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Marcelo Brutti Righia, Denis Borensteina

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A simulation comparison of risk measures for portfolio optimization

Marcelo Brutti Righia^{a,*}, Denis Borensteina^a

^a*School of Business, Federal University of Rio Grande do Sul, Rua Washington Luiz 855, 90010-460, Porto Alegre, RS, Brazil*

Abstract

In this paper, we compare risk measures regarding performance of optimal portfolio strategies. We consider eleven risk measures from different classes. In particular, we propose a formulation that generates from any loss measure, a deviation based on the dispersion of results worse than it, which leads to very interesting risk measures. We consider 198,000 portfolios composed by stocks of the U.S. equity market, considering different scenarios in a simulation framework. Results indicate there is no clearly dominant risk measure. Despite this lack of dominance, including deviation terms consistently exhibits advantages regarding performance.

Keywords:

Risk measures, Loss-Deviation, Portfolio selection, Simulation

JEL codes: C60, G10, G11.

1. Introduction

Portfolio optimization has been growing in importance among practitioners and researchers in finance since the classic mean-variance Markowitz's model. The research on modern portfolio theory is being concentrated on two main streams (Anagnostopoulos and Mamanis, 2010): (i) the incorporation of alternative risk measures, and (ii) the incorporation of real features in mathematical formulations. The present research work focuses on the former issue, experimentally comparing several risk measures when used in the portfolio selection.

The concept of risk in finance has been present since the beginning of financial transactions. The work of Markowitz (1952) pioneered the use of risk for decision-making. His modern portfolio theory is based on the dispersion or deviation of financial returns, measured by the variance or standard deviation as risk measure. In the past few decades, critical events and financial crises have turned attention to risk measures based on losses, such as Value at Risk (VaR) and Expected Shortfall (ES). Propelled by theoretical foundations of which properties a proper risk measure must fulfill, risk measures approaches can be broadly classified into two kinds: monetary or losses measures, which a stream of literature has begun with the seminal paper of Artzner et al. (1999), and deviation measures, with similar axiomatic theory started in Rockafellar et al. (2006). However, both types have drawbacks and limited applications (Sereda et al., 2010). Rachev

*Corresponding author

Email addresses: marcelo.righi@ufrgs.br (Marcelo Brutti Righia), denisb@ea.ufrgs.br (Denis Borensteina)

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