Diversifying with Negatively Correlated Investments

Monterosso Investment Management Company, LLC

Q1 2011
Presentation Outline

- I. Five Things You Should Know About Managed Futures
- II. Diversification and How it Works
- III. Correlation
- IV. Analyzing Our Program and the S&P 500
- V. Finding a Substitute for the S&P 500
- VI. Comparing Performance Statistics
- VII. Conclusion
1. Five Things You Should Know About Managed Futures
1 - Funding a Futures Account

- Most futures commission merchants (FCMs) will allow you to use U.S. treasury notes as collateral—accepting as much as 80% of the value of the notes to satisfy the exchange’s bonding requirement.

- Additionally, many FCMs will allow you to use foreign currencies as collateral.
2 - Tax Benefits to Trading Futures Contracts

- Title 26, Section 1256 of the United States Code provides for any gain or loss on a futures contract to be treated as a short-term capital gain or loss “to the extent of 40 percent of such gain or loss,” and a long-term capital gain or loss “to the extent of 60 percent of such gain or loss.”

- In other words, even if you trade managed futures on a short-term basis, 60% of your gains will be taxed at long-term capital gains rates. If you have a short-term strategy, it is much better to trade a futures contract than an exchange-traded fund (ETF.) Very few people know this.
One benefit to trading futures contracts is that you can use leverage without borrowing money.

A futures contract is a contract to buy or sell something at some point in the future.

You must have enough cash or securities on deposit in order to satisfy the exchange’s margin requirement, but it is not necessary to borrow the full value of the futures contract.

For the E-mini S&P 500 contract, as of March 2011, the initial margin requirement is $5625, while the dollar value of one contract is more than ten times that amount.
4 - Trading Managed Futures in your IRA

When you are buying or selling a futures contract, you are not buying or selling property. Instead, you are entering into a contract to buy or sell something at some point in the future.

You are not allowed to incur debt to finance property in an IRA account, so you cannot purchase securities on margin in an IRA account. But because a futures contract is an executory contract and “does not constitute an acquisition of the underlying commodities or any incurrence of indebtedness in connection therewith,”\(^1\) you can trade managed futures in your IRA account.\(^2\) LR 8044023
5 - Diversification with Managed Futures

- You can reduce the volatility of a domestic equities portfolio by adding a managed futures program that is negatively correlated with the S&P 500.
- We will spend the rest of the morning exploring 5.
II. Diversification and How it Works
Diversification – How and Why

- Many investors believe that diversification is best achieved by combining non-correlated investments.
- In fact, diversification is best achieved by combining negatively correlated investments.
- Diversification reduces your portfolio’s volatility.
- The end result should be more consistent returns and less risk.
The Typical Pension Fund Portfolio

- The typical pension fund has almost half of its assets invested in equities.
- If your portfolio has a large domestic equities component, then you should consider moving part of your portfolio into an investment that is negatively correlated with the S&P 500.
Diversifying with Negatively Correlated Investments

- Assume that you have a portfolio made up of two investments, each with a historical average return of 10% and volatility of 20%.
- Assume also that each investment has a normal return distribution.
- The table below shows how the volatility of your portfolio will change depending on the correlation between its components.

<table>
<thead>
<tr>
<th>correlation</th>
<th>volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>0.50</td>
<td>17%</td>
</tr>
<tr>
<td>0</td>
<td>14%</td>
</tr>
<tr>
<td>-0.50</td>
<td>10%</td>
</tr>
<tr>
<td>-1</td>
<td>0%</td>
</tr>
</tbody>
</table>
III. Correlation
Problems with Measuring Correlation

- In theory, correlation should be consistent at any resolution.
  - For any two instruments, their correlation at a daily resolution should be similar to their correlation at a monthly resolution.

- In practice, correlation coefficients tend to be more significant at lower resolutions.
  - e.g., monthly correlation coefficients for positively correlated instruments will be greater than daily correlation coefficients.

- The correlation between instruments changes over time.
  - It is unclear, even in theory, how this should be handled.
When Measuring Correlation Between Instruments

- Comparing prices is not useful.

