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Returns synchronization and daily correlation dynamics between international stock markets

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Abstract

The use of close-to-close returns underestimates returns correlation because international stock markets have different trading hours. With the availability of 16:00 (London time) stock market series, we find dynamics of daily correlation and covariance, estimated using two non-synchroneity adjustment procedures, to be substantially different from their synchronous counterparts. Conditional correlation may have different signs depending on the model and data type used. Other findings include volatility spillover from the US to the UK (and France), and a reverse spillover which is not documented before. Also, unlike previous findings, we found the increase in daily correlation is prominent only under extremely adverse conditions when a large *negative* return has been registered. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

The dynamics of daily correlation has a pivotal role in many important applications in finance. Riskmetrics™ uses it to produce value-at-risk (VaR) measures at short horizons. Erb et al. (1994) provide examples on how time varying correlation forecasts can affect optimal portfolio weights. Kroner and Ng (1998) show how time varying covariance matrices affect hedge ratios. Burns et al. (1998) show how a term structure of correlation can be built from a daily multivariate GARCH model. Such a correlation term structure can then be used to value derivative products whose payoff depends on the values of two or more assets. Under turbulent market conditions, real-time valuation of international portfolios can be critical. To produce accurate portfolio value, we need, among other things, accurate correlation estimates.

Given the crucial role of correlation measures, it is not surprising that correlation dynamics and intertemporal relations between international stock markets are areas frequently explored by researchers. Volatility spillovers from the US to the rest of the world are reported in Eun and Shim (1989), Becker et al. (1990), Fischer and Palasvirta (1990), and Hamao et al. (1990). Other studies such as Koch and Koch (1991) and Von Furstenberg and Jeon (1989) find correlations have increased over time. King and Wadhwani (1990) and Bertero and Mayer (1990) find a substantial increase in correlation during stock market crises. More recent papers such as Theodossiou and Lee (1993), Longin and Solnik (1995) and Theodossiou et al. (1997) exploit a multivariate GARCH framework where all the conjectured relationships are tested jointly. It has been argued that a multivariate approach is the only right platform for studying the transmission mechanism and correlation dynamics.

However, international stock markets have different trading hours. Hence the use of daily closing prices leads to an underestimation of the true correlations between stock markets. Some of the studies mentioned above by-pass the non-synchroneity problem by using weekly or monthly data.[2] The use of low frequency data leads to small samples, which is inefficient for multivariate modelling especially when parameters are time varying. Moreover, monthly and weekly data cannot capture daily correlation dynamics. On the other hand, we have studies that use daily non-synchronous open-to-close and close-to-open returns. These studies cannot distinguish a spillover from a contempo-

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[2] These include Longin and Solnik (1995), Theodossiou et al. (1997) and Ramchand and Susmel (1998). Koch and Koch (1991) uses daily data but for three separate years (1972, 1980 and 1987). King and Wadhwani (1990) and Bertero and Mayer (1990) use high frequency data, but for a short period surrounding the 1987 stock market crash.

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