

# Global Financial Crisis and Stock Markets Volatility: A Comparison of Diverse Financial Structure Countries

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## ABSTRACT

The stock markets play a crucial and dominant role in economic progression of countries. These are also considered as barometers of the economy. The external shocks can considerably effect the functioning of stock markets. The similar situation occurred in episodes of global financial crisis which shook the confidence of investors and enhanced volatility of stock markets across the globe. The study is intended to examine and compare the volatility pattern of stock markets across countries of different financial structure. The stock markets of top fifty countries are selected for this purpose and their daily prices are collected. The analysis of data is made by applying EGARCH methodology and effect of crisis is examined by adding a dummy variable in variance equation. The results indicate that volatility of stock markets significantly enhanced in majority of sample countries during crisis period. The differential effect across diverse financial structure countries is, however, not found.

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## Introduction

The financial development to economic growth association had been extensively discussed in literature. The debate in this domain was originated in 19<sup>th</sup> century but started systematically in 20<sup>th</sup> century. The contributions of Gerschenkorn (1962) and Goldsmith (1969) paved a way for systematic debate. In parallel of examining this association, the researchers also attempted to observe the relationship and contribution of financial structure in economic growth. The initial studies in this area had concentrated on four developed countries of the world. The broader cross country analysis was initiated by Demirgüç-Kunt and Levine (1999) and later on strengthened by Levine (2002). These studies induced many other researchers to explore the phenomenon from different perspectives. The researchers including Caporale, Howells, and Soliman (2004), Chakraborty and Ray (2006), Pinno and Serletis (2007), Ergungor (2008), Arestis, Luintel, and Luintel (2010), Yeh, Huang, and Lin (2013), Nyasha and Odhiambo (2015), Luintel, Khan, Leon-Gonzalez, and Li (2016), [Rapp and Udoieva \(in press\)](#) supported the relevance of financial structure for economic growth. Contrary to this; Levine (2002), Beck and Levine (2002), Song and Thakor (2010), Solo (2013), Deltuvaite and Sineviciene

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(2014), Apergis, Artakis, and Kyriazis (2015) proposed for irrelevance of financial structure in economic progression. They, instead, supported for overall development of financial services and system. The conclusive view in this area has not yet been emerged.

The existing studies in this domain were very much focussed on examining the pattern of economic growth across countries of diverse financial structure. This study, instead, attempted to explore the phenomenon through examining the volatility pattern of stocks in crisis episodes of 2008. This crisis, popularly termed as global financial crisis, initiated from United States and spread across majority of world countries. The integration of financial systems, globalization, and technological advancement had facilitated in transmission of panic to other countries globally (Chava&Purnanandam, 2011; Raz, Indra, Artikasih, & Citra, 2012). The crisis transmitted across countries through different channels. There are different researchers who supported for dominance of financial channel and tightening of financial conditions in spread of crisis (Cardarelli, Elekdag, &Lall, 2011; Fry-McKibbin, Hsiao, & Tang, 2014; Fink &Schüler, 2015; Yan, Phylaktis, & Fuertes, 2016). The harmful effects of crisis were observed almost everywhere in the world. Deltuvaite (2016) attributed the global financial crisis as most significant shock of this century that was transmitted to the stock markets of Central and Eastern European economies. This was the most severe crisis after great depression (Neaime, 2012).

This study is primarily intended to examine the volatility pattern of stock indices in diversified financial structure countries. The categorization of sample countries is based on a structure index. The volatility of stock indices is initially examined for each sample country through application of EGRACH methodology and insertion of crisis dummy in variance equation. The volatility pattern across different category countries is then examined by comparing the coefficients of dummy variable. The significant increase in volatility of stock indices is noted for majority of sample countries. The considerable variation across divergent category countries is, however, not found. The study is expected to be a valuable addition in literature relevant to comparative financial systems. The earlier discussion in this area remained very much focused on economic growth aspect. The distinctive aspect of stock markets behavior during crisis episodes is addressed in this study. The results will be helpful for investors to identify the diversification opportunities across different markets. It can also facilitate the officials regarding choice, strengthening, and development of better, vibrant, and resilient financial system.

