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## RADFORD REVIEW

### Relative TSR: If And When to “Risk-Adjust” Returns?

Performance-based equity awards measuring Relative Total Shareholder Return (Relative TSR or RTSR) against a comparator group or index are now among the fastest growing forms of employee equity compensation at Fortune 1000 companies. According to our research, over 500 companies have adopted Relative TSR programs, with more than 200 new plans coming online since 2010.<sup>1</sup> Under such plans, payouts may be determined in several ways; based on one's rank within a comparator group, or by falling into a specific quartile against an index.

Although we are steadfast supporters of including Relative TSR programs in long-term equity portfolios, due to its objectivity and alignment with shareholders, there are certainly a few points of criticism to consider before moving forward with Relative TSR performance measures. These concerns include:

- > **Defining an Appropriate Comparator Group** - The Achilles heel of Relative TSR programs (and all other relative measures for that matter) is the development of an appropriate group of comparators to measure relative performance against. Considering a multitude of variables like company size, industry landscape, business model, and other similar characteristics make choosing the comparator group a difficult process for Management and the Board. Additionally, many management teams feel their business model is unique, and as such, comparator companies do not face their distinctive set of challenges;
- > **The Lottery Ticket Effect** – Management may view TSR as an arbitrary measure, which is subject to the vagaries of market timing and forces beyond their control. If, for example, the comparator group represents a widely diverse group of sectors, markets, and expertise, then Management is more likely to believe it has little or no influence on payout outcomes. In sum, with a limited line of sight over outcomes, the award may be perceived as a lottery ticket;
- > **Incentive for Additional Risk** – In order to achieve stock price appreciation, management must take on risk. The bigger the risk, the more likely that Relative TSR outcomes will be at the extremes. Therefore, the program design may be inadvertently rewarding Management for taking on excessive risk.

<sup>1</sup> All research can be found at our free web portal at [www.RelativeTSR.com](http://www.RelativeTSR.com)

*The most widely recognized risk-adjusted performance metric is the Sharpe Ratio*

However, there are appropriate means for addressing these concerns. One solution to these challenges is to “risk-adjust” the TSRs by utilizing a total shareholder return *per unit of risk* calculation. In the following Radford Review, we explore the process of risk-adjusting returns.

### Per Unit of Risk

Financial economists measure “beta” as the sensitivity of stock price movements to the market as a whole. A stock with a beta of 1.00 is assumed to move by the same percentage as the market as a whole; if the market rises 10%, the stock price is expected to also rise by 10%. A stock with a beta greater than 1.00 is considered riskier than the market. A beta of 1.50 means that the stock would increase by 15% if the market rises by 10%. Conversely, if the market falls by 10%, the stock would fall by 15%.

With respect to Relative TSR plans, the comparison group may consist of companies with a higher beta than your own, which places them in an advantage when comparing TSRs. In other words, at various points in time, some portion of these companies is almost certain to rank higher than your own. An indicator of this is to compare your own beta to the betas of the comparator companies. If the comparators’ betas are higher, then they are riskier and some are more likely to outperform your company over a given period.

One possible solution to this situation is commonly found in the financial community. For example, fund managers are generally evaluated using “risk-adjusted” methods. This means a fund achieving a 10% return while taking on minimal risk is perceived to have done better than a similar fund with a 10% return and a greater amount of risk. There are several well-recognized statistical metrics for adjusting returns for risk, such as the **Sharpe Ratio**, the **Treynor Ratio**, and **Jensen’s Alpha**. Each of these approaches effectively normalizes returns based on the risk involved. In this article, we discuss the Sharpe Ratio, which is arguably the most widely recognized risk-adjusted performance metric.

### The Sharpe Ratio

In 1966, Nobel laureate William F. Sharpe developed what is now known as the Sharpe ratio. The Sharpe ratio indicates whether a portfolio’s returns are due to smart investment decisions or as a result of excess risk. This measurement is very useful because although one portfolio or fund can reap higher returns than its peers, it is a good investment only if those higher returns are not a result of excessive risk-taking. A higher Sharpe ratio for a portfolio translates to stronger risk-adjusted performance.

The formula is a measure of the excess stock return divided by a measure of risk. The risk factor is based on how volatile the share has been relative to some common reference investment (e.g., usually the stock market as a whole). It scales back the returns of riskier stocks proportionally and boosts the returns of less risky stocks, to provide a more level playing field.

Calculating the Modified Sharpe Ratio<sup>2</sup> using historical data can be calculated at any point in time. First, calculate the incremental excess return for each company “C” compared against the market “M,” by comparing the daily returns,  $S_n^C$ , of days 1 through day N during the entire Performance Period. The average of the excess returns can be described as  $\mu$  for each Company C.

$$\Delta R_{n-1}^C = \ln\left(\frac{S_n^C}{S_{n-1}^C}\right) - \ln\left(\frac{S_n^M}{S_{n-1}^M}\right) \quad \text{and} \quad \mu = \frac{\sum (\Delta R_{n-1}^C)}{n}$$

<sup>2</sup> In the case of bear markets, the traditional Sharpe Ratio may have opposite effects on the ranking of TSRs. Since most companies’ excess return is negative, a company with a higher total risk (larger standard deviation) would exhibit a higher (less negative) Sharpe Ratio while another company with a lower risk (smaller standard deviation) would have a lower (more negative) Sharpe Ratio, resulting in a reversed ranking of performance. As a solution to this problem, a [modification](#) has been made to the formula of Sharpe Ratio. Compared with the regular Sharpe Ratio, the modified Sharpe Ratio made one minor change which adds an exponent to the denominator of the original formula by William Sharpe.  $\mu$  is excess return divided by the absolute value of excess return.

The Modified Sharpe Ratio can now be calculated for each company C in the comparator group.

$$\text{Modified Sharpe Ratio} = \frac{\mu \times 250}{(\sqrt{\text{var}(\Delta R_{n-1}^C)} \times \sqrt{250})^{\mu/|\mu|}}$$

### Examples using a Single Performance Period

To illustrate the effect of the Sharpe Ratio, we have compared rankings during a performance period ranging from January 1, 2008 through December 31, 2010. Specifically, we compared the performance ranking using a traditional TSR calculation to the ranking based upon the Sharpe Ratio using the following two comparator groups:

*Comparator Group 1:* Philadelphia Semiconductor Index – This Index is representative of a single industry, and is generally very volatile relative to other Indexes. Further, this Index is easy to conceptualize given that it is comprised of less than 30 constituents, and the components are well correlated.

*Comparator Group 2:* The Standard & Poor's 500 – This Index represents a broad collection of industries with varying business cycles. The majority of companies with Relative TSR plans who do not develop a custom peer group rely on the broader S&P 500 Index.

Chart 1: Summary Statistics

| 1/1/2008 – 12/31/2010 Performance Period     | Comparator Group 1 | Comparator Group 2 |
|--|--------------------|--------------------|
| Starting Companies                           | 28                 | 500                |
| Ending Companies <sup>1</sup>                | 26                 | 420                |
| Average Volatility                           | 54.12%             | 48.07%             |
| Average Correlation Coefficient <sup>2</sup> | .7525              | .6874              |
| Average TSR                                  | 32.91%             | 7.72%              |

- 1 Of the 28 and 500 current constituents of the Philadelphia Semiconductor Index and the S&P 500 respectively, 26 and 420 of the group have stock prices dating back to 1/1/1998, the beginning of our long-term research study.
- 2 The average correlation coefficient is determined as the average correlation coefficient of each company to the index as a whole.

**Calculating the Sharpe Ratio using historical data is straightforward and can be calculated at any point in time.**

The chart below summarizes the TSR and Sharpe Ratio ranking for the Philadelphia Semiconductor Index.

