

Mutual Fund Ratings and Efficiency: An Examination of the Relationship

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Abstract

Morning Star is a rating agency that rates mutual funds based on past performance. The best performing funds are rated 5* while the lowest performing ones are rated 1*. Investors rely heavily on these ratings for making their investment decision. Funds with high rating tend to attract millions of dollars more than those rated lower. The highly rated funds also charge higher management fees as compared to the lower rated funds. Very few studies have examined whether the higher ratings and fees are justified by better performance. In this paper we use a Data Envelopment Based measure of efficiency to examine whether the funds rated 5* are more efficient than funds that are rated 3* by Morning Star ratings. We use returns as the sole output and standard deviation and expense ratio as the two inputs. The results of the study indicate that by and large the Morning Star 5* funds are more efficient than the 3* funds. Another significant find is that small cap funds are generally more efficient than large caps. This implies that even within a particular rating category small funds may be a better investment. The findings of the paper are significant as they provide evidence that ratings are a useful tool for investors in the selection of funds.

Keywords: Mutual funds, Morning Star, DEA, Rating, Efficiency

1. Introduction

Mutual funds have found their way into the lives of millions of people across the world either as part of their investments or as part of their pension pot. The choice of funds available to the investors is large and their decisions to invest in a particular fund are largely influenced by the ranking/rating of the fund. Companies that constantly evaluate mutual fund performance give these rankings/ratings. For the average investor planning to take advantage of a mutual fund as a "one-stop investment", it is imperative that a performance measure not only gives an accurate measure of the fund's historical performance, but also an indication of its future performance. In America, Morningstar Inc. is the industry leader whose star-ratings greatly influence the investor behaviour. However, earlier studies have revealed that the majority of mutual funds in the US did not perform any better than the indices against which they have been measured.

A ranking system like Morningstar derives its ratings by classifying funds on their risk adjusted return performance. Other measures of fund performance include Sharpe index (Sharpe, 1966), Treynor index (Treynor, 1965) and Jensen's alpha (Jensen, 1968). These indices and rating system lose out since they do not have a specific benchmark and ignore market timing and costs. As a result the performance measurement can be subjective. Grossman (1976) and Elton et al. (1993) support the inclusion of transaction costs in appraising the performance of funds. Sharpe (1998) argues that neither Morningstar's measure nor the excess-return Sharpe ratio is an efficient tool for choosing mutual funds within peer groups for a multi-fund portfolio.

The investor has access to information regarding performance of the funds and the various time-horizons over which the performance was achieved. However, the investor is typically left to his own intuition to decide which past performance is the most meaningful in terms of predicting the future performance. The ratings awarded to funds can be subjective and can lead to mis-identification of high performing funds. For example, in case of Morningstar's ranking system long-term performance is given more weighting than short-term performance, as a result a poor performing fund might still be highly rated due to strong long-term performance.

Blake and Morey (1999) point out that there is very little statistical evidence that Morningstar's highest rated funds outperform the next-to-highest or the median-rated funds. They also point out that Morningstar ratings do no better than the "naïve" predictor (historical average monthly return) for predicting fund performance.

To overcome the problem of specification of a benchmark and also to incorporate transactions cost like Murthi et al. (1997) this paper uses a non-parametric approach (DEA) for mutual fund performance appraisal. Using DEA eliminates the need for theoretical benchmarks by generating its own efficiency frontier using a number of inputs and outputs simultaneously.

Since equity funds are the most popular funds and the U.S. is the largest market for mutual funds, we examine the performance of U.S. domestic equity funds for the study. Using returns per unit of risk (standard deviation) and expense, we rank two distinctly rated groups of funds, viz., the Morning Star 5-star and 3-star, and assess the efficiency of both. As Blake and Morey (1999) point out that Morning Star 1-star and 2-star rated funds are poor performers and as there's little statistical difference between the returns of 5-star, 4-star and 3-star rated funds, we use 5-star and 3-star rated funds for this study. We exclude 4-star funds, since they may not be so different from highest rated fund and could well be "leftovers" under Morningstar rating system. This study covers three year historical return from the period 25-sep-01 to 24-sep-04. This study uses a DEA approach to rank the funds for each of the three years. By examining the difference in performance of the 5 star and 3 star funds, the study tests whether these ratings provide any useful information. It also helps investors to choose between the different rated funds. Thus this fills a void in the literature and also provides investors with a better understanding of the performance of the funds.

