ENGINEERING PORTFOLIOS: A UNIFIED APPROACH

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Common stock managers, whether by design or default, have tended to work particular market niches. Value managers, using disciplines such as P/E screening, concentrate on detecting earnings that can be bought cheaply. Growth managers seek companies with above-average growth prospects that are not fully reflected in current prices. Small-cap managers search out stocks that are off the beaten path and may offer opportunities for both value and growth investing.

Investment consultants have reinforced these tendencies. Faced with clients' desires to evaluate prospective managers, consultants have found the ready-made style subsets a useful typology by which to group and compare managers. This has encouraged the development of "style" indexes to benchmark manager performance.

Investment clients can now pick and choose from a menu that serves up the equity universe in a number of ways. Some would argue that this places the ultimate responsibility for decision-making exactly where it belongs — with clients. If clients believe growth, or small-cap, or value stocks will outperform the overall market, they can choose to overweight that subset. Alternatively, risk-averse clients can diversify across different styles to reduce the volatility of overall equity returns.

There is nevertheless an equally strong argument for an approach to equity investing that is 180 degrees removed from this kind of specialization. It begins with the largest feasible equity universe and the largest number of factors that may impact equity price. It searches for inefficiencies that can provide profit opportunities, regardless of industry, sector, or style. At the same time, it recognizes and takes advantage of systematic differences in stock price behavior across different types of stock and over time.

The goal is a unified model of a complex market, one that offers a detailed map of the investment terrain (see, e.g., Jacobs and Levy [1989b]). By enhancing the strength of investment insights as well as increasing the number of investment opportunities, such an approach provides a solid base from which to engineer any number of specific strategies.

IS THE MARKET SEGMENTED OR UNIFIED?

We live in an age of specialization; everyone from research scientists to assembly line workers seems to specialize to one degree or another. In many cases, specialization may optimize application

of talent, maximizing the potential for reward. As Henry Ford discerned, it can also save time and money by streamlining the work effort.

Investment analysts have long recognized that stocks that share certain characteristics (industry affiliation, say, or market capitalization) tend to have similar price responses to given economic factors (see, e.g., Farrell [1975]). Does it make sense for analysts — quantitative analysts in particular — to specialize their research efforts along the lines of these stock groupings?

The advantages of this type of specialization are perhaps most obvious in the case of fundamental investors who undertake very detailed company analyses. Fundamental research may become positively ungainly in the absence of some kind of focusing lens.

Quantitative analysts, too, often feel most comfortable in traditional market niches, finding or adapting valuation models for the very same stock groupings followed by fundamental analysts. And research has shown that different quantitative models may be more or less successful when applied to specific types of stock (see, e.g., Jones [1990]). Thus dividend discount model measures have performed better for utilities than for transportation, finance, and health sectors, while momentum measures such as earnings estimate revisions have done best in identifying attractive growth companies.

This type of specialization can present some theoretical and practical problems, however. In particular, does a focus on specific stock groupings reflect a market that is truly segmented?

It is certainly true that investors differ in terms of their return requirements, their risk tolerances, their investment horizons, and in many other respects. To the extent that these differences are relatively static, and to the extent they become the basis for differences between the price behaviors of stocks in different industry and style groupings, the equity market could become virtually segmented along industry/style lines.

But all stocks can be defined by the same parameters — by market capitalization, by price/earnings ratio, by a dividend discount model ranking, and so on. All stocks can be found at some level on the continuum of values for each parameter. Thus growth and value stocks can be seen to inhabit the opposite ends of the continuums of P/E and dividend yield, and small- and large-cap stocks the opposite ends of the continuum of firm size.

By the same token, changes in the values of the parameters for any individual stock can change that stock's position on the continuum. An out-of-favor growth stock may slip into value territory, while a small-cap company may grow into the large-cap range.

Furthermore, while the values of these parameters vary across stocks of different styles and industries, and different investors favor certain values above others — low P/E over high, for example — arbitrage tends to counterbalance too pronounced a predilection on the part of investors for any one set of values. In equilibrium, all stocks must be owned; if too many investors want low P/E, low-P/E stocks will be bid up to higher P/E levels; some investors will step in to sell them, and buy stocks deserving of higher P/Es. Arbitrage works toward a single, integrated market subject to a single pricing mechanism.

To the extent the market is integrated, a quantitative approach to valuation that models each industry or style grouping separately, as if it were a universe unto itself, is not the best approach: It is bound to ignore pertinent pricing information. A better approach would be to consider all the stocks in the universe, in order to glean the greatest amount of information possible. At the same time, one doesn't want to ignore the fact that the equity universe is characterized by subsets of stocks that behave similarly to one another and differently from the stocks in other subsets.

