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PRACTITIONER'S DIGEST

INSIGHTS

DON'T COUNT ON IT! THE PERILS OF NUMERACY PAGE 007

John C. Bogle, Advisory Board

The dawn of the Information Age has given momentum to an era in which Corporate America is increasingly fixated on numbers; an era in which the mantra seems to be "If you can't count it, it doesn't matter." In disagreeing with that syllogism, author John C. Bogle discusses the fallacies of some of the measurements we use and the pitfalls they create for economists, financiers, and investors.

His main concern is that investors focus too heavily on the momentary precision of the price of a stock, and not enough on the eternal vagueness of the intrinsic value of the corporation. Yet it is obvious, he points out, that in the long run, it is perception that reflects reality, and not the reverse.

In identifying four "Perils of Numeracy," Mr. Bogle argues that when *measures* become *objectives*, they are often counterproductive and self-defeating, and that numbers are a *means* and not an end, a condition *necessary* to measure corporate success, but not a condition *sufficient*. "To believe that numbers—in the absence of the more valuable albeit immeasurable qualities of experience, judgment, and character—are all that illuminate the truth," Mr. Bogle concludes, "is one of the great failings of our contemporary financial and economic system."

A THEORY OF INFLATION PAGE 019

Jack L. Treynor

For half a century, the centerpiece in our approach to inflation has been the Phillips Curve, which relates inflation (and in later versions, inflation change) to tightness or ease in the labor market. But with competitive markets in a closed economy, the real wage equals the marginal productivity of labor, irrespective of what wage negotiators do about the money wage.

Assume instead negotiators settle on a money wage that, combined with recent inflation experience, gives them the real wage they expect. Then, when the actual real wage is a surprise, the only undetermined variable still free to preserve the real wage identity is the level of money prices. But then the actual level of money prices, hence any consequent inflation surprise, depends on the actual marginal productivity of labor.

But the marginal productivity of labor is the labor productivity of the marginal plant—a number that reflects the scarcity of plant capacity, not the scarcity of labor. Inflation results from too many workers chasing too few jobs. Stagflation, the combination of accelerating inflation and surplus labor, is the result of a failure to invest in new capacity.

GREAT MOMENTS IN FINANCIAL ECONOMICS: I. PRESENT VALUE **PAGE 045**
Mark Rubinstein

Great ideas often have great histories. To reach a mature understanding of great ideas and be able to apply them better, it helps to know the history of the development of the idea—what are it's origins? By what paths of thought was it elaborated? How does one idea lead to another? Why was there once confusion where now the matter seems obvious. This paper is the first in a series to appear in this Journal that looks at ideas in investments from just this perspective. The idea examined in this issue is "present value."

IT'S 11PM—DO YOU KNOW WHERE YOUR LIQUIDITY IS? THE MEAN-VARIANCE-LIQUIDITY FRONTIER **PAGE 055**
Andrew W. Lo, Constantin Petrov and Martin Wierzbicki

Although liquidity has long been recognized as one of the most significant drivers of financial innovation, the collapse of several high-profile hedge funds such as Askin Capital Management in 1994 and Long Term Capital Management in 1998 has refocused the financial industry on the importance of liquidity in the investment management progress. Many studies—both in academic journals and more applied forums—have made considerable process in defining liquidity, measuring the cost of immediacy and price impact, deriving optimal portfolio rules in the presence of transactions costs, investigating the relationship between liquidity and arbitrage, and estimating liquidity risk premia in the context of various partial general equilibrium asset-pricing models. However, relatively little attention has been paid to the more practical problem of integrating liquidity directly into the portfolio construction process.

In this paper, we attempt to remedy this state of affairs by modeling liquidity using simple measures such as trading volume and percentage bid/offer spreads, and then introducing these measures into the standard mean-variance portfolio optimization process to yield optimal mean-variance-liquidity portfolios. We begin by proposing several measures of the liquidity of an individual security, from which we define the liquidity of a portfolio as the weighted average of the individual securities' liquidities. Using these liquidity metrics, we can construct three types of "liquidity-optimized" portfolios: (1) a mean-variance-efficient portfolio subject to a liquidity filter that each security in the portfolio have a minimum level of liquidity;

(2) a mean-variance-efficient portfolio subject to a constraint that the portfolio have a minimum level of liquidity; and (3) a mean-variance-liquidity-efficient portfolio, where the optimization problem has three terms in its objective function: mean, variance, and liquidity.

Using three different definitions of liquidity—turnover, percentage bid/offer spread, and a nonlinear function of market capitalization and trade size—we show empirically that liquidity-optimized portfolios have some very attractive properties, and that even simple forms of liquidity optimization can yield significant benefits in terms of reducing a portfolio's liquidity-risk exposure without sacrificing a great deal of expected return per unit risk. Our framework adds an important new dimension—literally as well as figuratively—to the toolkit of quantitative portfolio managers. In particular, with three dimensions to consider, portfolio management can no longer operate within a purely numerical paradigm, and three- and four-dimensional visualization techniques will become increasingly central to industrial applications of portfolio optimization.

UNDERSTANDING MUTUAL FUND AND HEDGE FUND STYLES USING RETURN-BASED STYLE ANALYSIS

PAGE 094

Arik Ben Dor, Ravi Jagannathan, and Iwan Meier

By holding securities through institutions managed by professional money managers, individual investors and plan sponsors get the benefits of diversification and specialization. However, this benefit is not without cost. Indirect holding of securities by relying on fund managers introduces invisible agency costs in addition to visible fees. This is due to the need to monitor the actions of fund managers to understand the nature of the risks associated with their investment strategies, ensure compliance with stated objectives, and evaluate their performance. In addition, it is also necessary to ensure that the bets taken by the different managers do not cancel out. The large number of fund categories and the diversity in investment objectives even within narrow fund categories makes it difficult to understand how the returns on different funds interact with each other. Hence, there is a need for a conceptual framework that helps individual investors and plan sponsors understand what a fund manager is doing. Sharpe provides one framework, "return-based style analysis", that is attractive for that purpose.