- You should convert prices to percent change before calculating correlation.

- You need large sample sizes in order to be sure that your correlation coefficients are significantly different from zero.
  - As a rule of thumb, sample size > 100 events.
Correlations over Different Resolutions

- In the following slides, we will compare correlations of different instruments at various resolutions.
- First we will compare monthly and daily correlations going back approximately ten years.
- Then we will compare one-hour and five-minute correlations going back approximately three years.
- Our analysis will show that correlation coefficients tend to be more significant at lower resolutions.
Symbol Guide

- **ES = E-mini S&P 500 [CME]**
- **TY = Ten-year treasury futures [CBOT]**
- **DX = Dollar index futures [ICE]**
- **GC = Gold futures [COMEX]**
### Monthly Correlations – June 2001 to Present

<table>
<thead>
<tr>
<th></th>
<th>ES</th>
<th>TY</th>
<th>DX</th>
<th>GC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>1</td>
<td>-0.32</td>
<td>-0.36</td>
<td>0.03</td>
</tr>
<tr>
<td>TY</td>
<td>-0.32</td>
<td>1</td>
<td>-0.26</td>
<td>0.24</td>
</tr>
<tr>
<td>DX</td>
<td>-0.36</td>
<td>-0.26</td>
<td>1</td>
<td>-0.43</td>
</tr>
<tr>
<td>GC</td>
<td>0.03</td>
<td>0.24</td>
<td>-0.43</td>
<td>1</td>
</tr>
</tbody>
</table>
### Daily Correlations – June 2001 to Present

<table>
<thead>
<tr>
<th></th>
<th>ES</th>
<th>TY</th>
<th>DX</th>
<th>GC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>1</td>
<td>-0.31</td>
<td>-0.08</td>
<td>-0.04</td>
</tr>
<tr>
<td>TY</td>
<td>-0.31</td>
<td>1</td>
<td>-0.17</td>
<td>0.09</td>
</tr>
<tr>
<td>DX</td>
<td>-0.08</td>
<td>-0.17</td>
<td>1</td>
<td>-0.40</td>
</tr>
<tr>
<td>GC</td>
<td>-0.04</td>
<td>0.09</td>
<td>-0.40</td>
<td>1</td>
</tr>
</tbody>
</table>
Note About the Following Slides

- Keep in mind that the following slides cover a different period of time than the previous slides.
- Because of this, it isn’t fair to compare the results that follow this slide to the results that preceded this slide.
### One-hour Correlations – Jan 2008 to Present

<table>
<thead>
<tr>
<th></th>
<th>ES</th>
<th>TY</th>
<th>DX</th>
<th>GC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ES</strong></td>
<td>1</td>
<td>-0.42</td>
<td>-0.28</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>TY</strong></td>
<td>-0.42</td>
<td>1</td>
<td>0.00</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>DX</strong></td>
<td>-0.28</td>
<td>0.00</td>
<td>1</td>
<td>-0.40</td>
</tr>
<tr>
<td><strong>GC</strong></td>
<td>0.12</td>
<td>0.04</td>
<td>-0.40</td>
<td>1</td>
</tr>
</tbody>
</table>
Five-minute Correlations – Jan 2008 to Present

<table>
<thead>
<tr>
<th></th>
<th>ES</th>
<th>TY</th>
<th>DX</th>
<th>GC</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>1</td>
<td>-0.39</td>
<td>-0.20</td>
<td>0.1</td>
</tr>
<tr>
<td>TY</td>
<td>-0.39</td>
<td>1</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>DX</td>
<td>-0.20</td>
<td>0.02</td>
<td>1</td>
<td>-0.30</td>
</tr>
<tr>
<td>GC</td>
<td>0.1</td>
<td>0.00</td>
<td>-0.30</td>
<td>1</td>
</tr>
</tbody>
</table>
The Consequences of Biased Correlations

- It is difficult to know what we should think about this.

