Intertemporal CAPM and horizon-specific risk prices in the Japanese stock markets

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1 Multi-factor model

Asset pricing theory states that high expected return must associate with some kind of risk. This trade off relationship between risk and returns comes from the difference of marginal utilities of wealth among economic conditions. In empirical asset pricing models, these trade off can be measured by regression coefficients of stock returns on factors:

$$E[R_{i,t}] - R_{f,t} = \beta'\lambda$$

where β is regression coefficients of individual stock returns on the factors f. Also, elements of λ are the risk premiums on the factors and the risk prices are defined as $q = -\mathrm{Var}[f]^{-1}\lambda$. The well known Fama-French three factors have significant risk premiums in many countries. Also, aggregate dividend yield, price to earnings ratio and term spread are used as empirical factors. However, the economic interpretations of these factors are not clear and of the interest of researchers. An approach for this is to make it clear the relationship between these factors and economic variable which affects the utilities of investors such as consumption and market return. Intertemporal CAPM links the empirical multifactor model and economic models in this way.

2 Intertemporal CAPM and horizon specific risk price

Campbell (1996) consider the empirical ICAPM which express the stochastic discount factor as the function of future market returns. They construct a empirical framework for risk prices using the innovations of VAR models as factors. After that, Dew-Becker and Giglio (2016) propose the horizon specific risk price using reduced form stochastic discount factor by decomposing the risk price using impulse response function to the market returns as follows:

$$m_{t+1} - E_t[m_{t+1}] = \sum_{h=0}^{\infty} q(h)(E_{t+1}[r_{m,t+h}] - E_t[r_{m,t+h}]) = \sum_{h=0}^{\infty}\sum_{j=1}^{k} q(h)\gamma_j(h)$$

where q_h is horizon specific risk price and $\gamma_j(h)$ is an impluse response function from factor j to the log market return. A linear constraint for $q(h)$ make stochastic discount factor the special case of Campbell (1996) which are related to time non-separable utility functions.

This paper applies these framework to the Japanese stock market. Using the GMM sequential estimation, the confidence intervals of horizon specific risk prices and preference parameters are estimated. The empirical results will be shown in the presentation.

References

Campbell, J. Y. (1996), "Understanding risk and return." *Journal of Political Economy*, **104(2)**, 298-345.

Dew-Becker, I., Giglio, S. (2016), "Asset Pricing in the Frequency Domain: Theory and Empirics," *Review of Financial Studies*, **29(8)**, 2029-2068.