

Determining the Optimal Mutual Fund Style Classification Methodology

There are currently two primary methodologies used to classify the investment style of mutual funds: holdings-based style analysis (HBSA) and returns-based style analysis (RBSA). HBSA classifies any investment based on the underlying holdings in the portfolio (what it is), while RBSA classifies an investment based upon its historical returns (what it did). While there has been research noting the advantages and disadvantages of each strategy, little research has been conducted to determine which classification methodology results in a more consistent definition of mutual funds and which methodology best determines the likely future style of a mutual fund. This paper will explore this topic in order to determine the ideal methodology for classifying mutual funds as well as provide a general discussion of HBSA and RBSA.

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INTRODUCTION

What is the optimal methodology to classify a mutual fund? Mutual funds (and other equity investments) are typically classified using either holdings-based style analysis (HBSA) or returns-based style analysis (RBSA). HBSA classifies an investment based on its underlying holdings (what it is), while RBSA classifies an investment based upon its historical returns relative to a variety of passive indexes (what it did). This paper will provide the reader with a general understanding of both RBSA and HBSA, review which methodology results in a more consistent definition of investment style for mutual funds, and determine which methodology best determines the likely *future* style of a mutual fund.

Related Research

Christopherson (1995) was one of the first to address

the importance of the future predictability of style analysis by noting “style is of interest not because we are concerned with observed past returns, but because we want to anticipate future returns.” While Trzcinka (1995) provides commentary questioning the reliability of Christopherson’s research, the concept raised by Christopherson - that style is important not only for peer group comparisons but also to the extent it can provide us information about the future style of the investment - is important nevertheless.

Most research on RBSA and HBSA has viewed each methodology as mutually exclusive and has not compared them directly. However, two Morningstar research papers - one by Rekenhaller, Gambera, and Charlson (2002) and a second by Kaplan (2003) - compare the relative merits of each methodology. Rekenhaller et al. conclude that whether measured by correlation or mean absolute deviation, RBSA produces significantly weaker results than fundamental analysis

(i.e., HBSA). The authors also found that HBSA continued to provide results that were on par or superior to RBSA as far out as three years from initial classification. The authors do caution the reader, though, that neither methodology is likely to provide a reliable classification for investments that drift frequently. Kaplan (2003) noted that HBSA and RBSA resulted in similar classifications for some styles but differed substantially for others. Kaplan concluded that when an investment is composed primarily of direct stock holdings, HBSA is the more advantageous style methodology. He also reminds the reader that quantitative techniques should complement, but never replace, qualitative knowledge of an investment's style and strategy.

A common criticism of RBSA is its inability to provide an effective style definition when there is a strong relationship between the indices used for the RBSA analysis (a term known as multicollinearity). This has been noted by Lobosco and diBartolomeo (1997), stating "if the independent variables are highly correlated... the reliability of the estimated coefficients... is very much in doubt." LaRoche (2006) conducted a case study on the American Century Small Cap Core mutual fund and had similar findings.

Buetow, Johnson, and Runkle (2000) have noted the importance of index selection during an RBSA analysis, concluding that "RBSA is a useful tool only when the investment philosophy of the portfolio manager is well understood and there are a set of asset classes that properly capture this philosophy." Buetow et al. also note without such a framework the usefulness of the results of an RBSA is questionable. Mayes, Jay, and Thurston (2000) found that most funds are correctly classified by fund objective according to their return patterns; however, the authors did not provide a discussion as to whether HBSA would be a more or less useful style methodology than RBSA.

Why Primary Investment Styles are Important

Investment style is important for a variety of reasons. Client allocations are typically created based on some type of optimization process in order to maximize the return of a portfolio for a given level of risk. While index data is used to represent the return of a given asset category during the optimization, active managers

are often used to represent a certain investment category when the portfolio is actually implemented. If the selected active investment "drifts" away from the selected mandate, a suboptimal portfolio exposure could develop that would require action.