Chart 2: Philadelphia Semiconductor Index

| Ticker | Volatility    |                    | Correlation | TSR    | Rankings |                         |
|--------|---------------|--------------------|-------------|--------|----------|-------------------------|
|        | Against Index | Company Volatility |             |        | TSR      | Sharpe Adjusted Ranking |
| CRUS   | 59.7%         | 70.8%              | 53.8%       | 218.3% | 1        | 3                       |
| VECO   | 59.4%         | 74.4%              | 60.9%       | 162.9% | 2        | 6                       |
| CREE   | 43.6%         | 56.5%              | 63.7%       | 139.7% | 3        | 2                       |
| ALTR   | 22.8%         | 41.8%              | 84.2%       | 97.8%  | 4        | 1                       |
| BRCM   | 29.8%         | 50.9%              | 81.3%       | 67.0%  | 5        | 5                       |
| TSM    | 29.3%         | 44.1%              | 75.7%       | 50.9%  | 6        | 7                       |
| SNDK   | 60.6%         | 78.2%              | 65.3%       | 50.3%  | 7        | 14                      |
| XLNX   | 20.6%         | 39.3%              | 86.0%       | 48.4%  | 8        | 4                       |
| TER    | 33.7%         | 57.3%              | 82.2%       | 39.6%  | 9        | 8                       |
| MRVL   | 34.1%         | 56.0%              | 80.2%       | 39.2%  | 10       | 10                      |
| MKSI   | 33.5%         | 49.1%              | 73.3%       | 31.4%  | 11       | 12                      |
| POWI   | 38.2%         | 47.7%              | 62.6%       | 27.3%  | 12       | 16                      |
| HITT   | 30.9%         | 41.7%              | 70.5%       | 26.0%  | 13       | 13                      |
| LLTC   | 19.6%         | 35.4%              | 86.3%       | 23.0%  | 14       | 9                       |
| LRCX   | 26.9%         | 51.1%              | 85.5%       | 21.5%  | 15       | 15                      |
| NVLS   | 21.0%         | 43.9%              | 87.9%       | 21.4%  | 16       | 11                      |
| AMD    | 53.2%         | 70.6%              | 66.9%       | 14.6%  | 17       | 17                      |
| TXN    | 21.0%         | 37.6%              | 84.9%       | 6.6%   | 18       | 18                      |
| RBCN   | 88.8%         | 97.2%              | 40.7%       | -4.1%  | 19       | 22                      |
| INTC   | 21.4%         | 39.8%              | 85.1%       | -9.1%  | 20       | 19                      |
| KLAC   | 22.1%         | 46.5%              | 88.2%       | -11.8% | 21       | 20                      |
| AMAT   | 23.9%         | 44.5%              | 84.4%       | -14.5% | 22       | 21                      |
| STM    | 31.8%         | 49.0%              | 76.1%       | -18.9% | 23       | 23                      |
| NSM    | 25.2%         | 46.1%              | 83.7%       | -31.3% | 24       | 24                      |
| NVDA   | 45.3%         | 65.2%              | 73.3%       | -53.3% | 25       | 25                      |
| WFR    | 50.8%         | 72.2%              | 74.0%       | -87.2% | 26       | 26                      |

The biggest benefactors of the Sharpe Ratio are the companies with lower volatilities.

The Sharpe Ratio could be the difference between paying out at Target or paying out at the Maximum.

The changes in rankings can appear *de minimus* in the aggregate, with rankings colored in Red or Green if the company was negatively or positively impacted by the use of the Sharpe Ratio. The correlation between the TSR and Sharpe ranking above is 0.94 which implies they are very similar. However, a closer review reveals that [Altera \(ALTR\)](#), for example, moves from #4 to the #1 position after factoring a lower level of volatility compared against the market.

The change can be even greater when examining the details of the S&P 500 (summarized in Appendix A). Consider S&P 500 constituents [United Technologies \(UTX\)](#) and [3M \(MMM\)](#). Both firms had solid performance over the three-year performance period with approximately 13% and 14% returns, respectively. These returns ranked #178 and #173, respectively, or approximately at the 58<sup>th</sup> percentile. However, both firms have relatively low volatilities (approximately 30%) over the same three-year period while the average volatility of the S&P during the period was 48%. The risk-adjusted returns using the Sharpe Ratio resulted in rankings in the 80<sup>th</sup> percentile, or #88 and #94 respectively. This could be the difference between paying out at target and the maximum for most program designs.

## **Long-Term Research on the Sharpe Ratio: Examples using Multiple Overlapping Performance Periods**

To further illustrate the effect of the Sharpe Ratio, we also compared the hypothetical rankings of all companies included in the S&P 500 Index over a 13-year period, between 1998 and 2010. Using three-month increments, we divided the 13-year period into 41 periods. In Appendix B, we summarize several long term statistics when comparing the performance ranking based upon both a traditional TSR calculation as well as a Sharpe Ratio.

From this data, we are able to generate the following notable items:

- > With a base of 41 measurement periods, a total of 17,220 surviving three-year performance periods were studied, with 420 companies in each measurement period (1/1/1998-12/31/2010).
- > The correlation between traditional TSR rankings and Sharpe Ratio rankings is highly significant. Note that, among the total 41 periods, 35 periods have correlations higher than .94. The period with the lowest correlation was still above .90. See Chart 3 of Appendix B.
- > The periods that had the greatest change (the Average Delta) between the TSR ranking and the Sharpe Ratio ranking occurred in the periods with more significant volatility. See Chart 3 of Appendix B.
- > The more volatile companies generally have the larger Absolute Change, as one would expect. Note that on Chart 4 of Appendix B for example, the companies with volatilities between 90%-100% on average changed by 45 positions in the rankings.
- > The biggest benefactors of the Sharpe Ratio are the companies with lower volatilities, as they were frequently pushed up into higher Percentile Ranking buckets. Note that on Chart 4 of Appendix B for example, the companies with volatilities less than 30% frequently moved up into the top quartile of the Sharpe Ratio rankings (a total of 10.1% of companies with less than 30% volatilities using the Sharpe ratio, compared with 7.0% of those using TSR).
- > The companies with a lower volatility (below 25th percentile) increased their average ranking by 22 places (from #208 to #186) while firms with a relatively high volatility (above 75th percentile) had their average ranking drop by 34 places. The average rankings of companies whose volatilities are in the middle range barely changed (only one place movement on average). See Chart 5 of Appendix B.

## **The Downsides of Using Risk-Adjusted Returns**

Attempts to refine TSR measurement with complex financial techniques may only lead to greater cynicism about the measure from executives. Ultimately, long-term incentives only have value to the extent they are appreciated, understood and drive desired behaviors. We believe using a comparator group of comparable industries and risk will be sufficient to [calculate TSR using traditional methodologies](#). However, there are situations where risk-adjustment is warranted for the design of the award and can lead to a stronger program overall. For example, we believe it would be appropriate to use a risk-adjusted TSR if a company is using a broad index (e.g., S&P 500 or the Russell 2000) where there is a wide diversity of industries, volatilities, and market capitalizations. Applying risk adjusted returns can level the playing field, enabling more effective and valid cross-industry comparisons.

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## Conclusion

Two over-arching forces would seem to be driving toward expanded consideration of risk-adjustment methods like the Sharpe Ratio. First, institutional investors are increasing their emphasis on pay for performance, and long-term incentive grants are a key area of scrutiny. Simply put, institutional shareholders now demand that incentive compensation be aligned with long-term shareholder returns. Concurrently, federal regulators are asking for incentive compensation to be risk-adjusted as a result of the financial crisis of 2008 and 2009. Together, these forces place pressure on companies to think more creatively about the design of their long-term incentives. The use of the Sharpe Ratio or other recognized market-based statistical ratios is a valid and objective approach for developing *ex-ante* risk-adjustments.

Institutional shareholders and regulators would be wise to consider this sort of explicit linking of risk and compensation. Risk-adjusted TSR may prove to have a higher alignment with shareholder value creation than more simplistic, non-risk-adjusted TSR measures. Since institutional managers are evaluated using these same approaches, why wouldn't senior management also be evaluated using comparable techniques?

As performance plan designs continue to evolve in the United States, methodologies are progressing to better measure and quantify performance. In this Radford Review, we highlight just one more-objective approach for risk-adjusting performance equity based upon Relative TSR. Further, we believe the methodology presented can be easily calculated and transparent to your senior management.

To learn more about this topic, please contact your Radford consultant and ask how Radford can help your organization use risk-adjusted TSR.

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**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500**

