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Stock market interdependence, contagion, and the U.S. financial crisis: The case of emerging and frontier markets[☆]

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ABSTRACT

This paper examines transmission of shocks between the U.S. and foreign markets to delineate interdependence from contagion of the U.S. financial crisis by constructing shock models for partially overlapping and non-overlapping markets. There exists important bi-directional, yet asymmetric, interdependence and contagion in emerging markets, with important regional variations. Interdependence is driven more by U.S. shocks, while contagion is driven more by emerging market shocks. Frontier markets also exhibit interdependence and contagion to U.S. shocks. Except for Latin America, there is no contagion from U.S. to emerging markets. But there is contagion from emerging markets to the U.S.

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1. Introduction

The recent U.S. financial crisis, particularly the severity with which it gripped the markets and economies around the world, was one of the most unanticipated and tumultuous economic events in the recent history. The decline in the U.S. stock market began in late 2007, which was quickly followed by declines in both emerging and frontier markets. During the most turbulent episode of the meltdown

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that lasted for about 6 months from September 2008 to early March 2009, the U.S. stock market plummeted by 43%, the emerging markets by 50%, and frontier markets by 60%. Do these declines in stock markets around the world during the U.S. financial crisis provide evidence of contagion? If contagion exists during the U.S. crisis, then what is the magnitude of such contagion? How is the contagion during this crisis period different from the transmission of shocks during relatively tranquil periods? The motivation of this paper is to answer these questions by investigating the propagation of return shocks between the U.S. and emerging and frontier stock markets.

To answer these questions, this paper develops a framework for estimating the impact of shocks during normal times, i.e. interdependence, and the impact during crisis, i.e. contagion, and implements the models using a comprehensive sample of emerging and frontier markets. The methodology of this paper proceeds as follows. First, unexpected returns or return shocks are calculated by specifying an autoregressive model of returns allowing for time-variation of expected returns for the U.S. market and for each emerging and frontier market studied. Second, U.S. return shocks are related to return shocks in another market, and vice versa, employing the vector auto regressions (VAR) framework. To accommodate differences in trading hours across markets, stock markets are classified into two groups as partially overlapping and non-overlapping markets. Accordingly, two separate shock models, called partially overlapping shock model and non-overlapping shock model, are developed for each market type. In the two models, the interdependence is captured by the coefficient on shocks, and the contagion is measured by the interaction of the U.S. crisis dummy with return shocks. The models are estimated using daily index returns data for 62 stock markets for period from 2000 to 2009.

This paper contributes to the literature in a number of important ways. The first major contribution is to develop a straightforward framework for distinguishing between cross-market interdependence and contagion. Unlike most previous studies, cross-market interdependence and contagion is framed on the basis of time-varying return shocks rather than correlation or volatility. The relation between return shocks of one market with another is formulated using the VAR methodology with particular consideration of the differences in trading hours across markets and the need to distinguish between interdependence and contagion. The resulting two models – partially overlapping and non-overlapping shock models – allow for a clear separation of the transmission of shocks during times of stability vs. crisis, enabling a complete understanding of the propagation of shocks in international markets.

The second major contribution of this paper is to provide empirical evidence on the degree of interdependence and contagion between the U.S. and emerging and frontier markets during the U.S. financial crisis. Different from most previous work, interdependence and contagion due to shocks from the U.S. to emerging and frontier markets as well as contagion due to shocks from emerging to the U.S. are investigated. There is very little published work that examines the issue of interdependence and contagion associated return shocks generated during the U.S. financial crisis in international markets. Particularly important is the study of emerging and frontier markets, which have become an increasingly important asset class for investors in international portfolio diversification.

The rest of this paper is organized as follows. Section 2 provides an overview of related literature. Section 3 presents data and summary statistics. Section 4 outlines the methodology. The empirical results are discussed in Section 5. Section 6 provides the summary and conclusions.

2. Overview of related literature

One approach used in the previous literature to study contagion is to estimate cross-market correlations between stable vs. crisis periods. An increase in correlation during a crisis relative to a stable period is interpreted as evidence of contagion (for example, King and Wadhvani, 1990; Lee and Kim, 1993). These studies find considerable evidence of increases in cross-market correlations during relatively more volatile periods, suggesting contagion. However, some argue that the heteroscedasticity problem caused by an increase in market volatility during crisis periods biases estimated correlations (Forbes and Rigobon, 2002), contagion must involve a dynamic increase in return correlations (Pesaran and Pick, 2007), and that there exists an omitted variable problem in the estimation of cross-country

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