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Impact of Global Financial Crisis on stock market comovement in Europe

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Abstract

The purpose of this study is to analyze if global financial crisis had any impact on the evolution and determinants of stock market integration between developed and emerging markets of Europe. Such an analysis is throws light on the flexibility of European financial system. For this purpose, realized correlation and pooled regression is employed. The results indicate that stock market linkages strengthened during financial crisis. The three stages of crisis transmission i.e. contagion, herding and post crisis is identified in the study. Regression results indicate that during pre-crisis period, inflation rate differential drove stock market integration in Europe. However, in the post crisis period, stock market interdependence in Europe is explained liquidity. The change in determinants of stock market integration due to crisis indicates that global investors are flexible as they are able to adapt to dynamic environment.

Keywords: Emerging Markets, Asia Pacific, Stock Market Comovement.

Introduction

Stock market comovement is a matter of interest for policymakers, financial institutions, and portfolio managers. For policymakers, it entails increased vulnerability to financial crisis happening at any part of the world. For financial institutions, strong stock market comovement opens avenues to acquire foreign funds at lower costs. For portfolio managers, it implies reduced international portfolio diversification benefits. Given the importance of stock market integration for different fraternities, it is imperative to analyze evolution and determinants of stock market integration.

The literature on stock market comovement can be divided into two strands. First, studies have focused on analyzing thelong run relationship between various equity markets. For instance, Arshanapalli and Doukas (1993) find that equity markets of UK, Germany, and France are cointegrated with that of USA. Gerrits and Yuce (1999) report influence of USA on equity markets of UK, Germany, and Netherlands. Taylor and Tonks (1989), Corhay et al. (1993) and Mylonidis and Kollias (2010) find that cointegration relationship exists among major stock markets of

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Europe. According to Batareddy et al. (2012), Asian markets share cointegration relationship with the USA. The empirical results of Darrat and Zhong (2002) indicate that Japan has long run influence on Asian markets. The second strand of literature focuses on the factors that foster long run relationship between stock markets. Erb et al. (1994) find that business cycle influences correlation between stock market returns of G7 countries. Morana (2008) shows that financial integration and economic integration play an important role in influencing comovement between stock market returns of G7 countries. According to Bracker et al. (1999) bilateral import dependence, geographic distance between markets, market size differential, and time trend are the key macroeconomic factors that influence same day relationships between developed markets of UK, USA, Canada, Japan, Australia, Hong Kong, Singapore, Switzerland and Germany during 1972 to 1993. Chen and Zhang (1997) find that countries with strong economic relationships tend to have well-integrated stock markets. Wälti (2011) reveals that monetary integration strengthens stock market integration.

There is voluminous work on stock market integration in developed markets. However, researchers have not worked in emerging markets in much detail. Global investors and portfolio managers are showing increasing interest in emerging markets because of its better risk adjusted returns, good economic growth prospects and improving financial system. This calls for empirical analysis regarding integration of emerging markets with its developed counterparts as strong equity market interdependence will reduce long term international diversification benefits. Further, after the 1930s Great Depression, the 2008-2009 Global Financial Crisis (GFC) is considered as world's worst economic downturn. Equity markets across the world reeled under its adverse impact. According to Sushil (2012) firms must always look for innovative strategies in chaotic business environment. As GFC instilled chaos and uncertainty in financial systems across the world, it is important to analyze the impact of GFC not only on the degree of comovement between different equity markets but also on the factors that foster such comovement. Such an analysis will reflect if European financial system were flexible in responding to the dynamics injected by such a grave crisis.

This study addresses the above issues and examines how GFC influenced stock market integration between developed and emerging markets in Europe. It also assesses if the determinants of stock market comovement have changed post global financial crisis.Rest of the paper is organized as follows. Section 2 details the data and methodology. Section 3 presents the empirical results. Section 4 discusses the results and provides concluding observations.

Data and Methodology

Table 1enlists the developed and emerging markets of Europe that are included in the study. The time period of this study is from January 2000 till 31 December 2015.

Table 1: List of equity markets and respective stock indices under study

Country	Index
Europe: Developed Markets	
United Kingdom	FTSE 100
France	CAC 40
Germany	DAX 30
Switzerland	SMI
Europe: Emerging Markets	
Czech Republic	Prague SE PX
Greece	Athex Composite
Hungary	BUX
Russia	MICEX

This study adopts atwo-stage framework. In the first stage, we understand the how stock market integration between developed and emerging markets in Europe has evolved over time using realized correlation. In the second step, we use pooled regression to identify the factors that drive stock market integration in this region. Details of these two steps are given below.

Step 1: Realized Correlation

Realized correlation is estimated by using daily stock returns. Daily stock returns are the log difference of daily stock price index. The stock price indices used in the study are expressed in local currency.

Let r_{itd} and r_{jtd} be thedaily return of market i and market j at day d in year t respectively. Annual realized variance of market i ($\sigma_{t,i}^2$) is computed by using sum of squared returns observed during the period.

$$\sigma_{t,i}^2 = \sum_{d=1}^{D_t} r_{itd}^2 \quad (1)$$

whereD_t is the number of trading days in year t. The number of years in this study is 16 (2000 till 2015). Realized variance of market j ($\sigma_{t,j}^2$)can be estimated in the same manner. Realized covariance between annual stock returns of market i and market j is computed using the following approach.

$$\sigma_{ij,t} = \sum_{d=1}^{D_t} (r_{itd} \, x r_{jtd}) \quad (2)$$

Realized variance and Realized covariance is used to compute realized correlation in the following manner

$$\rho_{ij,t} = \frac{\sigma_{ij,t}}{\sigma_{t,i}^2 x \sigma_{t,j}^2} \quad (3)$$

The estimated realized correlations are Fisher transformed so that the values range from -"till".

$$\overline{\rho_{ij,t}} = \ln\left(\frac{1+\rho_{ij,t}}{1-\rho_{ij,t}}\right) \quad (4)$$

In depth discussion on realized correlation can be found in Lee and Cho (2017).

Step 2: Pooled Regression

Pooled regression is used to identify the determinants of stock market comovement. Realized correlation is used as the dependent variable. We propose that stock market comovement can be explained by variables that proxy for economic integration and financial sector development.

To capture economic integration,macroeconomic variables like bilateral trade relationship, GDP growth rate differential and inflation rate differential are used. Paramati et al. (2016) argue that strong bilateral trade relationship encourages business cycle synchronization which in turn strengthens stock market integration. Mobarek et al. (2016) find that economies at similar levels of GDP growth rate tend to have strong stock market comovement. Pretorius (2002) maintains that economies that are homogenous in terms of inflation rates will display ahigh degree of stock market comovement. Financial sector development implies thedevelopment of equity market.

Variables like volatility ratio, stock turnover ratio differential and market capitalization to GDP ratio differential are used to capture stock market development. Time trend is also introduced in the regression model.

The above-mentioned factors are used as explanatory variables in the pooled regression model. The regression model is given below:

$$RC_{i*j,t} = \alpha + \beta_1 t + \beta_2 ECO_{ij,t} + \beta_3 FD_{ij,t} + \varepsilon_{ij,t} \quad (5)$$

where the dependent variable is realized correlationbetween markets i and j at time t, á is constant, $ECO_{ij,t}$ is the vector of variables that proxy for economic integration and $FD_{ij,t}$ is the vector of variables that capture financial sector development. To capture the impact of the global financial crisis on determinants of stock market integration, samples are divided into pre-crisis period (2000-2007) and post crisis period (2008-2015). The regression analysis as explained in equation 6 is performed on both these sub-periods.

