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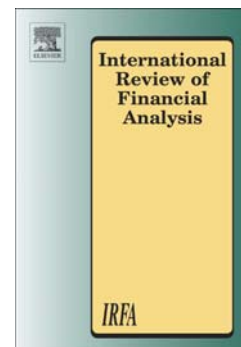
Multiple-days-ahead value-at-risk and expected shortfall forecasting for stock indices, commodities and exchange rates: Inter-day versus intra-day data

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**Multiple-days-ahead value-at-risk and expected shortfall forecasting for stock indices,  
commodities and exchange rates: Inter-day versus Intra-day data**

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**Abstract**

In order to provide reliable Value-at-Risk (*VaR*) and Expected Shortfall (*ES*) forecasts, this paper attempts to investigate whether an inter-day or an intra-day model provides accurate predictions. We investigate the performance of inter-day and intra-day volatility models by estimating the AR(1)-GARCH(1,1)-skT and the AR(1)-HAR-RV-skT frameworks, respectively. This paper is based on the recommendations of the Basel Committee on Banking Supervision. Regarding the forecasting performances, the exploitation of intra-day information does not appear to improve the accuracy of the *VaR* and *ES* forecasts for the 10-steps-ahead and 20-steps-ahead for the 95%, 97.5% and 99% significance levels. On the contrary, the GARCH specification, based on the inter-day information set, is the superior model for forecasting the multiple-days-ahead *VaR* and *ES* measurements. The intra-day volatility model is not as appropriate as it was expected to be for each of the different asset classes; stock indices, commodities and exchange rates.

The multi-period *VaR* and *ES* forecasts are estimated for a range of datasets (stock indices, commodities, foreign exchange rates) in order to provide risk managers and financial institutions with information relating the performance of the inter-day and intra-day volatility models across various markets. The inter-day specification predicts *VaR* and *ES* measures adequately at a 95% confidence level. Regarding the 97.5% confidence level that has been recently proposed in the revised 2013 version of Basel III, the GARCH-skT specification provides accurate forecasts of the risk measures for stock indices and exchange rates, but not for commodities (i.e. Silver and Gold). In the case of the 99% confidence level, we do not achieve sufficiently accurate *VaR* and *ES* forecasts for all the assets.

**Keywords:** Basel II, Basel III, Value-at-Risk, Expected Shortfall, volatility forecasting, intra-day data, multi-period-ahead, forecasting accuracy, risk modelling.

**JEL Classifications:** G17; G15; C15; C32; C53.

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