"Investment Style in a Turbulent Decade"

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1. Abstract

Is the categorisation of investment funds useful in extremely volatile market conditions? Which method of style analysis, if any, dominates in terms of consistency, accuracy and robustness? We analyse the turbulent period 2000-2010 using Returns-Based (RBS), Characteristics-Based (CBS) and a new combined BFI-CBS method. All three perform well in terms of explaining out-of-sample cross sectional returns of a large sample of diversified US equity funds. The combined methodology performs best 2000-2005 but the CBS method performs best in the second period, (including 2007-2008 financial crisis). We attribute this to the timeliness of a portfolio snapshot relative to time-series analysis in a period of extreme economic and market turbulence.

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Introduction

The most recent decade (2000-2010) has been a period of extreme economic and stock market turbulence. According to the NBER there have been 33 economic cycles since the 1850s, 2 of them occurring in the last decade. The equity market has traded in a very wide range, generally between 2,000 and 3,500 on the Russell 1000 index, but there have been several occasions when these levels have been breached as the economy has lurched between boom and bust and risk appetites have moved in similar fashion. The overall equity market has made little headway while within the U.S. equity market there have been major shifts in performance of different investment styles. This can be observed most markedly in the first half of our study period when there was a big relative shift in performance of large cap versus small cap stocks, as represented by the Russell 1000 and Russell 2000 indices. There was also a major relative adjustment in the performance of large cap growth and large cap value as measured by the Russell 1000 Growth and Russell 1000 Value indices. (See Figure 1)[1] This shift was driven by the bursting of the Technology Media Telecom (TMT) bubble and the shift into interest rate driven value stocks as negative real interest rates were introduced in an attempt to stave off deflation, and from large cap, liquidity driven stocks into smaller cap stocks. In the second part of our period there was a partial reversal of the growth versus value trend as the interest sensitive value sectors were devastated in the wake of the 2007-2008 Financial Crisis. Scherbina and Schlusche (2012) note that a real estate bubble has a greater effect on the economy than an equity bubble because the balance sheets of individuals and banks are more exposed to real estate than equity markets and the transmission throughout the economy is more far reaching. This may in part explain the

[1] See Fig.1 for GDP, Index and Style Shift charts

difficulty in recovering from the Financial Crisis of 2007-2008 as corporation and individuals de-leverage and banks rebuild their balance sheets.

Figure 1 About Here

Against this backdrop of market turbulence we review the forecasting properties of three equity style models; a returns-based style analysis model, a characteristics-based model and our combined returns-based and characteristics-based model, in order to evaluate whether membership of style groupings includes important information for future performance. Style groupings which are not robust to market volatility are obviously of limited use to investors, especially with the globalization of the investment management industry and the need for consistent appreciation of what constitutes the various styles in an international context. Such a study has great relevance for style analysis in Europe which is itself in the midst of a period of great turbulence when even the survival of the Eurozone is being questioned. It should also be noted that European Investors are the largest international investors in U.S. equities and Funds, so there are significant implications for European asset allocators and investors (Federal Reserve Bank of New York 2011). We use a large heterogeneous sample of US diversified equity mutual funds for our empirical analysis. For our returns-based analysis we use a Best Fit Index (BFI) approach.[2] For our Characteristics-based analysis (CBS) we use Morningstar style classifications, which are based on portfolio holdings. We also introduce a combined returns-based and characteristics-based style analysis (BFI-CBS).

There has been much debate in the literature about the relative merits of Returns-based Style (RBS) analysis and Characteristics-based Style Analysis (CBS) as in Coggin and Fabozzi (2003), and comparisons of the efficiency of the various models employed in style analysis Brown and Goetzmann (1997) and Chan et al. (2002). The majority of studies

[2] See Mason et al 2012 for a comparison of a BFI model with Sharpe's (1992) RBSA model and confirmation that it performs the Returns-based Style analysis best.

seem to come down in favour of CBS analysis where there is any difference in outcome, (see Chan et al. (2002) and references therein). We found little to choose between them in the full period under review, although CBS performed better in the latter part of the period. The literature in this area does not address the issue of whether these returns-based or portfolio holdings based (CBS) are contradictory or complementary, preferring to focus on the relative attractiveness of the various methods or any apparent shortcomings. Some, such as Dor and Jagannathan (2003) conclude that RBS may be a useful precursor to CBS analysis whilst Brown and Goetzmann (1997) use portfolio characteristics to check their returns-based GSC styles. We also note that organisations such as Morningstar which favour CBS style analysis, as evident from Rekenthaler et al. (2006), provide a large amount of other portfolio data alongside this style analysis, including a best-fit index based on regression analysis and portfolio returns. Both of these approaches have used returns-based and portfolio characteristics-based information in conjunction with each other but have not combined the information into a single style analysis model. Our empirical results confirm that returns-based and characteristics-based style analyses may be complementary.

