

# Robust Statistics and Robust Approaches for Portfolio Selection: Overview

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# 1 Robustness in Finance

- Two related research fields on robustness:
  - Modelling preferences for robustness and robust decision processes of agents that take into account some forms of model misspecification in their decisions
  - Developing robust statistics for the econometric analysis of financial time series using models that are possibly misspecified

## 1.1 Portfolio Selection: Merton's Type Robust Models

- Continuous-time reference model for asset prices (for instance GBM)
- Neighborhood of absolutely continuous misspecifications of the reference model
- Preference for robustness determines the relevant model "neighborhood"
- Portfolio solution through Max-Min expected utility approach
- AHS (1998, 2000), Maenhout (1999), Lei (2001), Trojani and Vanini (2001a, 2001b), Uppal and Wang (2001), Chen and Epstein (2000)

## 1.2 Superhedging under Bounded Volatilities

- No explicit reference model for asset price (volatility) dynamics
- Neighborhood of (not necessarily absolutely continuous) model misspecifications implied by some volatility bounds for the underlying's process
- Superhedging through maximization of expectations on a set of martingale measures satisfying the given volatility conditions
- Avellaneda et al. (1995), Avellaneda and Paras (1996), Frei (1999), Mykland (2000)

## 1.3 Robust Statistics/Econometrics

- Reference model for asset prices (for instance conditional normality)
- Neighborhood of  $\varepsilon$ —contaminations of the given reference model
- Bound on contaminating probability  $\varepsilon$  fixes the relevant neighborhood
- Maximization of a statistical objective function (e.g. expected pseudo log likelihood) subject to a robustness constraint
- Huber (1968), Hampel (1974), Künsch (1986), Cavadini, Sbuelz and Trojani (2001), Dell'Aquila, Ronchetti and Trojani (2001), Ronchetti and Trojani (2001), Victoria-Feser (1998).

## 1.4 Wanted:

- Robust procedures that take into account model misspecifications both
  - when determining optimal policies in financial models
  - when estimating the parameter inputs for a financial model
- Procedures incorporating jointly Estimation Risk and Model Risk in financial decision making!

## 2 Structure of the Lectures

- Part I (Cavadini, Sbuelz and Trojani (2001))
  - Simple application of robust statistics that incorporates Estimation and Model Risk (ER and MR) in mean variance portfolio choice by some pseudo risk aversion corrections
- Part II (Trojani and Vanini (2001a, 2001b, 2001c))
  - Presentation of a few continuous-time robust models of intertemporal consumption and portfolio choice
  - Description of a perturbative approach to obtain approximate analytical solutions