Advisor’s Report on Dissertation Thesis

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Title of the Thesis: Applications of modern spectral tools in financial econometrics.
Type of Defense: DEFENSE
Date of Pre-Defense: May 17, 2017

Address the following questions in your report, please:

a) Can you recognize an original contribution of the author?
b) Is the thesis based on relevant references?
c) Do the results of the thesis allow their publication in a respected economic journal?
d) Are there any additional major comments on what should be improved?
e) Were the comments raised at the pre-defense, addressed in the dissertation submitted to the regular defense?
f) What is your overall assessment of the thesis? (a) I recommend the thesis to be defended without major changes; (b) The thesis is not defendable.

(Note: The report should be at least 2 pages long.)

Content of the Report:

The thesis under consideration is a collection of three papers that all present original contribution to the time series literature on financial econometrics. Unifying theme of the three separate works is endeavor to understand horizon-specific disaggregate behavior of economic agents as opposed to classical economic and financial literature that commonly describes the economic processes using aggregate measures. Frequency properties of economic problems have been currently studied by several researchers, and number of important contributions have been made in past few years introducing important concepts including frequency domain asset pricing theory. The thesis contributes to the contemporaneous state of art theoretically as well as empirically. From the theoretical side, the thesis develops two distinct frameworks. First, it introduces new frequency based measures of connectedness that are useful for an economist wishing to measure horizon-specific connections of economic variables. Second, it builds new forecasting model based on the frequency decomposition of data. From the empirical side, the thesis brings new original results about frequency specific features of financial and macroeconomic time series.

Originality and usefulness of the results is also highlighted by the fact that results on new frequency-specific forecasting model has already been published by the European Journal of Operational Research, results on new frequency-specific connectedness and directional connectedness measures are currently resubmitted after revision in the Journal of Financial
Econometrics, and accepted for publication by Energy Economics journals. All the three journals are leading journals in the respective fields. Let me briefly discuss the contributions separately.

The first paper studies how horizon-specific decomposition of volatility (or risk) in financial markets help in building more powerful forecasting model. Using time-frequency decomposed volatility measures and Realized GARCH framework estimated with observation-driven criterion, several new models are proposed to study influence of different time-scales, or jumps on volatility forecasts. Empirical study brings improved forecasts of the foreign exchange rate futures.

The second paper contributes to large literature measuring spillovers, or connectedness of economic variables. Using frequency decomposition of forecast error variance decompositions from vector auto-regressions, the paper introduces new frequency-based connectedness measure build to show influence of shocks at different frequencies. The new measure allows for perfect decomposition of aggregate connectedness into chosen frequencies. The main economic intuition of the work is to disentangle between different shocks carrying various frequency responses in the economic system. Allowing to measure the strength of connectedness at these frequencies shows important insight about the nature and sources of connectedness. Empirical study investigates the US systemic risk of financial markets from 2001 to 2016 finding rich dynamics of frequency-specific systemic risk. While systemic risk is driven more by the long-run connectedness during periods of turmoil, it is driven by short-run connectedness during calm periods.

The third paper adds to the previous one deriving frequency-specific directional connectedness measures and applying them to petroleum markets. The paper presents new stylized facts about dependence structure of petroleum markets. Key finding is that the shocks to volatility with response shorter than one week are increasingly important to the transmission mechanism over the studied period. Demand-side shocks to volatility are becoming increasingly important in creating short-run connectedness. Finally, the supply-side shocks to volatility resonating in both the long run and short run are important sources of connectedness.

In conclusion, the dissertation discusses wide range of problems in the spectral domain econometrics and applies them to three appealing empirical problems. The thesis proposes new important concepts pushing the state of the current knowledge, as they allow us to improve our understanding of the frequency-specific behavior of economic agents in the described situations. The work is original, contributive, it is done rigorously, and is almost complete, with exception of the introduction that needs to be polished. Hence my overall assessment of the thesis is (a) the thesis can be defended without substantial changes.

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