When comparing benchmarking methods used in academic research and by investment practitioners Chan et al. (2009) note that benchmarking measures that use size and value-growth orientation accurately reflect investment styles but that more comprehensive measures of portfolio characteristics do a better job of matching equity managers' value-growth orientation than a simple price book rank. They also observe that benchmarks which aim to reflect portfolio characteristics perform better than regression based benchmarks. Our BFI-CBS methodology takes note of these observations; we use the Best Fit Indices to establish the 'investment domains' of our sample managers, along the lines of size and 'style', and then use our multidimensional characteristics-based analysis to form style groups within those domains. Our findings show that the combined BFI-CBS methodology performs best out of sample in the early part of the decade (2001-2005) with CBS performing better than RBS which is consistent with the views expressed above. In the second part of the period however, (2006-2010) the Morningstar (CBS) performs best. We attribute this to the timeliness of using a snapshot of portfolio holdings rather than a regression based time series approach in a time of significant turbulence.

In Section 2 we review the style analysis literature; in Section 3 we describe the data, while in Section 4 we describe the various style grouping methodologies popular in practice; In Section 5 we analyse our results in more detail. Section 6 contains out-of-sample robustness checks on our methods and finally in Section 7 we provide our conclusions.

Review of Style Analysis Literature

Investment managers have a range of investment philosophies and operate various investment processes to implement differentiated investment styles. US equity investment managers are a heterogeneous group. Our aim is to observe these different investment styles, and to consider the different systematic approaches in the literature aimed at identifying these styles for the purpose of forming comparative peer groups or identifying appropriate benchmarks. During turbulent periods, such as the period under review, a clear method of establishing appropriate peer groups and benchmarks to facilitate portfolio diversification and performance appraisal is even more important than in more settled times.

The analysis of investment management style typically falls into three broad categories, although there are many variants: identification of style through portfolio characteristics, identification of style through portfolio returns, and assessment of portfolio performance. Through these avenues it is possible to consider many of the key elements important to identification of investment styles, the risks being undertaken by portfolio managers and whether investors are being adequately compensated for the risks taken. Our analysis considers both portfolio characteristics and portfolio returns and is the first to combine both.

Equity Investment Styles: The Classification of Stocks.

Much of the early analysis of equity investment style focuses on identifying styles of stock, with Fama French(1992), in their three factor model of equity returns, building on the earlier work of Fama (1972), Sharpe (1964), Lintner (1970), Nicholson (1977), and others who contributed ground breaking work on the effect of the market factor (beta), valuations (Price to Equity or Price to Book), and size (small cap large cap). In parallel with these discoveries King (1966) and Farrell (1974) produced studies which suggested that common or latent factors explained stock price behaviour; in King's case a market factor, an industry factor and company factor, which was supplemented by Farrell (1974) with a cluster based classification according to growth, cyclical or stable return characteristics. Traditionally many academics, consultants and index providers following in the footsteps of Fama and French (1992) based their classification on a size and book value to price, or price to earnings metric as noted by Fabozzi (1998). Many observers such as Brown and Goetzmann (1997) and Michaud (1998) feel that this approach does not capture the diversity of investment styles. We note that all of the major index providers and mutual fund data base providers Russell, Standard & Poor's/Citigroup, MSCI and Dow Jones Wilshire plus Morningstar and Lipper have abandoned ranking by a single valuation multiple for their stock style indices and established growth-value orientation based on valuation and growth metrics reflecting their concern that a two-dimensional model, comprising size and a single valuation metric, may fail to capture the diversity and complexity of the range of investment styles operated in the U.S. equity market and thus fail to provide adequate tools for benchmarking or peer group assessment.

Equity Investment Fund Styles: Multidimensional Classification and Growth-Value Orientation

Bailey and Tierney (1995) observe that different styles lead to differentiated portfolios and differentiated performance. We share the beliefs of Brown and Goetzmann (1997) and Speidell and Graves (2003) that classification of equity investment style is a multi-dimensional issue reflecting different combinations of revealed preference for income, growth and asset backing, as a form of product differentiation. Kaplan et al. (2003) highlight the fact that growth-orientation and value-orientation are distinct concepts something that becomes more apparent when growth is measured directly rather than implied from valuation. These growth-valuation nuances are widely accepted both in academic literature and practitioner writing although the exact terminology or definition may differ. Brown and Goetzmann (1997) produce a methodology which generates a wider range of mutual fund styles than traditional industry classification and performs well in terms of predicting out of sample cross-sectional performance. The results of Michaud (1998) also indicates that value may be multidimensional.

Many observers of funds' styles including Bailey and Tierney (1995), Damodaran (2003) and Slager and Koedijk (2007) believe that investment managers differentiate themselves, their portfolios and the attendant returns through their investment philosophy, investment process and their investment style. The investment philosophies and processes which spawned the wide range of equity investment styles in evidence today were first documented by Graham (1934) and Fisher (1957). Bernstein and Damodaran (1998) illustrate how the investment process reduces a universe of stocks, through research, stock screening, stock selection, portfolio construction and execution, into a portfolio which has a certain style. Vardharaj and Fabozzi (2007) believe that in order to better understand the motivations and outcomes of actions taken by fund managers wherever possible empirical studies should reflect the constraints faced by investment managers. Clarke et al. (2002) note typical portfolio constraints which an active manager may have such as market capitalization restrictions, value-growth neutrality or economic sector neutrality relative to a benchmark, and turnover constraints which may affect a fund's character and performance.