- In the first place, it would seem to be evidence against the efficient market hypothesis.
  - If instruments really do follow a random walk, then we would expect the correlations between them to look the same at different resolutions.

- There may also be some trading opportunities here.

- Can you think of ways to profit from this inefficiency?
Using Correlations When Diversifying

- Because correlations tend to be underestimated at higher resolutions, we suggest using monthly correlation statistics to measure the correlation between potential investments.

- Another benefit to using monthly correlations is that the correlations can be calculated in an Excel spreadsheet.

- Keep in mind, however, that you should have at least ten years of data if you are using monthly data.
IV. Analyzing Our Program and the S&P 500
Introducing Our Program

- We designed our Short-Term Managed Futures Program to be negatively correlated with the S&P 500.
- The monthly correlation in actual trading is $-0.50$.
- Our goal is to provide investors with an imperfect hedge for their domestic equities exposure, but also, to trade a program that has an attractive return profile on its own.
- Our preference is to trade strategies with positively skewed return distributions because positively skewed return distributions make it easier to predict downside risk.

Past performance is not necessarily indicative of future results.
Disclaimer

- The returns for our program are given net of fees.
- Past performance is not necessarily indicative of future results.
- An investment in the Program is speculative and involves a substantial risk of loss.
- Please refer to the Monterosso Investments disclosure document for more complete information.
Equity Curves for S&P 500 and Monterosso

Past performance is not necessarily indicative of future results.
Introducing the Sortino Ratio

The Sortino Ratio is a return/risk ratio. It is similar to the Sharpe Ratio. We will use it to analyze the relative risk of different investment alternatives.

- Both ratios have geometric mean return in the numerator.
- The Sharpe Ratio uses standard deviation in the denominator.
- The Sortino Ratio uses downside deviation instead.
- Downside deviation is a better measure of risk because it only considers downside risk.
Performance Statistics for S&P 500

- Compound Annualized ROR = 1.22%
- Total return = 3.50%
- YTD = 5.88%
- Upside deviation (monthly) = 4.14%
- Downside deviation (monthly) = 6.46%
- Skewness = -0.73
- Sortino Ratio (monthly; 0%) = 0.02
- Sortino Ratio (annualized; 0%) = 0.07

Past performance is not necessarily indicative of future results.
Monthly Return Distribution for S&P 500

Past performance is not necessarily indicative of future results.
Performance Statistics for Monterosso

- Compound Annualized ROR = 22.70%
- Total return = 78.54%
- YTD = 0.58%
- Upside deviation (monthly) = 4.16%
- Downside deviation (monthly) = 1.00%
- Sortino Ratio (monthly; 0%) = 1.71
- Sortino Ratio (annualized; 0%) = 5.93

Past performance is not necessarily indicative of future results.
Monthly Return Distribution for Monterosso

Monthly Return Distribution (Monterosso)

Past performance is not necessarily indicative of future results.
Combining These Two Investments in One Portfolio

- What would your equity curve look like if you were to combine the S&P 500 and our Short-Term Managed Futures Program in one portfolio?
Equity Curve – Mix1 [S&P 500, Monterosso]

Past performance is not necessarily indicative of future results.
Performance Stats – Mix 1 [S&P 500, Monterosso]

- Compound Annualized ROR = 12.83%
- Total return = 40.79%
- YTD = 3.21%
- Upside deviation (monthly) = 2.60%
- Downside deviation (monthly) = 1.51%
- Sortino Ratio (monthly; 0%) = 0.67
- Sortino Ratio (annualized; 0%) = 2.32

Past performance is not necessarily indicative of future results.
Return Distribution – Mix1 [S&P 500, Monterosso]

Monthly Return Distribution (Mix1)

Past performance is not necessarily indicative of future results.
The equity curve for the mixed investment shows an improvement from a simple investment in the S&P 500.

However, the S&P 500’s downside risk is so great that it makes the mixed investment’s equity curve unattractive.

