Essays on tail risk in macroeconomics and finance: measurement and forecasting

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Summary

This thesis is composed of three chapters that propose some novel approaches on tail risk for financial market and forecasting in finance and macroeconomics. The first part of this dissertation focuses on financial market correlations and introduces a simple measure of tail correlation, TailCoR, while the second contribution addresses the issue of identification of non-normal structural shocks in Vector Autoregression which is common on finance. The third part belongs to the vast literature on predictions of economic growth; the problem is tackled using a Bayesian Dynamic Factor model to predict Norwegian GDP.

The first chapter introduces a simple measure of tail correlation, TailCoR, which disentangles linear and non-linear correlation. The aim is to capture all features of financial market co-movement when extreme events (i.e. financial crises) occur. Indeed, tail correlations may arise because asset prices are either linearly correlated (i.e. the Pearson correlations are different from zero) or non-linearly correlated, meaning that asset prices are dependent at the tail of the distribution. Since it is based on quantiles, TailCoR has three main advantages: i) it is not based on asymptotic arguments, ii) it is very general as it applies with no specific distributional assumption, and iii) it is simple to use. We show that TailCoR also disentangles easily between linear and non-linear correlations. The measure has been successfully tested on simulated data. Several extensions, useful for practitioners, are presented like downside and upside tail correlations.

The second chapter deals with the structural interpretation of the VAR using the statistical properties of the innovation terms. In general, financial markets are characterized by non-normal shocks. Under non-Gaussianity, we introduce a methodology based on the reduction of tail dependency to identify the non-normal structural shocks. Borrowing from statistics, the methodology can be summarized in two main steps: i) decorrelate the estimated residuals and ii) the uncorrelated residuals are rotated in order to get a vector of independent shocks using a tail dependency matrix. We do not label the shocks a priori, but post-estimate on the basis of economic judgement. Furthermore, we show how our approach allows to identify all the shocks using a Monte Carlo study. Finally, we apply our method to two different empirical illustrations that focus on the interaction between monetary policy and the stock market.

The third chapter consists in predictions of Norwegian Mainland GDP. Policy institutions have to decide to set their policies without knowledge of the current economic conditions. We estimate a Bayesian dynamic factor model (BDFM) on a panel of macroeconomic variables (all followed by market operators) from 1990 until 2011. The BDFM is an extension to the Bayesian framework of the dynamic factor model (DFM). The difference is that, compared with a DFM, there is more dynamics in the BDFM introduced in order to accommodate the dynamic heterogeneity of different variables. Through a pseudo real-time exercise, we show that the BDFM performs well both in terms of point forecast, and in terms of density forecasts. Results indicate that our model outperforms standard univariate benchmark models, that it performs as well as the Bloomberg Survey, and that it outperforms the predictions published by the Norges Bank in its monetary policy report.