Characteristics-based Analysis: Portfolio Holdings

One important method of analysing investment style is to consider the portfolio holdings of investment funds and the characteristics of those portfolios with a view to identifying common factors which will facilitate the formation of style groups which may provide insights into estimates of expected future performance of such groups. Daniel et al. (1997) use characteristics-based benchmarks in their work on fund performance. Amenc et al (2009) however, argue that characteristics-based indices have a significant value bias which must be adjusted for. Falkenstein (1996) examines mutual funds revealed preferences for certain stock characteristics-based on portfolio holdings. Speidell and Graves (2003) note that due to the sophisticated methods of analysis undertaken, and access to the same news sources and databases, what differentiates investment managers is the emphasis placed on different measures of valuation, growth and qualitative factors. Commercial providers of portfolio analysis, risk and performance attribution systems, such as BARRA[3], Morningstar (Morningstar 2008) & Lipper (Lipper 2008) adopt characteristics-based style classification based on portfolio holdings but also provide supplementary information on 'best fit' or benchmark indices. We use the Morningstar Style Analysis to form our CBS sample.

Returns-based Analysis: Market Segmentation and Benchmarking

Analysis of the returns of investment funds generally focuses on performance analysis and style analysis, including factor analysis. The Best Fit Index model that we propose can be considered a variation on Sharpe's (1964) CAPM model which we develop to consider which benchmark or index reflects an investment fund's 'market' or investment universe. Reflecting concerns about appropriate benchmarks from many authors such as Lehman and

[3] Based on the work of Rosenberg, B. and A. Rudd (1982).

Modest (1987) to Chan et al. (2009), we run a simple regression against a range of Russell equity indices to identify which index best represents the investment universe of a particular fund rather than assuming that it is a broad market universe such as the S&P500 or the Russell 1000.[4] Mason et al (2012) provide evidence that a BFI methodology performs the role of style identification better than the Returns-based Style Analysis established by Sharpe (1992). This approach also has the benefit of recognising market segmentation and is aligned with the industry practice of benchmarking against a specified index. We use a Best Fit Index to identify the broad style grouping of a fund. We are cognisant of Cremers and Petajisto's (2010) work on measurement of active management and note the importance of selecting the correct benchmark index for a mutual fund.[5] Much of the debate about returns-based style analysis has included some consideration of Sharpe's (1992) Returns-based Style Analysis (RBSA) in various guises. Returns-based style analysis (RBSA) as described by Sharpe (1992) is a specialised form of factor analysis where the factors are index returns. Sharpe's model estimates 'average' economic exposure of a fund to selected asset classes based solely on the co-movements of the fund's returns relative to those asset classes. Our consideration of Sharpe's (1992) RBSA leads us to conclude that although it still has a role to play in style analysis; it may have limited appeal for single asset portfolios such as equity investment funds.

Returns-based Style Analysis and Characteristics-based Style Analysis: Complementary or Contradictory?

Radcliffe (2003) in his review of Returns-based Style analysis (RBS) and Characteristics-based Styling (CBS) concludes that neither RBS nor CBS dominates in terms of explaining future returns and that it is important to use all style information to gain insights into a portfolio's 'true style characteristics'. Chan et al. (2002) in a comprehensive review of mutual

[4] For some funds of course these indices are the most appropriate benchmark and this is illustrated in Table I where the S&P500 and the Russell 1000 BFI funds are found in the 'Large Core' category
[5] The selection of the correct benchmark can facilitate more accurate assessment of risk adjusted return and many commercial research organisations such as Morningstar, Lipper and S&P/BARRA publish best fit indices and risk measures alongside their style information.

fund styles reaches the conclusion that where the results differ CBS does a better job of predicting future fund performance than RBS. Finally, Chan et al. (2006) when comparing benchmarking methods used in academic research and by investment practitioners note that benchmarking measures using size and value-growth orientation accurately reflect investment styles but that more comprehensive measures of portfolio characteristics do a better job of matching equity managers' value-growth orientation than a simple price book rank. They also observe that benchmarks which aim to reflect portfolio characteristics perform better than regression based benchmarks. Thus whilst on balance characteristics-based analysis may produce more accurate assessment of style it is useful to use both characteristics and returns-based analysis together wherever possible in order to get a more comprehensive assessment of investment style.

Data

The data used in this study comprises portfolio characteristics and total returns data for a large sample of US Diversified Equity Mutual Funds supplied by Morningstar and total return data for US Equity Indices supplied by Russell Indexes. The fund database was formed by the oldest share class of funds and removing all other classes. Index funds are excluded from the sample which is survivor bias free. Multiple share classes of mutual funds have increased significantly over the past decade or so and the issue needs to be addressed in empirical studies. [6] We also used portfolio characteristics of funds supplied by Morningstar. This sample is smaller the returns-based sample as not all funds provide portfolio characteristics data for December year end periods. The sample size ranged from 872 to 1073 for the BFI and Morningstar sample and 435 to 833 for the combined BFI-CBS sample.

