Whayoung Jung, Research Statement
University of Illinois at Urbana-Champaign

My research focuses on comprehensive understanding of a shock-response mechanism for macroeconomic and finance variables. Specifically, I study heterogenous dynamics at various parts of an outcome distribution and explore sources of the heterogeneity using quantile regression methods. My research provides policymakers with a quantitative assessment of the downside and upside risks to the economy. In this research statement, I highlight aspects of my research agenda, including: (1) the first job market paper that studies quantile responses of macro-finance variables, (2) the second job market paper that examines local projection quantile impulse response functions with applications to Value-at-Risk dynamics, and (3) projects in progress and plans for future research.

(1) "Quantile Impulse Response Analysis with Applications in Macroeconomics and Finance" (with Ji Hyung Lee) [Job Market Paper I]
We study quantile impulse response functions (QIRFs) and their applications in macroeconomics and finance. As extreme events have significant effects on the economy, the scientific interests of policymakers and researchers go beyond the conditional mean. We build a multi-equation autoregressive conditional quantile model and propose a new construction and statistical inference of the QIRF. The QIRF describes how quantiles of endogenous variables respond over time to a shock and complements the conventional impulse response functions (IRF) by providing a much more complete shock-response mechanism.

We investigate dynamic QIRFs of the US economy in response to monetary policy and financial shocks, providing some interesting results: (i) Economic activity has the most heterogeneous response across its distribution among the variables under study. The left tail of economic activity is the most responsive to monetary policy and financial stimuli. (ii) The conditional 5% quantile of economic activity (Growth-at-Risk) shows a much more persistent response to a monetary policy shock than the mean IRF of the economic activity. A financial shock, on the contrary, has an acute but transient impact on Growth-at-Risk. (iii) We also assess the impacts of financial and monetary policy shocks on Growth-at-Risk during the global financial crisis. Negative financial shocks during August 2007–June 2009 substantially aggravated Growth-at-Risk over 2008–2009. Unconventional monetary policy tools used during July 2009–December 2015 ameliorated Growth-at-Risk successfully over 2010–2015. (iv) When a measure of financial conditions (NFCI) stays at its right tail quantiles (tighter financial conditions), NFCI displays a locally explosive behavior. As a result, the consecutive right tail events create extreme downside risks to the economy. The tool set of QIRFs, therefore, provides detailed dynamic distributional evolution of macroeconomic and financial variables over time in response to economic shocks.

(2) "Estimation and Inference of Quantile Impulse Response Functions by Local Projections: With Applications to VaR Dynamics" (with Heejoon Han and Ji Hyung Lee) [Job Market Paper II, submitted]
In this paper, we investigate the estimation and inference of QIRFs for dynamic analysis of Value-at-Risk (VaR). The effect of a shock associated with tail events or tail co-dependence among financial variables is important for risk analysis. Since a structural impulse response can be substantially different between downside and upside risks to the market, we study the QIRF that can measure the expected change in the conditional quantile of the response variables due to a shock.

We propose a simple estimation method based on local projection for the financial market data whose stochastic property is largely determined by persistent volatility dynamics. We provide valid econometric inferential tools based on both asymptotics and the stationary bootstrap. Monte Carlo simulation evidence shows that the QIRF estimation using local projections effectively describes the true dynamics of VaR and that both asymptotic and bootstrap confidence intervals have proper coverage probabilities. However, for relatively longer horizons, the bootstrap confidence interval works better because the bootstrap method avoids the estimation of a density-like nuisance parameter. We study dynamic reactions of 1% and 5% VaR of 61 US financial institutions when there is a shock to the market. The local projection QIRFs generally exhibit substantial fluctuations compared with previously suggested quantile response tools. Our QIRF can capture heterogeneous dynamic responses across different economic conditions and hence, is a useful tool for the risk analysis conditional on the market information.

(3) Work in Progress and Plans for Future Research

(a) The Importance of Stock-Specific Shocks for Aggregate Volatility in the US Stock Market

I quantitatively assess the role of stock-specific shocks on aggregate volatility in the US stock market. Under a fat-tailed market capitalization distribution, stock-specific shocks can create non-negligible fluctuations in the aggregate market. When a power law is fitted to the upper tail of the market capitalization distribution in the S&P 500, the estimate of tail exponent is slightly above one, in which case the contribution of stock-specific shocks to aggregate volatility can be non-trivial.

The variance decomposition analysis suggests that the contribution of idiosyncratic shocks to aggregate volatility is not considerable; the volatility of stock-specific component is about 20% of the volatility of aggregate returns. This small role of stock-specific shocks is attributable to the size-variance relationship and highly positive correlations among macro-sectoral components. However, I find idiosyncratic shocks can lead to systemic risk using quantile regression methods. Preliminary results show that the lower conditional quantiles are significantly affected by stock-specific shocks, while the upper quantiles are not. This finding implies that stock-level shocks create downward systemic risk to the market with asymmetric effects on aggregate volatility.

(b) Future Research

As an extension of my job market papers, I am interested in examining predictability of Growth-at-Risk for asset prices. Understanding the relationship between asset prices and business cycles has long been a goal of macro-finance. But traditional macroeconomic variables have not been successful at predicting financial market movements. The empirical results of my job market papers show that Growth-at-Risk is more volatile than real macroeconomic variables, especially during the recession period. These findings suggest that Growth-at-Risk has the potential for describing fluctuations in asset prices. Moreover, I would like to explore if risk attitudes of economic agents are affected by their perception of downside risk to the economy. The research will describe how beliefs influence outcomes in macro settings, emphasizing the importance of Growth-at-Risk for policy makers.