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Looking Under the Hood of Variance¹

“Semi-variance seems more plausible than variance as a measure of risk, since it is concerned only with adverse deviations.”

— Harry Markowitz, Nobel Prize winner in economics.

Sometimes investors focus on a single statistic and miss the overall value of an investment that comes from a more nuanced analysis. This may be the case with volatility. There is both good and bad volatility. Investors should be more concerned about downside risk than volatility associated with high positive returns. In fact, the semivariance, the variance associated with half of the distribution, which in this case is the downside, may better correlate with utility or investor preference functions that represent preferences of investors who are more risk averse.² If you break down variance, its parts may tell you more about the behavior of a manager's investment style than a single variance number. Higher volatility may not be bad if it comes when returns are positive. In fact, investors should expect higher (lower) upside (downside) volatility as part of the value-added from a manager.

We measure upside and downside variance for our JWH managed futures programs to show whether there is a difference in the volatility when our portfolios are generating positive versus negative returns. We observe a significant difference in the upside and downside variance for three of our largest JWH programs. Historically, volatility for JWH managed futures programs is associated with periods of higher returns and lower volatility which may occur during or just after unprofitable months.

We also show the impact on the return-to-risk ratio by comparing Sharpe and Sortino ratios. The Sharpe ratio measures risk through the regular standard deviation, while the Sortino Ratio chooses downside risk. Using the Sortino Ratio, we observe JWH programs historically feature significant upside profit potential with lower downside risk than found with Sharpe ratios.

There are reasonable explanations of why this difference in return behavior occurs based on the style of management.

What will Cause a Difference in Upside and Downside Volatility?

The reasons for the difference between upside and downside volatility are actually straightforward and consistent with the management practices of a systematic manager. If there are changes in price that cause negative returns, risk management systems, primarily through the use of stops, will usually attempt to constrain the overall risk in the portfolio. As more markets get stopped out, there will be a reduction in risk or a reversal in positions. There is a limit to the downside losses that can occur both for individual positions and the portfolio in aggregate. Hence, there will be lower volatility when returns are lower. Because profitable positions are held when markets trend, there should be expected higher upside volatility when programs are making money. The systematic style of hanging onto winners and selling losers will create asymmetry in the variance of the portfolio.

In the case of any single market or program, when there is a reversal in price trend, the

stop-loss levels will become a binding constraint to limit losses. Generally, positions will be changed or closed out when the stop-loss level is hit. The actual losses will be related to market conditions. For our JWH two-phase models, there is a reversal in positions. With our JWH three-phase models, hitting stops will usually move position exposures to neutral, and there is a decrease in the program leverage.

We may expect that the three-phase non-linear programs have greater differences between upside and downside volatility because of the possibility of being in a neutral phase. If a market loses a position and moves to the neutral phase, the decline in leverage will reduce volatility. Additionally, for our three-phase models, dynamic position sizing will also cause a greater difference in upside versus downside volatility. When there are very strong trends or strong signals relative to the volatility in the market, there will be greater position sizes, which mean there will be higher leverage in the program. When there is higher

leverage associated with greater opportunities, there will be higher program volatility. Similarly, if there are poorer opportunities, there will be corresponding decreasing positions and leverage, which should be associated with lower volatility during those months that are negative.

How do you Measure Upside and Downside Volatility?

