Alternative Performance Measures for Hedge Funds

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The measurement of performance is the cornerstone of the evaluation of an investment. Since the advent of modern finance theory, this task has been performed within the risk-return framework. While return is easy to define, the notion of risk is much more complex. The most used measure, namely the Sharpe ratio, assumes that the standard deviation of the return distribution provides the full description of risk. However, risk averse investors tend to strongly dislike negative returns and large draw-downs. They would even prefer to partly sacrifice positive returns in order to avoid negative ones. This asymmetric behaviour is not captured by the Sharpe ratio, which may be "gamed" using simple derivative strategies (see Spurgin (2001)).

As an alternative, the Sortino ratio has been advocated in order to capture the asymmetry of the return distribution. It replaces the standard deviation in the Sharpe ratio by the downside deviation which captures only the downside risk. However, higher moments are incorporated only implicitly. *In this article, we present the advantages of two new performance measures which take into account higher moments.*

Higher Moments

The mean and the standard deviation are the first two moments of the return distribution. All the other moments are labelled as higher moments. The most prominent ones are skewness and kurtosis. The former mainly describes how asymmetric the distribution is. In other words, a positive skewness indicates that more observations are found in the right tail of the distribution. The latter is linked to the existence of extreme returns. The higher the kurtosis is, the more likely extreme observations are. In this context, risk averse investors like positive skewness and dislike negative skewness and high kurtosis.

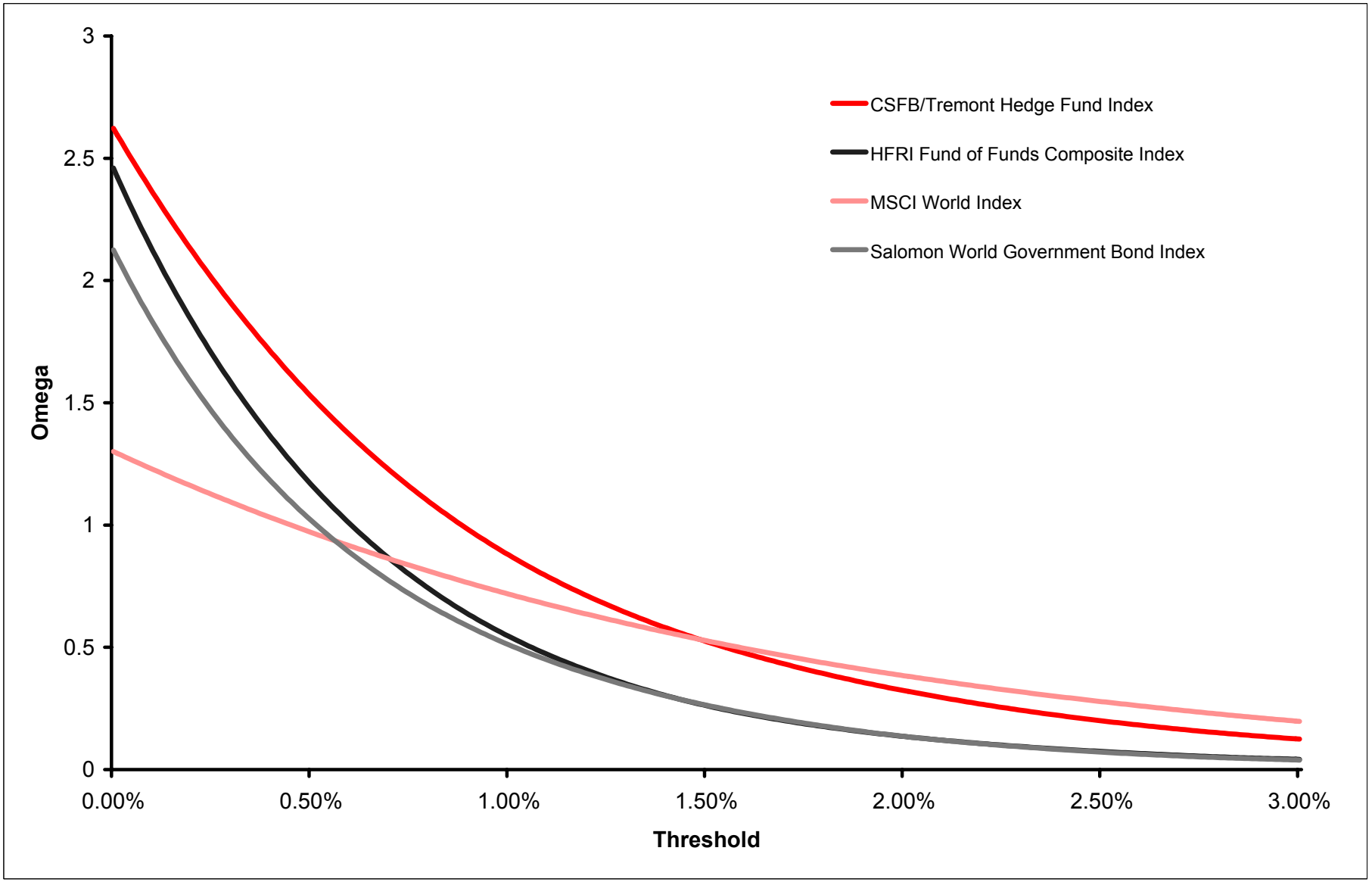
As pointed out by Schmidhuber and Moix (2001), hedge fund returns are not normally distributed and may be better represented by a hyperbolic distribution. Indeed, they usually exhibit skewness and kurtosis. This may be linked to the fact that hedge funds' ultimate goal is to make money and protect capital against losses. This capital protection obtained through hedging strategies and particular investment styles induces asymmetric return distributions.

