Economic Modelling 58 (2016) 219–226

Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/ecmod

Evidence of cross-asset contagion in U.S. markets

Guang-Di Chang *, Po-Ching Cheng

Graduate Institute of Finance, National Taiwan University of Science and Technology, 43 Keelung Rd, Sec. 4, Taipei, 106, Taiwan

ARTICLE INFO

Article history:
Received 25 August 2015
Received in revised form 15 May 2016
Accepted 17 May 2016
Available online 16 June 2016

JEL classifications:
C58
G01
G11

Keywords:
Contagion
REIT
Granger causality test
Diversification
Subprime crisis
European sovereign debt crisis

ABSTRACT

This study examines evidence of cross-asset contagion among REIT, money, stock, bond, and currency markets in the US from 2006 to 2012, which covers the subprime and European sovereign debt crisis. We apply the Granger causality test and a vector auto-regression to examine the change of causality structure. Our results show that contagion exists from medium-term bond markets to equity markets; REIT, money markets and short-term bond markets show little evidence of cross-asset contagion with other markets; and the currency market shows high co-movement and contagion with equity markets. Our findings provide more rewarding asset reallocating strategies for the investors who invest in both bond and equity markets before a crisis to consider reallocating their portfolio into REIT and money markets to benefit from diversification during a crisis period.

1. Introduction

This study examines the effectiveness of domestic diversification by testing for evidence of cross-asset contagion among real estate investment trusts (REIT), money, stock, bond, and currency markets, which are the main investment segments of investors' portfolio in any country. Our goal is to pinpoint the causality of a crisis transmission and its mechanisms to help domestic investors efficiently allocate their assets in a crisis.

Most previous studies focus on cross-border contagion (e.g., Caporale et al., 2005; Dungey et al., 2006; Gray, 2009; Matei, 2010) or cross-border and cross-asset contagion between different countries (Hartmann et al., 2004; Baur and Lucey, 2009; Baur, 2010). Studies associated with cross-asset contagion within a country are relatively few and quite recent. Also, prior literature usually tests only two of the five asset segments addressed in this research. For example, most studies of cross-asset contagion focus on the interaction of stocks and bonds (Baur and Lucey, 2009; Baur, 2010; Longstaff, 2010), stocks and currency (Hegerty, 2012), or stocks and REITs (Nneji et al., 2013); only a few focus on the stock–REIT–credit default swap–energy markets (Guo et al., 2011) or other such combinations.

Our study adds to the literature in at least two ways. First, unlike prior studies, we test contagion of 12 financial products in five kinds of assets, which implies more potential choices of asset reallocation for diversification. We choose the five assets that are most essential, available, and common to investors' portfolios; these assets are also most commonly adopted in previous studies. Second, our sample period of 2006 to 2012 includes the subprime crisis of 2007 and the European sovereign debt crisis of 2009. Thus, we can examine whether contagion from the real estate market (in this case, the REIT market), which is assumed to be the originator of the subprime crisis, spreads to other main financial markets within a country and whether the European sovereign debt crisis changes the structure of causality in the subprime crisis.

We investigate contagion between five domestic markets—REITs, bond, equity, money, and currency—using the Granger's (1969) causality test and a vector auto-regression (VAR) method. These tests indicate whether Y market has more explanatory power to influence X market after a crisis and straightforwardly examine the contagion by the change of the causality structure. We separate the sample period into six subsample periods to compare the causality structure before and after the two crises. We use local currency to account for the daily market data for the United States, which has the largest REIT market in the world, to avoid currency risk and to avoid the loss of important signs of contagion, which may occur within a few days.

Our results provide several key findings. First, the currency market and the medium-term bond market are the origin of contagion to the equity rather than REIT market in the United States during the two crisis periods. Second, money markets and short-term bond markets show little evidence of cross-asset contagion with other markets. Finally, the

* Corresponding author.
E-mail address: gchang@mail.ntust.edu.tw (G.-D. Chang).

http://dx.doi.org/10.1016/j.econmod.2016.05.014

currency market shows evidence of significant Granger causality from equity both before and after the two crisis periods. Therefore, investors should consider reallocating their portfolios into money markets and short-term bond markets to benefits from diversification. However, holding U.S. dollars and equity at the same time is not beneficial.

The remainder of this study is structured as follows. Section 2 reviews the empirical literature concerning contagion in financial asset returns. Section 3 describes the approaches used to test the evidence for contagion. Section 4 provides the data set and empirical results. Finally, Section 5 concludes this study by summarizing the main findings.

2. Literature review

According to Forbes and Rigobon's (2001) definition, contagion is the change in the risk transmission mechanisms that occurs during a period of turmoil. Contagion can also be defined as a significant increase in the cross-asset or cross-border (cross-market) linkages after a shock. Therefore, even if two markets show a high degree of co-movement during a period of stability, contagion does not exist if the cross-market linkages do not significantly increase after the shock.

The channels of contagion can be classified into two categories (Glick and Rose, 1999; Dornbusch et al., 2000; Collins and Biekpe, 2003; Caporale et al., 2005; Dungey et al., 2006; Hegerty, 2012; Nneji et al., 2013). Dornbusch et al. (2000) conclude that the first channel is the real linkages such as trade, financial, and political links between markets. The second channel is the change in investor behavior, which is a nonfundamental factor between two independent markets. Changes in investor behavior can have several causes. First, investors with herd behavior may review bad information on robust markets without any new information because of the information asymmetric. Second, two markets may drop together when investors withdraw their money in robust markets to maintain the liquidity of their portfolios. Finally, most institutional investors reallocate their assets to maintain specific restrictions based on the law or contracts, such as the cap and floor of investing specific asset classes and the fixed percentage of asset allocation.

