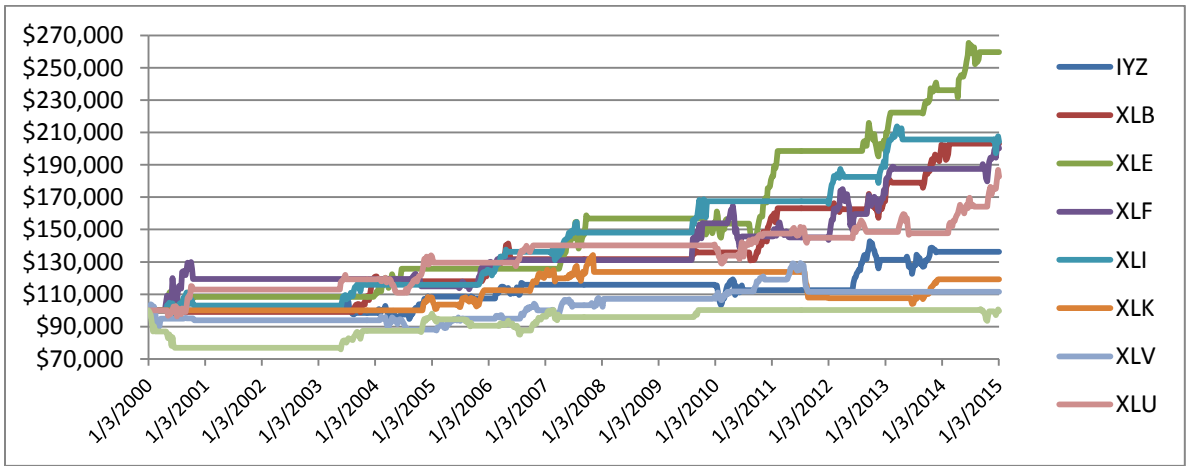
Trade Statistics	Sector	SPY	RS Trade Statistics	RS
Total Return	480.78%	425.49%	Total outperformance	55.29%
# of profitable trades	66	77	# of outperformers	46
# of unprofitable trades	35	24	# of underperformers	55
average gain	9.55%	7.04%	average outperformance	5.65%
average loss	-3.23%	-4.20%	average underperformance	-3.80%
win rate	65.48%	77.76%	win rate	47.64%

5 "Sector ETF MoRS 4 and 9 signal cross results"

Figure 7 depicts the MoRS ratio and multiple signal lines of XLU in 20013-2014. The MoRS 4 and 9 signal line crossover triggered a buy of XLU on 2.10.2014 and sale on 7.28.2014 yet at that time the multiple signal line crossover would have continued to maintain a position.



7 "MoRS of XLU and multiple signal lines"



8 "ETF equity curves, MoRS 4 and 9 signal cross buy"