Contrary to the variance, the interpretation and the perception of higher moments is difficult: for example, a kurtosis of 6 does not mean that there are twice as many extreme returns as with a kurtosis of 3. In theory, it is possible to incorporate them in the framework of utility functions. However, the notion of utility is usually complex and the choice of a functional form leads to even more debates. As a consequence, we present two potential and more intuitive solutions taking higher moments into account.

Alternative Measures

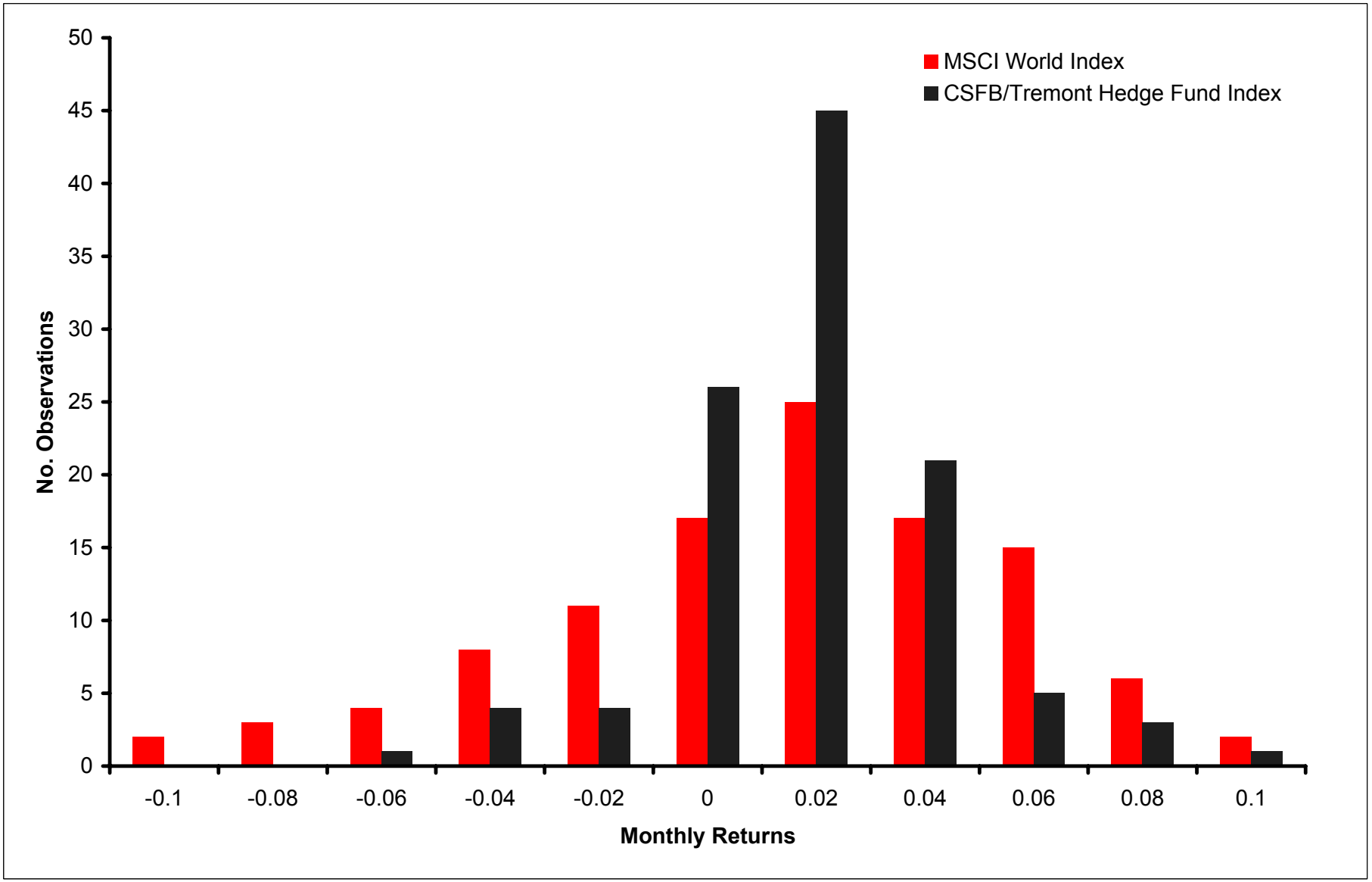
The **Omega measure** suggested by Keating and Shadwick (2002) incorporates all the moments of the distribution as it is a direct transformation of it. This measure splits the return universe into two sub-parts according to a threshold. The "good" returns are above this threshold and the "bad" returns below. Very simply put, the Omega measure is defined as the ratio of the gain with respect to the threshold and the loss with respect to the same threshold.

