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Common trends in global volatility [☆]



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ABSTRACT

This paper investigates the long-term patterns in global foreign exchange, equity and bond markets in three different trading zones, namely, Japan, Europe and the United States. Recent advances in the measurement of volatility from high-frequency data are used together with the concepts of fractional integration and cointegration. The specific objective is to consider whether there are common trends that drive volatility in the global marketplace. This so-called commonality in volatility hypothesis is formulated using a cofractional model. The results confirm that volatility in all three financial asset markets, across all three trading zones share a single common trend which lends itself to interpretation as a global news stream.

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1. Introduction

An important strand of research into the volatility of global financial markets has been the examination of the transmission of volatility across different international trading zones. The seminal paper is that of Engle et al. (1990) who examine international linkages in foreign exchange volatility. Using the framework of Ito (1987) and Ito and Rokey (1987), Engle et al. (1990) partition each 24 hour period (calendar day) into four non-overlapping trading zones, namely, Asia, Japan, Europe and finally the United States. An important conclusion that emerges from this line of research is that periods of high

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volatility in the foreign exchange markets are expected to be followed by high volatility in the subsequent trading zone within the same calendar day (the so called meteor-shower pattern). Given that volatility is linked to news arrival (Andersen, 1996; Clark, 1973; Ederington and Lee, 1993; Tauchen and Pitts, 1983), one potential interpretation of this result is that news is a global phenomenon.¹ This paper seeks to provide a different perspective on this result.

The recent literature on financial asset volatility has used high frequency intra-day data on financial asset returns to construct a realized volatility measure, known as realized volatility (Andersen et al., 2003). The core idea of this paper derives from the observation of Andersen et al. (2001, 2003) that realized volatility is a long memory process or, more formally, that realized volatility has a fractional order of integration. The aim of this paper, therefore, is to investigate the long-term relationships between volatility in different international trading zones and hence examine whether or not there is evidence of common trends in these series. Put another way, evidence of common trends may be interpreted as the existence of global news. Common components in volatility will be identified by means of the presence of fractional cointegration (Baillie and Bollerslev, 1994; Shimotsu, 2012) between the series when their dynamics are given by a vector error correction representation. The longer-term fundamental determinants of volatility in different trading zones has not previously been investigated, and it is hoped that the proposed approach will allow a deeper understanding of the patterns of transmission of financial asset volatility in global markets and provide another perspective on whether or not volatility in financial markets is driven by a common global news stream.

In this paper a specially constructed data set comprising high-frequency foreign exchange, equity, and bond market data is used to explore the transmission of volatility and news between these markets and across international trading zones. The calendar structure used by Engle et al. (1990) is amended slightly so that three trading zones for Asia, Europe and the United States are established and high frequency returns are used to construct realized volatility estimates for each asset class in each zone for each calendar day. The behaviour of volatility is then examined from a number of perspectives, namely, transmission across asset classes in local markets, linkages between international trading zones for each asset class and finally the most general case of linkages between all asset classes in the global market.

The results obtained in the empirical sections of the paper can be summarized succinctly as follows. Although volatility linkages between different markets and across global trading zones are fairly complex, fractional cointegration exists between the volatility of financial assets in different trading zones. Evidence of commonality in volatility is found in the foreign exchange, equity and bond markets, suggesting that volatility in these markets is strongly interrelated in the long run. The results provide significant support for the conclusion that the volatility of financial assets in different markets and across global trading zones can be explained by a single stochastic trend. In addition, this common trend can be related to a global measure of news flow, obtained by collecting data on news items from the Thomson Reuters News Analytics database. Using the fact that volatilities in these markets are fractionally cointegrated provides economically significant information when formulating a strategy to trade on volatility. Specifically, a simple trading strategy based on positions in volatility taken on the basis of forecasts generated by a model in which the fractional cointegration restrictions are imposed generates smaller returns than positions taken on the basis of forecasts from a model in which these cofractional restrictions are ignored.

The rest of the paper proceeds as follows. Section 2 describes the construction of the global trading day, the high-frequency data set used in the paper and how jump-robust measures of realized volatility, which are used in the empirical analysis, are constructed. Section 3 discusses the presence of long memory in realized volatility. In Section 4 a fractionally cointegrated volatility model is proposed. Section 5 addresses the issue of the transmission of volatility between the foreign exchange, equity and bond markets of a single trading zone. This is the simplest case to address and uses cofractional vector autoregressive models to explore volatility linkages. Section 6 explores volatility patterns between

¹ This result is not found uniformly in all markets. For example, Fleming and Lopez (1999) and Savva et al. (2005) find that in bond and equity markets volatility is expected to be followed by high volatility in the same trading zone on the following calendar day (the heatwave hypothesis).

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