Morningstar calendar year end portfolio characteristics data is used for the period 2000-2010. Portfolio characteristics are weighted in proportion to individual funds' equity holdings and are as follows; Price Earnings, Price to Book, Price to Revenue and Price to Cash Flow

[6] According to the Investment Company Institute Fact Book there were 4,586 equity mutual funds in 2005 and 11,824 Equity Mutual Fund Share Classes.

(X), Dividend Yield (%), Five Year Earnings Growth Forecast, Earnings Growth, Book Value Growth, Revenue Growth and Cash Flow Growth (% pa 5 years historic data). Such a large and detailed database only became available when Morningstar revised their Stylebox methodology in 2002. Monthly total returns data for US Diversified Equity Mutual Funds was collected for the period 1998-2011 to facilitate the requirements of the models.

Monthly total return data was supplied for the following indices by Russell for the period 1998-2011: Russell 1000 Growth, Russell 1000, Russell 1000 Value, Russell Midcap Growth, Russell Midcap, Russell Midcap Value, Russell 2000 Growth, Russell 2000, and Russell 2000 Value.

Methodology: Combining BFI and CBS Style Analysis

In this study we employ several different methodologies to establish style groups based on portfolio characteristics and portfolio returns. We combine returns-based and characteristics-based analysis to establish a two stage model 'BFI-CBS' which is introduced in this paper to address the question whether returns-based and characteristics-based style methodologies are complementary. The validity of our style group formation is tested using procedures formulated by Brown and Goetzmann (1997) in terms of explanation of the cross section of returns in the out of sample period which is described later.

Stage 1: Best Fit Index (BFI) Methodology

We consider whether a single 'Best Fit Index' can adequately represent individual funds' various investment styles. This method has intuitive appeal because we know that funds are often explicitly benchmarked against a stock market index. In order to establish whether the main Russell style indices can explain a large proportion of the monthly returns of our sample of mutual funds we ran individual regression analysis for each fund in our sample against two sets of Russell Indices U.S. equity indices encompassing the full range of style and value-growth permutations. We recorded the results for each regression and selected the index with the highest r^2 or best-fit index for each fund to create our Best Fit Index (BFI) sample. The methodology is outlined below.

For each mutual fund for we run a series of Ordinary Least Squares regressions for a 36 month period against nine Russell Indices monthly returns to establish which individual index of the style indexes provided the best explanation or best fit of each individual fund's returns. Funds with less than 30 months returns are excluded.

$$r_{it} = \alpha_i + \beta R_{It} + \epsilon_{it} \qquad \text{Equation 1}$$

Where:

r_{it}= return on fund i for month t

α_i = alpha

R_{It}= return on index I for month t; I is calculated individually for each of the 9 Russell

ϵ_{it}= error term

Thus for each fund in the sample, e.g. 955 funds for the period Jan 2007 to Dec 2009, the index with the highest r^2 is selected from nine sets of regression results and we record the index name and it's r^2. Each fund is then assigned to a style group comprising all funds whose performance is best explained by a particular index. The result is nine style groups ranging from large-cap growth to small-cap value which is consistent with the 9 segment style box as used by Morningstar and others. This process is repeated for each year end from 1998-2009. Thus we have ten sets of Best Fit Index (BFI) Style groups which can be used for out of sample testing with returns data for the subsequent year for out of sample testing.

This concludes the first stage of our two-stage combined returns-based and characteristics-based analysis. The results of this stage are used in two ways; first as an input to the combined BFI-CBS model and secondly as a comparative model to judge the contribution of the combined model relative to a single stage BFI model. In order to provide a further comparison we run the BFI analysis for a reduced set of Russell Indices, Russell 1000 Growth, Russell 1000, Russell 1000 Value, Russell 2000 Growth, Russell 2000, and Russell 2000 Value, which excludes the Mid Cap indices and allocates the funds to an appropriate large cap or small cap category. This is also used to test the combined BFI-CBS model.

Stage 2: Characteristics-based Style Analysis (CBS) Methodology

We use the results of our first stage (BFI) as the starting point on our 2nd stage Characteristics-based Style Analysis (CBS). The CBS analysis is run separately for each style group i.e. large cap value through to small cap growth, to provide a more differentiated breakdown of each style group; a finer classification.

Our portfolio characteristics follow an approach employed by Abarbanell et al. (2003) in their work on institutional investors and corporate spin-offs. This combination of factor analysis and cluster analysis allows us to identify the differentiated products or styles being offered by the mutual fund universe. We use principal factor analysis with the factor loadings providing the inputs for our k-means cluster analysis; this is similar to the approach utilized by Abarbanell et al. (2003), Brown and Goetzmann (1997), Michaud (1998) and Brush (2007). Our variables, which are asset-weighted portfolio statistics, include static or valuation multiple variables and dynamic or growth variables. We use the ten variables used in Morningstar's Style Box analysis which we feel reflect different combinations of investors' preferences for income, growth and asset backing. We use Morningstar's Style Box classification for our characteristics-based sample (CBS). This allows us to compare their

CBS approach with our combined BFI-CBS approach. We treat the variables slightly differently as we treat all variables equally whereas Morningstar assign PE and 5 year earnings growth forecast dominant weightings in their calculation of value-orientation and growth orientation respectively. (See Morningstar(2008)).

