RADFORD REVIEW

Relative TSR: If And When to "Risk-Adjust" Returns?

One solution is to "risk-adjust" the TSRs by utilizing a total shareholder return per unit of risk calculation

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.[1] 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.

[1] All research can be found at our free web portal at www.RelativeTSR.com

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

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

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[2] 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.

$$\Delta R_{n-1}^C = \ln\left(\frac{S_n^C}{S_{n-1}^C}\right) - \ln\left(\frac{S_n^M}{S_{n-1}^M}\right) \quad \text{and} \quad \mu = \frac{\sum_1^n(\Delta R_{n-1}^C)}{n}$$

[2] 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. μ μ 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.

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

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.

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

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[1]	26	420
Average Volatility	54.12%	48.07%
Average Correlation Coefficient[2]	.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.

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

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

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 **58th** 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 **80th** 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.

About Radford

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

Ticker	Volatility Against Index	Company Volatility	Correlation	TSR	Rankings TSR	Rankings 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
GWW	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 Against Index	Company Volatility	Correlation	TSR	Rankings TSR	Rankings 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 Against Index	Company Volatility	Correlation	TSR	Rankings TSR	Rankings 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 Against Index	Company Volatility	Correlation	TSR	Rankings TSR	Rankings Sharpe
ADP	19.11%	28.68%	79.06%	17.88%	151	76
AMGN	29.68%	33.38%	56.84%	17.81%	152	144
BMY	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 Against Index	Company Volatility	Correlation	TSR	Rankings TSR	Rankings 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
SYY	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)

	Volatility	Company			Rankings	
Ticker	Against Index	Volatility	Correlation	TSR	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)

	Volatility	Company			Rankings	
Ticker	Against Index	Volatility	Correlation	TSR	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 Against Index	Company Volatility	Correlation	TSR	Rankings TSR	Rankings 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 Against Index	Company Volatility	Correlation	TSR	Rankings TSR	Rankings 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[1]	Average Volatility[2]	Correlation[3]	Average Delta[4]
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

[1] The average Total Shareholder Return of S&P 500 constituents during one measurement period.
[2] The average volatilities of S&P 500 constituents during one measurement period.
[3] The correlation between the traditional TSR ranking and the Sharpe Ratio ranking.
[4] 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 25th percentile or above 75th percentile).

Company Volatility	Number of Companies	Absolute Change[1]	Below 25th Percentile TSR[2]	Below 25th Percentile Sharpe[3]	Above 75th Percentile TSR[2]	Above 75th Percentile Sharpe[3]
< 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%

[1] The average absolute change between the TSR ranking and the Sharpe Ratio ranking

[2] Traditional Total Shareholder Return ranking

[3] Sharpe Ratio ranking

Appendix B
Chart 5: Distribution by Volatility Quartile

Company Volatility Quartile [1]	Number of Companies	Average TSR Ranking[2]	Average Standard Deviation (TSR)[3]	Average Sharpe Ranking[1]	Average Standard Deviation (Sharpe)[3]
<= 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

[1] For each measurement period (41 of them), we determined which quartile a company was in with respect to their volatility calculation

[2] The average Traditional TSR / Sharpe Ratio ranking of each company across all 41 measurement periods (13 years)

[3] The average standard deviation of each company's TSR / Sharpe Ratio ranking across all 41 measurement periods (13 years)