Morgan Stanley

INVESTMENT MANAGEMENT

How to Think About Correlation Numbers: Long-Term Trends versus Short-Term Noise

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A Discussion on Correlation

The primary goal for asset managers, financial advisors and investors alike is creating a robust portfolio that can withstand market cycles.

One of the most widely accepted tenets of portfolio construction is Modern Portfolio Theory, a hypothesis introduced by Professor Harry Markowitz in 1952.[1] Simply summarized, Modern Portfolio Theory suggests it is possible to construct optimal portfolio combinations consisting of groups of investments, assuming the investments are uncorrelated. In simple terms, the group of investments should outperform any single investment on a stand-alone, risk-adjusted basis over time. The measurement of correlation, or degree of co-movement between investment choices, thus became, and remains, a central point in any portfolio construction discussion.[2]

[1] Harry Markowitz, "Portfolio Selection", *The Journal of Finance*. (1952)

[2] Dorag Peleg. "Fundamentals in Financial Theory." *MIT Press*. (March 2015)

DISPLAY 1

Correlation Analysis

January 1990 – January 2018

	BARCLAY CTA INDEX (MANAGED FUTURES)	S&P 500 TOTAL RETURN INDEX (US EQUITIES)	MSCI WORLD (GLOBAL EQUITIES)	BLOOMBERG BARCLAYS AGGREGATE BOND INDEX (BONDS)	S&P GSCI TOTAL RETURN (COMMODITIES)	HFRI FUND OF FUND COMPOSITE INDEX (HEDGE FUNDS)
Barclay CTA Index (Managed Futures)	1.00					
S&P 500 Total Return Index (US Equities)	-0.10	1.00				
MSCI World (Global Equities)	-0.08	0.91	1.00			
Bloomberg Barclays Aggregate Bond Index (Bonds)	0.19	0.10	0.08	1.00		
S&P GSCI Total Return (Commodities)	0.15	0.18	0.24	-0.02	1.00	
HFRI Fund of Fund Composite Index (Hedge Funds)	0.24	0.54	0.58	0.07	0.36	1.00

Past performance is no guarantee of future results. Indices are unmanaged and generally their returns do not include sales charges or fees, which would lower performance. It is not possible to invest directly in an index. The index results above are not intended to predict the performance of any specific investment. See disclosure page for index definitions. Source: PerTrac

Display 1 measures the correlation of monthly returns among various global indices over a nearly 30-year time frame and should be very familiar to financial professionals. But how well do we understand and communicate the nuances of the numbers in this table?

A financial professional would, correctly, look at this table and determine that over the past 28 years the 0.10 correlation between US stocks and bonds has been low. The financial professional might then combine stocks and bonds in a portfolio, assuming that the combination of the two investments would result in better long-term, risk-adjusted returns than either investment by itself—with the emphasis on "long-term". Most would agree that 337 monthly data points represent a very long and robust observation period. An investor with a long-term time horizon could find comfort in using this data when making asset allocation decisions; a statistician would also consider this number of observations meaningful, as long as the observed relationship is stationary.

Yet over this 28-year period, there were periods of time during which the correlation between stocks and bonds varied greatly; sometimes the two asset classes moved in sync. In other words, this table of summary statistics does not tell the whole story of the variability of the relationship. This variability is present in all summary statistics, and it changes depending on the time frame being studied, as we will illustrate.

Are Managed Futures Non-Correlated with Equities?

Yes, but it depends greatly on the time frame over which you look. Importantly, low or non-correlation is not a "hedge" or a "put". A true hedge is actively managed to a -1.0 correlation. A put is structured to have some degree of price increase when the price of the underlying asset declines.

Managed futures is an investment choice that stands out as having had low correlation of -0.10 to US Equities and Global Equities. Managed futures is often used in a portfolio of stocks and bonds as a diversifier. Yet, this number being a summary statistic, it has varied over time, and there have been some distinct periods of positive and negative correlation over the past 28 years. Thus, depending on the timing and length of one's investment in managed futures, the experience with correlation could have been very different from those summarized in *Display 1*.

Managed futures traders generate returns in a wide variety of markets including equities, but also fixed income, foreign exchange, energy, metal and agricultural sectors. We could use charts to highlight any of these market sectors, but the bulk of investor interest in managed futures relates to how its performance over time interacts with equity markets.

DISPLAY 2

36-Month Rolling Correlation: Managed Futures vs. Equities

Average -0.02, high +0.56, low -0.48

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In *Display 2* we observe the rolling 3-year correlation relationship between managed futures and the S&P 500 dating back to 1990, which is also the starting date of the summary table in *Display 1*. While the summary statistic for this series of 36 variable relationships is -0.02, we observe that the number varies between -0.48 and +0.56 on the correlation scale over time.