| Ticker | Volatility    | Company    | Correlation | TSR     | Rankings |        |
|--------|---------------|------------|-------------|---------|----------|--------|
|        | Against Index | Volatility |             |         | TSR      | Sharpe |
| FFIV   | 42.40%        | 51.65%     | 57.14%      | 381.90% | 1        | 1      |
| FDO    | 41.23%        | 42.71%     | 40.20%      | 180.72% | 2        | 8      |
| ROST   | 29.26%        | 37.84%     | 65.12%      | 161.88% | 3        | 2      |
| F      | 60.71%        | 72.02%     | 55.45%      | 154.39% | 4        | 57     |
| AZO    | 27.34%        | 32.75%     | 62.56%      | 134.57% | 5        | 3      |
| CTSH   | 33.11%        | 49.56%     | 75.89%      | 127.40% | 6        | 7      |
| NTAP   | 36.99%        | 49.69%     | 67.06%      | 123.23% | 7        | 13     |
| RHT    | 35.92%        | 47.40%     | 65.27%      | 121.60% | 8        | 12     |
| HAS    | 29.29%        | 36.71%     | 63.23%      | 104.13% | 9        | 6      |
| ALTR   | 30.36%        | 41.84%     | 68.89%      | 97.79%  | 10       | 11     |
| BIG    | 44.35%        | 54.91%     | 59.08%      | 96.01%  | 11       | 52     |
| WPI    | 26.26%        | 29.79%     | 61.71%      | 92.15%  | 12       | 5      |
| DRI    | 36.48%        | 48.70%     | 66.39%      | 89.49%  | 13       | 27     |
| LTD    | 38.73%        | 53.90%     | 71.18%      | 89.15%  | 14       | 37     |
| AMZN   | 39.27%        | 51.22%     | 64.42%      | 87.01%  | 15       | 42     |
| ORLY   | 30.30%        | 37.76%     | 62.26%      | 86.89%  | 16       | 14     |
| CMI    | 44.16%        | 63.32%     | 77.69%      | 86.83%  | 17       | 61     |
| AN     | 46.78%        | 59.97%     | 64.06%      | 86.26%  | 18       | 73     |
| COH    | 37.87%        | 53.59%     | 72.59%      | 84.67%  | 19       | 38     |
| RL     | 33.86%        | 49.15%     | 73.48%      | 82.13%  | 20       | 24     |
| CTXS   | 33.19%        | 45.23%     | 67.94%      | 79.79%  | 21       | 22     |
| PXD    | 46.21%        | 63.81%     | 73.89%      | 77.90%  | 22       | 81     |
| BBBY   | 31.43%        | 43.47%     | 69.09%      | 73.31%  | 23       | 21     |
| GWV    | 20.17%        | 31.62%     | 78.81%      | 71.31%  | 24       | 4      |
| SBUX   | 32.20%        | 46.02%     | 71.68%      | 68.68%  | 25       | 33     |
| CERN   | 33.27%        | 37.86%     | 54.18%      | 67.03%  | 26       | 39     |
| BRCM   | 39.57%        | 50.89%     | 62.99%      | 66.97%  | 27       | 69     |
| AAPL   | 30.56%        | 42.10%     | 68.84%      | 65.55%  | 28       | 30     |
| EQR    | 51.67%        | 69.83%     | 73.93%      | 65.47%  | 29       | 119    |
| TJX    | 26.37%        | 35.85%     | 69.35%      | 65.19%  | 30       | 16     |
| CHRW   | 26.73%        | 38.64%     | 72.44%      | 63.48%  | 31       | 17     |
| FAST   | 29.16%        | 43.50%     | 74.36%      | 61.61%  | 32       | 28     |
| LEG    | 28.02%        | 42.33%     | 75.04%      | 59.18%  | 33       | 25     |
| SHW    | 28.50%        | 35.99%     | 64.17%      | 59.09%  | 34       | 29     |
| KMX    | 43.68%        | 56.79%     | 64.98%      | 58.84%  | 35       | 102    |
| ABC    | 27.43%        | 29.34%     | 57.60%      | 58.41%  | 36       | 23     |
| INTU   | 26.14%        | 35.47%     | 69.42%      | 58.37%  | 37       | 19     |
| CSX    | 30.89%        | 46.64%     | 75.73%      | 57.82%  | 38       | 46     |
| UNP    | 28.91%        | 42.09%     | 72.67%      | 57.43%  | 39       | 34     |
| SWK    | 24.23%        | 41.68%     | 81.91%      | 57.00%  | 40       | 15     |
| BLL    | 21.37%        | 33.49%     | 77.97%      | 56.99%  | 41       | 9      |
| MEE    | 70.88%        | 88.57%     | 69.74%      | 56.59%  | 42       | 178    |
| MAT    | 31.13%        | 39.69%     | 63.33%      | 55.46%  | 43       | 50     |
| EMN    | 29.62%        | 45.79%     | 77.06%      | 54.48%  | 44       | 44     |
| MYL    | 34.81%        | 43.75%     | 61.10%      | 52.23%  | 45       | 75     |
| HOT    | 44.83%        | 64.15%     | 77.86%      | 52.15%  | 46       | 117    |
| FMC    | 36.83%        | 54.56%     | 76.84%      | 52.01%  | 47       | 86     |
| PSA    | 38.60%        | 57.65%     | 78.82%      | 51.59%  | 48       | 95     |
| TIF    | 36.83%        | 52.41%     | 72.72%      | 50.65%  | 49       | 90     |
| SNDK   | 68.22%        | 78.22%     | 50.29%      | 50.32%  | 50       | 184    |

**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company<br>Volatility | Correlation | TSR    | Rankings |        |
|--------|---------------|-----------------------|-------------|--------|----------|--------|
|        | Against Index |                       |             |        | TSR      | Sharpe |
| CCE    | 35.25%        | 42.29%                | 57.09%      | 49.29% | 51       | 84     |
| HD     | 24.97%        | 38.67%                | 76.37%      | 48.82% | 52       | 26     |
| XLNX   | 28.31%        | 39.30%                | 69.73%      | 48.42% | 53       | 48     |
| IBM    | 19.33%        | 28.01%                | 78.21%      | 48.30% | 54       | 10     |
| CVC    | 37.49%        | 51.42%                | 69.25%      | 48.18% | 55       | 97     |
| ESRX   | 30.50%        | 40.11%                | 65.67%      | 47.78% | 56       | 60     |
| JBL    | 52.00%        | 67.07%                | 66.80%      | 47.03% | 57       | 147    |
| CAT    | 28.46%        | 45.61%                | 79.21%      | 45.72% | 58       | 53     |
| MCD    | 22.36%        | 25.02%                | 68.71%      | 45.29% | 59       | 18     |
| DOV    | 23.54%        | 40.74%                | 82.00%      | 42.05% | 60       | 32     |
| NKE    | 25.55%        | 37.41%                | 73.42%      | 41.91% | 61       | 47     |
| AKAM   | 45.44%        | 57.88%                | 62.85%      | 41.72% | 62       | 140    |
| ORCL   | 23.71%        | 36.46%                | 76.26%      | 41.32% | 63       | 35     |
| OKE    | 24.87%        | 40.25%                | 78.71%      | 41.22% | 64       | 40     |
| VFC    | 27.62%        | 38.48%                | 70.13%      | 40.95% | 65       | 59     |
| CTL    | 28.89%        | 35.59%                | 62.53%      | 40.84% | 66       | 67     |
| Q      | 44.03%        | 54.65%                | 59.38%      | 40.15% | 67       | 136    |
| SRCL   | 26.40%        | 30.09%                | 61.68%      | 39.90% | 68       | 54     |
| SJM    | 27.85%        | 26.81%                | 52.84%      | 39.80% | 69       | 64     |
| TER    | 41.40%        | 57.34%                | 71.77%      | 39.56% | 70       | 129    |
| YUM    | 23.84%        | 35.52%                | 74.83%      | 38.38% | 71       | 43     |
| GAS    | 22.96%        | 31.60%                | 72.49%      | 37.98% | 72       | 36     |
| NSC    | 26.78%        | 42.04%                | 77.29%      | 37.46% | 73       | 63     |
| PPG    | 20.73%        | 38.32%                | 84.29%      | 37.40% | 74       | 20     |
| GIS    | 26.53%        | 22.46%                | 52.58%      | 37.31% | 75       | 62     |
| NFX    | 45.52%        | 62.26%                | 72.22%      | 36.99% | 76       | 149    |
| MKC    | 23.92%        | 22.30%                | 62.21%      | 35.96% | 77       | 49     |
| ADI    | 28.25%        | 38.76%                | 69.04%      | 35.90% | 78       | 77     |
| BMC    | 26.57%        | 34.81%                | 67.44%      | 35.85% | 79       | 66     |
| HRL    | 28.57%        | 22.87%                | 44.85%      | 35.75% | 80       | 79     |
| QCOM   | 29.29%        | 40.34%                | 69.03%      | 35.39% | 81       | 87     |
| GR     | 26.81%        | 42.20%                | 77.44%      | 34.74% | 82       | 72     |
| BMS    | 20.83%        | 33.80%                | 79.38%      | 34.61% | 83       | 31     |
| IPG    | 46.96%        | 62.38%                | 68.95%      | 34.43% | 84       | 159    |
| WEC    | 23.34%        | 22.54%                | 64.33%      | 34.13% | 85       | 51     |
| HSY    | 27.72%        | 28.96%                | 56.18%      | 33.63% | 86       | 80     |
| THC    | 72.47%        | 79.44%                | 41.06%      | 33.53% | 87       | 217    |
| CPWR   | 34.18%        | 45.66%                | 66.32%      | 33.52% | 88       | 115    |
| VAR    | 28.84%        | 36.31%                | 63.78%      | 32.80% | 89       | 93     |
| MO     | 25.39%        | 26.09%                | 60.19%      | 32.50% | 90       | 68     |
| OXY    | 33.66%        | 52.04%                | 79.10%      | 32.30% | 91       | 118    |
| MCHP   | 23.86%        | 37.08%                | 76.70%      | 32.03% | 92       | 58     |
| SNA    | 25.30%        | 41.05%                | 78.93%      | 31.76% | 93       | 70     |
| PLL    | 28.03%        | 41.35%                | 73.51%      | 31.32% | 94       | 92     |
| DD     | 21.28%        | 40.39%                | 85.69%      | 31.20% | 95       | 45     |
| URBN   | 41.44%        | 53.99%                | 64.71%      | 30.74% | 96       | 152    |
| FLS    | 43.56%        | 61.32%                | 74.91%      | 30.61% | 97       | 157    |
| CMCSA  | 28.47%        | 44.62%                | 77.63%      | 30.39% | 98       | 96     |
| WFMI   | 46.39%        | 56.05%                | 56.18%      | 29.89% | 99       | 171    |
| JWN    | 46.20%        | 60.26%                | 66.17%      | 29.72% | 100      | 170    |