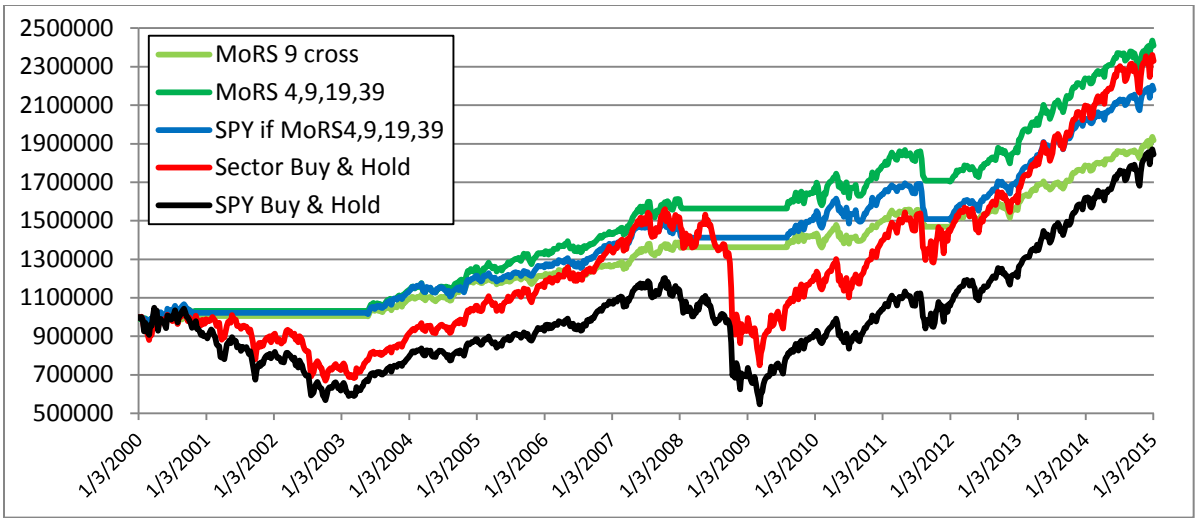
3.5 S&P Sector ETF Portfolios

Rule set 1 (MoRS and 9 signal line cross) is tested against rule set 2 (MoRS multiple signal line cross). Two sector portfolios are created for each of these rule sets and both portfolios dedicates a position or sub strategy to each of the 10 S&P Sector ETFs. Additionally each portfolio accepts signals only when the S&P 500 ETF is trading in a positive long term trend. Each sector ETF is purchased when a buy signal occurs. Yet when a sell signal occurs the proceeds are parked in cash or money market account. Each of the portfolio's exposure can vary between 100% invested (10% allocation to each ETF) and 0%. Essentially the objective is to create a portfolio that offers a targeted yet dynamic approach to sector investing while also providing a degree of bear market protection.

Table 5 and Figure 9 illustrate the results of each portfolio and it is seen that the multiple signal line portfolio outperforms the MoRS and 9 signal crossover portfolio while also resulting in fewer trades. "SPY if MoRS 4,9,19,39" assumes that money is invested into SPY instead of the MoRS multiple signal line portfolio. Consequently the relative outperformance of the MoRS multiple signal portfolio can be directly measured. Additionally the MoRS multiple signal portfolio outperformed the buy and hold results of the sector average and the S&P 500 ETF SPY.

Rule	MoRS 9 cross	MoRS 4,9,19,39	SPY 4,9,19,39	Sector B&H	SPY BH
Total Return	91.72%	140.86%	117.95%	132.93%	84.37%
Avg. Annual	4.54%	6.22%	5.55%	7.33%	5.95%
Annualized	4.43%	6.04%	5.33%	5.80%	4.16%
Std. Dev. '00-'12	4.94%	6.48%	6.95%	17.45%	18.99%
Coeff. Of Variation	1.09	1.04	1.25	2.38	3.19
Max Drawdown	-5.78%	-8.56%	-10.95%	-48.61%	-51.32%
# of trades (RT)	391	300			

6 "S&P Sector ETF portfolio results"



9 "Equity curves of Sector portfolios compared to Sector composite and SPY"

Table 7 illustrates the Sector ETF or money market holdings of the multiple signal line portfolio. Rather than competing against all sector ETFs, this portfolio construction allows each Sector ETF to compete only with SPY on a one to one basis and offers a targeted yet dynamic approach to sector investing.

Date	IYZ or MMF	XLB or MMF	XLE or MMF	XLF or MMF	XLI or MMF	XLK or MMF	XLV or MMF	XLP or MMF	XLU or MMF	XLY or MMF
6/30/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
7/7/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
7/14/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
7/21/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
7/28/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
8/4/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
8/11/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
8/18/2014	MMF	XLB	XLE	MMF	MMF	XLK	MMF	XLP	XLU	MMF
8/25/2014	MMF	XLB	XLE	MMF	MMF	XLK	XLV	XLP	XLU	MMF
9/1/2014	MMF	XLB	XLE	MMF	MMF	XLK	XLV	MMF	XLU	XLY
9/8/2014	MMF	XLB	XLE	MMF	MMF	XLK	XLV	MMF	XLU	XLY
9/15/2014	MMF	XLB	XLE	XLF	MMF	XLK	XLV	MMF	XLU	XLY
9/22/2014	MMF	XLB	XLE	XLF	MMF	XLK	XLV	MMF	XLU	XLY
9/29/2014	MMF	XLB	XLE	XLF	MMF	XLK	XLV	MMF	XLU	XLY
10/6/2014	MMF	MMF	MMF	XLF	MMF	XLK	XLV	XLP	XLU	XLY
10/13/2014	MMF	MMF	MMF	XLF	MMF	XLK	XLV	XLP	XLU	XLY
10/20/2014	MMF	MMF	MMF	XLF	MMF	XLK	XLV	XLP	XLU	XLY
10/27/2014	MMF	MMF	MMF	XLF	MMF	XLK	XLV	XLP	XLU	XLY
11/3/2014	MMF	MMF	MMF	XLF	MMF	XLK	XLV	XLP	XLU	MMF
11/10/2014	MMF	MMF	MMF	XLF	MMF	XLK	XLV	XLP	XLU	MMF
11/17/2014	MMF	MMF	MMF	XLF	MMF	XLK	XLV	XLP	XLU	MMF
11/24/2014	MMF	MMF	MMF	XLF	XLI	XLK	XLV	XLP	XLU	MMF
12/1/2014	MMF	MMF	MMF	XLF	XLI	XLK	XLV	XLP	XLU	XLY