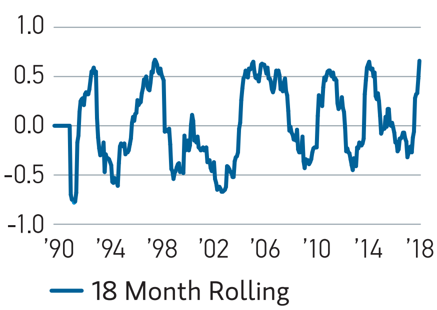
What is observable in this graph is that there are some noteworthy times when the negative correlation between managed futures and the S&P 500 coincided with periods of sustained negative equity performance. For example, one can observe the dip to negative 3-year rolling correlation territory in 2000-2005. Other times, however, the correlation was positive. More recently, we observed a rolling 3-year correlation of + 0.27 in late 2015, as the equity bull market was underway. Since the majority of managed futures managers use a trend-following methodology, it stands to reason that the correlation to equities would increase amid the positive equity returns observed in late 2017 and early 2018.[3] In these periods of higher than average correlation to equities, any abrupt decline in equity prices would result in losses to long equity futures positions, as the managers' models seek to identify the new trend.

As we shift to analyzing shorter-term time frames, we immediately observe less stationarity in the relationship. We see more volatility in correlation itself. *Displays 3-5* show 18-month, 6-month and 3-month rolling correlation relationships.

DISPLAY 3

18-Month Rolling Correlation: Managed Futures vs. Equities

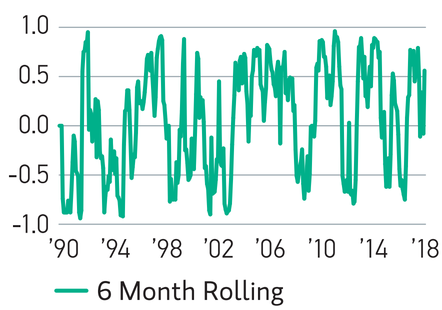
Average 0.02, high +0.67, low -0.78



DISPLAY 4

6-Month Rolling Correlation: Managed Futures vs. Equities

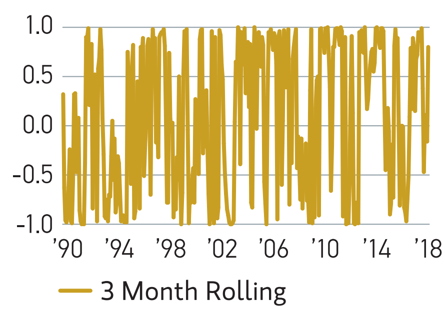
Average 0.05, high +0.96, low -0.94



DISPLAY 5

3-Month Rolling Correlation: Managed Futures vs. Equities

Average 0.08, high +1.00, low -1.00



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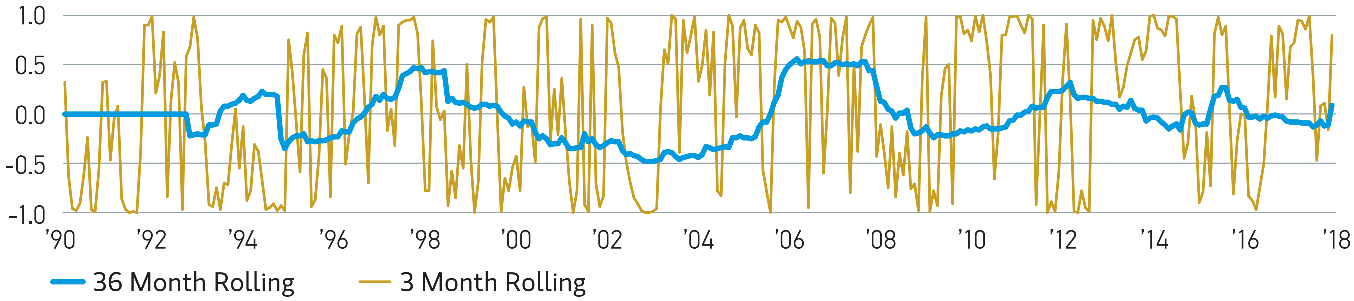
[3] Source: BarclayHedge, Ltd. (Fairfield, IA) (www.barclayhedge.com)

DISPLAY 6

36-Month and 3-Month Rolling Correlation Comparison: Managed Futures vs. Equities



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The increased volatility of these shorter-term correlations is just a result of randomness in the relationship between these two investments, a fact that is obscured over longer periods. As much as we rely on well-established tenets of finance to make long-term investment decisions, the emotions we experience in the short-term matter. It can be difficult to stay focused on long-term relationships amid statistical noise. So, while short-term correlation between stocks and managed futures may reach extreme values of -1.0 or +1.0, the long-term correlation may still be close to 0—meaning the diversification principle is still valid, in our view.

Display 6 superimposes a 36-month relationship between stocks and managed futures on a 3-month relationship between the two. The visualization of this contrast is striking. It shows why it is important to block out the noise and our natural "recent memory" bias when making investment decisions.

Conclusion

Managed futures have demonstrated their ability to act differently from stocks and bonds over time with no statistical long-term degradation evident in the numbers. An investor's short-term experience, however, can be very different and emotionally charged. This is why focusing on the historical statistics is important. If an investor can maintain a longer-term investment horizon, managed futures can be a valuable component of a well-diversified portfolio.

