IS VALUE MULTIDIMENSIONAL? IMPLICATIONS FOR STYLE MANAGEMENT AND GLOBAL STOCK SELECTION

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The earnings-to-price ratio is a simple and common measure of a stock's value as an investment. Intuitively, the larger the ratio, the more return we may expect, all other things the same.

Many measures of a stock's value are used in practice. Most are based on a comparison of a fundamental characteristic of the firm, such as earnings relative to price in the form of a ratio. Additional value measures may include dividend yield, book-to-price, sales-to-price, normalized earnings-to-price,[1] cash-earnings-to-price, consensus forecast earnings-to-price, and dividend discount model alpha.[2] All have adherents and rationales.

Dividend yield, for example, is an obvious measure of value that ranks stocks based on cash distribution to stockholders. In contrast to dividend yield, the earnings-to-price ratio implicitly includes a component of expected future growth of the firm as part of the valuation measure.

Other fundamental measures, such as sales-to-price, may be preferred over earnings-to-price because they are not as subject to the vicissitudes of accounting practices and may be less variable for economically sensitive companies. Such considerations may be particularly important in some global equity markets. Recently, a number of academic studies have popularized the book-to-price measure.[3]

One reason many asset managers use multiple measures of stock value is that the return relationships often vary significantly with time. For a global investor, multiple value measures are even more critical, since the effectiveness of a value measure often varies by market. The issue of which value measures to use in a given market and time period is a key investment decision.[4]

Evidently, there are many plausible measures of "value." Are all such measures fundamentally similar; i.e., is value single-dimensional and reasonably well approximated by each of these factors? Alternatively, is there more than one kind of stock value?

GLOBAL STOCK FACTOR ATTRIBUTION

A non-simulated monthly database of sixteen

normalized and standardized forecast factors and ex post index-relative returns for investable-grade stocks in many global markets has been maintained since December 1990.[5] The sixteen forecast factors include the eight value factors we have noted plus eight non-value factors that can be categorized in one of four groups: 1) trends in analysts' consensus earnings forecasts; 2) specific return reversal; 3) firm size; and 4) historical earnings growth. Monthly regressions of the ex ante factors with ex post index-relative risk-adjusted stock returns are performed for each equity market.

The database currently covers nearly seven years of monthly data for most MSCI EAFE countries and five years for the U.S. and Canada.[6] In Japan, for example, the database currently includes approximately 100,000 monthly stock returns and associated factor values.

This database provides a unique resource for the analysis of many significant global stock valuation issues. We use the data to analyze the concept of value in major global equity markets.

STUDY OBJECTIVE AND METHODOLOGY

Multivariate linear regression is widely used for analyzing historic factor-return relationships. The problem with this procedure with this data is that many of the forecast factors are strongly correlated with each other. Consequently, the factor-return regression coefficients are likely to be unstable and uninformative.

One solution is to identify low-correlation "macro" factors that parsimoniously represent the sixteen "micro" factors in each global market. Factor analysis is a useful and powerful procedure for identifying groups of statistically similar factors. Each group of similar factors can be combined to define macro factors.[7]

The end result is a parsimonious set of low-correlation factors for forecasting active return that may be useful as a framework for understanding investment style in many global markets. Such factors may provide a more stable factor-return estimation framework. In addition, relatively low-correlation macro style factors may be information-synergistic and useful for optimal multiple-factor model design (see Michaud [1990]).

Monthly factor data were pooled to study the relationships of the sixteen individual factors.[8] Various factor analysis methods were applied to the

entire historical period and for three equal duration subperiods. Few differences were found that were not easily attributable to random variation.[9]

THREE VALUE STYLE FACTORS

The study finds that seven mutually exclusive factor groups or stock style factors span the spectrum of the variation inherent in the sixteen individual forecast variables. Contrary to expectations, the eight individual value variables cluster into three mutually exclusive "value" style factors.[10] These three style factors are observed for all the developed markets with sufficient historical data, including Japan, the U.K., and the U.S. The three value styles are called:

1. Earnings yield.
2. Normalized earnings yield.
3. Asset yield.

The earnings yield factor consists of earnings-to-price and security analysts' consensus forecast earnings-to-price ratios. The normalized earnings yield factor consists of the normalized earnings-to-price ratio and dividend discount model alpha. The asset yield factor consists of the book-to-price, sales-to-price, and cash-earnings-to-price ratios and dividend yield. Each of these value categories has intuitive investment content.[11]

The earnings yield factor is estimates of current and near-term earnings. The normalized earnings yield factor is a time period-adjusted estimate of earnings-to-price and may be less business cycle-sensitive. The asset yield factor is based on cash assets or distributions relative to price.

The results indicate that value may be multidimensional; that is, that there are at least three distinct kinds of equity value styles.

DOES MULTIDIMENSIONALITY MATTER?