7 "MoRS multiple signal line Sector ETF portfolio signals"

The multiple signal line portfolio outperformed all benchmarks. Looking at Table 8 it can be seen that there was a wide variation in performance between each of the 10 sector ETFs on a buy and hold basis over the past 15 years. XLE, XLP and XLU were among the top performers while the returns of IYZ, XLF and XLK were bottom performers. Additionally XLK and IYZ actually lost money on a buy and hold total return basis over the test period while XLF generated a return of approximately one half of SPY's return.

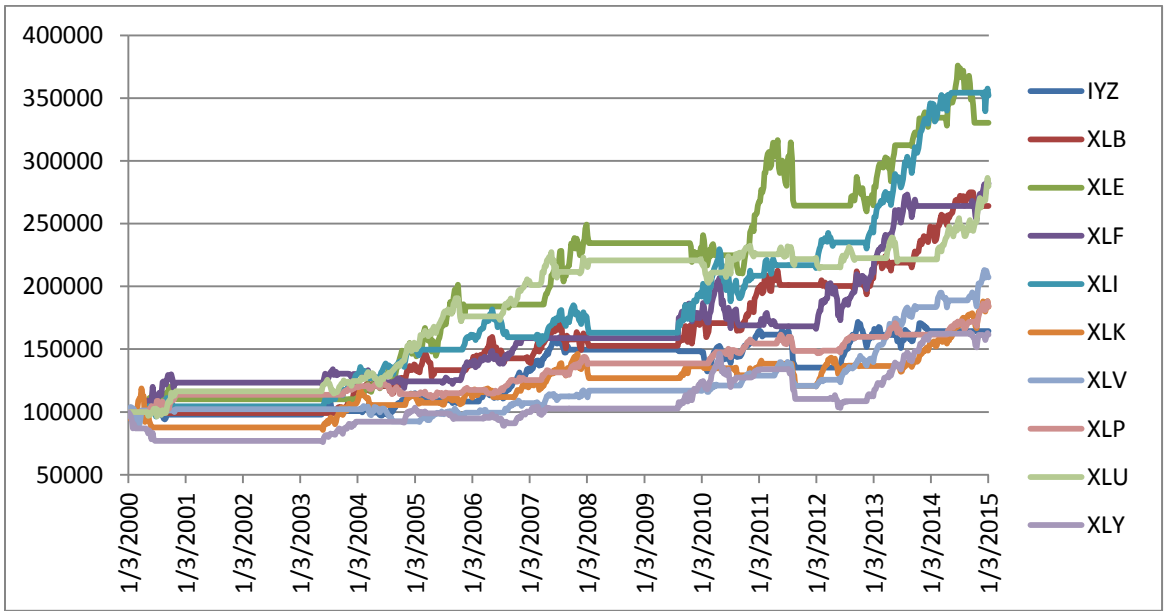
Period	SPY	IYZ	XLB	XLE	XLF	XLI	XLK	XLV	XLP	XLU	XLY
'00-'14	84.37%	-22.72%	162.41%	276.38%	41.15%	149.05%	-9.77%	173.75%	191.79%	192.12%	175.18%

8 "SPY and Sector ETF buy and hold total returns '00-'14"

In looking at Table 9 it can be seen that the sector multiple signal line portfolio on average was invested in S&P Sector ETFs only 41.70% of the time. Figure 10 depicts the individual sector ETF equity curves of the multiple signal line portfolio.

