Timing Indicator Performance and Optimization

Dallas Association for Technical Analysis
Special Interest Group

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December 13&17, 2011
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All set-ups presented are ex post facto, done with hindsight analysis and may be for trades that were not taken by the speaker. Although back testing has been done, future results are not assured. You, and you alone are responsible for all of your trades.
Agenda

Comparison of timing indicators performance

A Methodology for Quantitative Analysis
  ▪ How to test and optimize a timing indicator

Indicator backtesting and optimization
  ▪ Market Direction Timer
  ▪ Intermediate Term Trend Trading Timer
  ▪ Short Term Swing Trading Timers

Or, how I spent my summer backtesting various timing indicators
Why I Look at Mechanical Timing Indicators

Want to know what works and what doesn’t work

Want to know what to expect for gains and drawdowns

Want to take the emotions out of trading (as much as possible)

I’m an engineer - I just can’t help myself 😊
What Are My Objectives

1) Exceed the market for gains in the long term while minimizing drawdowns

2) Trading systems objectives
   - System for long term retirement investments
   - System(s) for shorter term trading for additional income (a work in progress)
   - Needs to be programmable so can backtest to evaluate performance

3) Time management objectives
   - Have full time job so want trading systems that require modest amount of daily work, so need to be programmable to automate timers and equity selection
Some Common Timing Indicators for Comparison

Buy & Hold
Death Cross - 50x200 Moving Average Crossover
8x20 Moving Average Crossover
10x20x30 Moving Average Bowtie
Stochastic+RSI

- The average of Stoch(21,13) with RSI(14)
But First - Calmar Ratio

What is the Calmar Ratio? CR is a very simple metric that relates return to drawdown. Easy to remember:

If CR < 0, your CAR is negative, and you’re losing money. This is a bad system.
If CR ~ 1, Reward to Risk is 1:1. In general, you lose a dollar for every dollar gained, but time frame is important.
If CR = 2, for every dollar lost, you gain 2 dollars. Good system.
If CR = 3, for every dollar lost, you gain 3 dollars. Great system! Practical, winning systems generally have a CR > 1.50

Calmar is metric I use to evaluate the relative performance of different systems
Buy & Hold Over Period of Market Up/Down Trend

SPY (1/1/03 to 4/09): 2.9% Gain, CAGR= 0.5%, Calmar = 0.01

-55.2% drawdown

Drawdowns can be very painful for buy & hold investing
Death Cross (50D-SMA x 200D-SMA):
SPY (1/1/03 to 4/09): 60.5% Gain, CAGR= 7.9%, Calmar = 0.79

Significant improvement in gains and drawdown if get out in downtrends
-9.9% drawdown

SPY B&H for Comparison:
Profit% = 2.9%
CAGR = 0.5%
MDD% = -55.2%
Calmar = 0.01

☐ Significant improvement in gains and drawdown if get out in downtrends
8D x 20D SMA Crossover
SPY (1/1/03 to 4/09): -1.7% Gain, CAGR= -0.3%, Calmar = -0.01

- Whipsaws during pullbacks and bear market rallies which erodes gains
- Filtering out bear market trades may improve performance

-22.0% drawdown

SPY B&H for Comparison:
Profit% = 2.9%
CAGR = 0.5%
MDD% = -55.2%
Calmar = 0.01
Bowtie (10 SMA x 20 EMA x 30 EMA):

SPY (1/1/03 to 4/09): 15.2% Gain, CAGR= 2.3%, Calmar = 0.11

- Whipsaws in choppy markets, but stays in trade when market in strong trend
- Filtering out bear market trades may improve performance
Stochastic+RSI:
SPY (1/1/03 to 4/09): 23.6% Gain, CAGR= 3.5%, Calmar = 0.25

-13.9% drawdown

Fewer whipsaw trades with reduced drawdowns, but overall mediocre gains
Some Conclusions & Next Steps

It surprised me that for the moving average cross over indicators the 50x200 Death Cross had the overall best performance for market period with strong uptrend and downtrend

- Better performance may be achieved by staying in the market when it is trending up even though you have to ride through some of the short term pullbacks
- Market direction filter may be needed with some indicators
- Most of the shorter term timing indicators I backtested in the past have had mediocre performance
  - They were late to get in and late to get out causing gains to be reduced when market had quick pullbacks
  - Suggests a closer look at short term indicators is needed

<table>
<thead>
<tr>
<th>In-Sample 1-03 to 4-09</th>
<th>Ticker</th>
<th>Net Profit%</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;H</td>
<td>SPY</td>
<td>2.9%</td>
<td>100%</td>
<td>0.45%</td>
<td>1</td>
<td>100%</td>
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<td>50x200</td>
<td>SPY</td>
<td>60.5%</td>
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<td>8x20 Cross</td>
<td>SPY</td>
<td>-1.7%</td>
<td>59.4%</td>
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<td>Bowtie</td>
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<tr>
<td>Stoch+RSI</td>
<td>SPY</td>
<td>23.6%</td>
<td>64.8%</td>
<td>3.5%</td>
<td>25</td>
<td>40%</td>
<td>-9.7%</td>
<td>0.25</td>
</tr>
</tbody>
</table>
ADDITIONAL TIMING INDICATOR PERFORMANCE ASSESSMENT

Follow is a summary of a test of intermediate term to short term timing indicators I have found code for on the Internet as well as a couple I put together from various sources.

Mike Douglas in his presentation in November mentioned that most systems don’t work. I have had similar experience, so I thought I would quantify how various indicators performed.
Over half of the timing indicators underperformed Buy & Hold. Surprisingly, the Connors indicators performed well given their low market exposure% (<10%) when used with a single equity.
Many indicators performed poorly even in an uptrend period
Some indicators performed very poorly
The faster the trend following indicator, the poorer it performed

Buy & Hold CAGR = 13.6%
Three indicators performed well in downtrend, but were poor in uptrends
The intermediate term Equity-Bond Relative Strength and AccuTrack indicators were the best performing during the uptrend and downtrend periods
Indicators Ranked By Calmar

SPY Calmar

Uptrend-Downtrend Period (2003-2009)

- Trend Following
  - Equity-Bond RS Indicator
  - 50 x 200 Death Cross
  - AccuTrack
  - Put-Call Ratio (poor in uptrend)
  - 3-Bar Inside Bar
  - Premier Stochastic (poor in downtrend)

- Mean Reversion
  - Connors RSI(4) 25
  - Connors R3
  - Connors %B
Some Conclusions

The fast timing indicators all tended to have mediocre uptrend performance, but very poor downtrend performance

- Of the fast indicators, the exceptions were the Larry Connor’s High Probability ETF Trading indicators which are all mean reversion indicators which buy market weakness and sell on strength.

