ALPHA – the financial pimpernel?

In their quest for the elusive alpha — the abnormal return on an overvalued or undervalued security — analysts often overlook a fundamental point: that the identification of an abnormal return implies an understanding of "normal" returns, which in turn demands a theory of risky asset pricing. ***Norman Sinclair*** *reminds analysts that the concept of alpha is valid only within an explicitly defined theoretical and empirical structure. Once this theoretical structure is identified, the scope of alpha analysis becomes clear and implications may be drawn for further research.*

The search for elusive stocks that are undervalued or overvalued has been central to the practice of portfolio management for a considerable time.[1] Recently, however, these investments have taken on a more exotic flavour — they are now referred to as negative or positive alpha stocks.[2] Although the central notion of an unusual investment opportunity remains unaltered, the new terminology represents more than a mere cosmetic change. There are many benefits to be gained by focusing fundamental stock research on alpha analysis.

First, alpha analysis generates quantitative estimates of under/overvaluation that are easily used in portfolio construction using powerful optimisation techniques. Second, if alpha analysis is carefully operationalised in a specific theoretical framework then it clarifies the meaning of portfolio decisions such as stock selection and market timing. In doing so, alpha analysis may highlight the need for change in the structure of research activities within many traditional fund management institutions.[3]

Finally, alpha analysis, when based on a rigorous conceptual framework, will encourage the organisation to focus on consistency between analysts with different specialisations at the micro- and macro-economic levels.

This paper has three objectives:

- to reconcile alpha analysis with the process of "fundamental stock analysis";
- to examine the theoretical framework that is required to operationalise alpha analysis; and
- to provide insights into the nature of the research activities required to support alpha analysis when consistency is a desirable attribute for the research process.

Fundamental research process

A simple overview of a typical research process will set the groundwork for a more rigorous analysis. Alpha analysis can be placed in a generic valuation framework such as an earnings discount model (EDM) given in Expression 1.

The EDM states that the current value for stock i is the sum of a discounted stream of future economic earnings. It should be noted that the EDM is general enough to permit varying growth rates and/or discount rates over the relevant time horizon, T. However, if an analyst has *exactly* the same earnings forecasts as the general market, then:

- if the correct discount rates are used for relevant earnings streams, the predicted price will be equal to current price; or

EXPRESSION 1

$$Value_{i0} = \frac{Earnings_1}{(1+R_{i1})^1} + \frac{Earnings_2}{(1+R_{i2})^2} + \ldots + \frac{Earnings_T}{(1+R_{iT})^T}$$

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THE ALPHA SELF-TEST

		YES	NO
1	Have I modelled the process by which stock returns evolve over time?		
2	Have I tested the ability of my time series model to explain cross-sectional differences in expected returns for individual stocks?		
3	Is my model of the earnings process underlying my approach to valuation consistent with the model I apply to stock returns?		
4	Do I explicitly check for consistency across the macro and micro analysts' inputs to the valuation process?		

If you answered NO to any question, then this article will offer some challenges.

■ if the EDM is used in reverse to estimate an average discount rate then it will equal the expected return for that stock.

Although both approaches to valuation using the EDM are valid, the second is more compatible with alpha analysis since it permits an analyst to generate an "expected return" based on subjective estimates of a firm's earnings process and the current stock price.

Of course, fundamental stock research is dedicated to the proposition that individual analysts' earnings expectations will differ from the market consensus and thereby identify profitable investment opportunities expressed as a stock price or predicted return. If the analyst's views are proved correct then the value of the portfolio will be enhanced, *ceteris paribus*.

While the EDM is an important valuation framework, its implementation is not straightforward and considerable additional structure is required if it is to provide a practical valuation framework. Nevertheless, it serves a useful purpose in emphasising the two sources of potential valuation differences between analysts and markets — earnings and/or discount rates — that combine to create the concept of an alpha or abnormal return.

Alpha is a predicted abnormal or unexpected return which may be expressed simply as: *Predicted alpha = predicted return to a security, less normal or expected return to that security.*

Clearly, there are two important elements in alpha analysis. First, an analyst is required to make a prediction for the return on a stock. If the EDM is used (in reverse) then the prediction will be driven largely by the analyst's view of the earnings process, given the current stock price. Second, an analyst needs to formulate the *expected* return on the stock using an appropriate theory of risky asset pricing.