A complex equity market, one that is neither completely integrated nor discretely segmented, calls for a valuation approach that considers the largest possible universe of stocks, while taking into account the differences between subsets that are captured by specific style models. In addition to a coherent evaluation framework, such an approach offers two major advantages over specific subset models.

First, it is likely to provide more robust results. Because a model based on extensive and heterogeneous data better controls for multicollinearity in the independent variables, its parameter estimates are more efficient. Second, because of its range and depth of coverage, it is poised to take advantage of more profit opportunities than a more narrowly defined subset model proffers.

A UNIFIED MODEL

The unified approach starts with a blank slate, having no built-in biases regarding any particular group or groups of stocks. It searches the widest possible universe for insights that may offer profitable investment opportunities. Rather than focusing on one or a few attributes — a DDM derivation of

value, say, or stock P/E level, or firm size — the unified model is multidimensional. It includes the largest number of pertinent variables possible. In addition to a company's industry affiliations, the model may look, for example, at price/earnings and price/cash flow, size and neglect, beta and idiosyncratic risk, return reversal and momentum.

Single-factor models of these variables offer only a naive indication of their relationships to price behavior. Such models cannot tell us how much of any detected correlation between P/E and price changes, for example, actually reflects variables such as firm size and/or industry affiliation, which are not included in the model. Simultaneous modeling of all these variables across companies can disentangle the "pure" return to each (Jacobs and Levy [1988]). It will show whether there is any abnormal return to P/E, after variables such as firm size and DDM value have been controlled for.

The size of the universe and the number of attributes encompassed by the unified model are matched by its depth of inquiry into the behavior of pure returns across different types of stocks. Researchers have noted, for example, that small-cap stocks have outperformed large-cap stocks in some periods. They have attributed the outperformance to various factors, including a low-P/E effect, book/price ratio, earnings surprise, lack of coverage by analysts, and tax-related calendar effects. A clear picture of the small-firm effect emerges only when we model all these factors, and other potential candidates, jointly, across the universe of stocks. Doing so allows us to disentangle the effects and to determine which are most significant for the returns of small stocks, and which might be most significant for large-stock returns.

Of particular interest is whether the relationships between stock prices and particular attributes are linear or non-linear. Does price change by a constant increment with a unit change in, say, earnings revisions? Or do positive revisions have a greater or lesser effect on price than negative revisions? Do these relationships change over time? That is, are some price responses stronger in some market environments than others? Are some linear in up markets but non-linear in down markets, or vice versa?

The aim in examining the behavior of price-attribute relationships across stock groups and over time is, of course, return prediction. Pure returns to equity attributes are more predictable than naive returns, because they are not contaminated by incidental factors. Naive returns to low P/E, for example, exhibit considerable volatility because of the effects of oil price shocks on utilities, which constitute a substantial portion of the low-P/E subset. Pure returns to P/E do not conflate this spurious effect with the low-P/E effect (see Jacobs and Levy [1989b]).

Pure attribute returns, combined with multivariate time series analyses that take explicit account of macroeconomic drivers such as inflation, interest rates, and exchange rates, can help in predicting how stock prices will vary over time as market and economic conditions change. The pure return to small size, for instance, can be expected to decline with increasing inflation and interest rates and rise with industrial production (Jacobs and Levy [1989a]).

A COMMON EVALUATION FRAMEWORK

Use of a unified model ensures that all the stocks within the firm's investment universe share a common evaluation framework. This may not be the case with a "family" of subset portfolios, even if they are managed by the same firm. Consider, for example, a firm that manages a diversified core portfolio and several "style" portfolios. Suppose the firm runs a model on its total universe of, say, 3,000 stocks. It then runs the same or a different model on a 500-stock subset of large-cap value stocks.

The expected returns that derive from running the model on the entire 3,000-stock universe will differ from those returns the firm gets from running the model on the smaller subset, either because the model coefficients are bound to differ between the large universe and the smaller subset or because the models differ. What if the model run on the broad universe shows GM outperforming Ford, while the model run on the large-cap value subset shows the reverse? (See also Jacobs and Levy [1995b].)

The firm could ensure consistency by using separate models for each universe subset — growth, value, small-cap — and linking the results via a single, overarching model that relates all the subsets. But, in an integrated market, the pricing of securities in one subset may contain information relevant to the security prices in other subsets. An economist attempting to forecast labor market conditions in the northeastern U.S. would undoubtedly consider economic expansion in the southeastern states. Similarly, the effects of inflation on value stocks might have repercussions for growth stocks, as the two groups represent opposite ends of the same P/E continuum.