Style consistency can also potentially lead to superior returns according to Brown and Harlow (2005), who note three reasons why this may occur.

1. Style consistent investments are likely to generate less turnover and therefore have lower transaction costs (see for example, Kasten (2007)).
2. Style consistent investments are less likely to make tactical asset allocation errors when trying to time the market.
3. Since better managers will want to be evaluated more precisely, they can signal their superior skill to potential investors by maintaining a more style consistent portfolio.

After an exhaustive analysis the authors found that style performance was important and that those investments with higher levels of style consistency tended to outperform those investments with lower levels of style consistency.

Morningstar recognized the importance of specific investment categories when they shifted their star ranking classifications in July 2002. The previous Morningstar star ranking system classified funds within four categories: domestic stock, international stock, taxable bond, and tax-exempt bond. Such a methodology ignored the fact that as certain styles came into favor (e.g., Large Growth) the funds within that style would be favored regardless of the fund's relative peer performance.

The 2002 update expanded the number of investment styles from the previously mentioned 4 to 48 (28 equity and 20 bond) in order to better capture the relative performance of mutual funds. While an organization could develop their style methodology for classifying mutual funds, this would be impractical given the relatively low cost at which this information can be obtained from organizations such as Morningstar

and Lipper.

Returns-Based Style Analysis (RBSA)

RBSA was first introduced as a low-cost solution to holdings-based style analysis (HBSA) by William Sharpe (1988). The concept behind RBSA is best paraphrased by the folk saying (used by Sharpe in his original research paper), “if it acts like a duck, assume it’s a duck.” RBSA uses constrained optimization to classify an investment by comparing its performance to a number of passive benchmark indices. RBSA searches for some combination of index returns that best mimics the portfolio performance over the test period. The test period can vary, although 36 monthly rolling periods is the most common test period.

RBSA is a popular investment classification methodology for a variety of reasons. Advances in computing technology have eased the calculation process considerably (*e.g.*, it can be done using the Solver function in Microsoft Excel). It also allows for a greater degree of customization than HBSA, since with RBSA the end user can select the benchmarks and time period for the constrained optimization process used to determine the underlying style. RBSA also necessitates far less information than HBSA, since only information on the returns is necessary for the determination (opposed to HBSA, which is dependent on obtaining reliable and timely data about the portfolio holdings). A limitation of RBSA, though, is that a minimum period of performance must be available to determine the appropriate style.

Typically four to twelve passive indexes are selected for the RBSA attribution analysis. While increasing the number of passive indexes can increase the precision of the RBSA process, increasing the number of indexes also increases the likelihood of multicollinearity, which reduces the reliability of the RBSA output. An additional consideration of RBSA is that it can result in stale style classifications depending on the time period used for the attribution analysis. For example, if the time period used for the RBSA calculation is 36 months, the average age of the returns for the classification would be 18 months old (assuming no type of time-weighting). Therefore, RBSA would be slow to pick up on any significant changes in investment policy.

Standard & Poor’s used to publish RBSA style definitions for mutual funds until it was purchased by Morningstar in May 2007. It classified investments based upon separate “investment styles,” each with its own risk and return characteristics. For each investment style, S&P would identify a corresponding index or “pure style” benchmark. Using nonlinear regression analysis and monthly total return data, S&P would compare the historical performance of each fund over three years against all the benchmarks within an asset class to determine its predominant investment style (Standard & Poor’s...).

Holdings-Based Style Analysis (HBSA)

HBSA is a bottom-up investment classification methodology based on the portfolio’s underlying holdings. While computationally much more difficult than RBSA, HBSA remains popular because it is based on the actual portfolio holdings (*i.e.*, if it is a duck, assume it’s a duck, regardless of how it acts) instead of RBSA, which is based on an approximation of its return exposures. However, in order for an HBSA classification to be worthwhile, both timely and accurate information must be available for the underlying holdings. The older the information on the portfolio holdings, the less reliable an HBSA classification will be. This has become much less of an issue, though, with increases in computer technology.