The Omega function is defined by varying the threshold. Figure 1 presents a comparison of the Omega functions of four indices (two hedge fund and two traditional indices) – CSFB/Tremont Hedge Fund Index, HFRI Fund of Funds Composite Index, MSCI World Index, and Salomon World Government Bonds Index.

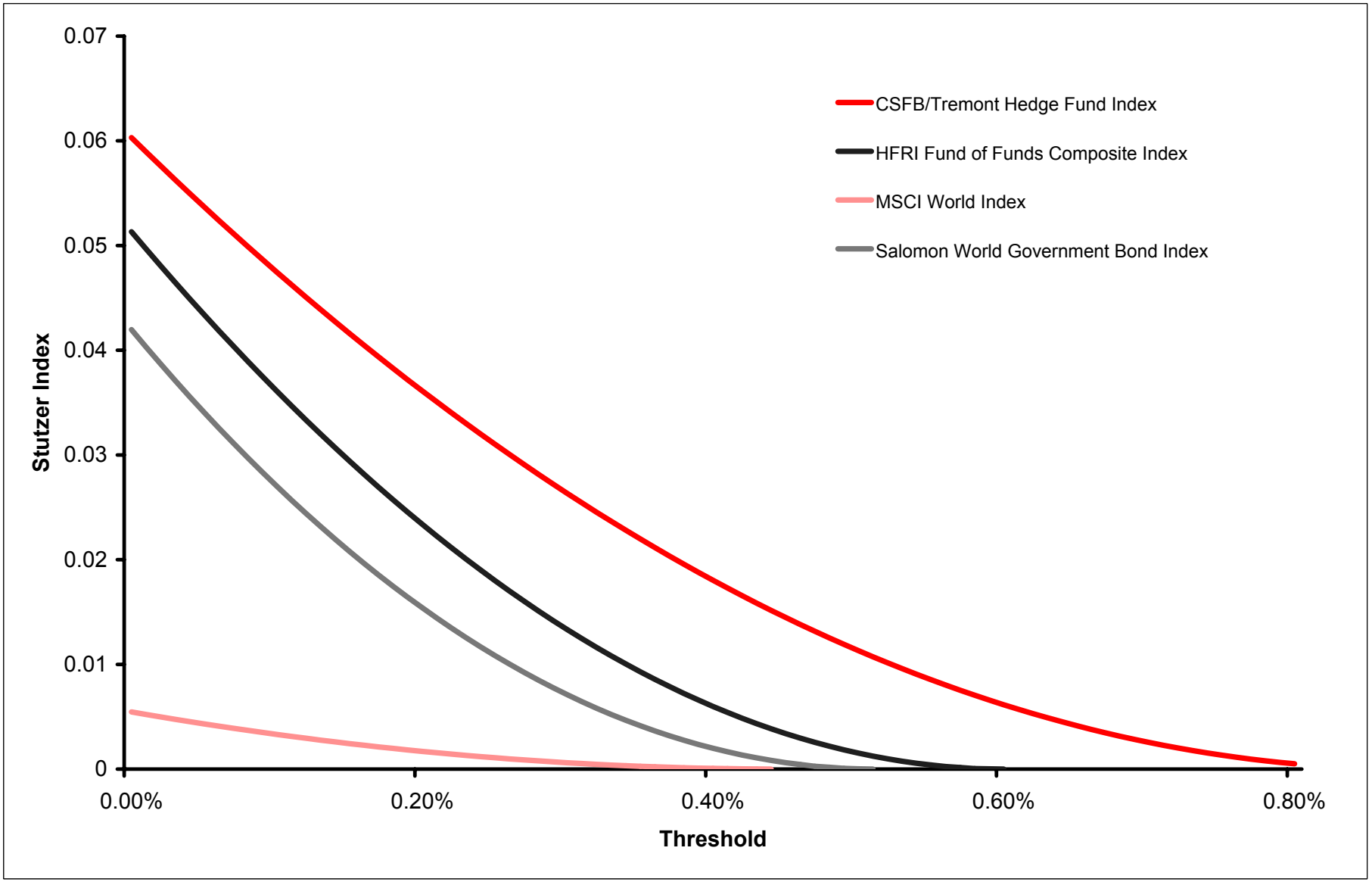

3
2.5
2
1.5
1
0.5
0
Omega
0.00%
0.50%
1.00%
1.50%
2.00%
2.50%
3.00%
Threshold
CSFB/Tremont Hedge Fund Index
HFRI Fund of Funds Composite Index
MSCI World Index
Salomon World Government Bond Index

It is interesting to note that the ranking depends on the threshold value. The two hedge fund indices provide a better performance when considering reasonable thresholds (below 0.6% monthly). At higher thresholds (above 1.5% monthly), the MSCI World Index is the best investment. However, as the Omega value is below one, this finding is mainly due to the asymmetric shape and some extreme positive returns of the MSCI World Index (see Figure 2). In fact, the evaluation of an investment with the Omega function should be considered for thresholds between 0% and the risk free rate. Intuitively, this type of threshold corresponds to the notion of capital protection already advocated.

Besides incorporating all the moments, the Omega function has two interesting properties. Firstly, when the threshold is set to the mean of the distribution, the Omega measure is equal to one. Secondly, whatever the threshold is, all investments may be ranked. In the context of the Sharpe ratio, the ranking is almost impossible for negative ratios.


MSCI World Index
CSFB/Tremont Hedge Fund Index
No. Observations
50
45
40
35
30
25
20
15
10
5
0
-0.1
-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
0.08
0.1
Monthly Returns

Contrary to the Omega function, the **Stutzer index** introduced by Stutzer (2000) relies heavily on a behavioural hypothesis. It assumes that investors aim to minimise the probability that the excess returns over a given threshold will be negative over a long time horizon. When the portfolio has a positive expected excess return, this probability will decay to zero at an exponential decay rate as the time horizon increases. The maximum possible decay rate is defined as the Stutzer index. The higher it is, the better is the portfolio. Figure 3 shows the ranking of the four indices according to the Stutzer index. In this framework, the two hedge fund indices are clearly dominating the two traditional ones. Note that the Stutzer index is only defined for thresholds below the mean return.


