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A note on the importance of overnight information in risk management models

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Abstract

This paper examines the economic value of overnight information to users of risk management models. In addition to the information revealed by overseas markets that trade during the (domestic) overnight period, this paper exploits information generated via recent innovations in the structure of financial markets. In particular, certain securities (and associated derivative products) can now be traded at any time over a 24-h period. As such, it is now possible to make use of information generated by trading, in (almost) identical securities, during the overnight period. Of the securities that are available over such time periods, S&P 500 related products are by far the most actively traded and are, therefore, the subject of this paper. Using a variety of conditional volatility models that allow time-dependent information flow within (and across) three different S&P 500 markets, the results show that overnight information flow has a significant impact on the conditional volatility of daytime traded S&P 500 securities. Moreover (time-consistent) forecasts from models that incorporate overnight information are shown to have economic value to risk managers. In particular, Value-at-Risk (VaR) models based on these conditional volatility models are shown to be more accurate than VaR models that ignore overnight information.

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Keywords: Value-at-Risk; Conditional volatility; Realized volatility; Overnight information

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1. Introduction

The importance of measuring and managing risk in financial markets has motivated a vast literature on the dynamics of asset return volatility.[1] All of the models proposed in this literature are, without exception, based on the highly time-dependent nature of information flow in each of the markets considered. However, they differentiate themselves from each other by innovating in terms of model specification, by using alternative definitions of volatility, or by enriching the informational content of the model; see Poon and Granger (2003) for an overview of the models used in the context of financial markets. It is to the latter tranche of the literature that this paper contributes. In particular, we introduce and examine conditional volatility models of S&P 500 returns that allow for interaction between information flow from related markets; viz., the S&P 500 index, regular futures, and E-mini futures markets.

The performance of conditional volatility models has been greatly improved by the incorporation of additional proxies for (lagged) information flow into their specification. An interesting example of such a proxy is considered by Engle et al. (1990) who, using the fact that foreign exchange is traded in different geographical locations (and hence over different periods within the day), introduce an alternative measure of (lagged) information flow. Moreover, Engle, Ito, and Lin demonstrate, via use of a conditional volatility model, that information flow in one geographical location has a significant impact upon subsequent information flow in other geographical locations.[2] Although the S&P 500 market is not geographically displaced, a similar exploitation of market structure (with respect to time) can be achieved. In particular, we utilize the fact that, while the S&P 500 index and regular futures markets are only open (each weekday) during normal business hours, the E-mini S&P 500 futures market is open for (almost) the entire 24-h period (excluding weekends). As such, not only can the dynamics of information flow in the S&P 500 market be modeled (and monitored) continuously, but improved conditional volatility models of daytime S&P 500 returns are possible via the incorporation of overnight information flow from the E-mini market.[3] These models contrast with existing conditional volatility models of S&P 500 returns, where overnight information flow is not considered.

It is surprising, given the importance of appropriate models of market risk in areas such as risk management and option pricing, that few (if any) studies have attempted to incorporate the above overnight information flow into a single conditional volatility model. It is this gap in the literature that this paper addresses. To anticipate some of the results, we find that return volatility forecasts produced by models that incorporate overnight information flow are more accurate than the forecasts produced by existing (and competing) conditional volatility models. In addition, the economic importance of the former set of return volatility forecasts is demonstrated by showing that Value-at-Risk (VaR) models based on these forecasts are more accurate than currently used VaR models.

[1] See Szegö (2004) for a collection of papers on a wide variety of risk management issues.

[2] Similar evidence from foreign exchange markets, equity markets, futures markets, and treasury markets has been found; see, respectively, Melvin and Melvin (2003), Gallo (2002), Gannon and Choi (1998), and Fleming and Lopez (1999), for typical examples.

[3] Most S&P 500 price discovery occurs in the E-mini S&P 500 futures market (Hasbrouck, 2003); consequently, it is likely that overnight information flow in this market will have a significant impact on subsequent information flow in the S&P 500 index and regular futures markets.