**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company<br>Volatility | Correlation | TSR    | Rankings |        |
|--------|---------------|-----------------------|-------------|--------|----------|--------|
|        | Against Index |                       |             |        | TSR      | Sharpe |
| BF-B   | 26.84%        | 30.04%                | 60.31%      | 29.68% | 101      | 91     |
| SPG    | 49.74%        | 69.42%                | 77.67%      | 29.59% | 102      | 183    |
| MFE    | 40.03%        | 45.87%                | 51.03%      | 29.39% | 103      | 150    |
| EXPD   | 29.95%        | 44.00%                | 73.41%      | 29.22% | 104      | 105    |
| GPC    | 22.08%        | 29.68%                | 72.85%      | 29.09% | 105      | 55     |
| MAR    | 33.26%        | 50.07%                | 76.47%      | 28.97% | 106      | 124    |
| SIAL   | 20.12%        | 36.20%                | 83.13%      | 28.69% | 107      | 41     |
| ARG    | 38.05%        | 50.65%                | 66.35%      | 27.91% | 108      | 146    |
| PH     | 25.06%        | 42.33%                | 81.19%      | 27.84% | 109      | 82     |
| CELG   | 34.96%        | 42.60%                | 58.47%      | 27.73% | 110      | 132    |
| SWN    | 52.25%        | 68.39%                | 69.20%      | 27.73% | 111      | 194    |
| WM     | 21.67%        | 29.26%                | 73.48%      | 27.72% | 112      | 56     |
| RHI    | 29.96%        | 45.48%                | 75.82%      | 27.38% | 113      | 110    |
| TGT    | 29.01%        | 42.46%                | 73.06%      | 27.18% | 114      | 106    |
| EMC    | 29.13%        | 39.85%                | 68.63%      | 27.08% | 115      | 108    |
| IFF    | 22.34%        | 32.94%                | 75.29%      | 27.00% | 116      | 65     |
| DVA    | 28.89%        | 30.72%                | 55.05%      | 25.23% | 117      | 113    |
| PCG    | 25.85%        | 28.02%                | 60.82%      | 25.07% | 118      | 99     |
| QLGC   | 34.10%        | 41.72%                | 59.14%      | 24.05% | 119      | 143    |
| TE     | 25.58%        | 35.34%                | 70.60%      | 23.81% | 120      | 101    |
| MTB    | 42.92%        | 56.69%                | 66.69%      | 23.43% | 121      | 182    |
| LLTC   | 25.65%        | 35.44%                | 70.55%      | 23.03% | 122      | 104    |
| R      | 38.50%        | 52.54%                | 69.01%      | 23.00% | 123      | 163    |
| LSI    | 49.46%        | 63.24%                | 64.53%      | 22.75% | 124      | 200    |
| XEL    | 20.98%        | 23.14%                | 72.10%      | 22.69% | 125      | 71     |
| SLE    | 28.69%        | 36.54%                | 64.54%      | 22.48% | 126      | 123    |
| WMT    | 24.52%        | 24.43%                | 61.54%      | 22.31% | 127      | 100    |
| DIS    | 21.06%        | 38.72%                | 84.13%      | 22.27% | 128      | 74     |
| HNZ    | 21.58%        | 23.77%                | 70.47%      | 22.23% | 129      | 78     |
| ED     | 21.89%        | 21.57%                | 68.98%      | 21.76% | 130      | 83     |
| WHR    | 42.62%        | 55.95%                | 65.86%      | 21.60% | 131      | 186    |
| CB     | 25.97%        | 40.56%                | 76.86%      | 21.55% | 132      | 109    |
| LIFE   | 30.29%        | 37.34%                | 61.59%      | 21.47% | 133      | 131    |
| NVLS   | 30.78%        | 43.93%                | 71.40%      | 21.37% | 134      | 137    |
| DTE    | 21.84%        | 28.94%                | 72.81%      | 21.29% | 135      | 85     |
| KSS    | 30.93%        | 43.22%                | 69.86%      | 21.05% | 136      | 141    |
| FCX    | 53.32%        | 70.63%                | 71.67%      | 20.73% | 137      | 215    |
| CMS    | 21.99%        | 30.14%                | 73.46%      | 20.71% | 138      | 89     |
| NEM    | 49.14%        | 52.21%                | 38.82%      | 20.50% | 139      | 206    |
| SEE    | 30.05%        | 43.17%                | 71.82%      | 20.20% | 140      | 139    |
| BIIB   | 34.98%        | 40.42%                | 54.17%      | 20.01% | 141      | 160    |
| APH    | 28.70%        | 45.15%                | 77.98%      | 20.00% | 142      | 130    |
| ETN    | 25.00%        | 40.45%                | 78.71%      | 19.54% | 143      | 111    |
| PNW    | 22.39%        | 27.22%                | 70.06%      | 19.27% | 144      | 98     |
| LOW    | 28.90%        | 42.75%                | 73.76%      | 19.03% | 145      | 134    |
| AIV    | 60.12%        | 79.78%                | 75.99%      | 18.90% | 146      | 226    |
| WDC    | 42.77%        | 56.37%                | 66.37%      | 18.53% | 147      | 196    |
| KO     | 24.20%        | 25.66%                | 63.57%      | 18.19% | 148      | 112    |
| JCI    | 35.47%        | 51.26%                | 73.68%      | 18.13% | 149      | 172    |
| TSN    | 41.32%        | 51.34%                | 59.37%      | 18.01% | 150      | 193    |

**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company    | Correlation | TSR    | Rankings |        |
|--------|---------------|------------|-------------|--------|----------|--------|
|        | Against Index | Volatility |             |        | TSR      | Sharpe |
| ADP    | 19.11%        | 28.68%     | 79.06%      | 17.88% | 151      | 76     |
| AMGN   | 29.68%        | 33.38%     | 56.84%      | 17.81% | 152      | 144    |
| BMJ    | 25.71%        | 29.53%     | 62.99%      | 17.62% | 153      | 128    |
| RSH    | 46.54%        | 54.64%     | 52.45%      | 17.59% | 154      | 209    |
| TROW   | 38.03%        | 59.97%     | 84.53%      | 17.25% | 155      | 187    |
| LH     | 24.68%        | 24.17%     | 60.81%      | 17.21% | 156      | 122    |
| ROK    | 29.07%        | 47.93%     | 81.66%      | 17.02% | 157      | 145    |
| HP     | 46.24%        | 62.52%     | 71.03%      | 16.97% | 158      | 210    |
| SO     | 23.58%        | 22.21%     | 63.35%      | 16.76% | 159      | 116    |
| APC    | 43.26%        | 59.60%     | 72.02%      | 16.63% | 160      | 204    |
| PX     | 22.85%        | 38.66%     | 80.70%      | 15.99% | 161      | 114    |
| LEN    | 72.78%        | 88.56%     | 64.64%      | 15.70% | 162      | 243    |
| GPS    | 32.37%        | 44.05%     | 67.84%      | 15.70% | 163      | 167    |
| NU     | 24.11%        | 27.88%     | 65.81%      | 15.52% | 164      | 127    |
| UPS    | 20.41%        | 32.28%     | 78.86%      | 15.14% | 165      | 103    |
| JNPR   | 36.48%        | 49.87%     | 68.65%      | 15.02% | 166      | 190    |
| WFC    | 60.51%        | 77.98%     | 70.72%      | 14.70% | 167      | 234    |
| AMD    | 58.68%        | 70.59%     | 57.51%      | 14.57% | 168      | 229    |
| SCG    | 21.15%        | 25.75%     | 72.54%      | 14.52% | 169      | 107    |
| PCAR   | 31.04%        | 51.28%     | 83.24%      | 14.18% | 170      | 168    |
| A      | 24.76%        | 40.75%     | 79.61%      | 14.13% | 171      | 133    |
| MU     | 61.05%        | 75.43%     | 63.08%      | 13.92% | 172      | 236    |
| MMM    | 18.67%        | 29.74%     | 80.61%      | 13.81% | 173      | 94     |
| EMR    | 22.59%        | 40.45%     | 83.41%      | 13.56% | 174      | 125    |
| MCK    | 29.81%        | 35.46%     | 59.82%      | 13.36% | 175      | 165    |
| TYC    | 25.99%        | 39.86%     | 75.82%      | 12.94% | 176      | 148    |
| NI     | 21.58%        | 31.58%     | 75.69%      | 12.91% | 177      | 121    |
| UTX    | 17.37%        | 32.89%     | 85.18%      | 12.67% | 178      | 88     |
| MMC    | 26.00%        | 35.77%     | 70.14%      | 12.39% | 179      | 151    |
| CL     | 23.97%        | 25.04%     | 63.80%      | 11.77% | 180      | 142    |
| ITW    | 20.39%        | 35.98%     | 82.41%      | 11.61% | 181      | 120    |
| NBL    | 37.95%        | 55.82%     | 76.73%      | 11.32% | 182      | 208    |
| IR     | 31.94%        | 49.47%     | 78.27%      | 10.91% | 183      | 192    |
| LUV    | 37.65%        | 46.82%     | 59.63%      | 10.66% | 184      | 211    |
| APA    | 34.35%        | 50.99%     | 75.72%      | 10.32% | 185      | 202    |
| JDSU   | 55.83%        | 69.73%     | 63.07%      | 10.28% | 186      | 238    |
| CCL    | 34.04%        | 50.67%     | 75.83%      | 10.18% | 187      | 201    |
| DHR    | 20.01%        | 31.68%     | 79.21%      | 10.11% | 188      | 126    |
| CNP    | 24.19%        | 32.45%     | 70.41%      | 10.10% | 189      | 153    |
| COST   | 24.28%        | 30.24%     | 67.74%      | 10.04% | 190      | 154    |
| FDX    | 28.63%        | 42.56%     | 74.06%      | 10.04% | 191      | 179    |
| HAL    | 39.77%        | 56.45%     | 73.81%      | 9.86%  | 192      | 219    |
| PGN    | 21.50%        | 24.64%     | 71.04%      | 9.71%  | 193      | 138    |
| AGN    | 28.20%        | 37.44%     | 67.16%      | 9.48%  | 194      | 180    |
| WAG    | 25.79%        | 33.32%     | 67.45%      | 9.47%  | 195      | 164    |
| PGR    | 27.04%        | 43.41%     | 78.75%      | 9.42%  | 196      | 176    |
| ACE    | 32.39%        | 45.73%     | 70.74%      | 9.37%  | 197      | 198    |
| CLX    | 23.88%        | 22.03%     | 62.20%      | 9.23%  | 198      | 155    |
| CPB    | 26.52%        | 23.12%     | 53.28%      | 8.98%  | 199      | 175    |
| CAG    | 27.88%        | 25.49%     | 51.00%      | 8.51%  | 200      | 185    |