The intermediate term trend following indicators performed well in uptrend and downtrends

- Note: the Equity-Bond Relative Strength and AccuTrack indicators are designed for switching between equities and bonds, so the gains in downtrend performance are driven by rising bond prices during these periods as money moves out of equities into bonds (more on this next).

- The best performing indicators have built-in filtering of downtrends
- Suggests other indicators may perform better if add downtrend filtering
CAN QUANTITATIVE ANALYSIS HELP TO DEVELOP BETTER PERFORMING TRADING SYSTEMS?
A Methodology for Quantitative Analysis:
Dr. Howard Bandy’s “Quantitative Trading Systems”

Define the objective function
- The performance measure to evaluate the trading system

Decide what to trade and how to trade it

Design the trading system/model

Determine in-sample and out-of-sample periods

Decide what to optimize

Perform walk forward testing
- Verifies if model will work going forward

Dr Bandy makes key point in his book:
All systems eventually fail and you either need to re-optimize, or discard the system and develop a new system
**Objective Function:**
Select single metric for comparison between alternatives being evaluated

<table>
<thead>
<tr>
<th>Performance Statistics</th>
<th>What I Look For</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Gain %</td>
<td>The bigger the gain the better</td>
<td></td>
</tr>
<tr>
<td>Compound Annual Growth Rate %</td>
<td>Looking for CAGR &gt; 12%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Doubles your money in 6 years</td>
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<tr>
<td>Exposure %</td>
<td>Want to be in the market &gt; 50% of the time</td>
<td></td>
</tr>
<tr>
<td>Winning %</td>
<td>Want &gt; 50% winners</td>
<td></td>
</tr>
<tr>
<td>Maximum Trade Drawdown %</td>
<td>Want &lt; 25% Trade DD</td>
<td></td>
</tr>
<tr>
<td>Maximum System Drawdown %</td>
<td>Want &lt; 15% System DD</td>
<td></td>
</tr>
<tr>
<td>Calmar Ratio</td>
<td>CAGR% ÷ MDD%, tells you if system has positive or</td>
<td>My preference</td>
</tr>
<tr>
<td></td>
<td>negative outcome and how strong or weak</td>
<td></td>
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<tr>
<td></td>
<td>Calmar &gt; 1.0, the higher the better</td>
<td></td>
</tr>
<tr>
<td>K-Ratio</td>
<td>Linear regression slope of equity curve ÷ standard</td>
<td>Dr Bandy’s favorite</td>
</tr>
<tr>
<td></td>
<td>error (smoothness) of the equity curve</td>
<td></td>
</tr>
</tbody>
</table>

*I use Calmar for evaluating performance of different timers*
What to Trade

Individual ETFs
- Leading market indexes – US Mrkt/Intl Mrkt/Commodities

Rotation of portfolio of ETFs
- Ranking mechanism to pick the top performers to increase returns

Rotation of portfolio of Stocks from Market Indexes
- Ranking mechanism to pick the top performers to increase returns

Individual stocks
- Fundamentals and ranking for stock selection

- Will only cover timing indicators with individual ETFs in this presentation
- Ranking systems are the next thing I will be working on
How to Trade:
Timing indicators to control trade entry/exit

Intermediate Term Timing Indicators

- Trend following
  - Equity-Bond Relative Strength Indicator
    - A market Ok/Not Ok indicator
  - Accutrack Indicator
    - A general purpose timing indicator for ETF trading and timing of stock rotation systems

Shorter Term Timing Indicators

- Mean Reversion
  - High Probability ETF Trading (Larry Connor)
- Swing Trading
  - Premium Stochastic Oscillator (March2011 TASC article)
  - Three-Bar Inside Bar (Aug2008 TASC article)
Optimization: In-Sample/Out-of-Sample Periods

Evaluates alternatives in-sample and selects the best alternative (backtesting with optimization)

In-Sample
- The time period and data used to evaluate the trading system for optimal performance
- In-sample results have no value in estimating the future performance of the system

Out-of-Sample
- The time period and data immediately following the in-sample period
- Used to evaluate the trading system performance using the optimized parameter values from the in-sample test period

Amibroker’s Walkforward Optimization tool used
- Automatically optimizes performance for the In-Sample and then calculates performance for the Out-of-Sample period
In-Sample, Out-of-Sample Walkforward Optimization

**Walk forward optimization** is a method for determining the best parameters to use for a future time interval based on optimization of the prior time interval

- The trading strategy is optimized with in-sample data for a time window in a data series
- The remainder of the data are reserved for out-of-sample testing to validate the optimized parameters
- The in-sample time window is shifted forward by the period of time covered by the out-of-sample test, and the process repeated
- At the end, all of the recorded results are used to assess the trading strategy
In-Sample/Out-of-Sample Period

How long should the in-sample and out-of-sample periods be?

- A long time period for in-sample
  - Pro: covers many different market conditions
  - Con: Cannot accurately model everything

- A short time period for out-of-sample
  - Pro: Stays in sync with current market conditions
  - Con: System can end up learning to react to the market “noise”

- So, what to do?
  - Desirable to pick as short of timeframe as possible for in-sample to stays in sync with changing market conditions

- I picked period of uptrend followed by downtrend for In-Sample (1-1-03 to 4-1-09) which is followed by a similar period (4-1-09 to 11-1-11) for the Out-of-Sample
- All optimizations run in the In-Sample and then verified in the Out-of-Sample
- I also tried shorter duration walkforward optimization, but with mixed results - more work needed
Technical Analysis Software for Backtesting and Optimization

Trade Station, Ninja Trader, Weathlab, OmniTrader, .......

Amibroker is tool I use:

- Inexpensive - $300 for Pro/Real-time version
- Has Charts, Backtester, Optimizer and Walkforward Optimizer
- Free EOD data from Yahoo (adjusted for dividends and splits)
- Other EOD and real-time data feed services supported
- Backtests individual equities and portfolios of equities
- Has a large library of specialized functions for writing trading models as well as large library of pre-written models from the user community
- Technical Analysis of Stocks & Commodities Magazine has large library of timing indicator models with the code for Amibroker, Trade Station, etc. that is a good jumping off point to get started
- It does require learning some programming in C/C++
Equity-Bond Relative Strength Indicator

Simple indicator to compare the relative performance of a market index versus bond fund to determine market direction

- Used in High Growth Stock Investor (HGSI) chart tool as a market direction indicator

Want to identify when market transitions from “risk-off” to “risk-on”

- Risk-on money flows out of bonds and into small cap stocks
- For small cap index use Russell 2000 (IWM)
- For intermediate term bond fund use iShares Barclays 7-10 Year Treasury (IEF)
  - Started in July 2002, but if you need history further back you could use T. Rowe Price US Treasury Intermediate (PRTIX); however, PRTIX tends to lag the performance of IEF so it is preferable to use IEF whenever possible