The seven style factors, including the three value factors, provide a framework for characterizing the risk-adjusted active return-generating process in global equity markets. They are useful for structuring portfolios and tilting the portfolio valuation process along any of the seven dimensions. Although some style factors may be significantly related to return over long time periods, others are not.

Style factors that are significantly related to ex post risk-adjusted excess return may be examples of market anomalies, a subject of significant academic

and practitioner research (see Michaud [1998]). In practice, many active managers use style factors that may only be episodically related to return.[12]

A key question is whether the three value factors are more useful for understanding the active return-generating process in global markets than simpler measures. To put this question to the test, the three value style factors are regressed against monthly index-relative returns for five recent years of data.[13]

Two separate multivariate regressions are performed for each market. In the first regression, the value style factor is unidimensional; it consists of an equal-weighted sum of all the eight micro value variables. In the second regression, the three value style factors — earnings yield, normalized earnings yield, and asset yield — are regressed against return.[14] The regression results use the Fama-MacBeth [1973] procedure.

Exhibit 1 provides the Fama-MacBeth t-statistics for the unidimensional and multidimensional value style factors in the U.S., U.K., and Japan markets. Exhibit 2 provides a graphical display of the t-statistics of the multivariate regression coefficients for the unidimensional and three value style factors.
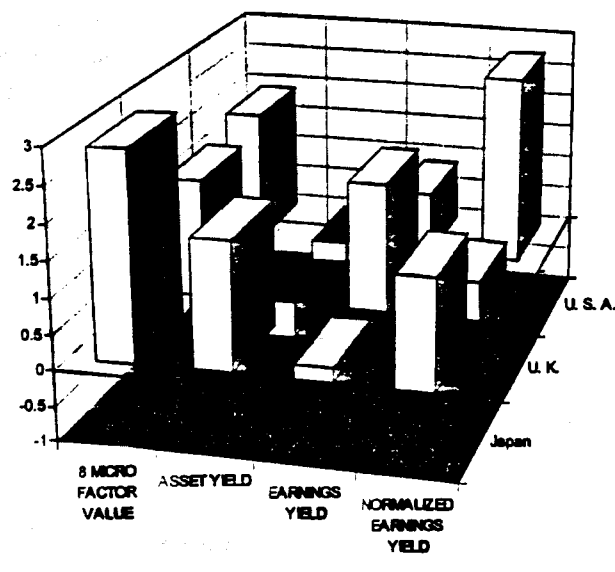
The t-statistics for the unidimensional value style factor in the three markets are positive and reasonably significant. We may safely conclude that value has been a significant contributor to return in the three markets on average over this time period.

A multidimensional framework provides a more detailed view of the relationship of value to return. The asset yield factor, which includes the book-to-price value measure, is statistically significant only in Japan. Earnings yield is significant only in the United Kingdom. Normalized earnings yield is roughly significant in Japan and the United States.

In two cases — the U.K. and the U.S. — one of the three multidimensional style factors has a stronger relationship with ex post return than unidimensional value. Such insights can be very useful in formulating forecasts and understanding performance.

SOME IMPLICATIONS FOR EQUITY STYLE MANAGEMENT

A number of authors have popularized the use of the book-to-price ratio to classify value and growth stock investment styles in global markets (see Capaul, Rowley, and Sharpe [1993], for example). High book-to-price stocks are defined as value stocks and low book-to-price stocks as growth stocks. The notion is that, if stocks are priced correctly, high book-to-price stocks are priced based on their current value while low book-to-price stocks are priced based on their future growth potential. Often the categories are defined to be mutually exclusive: 50% of stocks in a given stock universe are "value," and 50% are "growth." The size factor is often used as the second dimension of a two factor style analysis.

A number of consultants and index data providers now track the performance of value and growth indexes using book-to-price as the measure of the value/growth dimension. These indexes are used to measure the style performance of managers

EXHIBIT 1
UNIDIMENSIONAL VERSUS
MULTIDIMENSIONAL VALUE WITH RETURN
JUNE 1992-JULY 1997
POOLED MONTHLY DATA

T-STATISTICS	JAPAN	UNITED KINGDOM	UNITED STATES
Unidimensional	2.9	1.7	1.9
Asset yield	1.8	-0.5	-0.3
Earnings yield	0.2	1.8	0.9
Norm earn yield	1.5	0.6	2.7

and to determine whether value or growth outperformed in a given time period.

Such procedures assume that value and growth are unidimensional and well represented by the book-to-price ratio. Our evidence suggests that neither assumption has been true for the three largest global equity markets in this recent five-year time period. While asset yield, the aggregate factor that includes book-to-price, has been an important measure of value in the Japanese market in the period, it has not been useful in the other two markets. On the other hand, normalized earnings yield was significantly related to return in Japan and the U.S., while earnings yield was important in the U.K.

An asset yield definition of investment style would not have been optimal in any of the three markets. As the sole measure of global value, the book-to-price style criterion appears to have serious if not fatal investment management and performance measurement limitations.