Factor analysis is a good method for dealing with correlated variables especially when correlations fall into broad categories which also have an intuitive explanation as noted by Bushee (1998). In our sample of portfolio characteristics correlations are high between the various valuation characteristics and also between the various growth characteristics.

The factor equation, (equation 2), could be considered as follows, with an equation of this type applying to each variable and with total variance, including unique variance summing to one:

$$TV = F_1 + F_2 + F_n + (S + E) = 1 \qquad \text{Equation 2}$$

Where:

TV is total variance which is equal to one.

$F_1 + F_2 + F_n$ are the proportions of common factor variance.

$\in = (S + E)$ is unique variance.

Unique variance or uniqueness can be broken down further into specific variance and error variance

$$\in = S + E$$

Where:

S is the proportion of specific variance.

E is the proportion of error variance.

We validated the use of factor analysis using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy which confirmed that the portfolio variables used in our study were suitable for factor analysis. The number of factors to retain is determined by the scree test, the level of eigenvalues and the level of variance explained which all suggest that three factors are retained. In our study the two dominant factors are a valuation factor and a growth factor. A third less significant factor emerged after the ‘TMT Bubble’ distortion abated which could be thought of as an emerging company factor; this was also retained. We believe that it is vital to incorporate measures of growth as well as measures of valuation into any analysis of equity investment style.

Within our style groups we are trying to establish groups of mutual funds which share a group of portfolio characteristics which are more similar to the other members of their style group or cluster than to members of other style groups or clusters. We are looking for clusters, based on our common factors for growth and valuation, which may be viewed as distinct equity investment styles. We adopt the k-means cluster analysis the method used by Abarbanell et al. (2003) to further refine our BFI style groups using factor loadings to form clusters of most similar funds; k-means cluster analysis is an optimization method which forms a pre-determined number of groups or clusters based on a selected number of characteristics. The k-means methodology is an exclusive clustering algorithm i.e. data are grouped in an exclusive way, so that if an observation, in our case a mutual fund, belongs to a definite cluster (or style) then it cannot be included in another cluster, which is desirable for our purposes. The algorithm assigns each observation to the cluster whose centroid is nearest. The centre or centroid of a cluster is the arithmetic mean for each dimension of all the points in the cluster, based on the most commonly used Euclidean measure of similarity.

This iterative process continues until all objects remain in the same cluster as in the previous iteration. It should be noted that unlike sorting based classification systems the number of funds in a group or the percentage of funds in a group is not pre-determined, as is the typical case in style analysis when one third of funds is allocated to growth, one third core and one third value, the number of funds in each cluster (style group) is determined solely by its portfolio characteristics.

Thus our two stage methodology has generated 9 primary style classes each with 3 sub-groups which we test for their out of sample explanatory properties[7]. The aim of any classification system such as style analysis is to identify styles which behave similarly within a class and behave differently between classes. It is with these aims in mind that we construct our out of sample testing procedures. Our expectations of an investment style are that portfolio characteristics and portfolio biases will be similar within styles and these similarities will lead to similar performance over time under varying economic or market conditions.

If we consider the proposition, that funds within a style group should behave similarly, we can test this by asking the simple question, does membership of a style group have any explanatory power for subsequent performance? Using the methodology employed by Brown & Goetzmann (1997) an out-of sample test is formulated for the styles produced which we use to test our combined BFI-CBS analysis, our returns-based Best Fit Index analysis and our portfolio characteristics-based analysis. The basic method runs a regression of dummy variables which represent styles formed in the previous period against fund returns in the following twelve month period. Dummy variables are given a categorical value of 1 if a fund belongs to a style group and 0 if they do not belong to that group. Membership of a style class is mutually exclusive and exhaustive.

Out of sample regression equation:

$$r_{jt} = \alpha + \sum_{i=1}^{8} \beta_i \delta_{it} + \epsilon_{jt} \qquad \text{Equation 3}$$

Where:

[7] Our control model creates 6 primary style classes each with 3 sub-groups.

r_{jt}=fund returns at time t

δ_i =dummy variables 1 to 9 representing membership of each style group with dummy 1 dropped.

β_i = sensitivity coefficient for each fund to each style group

ϵ_{jt}= error term

The model represented by equation 3 represents the CBS and BFI versions with nine dummy variables. The combined BFI-CBS model has18 or 27 dummy variables, depending on the version of the model.

We test all models for the 12 months subsequent to their year-end style allocation for each year from 2000 to 2009. Thus we test out of sample for individual years 2001 to 2010. This test satisfies our criteria of establishing whether funds within a style group behave similarly.

