

MOMENTUM of RELATIVE STRENGTH (MoRS)

MACD is a simple and effective indicator that measures momentum and trend in one indicator. MACD ratios standardize the distance between two moving averages and enables comparative analysis between two or more securities.

By substituting price with price divided by an index (or another security) **MoRS**, converts a MACD ratio into an indicator that measures momentum and trend of *relative performance* between two securities. By measuring acceleration and deceleration in relative performance MoRS provides the ability to **detect when relative strength leaders are beginning to lag and when relative strength laggards are beginning to lead**.

While relative performance or relative strength is measured in a variety of ways, MoRS is more precise than many approaches and begins by dividing the price of a security by an index or another security which creates a relative strength ratio line. This expression results in a direct and relevant one to one relationship. Similar to measuring the trend of one security, the **trend of relative performance** between 2 securities can be measured simply by calculating a short and longer term moving average of the relative strength ratio line.

Acceleration and deceleration of relative strength is calculated and measured by dividing a short moving average by a longer term moving average which creates the Momentum of Relative Strength or MoRS oscillator.

Lastly multiple signal lines of MoRS (similar to MACD signal line(s)) are created which measures acceleration and deceleration of relative performance (strength) across varying time frames.

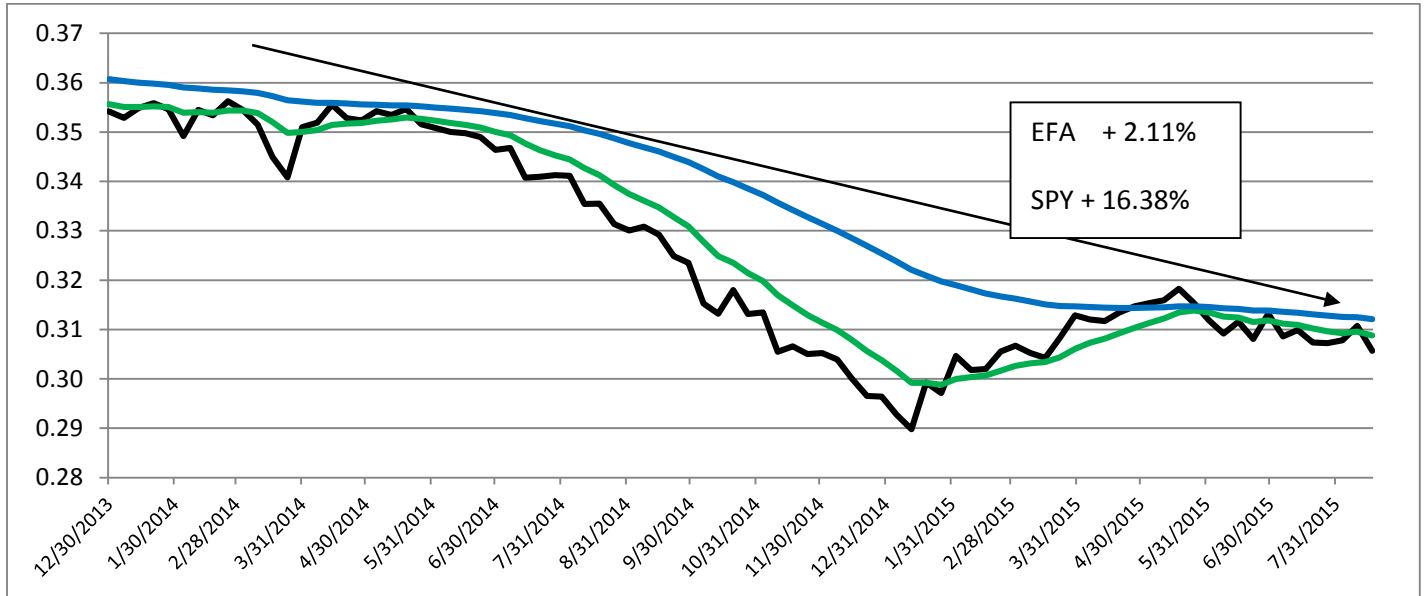
Relative strength investors know the advantages of employing a rank and rotation strategy. Top performing stocks and ETFs are purchased as they move into top rank and sold when they fall out of top rank. These strategies tend to work best in trending markets yet can encounter difficulties in a regime change to non trending markets. Parameters tend to be loose which allows high relative strength winners to run, yet may be non responsive to changes (deceleration) in relative performance. Occasionally a security might move into top rank position by rising a little too far too fast, only to decline in a few short weeks following a purchase.

