

What is Regression Style Analysis?

Regression style analysis is a statistical technique used to characterize the behavior of an active portfolio over a specific time period in terms of passive style indexes. This form of style analysis attempts to determine combinations of weights in the passive indices that most closely replicate the actual portfolio performance.

For example, using PEP we use a domestic equity portfolio to run a single period style exposure analysis for 20 quarters ending current quarter. Suppose the resulting chart shows the large cap growth bar at 80%, the mid and small cap growth bar's at 10% respectively. We can now say that the same performance (or something close to it) could have been achieved by allocating 80% to a large cap growth index, 10% to a mid cap growth index and 10% to a small cap growth index. This 80/10/10 combination represents a reasonable passive alternative to the fund's active management.

The process PEP uses is returns based analysis (as opposed to fundamental analysis), and was developed by William Sharpe, Professor and Nobel Laureate (as documented in the Journal of Portfolio Management Winter 1992).

What are the Ingredients of this Style Analysis?

To be appropriate for this style analysis, the passive style portfolios should exhibit the following properties:

- As a group, be representative of the entire inevitable universe (i.e., totally exhaustive)
- Stock holdings mutually exclusive across all passive style portfolios
- Uniquely different as possible from each other (i.e., orthogonal)

Within PEP, the default benchmarks for the domestic equity style analysis chart (i.e., single or rolling period style exposure and style map charts) are the following:

- LCG: S&P 500 Growth Index
- LCV: S&P 500 Value Index
- MCG: S&P 400 Growth Index
- MCV: S&P 400 Value Index
- SCG: S&P 600 Growth Index
- SCV: S&P 600 Value Index
- T-Bill: Salomon Brothers 3-month T-Bill Index

With the demise of the Callan Indices as of December 31, 2002 we have switched to using the Standard and Poor's indices as our underlying benchmarks used for the domestic equity style analysis charts. The historical benchmarks will be the Callan indices through December 31, 2002 and starting January, 2003 will be the S&P family.

Given these inputs, how does PEP calculate the best composite style portfolio?

Here are two technical descriptions of the methodology used in this style analysis:

- Quadratic optimization that minimizes the variance of the residual error terms when comparing the style index composite to the actual portfolio.
- “Regression analysis” constrained so that the coefficients of the style index variables must be positive and sum to 1.

Interpretation

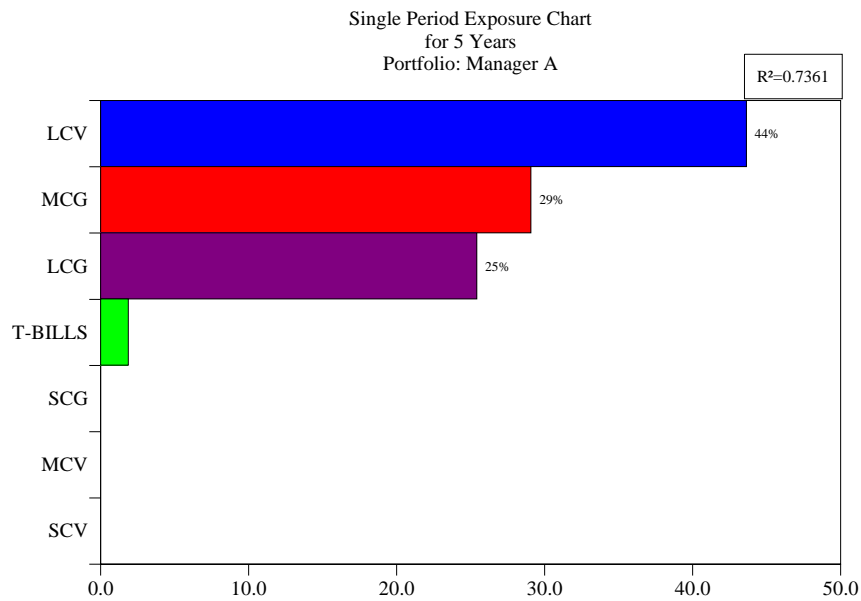
As measured by the R-squared (R^2), the statistical significance of a style analysis is important to recognize. The R^2 lies between 0 and 1 and indicates the proportion of the variation in the returns that is explained by the characterization developed in the style analysis. An R^2 close to 1 (say, above 0.9) indicates that the characterization explains a large proportion of the returns from the portfolio and that the proportion attributable to the style factors has been significantly high. A low R^2 (say, below 0.7) indicates a manager that does not behave much like any of the style indices used.

PEP charts to present this style analysis are the Single-Period and Rolling-Period Style Exposure Charts and the Style Map. Samples are shown in the following pages. In order to interpret these graphs, one must first remember that they represent a characterization of how the returns of an equity portfolio have behaved in the past relative to the set of passive style portfolios. So, it is not an analysis of the portfolio’s actual security composition, although we would expect some correspondence between the exposures in the analysis and the actual security holdings of the portfolio. Rather, the analysis looks at the “effective” style exposure of the portfolio for the time period being examined. Note, however, that because an investor buys returns from a manager and not actual securities, this seems to be an appropriate way to analyze a portfolio, especially one that is actively managed.