The difference between these two estimates is the analyst's *predicted alpha* for that stock. If the predicted alpha is negative, then the security is considered overvalued and its price is predicted to drop (and vice versa for a positive alpha).

So far, it seems that alpha analysis is nothing more than a restatement of the usual process of fundamental stock analysis. In fact, however, alpha analysis requires greater precision and thereby places more restrictions on fundamental research activities than traditional approaches. In the context of alpha analysis, current analytical approaches embody considerable complexity and scope for inconsistency that may have gone unnoticed.

Consider a hypothetical research process involving the following levels of analysis:

Macroeconomic analysis to provide overall analytical framework

↓

Microeconomic analysis including EDM valuation to generate the predicted stock return

↓

Comparison of predicted stock return with expected stock return = alpha

↓

Increase/decrease portfolio exposure to recommended stocks

Because alpha analysis attempts to be quantitatively precise, the approach forces an organisation to consider the importance of consistency across the research process. This need is reflected in the following questions that arise when fundamental stock analysis is viewed as a process for generating alpha predictions:

- Are all analysts using the same set of macroeconomic assumptions in their individual analyses?
- Is a predicted stock alpha attributable to the analyst's earnings forecasts, a view on expected returns or a combination of both?
- Are analysts' stock alphas comparable if they each have different views on normal or expected returns?
- Is there consistency between the model used by the analyst to predict security returns and the model used by the analyst to describe normal or expected returns?
- What happens to predicted alphas when stock recommendations are placed into a portfolio?
- Are analysts' alphas incorporated into the portfolio in an optimal way ?

Analogous issues arise whether or not the research process is focused on stock alphas, but because alpha analysis is more quantitatively driven, the answers become critical if an organisation is to avoid the problems of "rubbish in, rubbish out" in fundamental stock research.

Expected returns and discount rates

A useful starting point for alpha analysis is to ask the question: how does the return on any risky security evolve over time? That is, how do we explain the actual percentage change in the price of the stock? The answer to this question is usually referred to as the Return Generating Process (RGP) and is presented as Model 1.[4]

Although at first glance Model 1 appears daunting, it is conceptually straightforward. Model 1 proposes that, *over time*, the *actual* return on any security i, (R_i), will be equal to the return that the market expected for that period, $E(R_i)$, plus a set of unexpected returns (shocks) that occurred during that period. In other words, because current expectations concerning the relevant phenomena that determine stock prices are "priced" at any time, it is only unexpected changes in those phenomena that cause ob-

MODEL 1: THE RETURN GENERATING PROCESS (RGP)

$$R_i = E(R_i) + \beta_{i1}FS_1 + \beta_{i2}FS_2 + \ldots + \beta_{ik}FS_k + SS_i$$

served changes in stock prices. To that end, Model 1 identifies two separate classes of shock that may affect realised returns for any security:

- *Factor shocks (FS)*. These are unexpected changes in the returns to systematic factors that are believed to be the underlying determinants in the pricing of *all* securities.
- *Security shocks (SS)*. These are idiosyncratic returns, in that they affect a particular security and are not associated with the returns on any systematic factor or with a similar shock for other securities. Of course, if security shocks were correlated across stocks, then this would effectively constitute an additional factor.

Although Model 1 refers to realised returns, the same insights are valid if it is interpreted in a predictive framework, in which case, R_i is interpreted as a subjective forecast stock return and $E(R_i)$ remains the *objective* market-consensus expected stock return. Importantly, the structure of Model 1 suggests that the analyst should focus upon factor and security returns that are not already anticipated in current market expectations, $E(R_i)$. A *predicted* security return is therefore modelled as a set of unanticipated factor and security shocks around the normal or expected return to the security.

Model 1 adds the first level of complexity to the earlier definition of a predicted alpha as simply being the difference between a predicted stock return and its expected value. Now, it is clear that the overall stock alpha is a composite of factor alphas and a stock specific alpha.

Factor alphas

In Model 1, although the factor shocks are common to all securities, they affect each security differently. This is reflected in the factor beta risk (βij) in such a way that it is possible for a predicted factor shock to have a negative effect on one security and a positive effect on another. Hence, the portfolio implications for the set of factor shocks lies in the magnitude and sign of the factor betas for different stocks. Stocks with positive betas will amplify the predicted factor shock, whereas stocks with negative factor betas will provide natural hedges. The *combined* predicted effect of the factor beta and the factor shock is the factor alpha.

