# 11.    Impact of Quantitative Tightening at The Zero Lower Bound

**Company**
We are an asset management firm based in Los Angeles with nearly $120 billion in AUM.

**Background**
Wu and Xia (2016) pioneered by building a shadow rate model to study the macroeconomic impact of the monetary policy at the zero lower bound. In particular, they showed that the quantitative easing by the global central banks could further push the effective interest rates significantly below zero. Their work has been tremendously helpful to financial practitioners. It provides a quantitative tool to study the effectiveness of unconventional monetary policy in a zero lower bound environment. Also, Hamilton and Wu (2012) published a nice work linking the quantitative easing (QE) with the level, slope, and curvature of the yield curve. We believe one can study quantitative tightening (QT) in the same framework. Given the complexity with Wu-Xia shadow rate model, this project requires students to have very strong mathematical background and proficient programming skills.

**Project**
The goal of the project is to replicate the Wu-Xia Shadow Rate Model and study how the quantitative tightening might affect the pricing of level, slope and curvature term structure risk.
Part I: Implement the Wu-Xia Shadow Rate Model.
Part II: Study the impact of quantitative tightening by the Federal Reserve on level, slope, and curvature of the yield curve.

**Data**
All the constant maturity Treasury yields data is reported in the FRED database of the Federal Reserve Bank of St. Louis. The face value of outstanding U.S. Treasury debt is available on the U.S. Federal

**References**
Wu Jing Cynthia and Fan Dora Xia, 2016, "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound." Journal of Money, Credit and Banking, Vol. 48, No. 2-3.

Hamilton James D. and Jing Cynthia Wu, 2012, "The Effectiveness of Alternative Monetary Policy Tools in a Zero Lower Bound Environment." Journal of Money, Credit and Banking, Vol. 44, No.1.

Black Fischer, 1995, "Interest Rates as Options." Journal of Finance, Vol. 50, 1371-6.