0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Stutzer Index
0.00%
0.20%
0.40%
0.60%
0.80%
Threshold
CSFB/Tremont Hedge Fund Index
HFRI Fund of Funds Composite Index
MSCI World Index
Salomon World Government Bond Index

The Stutzer index possesses one remarkable property. When the return distributions are normal, their ranking is exactly the same as with the Sharpe ratio. In that case, the Stutzer index is equal to half of the square of the Sharpe ratio. Moreover, it is important to note that higher moments will have an impact on the value of the index. For example, a distribution with negative skewness and high kurtosis will result in a lower Stutzer index than a normal distribution with the same mean and variance. This is related to the fact that the former distribution exhibits more negative extreme observations.

Comparison and Implications

From a theoretical point of view, the Omega measure and the Stutzer index should provide better results than the Sharpe ratio. However, this remark is short-lived if it does not practically translate into different rankings implied by the various performance measures. For that purpose, we consider the ranking of the performance of 44 indices by the Sharpe ratio, Sortino ratio, Omega and the Stutzer index, for the time period January 1994 to February 2003. 14 indices are from the CSFB/Tremont database, 24 from the HFR database, 4 from the Stark database, and finally 4 indices are traditional ones (MSCI World Index, Russell 2000, S&P500 and Salomon World Government Bond Index). We use the Libor one-month USD as the threshold for all measures.

Table 1 summarises the main results in terms of ranking comparison. We define three categories: identical rank, significantly upgraded rank, and significantly downgraded rank. Ranks are considered to be identical if the change is less than one position. In other words, we are interested in finding the big changes and not the small movements. More changes are observed for the Sortino ratio than for the Omega measure or the Stutzer index. Moreover, for the indices whose rank improves, the skewness is reduced, and sometimes even turns positive, compared to the identical ranking case. The kurtosis also significantly decreases. In contrast, when looking at indices whose rank deteriorates, the skewness is clearly reduced and strongly negative while the kurtosis is very important. These results show that the mismatch between the alternative measures and the Sharpe ratio is due to higher moments. As a robustness check, we compare the ranks for the normally distributed indices[1] and do not find any mismatch.

[1] 15 indices are normally distributed according to the Jarque-Bera statistic at 5% significance level.

Table 1

	Sortino ratio	Omega	Stutzer index
Identical Ranking			
No. Indices	28	36	37
Mean (Avg.)	0.69%	0.76%	0.72%
Standard Deviation (Avg.)	2.79%	2.82%	2.67%
Skewness (Avg.)	-0.68	-0.75	-0.82
Kurtosis (Avg.)	6.48	7.18	7.22
Ranking Upgraded			
No. indices	8	3	3
Mean (Avg.)	0.91%	0.74%	0.99%
Standard Deviation (Avg.)	2.79%	1.41%	2.49%
Skewness (Avg.)	0.08	-0.45	0.23
Kurtosis (Avg.)	3.95	4.09	3.69
Ranking Downgraded			
No. indices	8	5	4
Mean (Avg.)	0.79%	0.73%	0.90%
Standard Deviation (Avg.)	1.65%	1.58%	1.88%
Skewness (Avg.)	-2.86	-2.60	-2.95
Kurtosis (Avg.)	17.71	16.85	19.17

The use of the alternative performance measures does not affect the ranks of traditional indices. They are ranked at the bottom by all the measures (between 43 for MSCI World Index and 33 for Salomon World Government Bond Index). The most significant improvements are found for HFRI Equity Hedge Index (from 12 to 9), HFRI Equity Market Neutral Index: Statistical Arbitrage (from 19 to 15), and HFRI Market Timing Index (from 16 to 13). On the contrary, the most significant drops are for CSFB/Tremont Event Driven Index (from 15 to 18) and HFRI Fixed Income: Mortgage-Backed (from 13 to 17).

Conclusion

As shown in this article, higher moments matter when performance has to be evaluated. When using the Sharpe ratio, some investments may mistakenly appear better or worse than they are, because all the risk characteristics are not taken into account. That is why we advocate the use of new performance measures, namely the Omega measure and the Stutzer index. Moreover, these measures can be applied in order to generate a better asset allocation among hedge fund styles as recently shown by Bacmann and Pache (2003).

References

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