What are the factors that could drive a model such as Model 1? The early Capital Asset Pricing Model (CAPM) suggested that there was only one factor, a value-weighted market portfolio, whereas the more recent Arbitrage Pricing Theory (APT) permits multiple factors. For example, Chen, Roll and Ross (1986) claim that four macroeconomic factors are significant determinants of stock prices on the New York Stock Exchange.[5] These are:

- industrial production
- inflation
- risk structure of interest rates
- term structure of interest rates

> *The structure of Model 1 suggests that the analyst should focus upon factor and security returns that are not already anticipated in current market expectations*

In practice, an analyst is required to predict unanticipated shifts in these factors and combine these with the appropriate factor betas to arrive at the factor alphas for each stock in the portfolio. The sum of all the factor alphas represents the overall predicted abnormal return for a stock associated with unanticipated changes in factor returns. However, if the stock portfolio is to be "factor enhanced" for particular factors, then it is the factor betas that provide the key, and this aspect of alpha analysis becomes the essence of the well-known portfolio strategy of *market timing*, in which if an analyst predicts that factor shocks will be positive the factor beta exposure for the portfolio is increased, and vice versa for negative factor shocks.

What phenomena are unlikely to be factors in the context of Model 1? The answer to this question centres on the issue of endogenous (the phenomena that we are trying to understand) versus exogenous (the phenomena that we use to help us understand) variables. In the context of the generic valuation model, the EDM, it is clear that changes in stock values are influenced by phenomena that affect earnings and discount rates. Hence, they are more likely to be macroeconomic variables, as in Chen, Roll and Ross (1986), than to be variables such as PE ratios or dividend yields. Even the small firm effect lacks a theoretical framework for its existence and may simply be a proxy for some combination of exogenous macroeconomic phenomena. These popular "factors" tend to be endogenous and determined by stock prices rather than exogenous and the determinants of stock prices.

Security alpha

The security shock in Model 1 is the pure *stock selection* component of return. Since it does not have a systematic source, a beta adjustment is not required and the security shock may be referred to directly as the security alpha. It is important to note that the security alpha in Model 1 is a component of return that is *independent* of the predicted systematic factor alphas. This raises a second level of complexity if an analyst obtains stock return forecasts using fundamental stock analysis (EDM or some other model) without discriminating between systematic and unsystematic factors.

It is common for fundamental stock analysts to estimate a single discount rate that discounts a single stream of predicted total earnings to the current stock price for individual firms. This predicted rate of return is the one referred to in Model 1 which, when compared with an expected return, provides a predicted overall alpha for the stock. However, it is clear from Model 1 that the predicted alpha from the usual EDM analysis implicitly contains a sequence of factor alphas as well as a security alpha. Unless the analyst explicitly estimates these factor alphas, then it cannot be said whether the stock has a positive or negative security alpha.

What does the factor structure of returns imply for the structure of the earnings process for the firm? Given the well documented association between earnings and stock returns, it may be postulated that associated with the set of alphas (or discount rates) is an analogous stream of earnings similar in structure to the returns process in Model 1. That is:

- A stream of consensus economic earnings shared by all analysts that drives the fundamental value of the stock. The discount rate for this stream is equivalent to $E(R_i)$ in Model 1.
- A stream of factor-driven shocks around the consensus earnings estimate. The discount rate for these streams are the set of risk- adjusted factor shocks — factor alphas in Model 1.
- A stream of firm-specific earnings shocks. The discount rate for this stream is the security alpha in Model 1.

In principle, the sum of the three earnings streams discounted at their respective rates could be compared with the current stock price to assess the extent of under/overvaluation.

While this analogy to the earnings process is conceptually revealing, it is unlikely to provide a practical approach to the fundamental analysis of stock earnings, given the complexities of the factor models.[6] Nevertheless, it highlights the complex nature of the predicted alpha that an analyst infers from a straightforward application of an earnings discount model without regard for the factor structure of returns (ie, discount rates).

