

Executive Summary

Problem

The pricing kernel is the ratio of the risk-neutral probabilities and the physical probabilities. It is an important link between asset prices and fundamental economic principles, such as the scarcity of endowment and the decreasing marginal utility of wealth. The risk-neutral probabilities can be derived from the prices of call options on aggregate consumption. A risk-neutral probability distribution estimated from the prices of options written on securities or security indices is a projection and can be used to price all securities in a large and important subset of all securities. In fundamental economic models, the pricing kernel should be monotonically decreasing on the aggregate wealth. But empirical research shows that there are locally increasing parts in the pricing kernel, which is called pricing kernel puzzle.

In this thesis we would like to do an empirical research on pricing kernel to try to answer the following questions: Does the pricing kernel puzzle still exist recently? What influence recent events (for instance the 2008 bankruptcy of Lehman Brothers, the 911 event etc.) have on the pricing kernel? What might be the reasons of such influence and what are the mechanisms of the evolution of the pricing kernel?

Method

Using the Fast and Stable Method provided by Jackwerth (2004) we back out a series of pricing kernel from prices of S&P 500 index options and realized returns on the same index to analyze the impact of the financial crisis 2008 on the pricing kernel. The data are downloaded from Wharton Research Data Services (WRDS) and we do the empirical research mainly with a MATLAB program.

Results

Through the time period June 2006 to July 2010, we get in total 56 cross sections of S&P 500 index option prices. As some of them do not contain enough option prices for deriving the RNDS, we finally get 44 RNDSs, and accordingly, 44 pricing kernels through this time frame.

In our results, a pricing kernel monotonically decreasing across wealth as the precrash period shape in Jackwerth (2000) never appears. But the locally increasing parts of the pricing kernel exist stably through our empirical sampling period. Before the financial crisis 2008 (in our research, from June 2006 to May 2008), the shape of the pricing kernel is generally decreasing with some locally increasing parts. During and shortly after the crisis (from August 2008 to October 2009) the shape of the pricing kernel is unstable. About one year after the crisis (from November 2009 to July 2010), the pricing kernel gradually returns to the Pre-Crisis shape with slight differences.

From our empirical results and with the research of Hens and Reichlin (2012) we can infer that probably the impact of the financial crisis 2008 on the pricing kernel operates by means of investors' beliefs. Another important conclusion we get is that some mechanisms that lead to the pricing kernel puzzle exist stably through our whole empirical time sampling period. Further research can be some theoretical work, for example to model the changes of the investors' beliefs during the crisis and with simulation tools to calibrate the evolution of the pricing kernel during the crisis.