- Equity-Bond RS Indicator = Price (Equity) / Price (Bonds)
  - Indicator rises when equity price rising (money flowing out of bonds into stocks) or falls when bond price rising (money following out of stocks into bonds)
  - Need to have a relative reference to see transition of risk-on/risk-off
    - HGSI uses a 34-day SMA of the indicator for reference to the raw indicator
  - The raw indicator has lots of whipsaws, so initially I added a 8-day SMA of the indicator and set buy/sell triggers when the 8-day SMA crossed the 34-day SMA
Equity-Bond RS Indicator

Added 8-day SMA to smooth out whipsaws and use moving average crossover to indicate changes in market direction.
Equity-Bond RS Default Settings Performance

IWM/cash with MA=8/34: Profit% = 10.7%, CAGR = 1.6%, Calmar = 0.06
IWM/IEF with MA=8/34: Profit% = 37.4%, CAGR = 5.2%, Calmar = 0.28

Buy IEF instead of going to cash when indicator shows sell

IWM B&H for Comparison:
Profit% = 19.9%
CAGR = 2.9%
MDD% = -58.9%
Calmar = 0.05

IS period 1-03 to 4-09 with 8/34 MA setting

-18.5% drawdown with 8/34 MA setting

2x improvement in total profit vs B&H with 70% less drawdown
Equity-Bond RS Indicator 3D Optimization Heat Map

In-Sample period 1/03 to 4/09 yields optimized values of 18/26
Default values of 8/34 lie at the edge of a peak indicating potential instability

IWM/IEF In-Sample with MA=8/34:
Profit % = 37.4%
CAGR = 5.2%
MDD% = -18.5%
Calmar= 0.28
Win% = 43.1%

IWM/IEF In-Sample with MA=18/26:
Profit % = 122.5%
CAGR = 13.7%
MDD% = -18.5%
Calmar= 0.74
Win% = 59.5%

In-Sample period 1/03 to 4/09 yields optimized values of 18/26
Default values of 8/34 lie at the edge of a peak indicating potential instability
Equity-Bond RS - OOS Period 4/09 to 11/11
IWM/cash with MA=18/26: Profit% = 57.5%, CAGR = 19.2%, Calmar = 1.46
IWM/IEF with MA=18/26: Profit% = 71.7%, CAGR = 23.2%, Calmar = 1.74

Optimization across up/down trend increases performance the over default values and decrease drawdown by 50% over B&H
### Equity-Bond RS Performance Examples

**Equity/IEF from 3-1-09 to 11-1-11**

<table>
<thead>
<tr>
<th>Equity</th>
<th>Ticker</th>
<th>Parameter Setting</th>
<th>Net Profit %</th>
<th>CAGR</th>
<th>Number Trades</th>
<th>Win %</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P500</td>
<td>SPY</td>
<td>18/26</td>
<td>49.7%</td>
<td>16.3%</td>
<td>17</td>
<td>52.9%</td>
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<td>1.50</td>
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<tr>
<td>NASDAQ100</td>
<td>QQQ</td>
<td>18/26</td>
<td>49.6%</td>
<td>16.3%</td>
<td>17</td>
<td>47.1%</td>
<td>-15.9%</td>
<td>1.03</td>
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<tr>
<td>S&amp;P400</td>
<td>IJH</td>
<td>18/26</td>
<td>51.3%</td>
<td>16.8%</td>
<td>21</td>
<td>47.6%</td>
<td>-12.4%</td>
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<td>Russell 2000</td>
<td>IWM</td>
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<td>71.7%</td>
<td>22.5%</td>
<td>19</td>
<td>57.9%</td>
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<td>REIT</td>
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<td>21</td>
<td>47.6%</td>
<td>-15.9%</td>
<td>1.09</td>
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<td>Semi-conductor</td>
<td>SMH</td>
<td>18/26</td>
<td>70.2%</td>
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<td>52.6%</td>
<td>-17.3%</td>
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<td>Emerging Mrkt</td>
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<td>21</td>
<td>61.9%</td>
<td>-7.3%</td>
<td>2.46</td>
</tr>
</tbody>
</table>

*Equity-Bond RS does better as a broad Market OK/NOT OK timer with IWM than as a general purpose indicator on individual market indexes.*
AccuTrack Indicator

AccuTrack was developed by FastTrack mutual fund tool to identify when to switch between two funds based on relative strength difference

- Have found it works very well when comparing the performance of an equity fund to the 7-10 year Treasury since they tend to move opposite of each other

AccuTrack

- Parameter 1 governs the length of the moving averages used internally in the computation of AccuTrack. Default value is 12.
- Parameter 2 is a smoothing factor. Default value is 48.

Each day's AccuTrack bar is computed as follows:

- Compute a daily change for the fund and the index by the formula:
  \[ \text{Change} = \frac{(\text{Today\_Price} - \text{Yesterday\_Price})}{\text{Yesterday\_Price}} \]
- Exponentially smooth FundChange and IndexChange by Parameter 1 starting from the 1st date in the database
- Subtract the smoothed FundChange and IndexChange computed above
  \[ \text{Diff} = \text{FundChange} - \text{IndexChange} \]
- Exponentially smooth Diff by Parameter 2
- Want to switch between holding the equity and bonds when buy/sell triggers

The two funds need to be highly non correlated

- If the two funds are closely correlated, then results will be similar to moving average crossover
AccuTrack Indicator

- Buy Equity
- Sell Bond

- Sell Equity
- Buy Bond
Accutrack Indicator Default Performance

IWM/cash with MA=12/48: Profit% = 52.6%, CAGR = 7.0%, Calmar = 0.39
IWM/IEF with MA=12/48: Profit% = 97.0%, CAGR = 11.5%, Calmar = 0.60

-19.2% drawdown with 12/48 setting

5x improvement in total profit vs B&H with 70% less drawdown
AccuTrack 3D Optimization Heat Map

IWM/IEF In-Sample with 12/48:
Profit % = 97.0%
CAGR = 11.5%
MDD% = -19.2%
Calmar = 0.60
Win% = 54.8%

IWM/IEF In-Sample with 5/67:
Profit % = 106.6%
CAGR = 12.3%
MDD% = -14.0%
Calmar = 0.88
Win% = 53.5%

- Optimized values of 5/67 lie on sharp peak indicating instability while default values of 12/48 lie in relatively flat plain indicating stability
- Higher returns possible with optimized values, but better long term use with default values
AccuTrack - OOS Period 4/09 to 11/11

IWM/cash with 12/48: Profit% = %, CAGR = %, Calmar =
IWM/IEF with 12/48: Profit% = 67.6%, CAGR = 22.1%, Calmar = 1.24