The separation of factor alphas from security alphas is important for two main reasons. First, security alphas will tend to average away in a large portfolio of stocks; factor alphas do not, since they represent "bets" on systematic effects. Second, it is likely that the responsibility for identification of factor alphas may not lie with the stock analyst and therefore should not be intermingled with the analyst's stock valuation. Hence, consideration of the implicit earnings process that is consistent with a factor model for stock returns such as Model 1 reveals another level of complexity. Because, to some extent, the same factors are affecting earnings and stock returns, an organisation needs to ensure that analysts are consistent in the way they estimate unanticipated changes in firms' earnings, both between analysts and across stocks and sectors. In other words, a consistent macro-analytic view is required so that analysts can determine pure stock alphas.

The issues of specialisation and comparative advantage are also important. It is common for analysts to be allocated stocks on the basis of an "industry grouping". Despite the observation that some industries are not homogenous, the rationale for this specialisation is that there are commonalities in the earnings processes of similar firms and a focused analyst will gain a comparative advantage. The problem with an arbitrary assignment of firms based on "industry" is that it ignores the commonalities that exist between industries that are also driven by the broad macroeconomic determinants of earnings.

> *An organisation needs to ensure that analysts are consistent in the way they estimate unanticipated changes in firms' earnings, both between analysts and across stocks and sectors.*

Instead, the theoretical framework underlying alpha analysis suggests that the concept of "industry" is derived from the observation that the earnings of groups of firms respond similarly because of their sensitivity to a set of common macroeconomic factors. In other words, industry structure is a consequence of earnings commonalities rather than a cause. Therefore, the analysis suggests that analysts should focus on the commonalities in the earnings process across stocks in addition to the earnings processes of individual stocks.

The value to be added by a security analyst lies in identifying unexpected changes in earnings caused by predicted changes in the systematic factors that generate the firms' earnings, together with predicted changes in firm-specific effects. The stock analyst does not identify value by predicting changes in discount rates — that comparative advantage lies elsewhere in the organisation. By relocating this responsibility, a consistency will be imposed across analysts' valuation activities. In turn, these research activities will be refocused on the unanticipated changes in earnings derived from common factors *and* firm-specific events, since these are the source of earnings alphas which in turn determine stock alphas.

Model 1 also implies that the factors whose shocks are to be predicted are also the systematic factors that determine normal or expected returns in the market. In other words, alpha analysis requires further specification of the structure of $E(R_i)$ in Model 1. This point is a source of confusion among many professional analysts who routinely identify "stock alphas" to convey to clients their view that a particular stock is a recommended buy or sell. A closer examination of the analysis underlying the advice of these analysts often reveals a multiplicity of analytical models that range from simple charting techniques to dividend discount models and to "factor models" of varying sophistication, none of which might satisfy the requirement that it explains security returns. The result is that it is not uncommon to find for one stock a negative alpha in one analyst's report, and a positive alpha in another's.

To the extent that this reflects differing expectations within a consistent analysis, there is no problem. A problem arises, however, if the differences result from inconsistencies in the analysis. First, an analyst may choose from legitimate competing theories for expected returns, many of which have some degree of empirical support.[7] Second, these alternative theories do not always have mutually exclusive explanatory variables; hence, their ability to specify expected returns is shared with other theories. Finally, it is often found that there is not a rigorous model for normal or expected returns. Instead, data-dependent techniques such as historical moving averages or related statistics are used as benchmark comparisons.

MODEL 2: THE ASSET PRICING THEORY (APT)

$$E(R_i) = R_0 + \beta_{i1}RP_1 + \beta_{i2}RP_2 + \ldots + \beta_{ik}RP_k$$

Although such contradictory advice may or may not present a problem to the discerning fund manager, it does raise fundamental questions concerning the validity of the analysis used by some professional analysts to determine stock alphas .

For that reason, a second question needs to be answered in alpha analysis: in any time period, does the set of factors in Model 1 successfully discriminate between returns on different securities? The answer to this question is central to alpha analysis because it provides the structure of $E(R_i)$ relative to which alphas are to be predicted. This model defines the underlying asset pricing theory (APT) that is consistent with the return generating process presented in Model 1. The APT for Model 1 is shown in Model 2.

Model 2 is "nested" with Model 1 and specifies the way in which the market forms expectations of security returns in cross-section. In model 2, it is seen that the expected return on any security i is the sum of the return on a riskless security (R_0) plus the separate factor risks (βij) times the factor risk premia awarded for bearing that kind of risk (RP_j). It is important to note that the number and identity of the factors specified in model 2 are the same as those in model 1. Hence, an analyst seeking to forecast factor shocks needs to understand the factor structure that determines expected returns. This seems an obvious point — but it is often overlooked. For example, an important distinction is that Model 1 is a time-series process and Model 2 is a cross-sectional model. Model 1 specifies the process generating a security's return as a set of return shocks influencing a market expectation of the security return. At the same time, Model 2 identifies how the risk coefficients from Model 1 combine with the market-determined risk premia to establish expected returns for each security.