The rest of paper is structured to four major sections. The brief summarization of existing relevant studies and research hypotheses are in section 2. The section 3 describes mechanism of categorization, estimation technique, selection of crisis period, population and sample of the study. The findings and key conclusions of study are described in section 4 and 5, respectively.

## **Literature Review**

Fama (1970) presented the efficient capital market theory, which like other traditional economic theories is based on assumption of perfect capital markets. In such markets, all participants have instantaneous and costless approach to same nature of information. The existence of informational

asymmetry in markets was, however, pointed out by Akerlof (1970). The buyers and sellers, in such a setting, may have different kind of information. This can create market imperfection and consequently lead to the issues of moral hazard and adverse selection. The markets can become inefficient and incapable of channelizing funds properly for industrious investment prospects, thereby resulting in economic downturn (Mishkin, 1991).

Blackburn, Bose, and Capasso (2005) blamed information asymmetries for generating capital market imperfections. The investors in such a situation may assign different value to similar projects because of having different nature of information with them (Bertocco, 2008). The informational asymmetry can also produce herd behavior and the information may become excessively costly for medium and small investors. These kind of investors then prefer to follow the movements of big players in market. This behavior may end up with the happening of bubbles, crisis, market crashes, and poor linkage of markets to economic fundamentals. The nearly similar situation was seen during the crisis episodes of 2008, popularly termed as global financial crisis. The efficient market hypothesis was criticized by many market specialists and economists including Volcker (2011) for its unjustified faith on market efficiencies. This undue belief was referred to as the main reason in start and expansion of global financial crisis.

The global financial crisis was initiated from United States and transmitted speedily to the majority of world economies. The crisis not only effected the economic progression of countries but had also significantly influenced the stock markets returns and volatility. It was earlier attempted by some researchers to examine the impact of global financial crisis on stock markets across different countries. The increase in stocks volatility was observed by majority of researchers during crisis episode. The similar evidence for Indian stock market was found by Anbarasu and Srinivasan (2009), Sah (2011), Dufrénot and Keddad (2014). Ayodeji (2009) observed the same in Nigerian stock exchange while in Malaysia it was reported by Angabini and Wasiuzzaman (2011). The increased volatility pattern of stock exchange in Turkey was presented by Sekmen and Hatipoglu (2015). Banchit, Abidin, and Wu (2016) also found an overall increase in volatility of stock markets in New Zealand during global financial crisis period. The evidence regarding change in price jump behavior was, however, not observed. Lebedinsky and Wilmes (in press) observed larger spikes in industry-specific volatility, idiosyncratic volatility, and market volatility during episode of financial crunch in U.S. The volatility pattern, however, reversed back to its pre-crisis level in 2010.

During global financial crisis period, the markets having more integration with U.S. suffered relatively earlier and the magnitude of effect also remained higher in such markets. Hwang and Ogburn (2016) noted a volatility spillover effect from U.S. to the stock markets of some selected newly industrialized economies. Similarly, Dakhlaoui and Aloui (2016) observed the volatility of BRIC markets to be significantly influenced by the economic policy uncertainty of U.S. In another study, Chuliá, Gupta, Uribe, and Wohar (2017) observed a reduction in stock returns of both mature and emerging markets due to uncertainties in U.S. equity market. The integration, interlinkages, and interdependence of stock markets and economies were also considered as major sources in transmission of crisis. Due to interrelations among markets, the effect of crisis originated from U.S. was felt in majority of markets and economies across globe (Lee, Tucker, Wang, & Pao, 2014). The similar evidence of

volatility spillover in Asian markets was observed by Morales and Andreosso-O'Callaghan (2012), Apostolakis (2016), Jebran, Chen, IrfanUllah, and Mirza (in press). Rejeb and Arfaoui (2016) documented the same for emerging and developed stock markets. Todea (2016) also noted a stronger volatility and its persistence in highly integrated emerging stock markets.