Results

Realized Correlation

The results of realized correlation will indicate that the three phases of crisis transmission as recognized by Chiang et al. (2007) can be observed here as well. Contagion phase is the first phase in which there is a steep rise in correlations among crisis-hit markets. In the second phase of herding period, correlations are maintained at high levels asany bulletin from one market is considered as the news from the entire region. In the last phase of post crisis period, correlations fall back to pre-crisis levels. A visual examination of the data shows that the years 2008-2009, 2010-2013 and 2014-2015 can be categorized as contagion, herding, and post-crisis phase respectively. The average values of realized correlation between developed and emerging markets of Europefor each of these phases including pre-crisis phase (2000-2007) presented in Table 2. The results of Table 2 confirm the impact of the global financial crisis of stock market comovement in both the regions.

Table 2: Average Values of Realized Correlation between developed and emerging markets of Europe

Phases	Europe
Pre Crisis	0.56
Contagion	0.91
Herding	0.72
Post Crisis	0.51

Pooled Regression

Pooled regression is used to identify the determinants that drive stock market integration between developed and emerging markets in Europe. Regression results are presented in Table 3. As discussed earlier regression is performed on pre crisis and post crisis periods.

Table 3: Pooled Regression Results

Determinants	Europe	
	Pre-Crisis	Post Crisis
Trend	0.06***	-0.02***
Trade	-0.30	0.96
GDP	0.002	0.05
Inflation	0.07*	0.09
Volatility	-0.12	0.27
Stock Turnover Ratio	-0.02	-0.15**
Market Capitalization	-0.02	0.12
Intercept	0.51	2.45**
F Test	2.20**	2.52**
R^2	0.12	0.23

***,** and * indicate statistical significant at 1%, 5% and 10% respectively

The R^2 of the pre-crisis period is lower than that of post crisis period. This implies that the contribution of statistically significant determinants increased post the financial crisis. Trend and inflation are the two factors that are found to be statistically significant in the pre-crisis period. Past studies have shown that globalization and growth of information technology have improved stock market comovements. This might be the probable explanation of the positive impact of trend on stock market integration in Europe. Pretorious (2002) suggests that economies at the same level of inflation will have similar levels of discount rates. This will lead to homogeneous valuations as a result of which respective stock indices will converge. Hence as inflation rate differential between two markets reduce, their stock market comovement increases.

The determinants have changed in the post crisis period. The results surprising show the negative impact of the trend on stock market integration. This result probably reflects the fragility of markets after the financial crisis. Also, in the post crisis period inflation rate differential no longer plays a significant role. In fact, stock turnover ratio differential, which is a proxy for liquidity becomes a statistically significant factor for stock market integration in Europe. This finding indicates that the post the crisis investors became very conscious and were primarily concerned about the ease of exit from an equity market while making investment decisions.

Concluding Observation

This study investigates the impact of the global financial crisis on evolution and determinants of stock market comovement between developed and emerging markets of Europe. For this purpose, realized correlation is used to understand how stock market comovement between this market pair has evolved over the last 16 years. Pooled regression is employed to assess the impact of the global financial crisis on the determinants of stock market integration.

The results of realized correlation indicate strengthening of stock market comovement during the global financial crisis. This confirms the concept of contagion which is documented by the literature. Contagion implies that during the crisis, economic shock in one country rapidly gets transmitted to other parts of the world.

The regression results reveal that during the pre-crisis period (2000-2007), stock market comovement in Europe was primarily influenced by economic factors like inflation rate differential. However, global financial crisis altered the situation. Post crisis liquidity of stock returns became the significant determinants of stock market integration. The findings reveal that post global financial crisis, global investors paid more importance to the ease of exit from the equity markets of the European region.The change in determinants of stock market integration due to financial crisis reflect that global investors are flexible as they are able to react effectively to changing circumstances (Piore, 1998) and are able to adapt to dynamic internal and external environment (Sushil, 2001).

Findings of this study have important implications for global investors and policy makers. Investors can use the findings in designing a portfolio which provides better risk adjusted returns. Policy makers can use the findings of this study to formulate suitable economic stabilization and resource-mobilizing policies.

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