In a sense, Models 1 and 2 are different sides of the same coin but both are needed to provide a consistent estimate of a security's alpha. This means that if an analyst has a pet factor model with a similar structure to Model 1, it is a *necessary* but not *sufficient* ingredient for alpha analysis, because the analyst must demonstrate that the chosen factors also explain cross-sectional pricing differences in accordance with Model 2.[8] Analysts who generate alphas from time-series factor models without a valid underlying Model 2 are providing views that are at best meaningless and at worst misleading.

"An analyst seeking to forecast factor shocks needs to understand the factor structure that determines expected returns."

The alpha realisation process

Assuming that the alpha forecasts are unanticipated by the market and are therefore not included in currently expected returns, then when the market does perceive the actual shocks, security prices will adjust and the predicted alphas will be realised. That is, significant outperformance will arise from factor timing and/or stock selection through the prediction of factor shocks and/or security shocks. Hence, Models 1 and 2 imply an adjustment process whereby unanticipated shocks are eventually embedded into security returns. The final model helps to show how returns adjust over the investment horizon so that the forecast alpha is realised and is referred to as the Alpha Realisation Process (ARP). It is simply a combination of Models 1 and 2.

The main insight from Model 3 is that the predicted factor shocks should eventually become embedded in a new set of factor risk premia, implicitly altering the analyst's view of normal or expected returns for subsequent periods. How will the organisation know? The major implications for the performance-attribution system are beyond the scope of this paper. However, in general the structures within which investment decision-making occurs, such as Models 1 and 2, become a natural starting point for the design of an appropriate performance-measurement system.

Research implications of alpha analysis

Figure 1 depicts the framework for alpha analysis developed in this paper. This framework suggests the need for the following research activities:

Macro-analysis

1. Test alternative cross-sectional asset pricing models to provide insights into normal or expected returns.
2. Estimate factor betas for individual stocks within the best model from step 1.
3. Model and forecast factor risk premia to generate expected returns for individual stocks. These can be used in other valuation models that require risk-adjusted discount rates.
4. Model and forecast factor shocks for input to alpha analysis.
5. Estimate factor alphas as the product of steps 2 and 4 to assist with the market-timing decision.

Micro-analysis

(Direct estimation of stock alphas)

1. Focus on unanticipated shifts in factor driven earnings.

MODEL 3: THE ALPHA REALISATION PROCESS (ARP)

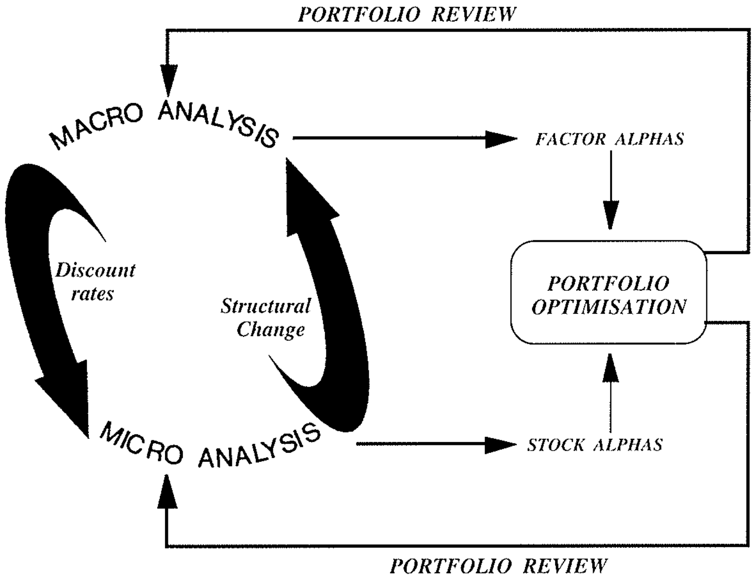
$$R_i = R_0 + \beta_{i1}[RP_1 + FS_1] + \beta_{i2}[RP_2 + FS_2] \ldots + \beta_{ik}[RP_k + FS_k] + SS_i$$

2. Focus on unanticipated shifts in stock specific earnings.
(Indirect estimation of stock alphas)

3. Estimate the predicted stock return from an EDM and subtract the $E(R_i)$ based on Model 2 together with the factor alphas from Model 1. The stock alpha may then be treated as a residual.