	Average	IYZ	XLB	XLE	XLF	XLI	XLK	XLV	XLP	XLU	XLY
# weeks	326.1	331	338	329	318	377	349	309	285	339	286
% exposure	41.70%	42.33%	43.22%	42.07%	40.66%	48.21%	44.63%	39.51%	36.45%	43.35%	36.57%

9 "Sector portfolio percentage of time invested"



10 "Equity curves of each sector ETF in the MoRS multiple signal line portfolio"

3.6 Sector Hierarchy Portfolio

The MoRS multiple signal line approach is applied to a hierarchy portfolio and is created with the intent of reducing the percentage of time that a portfolio is allocated to a money market position. The hierarchy reduces the number of positions or sub strategies from 10 to 5 by arranging 5 sub strategies based on a risk on and risk off mode. Table 9 outlines the order of the Sector ETF hierarchy. In Position 1 for example if the MoRS signal on XLB is positive the strategy either buys or holds XLB. If the MoRS signal on XLB changes to a sell the strategy sells XLB and buys IYZ if the MoRS signal on IYZ is positive. If neither XLB or IYZ has a positive MoRS signal the strategy owns a 20% money market position until either XLB or IYZ generates a new MoRS buy signal. Additionally the portfolio only accepts trades when the long term trend of SPY is positive. On average this portfolio maintained sector ETF exposure 62% of the time.

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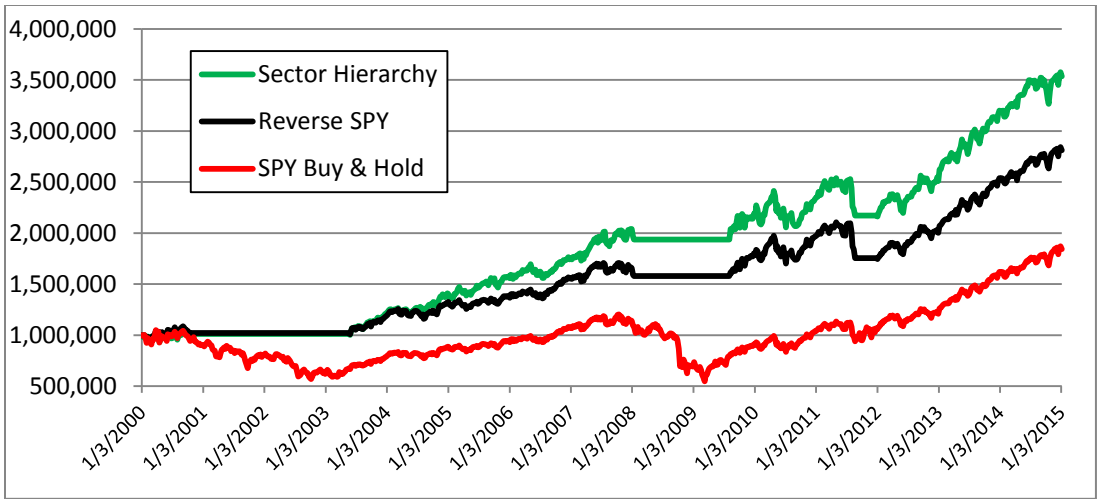
Sector Hierarchy Portfolio					
Hierarchy	Position 1	Position 2	Position 3	Position 4	Position 5
1	XLB	XLF	XLE	XLI	XLK
2	IYZ	XLU	XLY	XLV	XLP
3	MMF	MMF	MMF	MMF	MMF

10 “Sector Hierarchy”

Risk & Reward	Sector Hierarchy	SPY if MoRS 4,9.19,39	SPY Buy and Hold
Total Return	253.63%	181.21%	84.37%
Avg. Annual	9.20%	7.54%	5.94%
Annualized	9.44%	7.66%	4.47%
Std. Dev. '01-'12	9.84%	9.65%	19.00%
Coeff. Of Variation	1.07	1.28	3.20
# of trades (RT)	326		

11 “Sector hierarchy returns versus SPY ”



11 "Sector hierarchy portfolio equity curve versus SPY"