The rest of the paper is organized as follows. Section 2 explores the prior studies in the field of non-parametric approaches to mutual fund performance appraisal. It introduces the concepts of DEA and the DEA indexes proposed for mutual fund appraisal. Section 3 describes the data and the methodology. Section 4 reports the results and contains the analysis of our findings. Finally, we conclude in Section 5 with some conclusions.

2. Literature Review

Treynor (1965) suggested the first substantially different and a more meaningful predictor of mutual fund performance by incorporating the volatility of a fund's return. It is a numerical index that measures reward-to-variability ratio. The Treynor measure produces excess return per unit of systematic risk. A higher value indicates superior performance. It is measured as:

$$(r_p - r_f)/\beta_p$$

Sharpe (1966) proposed the Sharpe index that measured reward-to-volatility ratio and it soon became a major index to assess portfolio performance. It is defined as the ratio of excess return of the portfolio to the standard deviation. A fund that earns higher return per unit of standard deviation is a superior performer. The Sharpe measure is calculated as:

$$(r_p - r_f)/\sigma_p.$$

In finance literature, the return/risk relationship is well established in the CAPM and CML (capital market line). Both these measures avoid the problems of specification of a benchmark and do not take into consideration the transaction costs associated with the buying and selling of assets.

Jensen proposed Jensen's alpha (Jensen, 1968), which is defined as the difference between the actual portfolio return and the estimated benchmark return. This is by far the most widely used index of performance and it addresses the issues of benchmarking and market timing. The benchmark could be based on either the CAPM (capital asset pricing model) or the APT (arbitrage pricing theory) model. Jensen's alpha is calculated as:

$$\alpha = r_p - [r_f + \beta_p (r_m - r_f)]$$

Many studies as summarised in Elton et al., (1993) find that Jensen's alpha is sensitive to the choice of the benchmark model that is employed for the comparison and argue that the estimation of Jensen's alpha may be biased due to market timing, which is the ability of the fund managers to systematically change the target risk of the fund. Barras et al (2010), controlling for luck, find that most funds exhibit zero alpha.

Researchers have established a connection between transaction costs and portfolio performance (Grossman, 1976; Elton et al., 1993). They argue that as the collection and usage of information is costly, informed investor should earn higher returns. A performance measure of funds, therefore, should also incorporate transaction costs. Varian (1990) advocates the use of nonparametric approach to measure optimal behaviour of investors. He argues that

parametric testing for significance puts a great emphasis on statistical significance and ignores economic significance.

The nonparametric approach used in this paper is the Data Envelopment Analysis (DEA), proposed by Charnes, Cooper and Rhodes (1978). This model (hereafter, CCR model) focuses on the relative efficiency of a set of decision-making units (DMUs). All these units require some input and in return generate some output. The DEA is essentially the ratio of weighted sum of outputs to a weighted sum of inputs. It generates a linear frontier that represents the best achievable output for given level of input. This frontier becomes the benchmark for other DMUs. The DMUs on the frontier become peers for the inefficient DMUs.

Murthi et al. (1997) used DEA to take into account risk and transaction costs to evaluate mutual fund performance by incorporating expense ratio, load, turnover and standard deviation as inputs and return as output. Blake and Morey (1999) find that returns generated by highest rated funds are not statistically different from median-rated funds.

Basso and Funari (2001) propose a multiple input single output model but takes into account only subscription cost and redemption fees as input. For excluding other costs, the authors argue that other costs like operational expenses, management fees, markets and administrative expenses and trading turnover ratio do not directly burden the investor and that these expenses are deducted from the fund quotation. However, using data on French mutual funds, Dermine and Roller (1992) show that economies (diseconomies) of scale for small (large) funds may exist.

Murthi and Choi (2001) address this issue by incorporating variable returns to scale in a DEA based efficiency measure. Since CCR model assumes constant return to scale, they employ the BCC model of DEA was proposed by Banker, Charnes and Cooper (1984) that assumes variable return to scale (VRS). Morey and Morey (1999) apply the philosophy of DEA to mutual fund performance appraisal, simultaneously considering fund risks and returns over different time periods. They propose that inclusion of timing in performance appraisal of funds may provide useful insights in ranking/rating of funds.