An approach that merely "connects the dots" of various style portfolios is not efficient in terms of

making use of all available information. The unified approach, by contrast, considers the whole picture — the interrelationships of numerous variables across a wide cross-section of stocks and over a range of market environments. Its insights emerge from an in-depth examination of a market universe in which value and growth, large-cap and small-cap, and everything in between interact and evolve in complex ways.

PORTFOLIO CONSTRUCTION AND EVALUATION

Before a unified model's results can be implemented, they must be tested. The aim of testing is to find out how robust the results are, both for the whole universe of stocks and for each style subset within that universe.

Does the power of the model's insights differ across different subsets, as subset industry and sector concentrations, idiosyncratic risks, and the relative impacts of economic and fundamental factors differ? Simulations also should be carried out to determine if insights offer real-world profit opportunities: Are perceived profit opportunities too ephemeral, or too small to survive such frictions as trading costs?

To optimize implementation of the model's insights, the portfolio construction process should consider all the dimensions found relevant by the unified valuation model. Failure to do so can lead to imbalances in the portfolio's factor exposures.

Consider, as an example, a commercially available portfolio optimizer that recognizes only a subset of the factors in the unified model. Risk reduction using such an optimizer will reduce the portfolio's factor exposures, but only along the dimensions the optimizer recognizes. As a result, the portfolio is likely to wind up more exposed to those factors recognized by the model — but not the optimizer — and less exposed to those factors common to both the model and the optimizer.

Optimization that uses all relevant factors from the unified model ensures a portfolio whose risk and return opportunities are balanced in accordance with the model's insights. Furthermore, use of the more numerous model factors allows portfolio risk to be more finely tuned.

Any performance measurement process should similarly consider all the factors found relevant by the unified model and used in the portfolio's construction. A measurement process that is congruent with the unified model's return-generating dimensions is likely to provide more insightful direction than a commercial performance attribution system applied in a "one-size-fits-all" manner. A performance measurement process tailored to the unified model functions as a monitor of the model's reliability, while the addition of a feedback loop to the research/modeling process can help ensure that the model retains robustness over time.

ENGINEERING "BENCHMARK" STRATEGIES

Given its range and depth of coverage, a unified model can provide a firm with substantial flexibility to engineer portfolios to meet a variety of client risk/return preferences. And a portfolio construction process that includes the same multidimensional variables that the unified model uses to forecast returns can offer substantial control over the portfolios' risk/return profiles.

Suppose a client desires a style-specific return. This could be a return that tracks a published value, growth, or small-stock index, or even a return related to a customized index — one focusing on, say, high-yield stocks or stocks within a limited capitalization range. As we have noted above, the unified model "purifies" returns to many style-related attributes; hence expected returns to any one attribute are not influenced by illusory effects. As we also note, the model predictions can be expected to be more robust and consistent than the returns derived from more limited style-specific models. The result: portfolios that will behave like, while offering value-added with respect to, passive style benchmarks.

Over time, different style subsets offer different payoffs as economic conditions change. A portfolio of value stocks is thus unlikely to outperform the broad market, or a portfolio of growth stocks, on a consistent basis over time. An investment strategy devoted to one style is bound to experience significant variability relative to broad market averages.

Clients in search of a smoother return path can, as we noted at the outset of this article, diversify their assets across a variety of different style portfolios. But there are likely to be gaps between the aggregate of a client's portfolios and the client's target benchmark. A manager can take advantage of the range of the unified approach to construct completeness funds designed to fill such gaps.

Alternatively, risk-averse clients can choose to hold a "core" portfolio, one representative of the overall market, including all style subsets. The unified approach can be used to engineer core port-

folios that have systematic risk and other attributes similar to a capitalization-weighted benchmark such as the S&P 500, the Russell 1000, or the Wilshire 5000. Given the model's insights, these portfolios can be designed to deliver value-added relative to the passive market benchmark, at any given level of residual risk relative to the market.

Furthermore, given the large universe of stocks covered by the unified model, the manager can fairly readily accommodate special client constraints, if necessary. If an endowment fund does not want to hold any alcohol, tobacco, or defense stocks, for example, the manager should be able to find "sin-free" substitutes that offer equivalent risks with little return give-up.

ADDED FLEXIBILITY

The advantages of the unified approach are perhaps most fully exploited by strategies that are not constrained to deliver returns that are representative of a style or a broad market index. A style rotation strategy, for example, seeks out profit opportunities as they arise, rotating the portfolio aggressively among various universe subsets as defined by stock attributes (see Jacobs and Levy [1995a]). Portfolio weights and changes in those weights are determined, not by some benchmark index, but by the insights of the unified model. Such a strategy takes advantage of the entire universe of stocks covered and the entire range of insights uncovered by the model, and offers potentially high returns at commensurate risk levels.