In parallel to mutual interdependence of markets, the contagion and spillover effect from U.S. market was also a major source in transmission of crisis. This was observed by Bianconi, Yoshino, and de Sousa (2013) in BRIC countries. The contagion effect of crisis was also observed by Hwang (2014) in four stock markets of Latin America. The pattern of effect, however, differed across countries on the basis of their integration mechanism with international economy. The similar evidence was documented by Dimitriou, Kenourgios, and Simos (2013), Mensi, Hammoudeh, Nguyen, and Kang (2016) in BRICS countries. The contagion effect from U.S. to other major emerging and developed markets of world was noted by Mollah, Quoreshi, and Zafirov (2016), Boubaker, Jouini, and Lahiani (2016) during and after crises episodes. The evidence of financial contagion among markets of U.S. and Asia was also found by Jin (2016). He had observed an adverse impact of global financial crisis on efficiency of stock markets in Asia.

The cross-country studies were made by different researchers to identify the differential effect of crisis across countries. In one such study, Ali and Afzal (2012) compared the stock markets of India and Pakistan. The researchers observed a larger effect of crisis in Indian stock market. Dua and Tuteja (2016) noted a significant intensification in volatility of both U.S. and Indian financial markets during global financial crisis episodes. The effect of volatility in U.S. market was noticed in India without having a reverse impact. The cross-country studies were also conducted by Karunanayake, Valadkhani, and O'Brien (2010), Kotkatvuori-Örnberg, Nikkinen, and Åijö (2013), Singhanian and Anchalia (2013), Aizenman, Jinjark, Lee, and Park (2016). The significant effect of crisis on returns and volatility of stock markets was reported in majority of studies. Mobarek and Li (2014), however, observed the contribution of common instead of country specific factors in determining the volatility of stock returns. One such common factor can be the similarity of financial structure across different countries. This aspect has yet not been addressed and study to examine the volatility pattern of stocks in comparative financial systems has not been found in literature. The current study is an attempt to fill this gap by analyzing the stocks volatility of diversified financial structure countries in context of global financial crisis.

## **Methodology**

### **Classification of Countries**

The sample countries are initially segregated according to their level of economic development. This is based on an official publication named as *world economic outlook* (International Monetary Fund, 2013). The countries are then categorized on the basis of financial system structure for which an index of financial structure is constructed. The previous studies of Demirguç-Kunt and Levine (1999), Levine (2002) are followed for this purpose. The size, activity, and efficiency indicators of both banks

and markets are analysed with the help of related ratios. The data of each indicator for market to banking side is determined and averaged. The individual countries are then compared with sample average. The countries with above average sample values are placed in market dominant category while those of below mean value to respective bank based category. The list of categorized sample countries is at Appendix 1.

### Estimation Model

The Autoregressive Conditional Heteroscedasticity (ARCH) models are common for measuring the volatility of stock markets. Engle (1982) developed the first ARCH model. The mathematical expression of basic ARCH model, as proposed by Asteriou and Hall (2007), is as follows:

$$R_t = \alpha + \beta R_{t-1} + \mu_t \text{----- (i)}$$

This is equation of mean. The stock returns at time period 't' and 't-1' are represented by 'R<sub>t</sub>' and 'R<sub>t-1</sub>', respectively. "Ln (P<sub>t</sub>/P<sub>t-1</sub>)" is used for calculation of returns while 'μ<sub>t</sub>' is used for error term. The basic variance in ARCH model is of following form:

$$\sigma_t^2 = \gamma_0 + \gamma_1 \mu_{t-1}^2 \text{----- (ii)}$$

The extensions in basic ARCH models had later been introduced by many econometricians and researchers. This family models are generally preferred due to their superior volatility projections (Brailsford & Faff, 1996). The ability of handling dummy variables is another beauty of these models. The EGARCH approach of Nelson (1991) has been favored and used by many researchers in past, including Nor and Shamiri (2007), Ayodeji (2009), Haniff and Pok (2010), Ali and Afzal (2012), Abbas, Khan, and Shah (2013), Singhania and Anchalia (2013). Considering its diversified strengths, the present study also deployed EGARCH approach for empirical analysis. The mathematical expression of proposed model for examining the effect of global financial crisis on stock markets volatility of sample countries is given below:

$$\text{Log } \sigma_t^2 = \alpha_0 + \sum_{i=1}^m \beta_i \left| \frac{\mu_{t-i}}{\sqrt{\sigma_{t-i}^2}} \right| + \sum_{i=1}^m \beta_i \frac{\mu_{t-i}}{\sqrt{\sigma_{t-i}^2}} + \sum_{j=1}^n \gamma_j \text{Log } \sigma_{t-j}^2 + \lambda \text{GFC} \text{----- (iii)}$$

The effect of crisis on volatility of stock markets is detected by the inclusion of dummy variable in variance equation. It takes value of '1' for crisis period, while '0' otherwise. AIC and related diagnostic tests are used for ARMA specification.

