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Understanding Investment Funds

Virginie Terraza
and
Hery Razafitombo

Insights from Performance and Risk Analysis

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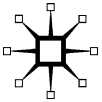

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Introduction

Virginie Terraza and Hery Razafitombo

The last decade has seen an unprecedented development of the investment funds industry. The number of funds available to investors has increased steadily. According to data from European Fund and Asset Management Association (EFAMA), 72,657 investment funds – including funds of funds – are distributed throughout the world at the end of 2011. Despite the increase in net outflows due to recent financial shocks, the total outstanding investment funds have increased about 20 percent between 2005 and 2011. Investment fund assets worldwide stand at $25.84 trillion – including funds of funds – at the end of 2011. The market share is dominated by the United States (49%), Europe (28.2%), and four major countries (Brazil, Australia, Japan, and Canada). Several factors may explain this development. These include the large volume of savings worldwide, a regulatory framework for the gradual opening of financial markets, growth in emerging markets, especially for the Brazil, Russia, India, China and South Africa countries, and low interest rates for developed countries. Another explanation, with reference to the foundations of, financial theory attributes this situation to the logic of portfolio diversification. The ongoing search from investors for both performance and global investments has prompted managers to offer new products that are more sophisticated and more or less attractive. Recently, in light of financial crises, the role of investment funds became a recurring subject for discussion among practitioners, academics, and regulators. In the past, crises used to be limited to singular markets or specific asset classes. In today's crises, many different asset classes are affected simultaneously and globally. Given this new context, our traditional methods must be adapted with the overall objective to strengthen the scientific knowledge of investment funds.

This book is in keeping with this standpoint. For this purpose, the aim is to provide new insights, ideas, and empirical evidences that will improve tools and methods at our disposal for fund performance analysis. To this end, the distinguishing feature of this book is its attempts to propose new methodological advances in the treatment of some of the topics previously underlined. The extraordinary development of alternative investment with the deployment of hedge funds and multi-managers strategy is the culmination of this dynamic. Indeed, this bears out the challenges and critics of the original efficient capital market theory in the performance and risk analysis framework. These challenges and critics have focused on many core topics

such as the complexity of financial products, especially through the presence of derivatives, the non-linearity and non-normality of return series, the concentration of risks, the possibility of panics related to excessive volatility of securities, herding behavior, the issues surrounding benchmark construction, performance measurement choice, and fund rating system relevance.

This book consists of two parts that are currently first of interest. The first part of the book deals with new methodologies related to performance measurements. This includes the evaluation of funds, such as the prediction of a fund's failure, the construction of an alternative benchmark, and a possibilistic approach to evaluate performance measures.

The question about the consistency of performance measures of funds has been a topical issue in the existing literature. In Chapter 1, **P. Cogneau, L. Bodson and G. Hübner** propose an exhaustive analysis of the joint application of performance measures in the context of the prediction of fund failure. The authors construct a subset with about 40 measures to extract predictive information on actively managed portfolios. More precisely, they assess whether performance measures can be good predictors of a fund's disappearance within the short or the medium term. As a result, the authors show that the disappearance of a fund is to a significant extent predictable and they distinguish the circumstances that lead to the disappearance of a fund (liquidation vs. absorption), the currency, or the country of emission.

The choice of the appropriate benchmark for comparison and to adjust a fund's return for risk is an important issue for fund practitioners. In the second chapter, **V. Terraza and H. Razafitombo** create fund synthetic indexes in order to represent alternative benchmarks to compare the performance of investment funds. The authors combine the use of portfolio holdings data and Principal Component Analysis to create synthetic fund indexes. Synthetic funds are funds portfolios which aim to duplicate a fund market in order to represent alternative benchmarks to compare the performance of investment funds. Their weight-based measure has several advantages. Using the Principal Component Approach, it avoids biases in the linear weighting scheme of portfolios, reducing the dimensionality of the data and keeping the representivity of financial markets. Synthetic Fund Indexes permit better comparison of fund markets when structural information of returns is used; means-based measures face a bias if managers can trade between observation dates. The new measures avoid this interim trading bias. Using the benchmark provides insights about performance in a sample of equity investment funds of five countries. By constructing indexes from data collected in different time periods, some conclusions are drawn about the consistency of the results. The authors show that domicile country characteristics have additional explanatory power analyzing the intrinsic properties of cross-country funds returns and their relative performance.

In Chapter 3, **A. Mbairadjim, J. Sadefo Kamdem, and M. Terraza** propose new parametric risk adjusted performance measures, using the quantile

function, which accommodates the skewness and the heaviness of distributions tails better than the classical Sharpe approach. The use of quantiles offers certain advantages over classical sampling, such as robustness against outliers and easier characterization of distributional shapes. The quantile function is used to construct a family (defined on the confidence levels) of confidence intervals. This family is then encoded into a possibility distribution, more precisely into a membership function of fuzzy set which now models the uncertainty of hedge funds returns. The alpha-cut of this fuzzy set represents the confidence interval of risk level alpha. This course of action can be viewed as the probability-possibility transformation introduced by Dubois and Prade (1982) and enhanced by Dubois et al. (2009). Using the possibility distribution, the authors propose an expectation and a variance operator as a particular case of the weighted mean and variance of fuzzy numbers of Fuller and Majlender (2003). These two statistics are finally used to define the Sharpe ratio and the information ratio in an analogous way to the classical approach. In an empirical study, an application is given with a set of 15 French hedge funds randomly chosen. The findings confirm the inclusion of the skewness and the kurtosis in the performance evaluation.