Russel (2006) examining the efficacy of the Morning Star rating systems find that these ratings reflect past performance but do not foretell the future. Haslem et al (2008) investigating US equity funds from Morning Star indicate that funds with low expense ratios and no or low front-end fees tend to have superior performance.

3. The Data Envelopment Analysis

3.1 Charnes, Cooper, Rhodes (CCR) model:

The DEA (Charnes et al., 1978) is an optimization based technique that allows measuring the relative performance of decision making units (DMUs), characterized by multiple objectives and/or multiple input structures. A DMU is regarded as an entity responsible for converting inputs into outputs. The measure of efficiency is essentially defined as a ratio of weighted outputs to weighted inputs. Formally to compute the DEA, we have to solve the following fractional problem:

$$\begin{aligned} \text{maximize: } & h_o = \frac{\sum_{r=1}^s u_r y_{ro}}{\sum_{i=1}^m v_i x_{io}} \\ \text{subject to: } & \frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1; \quad j = 1, 2, \dots, n \\ & \frac{u_r}{\sum_{i=1}^m v_i x_{io}} > \varepsilon; \quad r = 1, \dots, s \\ & \frac{v_i}{\sum_{i=1}^m v_i x_{io}} > \varepsilon; \quad i = 1, \dots, m \\ & \varepsilon > 0 \end{aligned}$$

where

$j = 1, 2, \dots, n$ decision making units
 $r = 1, 2, \dots, s$ outputs
 $i = 1, 2, \dots, m$ inputs

y_{rj}	amount of output r for unit j
x_{ij}	amount of input i for unit j
u_r	weight assigned to output r
v_i	weight assigned to input i
$y_{rj}, x_{ij} > 0$	
u_r and $v_i \geq \varepsilon$	where ε is a non-Archimedean constant

The numerator represents a set of desired outputs and the denominator represents a collection of resources used to obtain these outputs. The value h_o^* obtained from this ratio satisfies $0 \leq h_o^* \leq 1$ and can be interpreted as an efficiency rating in which $h_o^* = 1$ represents full efficiency and $h_o^* < 1$ means inefficiency is present. The star (*) indicates an optimal value obtained from solving the model. The optimal values u_r^* , v_i^* may be interpreted as weights when solutions are available from the equation. They are the weights which are most favourable for the DMUs. v_i^* is the optimal weight of the input and u_r^* is the optimal weight of output.

Farrell (1957) proposed that the efficiency of a firm consists of two components: *technical efficiency*, the ability of a firm to obtain maximal output from a given set of inputs and *allocative efficiency*, which is the ability of a firm to use the inputs in optimal proportions, given their respective prices. The product of these two measures is total *economic efficiency*.

4. Data and Methodology

Following the analysis done by Murthi et al (1997) and Basso and Funari (2001), this paper also looks at measuring mutual fund performance in terms of standard deviation of returns and the expenses incurred by the fund. We use return as an output and standard deviation and expense ratio as two inputs for our DEA. Thus, we have a single output – multiple input model of DEA. Standard deviation is a proxy for risk and investors will expect higher returns at higher risk levels. Expense ratio is the annual fee that funds charge their shareholders and includes expenses such as marketing or 12b-1 fees, management fees, administrative fees, operating costs, and all other asset-based costs incurred by the fund. Investors expect higher returns for higher costs incurred. Since our DEA is a maximization process, our objective is to maximize returns for a given level of risk and cost.

4.1 Data Source

The Morningstar database consists of more than 15,000 open-ended mutual funds. Our sample is drawn from the set of all domestic equity funds represented in the Morningstar data base from August 31, 2001 to August 31, 2004. We have excluded all specialty funds to avoid bringing in sector specific discrepancies. We eliminate index funds in order to more clearly see the response of investors and managers to a change in the overall star rating. Morningstar does not rate funds that have less than three years of data and so very young funds are also eliminated. We include only no-load funds, the rationale being that as we are considering only expense ratio as a proxy for cost of funds, it would be inappropriate to include funds that also have other costs like front-end or deferred load. We exclude funds that have negative 3-year return figures since DEA cannot accept negative values. We further exclude a very small number of funds with reported expense ratios in excess of 10% because these atypical funds may act as outliers and distort the overall results of our tests. Then from the Morningstar Style Box we choose the Growth funds in all the three sizes – large cap, mid-cap and small cap. This allows us to examine the performance of the Growth funds for the three sizes as well across the two different star ratings.