MoRS is simple, practical, and relevant as it provides a **one to one** measure of performance. Additionally MoRS is more precise than many traditional measures of relative strength and can **facilitate the timing of entry and exits**. Lastly MoRS can also facilitate **analysis of a multitude of securities relative to a benchmark index** and can play a critical role in developing targeted approaches to dynamic asset allocation and portfolio construction.

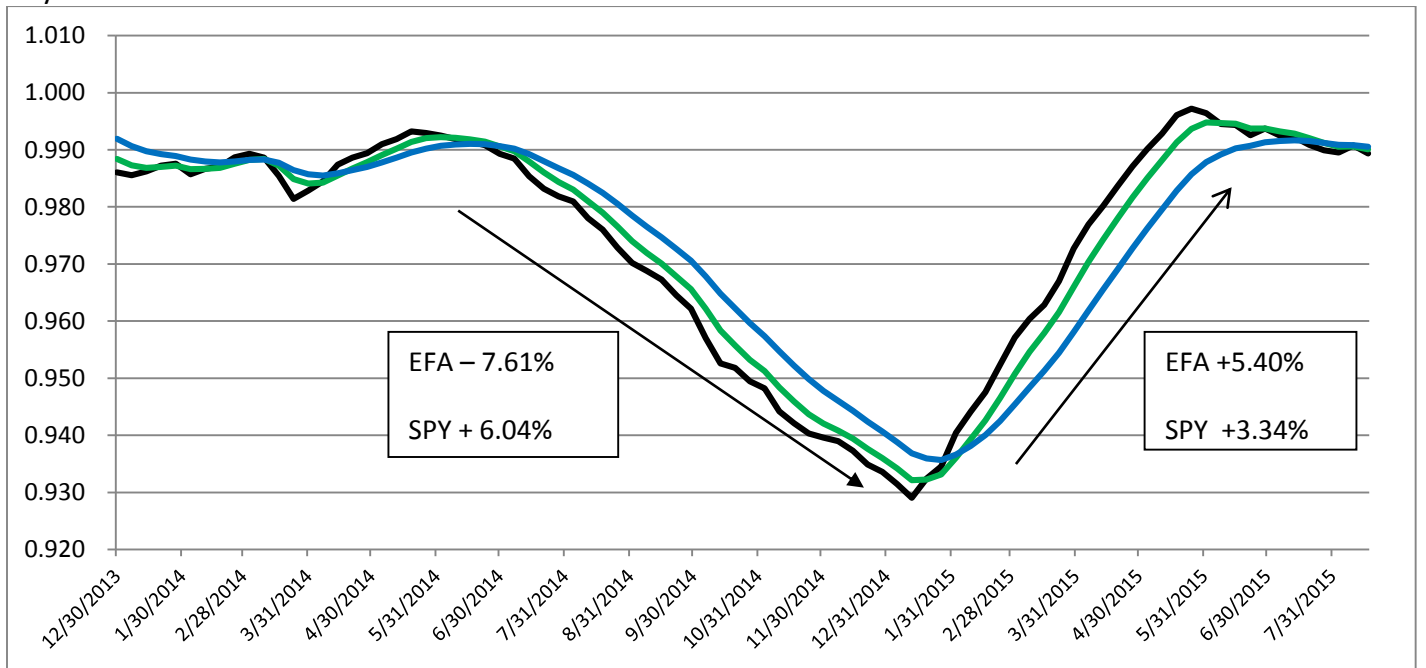
Derivation of MoRS: MACD is a popular indicator that is utilized to measure momentum and trend. Yet analysis of one security does not take place in a vacuum i.e. investors are constantly weighing the relative attractiveness of one security versus a group of securities. MACD ratios, which standardize the distance between moving averages offer the opportunity to assess the relative attractiveness of a group of securities. This process can be made simpler by dividing the MACD ratios of each security by the MACD ratio of an index. Which results in a derivation of MoRS.