Once holdings data has been obtained, a methodology must be developed to categorize the underlying holdings and then aggregate the holdings into an overall composite style classification. Investment professionals typically have little input into this process and must accept the definitions created by the major HBSA data providers. Unlike RBSA, which requires only historical return information, it would be far more difficult for the average investment professional to obtain accurate and timely holdings information for a portfolio in order to make an accurate HBSA classification.

Since HBSA is based upon the underlying holdings of the portfolio, it is possible for portfolio managers to “window dress” their investment style by modifying the portfolio holdings shortly before the reporting period. While Morningstar uses a three-year look-back period to determine Investment Category, using a shorter period (*i.e.*, the last period of reported holdings) would

potentially enable a portfolio manager to alter his or her investment style in order to achieve a more favorable peer group.

An additional consideration of HBSA is that it is less useful when defining investments that obtain market exposures using derivatives (such as forwards), since these investments can be difficult to categorize or combine with the other portfolio holdings to determine a primary investment style. In addition, mutual funds which invest in a variety of different assets (blended funds, asset allocation funds, target date funds, etc.) may be more difficult to categorize under HBSA.

While a number of different organizations offer HBSA, Morningstar is the most common, especially among retail investors, who are most likely to invest in mutual funds. Morningstar offers both Investment Style and Investment Category classifications; Investment Style is a current snapshot of the underlying holdings, while the Investment Category is a three year average. Morningstar Categories are the more popular of the two, since they represent a longer term perspective of the style exposure for a given investment.

Prospectus Category

A third methodology that can be used to determine a mutual fund's style is to use the information contained in the prospectus (*e.g.*, the fund objective) or by relying on information provided by the sponsoring organization. While such a classification methodology provides information on the *intended* style, it does not provide an investor with information on the actual style exhibited by the fund. The stated style objectives can be very broad (giving the portfolio manager a high degree of flexibility) and may change slightly over time. The reliability of using this methodology is akin to calling something a duck without ever having seen it (the duck). RBSA and HBSA allow an investor to determine an investment's style in a relatively independent and objective manner, which is why they tend to be much more popular methodologies among investors.

ANALYSIS

In order to determine whether HBSA or RBSA results in a more consistent definition of investment style for mutual funds, and which methodology better predicts

the future investment style for mutual funds, an analysis was conducted. Unlike previous research that has typically determined style independently (primarily to determine RBSA style), this analysis is based on style definitions from popular data providers, S&P (RBSA) and Morningstar (HBSA).

While the reader may contend that the analysis is of less value because S&P's RBSA is no longer available, RBSA style is still common, and S&P's methodology is certainly a reasonable way to assign an RBSA style. The key consideration is whether or not each methodology (S&P and Morningstar) represents a valid way to determine the style of a fund, which the authors would contend the methodologies are.

For RBSA style, the S&P Style Name is used, which is based on the previous three years of returns. For HBSA style, the Morningstar Category is used, which is based on the average HBSA style over the preceding three years. Note the time period of consideration for both style definitions is the same - three years - although the methodologies differ.

Data was collected from each provider from sixteen consecutive calendar year quarters from March 31, 2003 to December 31, 2006. Only those mutual funds defined as one of the nine pure domestic equity categories were included in the analysis. Limiting the test population in such a way ensured that the overall population was the same and that the differences between the two methodologies would be based upon the classification methods, not the populations.

The nine pure domestic styles were selected since they represent the most purely defined style categories (opposed to say Foreign Large Blend which could have varying national, valuation, and market capitalization exposures) and because of the large number of mutual funds available to test in each style classification. Mutual funds classified by S&P as multi-cap funds were ignored. For mutual funds that had multiple share classes, only the mutual fund with the lowest expense ratio was selected to represent the investment for analysis purposes. This methodology ensures that each fund is considered only once, regardless of the number of share classes outstanding (for example, some funds with a number of different share classes, such as in the American Funds family, would have had a greater

weight than others with less share classes).