There are a total of 15,748 funds, of which 5,837 are no-load funds. For the purpose of this study we have selected 25 each of 5-star rated and 3-star rated from each of the three Growth categories. In case where 25 funds are not available, we have taken the maximum possible number of funds and made an attempt to keep the total number of funds around 50 from each category. After satisfying all the previous criteria, the funds were selected randomly, the random numbers being generated by random function of Microsoft Excel. These criteria resulted in a sample of 420 funds from a universe of 2,765 funds as shown in Table 1:

Table 1. Segregation of Sample Data

Category	No. of Funds	5-star Funds	Funds Selected	3-star Funds	Funds Selected	Total Funds
Large Growth	1,289	38	25	131	25	50
Mid-cap Growth	778	21	21	76	29	50
Small Growth	698	28	25	78	25	50
Total	2,765	87	71	285	79	150

We use the Kolmogorov-Smirnov (K-S) test to determine the distribution of the input and output variables. The test results are positive for all variables under all categories. This means that all the input and output variables used for this study are normally distributed.

To test the hypothesis that the DEA efficiency ratings of two groups of DMUs are different and one group of DMUs is more efficient than the other group, we undertake Banker's test proposed by Banker (1993). This test determines whether the difference in DEA ratings for two groups of DMUs (N_1 and N_2) is statistically significant. Different test statistics are used depending on the assumption that is made regarding the distribution of the efficiency rating ($1/k_o^*$).

There are two assumptions regarding the distribution of efficiency ratings:

- i. The distribution is exponential, or
- ii. The distribution is half-normal

If the distribution of efficiency ratings is assumed to be exponential with means $1 + \sigma_1$ for group N_1 and $1 + \sigma_2$ for group N_2 , then the null hypothesis for no difference in the efficiency ratings of the two groups is given by $H_0: \sigma_1 = \sigma_2$. The alternative hypothesis is $H_a: \sigma_1 > \sigma_2$ if it is believed that group N_1 has a lower efficiency rating than group N_2 . In this case, the test statistic (B_e) is given by:

$$B_e = \left[\sum_{j \in N_1} (1/k_j^* - 1)/n_1 \right] / \left[\sum_{j \in N_2} (1/k_j^* - 1)/n_2 \right]$$

where:

- k_j^* = DEA efficiency rating of each DMU
- N_1 = DMUs in group 1
- N_2 = DMUs in group 2
- n_1 = number of DMUs in group 1
- n_2 = number of DMUs in group 2

B_e follows an F-distribution with $2n_1$ and $2n_2$ degrees of freedom.

5. Results

The data was analysed using DEA assuming constant returns to scale. For the purpose of this study, we use the exponential distribution model of Banker's test for finding differences in efficiencies of two groups of growth funds viz. 5-star rated funds and 3-star rated funds. It is established by using K-S test that the efficiency ratings for funds studied are exponentially distributed.

We state the null hypothesis as there is no difference between the efficiency of the two sets of growth funds. That is to say that the 5-star and 3-star funds are equally efficient. As a result, our alternate hypothesis states that the 3-star growth funds are less efficient than the 5-star growth funds. Hence, our hypothesis can be written as:

$$H_0: \sigma_3 = \sigma_5$$

$$H_a: \sigma_3 < \sigma_5$$

Table 2 gives the Z scores and F scores from the K-S test and Banker's test respectively. In the fifth column we have the values of F, from an F-distribution table, above which null hypothesis can be rejected at 95% confidence level. We find that the null-hypothesis is rejected in all the three categories – large growth, mid-cap growth and small growth and hence conclude that at 95% confidence level 5-star funds are more efficient than 3-star funds.

Table 2. Results of K-S and Banker's tests of Mutual Funds

<i>Category</i>	<i>No.</i>	<i>K-S Z</i>	<i>Banker's F^a</i>	<i>Sig. Value^b</i>	<i>Numerator DoF^c</i>	<i>Denominator DoF</i>
Large Growth	50	0.765	9.787	1.60	50	50
Mid-cap Growth	50	1.662	2.371	1.60	50	50
Small Growth	50	1.982	5.173	1.60	50	50

^a Banker's F is the value returned by carrying out Banker's test, i.e. the B_e .