The max drawdowns for the alternative portfolios are:

- S&P 500: 46.41%
- Monterosso: [5.16% 2.24% 1.67%]
- Mixed investment: [8.20% 5.62% 1.60%]
V. Finding A Substitute for the S&P 500
Finding a Substitute for the S&P 500

- Can we find a substitute for the S&P 500 that is positively correlated with the S&P 500 but with less downside risk?
- We will analyze a moving average crossover strategy whereby an investor would go long in the S&P 500 any time the 60-day moving average crosses over the 200-day moving average.
- The investor would exit his long position when the short-term moving average crosses below the long-term moving average.

Past performance is not necessarily indicative of future results.
Equity Curve – [60, 200] MA Crossover

Past performance is not necessarily indicative of future results.
Performance Statistics for [60, 200] MA Crossover

- Compound Annualized ROR = 12.07%
- Total return = 38.11%
- YTD = 5.85%
- Upside deviation (monthly) = 2.78%
- Downside deviation (monthly) = 1.82%
- Sortino Ratio (monthly; 0%) = 0.52
- Sortino Ratio (annualized; 0%) = 1.81

Past performance is not necessarily indicative of future results.
Return Distribution – [60 200] MA Crossover

Past performance is not necessarily indicative of future results.
Equity Curve – Mix2 [MA60200, Monterosso]

Past performance is not necessarily indicative of future results.
Performance Stats – Mix2 [MA60200, Monterosso]

- Compound Annualized ROR = 17.79%
- Total return = 59.02%
- YTD = 3.20%
- Upside deviation (monthly) = 2.46%
- Downside deviation (monthly) = 0.90%
- Sortino Ratio (monthly; 0%) = 1.53
- Sortino Ratio (annualized; 0%) = 5.29

Past performance is not necessarily indicative of future results.
Return Distribution – Mix2 [MA60200, Monterosso]

Monthly Return Distribution (Mix2)

Past performance is not necessarily indicative of future results.
VI. Comparing Performance Statistics
Comparing Performance Statistics

- **Max drawdowns:**
  - S&P 500: 46.41%
  - Monterosso: [5.16%  2.24%  1.67%]
  - Mix1: [8.20%  5.62%  1.60%]
  - MA60200: [13.12%  3.70%]
  - Mix2: [5.78%  2.58%  1.65%]
Comparing Performance Statistics

- **Sortino Ratios (annualized, 0%)**:  
  - S&P 500: 0.07  
  - Monterosso: 5.93  
  - Mix1: 2.32  
  - MA60200: 1.81  
  - Mix2: 5.29
Comparing Performance Statistics

- **Compound annualized ROR:**
  - S&P 500: 1.22%
  - Monterosso: 22.70%
  - Mix1: 12.83%
  - MA60200: 12.07%
  - Mix2: 17.79%
VII. Conclusion
Conclusion

- Mix2 appears to be an improvement on both the S&P 500 or Mix1.
- There is some question as to what the correlation between MA60200 and our program will be over the long-term.
- From May 2008 to the present, including only those months where MA60200 actually has a long position open, the correlation between the two strategies is −0.47.
- If you look back earlier than May 2008, the performance for MA60200 is quite good.
- My conclusion is that MA60200 would be a good complement to our program, and that Mix2 provides a simple way to construct a well-diversified portfolio.
Disclaimer

- Past performance is not necessarily indicative of future results.
- An investment in the Program is speculative and involves a substantial risk of loss.
- Please refer to the Monterosso Investments disclosure document for more complete information.
Note on Volatility

- Volatility does not change with the square root of time.
- Most people believe that it does, but in fact shorter time frames are relatively more volatile than longer time frames.
- Because of this, you should not expect to reduce the downside risk on a moving average strategy simply by reducing your moving average look-back window.
- In other words, a [20, 60] MA crossover strategy might have just as much downside risk as a [60, 200] MA crossover strategy.
Definitions

- **Skewness** – A negative skew indicates that the tail on the left side of the probability density function is longer than the right side and the bulk of the values (including the median) lie to the right of the mean. A positive skew indicates that the tail on the right side is longer than the left side and the bulk of the values lie to the left of the mean.