Analysis of Results

Table I illustrates the dispersion of funds across the various style or sub-style groups for Morningstar Classifications, BFI and combined BFI-CBS.

Table 1 about here

Table I: Overview of Style Groups: Morningstar, BFI and BFI-CBS

We now need to consider whether these style groups behave in a similar manner out of sample and which method contributes most against a turbulent market backdrop.

Out of Sample Testing

We test whether membership of a style group plays a significant role in explaining ex post performance of mutual funds for the year subsequent to formation, using a methodology based on the approach of Brown and Goetzmann (1997) to see if funds within style groups behave similarly out-of-sample. The test employs a cross- sectional regression of fund returns for the 12 month period following the establishment of style groups. Membership of style groups, which is exclusive and exhaustive, is represented by dummy variables. We illustrate the results in Table 2

Table 2 about here

We present the results in two forms, firstly, using the maximum number of valid cases, which is the same for BFI (Panel A) and Morningstar(Panel B), but lower for BFI-CBS as determined by availability of portfolio statistics, and secondly, using the common sample based on the CBS-BFI sample. We also present two versions of the BFI-CBS model. The first, illustrated in Panel C, is based on 6 indices, the Russell 1000 and 2000 indices, and their growth and value variants. The second, panel D, also includes the Russell Mid-Cap indices.

The results for each method exhibits a high level of statistical significance verified by the high levels of F statistics which rejects the null hypothesis that membership of style groups does not explain a significant proportion of out of sample returns of mutual funds belonging to designated style groups. If we consider the mean adjusted coefficients of determination for the larger sample, the valid number sample, we find only marginal differences over the full out of sample test period, 2001-2010, for the BFI method recording an r^2 of 0.230 and the Morningstar (CBS) style groups recording an r^2 of 0.241. These results are consistent with others such as Chan et al (2002) who find that CBS tends to perform better than RBS where there is a noticeable difference. Both versions of the combined BFI-CBS methodology record higher mean $r^{2's}$, BFI-CBS(6) r^2 of 0.3204 and BFI-CBS(9) r^2 of 0.3204. This could leads us to conclude that returns-based and characteristics-based style analysis is complementary and the combined method (BFI-CBS) performs the style analysis function better than either a returns-based on characteristics-based system in isolation.

If however we look at the common sample we find the results are much closer for the full period 2001-2010; BFI 0.2914, Morningstar (CBS) 0.324 and BFI-CBS(6) and BFI-CBS(9) 0.3204 and 0.3175 respectively.

Given the turbulence of the analysis period we consider the review period in two sub-periods of 5 years each; 2001-2005 and 2006-2010. For the common sample all classification methods exhibit higher explanatory power in the first period, 2001-2005, than in the second period, 2006-2010, which contains the financial crisis. For the larger, valid case sample, only the Morningstar style classification showed a stronger performance in the second half. In terms of comparisons the BFI-CBS method performs better in the earlier period while the Morningstar (CBS) method performs better in the second period.

The second period contained a more severe recession and the crisis was focussed on the financial sector, of which the mutual fund industry is a part. (Many of the largest mutual fund families are owned by banks). Anecdotal evidence suggests that value funds may have exhibited more differentiated strategies than in previous periods. Some value funds bought into the technology sector post TMT crash as former growth companies met their valuation criteria. Perhaps the biggest differentiator between value funds was when, or if, they bought into the financial sector as stock prices fell in the wake of the financial crisis. Many value funds destroyed their long term performance track records by increasing their holdings in banks, a traditional value sector, too early.

One factor which could explain the stronger performance of the CBS method in the second period could be due to methodology and the issue of timeliness. The CBS approach is based on a snapshot of portfolio characteristics at a single point in time, December year-end in our case. Returns-based analysis by definition assigns style groups on the basis of analysis over time. Timeliness was a criticism of Sharpe's (1992) Returns-based Style Analysis (RBSA) which was based on 60 months observations. Our BFI methodology was based on 36 months observations, but in such a turbulent time that could pose timeliness problems for this method. We observe a decline in the coefficient of determination for the BFI method from a mean of 0.3292 in period 1 to 0.2536 in period 2 and we believe it is this deterioration in the predictive power of the BFI method which drives a similar reduction in the adjusted r^2 for the BFI-CBS method e.g. BFI-CBS(6) from period 1's 0.3634 to period 2's 0.2638.

8. Conclusions

Our results confirm that both the roles of benchmarking and peer group formation may play an important role in explaining the future performance of groups of mutual funds i.e. style groups. Both the BFI, returns-based method and the Morningstar (CBS), portfolio holdings based method explain a significant amount of the cross sectional returns of mutual funds in the period subsequent to style group formation solely by membership of an exclusive style group. We observe the advantages of both methods and note the useful properties of an appropriate benchmark when assessing risk adjusted returns or active risk. Both methods of style identification allow the benefits of diversification to be reaped. In line with others we find that the CBS approach performs slightly better than the RBS method. The different information gathered from the two approaches may be complimentary and this leads us to consider at a combined returns-based and characteristics-based methodology BFI-CBS. Whilst we find in the earlier period 2001-2005 some benefit from the combined methodology over either the BFI or the CBS methodology we find that in the more turbulent latter period 2005-2010 the CBS method performs better than the combined BFI-CBS methodology. We attribute this to the timeliness advantage of the CBS portfolio snapshot over any returns-based system. The message for asset allocators and investment managers, wherever they are domiciled, is clear: there are times when a combined methodological approach of BFI and CBS to defining style groupings will be superior in terms of out-of-sample behaviour but a safer bet is to rely on the characteristics-based model especially during turbulent market conditions.