Within this framework, there is a need for communication between macro and micro-analysts on issues such as expected returns/discount rates and structural changes or new stock issues. Once the independent factor and stock alphas are obtained, these may then be reflected in a portfolio using optimisation techniques and this portfolio will then be communicated to the analysts for review before implementation.

Figure 1: The Alpha Analysis Investment Cycle



Conclusions

■ Many fundamental stock analysts could redefine the business they are in as alpha analysis.

■ The sources of alphas are both systematic (emanating from factor shocks) and unsystematic (security shocks).

■ The identification of factor alphas is largely a macro-analytic activity that encompasses research activities such as:

- asset pricing methodologies to identify valid factors
- factor beta estimation and forecasting
- modelling and forecasting factor shocks
- estimating expected returns for stock valuation

■ The identification of security shocks remains a microanalytic activity that focuses on research activities such as:

- estimating and forecasting earnings processes
- evaluating managerial effectiveness
- forecasting changes in a firm's operations
- forecasting changes in a firm's financial structure

■ The principle of consistency was found to be important at three levels of the analysis. First, the linkage between macro-economic and micro-economic analysis needs to be consistent across all analysts. Second, the analytical framework used to predict security returns should be consistent with the framework that the analyst believes describes normal or expected returns. Third, alpha analysis requires a consistent framework to be applied to both the earnings process *and* the structure of expected returns on risky securities in the economy. The factor structure underpinning a firm's earnings process is related to the factor structure that is central to alpha analysis.

"There is a need for communication between macro and micro-analysts on issues such as expected returns/discount rates and structural changes or new stock issues."

Analysts should ensure consistency across these frameworks in fundamental security analysis.

■ The integration of macro and micro alpha analysis demands consistency and may require a restructuring of organisational research specialisations and enhanced communication.

NOTES

1. It is probably fair to say that the early days of security analysis were dominated by the views of Graham, Dodd and Cottle. For example, see Graham, B., D.C. Dodd and S. Cottle, 1962, *Security Analysis: Principles and Techniques*, 4th Edn, McGraw Hill, New York.

2. See Jensen, M.C., 1968, "The Performance of Mutual Funds in the Period 1945-1964", *Journal of Finance*, May, 389-419. It should be noted that Jensen was concerned with *ex post* performance measurement within the context of the Capital Asset Pricing Model (CAPM), whereas current discussion of alpha is typically *ex ante* or forward-looking.

3. The importance of the theoretical framework that underpins the concept of alpha is a key argument pursued in this paper. For a discussion of market timing in the context of the CAPM see Sinclair, N.A., 1990, "Market Timing Ability of Pooled Superannuation Funds: January 1981 to December 1987", *Accounting and Finance*, May, 30, 1, and references therein.

4. The structure of the return generating process (RGP) follows the theoretical framework of the arbitrage pricing theory developed in Ross, S.A., 1976, "The Arbitrage Theory of Capital Asset Pricing", *Journal of Economic Theory*, 13, 341-60. Within this framework, the CAPM may be a special case.

5. See Chen, N., R. Roll and S.A. Ross, 1968, "Economic Forces and the Stock Market", *Journal of Business*, 59, 3, 383-403.

6. A simpler earnings model based on a single earnings factor was presented in Ball, R., and P. Brown, 1969, "Portfolio Theory and Accounting", *Journal of Accounting Research*, Autumn, 300-23. There, the sensitivity of individual stock earnings to market earnings was shown to be highly associated with the market sensitivity of stock price to market index. This paper provided early evidence of the importance of the earnings process to stock price formation. In principle, the Ball and Brown methodology can be extended to obtain multi-factor earnings response coefficients which will be associated with the factor betas in Models 1 and 2.

7. For a discussion of potential candidates, see Sinclair, N.A., 1987, "Multifactor Asset Pricing Models", *Accounting and Finance*, 27, 1, 17-36.

8. For a recent discussion of asset pricing methodologies, see Gibbons, M.R., 1982, "Multivariate Tests of Financial Models: A New Approach", *Journal of Financial Economics*, 10, 3-27. ■