Factor-return relationships are generally time period-dependent. The data in Exhibit 1 represent results for a relatively short, although investment-relevant, period of time.[15] On the other hand, the results of many long-term studies may be less convincing than they appear. Lo and MacKinlay [1990] note that, for any time period however long, some factor is likely to be found that is related to return. Consequently, the longevity of a factor-return study may provide little additional evidence of out-of-sample reliability or forecasting power.

Also, because many studies use similar historical databases, the multiplicity of confirming studies may provide little additional reliability of the stability of future factor-return relationships. Indeed, one of the primary motivations for the design and development of the database that provides the factor-return relationships in Exhibit 1 is to minimize data snooping bias. While time period-dependent, the data provide an investment-relevant view of factor-return relationships that may be of interest to many global institutional investors.

DEFINING GROWTH STOCKS

If book-to-price is a limited measure of value, it follows that it is similarly flawed as a growth stock measure. However, the book-to-price criterion may have additional limitations for characterizing growth stock investment.

Are growth stocks the polar opposite of value stocks? As implied by the book-to-price criterion, do growth stock managers invest only in low book-to-price stocks? In many institutions, growth stock portfolios often include a substantial proportion of high book-to-price stocks. Prudent institutional growth stock managers are also concerned with stock price and relative valuation. Consequently, the growth stock index defined by a book-to price variable may often be inconsistent with institutional practice for growth stock managers.

Growth stocks are also likely to be multidimensional. A multidimensional style factor framework, including factors related to business cycle sensitivity, changes in earnings expectations, short-term trade price biases, and firm size, may provide a more useful approach for formulating active return forecasts and manager style analysis.[16]

CONCLUSION AND SUMMARY

A useful characterization of value and growth stocks for global stock selection is likely to be multidimensional. Other important style dimensions of stock valuation may also be related to active risk-adjusted return over time periods of institutional interest.

Single-factor characterizations of stock investment strategies may be seriously misleading in many practical investment situations. A multidimensional framework of the active return generating process may provide a significantly richer and more reliable framework for attributing performance and forecasting return.

ENDNOTES

[1]Defined as the inverse of the price-to-book ratio divided by time weighted average of return on equity.

[2]For a discussion of some of the properties of the standard dividend discount model, see Michaud and Davis [1982].

[3]A recent example is Fama and French [1992].

[4]For more extensive discussion of the issue of the dynamic character of valuation measures with return, see Michaud et al. [1996, pp. 15-17].

[5]The investability criterion for a stock depends on whether a sufficient number of forecast factors are available in each time period. The database has been developed month-by-month since December 1990 and reflects a "forward" test of stock attributes with monthly ex post index relative risk-adjusted return. It is specifically designed to address many critiques of factor-return studies in the context of an institutionally relevant framework for active stock selection. The database includes beta, index, and sector membership variables that are used to risk-adjust returns in the monthly cross-sectional multivariate regressions. This database is described further in Michaud [1998].

[6]MSCI EAFE refers to the Morgan Stanley Capital Inter-

national Europe, Australasia, and Far East Index.

⁷There are a number of factor analysis procedures. Principal factors analysis with orthogonal rotations is the primary method used to analyze the data here. Many alternatives were employed to cross-check the robustness of the results.

⁸The definitions given here are based on up to forty-three months of stock factor data for many global equity markets, including the U.S., the U.K., and Japan.

⁹The aggregate factor definitions are based on research completed in September 1994 and data then available. Subsequent studies have found few differences in the results.

¹⁰The procedure and results are described in more detail in Michaud [1998].

¹¹As a rough rule of thumb, the group factors are an equal weighting of their constituents. The process uses ridge regression methods that tend to deviate from equal weighting in some cases.

¹²Style factors need not be long-term significant or anomalous to be useful in forecasting active return. Some style factors, such as size, may be insignificant long-term but may exhibit significant episodic behavior that may be useful in forecasting return over institutionally relevant time periods. Episodic style factors are often used by active managers. In particular, a number of managers use Barra risk model factors as style factors for forecasting return. See, for example, Leinweber, Krider, and Swank [1995]. While similar, factor relationships derived from forecasting risk may not be equivalent to those derived from forecasting risk-adjusted excess return. This is because risk estimation is often designed to estimate episodic, rather than long-term anomalous, factor-return relationships. Further discussion appears in Michaud [1998].

¹³This period covers the bulk of the historically useful information in the U.S. factor-return database when this was written.

¹⁴The regressions are multivariate in both cases and include the remaining four aggregate style factors — size, earnings trend, reversal, and cyclical — plus beta and index membership and sector dummy variables. For simplicity of presentation, the t-statistics of the aggregate and other factors in the multivariate regression are omitted.

¹⁵The Hotellings T-square rejection probability for the seven-factor style framework over the five-year period in each of the three countries is less than 0.5% (Michaud [1998]).

¹⁶This is the framework used in Michaud [1998].

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