Here's a quick description of PEP's three Regression Style charts:

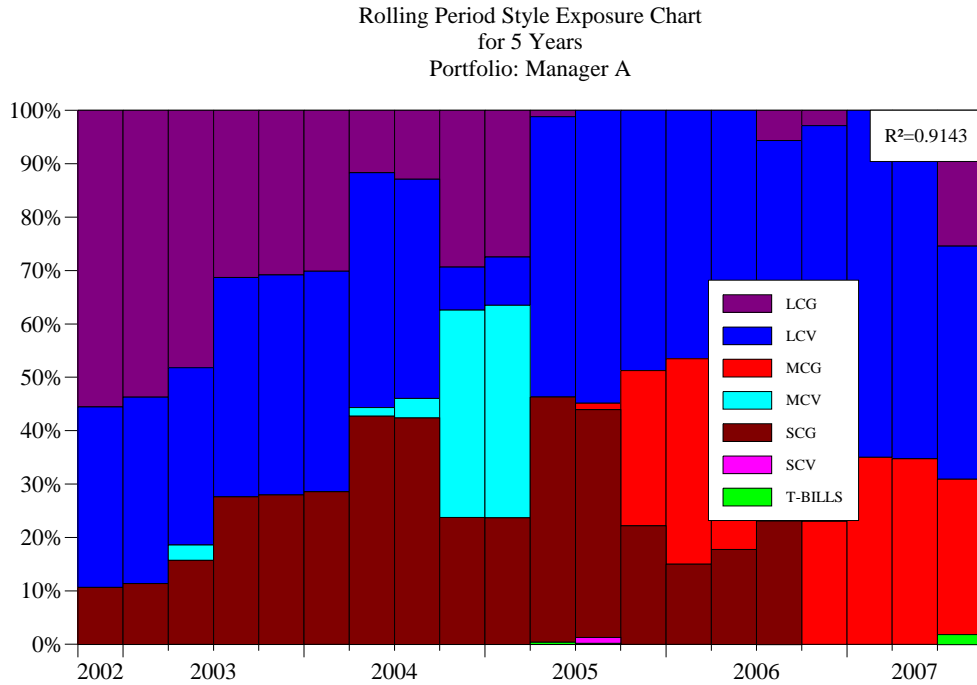
Single-Period Style Exposure Charts

This chart shows the weighted composite of passive style indices that best replicates the manager's portfolio for the time period specified. The R^2 of this composite to the actual portfolio is very important to determine the significance of this proxy.



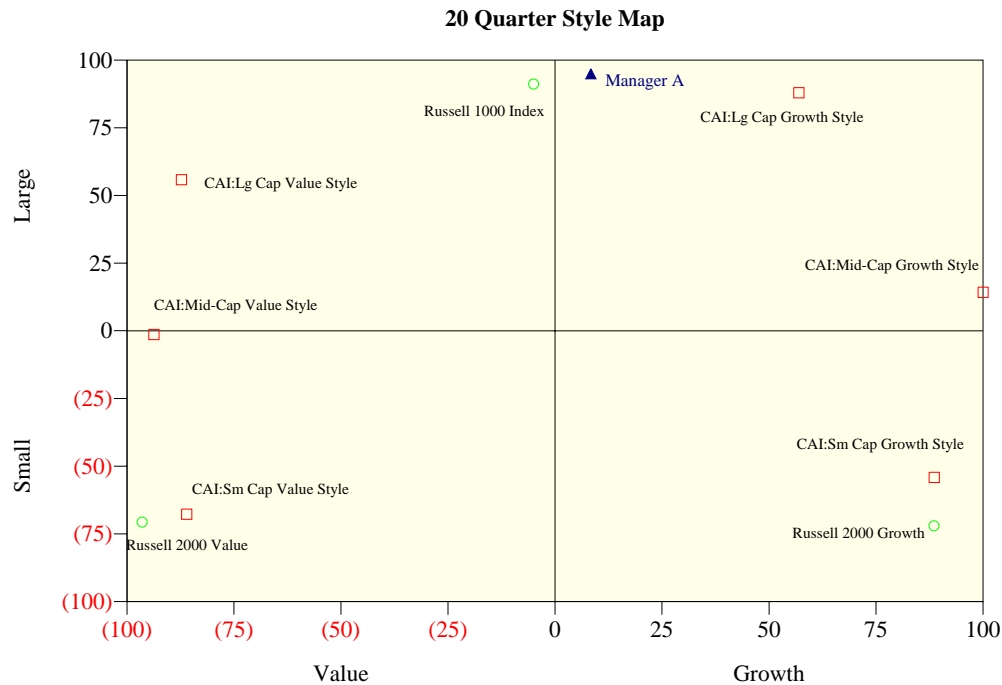
Rolling Period Style Exposure Chart

This chart shows multiple periods of style exposures in a stacked bar format. Each stacked bar represents a style exposure analysis based on the specified time period (preferably 20 quarters at least) ending on the quarter indicated. For example, the last stacked bar in the graph below is the same as that shown above but in a stacked vertical format.



Style Map

The Style Map uses the passive portfolio weights calculated from the style analysis of multiple managers, indices, and/or total equity allocations and plots them in a manner such that direct comparisons can be made. The map consists of points whose positions are determined by their exposure to the size and the growth/value factors. The size factor lies on the vertical axis and the growth/value factor lies on the horizontal axis. Note that the six passive portfolios listed above define the edges of the style map. Therefore, all other portfolios are defined as percent allocations (i.e., 0% to 100%) to these style components. This introduces one caveat to this analysis. If you analyze an extremely value-oriented or growth-oriented manager, you can not create a passive index with more than 100% allocated to the growth indices; a similar limitation exists in the capitalization spectrum. Defining your own benchmark exposures, if done properly, can address this limitation.



Analytical Solutions Group

Phone: 415.291.4191 E-mail: pep@callan.com
 101 California Street, Suite 3500 San Francisco, CA 94111 Fax: 415.291.4018