Didn’t beat B&H for gains, but cut drawdown by 40% and improved Calmar

-17.9% drawdown with 12/48 MA setting
## AccuTrack ETF Performance Examples

**Equity/IEF from 3-1-09 to 11-1-11**

<table>
<thead>
<tr>
<th>Equity</th>
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<tbody>
<tr>
<td>S&amp;P500</td>
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<td>12/48</td>
<td>75.6%</td>
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<tr>
<td>REIT</td>
<td>IYR</td>
<td>12/48</td>
<td>55.7%</td>
<td>18.1%</td>
<td>15</td>
<td>40.0%</td>
<td>-20.2%</td>
<td>0.89</td>
</tr>
<tr>
<td>Financial</td>
<td>XLF</td>
<td>12/48</td>
<td>89.5%</td>
<td>27.1%</td>
<td>15</td>
<td>53.3%</td>
<td>-15.9%</td>
<td>1.70</td>
</tr>
<tr>
<td>Semiconductor</td>
<td>SMH</td>
<td>12/48</td>
<td>78.2%</td>
<td>24.2%</td>
<td>19</td>
<td>52.6%</td>
<td>-15.7%</td>
<td>1.54</td>
</tr>
<tr>
<td>Emerging Mrkt</td>
<td>EEM</td>
<td>12/48</td>
<td>69.3%</td>
<td>21.8%</td>
<td>15</td>
<td>46.7%</td>
<td>-13.8%</td>
<td>1.58</td>
</tr>
<tr>
<td>Energy</td>
<td>XLE</td>
<td>12/48</td>
<td>33.5%</td>
<td>11.4%</td>
<td>19</td>
<td>42.1%</td>
<td>-15.7%</td>
<td>0.73</td>
</tr>
<tr>
<td>Gold</td>
<td>GLD</td>
<td>12/48</td>
<td>31.9%</td>
<td>10.9%</td>
<td>22</td>
<td>45.5%</td>
<td>-17.8%</td>
<td>0.61</td>
</tr>
<tr>
<td>Silver</td>
<td>SLV</td>
<td>12/48</td>
<td>121.7%</td>
<td>34.8%</td>
<td>13</td>
<td>61.5%</td>
<td>-31.9%</td>
<td>1.09</td>
</tr>
<tr>
<td>Junk Bonds</td>
<td>JNK</td>
<td>12/48</td>
<td>66.1%</td>
<td>21.0%</td>
<td>11</td>
<td>45.5%</td>
<td>-6.9%</td>
<td>3.06</td>
</tr>
</tbody>
</table>

Good general purpose intermediate term trend trading indicator when IEF used as cash alternative.
High Probability ETF Trading (Larry Connors)

RSI 25
- Buy when RSI(4) < 25, Sell when RSI(4) > 55

R3
- Buy when RSI(2) drops 3 days in a row, Sell when RSI(2) > 70

%B
- Bollinger Band % - price with respect to the Bollinger Band upper/lower range
- Buy when %B < 0.2 for 3 days in a row, Sell when %B > 0.8

TSP (Time, Price, Scale-in) - didn’t test well with SPY
- Buy when RSI(2) < 25 for 2 days in a row - 10% position
- Average down 20%, 30%, 40% if down subsequent days (catch that falling knife)
- Sell when RSI(2) > 70

RSI10/6 - didn’t test well with SPY
- Buy when RSI(2) < 10, buy 2nd unit if RSI(2) < 6, Sell when P > 5-day SMA
- Buying 2nd unit not in the code for the following test results

There are couple of others that I didn’t have time to code and test

- Price has to be above 200-day SMA to enter any trades
- Can be applied to long and inverse ETFs
- Following tests long and inverse ETFs for comparison
Portfolios of ETFs to Trade with Connors Strategies

Connors’ ETFs from his book “High Probability ETF Trading”

- 20 ETFs covering the major US and International markets, countries and US sectors

Selection of ETFs from current pool of 1317 ETFs

- Some ETFs trade only a few thousand shares a day which can lead to wider than expected bid/ask prices
- Liquidity can be created on the fly by market makers, but it makes me a bit nervous to trade something that has no trades at times on 1-min chart
- Filtered the pool for only ETFs with volume greater than average of 50K shares per day over 3 month timeframe; if filter at 100K shares it would eliminate large portion of the inverse ETFs
- Created watchlists
  - 1x Bull-Bear: 203 ETFs total, 193 Bull, 10 Bear
  - 2x Bull-Bear: 43 ETFs total, 21 Bull, 22 Bear
  - 3x Bull-Bear: 28 ETFs total, 15 Bull, 13 Bear
  - 1x Income/Bond Bull: 42 ETFs total
  - 80 Most Liquid ETFs from Howard Bandy’s book “Modeling Trading System Performance”

Ranked the ETFs using lowest RSI to select the ETFs which have been beaten down the most and should bounce the most
### Connors RSI(4) 25: In-Sample 1/03 to 4/09

(Inverse and Leveraged ETFs not available until 2006, 3x not until 2009-10)

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/ Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connors’ ETFs</td>
<td>10/10</td>
<td>65.6%</td>
<td>19.6%</td>
<td>8.4%</td>
<td>516</td>
<td>77.1%</td>
<td>-23.0%</td>
<td>-9.6%</td>
<td>0.87</td>
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<tr>
<td>1x Bull-Bear</td>
<td>10/10</td>
<td>94.0%</td>
<td>40.5%</td>
<td>11.2%</td>
<td>1004</td>
<td>71.5%</td>
<td>-53.3%</td>
<td>-15.4%</td>
<td>0.73</td>
</tr>
<tr>
<td>1x Bull</td>
<td>10/10</td>
<td>83.1%</td>
<td>38.8%</td>
<td>10.2%</td>
<td>958</td>
<td>71.2%</td>
<td>-53.3%</td>
<td>-15.0%</td>
<td>0.68</td>
</tr>
<tr>
<td>1x Bear</td>
<td>10/10</td>
<td>6.3%</td>
<td>4.4%</td>
<td>2.2%</td>
<td>56</td>
<td>73.2%</td>
<td>-14.7%</td>
<td>-6.9%</td>
<td>0.32</td>
</tr>
<tr>
<td>2x Bull-Bear</td>
<td>10/10</td>
<td>23.4%</td>
<td>8.1%</td>
<td>7.9%</td>
<td>93</td>
<td>77.4%</td>
<td>-41.3%</td>
<td>-21.0%</td>
<td>0.37</td>
</tr>
<tr>
<td>2x Bull</td>
<td>10/10</td>
<td>0.3%</td>
<td>2.6%</td>
<td>0.1%</td>
<td>27</td>
<td>70.4%</td>
<td>-25.5%</td>
<td>-4.7%</td>
<td>0.02</td>
</tr>
<tr>
<td>2x Bear</td>
<td>10/10</td>
<td>23.1%</td>
<td>5.6%</td>
<td>7.9%</td>
<td>66</td>
<td>80.3%</td>
<td>-41.3%</td>
<td>-21.0%</td>
<td>0.38</td>
</tr>
<tr>
<td>3x Bull-Bear</td>
<td>10/10</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>3x Bull</td>
<td>10/10</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>3x Bear</td>
<td>10/10</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>1x Income Bull</td>
<td>10/10</td>
<td>-0.7%</td>
<td>11.5%</td>
<td>-0.1%</td>
<td>247</td>
<td>56.3%</td>
<td>-10.8%</td>
<td>-3.5%</td>
<td>-0.03</td>
</tr>
<tr>
<td>80 Most Liquid</td>
<td>10/10</td>
<td>95.6%</td>
<td>36.49%</td>
<td>11.3%</td>
<td>904</td>
<td>71.8%</td>
<td>-53.3%</td>
<td>-11.9%</td>
<td>0.95</td>
</tr>
</tbody>
</table>