**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company    | Correlation | TSR    | Rankings |        |
|--------|---------------|------------|-------------|--------|----------|--------|
|        | Against Index | Volatility |             |        | TSR      | Sharpe |
| UNM    | 47.56%        | 66.93%     | 77.40%      | 8.46%  | 201      | 230    |
| CVX    | 20.32%        | 37.67%     | 84.30%      | 8.41%  | 202      | 135    |
| CMA    | 55.01%        | 70.80%     | 67.75%      | 8.26%  | 203      | 241    |
| K      | 23.45%        | 23.45%     | 64.42%      | 8.24%  | 204      | 156    |
| VNO    | 46.96%        | 67.44%     | 79.88%      | 7.90%  | 205      | 232    |
| SPLS   | 27.69%        | 43.72%     | 77.88%      | 7.47%  | 206      | 191    |
| TLAB   | 39.09%        | 49.06%     | 60.42%      | 7.45%  | 207      | 223    |
| DUK    | 23.40%        | 25.87%     | 66.20%      | 6.94%  | 208      | 166    |
| SYX    | 22.45%        | 28.60%     | 70.99%      | 6.67%  | 209      | 161    |
| TXN    | 27.68%        | 37.56%     | 68.63%      | 6.56%  | 210      | 195    |
| DGX    | 25.98%        | 28.86%     | 61.41%      | 6.31%  | 211      | 189    |
| STJ    | 29.23%        | 33.96%     | 59.06%      | 6.11%  | 212      | 203    |
| RSG    | 27.91%        | 36.39%     | 66.32%      | 6.07%  | 213      | 197    |
| TAP    | 30.11%        | 31.23%     | 52.04%      | 6.05%  | 214      | 207    |
| FISV   | 21.91%        | 34.43%     | 77.78%      | 5.97%  | 215      | 162    |
| CSC    | 22.87%        | 35.81%     | 77.27%      | 5.66%  | 216      | 174    |
| JPM    | 50.09%        | 68.82%     | 75.50%      | 5.57%  | 217      | 244    |
| PKI    | 32.92%        | 42.00%     | 62.79%      | 5.49%  | 218      | 220    |
| OMC    | 20.97%        | 35.09%     | 80.39%      | 4.29%  | 219      | 169    |
| SYMC   | 33.49%        | 43.45%     | 63.95%      | 4.23%  | 220      | 222    |
| D      | 20.96%        | 26.40%     | 73.39%      | 3.99%  | 221      | 173    |
| TMK    | 38.70%        | 55.38%     | 74.18%      | 3.95%  | 222      | 231    |
| KMB    | 22.44%        | 22.95%     | 67.49%      | 3.62%  | 223      | 188    |
| EFX    | 18.82%        | 33.93%     | 83.40%      | 3.56%  | 224      | 158    |
| AON    | 27.43%        | 30.23%     | 58.82%      | 3.53%  | 225      | 213    |
| JNJ    | 20.49%        | 21.08%     | 73.59%      | 3.26%  | 226      | 177    |
| BBT    | 47.72%        | 64.07%     | 70.79%      | 3.20%  | 227      | 248    |
| ECL    | 20.65%        | 32.18%     | 78.27%      | 2.91%  | 228      | 181    |
| BDX    | 26.34%        | 24.73%     | 55.59%      | 2.91%  | 229      | 212    |
| LXK    | 40.44%        | 45.99%     | 50.13%      | 2.59%  | 230      | 240    |
| EOG    | 39.10%        | 54.02%     | 70.53%      | 2.09%  | 231      | 239    |
| CA     | 26.98%        | 39.07%     | 72.49%      | 1.91%  | 232      | 218    |
| BCR    | 26.47%        | 23.37%     | 53.70%      | 1.80%  | 233      | 216    |
| APD    | 23.04%        | 39.01%     | 80.76%      | 1.63%  | 234      | 205    |
| CAM    | 42.25%        | 59.18%     | 73.53%      | 1.60%  | 235      | 245    |
| PCP    | 32.35%        | 47.13%     | 73.31%      | 1.33%  | 236      | 228    |
| WAT    | 33.19%        | 39.33%     | 57.14%      | 1.25%  | 237      | 233    |
| PNC    | 59.40%        | 73.89%     | 63.70%      | 0.79%  | 238      | 260    |
| BEN    | 32.62%        | 54.68%     | 85.90%      | 0.76%  | 239      | 235    |
| DNB    | 23.53%        | 27.48%     | 67.12%      | 0.59%  | 240      | 214    |
| PAYX   | 20.51%        | 30.80%     | 77.41%      | 0.39%  | 241      | 199    |
| CAH    | 37.20%        | 42.41%     | 51.81%      | -0.52% | 242      | 247    |
| DOW    | 38.28%        | 53.51%     | 71.45%      | -0.66% | 243      | 250    |
| TMO    | 27.02%        | 36.44%     | 68.60%      | -0.79% | 244      | 227    |
| VZ     | 22.27%        | 30.43%     | 73.02%      | -1.05% | 245      | 221    |
| AFL    | 54.55%        | 71.10%     | 69.64%      | -1.76% | 246      | 263    |
| DHI    | 62.32%        | 76.46%     | 62.22%      | -1.82% | 247      | 268    |
| DE     | 34.78%        | 51.07%     | 74.90%      | -1.86% | 248      | 249    |
| CINF   | 27.66%        | 46.69%     | 82.50%      | -1.98% | 249      | 237    |
| HON    | 20.85%        | 37.59%     | 83.25%      | -3.06% | 250      | 225    |