Previous literature focuses on cross-asset and cross-border contagion using four methods: (i) correlation of asset prices; (ii) conditional probability of currency crises; (iii) volatility changes; and (iv) co-movements of capital flows and rates of return. The correlation coefficient analysis employed by the first method (Forbes and Rigobon, 2002; Hon et al., 2004; Pretorius and de Beer, 2004; Syllignakis and Kouretas, 2011; Chang and Chen, 2014) has a statistical bias due to the omitted variables, endogeneity, and heteroscedasticity. In addition, specifying the origin and receiver of contagion and the influence of propagation of shocks over time is difficult using this method. Although Forbes and Rigobon (2002) use an adjusted (unconditional) correlation coefficient analysis to eliminate the bias of heteroscedasticity, the assumption of no omitted variables and endogeneity still influence the empirical results. Prior research seldom uses the conditional probability of currency crises and volatility changes methods.

We use the co-movements of capital flows and rates of return by employing the Granger causality test within a VAR framework, which is widely used in previous literature (Collins and Biekpe, 2003; Sander and Kleimeier, 2003; Bodart and Candelon, 2009; Gray, 2009; Baur, 2010; Longstaff, 2010; Matei, 2010; Hegerty, 2012). Bodart and Candelon (2009) find three advantages to this method. First, the Granger causality test is based on the dynamic framework (VAR), which can explain the lead–lag relation by the significant level of parameters in the model during a crisis period. Second, if the VAR framework is correctly specified, our approach is free from the omitted variable problem that occurs in research using a contemporaneous correlation. Third, causality allows for the asymmetric dimension of contagion. By changing the causality structure, Matei (2010) examines the contagion phenomenon during the subprime crisis for seven European Union and non-European Union countries and applies a Granger causality/vector error correction model method on sovereign bond spreads as a measure of perceived country risk. Matei finds evidence of contagion of sovereign bond spreads from Germany to Finland and Japan, Finland to Portugal, France to Portugal and Japan, and England to Portugal and Japan during the subprime crisis. Gray (2009) examines whether the contagion of the banking crisis in the United States and western Europe in August 2007 spills over to the currencies of Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slovakia, and the Euro zone. Before August 2007, no Granger-causality exists between these eight European Union zones. Gray (2009) concludes that the contagion of currency occurs from Poland and Hungary to six other zones with evidence of significant Granger-causality from August 2007 to October 2008.

Most of previous studies on contagion investigate cross-border contagion related to globalization and the increasing number of global institutional investors who focus on a specific kind of asset such as global bond funds, global world equity funds, or money market funds. Most studies find that the benefits of international diversification prior to a crisis are greatly reduced during a crisis when cross-border contagion occurs because the markets drop together with significant co-movement after a crisis period (Caporale et al., 2005; Bond et al., 2006; Dungey et al., 2006; Haile and Pozo, 2008; Bacchiocchi and Bevilacqua, 2009; Chang and Chen, 2014; Gorea and Radev, 2014; Morales and Andreosso-O'Callaghan, 2014). For example, Bond et al. (2006) test the contagion across the REITs markets of major developed economies during the Asian crisis. They find evidence that the Hong Kong real estate market is the originator of contagion and Australia, the United States, Singapore, and Japan are the receivers of contagion over this period. Chang and Chen (2014) expand the study of cross-border contagion between global REIT market during the 2007–2009 global financial crisis with the daily REIT indices for 16 countries. They assume that the U.S. market is the origin of contagion and, using a correlation analysis, find significant evidence of contagion from the United States to Singapore, Malaysia, Taiwan, and New Zealand. However, Baur (2010) argues that few studies focus on cross-asset or cross-border contagion. Therefore, he analyzes and compares the relation of cross-country and cross-asset linkages between global equity and bond markets using daily continuously compounded MSCI stock and bond index returns from the United States, the United Kingdom, Germany, France, Italy, Australia, Canada, and Japan from January 1994 until September 2006. Baur separates the sample period into 26 subperiods. He finds that few causality effects exist from bond to stock markets or from stock to bond markets in several subperiods; the U.S. stock and bond markets affect foreign stock and bond markets, respectively; and the influence of the U.S. stock and bond markets increases for all countries and dominates other influences such as the effects of a country's own stock or bond markets. Baur concludes that the benefits of cross-asset diversification outperform those of cross-country diversification because the correlations of cross-asset portfolios are lower than those of cross-country portfolios in those subperiods.

Most of the few studies that examine cross-asset contagion provide limited benefits to the domestic investors in terms of diversification and asset reallocation because they only examine the interaction of two or three kinds of assets, such as stocks and bonds (Hartmann et al., 2004; Baur and Lucey, 2009; Baur, 2010), stocks and currency (Hegerty, 2012), and stocks, REITs, and real estate (Nneji et al., 2013), which are the main investment segments for most investors' portfolios. For example, Baur and Lucey (2009) examine flight to quality and flight from quality and reject the existence of contagion between stock and bond markets within a country and cross-asset contagion of stock and bond investment in six crises from January 1994 to December 2006. They only find direct evidence of stock–bond contagion in the United States, Australia, and Italy after the September 11, 2001 crisis. Nevertheless, most countries experience flight from quality, such as during the Enron crisis (December. 2001), and flight to quality, such as during the Russia crisis (August 1998), which indicates the benefits of the domestic diversification. Nneji et al. (2013) use a regime-switching bubble model of returns to