### Time Period of Crisis

The global financial crisis, no doubt, effected all the major countries of world. Its effect, however, was not appeared at same time in all the countries. The crisis started from United States in September, 2007. Its severe effects started appearing by the start of 2008 and continued till March, 2009. The

gradual recovery process started afterwards that also varied across countries. The dummy variable inserted in variance equation covered thesevere crisis period of 1/1/2008 to 31/03/2009. For detailed and in-depth examination, the timeline suggested by (Bank for International Settlements, 2009) is also applied. The overall crisis period has been classified to four major phases. The first phase, termed as *initial financial turmoil*, ranges from 01/08/2007 to 15/09/2008. The second and third phases were named as *sharp financial market deterioration*, *macroeconomic deterioration* and covered the time span of 16/09/2008- 31/12/2008, 1/1/2009-31/03/2009, respectively. The fourth phase started afterwards and has been termed as *stabilization and tentative signs of recovery*. This approach was earlier applied in the studies of Dimitriou, Kenourgios, and Simos (2013), Luchtenberg and Vu (2015), Bhimjee, Ramos, and Dias (2016). The dummy variables 'D1', 'D2', and 'D3' are inserted in variance equation to document the effect of crisis in each phase.

### **Population, Sample, and Data**

The total world countries constituted the population of study while a sample of top fifty countries, excluding those belonging to OPEC group, is selected for empirical investigation. The daily data of stock indices is gathered from *yahoo finance*, *stock exchanges* of sample countries, and other relevant sources.

### **Empirical Results**

The first step in empirical analysis is the segregation of countries according to their economic development and financial system structure. The classification mechanism has earlier been described in methodology section. The countries are placed to four major categories. The list of categorized countries is presented in Appendix 1. The EGARCH technique with crisis dummy is then applied for empirical analysis. The results of analysis are presented in Table 1. The effect of crisis is being determined by examining the sign and significance of crisis dummy "GFC", inserted in variance equation. The decomposition of crisis duration into different phases and its analysis is helpful for detailed investigation. The results of phase-wise analysis for both category countries are summarized in Table 2. The volatility pattern of stocks markets in diversified category countries and in different phases is observed through simple comparison of coefficients and their significance level.

**Table 1: Volatility Pattern of Stock Markets during Global Financial Crisis**

Country	Index	GFC	Country	Index	GFC
<b>Bank Based Countries</b>			<b>Market Based Countries</b>		
<b>Economically Developed Category</b>					
Austria	ATX	0.0256*** (0.0102)	Australia	AORD	0.0334*** (0.0121)
Belgium	Bel20	0.0250*** (0.0096)	Canada	SPTSX	0.0378*** (0.0090)
France	CAC40	0.0141* (0.0077)	Finland	HEX	0.0157** (0.0066)
Germany	DAX	0.0179** (0.0083)	United States	NASDAQ100	0.0565*** (0.0122)
Japan	NIKKEI225	0.0639*** (0.0150)	United Kingdom	FTSE100	0.0267*** (0.0075)
Ireland	ISEQ	0.0330*** (0.0095)	Korea, Rep.	KOSPI	0.0468*** (0.0114)
Israel	TA25	0.0348*** (0.0099)	Singapore	STI	0.0388*** (0.0095)
Norway	OSEAX	0.0342*** (0.0124)	Denmark	OMXCOPEN	0.0341*** (0.0107)
Czech Republic	PX	0.0471*** (0.0142)	Hong Kong	HANG SANG	0.0228** (0.0093)
New Zealand	NZ50	0.0577*** (0.0148)	Netherlands	AEX	0.0200** (0.0080)
Portugal	PSI20	0.8170*** (0.0487)	Switzerland	SPI	0.0316*** (0.0093)
Spain	IBEX35	0.0096 (0.0064)	Sweden	OMXNORDIC40	0.0109 (0.0070)
Greece	ASE	0.0027 (0.0062)			
Italy	ITLMS	0.0092 (0.0069)			