**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company    | Correlation | TSR     | Rankings |        |
|--------|---------------|------------|-------------|---------|----------|--------|
|        | Against Index | Volatility |             |         | TSR      | Sharpe |
| PG     | 20.44%        | 23.79%     | 73.81%      | -3.09%  | 251      | 224    |
| TWX    | 27.12%        | 42.65%     | 77.48%      | -3.19%  | 252      | 242    |
| MWV    | 31.22%        | 48.52%     | 78.19%      | -3.53%  | 253      | 251    |
| USB    | 47.14%        | 62.16%     | 68.00%      | -3.59%  | 254      | 264    |
| COF    | 64.10%        | 82.57%     | 72.58%      | -3.66%  | 255      | 272    |
| DV     | 46.23%        | 47.64%     | 36.30%      | -4.19%  | 256      | 266    |
| FLIR   | 33.42%        | 44.83%     | 66.65%      | -4.43%  | 257      | 257    |
| PCL    | 35.14%        | 53.49%     | 78.54%      | -4.68%  | 258      | 259    |
| GENZ   | 31.23%        | 35.36%     | 55.59%      | -4.75%  | 259      | 255    |
| PEP    | 23.45%        | 24.19%     | 64.88%      | -5.34%  | 260      | 246    |
| FLR    | 42.23%        | 59.75%     | 74.75%      | -5.45%  | 261      | 267    |
| IP     | 46.39%        | 62.33%     | 70.25%      | -5.50%  | 262      | 270    |
| STZ    | 28.88%        | 36.23%     | 63.56%      | -5.66%  | 263      | 258    |
| ABT    | 25.88%        | 24.29%     | 56.78%      | -5.92%  | 264      | 253    |
| PDCO   | 24.43%        | 34.05%     | 71.71%      | -6.51%  | 265      | 254    |
| SRE    | 22.91%        | 32.21%     | 73.23%      | -6.51%  | 266      | 252    |
| MHP    | 33.01%        | 50.09%     | 77.06%      | -6.78%  | 267      | 265    |
| BAX    | 27.67%        | 27.38%     | 54.23%      | -6.91%  | 268      | 261    |
| CTAS   | 23.23%        | 34.68%     | 75.20%      | -7.10%  | 269      | 256    |
| MOLX   | 28.00%        | 45.20%     | 79.51%      | -7.22%  | 270      | 262    |
| NOV    | 51.13%        | 69.70%     | 74.95%      | -7.62%  | 271      | 283    |
| COG    | 45.94%        | 61.91%     | 70.43%      | -7.80%  | 272      | 281    |
| MUR    | 34.16%        | 50.97%     | 76.09%      | -8.67%  | 273      | 275    |
| KR     | 29.84%        | 30.80%     | 52.20%      | -8.71%  | 274      | 271    |
| INTC   | 24.54%        | 39.81%     | 78.79%      | -9.08%  | 275      | 269    |
| CVS    | 31.63%        | 36.91%     | 57.16%      | -9.13%  | 276      | 278    |
| PBCT   | 28.10%        | 38.93%     | 69.66%      | -9.53%  | 277      | 277    |
| NOC    | 25.45%        | 32.45%     | 67.24%      | -9.67%  | 278      | 273    |
| FO     | 27.93%        | 41.23%     | 73.57%      | -9.82%  | 279      | 280    |
| AVY    | 25.44%        | 41.03%     | 78.62%      | -9.83%  | 280      | 276    |
| FRX    | 29.36%        | 35.22%     | 60.67%      | -9.94%  | 281      | 282    |
| AEP    | 23.52%        | 29.56%     | 69.06%      | -10.02% | 282      | 274    |
| AXP    | 42.53%        | 62.79%     | 80.28%      | -10.18% | 283      | 284    |
| PFE    | 22.36%        | 30.88%     | 73.24%      | -10.41% | 284      | 279    |
| NOVL   | 36.10%        | 47.06%     | 64.16%      | -11.38% | 285      | 285    |
| RDC    | 45.62%        | 64.43%     | 76.60%      | -11.42% | 286      | 288    |
| EQT    | 31.36%        | 48.13%     | 77.21%      | -11.78% | 287      | 286    |
| KLAC   | 32.86%        | 46.53%     | 71.05%      | -11.80% | 288      | 287    |
| DVN    | 34.28%        | 50.24%     | 74.49%      | -12.01% | 289      | 289    |
| VRSN   | 34.23%        | 48.19%     | 70.86%      | -12.11% | 290      | 290    |
| NEE    | 25.51%        | 33.12%     | 67.90%      | -12.91% | 291      | 291    |
| GD     | 23.76%        | 32.48%     | 71.51%      | -13.02% | 292      | 292    |
| HPQ    | 25.38%        | 36.14%     | 72.11%      | -13.21% | 293      | 293    |
| SLB    | 34.37%        | 51.92%     | 77.37%      | -13.51% | 294      | 295    |
| COP    | 24.54%        | 42.50%     | 82.43%      | -13.61% | 295      | 294    |
| ITT    | 20.04%        | 35.93%     | 83.01%      | -13.95% | 296      | 296    |
| GLW    | 33.06%        | 46.49%     | 70.53%      | -14.15% | 297      | 299    |
| CEPH   | 29.77%        | 28.56%     | 48.81%      | -14.19% | 298      | 298    |
| EBAY   | 30.94%        | 44.44%     | 71.89%      | -14.34% | 299      | 300    |
| AMAT   | 31.23%        | 44.50%     | 71.32%      | -14.48% | 300      | 301    |

**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company    | Correlation | TSR     | Rankings |        |
|--------|---------------|------------|-------------|---------|----------|--------|
|        | Against Index | Volatility |             |         | TSR      | Sharpe |
| T      | 20.18%        | 31.16%     | 78.41%      | -14.62% | 301      | 297    |
| IVZ    | 46.65%        | 68.91%     | 83.69%      | -14.84% | 302      | 304    |
| JCP    | 41.96%        | 55.29%     | 66.10%      | -15.61% | 303      | 306    |
| MSFT   | 24.85%        | 37.23%     | 74.75%      | -15.68% | 304      | 303    |
| XOM    | 20.18%        | 34.64%     | 81.48%      | -16.22% | 305      | 302    |
| GS     | 42.73%        | 59.49%     | 73.06%      | -16.49% | 306      | 310    |
| NUE    | 41.91%        | 59.73%     | 75.47%      | -16.50% | 307      | 309    |
| NBR    | 47.42%        | 63.99%     | 71.35%      | -16.99% | 308      | 313    |
| EP     | 40.02%        | 59.24%     | 78.79%      | -17.01% | 309      | 311    |
| RTN    | 24.94%        | 29.17%     | 64.78%      | -17.12% | 310      | 305    |
| BA     | 26.98%        | 39.77%     | 73.50%      | -17.87% | 311      | 307    |
| EIX    | 21.95%        | 31.58%     | 74.87%      | -19.29% | 312      | 308    |
| AVP    | 31.70%        | 42.00%     | 65.88%      | -19.65% | 313      | 315    |
| GILD   | 30.36%        | 34.62%     | 56.86%      | -20.07% | 314      | 317    |
| MET    | 60.71%        | 78.86%     | 72.31%      | -20.20% | 315      | 336    |
| ISRG   | 43.63%        | 55.49%     | 62.30%      | -20.44% | 316      | 327    |
| NTRS   | 37.66%        | 56.46%     | 78.61%      | -20.54% | 317      | 321    |
| XRAY   | 23.85%        | 31.87%     | 70.61%      | -20.54% | 318      | 312    |
| MCO    | 41.96%        | 57.22%     | 70.16%      | -20.72% | 319      | 328    |
| MDT    | 27.22%        | 31.20%     | 60.75%      | -20.76% | 320      | 316    |
| ADSK   | 36.08%        | 49.77%     | 69.44%      | -20.81% | 321      | 320    |
| NWL    | 37.26%        | 50.70%     | 68.36%      | -21.13% | 322      | 324    |
| LLY    | 22.15%        | 30.26%     | 73.18%      | -22.18% | 323      | 314    |
| HRS    | 31.02%        | 41.88%     | 67.37%      | -22.24% | 324      | 323    |
| ANF    | 44.54%        | 57.29%     | 63.87%      | -22.39% | 325      | 334    |
| XRX    | 34.58%        | 49.00%     | 71.53%      | -22.83% | 326      | 329    |
| PWR    | 41.58%        | 58.81%     | 74.36%      | -23.33% | 327      | 337    |
| CSCO   | 22.80%        | 39.06%     | 81.30%      | -23.78% | 328      | 318    |
| PBI    | 25.63%        | 35.27%     | 70.38%      | -23.82% | 329      | 322    |
| POM    | 24.83%        | 33.46%     | 70.02%      | -23.99% | 330      | 319    |
| FII    | 36.52%        | 51.56%     | 71.81%      | -24.47% | 331      | 335    |
| NWSA   | 31.51%        | 53.09%     | 85.35%      | -24.58% | 332      | 331    |
| SYK    | 25.36%        | 31.89%     | 66.77%      | -25.05% | 333      | 325    |
| WY     | 32.28%        | 49.62%     | 77.80%      | -25.07% | 334      | 332    |
| PEG    | 25.25%        | 34.75%     | 70.61%      | -25.18% | 335      | 326    |
| MWW    | 45.85%        | 60.88%     | 68.41%      | -25.29% | 336      | 347    |
| WMB    | 35.66%        | 54.98%     | 80.17%      | -25.99% | 337      | 340    |
| ADBE   | 32.84%        | 47.28%     | 72.44%      | -26.20% | 338      | 338    |
| BHI    | 40.17%        | 56.62%     | 73.22%      | -26.79% | 339      | 346    |
| PHM    | 56.49%        | 71.07%     | 64.57%      | -26.88% | 340      | 356    |
| SCHW   | 37.03%        | 55.12%     | 77.44%      | -27.56% | 341      | 345    |
| LMT    | 26.03%        | 31.60%     | 64.63%      | -27.70% | 342      | 333    |
| MRK    | 29.70%        | 37.32%     | 63.12%      | -27.83% | 343      | 339    |
| MDP    | 32.44%        | 44.90%     | 69.17%      | -28.53% | 344      | 342    |
| HRB    | 35.72%        | 44.50%     | 60.15%      | -29.01% | 345      | 350    |
| IRM    | 32.09%        | 41.67%     | 64.31%      | -29.28% | 346      | 344    |
| SWY    | 31.39%        | 35.66%     | 55.65%      | -29.32% | 347      | 343    |
| LLL    | 20.73%        | 28.59%     | 75.28%      | -29.34% | 348      | 330    |
| ADM    | 34.47%        | 45.73%     | 65.70%      | -29.66% | 349      | 351    |
| BBY    | 32.80%        | 46.43%     | 71.03%      | -29.72% | 350      | 348    |