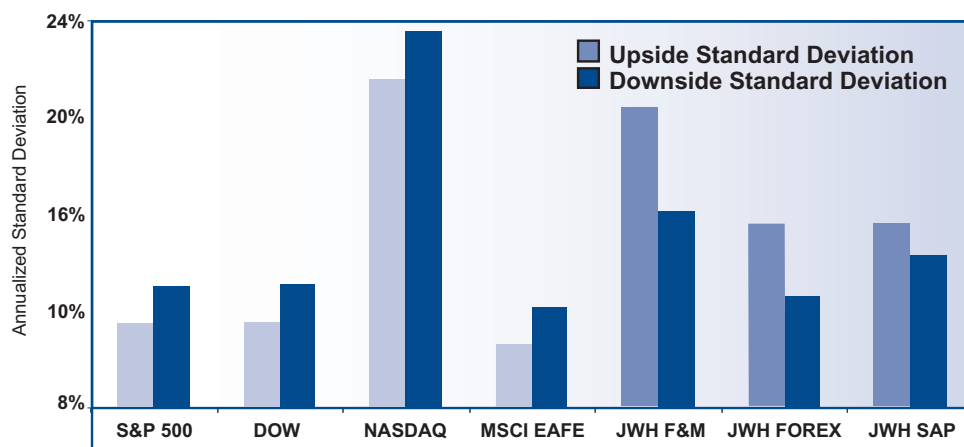
There is no single agreed-upon measure for the break-down or decomposition of volatility.³ Our preferred measure is the semi-variance which looks at the variance above and below the mean of the return series. If the mean return is positive, the downside semi-variance will include months where the return is actually positive. This may not capture exactly what investors mean by downside risk, but it has the nice additive property that the upside variance and downside variance sum to the total variance of a program. Other measures will not have this property. Note that this property does not hold with standard deviations, which are the square root of

variance. The semivariance is a good statistic because it actually combines two measures into one: variance and skewness. If there is no skewness, or bias to the probability of being in either tail of the distribution there should be no difference in the upside and downside volatility.⁴

Figure 1 shows the semi-deviation around the mean return for three of our largest JWH programs, the Strategic Allocation Program (SAP), the Financial and Metals (F&M) Portfolio program and the International Foreign Exchange program (Forex), since the inception of our flagship SAP.⁵ The difference between the upside and downside volatility is in some cases fairly large. If the return distribution were perfectly symmetric, the downside and upside volatility would be the same. The behavior of these programs is not symmetric and seems consistent with our findings of positive skewness. There is a higher probability of being in the right-hand tail relative to a normal distribution.

Figure 1: Downside Standard Deviations are Lower than Upside Standard Deviation for JWH Programs

(July 1996 - February 2004)



Sources: Standard & Poors, JWH

Sharpe Ratio and Sortino Ratio

The Sharpe ratio is the excess returns over the risk-free rate of an asset divided by the standard deviation of the asset. It tells us the excess return per unit of risk, yet does not focus on the downside risk of the investment. The Sortino ratio extends the concept of risk-adjusted return through the use of downside risk. First, it evaluates the excess return by taking the difference of the program return over a target return or a minimum acceptable return. Second, rather than focusing on the risk of deviating from the mean return, which varies across the programs, the Sortino ratio chooses the downside risk of

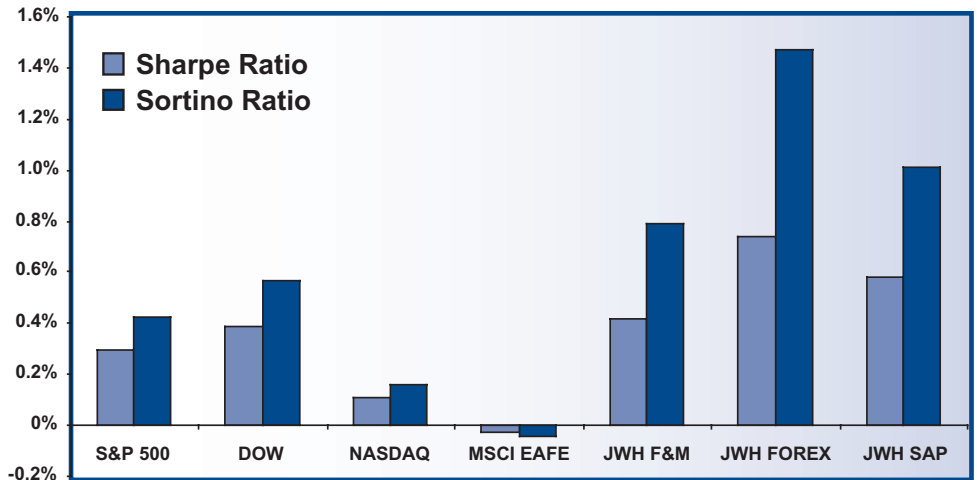
falling below a common target return level. The Sortino ratio is calculated as the ratio of this “revised” excess return over the downside deviation. There should be a preference for the asset that has higher excess return and less downside risk relative to another asset with the same overall volatility and target return.