Funds were selected each quarter independently in order to minimize any type of look-back bias (often referred to as “survivorship bias,” which would have existed had only those funds as of December 31, 2006 been selected). Four different tests will be discussed:

1. **Percentage of Mutual Funds where HBSA and RBSA had the Same Style Classification Based Upon Primary Category:** this test looked at the differences between the style classifications.
2. **Percentage of Mutual Funds with the Same Style Classification One Year After Classification (13 Rolling Test Periods):** this test sought to determine the percentage of funds that changed style one year after initial classification.
3. **Average Correlations to Index Composite Benchmark for the Four Quarters Following Classification (13 Rolling Test Periods):** this test looked at the returns for the four quarters following the initial classification and took the average correlation to an appropriate benchmark.
4. **Absolute Deviation One Year Following Classification (13 Rolling Test Periods):** this test looked at the absolute deviation for the funds of each style when compared to an appropriate benchmark.

Distribution Between Populations

Exhibit I includes information on the overall average

distribution of the mutual funds for each of the sixteen quarters for each of the nine domestic styles tested. The minor notable difference was that HBSA tended to have a slightly higher proportion of funds determined as blend, while RBSA had a slightly higher proportion of funds determined as value. However, the differences between the overall distributions were not statistically different at the 5% level based upon a chi-square test.

Same Style Classification

When comparing HBSA and RBSA, the average percentage of mutual funds that were the same for the sixteen quarter test period was 75.36%, with a high of 78.18% and a low of 71.59 percent. This means approximately one out of every four domestic mutual funds is likely to have a different style definition when considering HBSA and RBSA. The actual levels of differences for the distinct asset categories varied considerably, especially when considering the “primary category.” The primary category is defined as the primary method used to determine style, which would either be RBSA or HBSA.

Looking at both RBSA and HBSA as primary categories is important because investment professionals (and organizations) are likely to use different methodologies when classifying mutual funds (e.g., Company X uses Morningstar to provide style definitions for mutual funds and would therefore view HBSA as the primary category while Company Y uses an RBSA methodology to provide style definitions and would therefore view RBSA as the primary category). Since each of the methodologies were tested as the primary methodology, it is possible for the reader to determine

Exhibit I: Percentage of Total Funds for the Entire Period		
Asset Category	HBSA (Morningstar)	RBSA (S&P)
Large Value	14.54%	16.82%
Large Blend	22.03%	18.04%
Large Growth	19.30%	21.77%
Mid-Cap Value	3.53%	5.10%
Mid-Cap Blend	5.63%	3.76%
Mid-Cap Growth	10.20%	8.55%
Small Value	5.10%	8.96%
Small Blend	7.81%	5.62%
Small Growth	11.85%	11.40%

the level of similarity based upon primary categorization methodology used by his or her company. Primary style is also an important consideration since both methods are not typically considered simultaneously during a manager search, and instead the second definition may only be considered to narrow down a potential field of finalists.

While it may surprise the reader that the results would differ based upon the primary category, it is important to realize that the total population is the same, but the distribution of the funds among styles is different. The percentage of mutual funds that are the same for each style, looking at either HBSA or RBSA as the primary style, is included in Exhibit II. With regard to Exhibit II, numbers in a column of “HBSA Primary” are calculated as follows: At every quarter end A_i is a number of funds that belong to category i both by HBSA classification and by RBSA classification and B_i is a number of funds that belong to category i by HBSA classification. Time series average of A_i/B_i is listed in the column of “HBSA Primary”.

These differences between the RBSA and HBSA style classifications were similar to those found by Kaplan (2003); however, while Kaplan’s research noted differences primarily in growth-oriented fund style classifications (as well as small-cap and mid-cap which were consistent with the research conducted for this paper), the research conducted for this paper noted little consistency between styles, although the results were consistent with Kaplan’s findings. Blend tended to have the

highest consistency for the valuations, and Large tended to have the highest consistency among the three market capitalizations. A potential explanation for the differing conclusions is the different time periods used by Kaplan compared to the current analysis.