^b The significance value at 95% confidence level, above which the null hypothesis can be rejected.

^c DoF stands for degree of freedom, which for Banker's test equals $2n$.

Category-wise Results

Large Growth Funds:

In this category we studied 50 funds, 25 each of 5-star and 3-star rated. The mean technical efficiency was 0.526 for 5-star funds and 0.179 for 3-star funds. In this category, 3 funds from the 3-star category rank in the top 25. No 3-star fund achieves the maximum efficiency level and the 3-star funds are statistically less efficient than 5-star funds.

Mid-Cap Growth Funds:

In this category we studied 50 funds, 25 each of 5-star and 3-star rated. The mean technical efficiency was 0.723 for 5-star funds and 0.421 for 3-star funds. In this category, 6 funds from the 3-star category rank in the top 25. No 3-star fund achieves the maximum efficiency level and the 3-star funds are statistically less efficient than 5-star funds.

Small Growth Funds:

In this category we studied 50 funds, 25 each of 5-star and 3-star rated. The mean technical efficiency was 0.666 for 5-star funds and 0.337 for 3-star funds. In this category, 3 funds from the 3-star category rank in the top 25. No 3-star fund achieves the maximum efficiency level and the 3-star funds are statistically less efficient than 5-star funds.

Figure 1 shows the mean efficiency of the different groups of funds

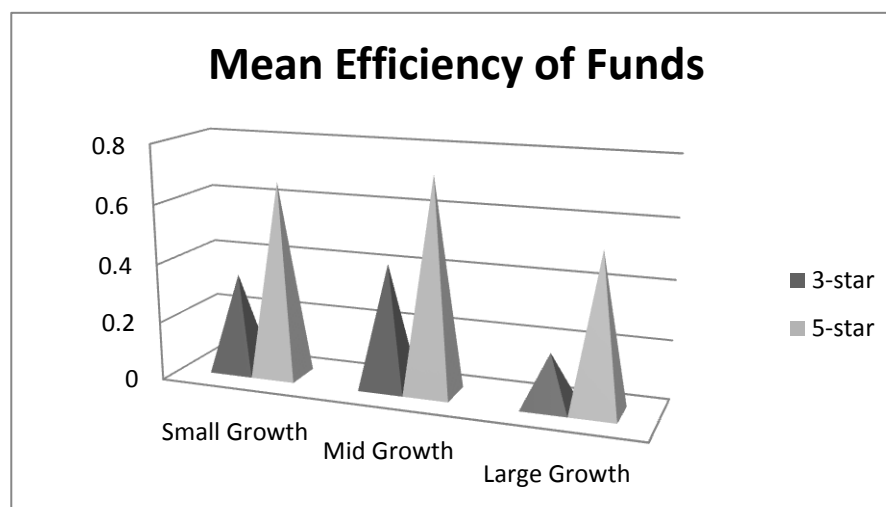


Figure 1. Mean efficiency of funds (5-star vs 3-star)

Large Growth Funds vs. Small Growth Funds:

Here, we compare 5-star rated large growth funds against 5-star rated small growth funds as well as 3-star rated large growth funds against 3-star rated small growth funds. As seen in figure 2, within the same star rating for both five and three star-rating the smaller fund outperforms the larger fund. The mean technical efficiency was 0.526 for large 5-star funds and 0.666 for small 5-star funds while for the 3-star funds the mean technical efficiency was 0.179 for large and 0.337 for small funds. It seems that smaller funds are more efficient than larger funds and this deduction is supported by Banker's test results at 95% confidence level.

