Transmission of the U.S. Subprime Crisis and the European Sovereign Debt Crisis to Emerging Markets

Abstract

This paper evaluates the transmission of the U.S. Subprime Crisis and the European Sovereign Debt Crisis to sixteen emerging markets. A GARCH model is estimated to test for the transmission of shocks across these sixteen emerging markets and compared across different sub-periods of the crises to test more explicitly for transmission effects through financial channels. The bankruptcy of Lehman Brothers and the Greek debt restructuring are used as breakpoints for these sub-periods. We find that the U.S. stock market has a significant transmission effect on emerging markets at the early stage of the crises and normal time, whether in terms of a contemporaneous day or a one-day lag time. We also find stock markets in emerging market tried to loosen their ties or reduce the connection with the Dow Jones after the bankruptcy of Lehman Brothers. Most emerging markets also attempted to moderate the effects of the crises and loosened their relationship between their local currencies and stock markets. Before the bankruptcy of the Lehman Brothers, all Asian emerging markets in our samples had already started to show significance to Spanish CDS. It is evident that the U.S. Subprime Crisis and the European Sovereign Debt Crisis had linkage. Finally, although most of the emerging markets depended on the performance of U.S. stock market on the same day and in the previous day, the decoupling phenomenon is quite obvious after the Greek debt restructuring.

JEL classification number:G10, G15

Keywords: financial crisis, emerging markets, GARCH, U.S. Subprime Crisis, European Sovereign Debt Crisis.

1. Introduction

Since the Great Depression of 1922, no other stock crises had such a significant impact on the stock market as the Subprime Mortgage Crisis in the U.S. or the European Sovereign Debt Crisis. The East Asian crisis in 1997-1998, the Russian default in 1998, and the Argentinian crisis in 2002, all showed a limited and short-term impact on stock markets. Most affected countries managed to decouple from these crises rather quickly and safely. On the contrary, the global stock and economic crisis of 2007-2013, which originated in the U.S. subprime mortgage market, triggered a severe chain reaction from the U.S. to Europe and across emerging markets (EM, hereinafter). Even the high growth rates of EM were unable to withstand the impact of such crises. The global transmission mechanism is a key factor of damage to EM.

The Subprime Mortgage Crisis in the U.S. or the European Sovereign Debt Crisis emanated from advanced economies and had a chain effect on EM, affecting EM even more seriously than advanced economies. Our interest in this topic is partly related to the widespread view that prior to these two crises, many policy makers in EM had advocated economic integration policies to their national advantages by abolishing tariffs and loosening stock restrictions to facilitate the movement of capital. As Claessens, et al. (2010) explain, although economic integration provides national benefits, it also brings significant risks. A frictionless global financial market will not bring the international risk sharing but instead, will bring about more dynamics.

This paper seeks to contribute to scant and existing studies on how transmission mechanisms work in the global stock market in several ways. First, this paper is one of the earliest attempts to investigate transmission mechanisms in emerging economies during the Subprime Mortgage Crisis and the Sovereign Debt Crisis. Second, although the financial channel is an effective transmission mechanism, there have been few attempts to establish a direct relationship between the stock markets of EM and the U.S. stock market or the Euro CDS, simultaneously. Third, this paper is an extension of ideas that builds on the work on Grammatikos & Vermeulen (2012) whose focus is on the impact of these two major crises on the EU countries, whereas in this paper we extend this study to include 16 emerging economies, which to our knowledge is an area that is rarely tapped on. Fourth, it is also one of the attempts to investigate concomitantly the impacts of these two crises on emerging markets. Existing or previous researches of recent crises deem the Subprime Mortgage Crisis and the Sovereign Debt Crisis as separate and independent events. In this paper, we argue that these two crises should not be isolated from each other and find that these two crises to be closely correlated to each other.

To do this, we use data of the U.S. and of 16 EM, the latter of which are members of the MSCI EM as of the December 2013, based on daily stock market indices. The sensitivity of stock markets in these 16 EM to both the Subprime Mortgage Crisis and to Sovereign Debt

problems as well as to exchange rate movements for the different stages of these two major crises are also investigated. By comparing different periods of time, we can test more explicitly for the transmission of the stock crises. In addition, we distinguish among different sub-periods within the stock crises, where the bankruptcy of the Lehman Brothers on September 15, 2008 and the Greek debt restructuring on March 9, 2012 are used as breakpoints.

This paper is organized as follows. Section 2 is our literature review. Section 3 covers the data, methodology and the empirical findings. Section 4 presents the conclusion.

2. Literature Review

In recent years, there has been a growing pool of literature that addresses transmission mechanisms of various financial crises. Although two transmission mechanisms identified in existing literature commonly include the real channel (Alessandria, et al. 2010; Eaton, et al. 2011; Levchenko et al. 2010) and the financial channel, the financial channel plays a more important role in recent years. Financial channels are also found to have a greater impact than real channels. Pericoli & Sbracia (2003) find the stock market and stock intermediaries to be immensely influential international transmission mechanisms. Rose & Spiegel (2010) find that transmission mechanisms through both the stock and real channels in the 2008 crisis. Four indicators are used in their study including changes in real GDP, stock market, credit rating, and exchange rate to check for international linkages. Financial channels are found to have a greater impact than real channels. Thao, et al. (2013) investigate the financial transmission in East Asian economies through equity markets including developed countries, EM and frontier markets by employing their conditional correlations based on the GARCH model. They find the transmission of Supreme Mortgage Crisis to East Asian equity markets varies over time and higher correlations to other markets in the region than U.S. Berkmen, et al. (2009) investigate the driving factors behind the disappointed forecast errors during the 2009 stock crisis. They also find that the financial channel is more important than the real channel for EM, explaining that the stock market shocks suffered by EM which possessed more leverage on domestic finance or more short-term debt, suffered more. Based on the behavior of exchange rates and events, researchers find financial transmission to be more effective. Fratzscher (2009) investigates the impact of the U.S. dollar appreciation during the U.S. stock crisis against the expectation of a weak U.S. dollar. By analyzing the transmission channel in exchange rates, they find that countries whose fundamentals and stock exposure to the U.S. to be statistically significant and economically meaningful. Dooley and Hutchison (2009) conducted an “event study” to find out how strong the Subprime Mortgage Crisis “news” transmission has on EM. They point out that financial and economic news emanating from Subprime Mortgage Crisis had a large impact on EM, statistically and economically.

The Subprime Mortgage Crisis and Sovereign Debt Crisis provide us with a perfect situation to observe the chain reaction of these two major crises and the linkages between them.

Ehrmann and Fratzscher (2004) find that the U.S. stock market can influence up to more than 25% of European Union(EU, hereinafter) economies, given any normal period. In addition, the U.S. Subprime Crisis also had a massive influence on the global economy. Toughening of the world economy and vastly reducing resources in international capitals were common measures during this period of time. Investors became more cautious and lending was also reduced, which in turn led to a decline in investment capitals. High leveraged EU countries started to face the cruel stock market environment which was when the European Sovereign Debt Crisis exploded.

Ehrmann, Fratzscher, and Mehl (2009) share with us the reasons behind the transmission and find that the degree of integration with the U.S. market is a major factor in global transmission mechanism, followed by country risk. Bussiere, et al. (2013) explains the sovereign risk by measuring the gaps between sovereign bonds in EU and pointed out that the sovereign bond spread among EU countries was quite minimal before the Subprime Mortgage Crisis, implying that sovereign bonds which were issued were considered as default-free. Thus, the sovereign default risk in EU countries is not considered an important issue. However, after the Subprime Mortgage Crisis, the increased spread of sovereign default risk in EU countries was significantly high, especially in southern EU countries. Investors became more cautious and treated sovereign default risk more seriously after the Subprime Mortgage Crisis. Obviously, the Subprime Mortgage Crisis had triggered a chain reaction in EU countries. Buessiere (2013) points out that a crisis can be an indicator as to whether a country is vulnerable or not, and that withdrawal of money from risky countries will increase risk in the future.