If there is a change in the rankings of downside risk or the target return for a number of programs, there will also be a change in the rankings of the Sortino ratios relative to the Sharpe ratios. Generally, the Sharpe ratio will be the most effective and easy measure for looking at the return-to-risk

ratio, except in the case of asymmetric distributions or certain preference of the minimum acceptable return level. Given the tendency of managed futures funds to have pay-offs that look more like options, there will be generally higher Sortino ratios for managed futures relative to management styles that do not follow a similar strategy.

In figure 2, we notice that JWH managed futures programs have historically had Sharpe ratios that are similar to traditional equity Sharpe ratios. However, when we evaluate those programs through downside risk using the risk-free rate as the minimum acceptable rate of return, there is a marked change in the Sortino ratios. As investors increase their minimum acceptable level of return, all JWH programs feature higher Sortino ratios than traditional equity returns. Simply put, for the same downside risk, JWH programs historically have higher upside profit potential.

Figure 2: JWH Programs and Selected Indices vs. the Best and Worst 57 S&P 500® Months (January 1990 - March 2004)



Sources: Standard & Poors, the Federal Reserve and JWH

The risk free rate equals 3.78. It is calculated as the average 3-month T-bill rate during the respective period.

Conclusions

A close look at JWH programs shows that historically there has been less downside volatility than upside volatility. Downside volatility may be a more effective measure for portfolio risk with our programs, where we try to limit our downside through stop-losses on all positions and hold trends as long as possible. The impact of looking at downside risk shows up when comparing Sharpe ratios with Sortino ratios. The lower downside volatility means that the return to downside risk is higher than would be the case

with conventional return-to-risk measures and may be more representative of what investors would prefer.

Mark S. Rzepczynski, Ph.D.
President &
Chief Investment Officer

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Appendix 1: Calculation of Downside Risk

Given a return series $R = \{R_1, R_2, \dots, R_N\}$ and a target return level M , we have

$$\text{Upside Variance: } V_{UP}^M = E[\max(R - M, 0)]^2 = \frac{1}{N} \sum_{i=1}^N [\max(R_i - M, 0)]^2,$$

$$\text{Downside Variance: } V_{DOWN}^M = E[\min(R - M, 0)]^2 = \frac{1}{N} \sum_{i=1}^N [\min(R_i - M, 0)]^2,$$

$$\text{Upside Standard Deviation: } \sigma_{UP}^M = \sqrt{V_{UP}^M},$$

$$\text{Downside Standard Deviation: } \sigma_{DOWN}^M = \sqrt{V_{DOWN}^M}.$$

$$\text{If, then the regular variance can be calculated as } V^{M=E(R)} = E[R - E(R)]^2 = \frac{1}{N} \sum_{i=1}^N [R_i - E(R)]^2,$$

$$\text{We note that } V^{E(R)} = V_{UP}^{E(R)} + V_{DOWN}^{E(R)}.$$

Footnotes

¹ Mark Rzepczynski, President and Chief Investment Officer, Ph. D., and Wei Feng, Research Analyst.

² See Javier Estrada "A Note on Mean Semi-Variance Behavior" Finance Letter 2003 2003:1 pp 9-14. He compares the mean variance framework against the mean semi-variance approach to determine which is more correlated with different utility functions.

³ Some analysts look at the variance of positive returns and the variance of negative returns as the measure of downside and upside risk. Others calculate the variance of returns below the mean but divide by the number of below-mean returns and not the total sample size. Both are technically incorrect and will not provide an effective measure of downside risk. Please see the appendix for the correct measure.

⁴ Note: If the distribution is symmetric, two times the semivariance will equal the variance.

⁵ We look at variance because it has the nice property, whereby the downside and upside semivariance will equal the total variance of the returns series. If you look at the standard deviations, this property will not exist because the square root of the upside variance and the square root of the downside variance is not the same as the square root of the sum of both variances.

