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Int. Fin. Markets, Inst. and Money 16 (2006) 71–86

Journal of
INTERNATIONAL
FINANCIAL
MARKETS,
INSTITUTIONS
& MONEY

www.elsevier.com/locate/intfin

Volatility transmission between stock and bond markets

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Received 15 February 2004; accepted 6 January 2005

Available online 27 June 2005

Abstract

A two-factor no-arbitrage model is used to provide a theoretical link between stock and bond market volatility. While this model suggests that short-term interest rate volatility may, at least in part, drive both stock and bond market volatility, the empirical evidence suggests that past bond market volatility affects both markets and feeds back into short-term yield volatility. The empirical modelling goes on to examine the (time-varying) correlation structure between volatility in the stock and bond markets and finds that the sign of this correlation has reversed over the last 20 years. This has important implications for portfolio selection in financial markets.

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JEL classification: G13; G15; C22

Keywords: Bond; Volatility; Correlation

1. Introduction

The world-wide downturn in equity prices in October 1987 focussed academic and practitioner attention on to the international transmission of financial market volatility. It was clear at that time that shocks were being transmitted around the global trading system. Evidence of an international volatility contagion effect was documented by [King and Wadhvani](#)

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(1990), who found that the correlation between market movements in different countries and general levels of volatility were positively related. Understanding the nature of linkages between financial markets, whether intra- or international, is fundamental to establishing the limits of diversification, to security pricing, and to successful asset allocation. While there is a large literature examining the international transmission of equity market volatility, and a growing literature examining the international transmission of bond market volatility, there are relatively few intra-national studies, and then usually within one asset class. By contrast, this study aims to explore the intra-national transmission of volatility between short-term risk-free yields, long-term bond yields and equity returns in the UK.

During the period immediately following the 1987 equity market crash, the flow of investment funds out of the equity market and into the gilt-edged market was substantial. The *Stock Exchange* (1988) reported that gilt-edged market average customer turnover reached a record £3114 million per day during November 1987, following the record average customer turnover of £1342 million per day during October 1987 in the equity market. In fact, during the second quarter of 1987, gilt-edged market turnover had declined. It was not until 1993, that turnover in either of the markets reached the levels observed during 1987. Indeed, during the intervening period, total average daily turnover values in each of the markets have been around one half of the levels experienced in the immediate post-crash period, see *Stock Exchange* (1994).

Over the period October 1 to November 30, 1987, prices in the equity market fell at an annualised rate of nearly 600%, while prices in the gilt-edged market rose at an annualised rate of nearly 40%. These observations and the Exchange's report on turnover activity suggested a clear link between the behaviour of the two markets at that time. The more recent Asian crisis in global financial markets during the late Nineties had a similar impact in the gilt-edged market; *Steeley and Ahmad* (2002) document the empirical effects of the gilt-edged market becoming a safe-haven for international capital during this period. While these are both "headline" market events, the long term nature of any relationships between the behaviour of prices and returns in the two markets over a longer time span has not received the same attention. In particular, there has been no systematic documentation of the relationship between return volatility in the two markets. It is the aim of this study to examine the nature of the dynamic relationships between equity and bond price movements both in theory and practice in the UK, with particular reference to the time series behaviour of the processes capturing the volatility in each of the two markets.

A number of studies have examined the interdependence of equity market volatility, typically using the framework of generalised autoregressive conditional heteroscedasticity (GARCH) time series models, for example, *Hamao et al.* (1990) and *Koutmos and Booth* (1995). *Hamao et al.* (1990) discovered that shocks to the volatility of financial market returns in one country could influence both the conditional volatility and the conditional mean of the returns in another country, while *Koutmos and Booth* observed asymmetric volatility relations between the financial markets of the USA, the UK and Japan, where the influence of negative shocks was different in both scale and direction to positive shocks. This kind of volatility asymmetry has become known as the "leverage effect" (*Black* (1976) and *Christie* (1982)), since an increase in a firm's debt to equity ratio will lead to both an

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