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Table 1: Overview of style groups
This table presents for each year the number of funds in each style group.

Morning Star Classification										
Style Group	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Large Growth	123	126	167	171	168	199	194	224	220	196
Large Core	119	159	169	190	213	206	208	185	201	206
Large Value	100	88	131	147	155	141	146	175	146	130
Mid Growth	75	69	100	108	119	124	105	128	124	107
Mid Core	28	35	57	55	55	61	56	49	60	54
Mid Value	33	30	32	33	37	40	46	37	42	35
Small Growth	62	75	85	87	85	87	88	117	103	65
Small Core	38	43	64	57	54	57	65	46	59	75
Small Value	33	24	27	34	42	37	47	48	31	39
Total	872	935	960	988	1009	1057	1073	1070	1012	955
Best Fit Index Classification										
Rusell 1000 G	75	84	73	67	84	106	101	125	128	196
Rusell 1000	207	235	256	299	259	240	240	241	270	256
Rusell 1000 V	98	91	122	125	140	149	123	120	97	94
Rusell MidCap G	96	114	111	106	96	106	142	146	168	113
Rusell MidCap	72	65	90	99	85	87	121	85	97	92
Rusell MidCapV	60	70	56	53	49	40	38	51	69	74
Rusell 2000G	80	82	93	71	107	130	132	110	105	87
Rusell 2000	43	48	51	78	97	76	74	88	76	73
Rusell 2000V	42	45	46	57	68	63	39	27	31	24
Total	773	834	898	955	985	997	1010	1041	1009	907

Table 2: Out of sample testing

This table presents results of the cross-sectional regressions that examines the extent to which ex-post returns are explained by membership of given style groups. *F-Stat* is the F-statistic and *Adj. RSQ* is the adjusted R-squared associated with the regression.

Panel A presents results based on all funds with relevant data for each specification. Panel B presents results based on funds with relevant data for all three specifications – common sample.

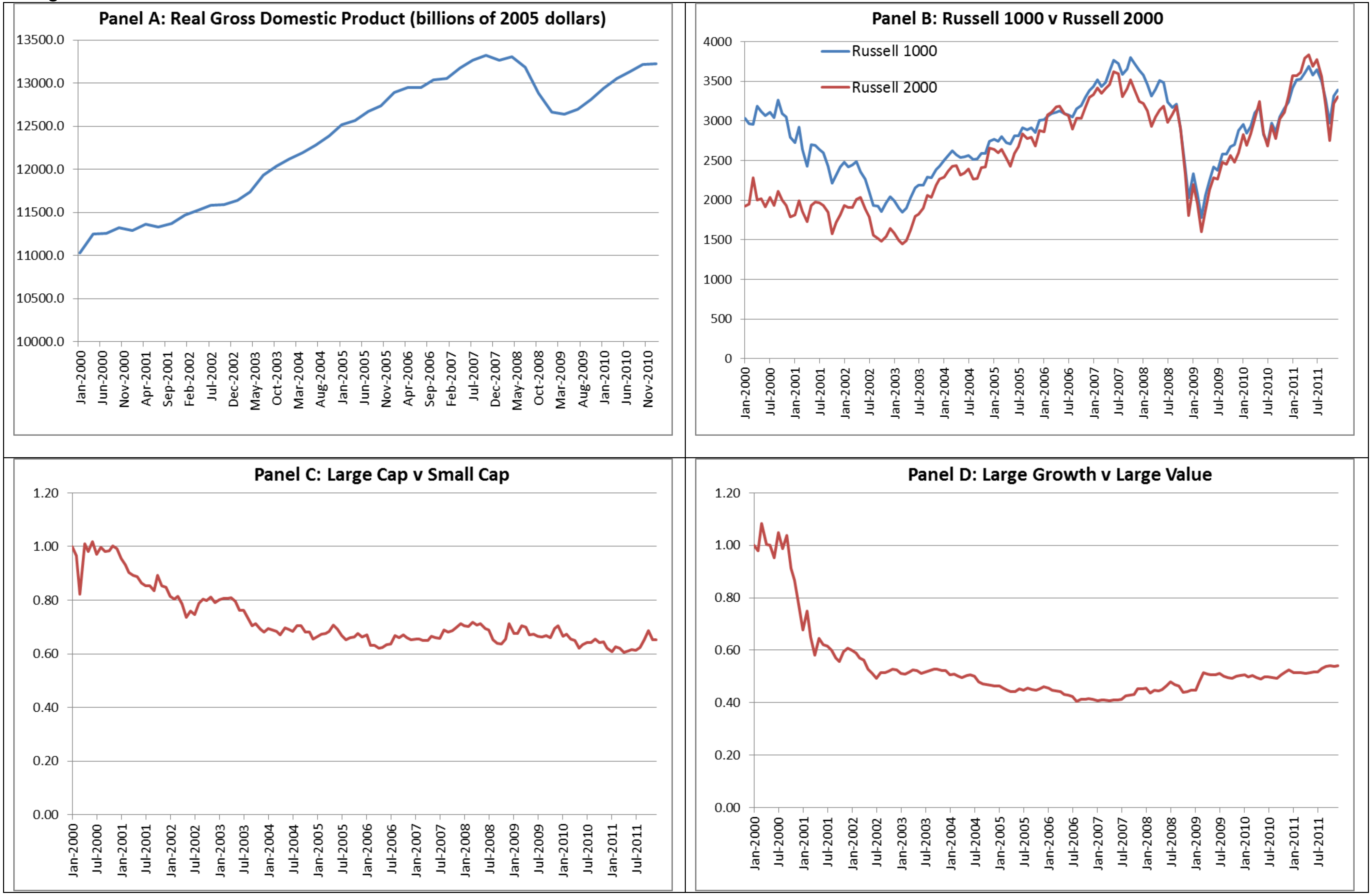
Panel A: Valid cases for each specification