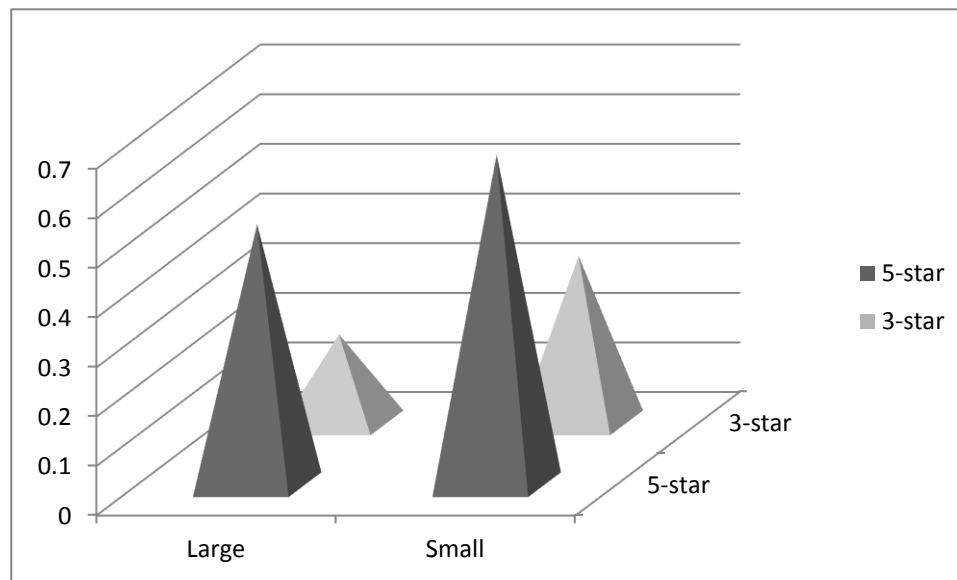


Figure 2. Mean Efficiency of Funds (Large vs Small)

In Table 3, we provide the mean and the standard deviation of the technical efficiency scores and Sharpe ratio, by investment objectives. We find that small funds are relatively more efficient in utilizing their resources than large funds.

Table 3. Summary statistics of the efficiency index and Sharpe ratio

	DEA-TE ^a Mean	DEA-TE Std. Dev.	Sharpe Ratio Mean	Sharpe Ratio Std. Dev.
Large Growth	0.35	0.266	0.11	0.214
Mid-cap Growth	0.57	0.267	0.02	0.233
Small Growth	0.50	0.233	0.18	0.319

^a DEA-TE is the technical efficiency score.

6. Conclusion

In this study we investigate the usefulness of Morningstar fund ratings by comparing the performance of the highest rated (5-star) set of growth funds against lower rated (3-star) growth funds. We apply the DEA methodology to measure mutual fund efficiency. The results obtained by using the above methodology indicate that statistically the 5-star rated funds have higher mean efficiency as compared to the 3-star rated funds.

Morning star classifies funds into 5 star ratings from 1-star to 5-star but in this study we only chose to compare 3-star to 5-star funds. We could have compared 1-star funds to 5-star funds as the difference between these two groups should be much larger than that between 3-star and 5-star funds. However, by comparing 3-star and 5-star funds which are closer to each other we conducted a much stronger test of the efficiency of Mornings Star ratings. If the 3-star and 5-star differ, then the likelihood of there being differences in 1-star and 5-star is much higher.

The study also examined the difference between large, medium and small cap funds in both the star rating categories. The surprising outcome, however, is that within both the star ratings the smaller funds seems to be more efficient than the larger funds. This is an interesting find as it indicates that even within the same rating it would be better for investors to choose smaller funds as they are more efficient. Also it is found that even though the average efficiency of the 5-star funds are more than that of the 53star funds there are quite a few number of 3-star funds that are equally efficient. This could also imply that the difference between 4-star and 5-star as well as that between 3-sar and 4-star may be very minimal not necessarily robust. We specifically chose the 5-star and 3-star rated funds leaving out the 4-star so as not to have any effects from the outliers of the two groups and so if the ratings are consistent no 3-star fund should be as efficient as 5-star funds. However, given our findings, it can be questioned why if funds are equally efficient, then some are given lower rating. The impact of Morningstar's rating is huge considering that loss of one star result in a net outflow of \$50 million from a fund. And moreover most investment decisions by individual investors are based on the star-rating of a fund.

The study only looked at one type of funds – growth funds and so it would be premature to generalize the results to the numerous types of funds in the markets as their strategies may be vastly different resulting in totally different performance characteristics. Also all the funds studied in this paper were from the US markets managed by more sophisticated managers whereas funds in other countries may not exhibit the same characteristics and so the results cannot be extended to these funds. Future studies need to examine the ratings in other types of funds including stocks, commodities, bonds etc.as well as funds investing in assets around the world to ensure that the Morning Star ratings provide valuable information for investors.

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