Introducing “Both” Methodology

Previous research papers that have compared HBSA and RBSA (*e.g.*, Rekenhaller et al. and Kaplan) have viewed each style methodology as mutually exclusive and did not consider what (if any) benefit existed from selecting investments which had the same style classification from each methodology. The “Both” concept addresses the idea that each methodology, RBSA and HBSA, potentially provides valuable insights as to the style of an investment and that by considering only one definition the potential information from the alternate definition is lost. While introducing the “Both” methodology reduces the sample population when selecting an investment, it ensures that the information available from both methodologies is incorporated into the selection process.

In order to help the reader understand the impact on the population size of selecting only those funds that had the same style classification, a table on the average number of investments per period has been included in Exhibit III. While introducing the “Both” category reduced the number of available funds for each category, as is outlined in Exhibit III, approximately 75% of the mutual funds were still available.

Exhibit II: Percentage of Funds where HBSA and RBSA had the Same Style Classification Based Upon Primary Category

Asset Category	HBSA Primary (Morningstar)	RBSA Primary (S&P)	Average
Large Value	90.42%	78.20%	84.31%
Large Blend	68.40%	83.70%	76.05%
Large Growth	88.29%	78.31%	83.30%
Mid-Cap Value	75.95%	52.73%	64.34%
Mid-Cap Blend	44.28%	66.44%	55.36%
Mid-Cap Growth	73.90%	88.27%	81.08%
Small Value	90.91%	51.95%	71.43%
Small Blend	41.48%	58.39%	49.93%
Small Growth	80.26%	83.45%	81.86%
Average	72.66%	71.27%	

**Exhibit III: Impact on Number of Funds from
Introducing the Both Concept**

Asset Category	HBSA (Morningstar)	RBSA (S&P)	Both
Large Value	294	338	265
Large Blend	444	365	304
Large Growth	388	437	342
Mid-Cap Value	71	103	54
Mid-Cap Blend	114	76	50
Mid-Cap Growth	205	172	152
Small Value	103	181	93
Small Blend	158	115	66
Small Growth	238	229	191
Total	2,016	2,016	1,517

Style Consistency One Year Following Classification

Style consistency is an important consideration for investment professionals. Ideally, an investment's style should remain relatively consistent over time unless the manager makes major changes to a portfolio. If an Investment Policy Statement (IPS) contains language that an investment must be replaced if it exhibits style drift, selecting investments that are less likely to drift could be important from a tax and turnover minimization perspective. Also, if there is no increased information about the future performance of the investment relative to an appropriate benchmark, excessive changes in style classification can cause unnecessary disruptions to client portfolios.

Exhibit IV contains information about the number of

funds that have different style classifications, one year following initial classification. With regard to Exhibit IV, numbers in the column of "HBSA & Both" are calculated as follows: At ever quarter let B_i be the number of funds that belongs to category i both by HBSA classification and by RBSA classification and let A_i be the number of those B_i funds that remain in category i by HBSA classification after one year. Time series average of A_i/B_i is listed in the column of "HBSA & Both". There is a notable difference in the change in style when comparing HBSA and RBSA. HBSA tended to be much more consistent and had a higher probability of being the same for each of the nine styles. These differences were statistically significant at the 5% level for each of the categories except for Small Value, based upon a two sample t-test assuming unequal variances, which had a p value of .053.