*In-Sample covers the interval Connors used for developing the indicators, so good results are expected (curve fitted)*
## Connors RSI(4) 25: Out-of-Sample 4/09 to 11/11

No Optimization

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connors’ ETFs</td>
<td>10/10</td>
<td>16.3%</td>
<td>24.4%</td>
<td>6.0%</td>
<td>263</td>
<td>71.1%</td>
<td>-20.1%</td>
<td>-13.4%</td>
<td>0.45</td>
</tr>
<tr>
<td>1x Bull-Bear</td>
<td>10/10</td>
<td>23.6%</td>
<td>54.6%</td>
<td>8.5%</td>
<td>507</td>
<td>63.9%</td>
<td>-27.6%</td>
<td>-17.2%</td>
<td>0.50</td>
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<tr>
<td>1x Bull</td>
<td>10/10</td>
<td>19.9%</td>
<td>52.2%</td>
<td>7.3%</td>
<td>488</td>
<td>63.7%</td>
<td>-27.6%</td>
<td>-17.1%</td>
<td>0.43</td>
</tr>
<tr>
<td>1x Bear</td>
<td>10/10</td>
<td>3.8%</td>
<td>2.7%</td>
<td>1.4%</td>
<td>22</td>
<td>68.2%</td>
<td>-10.7%</td>
<td>-6.0%</td>
<td>0.24</td>
</tr>
<tr>
<td>2x Bull-Bear</td>
<td>10/10</td>
<td>54.1%</td>
<td>25.0%</td>
<td>18.2%</td>
<td>257</td>
<td>71.6%</td>
<td>-39.1%</td>
<td>-24.8%</td>
<td>0.73</td>
</tr>
<tr>
<td>2x Bull</td>
<td>10/10</td>
<td>39.5%</td>
<td>20.1%</td>
<td>13.7%</td>
<td>213</td>
<td>71.4%</td>
<td>-39.1%</td>
<td>-24.8%</td>
<td>0.55</td>
</tr>
<tr>
<td>2x Bear</td>
<td>10/10</td>
<td>10.3%</td>
<td>5.2%</td>
<td>3.9%</td>
<td>45</td>
<td>73.3%</td>
<td>-23.9%</td>
<td>-9.1%</td>
<td>0.43</td>
</tr>
<tr>
<td>3x Bull-Bear</td>
<td>10/10</td>
<td>23.1%</td>
<td>13.5%</td>
<td>8.4%</td>
<td>147</td>
<td>66.7%</td>
<td>-49.5%</td>
<td>-26.4%</td>
<td>0.32</td>
</tr>
<tr>
<td>3x Bull</td>
<td>10/10</td>
<td>24.0%</td>
<td>12.1%</td>
<td>8.7%</td>
<td>136</td>
<td>68.4%</td>
<td>-49.5%</td>
<td>-26.4%</td>
<td>0.33</td>
</tr>
<tr>
<td>3x Bear</td>
<td>10/10</td>
<td>-0.8%</td>
<td>1.4%</td>
<td>-0.3%</td>
<td>11</td>
<td>45.5%</td>
<td>-33.0%</td>
<td>-13.4%</td>
<td>-0.02</td>
</tr>
<tr>
<td>1x Income Bull</td>
<td>10/10</td>
<td>3.1%</td>
<td>34.7%</td>
<td>1.2%</td>
<td>371</td>
<td>54.5%</td>
<td>-11.6%</td>
<td>-4.5%</td>
<td>0.27</td>
</tr>
<tr>
<td>80 Most Liquid</td>
<td>10/10</td>
<td>28.0%</td>
<td>42.9%</td>
<td>10.0%</td>
<td>448</td>
<td>66.5%</td>
<td>-49.5%</td>
<td>-23.1%</td>
<td>0.43</td>
</tr>
</tbody>
</table>

- **2x Bull-Bear group of ETFs best performing with roughly 2x the gains with only 1.5x increase in system drawdown resulting in higher Calmar ratio**
- **A lot of the 3x ETFs not available until 2010 so results skewed some**
### Connors RSI(4) 25: Out-of-Sample 4/09 to 11/11

Optimized for Number Positions Held and Worst Rank Held

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/ Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connors’ ETFs</td>
<td>3/3</td>
<td>22.5%</td>
<td>33.6%</td>
<td>8.2%</td>
<td>107</td>
<td>72.9%</td>
<td>-18.6%</td>
<td>-13.7%</td>
<td>0.6</td>
</tr>
<tr>
<td>1x Bull-Bear</td>
<td>5/5</td>
<td>37.5%</td>
<td>62.7%</td>
<td>13.1%</td>
<td>285</td>
<td>64.9%</td>
<td>-27.6%</td>
<td>-16.1%</td>
<td>0.82</td>
</tr>
<tr>
<td>2x Bull-Bear</td>
<td>3/3</td>
<td>97.9%</td>
<td>38.2%</td>
<td>30.2%</td>
<td>114</td>
<td>74.6%</td>
<td>-34.5%</td>
<td>-29.9%</td>
<td>1.01</td>
</tr>
<tr>
<td>3x Bull-Bear</td>
<td>1/1*</td>
<td>1.4%</td>
<td>13.5%</td>
<td>0.6%</td>
<td>147</td>
<td>64.0%</td>
<td>-50.3%</td>
<td>-27.9%</td>
<td>0.02</td>
</tr>
<tr>
<td>3x Bull-Bear</td>
<td>3/3</td>
<td>12.4%</td>
<td>24.2%</td>
<td>4.6%</td>
<td>71</td>
<td>60.6%</td>
<td>-47.9%</td>
<td>-42.8%</td>
<td>0.11</td>
</tr>
<tr>
<td>80 Most Liquid 1x/2x/3x</td>
<td>3/3</td>
<td>16.3%</td>
<td>55.5%</td>
<td>6.0%</td>
<td>171</td>
<td>66.7%</td>
<td>-49.4%</td>
<td>-32.8%</td>
<td>0.18</td>
</tr>
</tbody>
</table>