**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company    | Correlation | TSR     | Rankings |        |
|--------|---------------|------------|-------------|---------|----------|--------|
|        | Against Index | Volatility |             |         | TSR      | Sharpe |
| YHOO   | 44.80%        | 52.66%     | 52.74%      | -29.89% | 351      | 355    |
| HUM    | 47.47%        | 53.44%     | 46.93%      | -29.93% | 352      | 359    |
| ALL    | 39.55%        | 56.70%     | 74.82%      | -30.83% | 353      | 353    |
| ATI    | 52.75%        | 71.70%     | 75.49%      | -30.93% | 354      | 367    |
| NSM    | 34.81%        | 46.12%     | 65.59%      | -31.30% | 355      | 352    |
| MAS    | 44.98%        | 60.23%     | 69.15%      | -31.82% | 356      | 362    |
| FHN    | 65.44%        | 80.51%     | 63.97%      | -31.83% | 357      | 377    |
| BK     | 46.97%        | 66.40%     | 77.66%      | -31.96% | 358      | 363    |
| CI     | 47.03%        | 59.43%     | 62.18%      | -31.97% | 359      | 364    |
| ETR    | 25.06%        | 30.58%     | 66.03%      | -32.31% | 360      | 341    |
| BSX    | 39.70%        | 49.86%     | 60.49%      | -33.65% | 361      | 361    |
| MRO    | 33.29%        | 52.17%     | 80.13%      | -34.19% | 362      | 354    |
| SLM    | 81.43%        | 96.92%     | 62.73%      | -34.97% | 363      | 386    |
| HAR    | 58.95%        | 69.69%     | 54.47%      | -35.02% | 364      | 379    |
| MON    | 39.40%        | 48.75%     | 58.96%      | -35.15% | 365      | 365    |
| UNH    | 42.48%        | 51.85%     | 57.35%      | -35.37% | 366      | 369    |
| LUK    | 42.57%        | 61.32%     | 77.21%      | -35.44% | 367      | 370    |
| AEE    | 22.62%        | 31.88%     | 73.58%      | -36.35% | 368      | 349    |
| FITB   | 96.84%        | 112.01%    | 60.29%      | -36.39% | 369      | 392    |
| VMC    | 37.43%        | 50.82%     | 68.20%      | -36.61% | 370      | 366    |
| OI     | 45.31%        | 58.95%     | 65.56%      | -36.67% | 371      | 374    |
| RAI    | 48.35%        | 48.63%     | 31.99%      | -38.36% | 372      | 378    |
| SUN    | 42.36%        | 56.29%     | 67.24%      | -39.36% | 373      | 375    |
| DNR    | 55.92%        | 72.93%     | 70.46%      | -39.87% | 374      | 383    |
| STT    | 73.36%        | 89.39%     | 65.21%      | -40.04% | 375      | 388    |
| DO     | 36.91%        | 51.27%     | 70.34%      | -40.19% | 376      | 372    |
| FE     | 26.60%        | 34.34%     | 66.72%      | -40.72% | 377      | 358    |
| PPL    | 27.02%        | 33.73%     | 64.80%      | -40.90% | 378      | 360    |
| WPO    | 31.70%        | 40.53%     | 63.33%      | -41.24% | 379      | 368    |
| EXC    | 25.39%        | 36.02%     | 71.93%      | -41.41% | 380      | 357    |
| APOL   | 52.51%        | 54.89%     | 35.22%      | -41.75% | 381      | 384    |
| MOT    | 42.66%        | 56.51%     | 66.93%      | -41.91% | 382      | 380    |
| AES    | 44.79%        | 59.18%     | 67.36%      | -42.30% | 383      | 381    |
| GE     | 32.33%        | 48.12%     | 75.08%      | -43.31% | 384      | 373    |
| RRD    | 31.09%        | 48.77%     | 78.89%      | -43.52% | 385      | 371    |
| ZION   | 76.75%        | 91.29%     | 60.83%      | -43.94% | 386      | 395    |
| DELL   | 35.44%        | 45.08%     | 62.00%      | -44.44% | 387      | 376    |
| AET    | 40.32%        | 50.10%     | 59.36%      | -45.90% | 388      | 382    |
| LM     | 58.06%        | 75.95%     | 72.12%      | -46.77% | 389      | 390    |
| X      | 56.00%        | 75.59%     | 76.41%      | -46.92% | 390      | 389    |
| HBAN   | 101.62%       | 114.81%    | 54.30%      | -47.07% | 391      | 406    |
| STI    | 71.24%        | 86.51%     | 63.52%      | -47.13% | 392      | 396    |
| LNC    | 91.24%        | 108.91%    | 67.61%      | -47.89% | 393      | 405    |
| XL     | 95.62%        | 112.82%    | 65.98%      | -50.27% | 394      | 409    |
| JEC    | 41.43%        | 61.48%     | 80.11%      | -52.55% | 395      | 387    |
| NVDA   | 52.31%        | 65.24%     | 61.71%      | -53.35% | 396      | 394    |
| ETFC   | 83.62%        | 97.66%     | 58.58%      | -53.35% | 397      | 407    |
| GCI    | 60.48%        | 74.02%     | 61.12%      | -53.92% | 398      | 400    |
| AA     | 47.64%        | 66.31%     | 75.87%      | -54.40% | 399      | 393    |
| CVH    | 57.43%        | 66.39%     | 50.39%      | -55.25% | 400      | 399    |

**Appendix A:  
Comparison of TSR and Sharpe Ratio: S&P 500 (continued)**

| Ticker | Volatility    | Company    | Correlation | TSR     | Rankings |        |
|--------|---------------|------------|-------------|---------|----------|--------|
|        | Against Index | Volatility |             |         | TSR      | Sharpe |
| GT     | 54.74%        | 72.96%     | 73.47%      | -55.82% | 401      | 398    |
| IGT    | 42.03%        | 57.41%     | 70.39%      | -56.70% | 402      | 391    |
| KEY    | 77.55%        | 94.17%     | 66.20%      | -58.14% | 403      | 410    |
| JNS    | 59.92%        | 80.46%     | 78.08%      | -58.56% | 404      | 404    |
| AYE    | 28.96%        | 38.82%     | 67.41%      | -58.86% | 405      | 385    |
| AKS    | 68.72%        | 88.39%     | 74.94%      | -61.92% | 406      | 411    |
| TXT    | 61.71%        | 77.37%     | 66.11%      | -63.11% | 407      | 408    |
| BAC    | 75.03%        | 93.36%     | 70.88%      | -64.20% | 408      | 412    |
| VLO    | 40.62%        | 57.75%     | 74.44%      | -64.70% | 409      | 397    |
| HIG    | 108.60%       | 121.41%    | 52.58%      | -65.95% | 410      | 417    |
| CEG    | 46.15%        | 49.64%     | 41.57%      | -66.51% | 411      | 403    |
| RF     | 90.09%        | 104.56%    | 59.03%      | -66.61% | 412      | 414    |
| PLD    | 91.35%        | 110.26%    | 70.91%      | -67.01% | 413      | 415    |
| S      | 71.55%        | 84.73%     | 58.05%      | -67.49% | 414      | 413    |
| SVU    | 41.11%        | 48.43%     | 53.58%      | -68.87% | 415      | 401    |
| MI     | 82.05%        | 98.13%     | 64.25%      | -70.82% | 416      | 416    |
| ERTS   | 38.49%        | 49.28%     | 62.45%      | -71.14% | 417      | 402    |
| C      | 84.21%        | 100.45%    | 64.42%      | -82.72% | 418      | 419    |
| WFR    | 56.25%        | 72.24%     | 67.98%      | -87.16% | 419      | 418    |
| AIG    | 126.08%       | 137.77%    | 48.01%      | -94.78% | 420      | 420    |

