Research project on time-varying risk premium in large cross-sectional equity datasets : Olivier Scaillet, Professor at University of Geneva, Senior Research Chair at Swiss Finance Institute

Risk premia measure financial compensation asked by investors for bearing systematic risk. Financial and macroeconomic variables influence risk. Conditional linear factor models aim at capturing their time-varying influence in a simple setting. Time variation in risk biases time-invariant estimates of alphas and betas, and therefore asset pricing test conclusions. The workhorse to estimate equity risk premia in a linear multi-factor setting is the two-pass cross-sectional regression method developed by Black, Jensen, and Scholes (1972) and Fama and MacBeth (1973). A series of papers address its large and finite sample properties for linear factor models with time-invariant coefficients. The literature has not yet formally addressed statistical inference for equity risk premia in conditional linear factor models despite its empirical relevance.

We aim at developing an econometric methodology to infer the path of risk premia from a large unbalanced panel of individual stock returns. Our approach is inspired by the recent trend in macro-econometrics and forecasting methods trying to extract cross-sectional and time-series information simultaneously from large panels. The theoretical framework underlying the Arbitrage Pricing Theory (APT) also inspires our approach relying on individual stocks returns. In this setting, approximate factor structures with nondiagonal error covariance matrices answer the potential empirical mismatch of exact factor structures with diagonal error covariance matrices underlying the original APT of Ross (1976). Under weak cross-sectional dependence among idiosyncratic error terms, such approximate factor models generate no-arbitrage restrictions in large economies where the number of assets grows to infinity. Our paper develops an econometric methodology tailored to the APT framework. Indeed, we let the number of assets grow to infinity mimicking the large economies of financial theory.

We wish to estimate the time-varying risk premia implied by conditional linear asset pricing models where the conditioning includes both instruments common to all assets and asset specific instruments. The estimator uses simple weighted two-pass cross-sectional regressions, and we show its consistency and asymptotic normality under increasing cross-sectional and time series dimensions. We address consistent estimation of the asymptotic variance by hard thresholding, and testing for asset pricing restrictions induced by the no-arbitrage assumption. We derive the restrictions given by a continuum of assets in a multi-period economy under an approximate factor structure robust to asset repackaging. The empirical analysis on returns for about ten thousands US stocks from July 1964 to December 2009 shows that risk premia are large and volatile in crisis periods. They exhibit large positive and negative strays from time-invariant estimates, follow the macroeconomic cycles, and do not match risk premia estimates on standard sets of portfolios. The asset pricing restrictions are rejected for a conditional four-factor model capturing market, size, value and momentum effects.