- **2x Bull-Bear** 81% increase in gains with only 21% increase in drawdown over non-optimized results. 38% improvement in Calmar.
- **Optimization run for In-Sample period 1/1/03 to 4/1/09**
- **3x ETFs not available in IS period, so used settings from the 2x ETF optimizations - very poor results**
### Connors R3: Out-of-Sample 4/09 to 11/11

No Optimizations

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/ Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connors’ ETFs</td>
<td>10/10</td>
<td>15.1%</td>
<td>17.2%</td>
<td>5.6%</td>
<td>247</td>
<td>72.1%</td>
<td>-18.7%</td>
<td>-13.9%</td>
<td>0.40</td>
</tr>
<tr>
<td>1x Bull-Bear</td>
<td>10/10</td>
<td>21.1%</td>
<td>46.8%</td>
<td>7.7%</td>
<td>603</td>
<td>62.9%</td>
<td>-22.8%</td>
<td>-16.5%</td>
<td>0.47</td>
</tr>
<tr>
<td>1x Bull</td>
<td>10/10</td>
<td>15.1%</td>
<td>45.4%</td>
<td>5.6%</td>
<td>582</td>
<td>62.4%</td>
<td>-22.8%</td>
<td>-16.5%</td>
<td>0.34</td>
</tr>
<tr>
<td>1x Bear</td>
<td>10/10</td>
<td>6.0%</td>
<td>1.6%</td>
<td>2.3%</td>
<td>24</td>
<td>79.2%</td>
<td>-9.7%</td>
<td>-2.3%</td>
<td>0.98</td>
</tr>
<tr>
<td>2x Bull-Bear</td>
<td>10/10</td>
<td>65.3%</td>
<td>18.2%</td>
<td>21.5%</td>
<td>257</td>
<td>75.5%</td>
<td>-39.1%</td>
<td>-18.7%</td>
<td>1.15</td>
</tr>
<tr>
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<td>10/10</td>
<td>45.6%</td>
<td>14.3%</td>
<td>15.6%</td>
<td>210</td>
<td>75.2%</td>
<td>-39.1%</td>
<td>-19.0%</td>
<td>0.82</td>
</tr>
<tr>
<td>2x Bear</td>
<td>10/10</td>
<td>11.9%</td>
<td>4.2%</td>
<td>4.5%</td>
<td>48</td>
<td>75.0%</td>
<td>-25.7%</td>
<td>-8.2%</td>
<td>0.54</td>
</tr>
<tr>
<td>3x Bull-Bear</td>
<td>10/10</td>
<td>18.2%</td>
<td>9.2%</td>
<td>6.7%</td>
<td>134</td>
<td>64.9%</td>
<td>-49.2%</td>
<td>-24.1%</td>
<td>0.28</td>
</tr>
<tr>
<td>3x Bull</td>
<td>10/10</td>
<td>21.2%</td>
<td>8.3%</td>
<td>7.7%</td>
<td>125</td>
<td>65.6%</td>
<td>-49.2%</td>
<td>-24.1%</td>
<td>0.32</td>
</tr>
<tr>
<td>3x Bear</td>
<td>10/10</td>
<td>-2.5%</td>
<td>1.0%</td>
<td>-1.0%</td>
<td>9</td>
<td>55.6%</td>
<td>-34.4%</td>
<td>-8.1%</td>
<td>-0.12</td>
</tr>
<tr>
<td>1x Income Bull</td>
<td>10/10</td>
<td>-2.4%</td>
<td>26.9%</td>
<td>-0.9%</td>
<td>350</td>
<td>47.4%</td>
<td>-11.6%</td>
<td>-4.2%</td>
<td>-0.22</td>
</tr>
<tr>
<td>80 Most Liquid</td>
<td>10/10</td>
<td>32.9%</td>
<td>34.4%</td>
<td>11.6%</td>
<td>480</td>
<td>66.7%</td>
<td>-39.1%</td>
<td>-18.3%</td>
<td>0.64</td>
</tr>
</tbody>
</table>

- 2x Bull-Bear group 18% larger gains and 25% lower drawdown than RSI(4) 25 Strategy
Connors R3: Out-of-Sample 4/09 to 11/11
Optimized for Number Positions Held and Worst Rank Held

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
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<td>19.6%</td>
<td>25.5%</td>
<td>7.2%</td>
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<td>72.7%</td>
<td>-18.6%</td>
<td>-17.2%</td>
<td>0.42</td>
</tr>
<tr>
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<td>5/5</td>
<td>39.5%</td>
<td>55.0%</td>
<td>13.7%</td>
<td>361</td>
<td>64.8%</td>
<td>-22.8%</td>
<td>-15.4%</td>
<td>0.89</td>
</tr>
<tr>
<td>2x Bull-Bear</td>
<td>5/5</td>
<td>94.9%</td>
<td>25.3%</td>
<td>29.4%</td>
<td>178</td>
<td>77.5%</td>
<td>-39.0%</td>
<td>-27.1%</td>
<td>1.09</td>
</tr>
<tr>
<td>3x Bull-Bear</td>
<td>5/5</td>
<td>22.8%</td>
<td>13.4%</td>
<td>8.3%</td>
<td>94</td>
<td>63.8%</td>
<td>-48.0%</td>
<td>-35.8%</td>
<td>0.23</td>
</tr>
<tr>
<td>80 Most Liquid 1x/2x/3x</td>
<td>3/3</td>
<td>29.3%</td>
<td>49.4%</td>
<td>10.5%</td>
<td>199</td>
<td>68.3%</td>
<td>-39.0%</td>
<td>-29.0%</td>
<td>0.36</td>
</tr>
</tbody>
</table>

- 45% increase in gains and drawdown - slightly lower Calmar than non optimized results
- Optimization run for In-Sample period 1/1/03 to 4/1/09
- 3x ETFs not available in IS period, so used the settings from the 2x ETF optimizations - very poor results
# Connors %B: Out-of-Sample 4/09 to 11/11