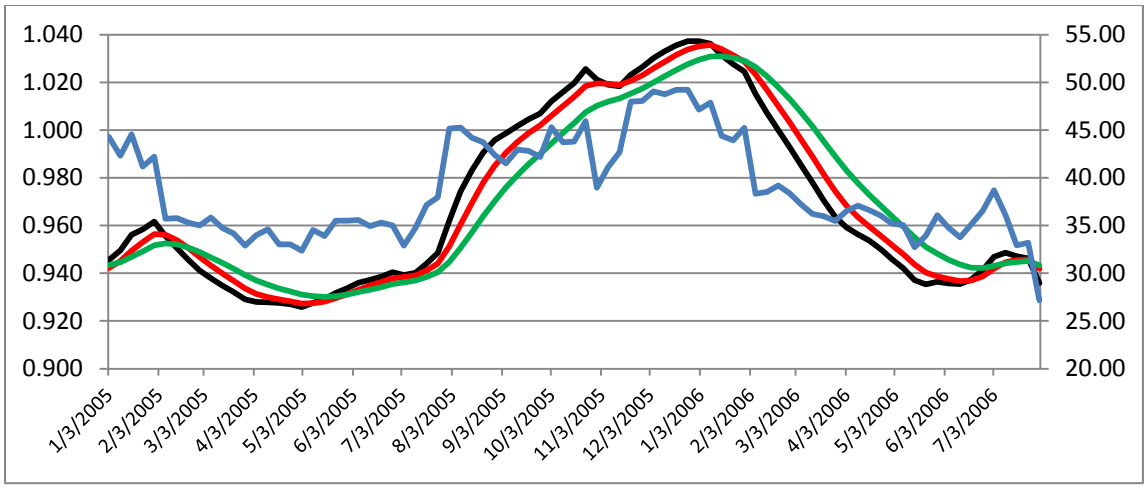
3.7 S&P 100 Stocks Buy Signal

The objective of this test is to assess the utility of MoRS as buy signal in an oversold relative strength condition. [3] The conditions are identical to the Sector buy signal as three conditions must be present for the strategy to accept a buy signal: One: 4 week ema signal line crosses above the 9 week ema signal line, Two: MoRS ratio value is below the 1.0 line. Three: Long term trend of SPY is positive. Sell Signal Condition: A sell signal is triggered when the 4 week ema signal line crosses below the 9 week ema signal line or after the position has been held for 26 consecutive weeks.

In table 11 it can be seen that this signal generated 500 trades. 58% of these trades were profitable and the average gain was 14.94% compared to an average loss of 6.55%. 44.80% of trades outperformed the S&P 500 and the average level of outperformance was 12.16% versus an average level of underperformance of -7.47%.

Trade Statistics		RS Trade Statistics	
Total Return	2548.43%	Total outperformance	605.80%
# of profitable trades	290	# of outperformers	224
# of unprofitable trades	210	# of underperformers	276
Average Gain	14.94%	Average outperformer	12.16%
Average Loss	-6.55%	Average underperformer	-7.47%
% profitable	58.00%	% outperformance	44.80%

12 "S&P 100 stocks MoRS 4 and 9 signal cross results"



12 "AMZN MoRS 4 and 9 signal lines"

Figure 12 depicts the weekly price of Amazon in blue. While the MoRS buy signal in mid 2005 lead to a profitable trade the buy signal in July of 2006 signaled a sell only 3 weeks later and resulted in a loss of -24.76%.

DISCUSSION

The advantage of utilizing a multiple signal line approach with MoRS is evident when compared to trading off of one signal line as the multiple signal line approach outperformed in the Russell 2000 versus S&P 500 test as well as the Sector ETF portfolios. Additionally the multiple signal line approach generated fewer total trades. The results of the Sector ETF portfolios appear to demonstrate the utility of MoRS particularly from a risk standpoint as the first sector portfolio maintained approximately a 40% allocation to sector ETFs and a 60% allocation to a cash. Similarly the Sector Hierarchy portfolio on average maintained approximately a 60% allocation to sector ETFs and a 40% allocation to cash. Yet in viewing the results from the Sector portfolio in Table 6 the margin of returns appear somewhat lacking. It is possible of course that in some cases the MoRS multiple signal line approach sold a relative strength winner too soon and held a loser too long. In looking at Table 8 it also possible that the available returns from the sector universe were somewhat lacking as IYZ and XLK failed to generate a positive return while the return from XLF was less than one half of the return of SPY.

Figure 6 illustrates the MoRS ratios of the 10 S&P Sector ETFs. This chart overlay provides a graphic depiction of relative strength winners and losers as well relative strength winners that began to lag and relative strength laggards that began to lead. As a result it is evident that this chart construct can facilitate the simultaneous comparative analysis of a multitude of securities based on momentum of relative strength.