- **Downside Deviation** – Similar to the loss standard deviation except the downside deviation considers only returns that fall below a defined Minimum Acceptable Return (MAR) rather than the arithmetic mean. For example, if the MAR is assumed to be 0%, the downside deviation would measure the variation of each period that falls below 0%. (The loss standard deviation, on the other hand, would take only losing periods, calculate an average return for the losing periods, and then measure the variation between each losing return and the losing return average).

- **Sortino Ratio** – This is a return/risk ratio developed by Frank Sortino. Return (numerator) is defined as the incremental compound average period return over a Minimum Acceptable Return (MAR). Risk (denominator) is defined as the Downside Deviation below a Minimum Acceptable Return (MAR).
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Monterosso Investment Management Co., LLC  
Capsule Performance Summary  
Period 5/01/2008 to 2/28/2011

Inception of trading by the CTA  
May-08

Inception of trading pursuant to current program  
May-08

# of accounts traded pursuant to the program  
52

Total actual assets under management by CTA  
$2,859,894

Total actual assets under this program  
$2,859,894

Total nominal assets under this program  
$45,905,539

Total nominal assets under management by CTA  
$45,905,539

Largest monthly draw-down  
-5.16%  
Jul-08

Worst peak to valley draw-down  
-5.16%  
June 30, 2008-July 31, 2008

Number of profitable accounts that have opened & closed since May 2008  
13

Range of returns experienced by profitable accounts  
0.20% - 8.55%

Number of losing accounts that have opened & closed since May 2008  
4

Range of returns experienced by losing accounts  
(0.16%) - (1.30%)

** Monthly Rates of Return **

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan %</th>
<th>Feb %</th>
<th>Mar %</th>
<th>Apr %</th>
<th>May %</th>
<th>Jun %</th>
<th>Jul %</th>
<th>Aug %</th>
<th>Sep %</th>
<th>Oct %</th>
<th>Nov %</th>
<th>Dec %</th>
<th>Y-T-D %</th>
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</thead>
<tbody>
<tr>
<td>2008</td>
<td>1.79%</td>
<td>1.07%</td>
<td></td>
<td>-5.16%</td>
<td>0.30%</td>
<td>9.54%</td>
<td>13.91%</td>
<td>10.51%</td>
<td>6.95%</td>
<td></td>
<td></td>
<td></td>
<td>44.32%</td>
</tr>
<tr>
<td>2009</td>
<td>5.24%</td>
<td>0.01%</td>
<td>9.09%</td>
<td>-1.67%</td>
<td>2.06%</td>
<td>-0.09%</td>
<td>-0.79%</td>
<td>-1.10%</td>
<td>-0.28%</td>
<td>3.33%</td>
<td>-1.08%</td>
<td>-0.18%</td>
<td>14.93%</td>
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<tr>
<td>2010</td>
<td>0.41%</td>
<td>0.92%</td>
<td>-0.10%</td>
<td>0.81%</td>
<td>3.01%</td>
<td>-1.19%</td>
<td>1.63%</td>
<td>0.99%</td>
<td>0.46%</td>
<td>-0.27%</td>
<td>0.35%</td>
<td>-0.15%</td>
<td>7.03%</td>
</tr>
<tr>
<td>2011</td>
<td>-0.46%</td>
<td>1.04%</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.58%</td>
</tr>
</tbody>
</table>

** Accounts that opened or closed during the month are excluded from the composite rate of return. **

Notes:

1. Drawdown means losses experienced by the composite over a specified period.
2. Rate of Return is calculated by dividing the Net Performance by the Adjusted Beginning Net Asset Value (Beginning Net Asset Value plus time weighted additions and withdrawals) multiplied by 100. Beginning January 1, 2010 the rate of return is the compounded daily return calculated by dividing the daily Net
3. Worst Peak-to-Valley draw-down is the greatest cumulative percentage decline in month-end net asset value of the composite due to losses during a period in which the initial month-end net asset value is not equaled or exceeded by a subsequent month-end net asset value.

PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS.