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Volatility spillover dynamics and relationship across G7 financial markets



Kim Hiang Liow*

Department of Real Estate, National University of Singapore, 4 Architecture Drive, Singapore 117566, Singapore

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ABSTRACT

This paper examines conditional volatility spillovers among five major asset classes (public real estate, stock, bond, money and currency) domestically and internationally in G7 countries from January 1997 to December 2013, utilizing the generalized spillover framework of [Diebold and Yilmaz \(2012\)](#). Results indicate that the extent of cross-asset volatility spillovers within each G7 country is low. Volatility persistence is dominant in all domestic asset markets. The main contributor to the total volatility spillovers is the general equity portfolio. Evidence of co-integration among the volatility spillover cycles implies the presence of unobserved common shocks. Finally, the co-movements between the spillover cycles of domestic business cycle fluctuations and financial/asset market return volatility cycles are correlated, but in different manner according to the frequencies considered. These empirical findings provide fresh insights in cross-asset and cross-market volatility spillovers for central bank policy makers, as well as risk management and portfolio diversification for international investors.

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1. Introduction

This study examines conditional volatility spillovers across five major asset classes (public real estate, general equity, bond, money and currency/foreign exchange) domestically and internationally

* Tel.: +65 65163420; fax: +65 67768684.

E-mail address: rstkh@nus.edu.sg

in G7 countries over the period from January 1997 to December 2013. With international financial markets become more correlated and connected than ever before, an in-depth understanding of the nature, intensity and variations in cross-market volatility transmission over time provides useful information regarding market/asset interdependence dynamics for investors, financial institutions and policy makers (Boubaker & Jouini, 2014; Majdoub & Mansour, 2014). It is also of great importance in portfolio diversification and volatility forecasting. One can also infer from such analysis which asset class/market is the most influential in transmitting volatilities to other domestic asset classes and to other markets in international investing (Liow, 2013). Moreover, the Asian financial crisis of 1997–1999 and the subprime mortgage/global financial crisis of 2007–2009 indicated that volatility spillovers could be widespread across countries during turmoil periods (Yamamoto, 2014; Zhang, Li, & Yu, 2013). Finally, the inclusion of public real estate in this study reflects the increasing important role of this new “asset” class in domestic and international financial markets and reinforces the contribution of our work.

Applying the newly generalized version of the spillover index of Diebold and Yilmaz (2012), we examine the volatility spillover effects across the G7 mixed-asset classes, grouped by Euro (EURO) and Non-Euro (NEURO) areas. This regional-based classification allows us to characterize and measure cross-portfolio volatility linkages (within EURO, within NEURO, as well as between EURO and NEURO areas) in asset pricing through applying the conditional volatility spillover index methodology. A volatility spillover index is defined as share of total return variability in one asset/market attributable to volatility surprises in another asset/market (Diebold & Yilmaz, 2012). We also model volatility spillovers across the five asset classes in each G7 country (domestic volatility spillovers), as well as volatility spillovers across the G7 countries for individual asset classes (international spillovers in single asset class). The generalized spillover approach produces variance decompositions which are insensitive to the variable ordering by allowing correlated shocks and using the historically observed distribution of the errors to account for the shocks, and thus represent a significant improvement over the traditional Cholesky-factor identification of vector autoregressive regression (VAR) (Gaspar, 2012). Moreover, as pointed out by Yilmaz (2009), since the spillover index is based on a multivariate VAR it can be better utilized to capture the increased co-movement of economic growth and financial market volatility fluctuations in more than two countries compared to an analysis based on bivariate correlation coefficients.

Additionally, the generalized spillover approach treats the rolling (time-varying) spillover index as a variable with a time series structure/evolution. As such, the time-dependent nature of the estimated spillover indices allows us to study the characteristics of volatility spillovers effects at various time horizons of economic cycle. The spillover framework is thus able to combine with recent developments in time series econometrics to provide a comprehensive analysis of the dynamic volatility co-movements domestically, regionally and globally. In view of the importance of the volatility spillover relationship, we examine whether the various markets/assets' volatility spillover cycles are co-integrated in multivariate manner. Co-integration can be used to simultaneously model long-run persistence and co-movement. The basic idea underlying our co-integration approach is also known as the “error correction mechanism - ECM” which captures the “equilibrium” relationship among the volatility spillover cycles within each of the three groups (all-asset, single-asset and domestic), as well as the dynamic adjustment toward this equilibrium when shocks occur and change it. Evidence of significant co-integration dependence across the G7 asset markets would thus imply the presence of unobserved common shocks and have implications on portfolio diversification and policy co-ordination.

Another contribution of our study is to apply the spillover index methodology to study the volatility spillover relationship of economic growth cycle among the G7 countries, as well as to examine whether there is significant dependence between the volatility spillover cycles of financial/asset markets and economic growth across G7. In contrast to many previous studies that employ time-domain approach, we investigate the extent of dependence between economic growth and financial markets at different time horizons of economic cycle using the frequency domain methodology of dynamic correlation (Croux, Forni, & Reichlin, 2001). Yilmaz (2009) has applied the spillover index methodology to study the business cycle spillover among G6 countries; however the author did not address the issue of spillover cycle dependence between business cycles and financial markets. Another notable international study by Antonakakis and Badinger (2014) examine the international business cycle transmission among 27

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