Abstract

My thesis focuses on the theoretical and empirical aspects of the time series modelling during different financial and economics conditions. In particular, I showed under which conditions some near explosive processes can be modelled by the Threshold Vector Autoregressive Model, which I explored further studying the non-linearity between stock volatility and market liquidity. Finally, I demonstrated how to improve the distribution of interest rate modelling around zero level using the Mixture of Distributions Model.

In the first chapter of my thesis, which is a joint work with Lars Stentoft, we examines the steady state properties of the Threshold Vector Autoregressive model. Assuming the trigger variable is exogenous and the regime process follows a Bernoulli distribution, we derive the necessary and sufficient conditions for existence of stationary distribution. We analyse a situation related to so-called locally explosive models", where the stationary distribution exists though the model is explosive in one regime. Using the simulations methods we show that locally explosive models can generate some of the key properties of financial and economic data. We also demonstrate that assessing the stationarity of threshold models based on simulations might well lead to wrong conclusions.

In the second chapter, I study the stock market liquidity and volatility relation over the period of 2000 - 2015 in multivariate regime switching setting. I build a tractable Threshold Vector Autoregressive Model of volatility and liquidity with two regimes, which are defined endogenously by the past level of market liquidity. I find supporting evidence that the link between market liquidity and volatility is non-linear and this results is robust for all stocks. My models demonstrates that the relationship between market liquidity and volatility is stronger when market liquidity is low. Interestingly, the model show that volatility might not affect liquidity of some stocks, when liquidity low, which is new result in the recent

literature and might be explored using bigger stock sample in the future. I demonstrate that the shock to market liquidity and volatility can lead to vicious cycles when liquidity is low forever, which is related to liquidity and volatility spirals observed in the data. On the other hand, I find supporting evidence that single negative shock to volatility and liquidity is not enough to create the explosive series when models evolves between regimes. Finally, we show that there is some sign and size asymmetry of the liquidity impact on volatility.

In the third paper, I model the distribution of the interest rate increments of the Canadian Government Bonds during normal times and Zero Lower Bound period. I examine the properties of the interest rate around zero lower bound and show that the whole distribution of the interest rate changes. To capture this effect I propose to use the mixture of t-scaled and Gaussian distribution with time-varying weights. The estimated mixture of distribution model defines two different distributions with the sharp transition between them around 0.9% level of interest rate. I show that resulting model leads to more accurate empirical performance when compared to standard models used in the literature.