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PRACTITIONER'S DIGEST

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PORTFOLIO MONITORING IN THEORY AND PRACTICE PAGE 5

Richard O. Michaud, David N. Esch and Robert O. Michaud

Since the publication of their original article in 1992, Black-Litterman (BL) has become a popular method in practical finance for creating superficially stable portfolios, adjusted to investor views. A popular perception is that BL can solve the instability problems of portfolios on Markowitz efficient frontiers. In fact, the instability issues of Markowitz portfolios are caused by estimation error (Michaud 1998, 2008), which BL does nothing to explicitly handle. The BL method assumes a perfectly known market portfolio in a state of undisturbed equilibrium, a perfectly known covariance matrix, and correct investor views numerically calibrated to perfectly quantify the exogenous knowledge of the investor. On top of these heroic assumptions, the BL formula itself is built on faulty statistical theory and is not optimal in any mathematical sense. Besides, since it is equivalent to a maximum Sharpe ratio Markowitz optimization with specific inputs, it inherits all of the instability of Markowitz optimization, especially when the frontier is extended beyond the BL portfolio.

Black and Litterman (1992) give a tuning parameter τ to adjust the strength of the views. This parameter may be fixed or adjusted, and is in practice often used to guarantee investable portfolios. Adjusting τ for investability amounts to either adjusting the data to fit the desired solution or adjusting one's "exogenous" views, and is a violation of fundamental principles of statistical analysis. Like the unadjusted BL portfolio, the τ-adjusted portfolio can also be found on a Markowitz frontier with particular inputs and inherits the properties and shortcomings of that method.

In our article, we provide a simple but detailed example of a realistic Black-Litterman analysis and show the corresponding Markowitz inputs and frontiers which contain the BL portfolios. Moving away from the BL portfolios at their maximum Sharpe ratio points, these frontiers veer quickly into uninvestable portfolios with short and/or leveraged positions in some assets and are not useful to managers who require access to multiple risk profiles tailored to investors' risk preferences. The BL portfolios and

frontiers in our example are compared with better solutions created with methods that explicitly account for estimation error. Michaud efficient portfolios are better diversified and more intuitive, have superior out-of-sample performance by design, and do not rely on false assumptions or dial in a preordained result.

Users of Black-Litterman or its implied returns should be mindful of these methods' limitations. BL does not solve but rather conceals the instability and estimation error problems of Markowitz mean-variance optimization. Because it is not a proper optimization method and tends to assign too much confidence to personal views it may often miss useful information while exposing investors to unnecessary risk. The simplicity and apparent adequacy of the procedure comes at the peril of ignoring better statistically-based methods that merge all of the available information into a more effective portfolio creation process.

COHERENT ASSET ALLOCATION AND DIVERSIFICATION IN THE PRESENCE OF STRESS EVENTS PAGE 19

Riccardo Rebonato and Alexander Denev

In this paper we present a methodology for asset allocation in the presence of stress events, or, more generally, of user-specified scenarios. The allocation can be arrived at by expected utility maximization or by mean-variance optimization. The underlying distribution of returns is made up of two parts: the body (which is estimated, after removing outliers, using traditional statistical techniques); and the 'tails', which are generated by a Bayesian net, constructed by the portfolio manager using her expert knowledge.

We explain in the paper how Bayesian net can be built and used for portfolio management. We show that, despite being mathematically rigorous, the approach is intuitive; that both the results and the construction can be questioned and modified by a non-expert; that the method can easily yield sensitivity analysis to the input parameters. It is, in this sense, the very opposite of a 'black box', and can therefore be used at all levels, from the trader, to the portfolio manager all the way to the investment committee.

THE CONTROVERSY IN FUNDAMENTAL INDEXATION: WHY BOTH SIDES OF THE ARGUMENT ARE (MOSTLY) CORRECT PAGE 54

Michael Dempsey

Fundamental indexation (FI) as advanced by Research Affiliates® represents one of the most successful new investment strategies of the last decade, having attracted many billions of dollars in portfolio investment. Research Affiliates® argue that portfolios constructed following conventional market capital-weighted indexes must tend logically to overweight overvalued stocks and underweight undervalued stocks, leading, thereby, to what they call a "structural drag" on the performance of these portfolios. In its place, they advocate an approach to indexation based on "fundamental" attributes of firm value (book value, earnings, etc.), which they term fundamental indexation (FI).

Nevertheless, the claims of FI have been vigorously attacked on theoretical grounds. In response, the contribution of the present paper is to separate two issues that are central to the FI thesis. The first is the issue of whether temporary stock mispricing—or "noise"—leads necessarily to a "structural drag" on market capital-weighted indexation as advocated by FI. The second issue, which can be separated from the first issue, is whether an understanding of noise in stock prices can be manipulated to provide superior stock performances.