An increasing body of literature exists on the research of Subprime Mortgage Crisis and European Sovereign Debt Crisis. Most existing literatures treat these two major crises as independent events except for Bussiere, et al. (2013) and Grammatikos and Vermeulen (2012). This paper assumes these two crises are interdependent of each other and investigates the influences on EM by extending the model of Grammatikos and Vermeulen (2012). However, this paper differentiates from the study by Grammatikos and Vermeulen (2012) in the following manner. Firstly, we posit that since emerging countries own their own local currencies, unlike EU countries which use a common Eurodollar is their currency base, emerging countries may response differently to the these two crises from EU countries. Grammatikos and Vermeulen investigated EU Member Union using a common EU currency to measure the stock performance. They found that the relationship behind EU dollar and the stock market to be quite different over different time periods. The relationship was positive and significant between the EU dollar and stock market in times of the crises, which is different from normal time. Some of EU countries were considered vulnerable during the Sovereign Debt Crisis due to the poor economic situation in the EU and also because EU possess a common currency, retarding them from the ability to adjust ‘local’ currency to

improve their export for economic growth purposes. Poorer EU countries lost their credit in the international capital market and could not find resources to bail them out of this dilemma. Secondly, due to the progression of these two crises, this paper extends the research period to the June 30, 2013 and set the Greek debt restructuring as additional milestone in order to investigate the decoupling effect of both crises which adds to existing research.

The following section presents the data and empirical methodology through which we analyze the transmission of shocks on EM.

3. Data and Methodology

3.1. Data

The U.S. and 16 EM daily-base stock market indices are obtained from Bloomberg and C-money. Data of EM are of countries who are members of the MSCI EM as of Dec. 2013. The MSCI EM Indices were launched on Dec 31, 1987. Data prior to these launch dates is back-tested data (i.e. calculations of how the index might have performed over that time period had the index existed). The MSCI EM Index captures large and mid-cap representation across 21 EM countries with 824 constituents covering approximately 85% of the free float-adjusted market capitalization in each country

The daily-base stock market index is obtained from the Bloomberg and C-money for the U.S. and 16 EM. Data of emerging market countries is obtained from the MSCI EM Index as of the year Dec. 2013. There are a total of 21 EM in the MSCI database. However, since EM are more susceptible to macro-economic factors, we select countries whose market capitalizations are greater than 100 billion USD at the year 2012 from the World Bank database and come up with a total count of 16 countries for our research. The list of emerging market countries is listed in Appendix 1. Data on currency exchange rates and the Spanish CDS are retrieved from the Bloomberg database, too. The exchange rate is measured in U.S. dollar per unit of local currency for each respective country.

In our study, we use the definition of crises period as defined in the study by Grammatikos and Vermeulen (2012). The Subprime Mortgage Crisis began on February 27, 2007. From the timeline given by the Federal Reserve Bank of St. Louis, the beginning event of the Subprime Mortgage Crisis was when the Freddie Mac Press was released on February 27, 2007. The message was *"The Federal Home Loan Mortgage Corporation (Freddie Mac) announces that it will no longer buy the most risky subprime mortgages and mortgage-related securities"*. For the purposes of comparison between crises and normal times, the study by Grammatikos and Vermeulen (2012) choose January 1, 2003 as their beginning date of the research. Similarly, we also use January 1, 2003 as our starting date.

The milestones of the crises are prescribed as follows. The bankruptcy of the Lehman Brothers on September 15, 2008 is used as the milestone for the Subprime Mortgage Crisis by Grammatikos and Vermeulen (2012). Many existing research also use this time as a prime date including Eichengreen, et al. (2012), Dooley and Hutchison (2009), and Didier et al.

(2010). Eichengreen, et al. (2012) claim that the bankruptcy of the Lehman Brothers let investors more concretely to identify the risk in the U.S. Subprime Mortgage Crisis and the imminent effects of a global recession. In this paper, the Greek debt restructuring on March 9, 2012 is prescribed as the other milestone for the European Sovereign Debt Crisis. Zettelmeyer, et al. (2013) point out that Greek debt restructuring is historic significance in many respects: (1) a new world record of restructured volume and credit losses, (2) first major debt restructuring in Europe after World War II, and (3) a watershed event in the history of the European crisis. The time of these milestones are presented in the Figure 1.

Insert Figure 1 about here

A ten-year Spanish government bond CDS is included in the later part of this paper. The study by Grammatikos and Vermeulen (2012) use the Greek CDS in order to investigate the impact of the European Sovereign Debt Crisis on the stock markets in EM, where the Greek government bond CDS is used as a European Sovereign Debt Crisis indicator due to the public strong attention. The ending of sample period in Grammatikos and Vermeulen (2012) was as of August 31, 2010. Greece announced restructuring of its government debt with its private-sector creditors in order to secure more bail-out money on March 9, 2012. Under this restructuring program, bondholders lost 75% of their investment by writing down a 53.3% in the value of Greek bonds. As a result, the Greek market price of CDS changed dramatically. In order to avoid the dynamics of such a change, we use the ten-year Spanish government bond CDS in our paper, which also obtained strong public attention at that time.

3.2 Methodology:

Many different methodologies are often used to measure how shocks are transmitted internationally. Hamao, et al. (1990), Engle et al. (1990) suggest the GARCH method. Forbes & Rigobon (2002) suggest using the correlation model, while Bae, et al. (2003) suggest using the logit model, when dealing with daily data. Engle (2001) suggested that the GARCH (1,1) is a robust methodology when dealing with time series data that is subject to high volatility. The basic variance concept of GARCH is as follows:

$$h_t = \alpha_1 + \beta_1 h_{t-1} + \gamma_1 \varepsilon^2_{t-1}$$

Where *h* is the variance relative to a past variance and residual. GARCH (1,1) with an additional lag term can detect the speed of a message, particularly for the equity index. Thus, we use the concept of GARCH (1,1) as an additional lag term in our regression model. We formulate four equations to capture the effects and behavior during across four time periods: (1) a full period, which starts from January 1, 2003 and ends June, 30 2013, (2) crises period, which starts from February 27, 2007 and ends June 30, 2013, (3) a post-bankruptcy of the

Lehman Brothers period, which starts from September 15, 2008 and ends June 30, 2013, and finally, (4) a post-Greek debt restructuring which starts from March 12, 2012 and ends June 30, 2013.

We postulate the following equation for a full sample period from January 1, 2003 to June, 30 2013 as follows:

$$R_{j,t}=C+\alpha R_{j,t-1}+\beta_j R_{us,t}+\gamma_j R_{us,t-1}+\delta_j E_{j,t}+\varepsilon_{j,t} \quad (1)$$

Where C is a constant and $\varepsilon_{j,t}$ is a random disturbance term. All the above variables are computed using $[100*(\log(P_t)-\log(P_{t-1}))]$.

The dependent variable, $R_{j,t}$ is designed to capture the independent variables of the stock market behavior including a one-day time lag, the different time zones of the stock markets of pairing countries with the U.S, and the local currency exchange rate of return. $R_{j,t}$ denotes the stock market return in country, j, at time, t, and $R_{j,t} =100*(\log(P_t)-\log(P_{t-1}))$. $R_{j,t-1}$ is a one-day lag, t-1 return of stock market in country, j. $R_{us,t}$ is the return of the U.S. Dow Jones, at time, t. $R_{us,t-1}$ is one-day time lag, t-1, of the U.S. Dow Jones. $E_{j,t}$ is exchange rate of return which is measured in terms of the return of a U.S. dollar per unit of currency in each country, j, in time, t.

A time dummy variable is created and included in equation (2) to test for stock market behavior:

$$R_{j,t}=C+\alpha R_{j,t-1}+\beta_j R_{us,t}+\beta_j^{cris} D_j^{cris} R_{us,t}+\gamma_j R_{us,t-1}+\gamma_j^{cris} D_j^{cris} R_{us,t-1}+\delta_j E_{j,t}+\delta_j^{cris} D_j^{cris} E_{j,t}+\varepsilon_{j,t} \quad (2)$$

Where C is a constant and $\varepsilon_{j,t}$ is a random disturbance term. D_j^{cris} refers to a dummy variable which equals to 1 during the period of the crises from February 27, 2007 to June 30, 2013, or 0, if otherwise. β_j^{cris}, γ_j^{cris}, δ_j^{cris} are coefficients of the independent variables during the crises period which may postulate positive or negative values.

Applying the GARCH methodology to our regression equation, we postulate regression equation (3) that attempts to capture the transmission effects of the European Sovereign Debt Crisis during the different stages within crises. The period we use starts from February 27, 2007 which is denoted as the beginning of the crises to June 30, 2013. The Spanish CDS is used as a measurement for the European Sovereign Debt Crisis. The period after the bankruptcy of the Lehman Brothers is denoted by a dummy variable D_j^{postL}.

$$R_{j,t}=C+\alpha R_{j,t-1}+\beta_j R_{us,t}+\beta_j^{postL} D_j^{postL} R_{us,t}+\gamma_j R_{us,t-1}+\gamma_j^{postL} D_j^{postL} R_{us,t-1}+\delta_j E_{j,t}+\delta_j^{postL} D_j^{postL} E_{j,t}+ \zeta_j CDS_t+\zeta_j^{postL} D_j^{postL} CDS_t+\varepsilon_{j,t} \quad (3)$$

Where C is a constant and $\varepsilon_{j,t}$ is a random disturbance term. D_j^{postL} refers to a time dummy

variable which equals to 1 if the time is after the bankruptcy of the Lehman Brothers that is between September 15, 2008 and June 30, 2013, and 0, if otherwise. CDS_t refers to the Spanish CDS, at time, t. β_j^{postL}, γ_j^{postL}, δ_j^{postL}, ζ_j^{postL} are coefficients of the independent variables after the post Leman Brother bankruptcy periods.

In order to investigate the behavior in final stages and decoupling from the two crises, we design regression equation (4) that attempts to find the transmission phenomenon after the Greek debt restructuring. The period of regression equation (4) starts from February 27, 2007 which is denoted the beginning of the crises to June 30 2013. D_j^{postGr} is created to refer to a time dummy variable which equals to 1 if the time is after the Greek debt restructuring that is between March 12, 2012 and June 30, 2013, and 0, if otherwise. β_j^{postGr}, γ_j^{postGr}, δ_j^{postGr}, ζ_j^{postGr} are coefficients of the independent variables after the post Greek debt restructuring.

$$R_{j,t}= C+\alpha R_{j,t-1}+ \beta_j R_{us,t} +\beta_j^{postL} D_j^{postL} R_{us,t}+\beta_j^{postGr} D_j^{postGr} R_{us,t}+\gamma_j R_{us,t-1} +\gamma_j^{postL} D_j^{postL} R_{us,t-1} +\gamma_j^{postGr} D_j^{postGr} R_{us,t-1}+\delta_j E_{j,t}+\delta_j^{postL} D_j^{postL} E_{j,t}+\delta_j^{postGr} D_j^{postGr} E_{j,t}+\zeta_j CDS_t+\zeta_j^{postL} D_j^{postL} CDS_t +\zeta_j^{postGr} D_j^{postGr} CDS_t+\varepsilon_{j,t} \quad (4)$$

Where C is a constant, and $\varepsilon_{j,t}$ is a random disturbance term.

3.3. Empirical Analysis

3.3.1. The stock market

In descriptive statistics, the periods of stock crises have been divided into two major time periods: before crises and crises, to observe whether there is a difference in stock market behavior during these two time periods. Table 1 shows the stock market behavior using the means and variances, before as well as after the time of the bankruptcy of the Lehman Brothers and after the Greek debt restructuring within crises.

Insert Table 1 about here

Before the crises, all of the stock markets enjoyed an upward trend and most of stock markets of EM outperformed the Dow Jones. This pattern is consistent with the results in the study by Grammatikos & Vermeulen (2012) which also showed a positive phenomenon in the EU before the Subprime Mortgage Crisis. Between the start of crises and Lehman Brother's Bankruptcy, most of the stock markets decreased in EM, producing negative mean values except for India, South Korea, Indonesia and Brazil. After the bankruptcy of the Lehman Brothers, the stock markets of EM recovered rather soon, all of them producing positive mean average values. Our results yield a contrasting phenomenon from the study by Grammatikos & Vermeulen (2012). Most the average means for EM posed positive values during crises times. One of the explanations for such a difference may be the length of time

used in our research data. The ending period of the data used by the study by Grammatikos & Vermeulen (2012) was as of August 31, 2010, at a time when most of countries were still facing a tough economic situation. On the other hand, the ending period of our study is of June 30, 2013, at that time when most of the countries were already recovering from the financial crises.

The rate of volatility before crises was quite minimal showing that the stock markets in these EM were not so dynamic. However, the variance increased sharply during crises period. The value was sometimes greater the double variance of pre-crises, implying that there was an enormous fluctuation in the stock markets of EM during crises period. The most intensive period of volatility is different within these EM. One-half of EM experienced an intense between the start date of the crises and the bankruptcy of the Lehman Brothers. The other half experienced such intensity from the time of the bankruptcy of the Lehman Brothers to the Greek debt restructuring. After the Greek debt restructuring, the impact of the crises began to fade out, and the volatilities of EM became smaller than the pre-crises periods.

3.3.2. Exchange Rate

The variability in exchange rate of return is used to determine its susceptibility within the stages of financial crises. Table 2 shows the empirical results of the means and variances of the exchange rate movements.

Insert Table 2 about here

Before the crises, most of currencies of EM appreciated against the U.S. dollar except for Indonesia and Mexico. During the time of crises, more than half of the EM depreciated against the U.S. dollar. When we check the total reserves of each EM (measured in current USD), EM with high reserves seemed to try to depreciate their currency against the U.S. dollar, except for China and Taiwan whose country reserves were also relatively higher. This phenomenon is in line with the results of the study by Fratzscher (2009) who finds that some macroeconomic fundamentals such as foreign exchange reserves, play an important factor during a financial crisis. After the Greek debt restructuring, the currency exchange rates of all of the EM depreciated against U.S. dollar, except for China. In effect, the individual currencies in EM allowed flexibility in policies unlike the Eurodollar, and created an *EM group behavior* against the U.S. dollar.

The volatility of the currency exchange rate of return for EM is rather similar to that of the stock market. Before crises, there is a low volatility in the exchange rate of return in these EM. More dynamic fluctuations in currency exchange rates returns are apparent for all EM in crises. The intensive period of volatility in most countries is the period after the bankruptcy of the Lehman Brothers to Greek debt restructuring while stock market happened before Lehman Brother corruption in crises. In the study by Grammatikos & Vermeulen (2012) uses

only one common currency: the Eurodollar. In our study, each emerging country has its own unique currency in which individual governments had more control over their local currencies compared to the countries in the EU, in times of crises.

3.3.3. Empirical Results

Table 3 shows the results of our regression equation (2) with respect to the return of the stock market index of each emerging country.

Insert Table 3 about here

The first coefficient is the one-day time lag which denoted the return of local stock market in the previous day. The values of the coefficients in each country provide us some phenomenon. The positive value means return of stock market in these countries had positive persistent with the stock market in previous day. Those countries will have the significant trends of stock markets, such as Malaysia, Indonesia, Philippines, Mexico, Chile, and Columbia. Countries with negative values, such as China, South Korea, Turkey, and South Africa are few. The value of the negative coefficient indicates a good day is pursued by a poor day.

The second item is the contemporaneous impact of the U.S. Dow Jones Index. All the coefficients of the EM yield positive and significant results except for the Philippines. Referencing for the fourth item which is the one-day lag return of Dow Jones, we also can find most of EM are significantly positive, except for China. Overall, the U.S. stock market has a significant influence on EM, consistent with the findings of Grammatikos and Vermeulen (2012), the EU stock market whether it is in terms of a contemporaneous day or a one-day lag time. During the time of the crises, most of countries loosened their ties or reduced their connections with the same day of Dow Jones and with the one-day lag of Dow Jones. It could be the reasons that the striking and deeply lost in emerging stock market at the early stage of crises or the better-than-expectation recovery of U.S. stock market at the later stage of crises to break the close relationship.

The behavior of the currency exchange rate yields similar trends as the stock market in the previous section. Normally, most of local currencies return of EM yield positive and significant results with respect to their local stock markets, implying that an appreciation of a local currency in an emerging country against U.S. dollar will bring the upward movement in the stock market, and vice versa. Only South Africa yields significant negative coefficient. However, during the time of crises, six EM yielded significantly negative relationship with respect to exchange rate of return, such Indonesia, Philippines, Brazil, Mexico, Columbia, and Turkey.

The currency behavior of EM is different from that of EU countries. Most of local currencies of the EU countries yield a significantly negative relationship against the U.S. dollar during most of the time, but changed to a positive relationship during the crises. The rather stagnant

Eurodollar cannot effectively reflect the economic variability faced in each EU country. For example, an appreciation of Eurodollar does not necessarily reflect the increase in wealth of each EU country. On the contrary to the Eurodollar, the local currencies of each EM possesses its unique mechanisms that is able to more accurately reflect the macroeconomic factors such as growth in gross domestic product (GDP) and exports.

3.3.4. After The bankruptcy of the Lehman Brothers and Sovereign Debt Crisis

When we investigate the behavior of the Subprime Mortgage Crisis more closely, the phenomenon after the bankruptcy of the Lehman Brothers during the period of crises appears to be quite different as shown in Table 4. In the early stages of the Subprime Mortgage Crisis, there appears to be a strong correlation with the Dow Jones before the bankruptcy of the Lehman Brothers. However, this relationship begins to diminish when the Lehman Brothers claimed bankruptcy. A one-day lag time in the Dow Jones yield the same results. Most of the EM still depends on the performance of U.S. stock market of the previous day during the early stages of the crises. Therefore, all the EM have significant and hold positive coefficients to this one-day lag time on the Dow Jones. However, after the bankruptcy of the Lehman Brothers, such a relationship grows weaker rather dynamically. All the coefficients of the EM changed to either insignificance or negative significance. Such a phenomenon implies huge revisions in the behavior of the stock market behavior during the crises.

Exchange rate of return shows quite an interesting issue. There is a significant and positive relationship with local stock market at the early stage of the crises, but this shifted significantly to either a negative level for Malaysia, Indonesia, Brazil, Mexico, Russia and Turkey or an insignificant level for the remaining countries with the exceptions of Columbia and Thailand which maintained positive relationship at that time.

The CDS behavior also presented an interesting phenomenon. Before the bankruptcy of the Lehman Brothers, the CDS started to impact the performances of the stock markets of all Asian EM in our sample. Asian EM showed a negative and significant relationship with the stock market. After the bankruptcy of the Lehman Brothers, Asian EM originally with negative coefficients turned either significantly positive or insignificant. On the contrary, Russia, Poland, Turkey, and South Africa started to present significant negative relationships after the bankruptcy of the Lehman Brothers. Other countries maintained an insignificant relationship within these different stages. These results are somewhat different shown in the study by Grammatikos & Vermeulen (2012) which shows a significant negative relationship between stock return and CDS after the bankruptcy of the Lehman Brothers.

Insert Table 4 about here

3.3.5 Decoupling from the Crises

Although most of the EM depended on the performance of U.S. stock market on the same day

and in the previous day, the decoupling phenomenon is quite obvious during crises. As shown in Table 5, 15 out of the 16 countries showed a significantly positive relationship to the Dow Jones on a contemporaneous day before the bankruptcy of the Lehman Brothers. However, after the bankruptcy of the Lehman Brothers only five countries are significantly and positively influenced by the Dow Jones. After the Greek debt restructuring, only Columbia was significantly and positively influenced by the Dow Jones.

The one-day lag time on the Dow Jones before the bankruptcy of the Lehman Brothers also showed the similar trends, with all 16 EM showing significant and positive coefficients. After the bankruptcy of the Lehman Brothers, none of the EM kept a significantly positive relationship with the one-day lag time on the Dow Jones. On the contrary, 11 countries turned into significantly negative relationships. Even after the Greek debt restructuring only South Korea shifted back to a significant positive relationship on the one-day lag time on the Dow Jones.

The behavior of the currency exchange rate of returns had similar trends to stock market. There are 13 countries whose exchange rate returns keep the significant and positive with local stock market returns. There are only 3 countries left after the bankruptcy of the Lehman Brothers and 2 countries left after Greek debt restructuring.

The impact of CDS, a measurement for the European Sovereign Debt Crisis, on the performance of the stock markets also has the similar phenomenon. We can find stock markets of 8 countries have significant and negative relationship with CDS within before the bankruptcy of the Lehman Brothers. 7 out of these 8 countries quickly shifted to a significantly positive relationship and 1 country, shifted to an insignificantly positive relationship with the CDS after the bankruptcy of the Lehman Brothers. At the same time period, there are 5 other stock markets that started to show significant and negative relationships with CDS. However, after the Greek debt restructuring, no stock markets show any significant and negative relationship with CDS. The influence of European Sovereign Debt Crisis fades so quickly after Greek debt restructuring; thus, the transmission effect of CDS disappears.

Insert Table 5 about here

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4. Conclusion

Generally, the influence of U.S. stock market plays an important role in the stock markets of EM. We find the U.S. stock market has a significant transmission effect on EM at the early stage of the crises, whether in terms of a contemporaneous day or a one-day lag time. We also find the stock markets tried to loosen their ties or reduce the connection with the Dow Jones

during the time of the crises. It is usually quite common to find local currencies of most EM to yield positive and significant relationships with respect to their local stock markets. However, what we find is that some EM attempted to moderate the effects of the crises and loosened the relationship between their local currencies and the stock market.

When the Lehman Brother's claimed bankruptcy, the strong correlation with the Dow Jones began to diminish. The bankruptcy of the Lehman Brothers on September 15, 2008 is an important milestone which presents a huge revisions behavior of the stock market within Crisis. From the CDS behavior, we can find that before the bankruptcy of the Lehman Brothers, some EM had started to show a relationship to Spanish CDS. It is also evident that the Subprime Mortgage Crisis in the U.S. and the European Sovereign Debt Crisis in the EU had strong linkage.

After the restructuring of the Greek debt, the decoupling effects with the Dow Jones and CDS appeared to be rather obvious. Only one country had a significantly positive relationship with Dow Jones on a contemporaneous day or at a one-day lag time. After the Greek debt restructuring, the CDS faded faster than expected. All above phenomenon presents a fading of transmission effects, which decoupled the influence with the U.S. and the EU.

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Table 1: Descriptive Statistics of Daily Stock Market Returns

Region		Country	Mean						Variance					
			Full sample period	Before-Crises	Crises Period				Full sample period	Before-Crises	Crises Period			
				Full sub-period	Full sub-period	Before Lehman Bankruptcy	From Lehman Bankruptcy to Greek Debt Restructuring	After Greek Debt Restructuring		Full sub-period	Full sub-period	Before Lehman Bankruptcy	From Lehman Bankruptcy to Greek Debt Restructuring	After Greek Debt Restructuring
Emerging Market	Asia	China	0.0073	0.0381	-0.0127	-0.0449	0.0086	-0.0307	0.5589	0.3696	0.6802	1.2726	0.5690	0.2519
		India	0.0305	0.0615	0.0101	0.0030	0.0117	0.0144	0.5107	0.3832	0.5935	0.8269	0.6521	0.1583
		South Korea	0.0188	0.0372	0.0068	0.0006	0.0161	-0.0112	0.4350	0.3572	0.4852	0.4822	0.6048	0.1659
		Taiwan	0.0101	0.0248	0.0006	-0.0265	0.0126	0.0008	0.3577	0.2802	0.4081	0.5296	0.4443	0.1644
		Malaysia	0.0181	0.0311	0.0096	-0.0232	0.0218	0.0165	0.1220	0.0792	0.1498	0.2908	0.1219	0.0536
		Indonesia	0.0436	0.0662	0.0289	0.0013	0.0421	0.0267	0.4249	0.3116	0.4980	0.6177	0.5606	0.1891
		Thailand	0.0251	0.0301	0.0219	-0.0065	0.0305	0.0321	0.3875	0.3507	0.4118	0.3482	0.5177	0.2054
		Philippines	0.0326	0.0535	0.0188	-0.0290	0.0327	0.0373	0.3601	0.2676	0.4205	0.5189	0.4277	0.2808
	Americas	Brazil	0.0245	0.0609	0.0008	0.0147	0.0126	-0.0482	0.6505	0.5110	0.7403	0.6867	0.9076	0.3508
		Mexico	0.0321	0.0652	0.0105	-0.0124	0.0199	0.0104	0.3341	0.2400	0.3946	0.3677	0.5059	0.1269
		Chile	0.0240	0.0461	0.0097	-0.0018	0.0242	-0.0162	0.2140	0.1296	0.2688	0.3126	0.3142	0.0916
		Columbia	0.0367	0.0834	0.0062	-0.0074	0.0228	-0.0229	0.3840	0.5271	0.2887	0.3211	0.3195	0.1649
	Europe, Middle East , and Africa	Russia	0.0225	0.0766	-0.0126	-0.0455	0.0117	-0.0387	0.9817	0.6478	1.1957	0.6255	1.7220	0.4647
		Poland	0.0194	0.0584	-0.0060	-0.0404	0.0027	0.0114	0.3415	0.2411	0.4057	0.3898	0.5020	0.1621
		Turkey	0.0341	0.0624	0.0159	-0.0186	0.0244	0.0350	0.7006	0.7459	0.6711	0.7845	0.7212	0.4012
		South Africa	0.0249	0.0465	0.0109	-0.0034	0.0134	0.0281	0.3190	0.2223	0.3816	0.4212	0.4570	0.1003
U.S.		Dow Jones	0.0097	0.0175	0.0046	-0.0113	0.0068	0.0194	0.2695	0.1087	0.3742	0.2510	0.5258	0.1095
Europe		STOXX 50	0.0014	0.0246	-0.0136	-0.0297	-0.0126	0.0046	0.4255	0.2367	0.5479	0.3261	0.7320	0.3140

Note: This table presents descriptive statistics (means and variances) for the daily stock market returns of the 16 EM. The full sample period is from January 1, 2003 to June 30, 2013. The full sample period is then divided two sub-periods: before crises and during the period of crises. The full sub-period before these crises begins on January 1, 2003 and ends 26 February, 2007. The period of crises is from 27 February, 2007 to June 30, 2013. The period of crises is divided three periods: (1) before the bankruptcy of the Lehman Brothers, (2) from the time of the bankruptcy of the Lehman Brothers to the Greek debt restructuring, and (3) after the Greek debt restructuring. All the above daily stock market returns are computed using $[100 * (\log(P_t)-\log(P_{t-1}))]$

Table 2: Descriptive Statistics of Daily Currency Exchange Rates of Return

Country	Mean						Variance					
	Full sample period	Before-Crises	Crises Period				Full sample period	Before-Crises	Crises Period			
		Full sub-period	Full sub-period	Before Lehman Bankruptcy	From Lehman Bankruptcy to Greek Debt Restructuring	After Greek Debt Restructuring		Full sub-period	Full sub-period	Before Lehman Bankruptcy	From Lehman Bankruptcy to Greek Debt Restructuring	After Greek Debt Restructuring
China	0.0054	0.0030	0.0069	0.0148	0.0044	0.0041	0.0021	0.0011	0.0027	0.0027	0.0026	0.0028
India	-0.0038	0.0037	-0.0086	-0.0039	-0.0045	-0.0255	0.0417	0.0165	0.0582	0.0318	0.0628	0.0775
South Korea	0.0008	0.0106	-0.0056	-0.0198	-0.0004	-0.0032	0.1296	0.0377	0.1890	0.0577	0.3050	0.0295
Taiwan	0.0026	0.0024	0.0027	0.0034	0.0045	-0.0029	0.0162	0.0135	0.0179	0.0128	0.0236	0.0088
Malaysia	0.0031	0.0038	0.0027	0.0011	0.0073	-0.0080	0.0264	0.0039	0.0410	0.0271	0.0494	0.0351
Indonesia	-0.0019	-0.0008	-0.0026	-0.0049	0.0018	-0.0119	0.0742	0.0546	0.0869	0.0352	0.1301	0.0330
Thailand	0.0059	0.0109	0.0026	-0.0038	0.0068	-0.0021	0.0450	0.0417	0.0471	0.1395	0.0166	0.0187
Philippines	0.0038	0.0046	0.0033	0.0034	0.0053	-0.0018	0.0335	0.0215	0.0414	0.0563	0.0414	0.0235
Brazil	0.0080	0.0232	-0.0020	0.0183	-0.0002	-0.0313	0.2095	0.1442	0.2519	0.1608	0.3534	0.0857
Mexico	-0.0038	-0.0028	-0.0044	0.0047	-0.0091	-0.0033	0.1078	0.0487	0.1465	0.0298	0.2197	0.0893
Chile	0.0060	0.0129	0.0015	0.0012	0.0047	-0.0070	0.0919	0.0678	0.1076	0.0823	0.1416	0.0455
Columbia	0.0069	0.0113	0.0041	0.0087	0.0080	-0.0124	0.1138	0.0599	0.1489	0.2102	0.1647	0.0319
Russia	-0.0005	0.0088	-0.0066	0.0028	-0.0078	-0.0145	0.0559	0.0105	0.0853	0.0208	0.1177	0.0754
Poland	0.0025	0.0113	-0.0033	0.0271	-0.0146	-0.0091	0.2044	0.1046	0.2697	0.0972	0.3960	0.1311
Turkey	-0.0025	0.0082	-0.0094	0.0127	-0.0190	-0.0104	0.1673	0.1541	0.1758	0.1962	0.2177	0.0386
South Africa	-0.0026	0.0080	-0.0094	-0.0140	0.0028	-0.0307	0.2842	0.2612	0.2993	0.2193	0.3854	0.1479

Note: This table shows the descriptive statistics (means and variances) for the daily currency exchange rates of returns of the 16 EM in our sample. The full sample period used is from January 1, 2003 to June 30, 2013. The full sample period is then divided two sub-periods: before crises and during the period of two crises. The full sub-period before the crises used is from January 1, 2003 to 26 February, 2007. The period of crises is from 27 February, 2007 to June 30, 2013. The period of crises is divided three periods: (1) before the bankruptcy of the Lehman Brothers, (2) from the time of the bankruptcy of the Lehman Brothers to the Greek debt restructuring, and (3) after the Greek debt restructuring. The exchange rate is measured in terms of U.S. dollar per unit of currency for each EM. All the above exchange rates returns are computed using $[100 * (\log(P_t)-\log(P_{t-1}))]$

Table 3: Regression results of equation (2)