JWH Financial and Metal Portfolio (F&M)

The annual performance for 1984 is for the period from October through December 1984. Commencing in August 1992, there was an approximate 50% reduction in position size in relation to account equity in the Financial and Metals Portfolio. The timing of additions and withdrawals materially inflate the 1987 rate of return. The three accounts that were open for the entire year of 1987 achieved rate of return of 138%, 163% and 259%.

JWH Strategic Allocation Program (SAP)

From inception to May 7, 1998, the performance of the individual program components are also included in the composite performance of each individual investment program.

All Index data is obtained from Standard & Poor's Fund Services (2004) (1-800-596-5323 - <http://www.micropal.com>). JWH cannot be responsible for errors or omissions from this source. Figures are calculated using the monthly rates of return on a compounded basis for the periods shown, and are not a sum or average of the annual rates of return.

S&P 500® is a trademark of The McGraw-Hill Companies. The S&P 500® Index tracks the stock performance of 500 U.S. companies across four industry groups. It is a market-value weighted index with each stock's weight in the index proportionate to its market value.

Morgan Stanley Capital International (MSCI): This Firm publishes a number of well-known benchmarks. **The Morgan Stanley Capital International MSCI EAFE Index** is a market capitalization weighted equity index composed of approximately 1,000 companies in 20 developed market countries.

The HFR Indices (HFRX) consist of eight primary hedge fund strategy indices and an asset-weighted Global Index, each providing a statistical-pure proxy to the universe of Hedge Funds. The individual strategy

indices and the overall composite (Global Index) have each been designed to offer full transparency, daily re-pricing, consistent fund selection is asset-weighted and rebalanced on a quarterly basis, stringent risk management, and strict reporting standards.

NASDAQ Composite Index: A market-value weighted index of all common stocks listed on NASDAQ.

Dow Jones Industrial Average (DJIA): Measure of the performance of the collection of 30 "blue-chip" companies, considered the leaders of the market.

Lehman Brothers Aggregate Bond Index: A benchmark index comprised of the Lehman Brothers Government/Corporate Bond Index, Mortgage-Backed Securities Index, and Asset-Backed Securities Index, including securities that are of investment-grade quality or better, have at least one year to maturity, and have an outstanding par value of at least \$100 million.

Salomon Brothers World Government Bond Index is an unmanaged index on a U.S. dollar total return basis with all dividends reinvested and is comprised of government bonds from 14 countries.

Correlation coefficient: A standardized statistical measure of the dependence of two random variables, defined as the covariance divided by the standard deviations of two variables.

Correlation: Statistical measure of the degree to which the movements of two variables (stock/option/convertible prices or returns) are related.

Sharpe ratio: A measure of a portfolio's excess return relative to the total variability of the portfolio.

Standard deviation: The square root of the variance. A measure of dispersion of a set of data from its mean.

Although offering potential benefits, an investment with JWH is speculative, involves a high degree of risk, and is designed only for sophisticated investors who are able to bear the loss of more than their entire investment. Some, but not all, of the risk factors that should be considered prior to making an investment decision include: forward contract trading, which is not afforded the regulatory protection of exchanges or the Commodity Exchange Act and may subject an investor to greater risks than trading on US exchanges; trading on non-US futures exchanges, which are not regulated by any US government agency and may involve certain risks not applicable to trading on US exchanges; currency risks associated with foreign-denominated margin deposits; possible failure of brokerage firms or futures exchanges; illiquid markets, which may make it more difficult to establish or liquidate a position at a given price. For more details on these and other risk factors, please refer to JWH's current disclosure document.

This newsletter does not constitute an offer to sell or a solicitation for any managed account and cannot disclose all risks and significant elements of the JWH investment programs. Solicitations can only be made with a JWH disclosure document, which is available at the offices of JWH upon request. Further details of past performance and definitions of terms used to state past performance is presented in the disclosure document.

An investment with JWH is speculative, involves a high degree of risk, and is designed only for sophisticated investors who are able to bear the loss of more than their entire investment. Read and examine the disclosure document before seeking JWH's services.

JOHN W HENRY & COMPANY

INC

John W. Henry & Company, Inc.

301 Yamato Road, Suite 2200
Boca Raton, Florida 33431-4931
561.241.0018
888.JWHENRY (toll free)
Fax: 561.994.6887

E-mail: investor@jwhmail.com

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