In this paper we show that return-based style analysis can provide information not available from commonly used peer group comparisons alone. We provide guidelines for choosing the right style benchmarks. Sector funds like utilities may require the addition of sector-specific benchmarks, whereas funds invested in convertible securities can be analyzed using standard bond and stock asset classes. We illustrate the use of return-based style analysis to estimate fund style changes and check the robustness of the conclusions.

We show how return-based style analysis can be modified to examine hedge funds. Whereas mutual funds, in general, follow a well-defined strategy, hedge funds employ dynamic trading strategies and may switch between strategies. Therefore, hedge fund returns exhibit option-like features with associated significant downside risks, but low correlations with traditional asset classes. Since significant declines in the prices of traditional asset class benchmarks are relatively rare, it is difficult to assess the exposure to such risks by augmenting traditional asset classes with selected options on those asset classes. We therefore propose a two step approach for using return-based style analysis to analyze individual hedge funds. The first step

involves a return-based style analysis of the individual hedge fund by augmenting traditional asset classes with benchmark hedge fund style indexes, each of which represents the return on a particular pure hedge fund strategy. The second step uses return-based style analysis with traditional asset classes augmented by carefully chosen index options to characterize the risks in the pure hedge fund strategies that the hedge fund style indexes represent. We illustrate the use of this two step approach through an example.

SEGMENTATION, ILLIQUIDITY AND RETURNS **PAGE 135**
Renato Staub and Jeffrey Diermeier

There is much evidence that the asset allocation decision is the key contributor to portfolio performance; determining an appropriate investment policy is, hence, of paramount importance. The main inputs for such an analysis are the long-term risk estimates of all asset classes and—based on the risk estimates—their long-term returns. Conventional models (e.g. the Capital Asset Pricing Model) are based on ideal assumptions, such as continuous tradability. However, since illiquid assets, such as venture capital, natural resources, and real estate, do not meet these assumptions, their returns are most likely inaccurately modeled.

In fact, there are still no compelling and generally accepted models for estimating returns of alternative asset classes, which, in turn, does not allow the derivation of a well-informed policy decision. This is becoming increasingly important as alternative assets are finding their way into the asset mix. Therefore, new models are needed. We derive two approaches for illiquidity compensation, investigating the implications of illiquidity for a long-term investor. The first approach compares a multi-period Sharpe ratio of the respective alternative asset to the multi-period Sharpe ratio of the entire market. The second one uses a put option approach. Both provide plausible and consistent returns. For assets with a high risk and a significant lock-in time, they suggest considerable compensation for illiquidity. And last, but not least, both approaches can be easily applied and, hence, are well suited for practical asset allocation.

PRIVATE EQUITY RETURNS: AN EMPIRICAL EXAMINATION OF THE EXIT OF VENTURE BACKED COMPANIES **PAGE 152**
Sanjiv R. Das, Murali Jagannathan and Atulya Sarin

In this paper we examine 52,322 financing rounds in 23,208 unique firms, over the period 1980 through 2000 by venture and buyouts funds and estimate the probability of exit, time to exit, exit multiples and the expected gains from private equity investments. The expected multiple (after accounting for dilution and the probability of exit) ranges from a low of 1.12 for late-stage firms to a high of 5.12 for firms financed in their early stages. We find that the gains from venture-backed investments depend upon the industry, the stage of the firm being financed, the valuation at the time of financing, and the prevailing market sentiment.

Unlike publicly traded firms, a private company has no observable stock price to serve as an objective measure of market value. Therefore, to value private companies, many valuation experts tend to find a set of comparable publicly traded companies and take valuation ratios like price-to-sales or price-to-earnings,

and apply these to the observable accounting characteristics of the private companies. They next apply a marketability discount to account for the lack of liquidity, because there does not exist a ready market for these investments. The amount of discount to be applied is often ad-hoc. Our expected exit multiples can provide a guideline about the appropriate amount of the marketability discount. The framework of this paper will also assist VCs in making portfolio decisions. Finally, our study is a first step in understanding the risk premium required for the valuation of private equity investments.

ESTIMATING DEFAULT PROBABILITIES IMPLICIT IN EQUITY PRICES **PAGE 178**
Tibor Janosi, Robert Jarrow and Yildiray Yildirim

This paper uses a reduced-form credit risk model to estimate default probabilities implicit in equity prices. The equity return model developed includes the possibility of default, market risk premiums, and price bubbles. For a cross-section of firms, this equity return model is estimated using monthly returns in a time series regression. Three conclusions are obtained. First, the analysis supports the feasibility of estimating default probabilities implicit in equity returns. As such, this new estimation procedure provides a third alternative to using either structural models with equity prices or reduced-form credit risk models with debt prices for estimating default probabilities.

Second, we find that equity returns contain a bubble component not captured by the traditional Fama-French four-factor model for equity's risk premium. This bubble component, proxied by the firm's P/E ratio, is significant for many of the firms in our sample.

Third, due to noise introduced in equity returns by price bubbles and market risk premium, the estimated default probabilities may confound these quantities, giving biased estimates with large standard errors. Indeed, the default probabilities obtained herein are larger than those previously obtained using either logit models based on historical data or those obtained implicitly from debt prices. By extrapolation, these results cast additional doubt on the precision of default probabilities obtained using structural models with equity prices.