Asset Allocation Strategies Based on Penalized Quantile Regression

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Abstract

It is well known that quantile regression model minimizes the portfolio extreme risk, whenever the attention is placed on the estimation of the response variable left quantiles. We show that, by considering the entire conditional distribution of the dependent variable, it is possible to optimize different risk and performance indicators. In particular, we introduce a risk-adjusted profitability measure, useful in evaluating financial portfolios under a pessimistic perspective, since the reward contribution is net of the most favorable outcomes. Moreover, as we consider large portfolios, we also cope with the dimensionality issue by introducing an ℓ_1-norm penalty on the assets weights.

Keywords: Quantile regression, ℓ_1-norm penalty, pessimistic asset allocation.

JEL codes: C58, G10.

1 Introduction

Starting with the seminal contribution by Markowitz (1952) on the mean-variance portfolio theory, portfolio estimation and asset selection got increasing attention from both a practitioner's and a research view point. In the finance industry, asset allocation and security selection have a central role in designing portfolio strategies for both private and institutional investors. Differently, the academia focused on developments of the Markowitz approach over different research lines: linking it to market equilibrium as done by Sharpe (1964), Lintner (1965b), Lintner (1965a), and Mossin (1966); modifying the objective function both when it is set as an utility function or when it takes the form of a performance measure (Alexander and Baptista, 2002; Farinelli et al., 2008); developing tools for the estimation and the forecasting of the Markowitz model inputs, with great emphasis on return and risk.

Among the various methodological advancements, we focus on those associated with variations of the objective function or, more generally, based on alternative representations of the asset allocation