The second part of the book proposes advanced risk analyses and modeling for investment funds. More precisely, econometric aspects are studied to explore funds' risk dynamics in order to construct risk indicators. This part includes new models for Value at Risk (VaR) estimations, for optimization of portfolios, and the question about fund rating systems.

In Chapter 4, **M. A. Limam, R. Hennani, and M. Terraza** develop a nonlinear model both in mean and variance equation to study hedge funds' risk dynamics. More precisely, the authors adopt ARFIMA-FIGARCH and ARFIMA-FIAPARCH models in order to take into account persistence phenomena. The aim of the chapter is to estimate more sophisticated VaR models for long and short trading positions as well as classical RiskMetrics and FIAPARCH models based on Gaussian and skewed student's innovation distribution. The performance of risk measures are studied using daily data of six French funds covering the period starting April 2002 and ending January 2008. The results indicate that considering persistence, fat-tails and asymmetry through a skewed student FIAPARCH model increases VaR performances, which confirms results obtained by Kang S.H. and Yoon S.M. (2007) and Mabrouk S. and Aloui C. (2010) in energy commodities. This may have important implications on market risk quantifying and hedging strategies for speculative funds.

The next chapter takes place in an optimization portfolio framework. Within a traditional context of myopic discrete-time mean-variance portfolio investments, **M. Boissaux and J. Schiltz** analyze the problem of conditioned optimization in which predictive information about returns contained in a signal is used to inform the choice of portfolio weights, first expressed and solved in concrete terms by Ferson and Siegel (2001). An optimal control

formulation of conditioned portfolio problems was proposed and justified in Boissaux and Schiltz (2010). This opens up the possibility of solving variants of the basic problem that do not allow for closed-form solutions through the use of standard numerical algorithms used for the discretization of optimal control problems. The present chapter applies this formulation to set and solve variants of the conditioned portfolio problem which use the third and fourth moments as well as the variance. To integrate the fourth moment into the optimization problem, two approaches were considered: a mean-kurtosis formulation equivalent to mean-variance but using kurtosis as the risk metric, and a utility function formulation which allows for an optimization strategy that simultaneously considers the first, second, and fourth moments of returns. After introducing both conditioned optimization and optimization involving higher moments, the optimal control formulation is presented in each case. Using backtests over a realistic data set, the performance of strategies resulting from conditioned optimization is then compared to that obtained using analogous optimization strategies which do not exploit conditioning information. In particular, the authors report on both ex-ante improvements to the accessible expected return-risk boundaries and the ex-post results obtained.

In Chapter 6, **F. Laube and V. Terraza** propose a new methodology for constructing a modern portfolio with improved resilience to extreme risks. In this work the authors show that the inter-market relationships phenomenon (re-correlation effect) has indeed been highly present during recent financial crises, and can be expected to play a key role when formulating current expectations of future markets. To address the re-correlation effect, the authors make use of the recently advocated Markov-switching multifractal model family by Mandelbrot (MMAR, 1997), Mandelbrot, Calvet, and Fisher (2001, 2003, 2006), Lux (2007, 2008), and others. This multi-fractal regime switching model takes into account that multiple classes of investors may coexist in one single market, each with different investment goals and investment timings. The general MSM framework filters different volatility frequencies within the market environment, using a best fit of its characteristic multi-fractal spectrum. This approach allows for modeling highly complex structures and non-linear processes as a combination of a clearly defined domain and a simple recursive fractal process. The authors use these new insights to propose a new capital allocation scheme for constructing a more crisis-resilient Fund-of-Hedge-Funds (FoHF) portfolio. To do this, the portfolio allocation process is divided into two levels. On the first level, the authors test for conditional market stability and bivariate contagion risk between single assets and then perform portfolio optimization on the subset of assets that passed the first layer of filters. This ensures that assets submitted to the portfolio optimization algorithm conform at least roughly to the required underlying theoretical properties (near continuity, near normality, low correlation, near serial independence, near homoscedasticity, and so on). As a

result the exposure to extreme risk can be significantly reduced for a portfolio monitored at daily frequency. For the portfolio optimization stage, the authors propose the MSM-CVaR(2) measure for risk assessment purposes. Correlations are calculated using the MSM-DCC model, as first advocated by Idier (2008, 2009). Finally the results indicate that the problem of spurious contagion can be managed, but requires active controlling in modern financial markets.

In order to help investors to select appropriate funds, Chapter 7 analyzes the relationship between an investment fund's performance and its ratings. Ratings should play a significant role in differentiating between good and bad funds. Choosing particular mutual funds requires considerable investor effort in terms of collecting and analyzing information about the funds operating within the same investment universe. This need for information has led to an increased demand for services that rate mutual funds. As a consequence, fund rating systems have been developed to give a basis for comparing fund performances. The best-known and widely used rating system is provided by Morningstar which assigns stars to a mutual fund based on the historical performance of the fund in comparison with its peers. **C. Toque and V. Terraza** propose a new rating indicator based on a symbolic data analysis (SDA) as developed by Diday (1987) and use this new indicator to compare rating systems. In order to further investigate the predictive power of a fund's rating, the authors also assess the relation of fund ratings with the risk structure of funds. More precisely, the authors verify if highly rated funds have a relatively lower exposure to risk as expected using the VaR measure as risk indicator. As a result, this chapter proposes to classify fund ratings against VaR to attribute the investment risk information and to identify new decision criteria depending on VaR ranking.

Part I

New Performance Measure Methodologies