Risk Considerations

Diversification does not eliminate the risk of loss. Managed futures investments should be considered as part of a diversified investment portfolio. Morgan Stanley Investment Management considers managed futures investments suitable solely for the risk capital portion of such a portfolio. If a managed futures fund does not perform in a manner that has a low correlation to the performance of traditional financial markets or does not perform successfully, investors will obtain no diversification benefits by investing in such fund, and there is no guarantee that a managed futures investment will provide such benefits.

- Investments in futures, forwards, and options on futures and forwards trading is speculative and volatile and an investor could lose all or a substantial part of his or her investment. Key risks to consider when investing in managed futures strategies include the following: Strategies generally employ substantial leverage in their trading which accentuates the trading profit and trading loss;
- Strategies may trade on non-U.S. exchanges and in the over-the-counter market which may not be subject to regulation by the Commodity Futures Trading Commission;
- Liquidity is restricted; there may be no secondary market for units in managed futures strategies and such units may be subject to restrictions on transfer;
- Fees and expenses can be substantial and will reduce trading profits and investment returns;
- Trading advisors may receive quarterly incentive fees, without regard to the overall performance of any of the funds; and
- Profits earned by managed futures funds will be taxable to an investor even though distributions will not be paid to investors.

DEFINITIONS

The indexes are unmanaged and do not include any expenses, fees or sales charges. It is not possible to invest directly in an index. Any index referred to herein is the intellectual property (including registered trademarks) of the applicable licensor. Any product based on an index is in no way sponsored, endorsed, sold or promoted by the applicable licensor and it shall not have any liability with respect thereto

HFRI Fund of Funds Composite Index – The **HFRI Fund of Funds Composite Index** is an index comprised of funds of hedge funds classified by Hedge Fund Research, Inc. as "diversified." Funds of hedge funds classified by HFR as "diversified" do not necessarily meet applicable diversification tests under the Investment Company Act of 1940 or the Internal Revenue Code. Rather, funds of hedge funds classified by HFR as "diversified" seek to minimize losses during down markets while still achieving superior returns in up markets, and they seek to do so by investing in underlying hedge funds collectively pursuing a variety of investment strategies and managed by multiple investment managers. The Index is an index of funds of hedge funds comprising approximately 340 funds of hedge funds which report monthly returns to HFR's database and have either a minimum of $50 million in net assets or a track record of at least 12 months.

While the HFRI Indices are frequently used, they have limitations (some of which are typical of other widely used indices). These limitations include survivorship bias (the returns of the indices may not be representative of all the hedge funds in the universe because of the tendency of lower performing funds to leave the index); heterogeneity (not all hedge funds are alike or comparable to one another, and the index may not accurately reflect the performance of a described style); and limited data (many hedge funds do not report to indices, and the index may omit funds, the inclusion of which might significantly affect the performance shown). The HFRI Indices are based on information self-reported by hedge fund managers that decide on their own, at any time, whether or not they want to provide, or continue to provide, information to HFR Asset Management, L.L.C. Results for funds that go out of business are included in the index until the date that they cease operations. Therefore, these indices may not be complete or accurate representations of the hedge fund universe, and may be biased in several ways. Index performance is not illustrative of fund performance. HFRI indices are presented net of fees as reported by the hedge fund managers.

It is not possible to invest directly in an index. All indices are unmanaged and their returns generally do not include sales charges or fees, which would lower performance.

S&P 500 Total Return Index – The S&P 500 Index is one of the most widely used benchmarks of U.S. equity performance. The performance of the S&P 500 Index does not account for any management fees, incentive compensation, commissions or other expenses that would be incurred pursuing such strategy. Total return provides investors with a price-plus-gross cash dividend return. Gross cash dividends are applied on the ex-date of the dividend.

Bloomberg Barclays Aggregate Bond Index – The Barclays Aggregate Bond Index covers the U.S. dollar-denominated, investment-grade, fixed-rate, taxable bond market of SEC-registered securities. The index includes bonds from the Treasury, Government-Related, Corporate, MBS (agency fixed-rate and hybrid ARM pass-throughs), ABS, and CMBS sectors.

Barclay CTA Index – The Barclay CTA Index is a leading industry benchmark of representative performance of commodity trading advisors. There are currently 541 programs included in the calculation of the Barclay CTA Index for 2018. The Index is equally weighted and rebalanced at the beginning of each year.

MSCI World Index. The MSCI World Index is a free float adjusted market capitalization weighted index that is designed to measure the global equity market performance of developed markets. The term "free float" represents the portion of shares outstanding that are deemed to be available for purchase in the public equity markets by investors. The performance of the Index is listed in U.S. dollars and assumes reinvestment of net dividends.

The **S&P GSCI Commodity Index** is a composite index of commodity sector returns, representing an unleveraged, long-only investment in commodity futures that is broadly diversified across the spectrum of commodities.

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