Economically Underdeveloped & Emerging Category					
Argentina	BURCAP	0.0385*** (0.0128)	Brazil	IBOVESPA	0.0480*** (0.0124)
Colombia	IGPC	0.0234 (0.0158)	China	CSI300	0.0218*** (0.0067)
Egypt, Arab Rep.	EGX30	0.0710*** (0.0114)	Chile	IGPA	0.0919*** (0.0201)
India	BSESENSEX	0.0532*** (0.0126)	Turkey	XU100	0.0570*** (0.0151)
Indonesia 0.0031(0.0049)	JKSE	0.0853***(0.0140)		Malaysia	KLSE
Pakistan	KSE100	0.0362*** (0.0100)	Peru	IGBVL	0.0555*** (0.0149)
Poland	WARSAW MIG40	0.0152* (0.0091)	Mexico	IPC	0.0186** (0.0086)
Romania	BET	0.1146*** (0.0162)	South Africa (0.0092)	FTSEJSE TOP40	0.0180*
Thailand	SET	0.0530*** (0.0140)	Russia	RTSI	0.0400*** (0.0076)
Ukraine	UX	0.0564*** (0.0086)	Philippines	PSEI	-0.5725*** (0.1237)
Bangladesh	CASPI	-0.0103 (0.0100)			
Hungary	BUX	0.0130 (0.0092)			
Kazakhstan	KASE	-0.0060 (0.0045)			
Vietnam	VN	0.0136 (0.0156)			

\*, \*\*, \*\*\* indicates significance at 10%, 5% and 1% levels, respectively and the values in parenthesis shows standard errors.



**Table 2: Effect of Crisis on Stocks Volatility: A Phase-Wise Analysis**

Index	D1	D2	D3	Index	D1	D2	D3
<b>Bank Based Countries</b>				<b>Market Based Countries</b>			
ATX	0.0046 (0.0088)	0.0365 (0.0232)	0.0604** (0.0240)	AORD	0.0225** (0.0110)	0.0544** (0.0248)	0.0553** (0.0221)
Bel20	0.0018 (0.0091)	0.0234 (0.0161)	0.0438** (0.0207)	SPTSX	0.0208*** (0.0070)	0.0875*** (0.0204)	0.0579*** (0.0211)
CAC40	-0.0071 (0.0065)	0.0282** (0.0139)	0.0351** (0.0152)	HEX	0.0060 (0.0057)	0.0247* (0.0127)	0.0346** (0.0161)
DAX	-0.0104 (0.0072)	0.0437*** (0.0162)	0.0555*** (0.0176)	NASDAQ100	0.0423*** (0.0106)	0.1389*** (0.0243)	0.1172*** (0.0276)
NIKKEI225	0.0358*** (0.0129)	0.1345*** (0.0300)	0.1043*** (0.0270)	FTSE100	0.0183*** (0.0065)	0.0444*** (0.0170)	0.0423** (0.0190)
ISEQ	0.0173* (0.0102)	0.0457*** (0.0165)	0.0444** (0.0198)	KOSPI	0.0402*** (0.0127)	0.1763*** (0.0311)	0.1328*** (0.0276)
TA25	0.000004** (0.000002)	0.00006*** (0.00002)	0.00002** (0.00001)	STI	0.0347*** (0.0084)	0.0330** (0.0150)	0.0511*** (0.0164)
OSEAX	0.0076 (0.0118)	0.1126*** (0.0278)	0.0653* (0.0335)	OMXCOPEN	0.0081 (0.0111)	0.0970*** (0.0206)	0.0520* (0.0305)
PX	0.0096 (0.0139)	0.1009*** (0.0279)	0.0928*** (0.0280)	HANG SANG	0.0348*** (0.0088)	0.0550*** (0.0188)	0.0494** (0.0217)
NZ50	0.0362*** (0.0128)	0.0968*** (0.0291)	0.0728*** (0.0244)	AEX	-0.0010 (0.0065)	0.0336** (0.0141)	0.0442** (0.0175)
PSI20	0.5773*** (0.0432)	1.3461*** (0.1023)	0.5216*** (0.1632)	SPI	0.0131 (0.0087)	0.0489*** (0.0164)	0.0471** (0.0192)
IBEX35	-0.0015 (0.0056)	0.0110 (0.0129)	0.0220 (0.0145)	OMXNORDIC40	0.0006 (0.0059)	0.0204 (0.0131)	0.0327* (0.0171)
ASE	-0.0069 (0.0071)	-0.0037 (0.0141)	0.0230* (0.0137)				
ITLMS	-0.0070 (0.0062)	0.0076 (0.0133)	0.0332** (0.0156)				
BURCAP	-0.0257 (0.0150)	0.1940*** (0.0389)	0.1235*** (0.0392)	IBOVESPA	0.0512*** (0.0138)	0.1817*** (0.0388)	0.1008*** (0.0299)
IGPC	0.0035 (0.0160)	0.1051*** (0.0364)	-0.0379 (0.0465)	CSI300	0.0170*** (0.0056)	0.0070 (0.0108)	0.0030 (0.0106)

