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Simultaneous volatility transmissions and spillover effects: U.S. and Hong Kong stock and futures markets

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Abstract

Contemporaneous transmission effects across volatilities of the Hong Kong Stock and Index futures markets and futures volume of trade are tested by employing a structural systems approach. Competing measures of volatility spillover, constructed from the overnight U.S. S&P500 index futures, are tested and found to impact on the Hong Kong asset return volatility and volume of trade patterns. The examples utilize intra-day 15-min sampled data from this medium-sized Asia Pacific equity and derivative exchange. Both the intra- and inter-day patterns in the Hong Kong market are allowed for in the estimation process.

JEL classification: G13
Keywords: Simultaneous volatility; Derivative transmission; International spillovers; Intra-day volume

1. Introduction

The determinants of short-horizon (including intra-day) volatility are generally assumed to be unknown and controversial. Existing studies do not jointly consider contemporaneous and lead/lag volatility and volume of trade effects between equity and derivative markets

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(volatility transmissions) and volatility effects from other derivative markets (volatility spillovers). The former issue is important in option-pricing models where better estimates of volatility are required. The latter issue can also be important in pricing options and in position setting in spot and derivative markets.

International volatility spillovers between developed stock markets, employing the vector autoregressive (VAR) time series estimator, is first reported in Eun and Shim (1989). A multi-country factor model is employed in King and Wadhwani (1990) to measure these effects between developed international stock markets. Confounding effects from employing close-to-close or open-to-close return data mean that it is difficult to separate the spillover effect from market specific volatility effects. Leachman and Frances (1996) use monthly recorded G7 stock market closing prices but do not separate market specific from volatility spillover effects. The conditional variance from fitted univariate GARCH models is employed in a VAR framework. Booth, Martikainen, and Tse (1997) measure asymmetric volatility spillover effects between Scandinavian stock markets using the multivariate exponential GARCH (EGARCH) estimator. Daily sampled price data is employed but some confounding is present as the Danish market closes 30 min prior to the Norwegian, Swedish and Finnish markets. Karolyi (1995) avoided the confounding effect and quantified daily volatility spillover effects between the synchronously sampled Canadian and U.S. equity markets. The study employs variants of multivariate generalized autoregressive heteroscedastic (MGARCH) time series volatility structures. In this paper, we avoid the confounding effects from sampling data from international markets where opening and closing times overlap by focusing on markets (U.S. and Hong Kong) that trade in different time zones. In addition, we employ intra-day data sampled from non-overlapping time zones for these markets in the analysis.

Volatility spillovers are reported from the U.S. and U.K. markets onto Asia Pacific markets trading in different time zones. Hamao, Masulis, and Ng (1990) find asymmetric pre-crash daily volatility spillovers from New York to London and London to Tokyo but no spillovers in other directions. Post-crash volatilities are reported to have increased and effects from Japan more pronounced in Hamao, Masulis, and Ng (1991). A univariate GARCH estimator is employed in those studies. Koutmos and Booth (1995) use open-to-close records from these markets and a multivariate EGARCH structure to measure these spillover effects. Other studies of volatility spillovers between these three markets employing MGARCH estimators are reported for daily price records in Dae and Karolyi (1994) and using weekly price records in Theodossiou, Kahya, Koutmos, and Andreas (1997). Volatility spillovers from the U.S. and Japan onto the Asia Pacific stock markets of Hong Kong, Singapore, Taiwan and Thailand are reported in Liu and Pan (1997). International index futures meteor shower spillovers and heat wave persistence volatility effects are tested by Booth, Chowdhury, Martikainen, and Tse (1997). MGARCH volatility estimators as well as extreme value volatility estimators with a VAR structure are employed. The extreme value estimates are constructed from open-to-close and high/low records from the U.S., U.K. and Japanese stock index futures markets so that confounding effects from differential market opening and closing are not accounted for. We take an alternative approach in this paper by employing a systems of equations estimator. The U.S. data is carefully sampled so that shocks from this market enter as exogenous variables but are actually observed overnight prior to the open of the Hong Kong market.