Trend of relative strength: EFA vs. SPY

In the example below the weekly price of EFA is divided by SPY. This creates the relative strength ratio line (black). 9 and 39 week exponential moving averages (ema) are utilized as a measure of long term trend of relative strength. By definition when (if) the green moving average crosses above the blue moving average EFA is in a positive or bullish long term relative strength trend condition. Conversely when the green ema crosses below the blue ema EFA is in a negative or bearish long term relative strength trend condition. As you can see EFA has been trading in a bearish condition relative to SPY since the beginning of 2014. If you had been following this signal your allocation to EFA would have signaled you to remove it from your portfolio or reduce from your normal allocation. If employing an asset allocation relative strength switching strategy you would have owned SPY instead of EFA.



The MoRS oscillator of EFA vs. SPY is depicted below as the (black line). This is the result of dividing the green ma by the blue ma from the chart above. Two signal lines are calculated and a signal line crossover determines buy or sell.



Timing of entry and exits (10 S&P Sector ETFs)

Sector performance relative to the S&P 500 tends to exhibit mean reversion characteristics. The back test below utilizing (19 and 39 week MoRS parameters) provides an example of the utility of MoRS in buying lagging sectors that are beginning to lead and selling sectors that are beginning to lag.

Three conditions must be present for the strategy to accept a buy signal:

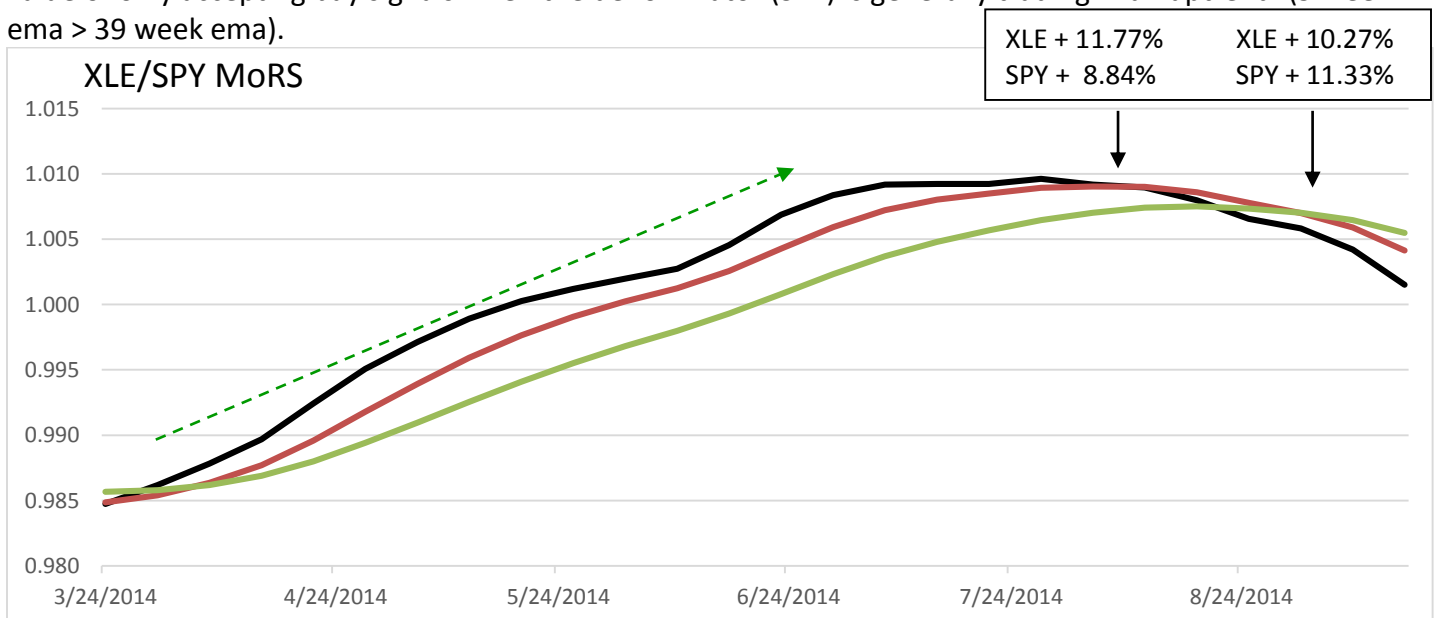
- 1: The 4 week ema signal line crosses above the 9 week ema signal line
- 2: MoRS ratio value is below the 1.0 line. (oversold and out of favor)
- 3: Long term trend of SPY is positive (9 week ema > 39 week ema)

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.