	Asia								Americas				Europe, Middle East, and Africa			
	China	India	South Korea	Taiwan	Malaysia	Indonesia	Thailand	Philippines	Brazil	Mexico	Chile	Columbia	Russia	Poland	Turkey	South Africa
$R_{j,t-1}$	-0.0269*	-0.0045	-0.0511***	-0.0025	0.1117***	0.0546***	-0.0193	0.1070***	-0.0276	0.0567***	0.1384***	0.1099***	0.0082	-0.0083	-0.0348**	-0.0832***
	(0.0200)	(0.0185)	(0.0177)	(0.0179)	(0.0180)	(0.0180)	(0.0194)	(0.0173)	(0.0185)	(0.0194)	(0.0191)	(0.0192)	(0.0179)	(0.0185)	(0.0177)	(0.0185)
$R_{us,t}$	0.0898*	0.2318***	0.2753***	0.2226***	0.0501**	0.1274***	0.1756***	0.0549	0.9223***	0.8031***	0.3725***	0.2736***	0.4127***	0.3260***	0.1890***	0.4005***
	(0.0694)	(0.0593)	(0.0537)	(0.0504)	(0.0298)	(0.0547)	(0.0554)	(0.0491)	(0.0537)	(0.0391)	(0.0366)	(0.0538)	(0.0784)	(0.0475)	(0.0674)	(0.0463)
$D_j^{cris}R_{us,t}$	0.0418	0.1266**	-0.1312**	-0.0791*	0.0291	0.0756	0.1161**	0.0629	-0.382	-0.0201	0.1034***	0.0927*	0.1121*	0.0703*	0.0509	0.0314
	(0.0758)	(0.0653)	(0.0598)	(0.0556)	(0.0329)	(0.0605)	(0.0606)	(0.0540)	(0.0604)	(0.0448)	(0.0403)	(0.0592)	(0.0872)	(0.0535)	(0.0776)	(0.0529)
$R_{us,t-1}$	-0.0374	0.3403***	0.5838***	0.4452***	0.2031***	0.3389***	0.2603***	0.4641***	0.1460***	0.1463***	0.0779**	0.2237***	0.4067***	0.2865***	0.2927***	0.4669***
	(0.0690)	(0.0594)	(0.0537)	(0.0505)	(0.0299)	(0.0547)	(0.0551)	(0.0488)	(0.0555)	(0.0411)	(0.0362)	(0.0536)	(0.0782)	(0.0475)	(0.0674)	(0.0465)
$D_j^{cris}R_{us,t-1}$	0.2855***	-0.075	-0.1542***	-0.0413	0.0268	0.0776*	0.0609	0.0689	0.0432	-0.0293	0.0293	-0.102**	0.0862	0.0403	0.1044*	-0.0990**
	(0.0754)	(0.0652)	(0.0584)	(0.0552)	(0.0327)	(0.0601)	(0.0601)	(0.0534)	(0.0563)	(0.0412)	(0.0390)	(0.0584)	(0.0860)	(0.0515)	(0.0737)	(0.0501)
$E_{j,t}$	0.2914	0.5838***	0.3647***	0.8886***	0.6029***	0.8060***	0.2473***	0.5809***	0.7149***	0.2351***	0.0231	0.7448***	0.8702***	0.0961**	0.9589***	-0.1887***
	(0.7051)	(0.1579)	(0.0935)	(0.1463)	(0.1604)	(0.0796)	(0.0918)	(0.1124)	(0.0471)	(0.0578)	(0.0470)	(0.0741)	(0.2591)	(0.0489)	(0.0580)	(0.0298)
$D_j^{cris}E_{j,t}$	0.1346	0.4487***	0.2164**	0.3730**	-0.174	-0.2274***	0.0696	-0.2006*	-0.3186***	-0.2044***	0.1461***	-0.5126***	0.5745**	0.1683***	-0.2058**	0.2660***
	(0.7946)	(0.1732)	(0.1010)	(0.1817)	(0.1659)	(0.0954)	(0.1156)	(0.1320)	(0.0578)	(0.0679)	(0.0568)	(0.0845)	(0.2711)	(0.0569)	(0.0806)	(0.0413)

Note: Figures in parentheses are t-statistics. *, ** and *** denote significant at the 10%, 5%, and 1%, respectively.

Note: Equation (2) : $R_{j,t}=C+\alpha R_{j,t-1}+\beta_j R_{us,t}+\beta_j^{cris} D_j^{cris} R_{us,t}+\gamma_j R_{us,t-1}+\gamma_j^{cris} D_j^{cris} R_{us,t-1}+\delta_j E_{j,t}+\delta_j^{cris} D_j^{cris} E_{j,t}+\varepsilon_{j,t}$

The sample period of regression equation (2) starts from January 1, 2003 to June 30, 2013.

$R_{j,t}$ denotes the stock market return in country, j, at time, t, and $R_{j,t}$ =100*($\log(P_t)$-$\log(P_{t-1})$). $R_{j,t-1}$ is a one-day lag, t-1 return of stock market in country, j. $R_{us,t}$ is the return of the U.S. Dow Jones, at time, t. $R_{us,t-1}$ is one-day time lag, t-1, of the U.S. Dow Jones. $E_{j,t}$ is exchange rate of return which is measured the return of U.S. dollar per unit of currency in each country, j, in time, t. D_j^{cris} refers to a dummy variable which equals to 1 during the period of the crisis from February 27, 2007 to June 30, 2013, or 0, if otherwise.

Table 4: Regression results of equation (3)

	Asia								Americas				Europe, Middle East, and Africa			
	China	India	South Korea	Taiwan	Malaysia	Indonesia	Thailand	Philippines	Brazil	Mexico	Chile	Columbia	Russia	Poland	Turkey	South Africa
$R_{j,t-1}$	-0.0413*	-0.0266	-0.0575***	0.0067	0.0993***	0.0248	0.0029	0.0961***	-0.0158	0.0584***	0.1206***	0.0158	-0.0125	-0.0386**	-0.0516**	-0.0974***
	(0.0255)	(0.0230)	(0.0216)	(0.0222)	(0.0223)	(0.0227)	(0.0242)	(0.0214)	(0.0240)	(0.0248)	(0.0234)	(0.0248)	(0.0219)	(0.0230)	(0.0225)	(0.0235)
$R_{us,t}$	-0.0693	0.2156***	0.1825***	0.1550***	0.0951***	0.1358**	0.1256**	0.0864*	0.7409***	0.8298***	0.5934***	0.3160***	0.3723***	0.4941***	0.1518**	0.4036***
	(0.0826)	(0.0674)	(0.0602)	(0.0570)	(0.0348)	(0.0672)	(0.0593)	(0.0561)	(0.0615)	(0.0462)	(0.0418)	(0.0488)	(0.0879)	(0.0537)	(0.0877)	(0.0602)
$D_j^{postL}R_{us,t}$	0.2213***	0.1708**	-0.0438	-0.0303	-0.0252	0.0346	0.1550***	0.0347	0.1897***	-0.0694*	-0.1495***	0.0420	0.1549*	-0.1355**	0.0993	0.0086
	(0.0908)	(0.0744)	(0.0673)	(0.0632)	(0.0384)	(0.0740)	(0.0652)	(0.0620)	(0.0686)	(0.0524)	(0.0466)	(0.0540)	(0.0986)	(0.0609)	(0.0964)	(0.0677)
$R_{us,t-1}$	0.3146***	0.5816***	0.5727***	0.5368***	0.4313***	0.3741***	0.3647***	0.7451***	0.1550***	0.1310***	0.1649***	0.2373***	0.4637***	0.4649***	0.6565***	0.41428***
	(0.0844)	(0.0685)	(0.0588)	(0.0570)	(0.0343)	(0.0632)	(0.0594)	(0.0565)	(0.0604)	(0.0455)	(0.0436)	(0.0491)	(0.0901)	(0.0547)	(0.0700)	(0.0538)
$D_j^{postL}R_{us,t-1}$	-0.1032	-0.3762***	-0.1943***	-0.1808***	-0.2501***	0.0226	-0.0827	-0.2636***	0.0286	-0.0157	-0.0631*	-0.1070**	0.0060	-0.1756***	-0.3355***	-0.1169**
	(0.0923)	(0.0753)	(0.0644)	(0.0625)	(0.0377)	(0.0697)	(0.0654)	(0.0619)	(0.0606)	(0.0442)	(0.0455)	(0.0532)	(0.0996)	(0.0589)	(0.0757)	(0.0584)
$E_{j,t}$	-0.0755	1.2007***	0.6290***	1.3423***	0.7513***	1.0427***	0.0658	0.3700***	0.8913***	0.4159***	0.0970*	0.1168**	1.7668***	0.1318*	0.8645***	0.0510
	(0.7881)	(0.1966)	(0.1270)	(0.2519)	(0.1068)	(0.1826)	(0.0811)	(0.1230)	(0.0772)	(0.1367)	(0.0739)	(0.0546)	(0.3120)	(0.0856)	(0.0990)	(0.0646)
$D_j^{postL}E_{j,t}$	0.7415	-0.2293	-0.0639	-0.1111	-0.4073***	-0.5492***	0.9181***	-0.0404	-0.6016***	-0.3891***	0.0979	0.1433**	-0.5070*	0.1102	-0.2120**	0.0093
	(0.9143)	(0.2122)	(0.1333)	(0.2812)	(0.1180)	(0.1923)	(0.1576)	(0.1525)	(0.0854)	(0.1417)	(0.0836)	(0.0688)	(0.3241)	(0.0920)	(0.1175)	(0.0732)
CDS_t	-0.0916***	-0.0406**	-0.0766***	-0.0815***	-0.0335***	-0.0690***	-0.0514***	-0.0409**	-0.0046	0.0082	-0.0041	-0.0011	0.0060	-0.0008	-0.0099	0.0006
	(0.0229)	(0.0183)	(0.0158)	(0.0150)	(0.0094)	(0.0173)	(0.0161)	(0.0156)	(0.0148)	(0.0110)	(0.0112)	(0.0126)	(0.0260)	(0.0143)	(0.0188)	(0.0145)
$D_j^{postL}CDS_t$	0.0779***	0.0374**	0.0495***	0.0669***	0.0235**	0.0248	0.0301*	0.0330	0.0072	-0.0127	-0.0009	-0.0202*	-0.0932***	-0.0460***	-0.0383**	-0.0533***
	(0.0258)	(0.0208)	(0.0180)	(0.0174)	(0.0107)	(0.0196)	(0.0184)	(0.0176)	(0.0170)	(0.0126)	(0.0128)	(0.0144)	(0.0291)	(0.0165)	(0.0214)	(0.0166)

Note: Figures in parentheses are t-statistics. *, ** and *** denote significant at the 10%, 5%, and 1%, respectively.

Note: Equation (3) : $R_{j,t}=C+\alpha R_{j,t-1}+\beta_j R_{us,t}+\beta_j^{postL}D_j^{postL}R_{us,t}+\gamma_j R_{us,t-1}+\gamma_j^{postL}D_j^{postL}R_{us,t-1}+\delta_j E_{j,t}+\delta_j^{postL}D_j^{postL}E_{j,t}+\zeta_j CDS_t+\zeta_j^{postL}D_j^{postL}CDS_t+\varepsilon_{j,t}$

The sample period of regression equation (3) starts from February 27, 2007 which is denoted the beginning of the crises to June 30, 2013.

CDS_t refers to the Spanish CDS, at time, t. D_j^{postL} refers to a time dummy variable which equals to 1 if the time is after the bankruptcy of the Lehman Brothers that is between September 15, 2008 and June 30, 2013, and 0, if otherwise.

Table 5: Regression results of equation (4)

	Asia								Americas				Europe, Middle East, and Africa			
	China	India	South Korea	Taiwan	Malaysia	Indonesia	Thailand	Philippines	Brazil	Mexico	Chile	Columbia	Russia	Poland	Turkey	South Africa
$R_{j,t-1}$	-0.0414*	-0.0290	-0.0572***	0.0067	0.0990***	0.0250	0.0001	0.0950***	-0.0165	0.0566***	0.1202***	0.0179	-0.0119	-0.0390**	-0.0500**	-0.0934***
	(0.0256)	(0.0228)	(0.0217)	(0.0222)	(0.0223)	(0.0228)	(0.0241)	(0.0214)	(0.0240)	(0.0248)	(0.0244)	(0.0248)	(0.0219)	(0.0230)	(0.0226)	(0.0236)
$R_{us,t}$	-0.0693	0.2150***	0.1626***	0.1550***	0.0950***	0.1358**	0.1252**	0.0864*	0.7408***	0.8298***	0.5934***	0.3160***	0.3725***	0.4941***	0.1521**	0.4041***
	(0.0827)	(0.0667)	(0.0601)	(0.0570)	(0.0348)	(0.0673)	(0.0590)	(0.0562)	(0.0615)	(0.0460)	(0.0418)	(0.0487)	(0.0879)	(0.0537)	(0.0877)	(0.0601)
$D_j^{postL}R_{us,t}$	0.2191***	0.1698**	-0.0413	-0.0320	-0.0207	0.0276	0.1494**	0.0289	0.1747***	-0.0571	-0.1433***	0.0317	0.1645**	-0.1383**	0.1198	-0.0145
	(0.0915)	(0.0741)	(0.0679)	(0.0638)	(0.0387)	(0.0760)	(0.0654)	(0.0624)	(0.0695)	(0.0528)	(0.0468)	(0.0543)	(0.0993)	(0.0615)	(0.0974)	(0.0686)
$D_j^{postGr}R_{us,t}$	0.0273	-0.2063**	-0.0247	-0.0071	-0.0857*	0.0478	-0.0127	0.0469	-0.1226	-0.2207***	-0.0898	0.1629**	-0.1837	0.0680	-0.1860*	0.1083
	(0.1513)	(0.1217)	(0.1077)	(0.1040)	(0.0627)	(0.1111)	(0.1078)	(0.1032)	(0.1029)	(0.0922)	(0.0846)	(0.0898)	(0.1872)	(0.1069)	(0.1359)	(0.1049)
$R_{us,t-1}$	0.3146***	0.5819***	0.5727***	0.5368***	0.4313***	0.3741***	0.3649***	0.7451***	0.1558***	0.1325***	0.1651***	0.2367***	0.4636***	0.4651***	0.6557***	0.4415***
	(0.0845)	(0.0678)	(0.0588)	(0.0570)	(0.0343)	(0.0633)	(0.0591)	(0.0565)	(0.0605)	(0.0454)	(0.0436)	(0.0490)	(0.0901)	(0.0547)	(0.0700)	(0.0537)
$D_j^{postL}R_{us,t-1}$	-0.1047	-0.4002***	-0.2036***	-0.1876***	-0.2471***	0.0141	-0.0906*	-0.2704***	0.0283	-0.0081	-0.0607*	-0.0980**	0.0127	-0.1730***	-0.3317***	-0.1133**
	(0.0929)	(0.0751)	(0.0647)	(0.0630)	(0.0379)	(0.0702)	(0.0655)	(0.0623)	(0.0611)	(0.0443)	(0.0458)	(0.0535)	(0.1003)	(0.0589)	(0.0762)	(0.0586)
$D_j^{postGr}R_{us,t-1}$	0.0229	0.0461	0.1359*	0.0840	-0.0443	0.0830	0.0889	0.0447	-0.0084	-0.1001*	-0.0537	-0.1398**	-0.1066	-0.0440	-0.0349	-0.1322*
	(0.1484)	(0.1159)	(0.1002)	(0.0989)	(0.0610)	(0.1099)	(0.1040)	(0.0976)	(0.0959)	(0.0721)	(0.0728)	(0.0826)	(0.1546)	(0.0935)	(0.1232)	(0.0943)
$E_{j,t}$	-0.0758	1.2076***	0.6289***	1.3425***	0.7513***	1.0427***	0.0660	0.3704***	0.8915***	0.4154***	0.0970*	0.1172**	1.7765***	0.1317*	0.8646***	0.0511
	(0.7891)	(0.1946)	(0.1269)	(0.2521)	(0.1067)	(0.1831)	(0.0808)	(0.1230)	(0.0773)	(0.1363)	(0.0738)	(0.0545)	(0.3121)	(0.0856)	(0.0990)	(0.0645)
$D_j^{postL}E_{j,t}$	0.7587	0.0849	-0.0786	-0.0518	-0.3790***	-0.5447***	1.2491***	0.0436	-0.5821***	-0.3812***	0.1189*	0.1515**	-0.4582*	0.1080	-0.2471**	0.0542
	(0.9623)	(0.2177)	(0.1335)	(0.2856)	(0.1209)	(0.1935)	(0.1807)	(0.1584)	(0.0865)	(0.1421)	(0.0845)	(0.0697)	(0.3269)	(0.0929)	(0.1193)	(0.0749)
$D_j^{postGr}E_{j,t}$	-0.0355	-0.8507***	0.4153**	-0.4498	-0.1148	-0.2264	-1.0438***	-0.4546**	-0.1498*	-0.0104	-0.1788*	-0.1742	-0.1801	-0.0139	0.3725**	-0.2691***
	(1.0462)	(0.1684)	(0.2044)	(0.3696)	(0.1208)	(0.2015)	(0.2953)	(0.2370)	(0.1155)	(0.1046)	(0.1333)	(0.1670)	(0.2352)	(0.1035)	(0.2253)	(0.0901)
CDS_t	-0.0916***	-0.0405**	-0.0766***	-0.0815***	-0.0335***	-0.0690***	-0.0513***	-0.0409**	-0.0045	0.0087	-0.0041	-0.0010	0.0059	-0.0008	-0.0099	0.0008
	(0.0229)	(0.0180)	(0.0157)	(0.0120)	(0.0094)	(0.0173)	(0.0160)	(0.0156)	(0.0149)	(0.0110)	(0.0112)	(0.0126)	(0.0261)	(0.0143)	(0.0188)	(0.0146)
$D_j^{postL}CDS_t$	0.0756***	0.0451*	0.0490***	0.0667***	0.0212**	0.0234	0.0330**	0.0348**	0.0074	-0.0144	-0.0006	-0.0205*	-0.0926***	-0.0514***	-0.0369**	-0.0537***
	(0.0263)	(0.0210)	(0.0183)	(0.0177)	(0.0109)	(0.0199)	(0.0187)	(0.0179)	(0.0173)	(0.0127)	(0.0130)	(0.0147)	(0.0296)	(0.0168)	(0.0217)	(0.0168)
$D_j^{postGr}CDS_t$	0.0195	-0.0280	0.0125	0.0050	0.0153	0.0159	-0.0059	-0.0072	0.0020	0.0022	-0.0167	0.0016	-0.0089	0.0384*	-0.0148	-0.0036
	(0.0362)	(0.0297)	(0.0262)	(0.0250)	(0.0155)	(0.0282)	(0.0269)	(0.0252)	(0.0247)	(0.0181)	(0.0186)	(0.0214)	(0.0388)	(0.0243)	(0.0313)	(0.0237)