	Best Fit Index			Morningstar Classification			9 BFI – CBS Classification		
Year	**No. of funds**	**F-Stat**	**Adj. RSQ**	**No. of funds**	**F-Stat**	**Adj. RSQ**	**No. of funds**	**F-Stat**	**Adj. RSQ**
2001	773	59.42	0.349	872	45.62	0.291	435	20.96	0.512
2002	834	34.36	0.222	935	21.87	0.152	464	14.64	0.405
2003	898	37.21	0.232	960	36.44	0.228	599	17.09	0.387
2004	955	39.28	0.237	988	30.03	0.190	633	22.78	0.439
2005	985	4.79	0.029	1009	8.72	0.058	699	4.03	0.113
2006	997	20.11	0.126	1057	34.24	0.201	727	7.57	0.188
2007	1010	24.61	0.150	1073	63.45	0.318	748	20.94	0.375
2008	1041	20.58	0.128	1070	13.36	0.085	833	11.46	0.224
2009	1009	19.93	0.130	1012	17.05	0.113	818	3.92	0.089
2010	907	90.03	0.427	955	82.28	0.405	800	31.09	0.443
Mean (2001 - 2005)			0.214			0.184			0.371
Mean (2006 - 2010)			0.192			0.224			0.264
Mean (2001 - 2010)			0.203			0.204			0.318

Panel B: Common Sample

Year	No. of funds	Best Fit Index		Morning Star		BFI – CBS Classification	
		F-Stat	Adj. RSQ	F-Stat	Adj. RSQ	F-Stat	Adj. RSQ
2001	435	62.24	0.53	70.86	0.563	20.96	0.512
2002	464	27.57	0.315	30.92	0.341	14.64	0.405
2003	599	45.44	0.373	52.22	0.407	17.09	0.387
2004	633	51.49	0.39	47.46	0.37	22.78	0.439
2005	699	4.46	0.038	7.37	0.068	4.03	0.113
2006	727	26.92	0.222	35.93	0.278	7.57	0.188
2007	748	24.07	0.198	70.21	0.426	20.94	0.375
2008	833	25	0.187	14.65	0.116	11.46	0.224
2009	818	21.64	0.168	22.06	0.171	3.92	0.089
2010	800	97.96	0.493	119.08	0.542	31.09	0.443
Mean (2001 - 2005)			0.329		0.350		0.371
Mean (2006 - 2010)			0.254		0.307		0.264
Mean (2001 - 2010)			0.291		0.328		0.318

Figure 1: Market Overview 2000 – 2011



Is the categorisation of investment funds useful in extremely volatile market conditions? Which method of style analysis, if any, dominates in terms of consistency, accuracy and robustness? We analyse the turbulent period 2000-2010 using Returns-Based (RBS), Characteristics-Based (CBS) and a new combined BFI-CBS method. All three perform well in terms of explaining out-of-sample cross sectional returns of a large sample of diversified US equity funds. The combined methodology performs best 2000-2005 but the CBS method performs best in the second period, (including 2007-2008 financial crisis). Which method of style analysis, if any, dominates in terms of consistency, accuracy and robustness? We analyse the turbulent period 2000-2010 using Returns-Based (RBS)Â Is the categorisation of investment funds useful in extremely volatile market conditions? Which method of style analysis, if any, dominates in terms of consistency, accuracy and robustness? We analyse the turbulent period 2000-2010 using Returns-Based (RBS), Characteristics-Based (CBS) and a new combined BFI-CBS method. All three perform well in terms of explaining out-of-sample cross sectional returns of a large sample of diversified US equity funds. The combined methodology performs best 2000-2005 but the CBS method performs best in the second period, (including 2007-2008 financial crisis).