101 trades were generated 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 an average level of underperformance 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%

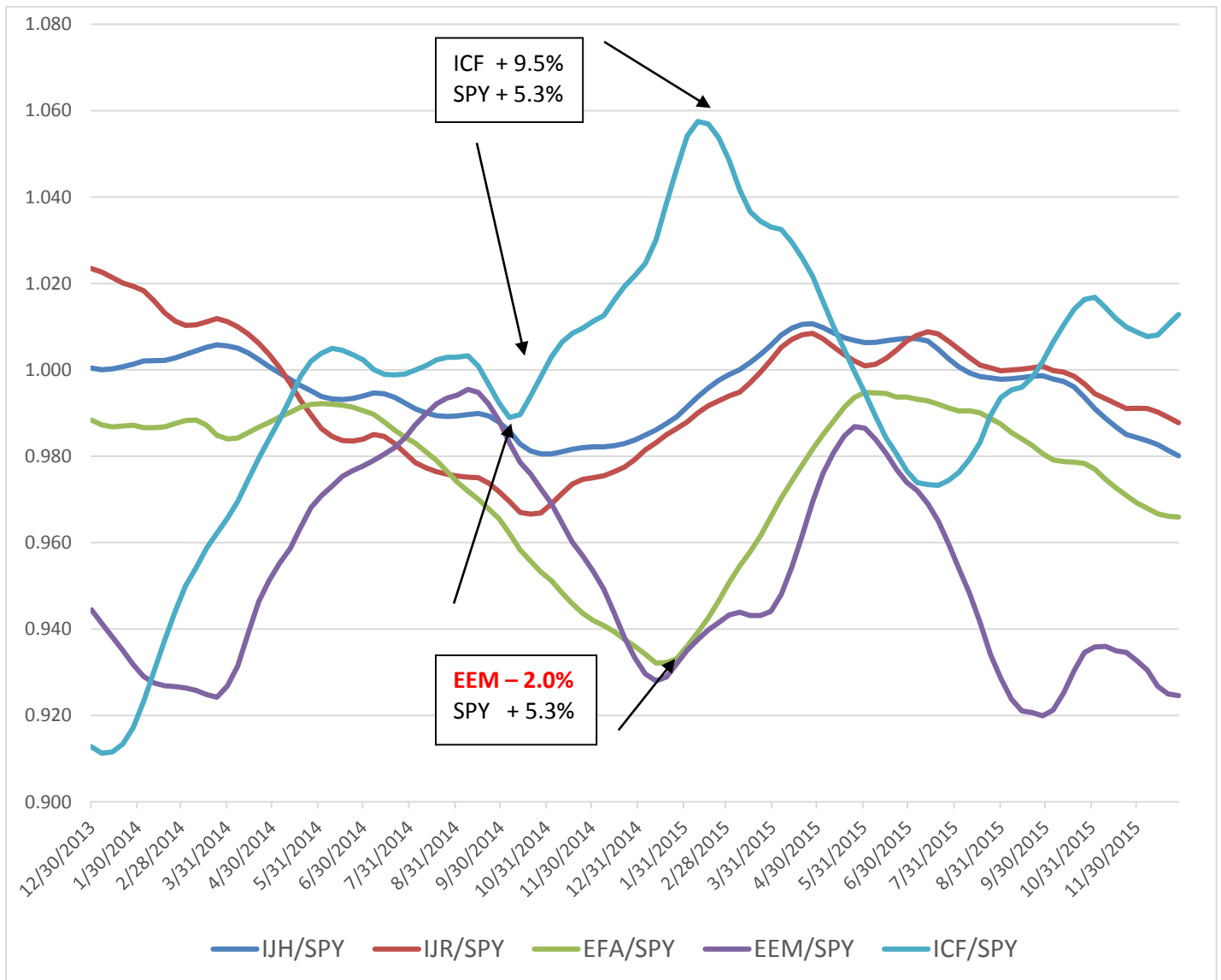
While this limited back test (only 101 occurrences) reveals only a 50% chance that any trade will outperform... the silver lining perhaps is that it produced a profit (absolute return) 65% of the time. This demonstrates the value of only accepting buy signals when the denominator (SPY) is generally trading in an uptrend. (9 week ema > 39 week ema).