**Exhibit IV: Percentage of Funds with the Same Style Classification One Year After Classification
(13 Rolling Test Periods)**

Asset Category	Same Style Year Following			
	HBSA (Morningstar)	HBSA & Both	RBSA (S&P)	RBSA & Both
Large Value	96.6%	97.4%	90.9%	95.5%
Large Blend	96.5%	97.8%	88.4%	90.8%
Large Growth	98.1%	99.0%	93.3%	97.7%
Mid-Cap Value	88.2%	92.8%	83.1%	88.5%
Mid-Cap Blend	93.1%	96.9%	82.7%	88.1%
Mid-Cap Growth	95.6%	98.4%	87.2%	91.8%
Small Value	93.6%	94.8%	90.8%	95.9%
Small Blend	94.9%	96.3%	78.7%	83.9%
Small Growth	96.5%	98.3%	90.6%	93.8%

Introducing the Both methodology increased style consistency for both HBSA and RBSA, most notably for RBSA, where the average increase in consistency one year following classification was 5.2% (versus 2.2% for HBSA). However, even increased benefit Both for RBSA, HBSA and Both was still higher for eight of the nine categories. Even when RBSA and Both are compared to just HBSA (without considering whether or not both styles are the same), HBSA still resulted in a higher level of consistency for all but two of the categories (Small Value and Mid-Cap Value).

Style Consistency Tests

HBSA clearly resulted in a higher level of style consistency a year following the classification when compared to RBSA. However, the previous test did not consider the actual returns of the mutual funds and the ability for each methodology (RBSA and HBSA) to predict the future style of an investment. In order to determine which methodology is more predictive of future style, two different tests were conducted. The first test looked at the correlations of future quarterly returns to an appropriate benchmark, and the second test looked at the absolute deviation of returns compared to an appropriate benchmark.

In order to minimize the potential bias in the selection of the index, and since portfolio managers tend to benchmark against different indexes, the average of three different well known indices (referred to as the Index Composite Benchmark) is used as a benchmark

for each of the nine styles. The importance of index selection for benchmark purposes has been noted as far back as 1970 in a study performed by Carlson (1970) and more recent research by Israelsen (2005). The three major index providers, along with the respective indexes used to calculate each style benchmark, are included below. All data was obtained from Callan Associates.

S&P: S&P:500 Value, S&P:500, S&P:500 Growth, S&P:400 Value, S&P:400 Mid Cap, S&P:400 Growth, S&P:600 Value, S&P:600 Small Cap, and S&P:600 Growth.

Russell: Russell Top 200 Value, Russell Top 200, Russell Top 200 Growth, Russell Midcap Value, Russell Midcap Index, Russell Midcap Growth, Russell 2000 Value, Russell 2000 Index, and Russell 2000 Growth.

MSCI: MSCI:US Large Cap 300 Value, MSCI:US Large Cap 300 Index, MSCI:US Large Cap 300 Growth, MSCI:US Mid Value Index, MSCI:US Mid Cap 450 Index, MSCI:US Mid Growth, MSCI:US Small Cap Value Index, MSCI:US Small Cap 1750, and MSCI:US Small Cap Growth Index.

Correlation Analysis

The correlation analysis looked at the correlations for returns of four quarters following the initial classification to the appropriate benchmark. If returns for the

Exhibit V: Average Correlations to Index Composite Benchmark for the Four Quarters Following Classification (13 Rolling Test Periods)

Asset Category	Both		HBSA (Morningstar)		RBSA (S&P)	
	Average Correlation	Standard Deviation	Average Correlation	Standard Deviation	Average Correlation	Standard Deviation
Large Value	0.912	7.59%	0.911	7.61%	0.902	8.43%
Large Blend	0.950	4.78%	0.936	5.97%	0.937	5.78%
Large Growth	0.887	14.87%	0.879	15.13%	0.877	15.50%
Mid-Cap Value	0.915	8.82%	0.903	9.73%	0.910	8.45%
Mid-Cap Blend	0.954	3.28%	0.928	5.13%	0.936	5.57%
Mid-Cap Growth	0.936	4.21%	0.930	5.01%	0.931	4.79%
Small Value	0.934	4.33%	0.933	4.53%	0.928	4.65%
Small Blend	0.968	2.42%	0.949	3.01%	0.959	2.56%
Small Growth	0.952	2.83%	0.951	2.90%	0.949	2.90%
Average	0.934		0.925		0.925	

mutual fund were not available for the entire four-quarter period, the mutual fund is removed from the study. The benchmark is determined based upon the style at the beginning of the period and does not change even if the mutual fund exhibits drift during the four-quarter period. Twelve one-year overlapping periods were considered for the analysis. Exhibit V contains the results of the analysis.