## No Optimizations

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/ Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connors’ ETFs</td>
<td>10/10</td>
<td>30.0%</td>
<td>27.5%</td>
<td>10.7%</td>
<td>107</td>
<td>83.2%</td>
<td>-19.8%</td>
<td>-9.9%</td>
<td>1.08</td>
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<tr>
<td>1x Bull-Bear</td>
<td>10/10</td>
<td>47.2%</td>
<td>57.2%</td>
<td>16.1%</td>
<td>203</td>
<td>71.9%</td>
<td>-21.7%</td>
<td>-15.5%</td>
<td>1.04</td>
</tr>
<tr>
<td>1x Bull</td>
<td>10/10</td>
<td>43.4%</td>
<td>56.4%</td>
<td>15.0%</td>
<td>200</td>
<td>72.5%</td>
<td>-21.7%</td>
<td>-15.5%</td>
<td>0.97</td>
</tr>
<tr>
<td>1x Bear</td>
<td>10/10</td>
<td>2.0%</td>
<td>2.4%</td>
<td>0.8%</td>
<td>10</td>
<td>30.0%</td>
<td>-14.2%</td>
<td>-5.7%</td>
<td>0.13</td>
</tr>
<tr>
<td>2x Bull-Bear</td>
<td>10/10</td>
<td>49.2%</td>
<td>30.8%</td>
<td>16.7%</td>
<td>104</td>
<td>69.2%</td>
<td>-41.9%</td>
<td>-17.1%</td>
<td>0.98</td>
</tr>
<tr>
<td>2x Bull</td>
<td>10/10</td>
<td>48.3%</td>
<td>24.0%</td>
<td>16.4%</td>
<td>84</td>
<td>78.6%</td>
<td>-41.9%</td>
<td>-17.1%</td>
<td>0.96</td>
</tr>
<tr>
<td>2x Bear</td>
<td>10/10</td>
<td>-0.7%</td>
<td>7.1%</td>
<td>-0.3%</td>
<td>22</td>
<td>27.3%</td>
<td>-31.8%</td>
<td>-14.4%</td>
<td>-0.02</td>
</tr>
<tr>
<td>3x Bull-Bear</td>
<td>10/10</td>
<td>29.1%</td>
<td>18.5%</td>
<td>10.4%</td>
<td>60</td>
<td>61.7%</td>
<td>-46.4%</td>
<td>-23.4%</td>
<td>0.44</td>
</tr>
<tr>
<td>3x Bull</td>
<td>10/10</td>
<td>27.2%</td>
<td>17.4%</td>
<td>9.8%</td>
<td>55</td>
<td>63.6%</td>
<td>-46.4%</td>
<td>-23.4%</td>
<td>0.42</td>
</tr>
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<td>10/10</td>
<td>1.4%</td>
<td>1.1%</td>
<td>0.6%</td>
<td>5</td>
<td>40.0%</td>
<td>-35.8%</td>
<td>-9.7%</td>
<td>0.06</td>
</tr>
<tr>
<td>1x Income Bull</td>
<td>10/10</td>
<td>1.9%</td>
<td>40.4%</td>
<td>0.7%</td>
<td>138</td>
<td>71.0%</td>
<td>-22.1%</td>
<td>-7.6%</td>
<td>0.09</td>
</tr>
<tr>
<td>80 Most Liquid</td>
<td>10/10</td>
<td>46.1%</td>
<td>50.2%</td>
<td>15.8%</td>
<td>178</td>
<td>74.2%</td>
<td>-41.9%</td>
<td>-17.3%</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Best of the Connors’s strategies without any optimizations
### Connors %B: Out-of-Sample 4/09 to 11/11
Optimized for Number Positions Held and Worst Rank Held

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connors’ ETFs</td>
<td>16/16</td>
<td>19.3%</td>
<td>20.8%</td>
<td>7.1%</td>
<td>126</td>
<td>78.6%</td>
<td>-20.1%</td>
<td>-8.2%</td>
<td>0.86</td>
</tr>
<tr>
<td>1x Bull-Bear</td>
<td>3/3</td>
<td>50.5%</td>
<td>65.9%</td>
<td>17.1%</td>
<td>67</td>
<td>76.1%</td>
<td>-21.5%</td>
<td>-20.3%</td>
<td>0.84</td>
</tr>
<tr>
<td>2x Bull-Bear</td>
<td>7/7</td>
<td>60.6%</td>
<td>35.5%</td>
<td>20.1%</td>
<td>84</td>
<td>70.2%</td>
<td>-41.8%</td>
<td>-21.1%</td>
<td>0.95</td>
</tr>
<tr>
<td>80 Most Liquid 1x/2x/3x</td>
<td>3/3</td>
<td>53.5%</td>
<td>63.0%</td>
<td>18.0%</td>
<td>67</td>
<td>76.1%</td>
<td>-41.8%</td>
<td>-17.3%</td>
<td>1.04</td>
</tr>
</tbody>
</table>

- 16% increase in gains and no increase in drawdown for the 80 Most Liquid
- Optimization run for In-Sample period 1/1/03 to 4/1/09
- 3x ETFs not available in IS period, so used the settings from the 2x ETF optimizations - very poor results
- RSI(4) 25 the best strategy overall in the Out-of-Sample period with optimization using the 2x Bull-Bear group of ETFs holding 3 positions (or 1 if you really like to bet)
## Summary of Connors’ ETF Strategies

<table>
<thead>
<tr>
<th>Equity</th>
<th>PosHeld/Worst Rnk</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI 25</td>
<td>2x Bull-Bear</td>
<td>3/3</td>
<td>97.9%</td>
<td>38.2%</td>
<td>30.2%</td>
<td>114</td>
<td>74.6%</td>
<td>-34.5%</td>
<td>-29.9%</td>
</tr>
<tr>
<td>R3</td>
<td>2x Bull-Bear</td>
<td>5/5</td>
<td>94.9%</td>
<td>25.3%</td>
<td>29.4%</td>
<td>178</td>
<td>77.5%</td>
<td>-39.0%</td>
<td>-27.1%</td>
</tr>
<tr>
<td>%B*</td>
<td>80 Most Liquid 1x/2x/3x</td>
<td>3/3</td>
<td>53.5%</td>
<td>63.0%</td>
<td>18.0%</td>
<td>67</td>
<td>76.1%</td>
<td>-41.8%</td>
<td>-17.3%</td>
</tr>
</tbody>
</table>

*Note: %B CAGR performance slightly better with 2x Bull-Bear, but drawdown slightly worse

- Sometimes you are catching a trend change instead of a pullback causing large drawdown.
- Plan to evaluate in the future the use of catastrophic stop loss or exiting when price breaks the 200 day SMA to reduce likelihood of large individual trade drawdown.
Premier Stochastic Oscillator (PSO) Description

From article in Technical Analysis of Stocks & Commodities March 2011 by Lee Leibfarth

- Modifies the traditional Stochastic Oscillator
  - Uses 5-period double-exponential smoothing of %K
  - Normalizes the oscillator on a symmetrical scale of +1 to -1
- Oscillator is best suited for trading changes in market direction per the author
  - This is **countertrend trading** which requires trader to act as soon as it triggers, “it requires an aggressive approach to anticipating price reversals before they actually occur or are confirmed”
- Long trade entry:
  - PSO crosses below 0.90 or crosses below 0.20
- Short trade entry:
  - PSO crosses above -0.90 or crosses above -0.20
- Exit when hit profit target
  - Target set at the amount of average pullback.
  - Requires some tuning for each market or equity
- Code for multiple platforms is available on the TASC webpage in the Trader’s Tips area (library is a rolling 1 year history)
Premier Stochastic Default Performance

