Spectral tools in econometrics have lately experienced a renewed surge in interest. This dissertation contributes to this literature by providing conceptually different spectral-based methods and their applications to problems of modern economics.

In the first part, we take a spectral decomposition of realized volatility and construct a multivariate GARCH style model that we fit by standard quasi-maximum likelihood and generalized autoregressive score procedures. We build our model on a belief that market agents obtain information in various time horizons and therefore form their expectations in various informational horizons. This behavior creates an overall volatility process that is a mixture of spectrum specific processes.

We then apply the model to the currency markets, namely GBP, CHF, and EUR. With the help of the model confidence set test we show that the multi-scale model and the generalized autoregressive score based models produce forecasts that are in most cases superior to the competing models. Moreover, we find that most of the information for future volatility comes from the high frequency part of the spectra representing the very short investment horizons.

In the second part, we provide a spectral decomposition of a system multivariate connectedness measure based on Diebold and Yilmaz (2014). We provide a spectral representation of the (generalized) forecast error variance decomposition for a standard stationary vector autoregressive process while also providing a discussion for the system that is co-integrated. Based on this spectral representation we define the frequency specific connectedness measures. Lastly, we provide two empirical applications of the connectedness measures. In the first empirical application, we study the connectedness of systemic risk in the US financial markets. We find evidence for rich time dynamics across frequencies that helps us better understand the overall connectedness. In the second empirical application, we study the connectedness of supply-side and demand-side shocks in petroleum markets and present new stylized facts about connectedness on petroleum markets.