EGX30	-0.0574*** (0.0130)	0.2730*** (0.0330)	0.1354*** (0.0351)	IGPA	0.0858*** (0.0310)	0.3904*** (0.0606)	0.1919*** (0.0491)
BSESENSEX	0.0511*** (0.0109)	0.0893*** (0.0272)	0.0869*** (0.0240)	XU100	0.0435*** (0.0151)	0.1391*** (0.0356)	0.0802** (0.0341)
JKSE	0.0511*** (0.0146)	0.2502*** (0.0295)	0.0589* (0.0342)	KLSE	-0.0135*** (0.0045)	0.0159 (0.0171)	-0.0141 (0.0187)
KSE100	0.0511*** (0.0102)	0.0375** (0.0187)	0.1530*** (0.0387)	IGBVL	0.0187 (0.0178)	0.1477*** (0.0325)	0.0742 (0.0482)
WARSAW MIG40	0.0089 (0.0098)	0.0412** (0.0186)	0.0436** (0.0197)	IPC	0.0079 (0.0076)	0.0469*** (0.0166)	0.0601*** (0.0197)
BET	0.0288* (0.0164)	0.1327*** (0.0354)	0.2491*** (0.0367)	FTSEJSE TOP40	0.0101 (0.0078)	0.0337 (0.0209)	0.0302* (0.0183)
SET	-0.0019 (0.0175)	0.1967*** (0.0373)	0.0627** (0.0319)	RTSI	-0.0065 (0.0066)	0.1040*** (0.0215)	0.1014*** (0.0212)
UX	0.0210*** (0.0077)	0.0151 (0.0186)	0.0730*** (0.0151)	PSEI	-1.7226*** (0.0983)	-0.1437 (0.1581)	-2.0148*** (0.2008)
CASPI	-0.0088 (0.0087)	0.0431** (0.0201)	-0.0227 (0.0303)				
BUX	-0.0203** (0.0097)	0.0778*** (0.0243)	0.0404 (0.0256)				
KASE	-0.0168*** (0.0048)	0.0268** (0.0116)	-0.0037 (0.0125)				
VN	-0.000004 (0.015664)	0.0057 (0.0395)	0.0415 (0.0278)				

\*, \*\*, \*\*\* indicates significance at 10%, 5% and 1% levels, respectively and the values in parenthesis shows standard errors.

The significant and positive coefficients of crisis dummy in Table 1 represent that the volatility of stock markets enhanced in global financial crisis duration. The similar volatility increase has earlier been documented by Anbarasu and Srinivasan (2009), Karunanayake, Valadkhani, and O'Brien (2010), Ali and Afzal (2012), Singhania and Anchalia (2013), Sekmen and Hatipoglu (2015). The pattern, however, didn't differ much across market and bank based category countries. The nearly similar situation is noted in phase-wise analysis for which results are presented in Table 2. In majority of world countries, the global financial crisis negatively affected the stock markets. The interlinkages and integration of markets resulted in rapid transmission of crisis across globe, without any significant exception. The investors in such a situation remained unable to draw considerable benefit from diversification of their investments. This is similar to the observations of Bartram and Bodnar (2009), Mobarek and Li (2014). The increase in volatility of stocks can be attributed to common rather than country specific or structure specific factors.