* IWM with 8/25: Profit% = 78.0%, CAGR = 9.67%, Calmar = 0.20

The really good gains were killed by the drawdown.
Premier Stochastic 3-D Heat Map

IWM In-Sample with 8/25:
Profit % = 78.0%
CAGR = 9.7%
MDD% = -48.6%
Calmar = 0.20
Win% = 73.6%

IWM In-Sample with 10/40:
Profit % = 116.6%
CAGR = 13.2%
MDD% = -23.1%
Calmar = 0.57
Win% = 81.6%

- Optimization shows best performance with 10/40, but a very steep peak
- 12/30 has a bit more of a flat area, but performance is no better than default settings
- This indicator might benefit from a filter to only trade when Price > 200-day SMA
Premier Stochastic OOS Performance

IWM with 10/40: Profit% = 79.2%, CAGR = 25.3%, Calmar = 1.55

Similar gain to Buy & Hold with 44% reduction in drawdown
Three-Bar Inside Bar Description

From article in Technical Analysis of Stocks & Commodities August 2008 by Johnan Prathap

- Was developed for gold, silver, oil futures trading
- A short term reversal strategy that looks for wide range bar followed by two bars with high/lows contained within the range of the wide range bar
- Uses the 3 bar formation to determine entry long/short
  - Successive closes with higher close but below prior high for long entry
  - Successive closes with lower close but above prior low for short entry
- Uses profit target or stop loss for exit
  - With futures author set PT = 0.75% and SL = 0.75%
  - Code written for Amibroker had PT = 6.5% and SL = 0.75% which is what I used for my initial backtesting
- TradeStation code is in the article and code for multiple platforms is available on the TASC webpage in the Article Code area - have to be a subscriber

Similar to Connors’ Multiple Days Up/Down strategy
Three-Bar Inside Bar Indicator Default Performance

IWM with 6.5/0.75: Profit% = 45.4%, CAGR = 6.2%, Calmar = 1.00

Performance mediocre, but drawdowns are excellent

Now let's see if optimization helps
Optimization shows best performance with 2% profit target and 5.25% stop loss

Not a very pretty 3D optimization curve - this is probably a candidate for continuously doing short term duration walkforward optimization
Three-Bar Inside Bar OOS Performance

IWM with 2/5.25: Profit% = 33.6%, CAGR = 11.87%, Calmar = 1.78

Not really anything to get excited about, except for the low drawdown
Three-Bar Inside Bar OOS Performance with 2X ETF

UWM with 2/5.25: Profit% = 65.6%, CAGR = 21.5%, Calmar = 3.54

-6.1% drawdown with 2/5.25 setting

With 2x ETF, has really good performance, especially the Win% = 94.4%
Summary of Timing Indicator Best Performance
Out-of Sample Period (4-09 to 11-11)

<table>
<thead>
<tr>
<th>Ticker</th>
<th>Settings</th>
<th>Net Profit %</th>
<th>Exposure %</th>
<th>CAGR %</th>
<th>Number Trades</th>
<th>Win %</th>
<th>Trade MDD%</th>
<th>System MDD%</th>
<th>Calmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy&amp;Hold</td>
<td>IWM</td>
<td>78.2%</td>
<td>100%</td>
<td>25.0%</td>
<td>1</td>
<td>100%</td>
<td>-28.9%</td>
<td>-28.9%</td>
<td>0.87</td>
</tr>
<tr>
<td>Death Cross</td>
<td>IWM 50/200</td>
<td>25.1%</td>
<td>75.2%</td>
<td>9.1%</td>
<td>2</td>
<td>100%</td>
<td>-24.4%</td>
<td>-24.4%</td>
<td>0.37</td>
</tr>
<tr>
<td>8x20</td>
<td>IWM 8/20</td>
<td>14.2%</td>
<td>58.1%</td>
<td>5.3%</td>
<td>19</td>
<td>63.2%</td>
<td>-10.0%</td>
<td>-18.3%</td>
<td>0.29</td>
</tr>
<tr>
<td>Bowtie</td>
<td>IWM 10/20/30</td>
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<td>67.7$</td>
<td>6.7%</td>
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<td>44.4%</td>
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<td>Stoch+RSI</td>
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<td>Equity-Bond RS</td>
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<td>AccuTrac</td>
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<td>22.1%</td>
<td>17</td>
<td>58.8%</td>
<td>-11.8%</td>
<td>-17.9%</td>
<td>1.24</td>
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<td>Premier Stoch</td>
<td>IWM 10/40</td>
<td>79.2%</td>
<td>60.2%</td>
<td>25.3%</td>
<td>15</td>
<td>66.7%</td>
<td>-14.4%</td>
<td>-16.3%</td>
<td>1.55</td>
</tr>
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<td>3-Bar Inside Bar</td>
<td>UWM 2/5.25</td>
<td>65.6%</td>
<td>3.4%</td>
<td>21.5%</td>
<td>18</td>
<td>94.4%</td>
<td>-6.1%</td>
<td>-6.1%</td>
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<td>RSI 25</td>
<td>2x Bull-Bear</td>
<td>97.9%</td>
<td>38.2%</td>
<td>30.2%</td>
<td>114</td>
<td>74.6%</td>
<td>-34.5%</td>
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<td>R3</td>
<td>2x Bull-Bear</td>
<td>94.9%</td>
<td>25.3%</td>
<td>29.4%</td>
<td>178</td>
<td>77.5%</td>
<td>-39.0%</td>
<td>-27.1%</td>
<td>1.09</td>
</tr>
<tr>
<td>%B</td>
<td>80 Most Liquid 1x/2x/3x</td>
<td>53.5%</td>
<td>63.0%</td>
<td>18.0%</td>
<td>67</td>
<td>76.1%</td>
<td>-41.8%</td>
<td>-17.3%</td>
<td>1.04</td>
</tr>
</tbody>
</table>
Conclusions

Just because it is in a book, doesn’t mean it is the path to riches
- You need to do your own due diligence, which based on what I have seen requires backtesting to see if it really works or not
- Backtesting gives you a good view what to expect for gains/drawdowns
- Need to measure your real performance to see if in line with backtest expectancy

Trend trading preferable for longer term horizon investment accounts
- Pick up the gains from the overall market moves, but need to be out of equities during bear market periods
- Switching to bonds during market downturns improves overall gains

What I personally use:
- Equity-Bond Relative Strength Indicator (IWM/IEF) for market direction
- AccuTrack for individual equity buy/sell timing and plan to use as timer for rotational systems with stocks as I develop the strategies
- Plan to start using the Connors’ strategies with 2x Bull-Bear portfolio of ETFs in trading account
- Will continue to evaluate short term swing trading indicators to see if I find one I like