In summary, our paper supports the critics of FI who argue *against* a structural drag on market capital-weighted indexes due to noise. However, our analysis confirms that it is possible in principle to manipulate noise along the lines proposed by the proponents of FI so as to generate superior returns. Thus, our paper supports the noise foundation of FI as offering an important insight in asset pricing, and, thereby, possibilities of out-performing a market capital-weighted index. It is somewhat unfortunate in our view that a preoccupation with the issue of a "structural drag" has distracted from the potential to apply the true insights of FI.

THE ROLE OF STRESS TESTING IN CREDIT RISK MANAGEMENT PAGE 64

Roger M. Stein

In the years following the onset of the financial crisis, stress testing has become a prominent tool for risk managers'. Stress tests are being used for applications that range from the more traditional regulatory and risk management reporting functions to newer applications as part of the due diligence process for acquisition analysis and in strategic planning to set banks' internal risk appetites. Within the regulatory community, stress testing has also emerged as a key tool in monitoring systemic risk.

Despite this increased focus, there seems to be little consensus on how stress testing should be done or on what constitutes an appropriate stress scenario. In this applied article, we outline some key issues in applied stress testing for credit risk management. To frame the discussion, we start by first introducing a bare-bones taxonomy that describes how different types of stress scenarios imply different analytic trade-offs. Because some market participants have voiced a preference for using stress-tests rather than distribution-based measures such as VaR and expected shortfall (ES) for setting capital, we next discuss both the benefits of stress-testing and scenario analysis as well as discussing some limitations of scenario-based approaches as a sole mechanism for assessing portfolio risk. In particular, except in special cases, it is difficult to use stress tests alone, ex ante, for allocating capital across disparate portfolios or to define a simple benchmark stress scenario for all market participants to use. This conclusion is based on three observations:

- It can be hard, in general, to order macro-economic stress scenarios (from worst to best) which is generally necessary for setting economic capital.
- An implication of this is that the cumulative loss probability under a stress scenario (i.e., the economic capital) will vary from portfolio to portfolio (or for a single portfolio over time), making designing generic stress thresholds hard ex ante.
- Finally, it is difficult to assert that the behavior of market participants during moments of extreme stress will be similar to (or an extrapolation of) the behavior of participants during normal or even

"very bad" times, implying that the linkage between an extreme state of the economy and the behavior of assets in that extreme state is a matter of judgment, not empirical fact.

However, stress-testing and scenario analysis can complement measures such as VaR and ES and thereby better inform both risk assessment and business strategy development. In this context, the accessible, intuitive nature a stress scenario and the resulting stress test result also provide a bridge between discussions of credit risk and discussions of strategy that senior managers can use to evaluate the impact of different business options on their firm's risk appetite.

WAS THE WRITING ON THE WALL? AN OPTIONS ANALYSIS OF THE 2008 LEHMAN BROTHERS CRISIS PAGE 91

Zhirong Chen and Wai Mun Fong

The accurate prediction of financial crises is a critical aspect of investment risk management. Although there are a plethora of crisis detection methods, few offer as powerful a visual impact as risk neutral densities (RNDs) derived from option prices. To demonstrate the usefulness of RNDs as a crisis signal, we a retrospective look at the recent financial crisis of 2007–2008, and in particular, the period leading up to the collapse of Lehman Brothers and other systematically important financial institutions. Multimodal RNDs are a signature of divergent views, and often a clear signal of impending crises. We use the well known double lognormal method to compute RNDs for the stock options of Lehman Brothers, Merrill Lynch, Goldman Sachs and the S&P 500 index. This method affords a simple yet flexible approach to incorporating multi-modality in RNDs.

Our results are highly intuitive. First, we find strong evidence of bimodality in the RND of Lehman Brothers as early as April 2008, one month after the collapse of Bear Sterns, an investment bank with heavy exposures to the U.S. sub-prime housing sector. Second, we find parallel changes in the shape of the RND for Merrill Lynch which collapsed almost the same time as Lehman Brothers. Third, in contrast to these results, we find no firm evidence of bimodality for Goldman Sachs or the S&P 500 index. Overall, these findings indicate that the market indeed anticipated a crash in the stock price of Merrill Lynch and Lehman Brothers months well before September 2008. Our study also highlights the usefulness of the RND as a forecasting tool in extreme market conditions. In particular, investment professionals should step up their risk monitoring efforts when signs of RND bimodality emerge. This paper takes a retrospective look at the recent financial crisis of 2007–2008, and in particular, the collapse of Lehman Brothers and other systematically important financial institutions. The RND of Lehman Brothers, Merrill Lynch and Goldman Sachs are computed using a double lognormal method, a widely used method which affords a simple yet flexible approach to incorporating multi-modality in RNDs. Multimodal RNDs are a signature of divergent views, and often a clear signal of impending crises. Using the double lognormal model, we interpret the emergence of bimodality in the RND as a warning signal of an impending crash in the stock price.