Allowing short sales as an adjunct to an active strategy can enhance implementation of and increase the opportunities to profit from the insights of a unified model. Say the model indicates a high likelihood of underperformance by the steel industry. The manager has more latitude to underweight steel with shorting than if the only option were *not to hold* steel companies.

Or consider the investment opportunities that may arise with earnings surprises. With a preponderance of security analysts focused on identifying purchase candidates, the price effects of positive earnings surprises may be arbitraged away very quickly. The effects of negative surprises may be more long-lasting, as sales are limited to investors who already hold the affected security and to those investors willing and able to sell short. A portfolio that is allowed to sell short can benefit by taking advantage of negative earnings surprises, and will also profit more from shorts than longs when the model detects such non-linearities in price response.

In general, shorting allows the manager to pursue potential mispricings without constraint, by going long underpriced stocks and selling short overpriced stocks. To the extent that overpricing is of a greater magnitude or more prevalent than underpricing, shorting offers enhanced profit potential vis-à-vis a long-only strategy. But shorting can also be used to reduce portfolio risk.

For example, we have noted that low-P/E stocks are influenced by a variety of factors, which can add unwanted risk. The manager in pursuit of "pure" portfolio exposure to low P/E can better neutralize these other factors by taking offsetting long and short positions.

Complete realization of the return enhancement and risk reduction possibilities of shorting involves using long positions to collateralize an equal-dollar position in shorts. By investing approximately equal dollar amounts long in stocks expected to outperform and short in stocks expected to underperform, given the stocks' characteristics and expectations for the market and the economy, the manager can construct a long-short portfolio that is virtually immunized against risk from broad market movements (see Jacobs and Levy [1993]).

Such a market-neutral strategy reflects neither the risk nor the return of the overall equity market. What it does offer is an active return, and residual risk, from the spread between the securities held long and sold short (as well as interest on the short-sales proceeds, which will approximate the risk-free rate).

This active return will likely benefit from the strategy's added flexibility to underweight via shorting, and also from the freeing up of capital to take active long positions. Being market-neutral, the portfolio is not constrained to hold a stock merely in order to reflect a market exposure; every dollar invested long (or sold short) either reduces risk or establishes an active position. Furthermore, every position long or short represents an active exposure; this is not true of index-constrained long-only portfolios, in which only the percentage of a stock position that represents an overweight or underweight relative to the benchmark is active (see Jacobs and Levy [1995c]).

An investor can take advantage of the flexibility of the long–short structure, while "adding back" a risk/return dimension representative of an equity market benchmark, by purchasing stock index futures equal in amount to the capital underlying the

long–short strategy. The resulting portfolio with futures overlay adds the long–short spread to the equity market's performance. In effect, long–short construction frees a portfolio from asset class constraint, allowing the investor to separate the security selection decision from the asset allocation decision.

ECONOMIES

A unified approach may offer economies not available to a client using separate managers for various strategies. The client's management and monitoring costs, for example, are likely to be lower under a single, unified manager. Furthermore, a unified approach is better able to minimize incidental costs, such as may arise if lack of coordination among managers leads to portfolio overlaps and gaps in coverage. It may also be better poised to take advantage of opportunities to arbitrage between different styles through style rotation.

Long–short strategies are especially suited to management under one roof. In particular, single-manager coordination of the long and short positions enhances profit potential and risk control compared with using separate long and short managers. Furthermore, because the stocks held long can be used to collateralize the short position, the client's investment capital can be effectively doubled.

All these advantages do not come without some costs. Any firm that offers multiple strategies, unified or not, must address implementation issues such as liquidity constraints and allocation of trades across various strategies. Construction of a multidimensional, dynamic model entails, in addition, a great deal of research effort. The more complex the model is, the more time-consuming will be the testing required to ensure its robustness.

The wide-screen "entertainment center" with high-definition resolution and stereo sound has substantial development costs, more than the standard color television. But it's also going to provide a bigger, better, more life-like picture. To the extent that a unified model's complexity, better reflecting the range and depth of the market, captures the complexities of security pricing, the rewards it offers are worth the effort.

The magnitude of the rewards to active investment management depends upon the strength (predictive accuracy) of the underlying insights and their number. Both better insights and more numerous insights provide additional profitability. Moreover, their impact on portfolio profitability is multiplicative (see Grinold and Kahn [1995]). Widening the range and deepening the focus of the investment research effort can significantly enhance investment performance.

ENDNOTE

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