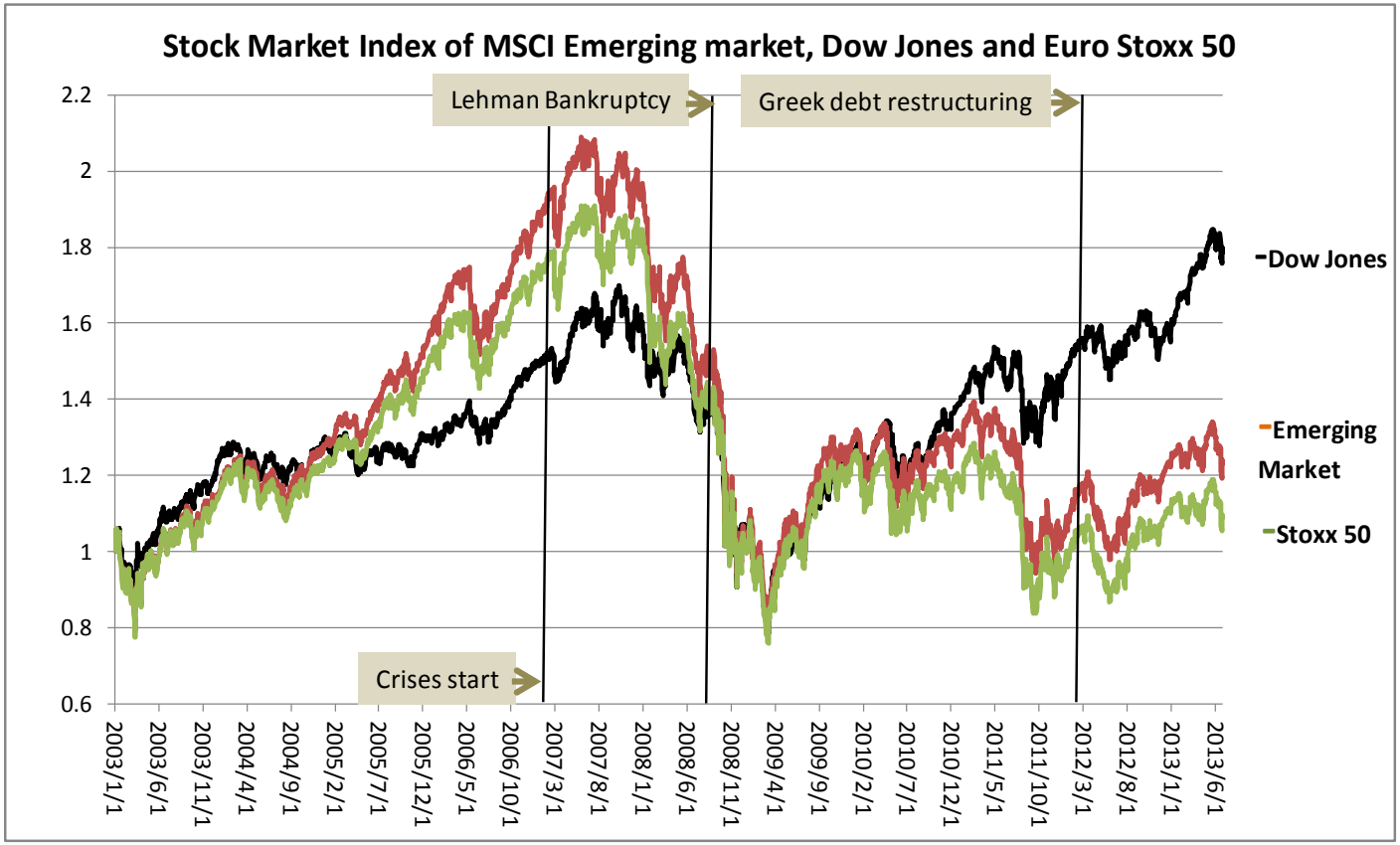
Note: Figures in parentheses are t-statistics. *, ** and *** denote significant at the 10%, 5%, and 1%, respectively.

Note: Equation (4) : $R_{j,t} = C+\alpha R_{j,t-1}+\beta_j R_{us,t}+\beta_j^{postL} D_j^{postL} R_{us,t}+\beta_j^{postGr} D_j^{postGr} R_{us,t}+\gamma_j R_{us,t-1}+\gamma_j^{postL} D_j^{postL} R_{us,t-1}+\gamma_j^{postGr} D_j^{postGr} R_{us,t-1}+\delta_j E_{j,t}+\delta_j^{postL} D_j^{postL} E_{j,t}+\delta_j^{postGr} D_j^{postGr} E_{j,t}+\zeta_j CDS_t+\zeta_j^{postL} D_j^{postL} CDS_t+\zeta_j^{postGr} D_j^{postGr} CDS_t+\varepsilon_{j,t}$

The sample period of regression equation (4) starts from February 27, 2007 which is denoted the beginning of the crises to June 30, 2013.

D_j^{postGr} is created to refer to a time dummy variable which equals to 1 if the time is after the Greek debt restructuring that is between March 12, 2012 and June 30, 2013, and 0, if otherwise.

Figure 1: Stock Market Index of MSCI EM, Dow Jones, and Euro Stoxx 50



Source: Bloomberg

Appendix 1: List of EM and market capitalization

Country	Market capitalization
1. China	3697.4
2. India	1263.3
3. Brazil	1229.8
4. South Korea	1180.5
5. Russia	874.7
6. Taiwan*	732.7
7. South Africa	612.3
8. Mexico	525.1
9. Malaysia	476.3
10. Indonesia	396.8
11. Thailand	383.0
12. Chile	313.3
13. Turkey	308.8
14. Philippines	264.1
15. Colombia	262.1
16. Poland	177.7

Source: World Bank. Data are in U.S. billion dollars

Notes:

The definition of market capitalization is explained by the World Bank as follows:

1. Market capitalization is the share price times the number of shares outstanding.
2. Listed companies are the domestically incorporated companies on the country's stock exchanges at the end of the year 2012.

(*)Data on Taiwan's market capitalization (USD$732.68 billion) is obtained from the database of the Taiwan Stock Exchange. The data on Taiwan's market capitalization is unavailable from the World Bank data.