Topics in financial econometrics

NES Research Project Proposal for 2012-2013

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Outline
Students with interests in time series econometrics applied to finance are invited to participate in this project. The research in spirit is empirical modeling using real financial data, sometimes with twists in econometric methodology and theory of financial markets. The target is producing high-quality research publishable in international journals, both more academic and more practical.

Literature overview
The main stylized fact that motivates the whole proposal is that stock return distributions exhibit negative skewness and excess kurtosis (see, for example, Harvey & Siddique, 1999; Peiró, 1999; Premaratne & Bera, 2000). Mean-variance relation has become a dominant way of thinking about investments. But in the view of the above stated empirical fact this relation seem to be overly restrictive if one starts thinking deeper about the nature of risk. In particular, it seems that the whole distribution of future outcomes is much more informative for an investor. To keep the trade-off between analytical complexity and economic intuition the analysis was enriched by including measures of moments higher than volatility, such as skewness and kurtosis. There is a large body of literature that deals with optimal portfolio choice, generalization of investor preferences, and general equilibrium models with higher moments.

Given the strong argument for the inclusion of higher order distributional characteristics in portfolio choice and risk management applications we are logically faced with measurement, modeling, forecasting of the moments of interest.

The usefulness of higher moments' precise measurement is evident from several strands of literature such as

- improving portfolio allocation and performance on the basis of volatility and skewness;
- return predictability in time series and in cross-section;
- predictability of option prices and option-implied volatility smile and smirk effects;
- predictability of bond premium and equity premium;
- pricing higher moment risk in overall equity premium.

The modeling of higher order moments is in its infancy. For example, Hansis et al. (2009) model risk-neutral higher moments in a vector autoregressive framework. Harvey & Siddique (1999) estimate jointly time-varying conditional variance and skewness under a non-central $t$ distribution of the error term although the model still keeps the kurtosis constant. Premaratne & Bera (2000) propose to use Pearson type IV distribution which has three parameters each interpreted as volatility, skewness, and kurtosis. In their model mean and variance are time varying but skewness and kurtosis are constant. Jondeau & Rockinger (2003) capture conditional skewness and kurtosis by imposing a time-varying structure for the two parameters of a conditional generalized Student’s-$t$ distribution. Brooks et al. (2005) use the standard $t$ distribution and capture conditional higher moments via time-varying degrees of freedom parameter. León et al. (2005) and Bali et al. (2008) construct a GARCH-type model that allows for time varying conditional skew and kurtosis. Bali et al. (2008) use generalized $t$ distribution with five parameters which is argued to be sufficiently flexible to capture many stylized facts of financial data. Durham & Park (2010) show that filtered state variables from stochastic volatility models have explanatory power for time-varying higher moments. Feunou et al. (2011) propose to model alternative measure of skewness in a GARCH-type model with unconventional error distribution. Feunou & Tedongap (2011) model distribution of returns through a simple characteristic function that allows for conditional skewness. White et al. (2008) extend the use of CAViaR model of conditional quantiles (Engle & Manganelli, 2004) to the alternative measures of asymmetry and fat tails.

**Research directions**

Below are some potential research directions, but the project may not be limited to these and may change its content depending on the tastes and strength of participating students. These are given only for inspiration.

1. Joint modeling of dynamics of realized and implied measures.
2. Estimation and prediction of realized and implied measures via linear and nonlinear VAR.
3. Nonlinear dynamics in realized and implied measures.
4. Return predictability by realized and implied measures.
5. Estimation of dynamics of volatility, skewness and kurtosis via Artificial Neural Networks.
7. ARCH, skewness and kurtosis in mean.
References