The results of this test indicate that any of the three methods is an appropriate method of style classification and that on a future-looking correlation basis, none of the definitions is uniquely optimal. Note, a discussion between the correlation results of this analysis and the research conducted by Rekenhaller, Gambera, and Charlson (2002) is not included due to the differing test methodologies; however, Rekenhaller noted the benefits of HBSA, while this correlation analysis showed no statistically significant benefit to either methodology.

Absolute Deviation

While the first test focused on the relationship (*i.e.*, correlation) of future returns, the second test conducted looked at the deviation of returns, on an absolute deviation basis, of the mutual funds and the Index Composite Benchmark. For those readers who are not familiar with absolute deviation, it is the average absolute difference between a value and its target. For example, if an investment had an annual return of either 5% or -5% and the target return was 0%, the absolute

deviation would be 5 percent. Absolute deviation is not concerned with the sign of the difference, only the overall average deviation from the target. From a calculation perspective absolute deviation is similar to tracking error, or tracking differential, in that only the relative difference against the respective benchmark is considered to be deviation, where the sign of the deviation does not matter.

The absolute deviation for each category for each period was determined by comparing the future one-year return of the mutual fund to the future return of the appropriate Index Composite Benchmark. Note, those mutual funds without one-year performance figures were excluded from the analysis. Similar to the correlation analysis, twelve rolling test periods were considered and averaged together to determine the overall period results.

The results of the absolute deviation analysis are included in Exhibit VI. The Both category had the lowest average absolute deviation, followed by RBSA, which was slightly lower than HBSA. The results of this analysis differ from the analysis by Rekenhaller, Gambera, and Charlson (2002), which found in favor of HBSA over RBSA. Two likely reasons for the difference is the different test time periods (1997-2000 versus 2003-2006) and the different methodologies for RBSA classification. Also, Rekenhaller utilizes a single time period, while these results are the average of twelve different periods.

Exhibit VI: Absolute Deviation One Year Following Classification (13 Rolling Test Periods)

Asset Category	Both		HBSA (Morningstar)		RBSA (S&P)	
	Average Absolute Deviation	Standard Deviation	Average Absolute Deviation	Standard Deviation	Average Absolute Deviation	Standard Deviation
Large Value	4.06%	0.77%	4.23%	0.73%	4.73%	0.76%
Large Blend	3.64%	1.34%	4.03%	1.48%	4.18%	1.63%
Large Growth	5.99%	2.63%	6.13%	2.67%	6.10%	2.48%
Mid-Cap Value	6.12%	2.57%	6.82%	2.73%	6.91%	2.45%
Mid-Cap Blend	5.35%	3.83%	7.00%	2.49%	5.93%	2.96%
Mid-Cap Growth	6.03%	1.24%	6.47%	1.33%	6.57%	1.18%
Small Value	6.25%	2.25%	6.40%	2.58%	6.82%	2.34%
Small Blend	6.18%	5.87%	7.28%	4.18%	6.33%	4.96%
Small Growth	8.59%	3.15%	8.37%	2.86%	8.99%	3.48%
Average	5.80%		6.30%		6.28%	

CONCLUSION

When determining the investment style of a mutual fund, most investment professionals are likely to look to well known data providers for a classification methodology opposed to creating one themselves. Based on the research conducted for this analysis, HBSA appears to be a more consistent definition of style, and this consistency did not come at the expense of lower future style predictability (based upon both correlation and absolute deviation). However, considering both categories, regardless of whether HBSA and RBSA is defined as the primary investment style, likely represents an even better method than considering HBSA or RBSA exclusively.

