

## **Supervisor's Report on thesis**

**PhDr. Jozef Baruník: „Wavelet-based realized variation and covariation theory“.**

His research interests presented in submitted thesis are oriented into computational econometrics and modeling. This thesis brings a wavelet-based theory for the realized variation and for an estimation of the realized volatility in the time-frequency domain. The first part of thesis presents the wavelet-based realized variation theory. The second part introduces the multivariate counterpart, i.e. wavelet-based realized covariation theory. The introduced theory is tested in numerical and simulation study on small samples and is compared to other popular and famous realized volatility estimators under the different simulation settings with changing noise as well as with different structures of the jumps. Time-frequency estimators bring not only more efficient estimates, but decompose the realized variation and covariation into arbitrarily chosen investment horizons. Results thus bring better understanding of the dynamics of the stock markets.

Considered thesis targets have been

- a. New complete theory generalizing the popular realized volatility and covariance measures.
- b. The theory of quadratic variation and realized volatility measuring.
- c. The wavelet-based realized variation theory.
- d. The decomposition theory for an empirical volatility.

By my opinion the author reached all prescribed targets. Moreover, an approach to covariation estimation is generalized. The wavelet-based framework for an estimation of realized variation is introduced. The complete wavelet-based realized variation theory generalizing the realized measures is presented. Wavelets for a jump detection are used as well. Presented wavelet-based estimator offers lowest bias of forecasts. Suggested methodology is able to improve the VaR forecasts as well. Very important is a multiscaling view on the VaR provided by wavelets enabling to decompose the risk measure to several investment horizons.

As over-all-look, I can state that all parties of this thesis have excellent professional level. Therefore I suggest, after successful defense, conferring the degree

**Ph. D.**

to PhDr. Jozef Baruník and recommend the Charles University's commendation.

Prague 2. 09. 2011

Prof. Dr. Miloslav Vošvrda  
supervisor

## Supervisor's Report on thesis

**PhDr. Jozef Baruník: „Wavelet-based realized variation and covariation theory“.**

A research area of the thesis is the time series econometrics and economic forecasting. It brings complete theory for the realized volatility and covariation estimation generalizing current knowledge and bringing the estimation to the time-frequency domain. The topic is the theory presents a wavelet-based realized variation theory firstly. The second part introduces its multivariate counterpart, wavelet-based realized covariation theory. The introduced theory is also tested in numerical study on small sample performance of the estimators and compared to other popular realized volatility estimators under the different simulation settings with changing noise as well as jump level. Time-frequency estimators bring not only more efficient estimates, but decompose the realized volatility and covariation into arbitrarily chosen investment horizons. Results thus bring better understanding of the dynamics of the stock markets.

### Thesis targets

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**Ph. D.**

to PhDr. Jozef Baruník.

Prague 15. 04. 2011

Prof. Dr. Miloslav Vošvrda  
supervisor