**Appendix B**  
**Chart 3: Long Term Research**

| Measurement Periods | Date Range            | Average TSR <sup>1</sup> | Average Volatility <sup>2</sup> | Correlation <sup>3</sup> | Average Delta <sup>4</sup> |
|---------------------|-----------------------|--------------------------|---------------------------------|--------------------------|----------------------------|
| 1.                  | 1/1/1998 - 12/31/2000 | 81.6%                    | 49.7%                           | 92.3%                    | 36                         |
| 2.                  | 4/1/1998 - 3/31/2001  | 41.9%                    | 50.4%                           | 92.5%                    | 34                         |
| 3.                  | 7/1/1998 - 6/30/2001  | 62.7%                    | 51.5%                           | 94.4%                    | 29                         |
| 4.                  | 10/1/1998 - 9/30/2001 | 44.1%                    | 51.1%                           | 90.3%                    | 43                         |
| 5.                  | 1/1/1999 - 12/31/2001 | 46.1%                    | 50.4%                           | 95.0%                    | 25                         |
| 6.                  | 4/1/1999 - 3/31/2002  | 52.3%                    | 49.8%                           | 92.5%                    | 31                         |
| 7.                  | 7/1/1999 - 6/30/2002  | 21.6%                    | 49.2%                           | 94.0%                    | 28                         |
| 8.                  | 10/1/1999 - 9/30/2002 | 15.0%                    | 50.9%                           | 94.6%                    | 26                         |
| 9.                  | 1/1/2000 - 12/31/2002 | 18.4%                    | 51.2%                           | 94.3%                    | 27                         |
| 10.                 | 4/1/2000 - 3/31/2003  | 12.3%                    | 49.2%                           | 94.0%                    | 27                         |
| 11.                 | 7/1/2000 - 6/30/2003  | 27.2%                    | 47.3%                           | 93.9%                    | 27                         |
| 12.                 | 10/1/2000 - 9/30/2003 | 26.0%                    | 45.9%                           | 94.9%                    | 26                         |
| 13.                 | 1/1/2001 - 12/31/2003 | 42.6%                    | 43.4%                           | 94.8%                    | 26                         |
| 14.                 | 4/1/2001 - 3/31/2004  | 52.4%                    | 41.4%                           | 94.9%                    | 26                         |
| 15.                 | 7/1/2001 - 6/30/2004  | 38.7%                    | 38.8%                           | 95.4%                    | 25                         |
| 16.                 | 10/1/2001 - 9/30/2004 | 67.1%                    | 37.2%                           | 95.2%                    | 26                         |
| 17.                 | 1/1/2002 - 12/31/2004 | 52.8%                    | 36.0%                           | 95.7%                    | 24                         |
| 18.                 | 4/1/2002 - 3/31/2005  | 42.1%                    | 35.3%                           | 95.9%                    | 24                         |
| 19.                 | 7/1/2002 - 6/30/2005  | 71.7%                    | 34.1%                           | 97.0%                    | 21                         |
| 20.                 | 10/1/2002 - 9/30/2005 | 123.4%                   | 30.4%                           | 97.5%                    | 19                         |
| 21.                 | 1/1/2003 - 12/31/2005 | 102.9%                   | 27.6%                           | 97.4%                    | 19                         |
| 22.                 | 4/1/2003 - 3/31/2006  | 133.2%                   | 26.2%                           | 97.0%                    | 21                         |
| 23.                 | 7/1/2003 - 6/30/2006  | 84.2%                    | 25.6%                           | 97.0%                    | 21                         |
| 24.                 | 10/1/2003 - 9/30/2006 | 76.0%                    | 25.4%                           | 97.3%                    | 20                         |
| 25.                 | 1/1/2004 - 12/31/2006 | 65.4%                    | 25.1%                           | 97.5%                    | 20                         |
| 26.                 | 4/1/2004 - 3/31/2007  | 64.2%                    | 24.8%                           | 97.5%                    | 20                         |
| 27.                 | 7/1/2004 - 6/30/2007  | 71.7%                    | 24.5%                           | 97.8%                    | 19                         |
| 28.                 | 10/1/2004 - 9/30/2007 | 69.5%                    | 25.2%                           | 98.0%                    | 18                         |
| 29.                 | 1/1/2005 - 12/31/2007 | 53.1%                    | 26.0%                           | 98.2%                    | 17                         |
| 30.                 | 4/1/2005 - 3/31/2008  | 37.4%                    | 27.7%                           | 98.2%                    | 17                         |
| 31.                 | 7/1/2005 - 6/30/2008  | 36.3%                    | 28.6%                           | 98.5%                    | 16                         |
| 32.                 | 10/1/2005 - 9/30/2008 | 10.9%                    | 32.2%                           | 98.0%                    | 17                         |
| 33.                 | 1/1/2006 - 12/31/2008 | -18.4%                   | 41.6%                           | 97.7%                    | 18                         |
| 34.                 | 4/1/2006 - 3/31/2009  | -29.4%                   | 45.6%                           | 98.5%                    | 16                         |
| 35.                 | 7/1/2006 - 6/30/2009  | -16.0%                   | 47.3%                           | 97.7%                    | 19                         |
| 36.                 | 10/1/2006 - 9/30/2009 | -4.0%                    | 47.7%                           | 97.3%                    | 19                         |
| 37.                 | 1/1/2007 - 12/31/2009 | -4.2%                    | 47.9%                           | 97.3%                    | 19                         |
| 38.                 | 4/1/2007 - 3/31/2010  | -2.9%                    | 48.1%                           | 97.5%                    | 19                         |
| 39.                 | 7/1/2007 - 6/30/2010  | -18.7%                   | 48.7%                           | 97.9%                    | 17                         |
| 40.                 | 10/1/2007 - 9/30/2010 | -9.3%                    | 48.5%                           | 97.2%                    | 19                         |
| 41.                 | 1/1/2008 - 12/31/2010 | 7.7%                     | 48.1%                           | 96.4%                    | 23                         |

<sup>1</sup> The average Total Shareholder Return of S&P 500 constituents during one measurement period.

<sup>2</sup> The average volatilities of S&P 500 constituents during one measurement period.

<sup>3</sup> The correlation between the traditional TSR ranking and the Sharpe Ratio ranking.

<sup>4</sup> The average Absolute Change between the TSR ranking and the Sharpe Ratio ranking.



## Appendix B

### Chart 4: Long Term Research

The chart below shows the percentage of time that companies fall into the extreme payout quartiles (below 25<sup>th</sup> percentile or above 75<sup>th</sup> percentile).

| Company Volatility | Number of Companies | Absolute Change <sup>1</sup> | Below 25th Percentile TSR <sup>2</sup> | Sharpe <sup>3</sup> | Above 75th Percentile TSR <sup>2</sup> | Sharpe <sup>3</sup> |
|--------------------|---------------------|------------------------------|--|---------------------|--|---------------------|
| < 20%              | 1,562               | 24                           | 1.9%                                   | 1.6%                | 1.1%                                   | 2.1%                |
| 20% - 30%          | 4,361               | 21                           | 4.2%                                   | 4.1%                | 5.9%                                   | 8.0%                |
| 30% - 40%          | 4,631               | 19                           | 5.0%                                   | 4.9%                | 7.7%                                   | 8.1%                |
| 40% - 50%          | 2,871               | 18                           | 4.3%                                   | 4.4%                | 4.6%                                   | 3.7%                |
| 50% - 60%          | 1,596               | 24                           | 3.2%                                   | 3.3%                | 2.6%                                   | 1.7%                |
| 60% - 70%          | 765                 | 30                           | 1.9%                                   | 2.0%                | 1.1%                                   | 0.6%                |
| 70% - 80%          | 562                 | 35                           | 1.6%                                   | 1.7%                | 0.8%                                   | 0.3%                |
| 80% - 90%          | 390                 | 43                           | 1.1%                                   | 1.1%                | 0.8%                                   | 0.3%                |
| 90% - 100%         | 211                 | 45                           | 0.6%                                   | 0.7%                | 0.4%                                   | 0.2%                |
| > 100%             | 271                 | 25                           | 1.2%                                   | 1.2%                | 0.2%                                   | 0.1%                |
| Total              | 17,220              | 22                           | 25.0%                                  | 25.0%               | 25.0%                                  | 25.0%               |

<sup>1</sup> The average absolute change between the TSR ranking and the Sharpe Ratio ranking  
<sup>2</sup> Traditional Total Shareholder Return ranking  
<sup>3</sup> Sharpe Ratio ranking

## Appendix B

### Chart 5: Distribution by Volatility Quartile

| Company Volatility Quartile <sup>1</sup> | Number of Companies | Average TSR Ranking <sup>2</sup> | Average Standard Deviation (TSR) <sup>3</sup> | Average Sharpe Ranking <sup>1</sup> | Average Standard Deviation (Sharpe) <sup>3</sup> |
|--|---------------------|----------------------------------|---|-------------------------------------|--|
| <= 25th Percentile                       | 4,305               | 208                              | 83  | 186                                 | 94   |
| 25th-75th Percentile                     | 8,610               | 209                              | 99  | 208                                 | 101  |
| >= 75th Percentile                       | 4,305               | 216                              | 127   | 240                                 | 115  |
| Total                                    | 17,220              | 211                              | 103   | 211                                 | 103  |

<sup>1</sup> For each measurement period (41 of them), we determined which quartile a company was in with respect to their volatility calculation  
<sup>2</sup> The average Traditional TSR / Sharpe Ratio ranking of each company across all 41 measurement periods (13 years)  
<sup>3</sup> The average standard deviation of each company's TSR / Sharpe Ratio ranking across all 41 measurement periods (13 years)