While there are a number of potential reasons for the differences between HBSA and RBSA, the authors believe the primary reason HBSA proved to be a more consistent methodology is because information on the underlying holdings provides a more complete picture of style than approximating style through the returns. However, only one definition of HBSA and RBSA style were considered for the analysis. Had a different HBSA definition been used (*e.g.*, Lipper), it is possible the results would have been different.

All things considered, RBSA attempts to determine style based by approximation, while HBSA determines style by analyzing the actual holdings. Therefore, the higher level of current and factual information clearly provides HBSA with an advantage in forecasting future investment style and therefore makes it the optimal style classification methodology. However, as a practical matter, the marginal superiority of HBSA over RBSA may not be sufficiently compelling to spend the extra time and money to perform HBSA.

REFERENCES

Brown, Keith C. and W. V. Harlow, "Staying the Course: The Impact of Investment Style Consistency on Mutual Fund Performance," White Paper.

Buetow, Gerald W., Robert R. Johnson, and David E. Runkle, "The Inconsistency of Returns-Based Style Analysis," *Journal of Portfolio Management*, Spring 2000, pp. 61-76.

Carlson, Robert S., "Aggregate Performance of Mutual Funds," *Journal of Financial and Quantitative Analysis*, 1970, pp. 1-32.

Christopherson, Jon A., "Equity Style Classifications," *Journal of Portfolio Management*, Spring 1995, pp. 32-43.

Fact Sheet: The New Morningstar Style Box™ Methodology:
http://news.morningstar.com/pdfs/FactSheet_StyleBox_Final.pdf.

Israelsen, Craig, "Variance Among U.S. Equity Indexes," *Journal of Financial Planning*, June 2005, pp. 62-69.

Kaplan, Paul D., "Holdings-Based and Returns-Based Style Models," Morningstar Inc., 2003, Research Paper:
http://datalab.morningstar.com/Midas/PDFs/Returns_vs_HoldingsPaper.pdf.

Kasten, Gregory W., "High Transaction Costs from Portfolio Turnover Negatively Affect 401(k) Participants and Increase Plan Sponsor Fiduciary Liability," *Journal of Pension Benefits*, Spring 2007, pp. 50-64.

LaRoche, Jeffrey P., "Returns-Based Style Analysis: The Squirrely Duck," American Century Research Paper 2006:
http://institutional.americancentury.com/institutional/pdf/returns-based-style-analysis_squirrely-duck.pdf.

Lobosco, Angelo and Dan diBartolomeo, "Approximating the Confidence Intervals for Sharpe Style Weights," *Financial Analyst's Journal*, July/August 1997, pp. 80-85.

Mayes, Timothy R., Nancy R. Jay, and Robin Thurston, "A Returns-Based Style Analysis Examination of Asset Classes," *Journal of Financial Planning*, August 2000, pp. 94-104.

Reichenstein, William, "Morningstar's New Star-Rating System: Advances and Innovations," *Journal of Financial Planning*, March 2004, pp. 40-47.

Rekenthaler, John, Michele Gambera, and Joshua Charlson. 2002. "Estimating Portfolio Style: A Comparative Study of Portfolio-Based Fundamental Analysis and Returns-Based Style Analysis." Morningstar Research Paper.

Sharpe, William F., "Determining a Fund's Effective Asset Mix," *Investment Management Review*, November/ December 1988, pp. 59-69.

"Standard & Poor's: U.S. Mutual Fund Style Classification: Guide to Methodology and Rankings."

"The Morningstar Category Classifications." http://corporate.morningstar.com/us/documents/MethodologyDocuments/MethodologyPapers/MorningstarCategory_Classifications.pdf

Trzcinka, Charles A., "Equity style classifications: Comment" *Journal of Portfolio Management*, Spring 1995, pp. 44-47.