Multiple security chart of broad equity ETFs (ETFs relative to SPY, MoRS based on 9 and 39 week emas)

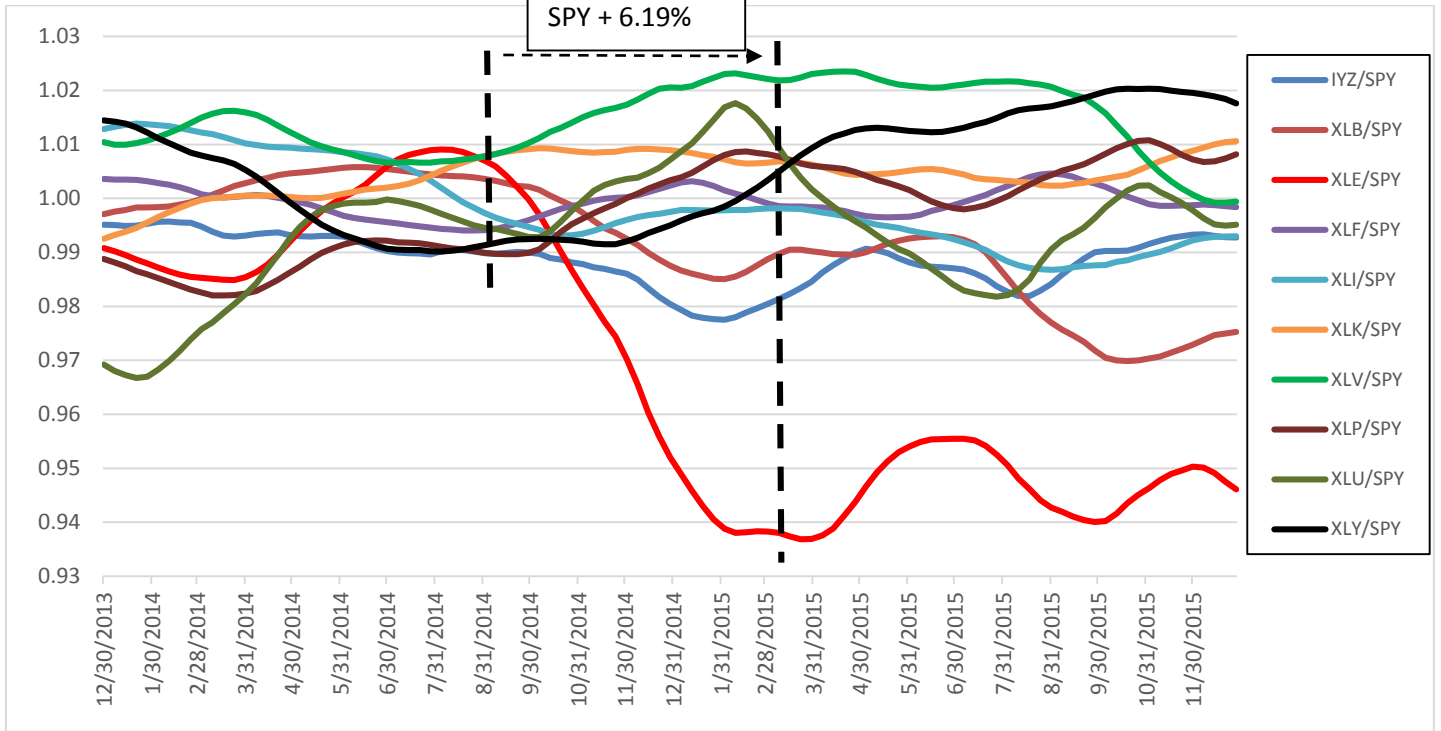
This is a simple chart construct that allows the identification of:

- 1) level of relative strength of each security relative to SPY, (positive long term RS if indicator is above 1.0, negative if below 1.0),
- 2) acceleration/deceleration of RS vs. SPY (rising indicator line = accelerating RS, declining RS line = decelerating RS),
- 3) simultaneous analysis of a multitude of securities based on relative strength vs. SPY AND RS compared to all securities

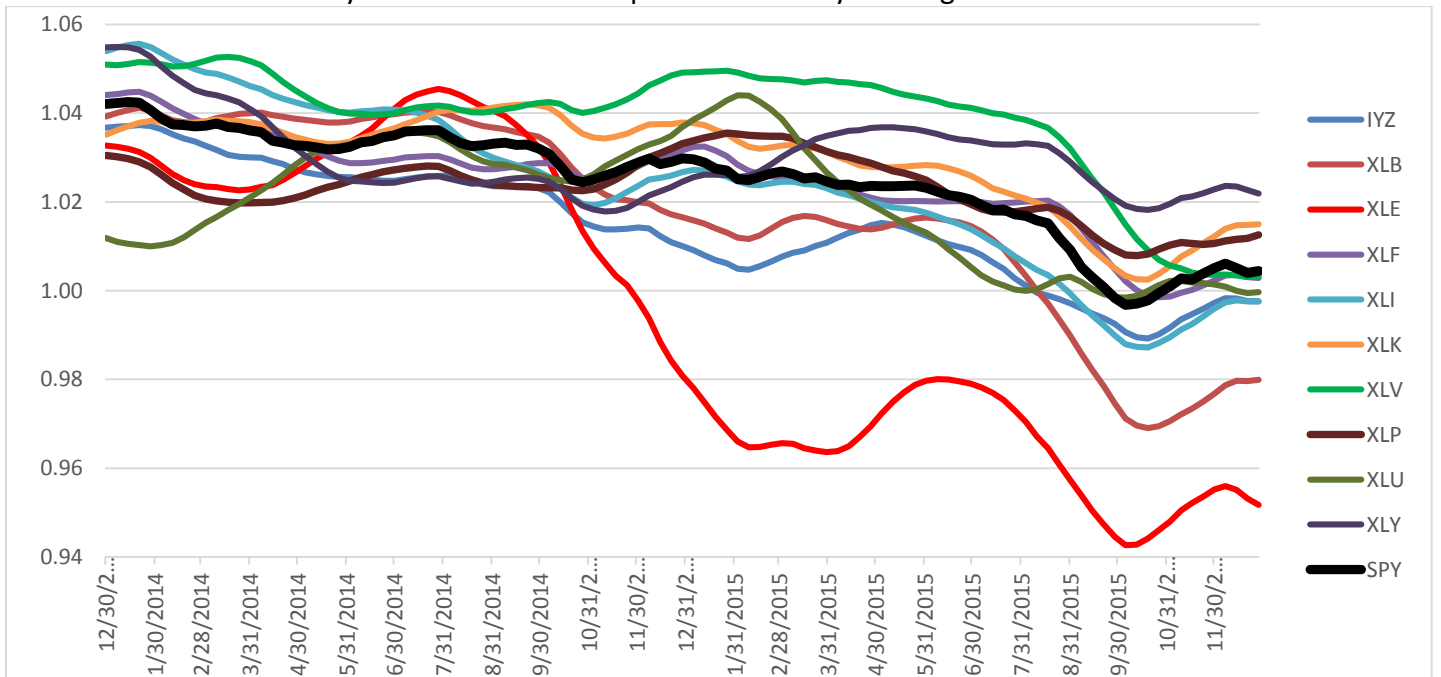


multiple security chart

Sector ETFs



MACD ratios & Derivation of MoRS: while MACD enables analysis of an individual security based on trend and momentum, MACD ratios offer an additional analytical vantage point i.e. they standardize the distance between the two moving averages which enables comparative analysis across a group of securities. Additionally while not readily apparent.. viewing MACD ratios below enables the analysis of the relative strength (attractiveness) of each security relative to SPY. (bold black line) i.e. in the chart below if the MACD ratio of XLV (green) is divided by the MACD ratio of SPY (black) this approximates the MoRS value of XLV in the chart above. And this analysis is cleaner and simpler of course by viewing the MoRS chart above.



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