## Summary and Conclusion

The contribution of financial system in stability and growth of economies has been extensively discussed in literature. It can facilitate in mobilization of savings and its allocation to productive investment. The financial institutions and markets are the major components of a financial system which are facilitating this entire process. The relative merits of these components have been discussed extensively. The debate related to this issue is very old but it got pace in 1970's. The debate was initially focused on four developed countries of the world, namely United Kingdom, United States, Japan, and Germany. The broader cross country discussion in this area was initiated by Demirgüç-Kunt and Levine (1999) and later on strengthened by Levine (2002). There are some other researchers who have contributed in this debate from different dimensions. The majority of studies in this area were preceded with respect to four major views. These include bank based, market based, financial service, law and finance view. The comparison was mainly concentrated in context of economic progression of countries. It is attempted in current study to examine the phenomenon from a different perspective of stocks volatility comparison in background of global financial crisis.

The crisis originated from United States in last quarter of 2007 with failure and collapse of some major financial institutions. The integration and interlinkages of institutions and markets resulted in rapid transmission of crisis to almost all advanced and emerging economies. Its negative effects were felt everywhere in the globe (Dovern & Roye, 2014). The crisis is resembled with tsunami which effected majority of world countries (Ioan & Maria, 2009). According to Spence (2009), it created uncertainties regarding stability of world financial and economic systems. It also effected the confidence of investors and resulted in drastic fall of many stock markets all over the world. The present study is intended to capture this volatility pattern empirically and then compare it across diversified financial structure countries. The analysis is carried on by applying EGARCH technique and incorporating crisis dummy in variance equation. The daily stock prices of major indices are utilized for this purpose.

The results of analysis show a significant increase in volatility of stocks for majority of sample countries. The major difference in volatility pattern is neither found for market based and bank based categories nor did it differ much in phases. On the basis of findings, it is concluded that structure of financial system didn't matter much in terms of bearing the consequences of crisis. The globalization, interlinkages, and interdependencies of financial systems made this traditional dichotomy of financial systems less relevant. The important aspect to be considered now is the better provision of financial services. The officials should attempt to strengthen institutions, internal systems, and infrastructure. The proper functioning of overall system can facilitate in absorbing external shocks, enhancing resilience, achieving rapid and sustainable growth. The study can be extended in future by comparing the volatility pattern in normal and troubled periods. It can further be extended by incorporating the country specific and market efficiency elements for more broader, comprehensive, and consistent results.

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## APPENDIX1

### Classification of Market Based and Bank Based Countries

S. No.	Name of the Country	S. No.	Name of the Country
<b>Developed and Market Based Countries</b>			
1.	Australia	2.	Canada
3.	Denmark	4.	Finland
5.	Hong Kong SAR, China	6.	Korea, Rep.
7.	Netherlands	8.	Singapore
9.	Sweden	10.	Switzerland
11.	United Kingdom	12.	United States
<b>Underdeveloped and Market Based Countries</b>			
1.	Brazil	2.	Chile
3.	China	4.	Malaysia
5.	Mexico	6.	Peru
7.	Philippines	8.	Russian Federation
9.	South Africa	10.	Turkey
<b>Developed and Bank Based Countries</b>			
1.	Austria	2.	Belgium
3.	Czech Republic	4.	France
5.	Germany	6.	Greece
7.	Ireland	8.	Israel
9.	Italy	10.	Japan
11.	New Zealand	12.	Norway
13.	Portugal	14.	Spain

<b>Underdeveloped and Bank Based Countries</b>			
1.	Argentina	2.	Bangladesh
3.	Colombia	4.	Egypt, Arab Rep.
5.	Hungary	6.	India
7.	Indonesia	8.	Kazakhstan
9.	Pakistan	10.	Poland
11.	Romania	12.	Thailand
13.	Ukraine	14.	Vietnam

(Source: Global Financial Development Database, and author's own calculations)