The MoRS 4 and 9 signal cross buy in the Sector ETF and S&P 100 stock universe provides evidence of the indicators ability to detect when a relative strength laggard is beginning to lead. Yet by looking at XLU in Figure 7 it is probable that in many cases the 4 and 9 signal line cross sells too soon. While a 4 and 39 signal cross sell was not tested in the buy signal tests it is apparent in the Russell 2000 versus S&P 500 and Sector portfolio tests that utilizing a 4 and 39 signal cross sell allowed relative strength winners to run when compared to the MoRS and 9 week signal cross sell.

CONCLUSION

The utility of MoRS has been demonstrated as a buy signal and dynamic asset allocation tool. MoRS measures the momentum of relative strength on a one to one basis. This offers the opportunity to identify when relative strength winners are beginning to lag, when relative strength laggards are beginning to lead and also offers the opportunity to develop targeted approaches to dynamic asset allocation. As a result it is expected that this study will be appealing to financial advisors, portfolio managers, analysts and traders.

REFERENCES

Appel, Gerald, Technical Analysis: Power Tools for Active Investors, FT Press, 2005

Carr, Mike, Smarter Investing in any Economy: The Definitive Guide to Relative Strength Investing, W&A Publishing, 2008, p. 70-71.

END NOTES

[1] All strategy tests were performed in Excel, a Microsoft product.

[2] IYZ did not begin trading until May of 2000. Signals if any were ignored until trading history resulted in an accurate MoRS calculation.

[3] Only 50 S&P 100 stocks were utilized in the S&P 100 study as only they were the only stocks that had a data history prior to the 1.3.2000 start date of the study based on price data downloaded from XLQ Plus.

APPENDIX A

DETAILED STEPS IN CALCULATING THE RS LINE

	19 Week EMA	39 Week EMA
Smoothing factor	2/(1+19) = .10	2/(1+39) = .05
Smoothing factor	1-.10 = .90	1-.05 = .95
RS line Week One	calculate 19 Week SMA	calculate 39 Week SMA
RS line Week Two	Current RS line x .10 + Last week RS line SMA x .90	Current RS line x .05 + Last week RS line SMA x .95
RS line Week Three	Current RS line x .10 + Last week RS line EMA x .90	Current RS line x .05 + Last week RS line EMA x .95

DETAILED STEPS IN CALCULATING THE MoRS RATIO

	4 Week EMA signal	9 Week EMA signal	19 Week EMA signal	39 Week EMA signal
Smoothing factor	2/(1+4) = .40	2/(1+9) = .20	2/(1+19) = .10	2/(1+39) = .05
Smoothing factor	1-.40 = .60	1-.20 = .80	1-.10 = .90	1-.05 = .95
MoRS Week One	calculate 4 Week SMA	calculate 9 Week SMA	calculate 19 Week SMA	calculate 39 Week SMA
MoRS Week Two	Current MoRS x .40 + Last week MoRS SMA x .60	Current MoRS x .20 + Last week MoRS SMA x .80	Current MoRS x .10 + Last week MoRS SMA x .90	Current MoRS x .05 + Last week MoRS SMA x .95
MoRS Week Three	MoRS x .40 + Last week MoRS EMA x .60	MoRS x .20 + Last week MoRS EMA x .80	MoRS x .10 + Last week MoRS EMA x .90	MoRS x .05 + Last week MoRS EMA x .95

DATA

Indices utilized in the Russell 2000 and S&P 500 study:
Russell 2000 (RUT)
S&P 500 (SPX)

Securities utilized in Sector portfolio studies:

Symbol	Name
IYZ	iShares Telecomm
XLB	Materials Select SPDR
XLE	Energy Select SPDR
XLF	Financial Select SPDR
XLI	Industrials Select SPDR
XLK	Technology Select SPDR
XLV	Healthcare Select SPDR
XLP	Consumer Staples Select SPDR
XLU	Utilities Select SPDR
XLY	Consumer Discretionary Select SPDR

S&P 100 constituents utilized in the study:

AAPL	COF	GILD	NKE	SPG
ABT	COP	HAL	NSC	T
AMGN	COST	HPQ	ORCL	TGT
AMZN	CSCO	INTC	OXY	UNH
APA	CVX	JNJ	PEP	UNP
BAC	DOW	LLY	QCOM	USB
BAX	DVN	MCD	RTN	UTX
BIIB	EXC	MDT	SBUX	VZ
BMY	FCX	MS	SLB	WFC
CMCSA	GE	MSFT	SO	XOM