Does the US Stock Market have the Volatilityspillover Effect on Gulf Stock Markets?

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Abstract

To analyze the effects of volatility spillover among the US stock market and Gulf stock markets, i.e., Saudi Arab, Qatar, Oman, Dubai, and Kuwait. The sample of data consist of daily data from 1st, Jun 2005 to 30th, Jun 2015 containing all working days in a week. The stationarity of data was analyzed by unit root test and autocorrelation, heteroskedasticity of data was analyzed by ARCH test in this study. The spillover of volatility was seized by employing the M-GARCH model. The factual analysis illustrates the significant effect of bidirectional overflow of return and volatility among Saudi Arab & Qatar, US & Kuwait, Qatar & Kuwait. And the significant transmission of unidirectional effect of volatility spillover among the following countries: Oman to Kuwait, Kuwait to Saudi Arab, Dubai to Qatar, US to Saudi Arab and Dubai. The findings of study are significant for policy maker to defend the local financial markets form the global shocks. With the help of these information the stockholdercan make a better decision for the diversification of the portfolio to increase their return with minimum possible level of risk.

Keywords: Gulf countries, US time series, M-GARCH model, ADF, PP.

Introduction.

The process of liberalization provides the diverse options of investment opportunities for investors. That opened the different chances for investors to invest in the international markets to select and manage the divers' portfolios options. The globalization of the stock markets gets significant importance from stockholders in the entire world. The investors of all over the world started the investment at many stock markets which produce more return. The co-integration among the different global stock markets which mobilize the earning of investors are due the elimination of hurdles in the way of stock markets. The co-integration of different markets are primary reasons for the stream of financial crisis among the various equity markets. The transmission of information of the volatility spillover among the different markets are increased a significant consideration in the previous two decades. The most attention of the researcher is to deliver the info regarding the interconnectedness of markets because the

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earning of the portfolio divergenceof the interconnected markets will not be provided (Zhang & Jaffry, 2015). Various recent reports analyzed the volatility spillover effects of many stock markets. A large numbera researcher analyzed the develop markets to identify the volatility spillover among different markets while some of them examined the emerging markets also. The numerus study conducted on develop economies are including the study of (Hu, et al. 1997), (Chou, et al. 1999), (Ng, 2000), (Baele, 2002), (Wagner & Szimayer, 2004), Harris and (Pisedtasalasai 2006), (Diebold and Yilmaz 2009), and (Xiao and Dhesi 2010). And the research on developing markets is (Mishra & Mukherjee, 2009), (Joshi, 2011), (Choo, et al. 2011), and (Sakthivel & kamaiah, 2011). And the study on emerging markets is (Worthington, and Higgs 2004), (Wang, et al. 2005), (Majerowska, & Li 2008) and (Beirne, et al. 2009). These investigations give the profitable bits of knowledge regarding the co-integration among the markets and give the speculators viable venture of openings with respect of portfolio.

The foundation of portfolio theory laid by Markowitz in 1952. He gave the idea of portfolioexpansions. As per him, the investment decision would be on the base of relationship among the return and risk. The investor must favor that decision of investment which give them maximum return with the lowest possible risk and should favor the lowest risk with highestpossible return. As per this theory the investor should prefer the non-correlated stock for investment. This means that investment in non-correlated assets, that the stuns generate in one market would not volatile the next market and same in opposite way. At this stage the return is max, and risk is min. The investor should be carefully choosing that asset which them maximum return of portfolio at lowest possible risk.

The underpinning of portfolio theory increased the significant consideration from investors to recognize the interconnection among the diverse market of the globe. This creates the interest of researcher and investors to analyze the different stock markets for integrations. The information regarding the interconnection among the markets, assist the investors to keep themselves from the adverse situations of the markets. The connections of the marketsin terms of volatility spillover means the shocks created in one market will be transformed to other stock market (Baele, 2002), (Choo, et al. 2011). The price of different stocks is determined by the co- integration among the markets. The shareholder will pay a high cost for non- coordinated securities as opposed to the connected stocks (Glezakos, et al. 2007). The significance of divulge relationship of the stock markets has interested this analysis to find out the association among diverse financial markets. This paper has been assumed to analyze the spillover of the volatility effects among the US and Gulf markets. The main goal behind this study is to deliver the awareness to stockholders

about the topographical stock markets. The Gulf countries and US are included in this study. From the south side countries are Dubai and Oman have been taken and from East side the countries are Saudi Arab, and Qatar. From the west Asia Kuwait is selected and US is selected in this study. Oman stock exchange is main market form Oman, Dubai stock market form Dubai, the Doha stock exchange form Qatar, Tadawul is selected from Saudi Arab, NYSE from US and Kuwait stock exchange stock exchange from Kuwait are selected in this study. The newness of this study is to engage the daily data which give more clear result instead of monthly or weekly data. Sample of this study is consisted of 15 years of data. And added some literature to the Gulf and rest of the world countries. This paper investigates the sample of different mixture of countries and add some literature of different Gulf nations. The study will be helpful to the policy maker and investorsto understand better the co-integration of the different markets to make a beneficial portfolio.

The structure of the paper is as under, the part two consist of literature review, part three containing the methodology, part four discussing results and last part is consisting of conclusion.

Theoretical background and Hypothesis

The volatility spillover effect is an important issue for the investors and research scholars toanalyze the volatility spillover effect among the different stock markets and foreign stock markets. The aim of the local and non-local investors for making an investment decision that how the information is transmitted form one market to another. Develop and non-develop economies are studied by different researcher in many reports. The literature can divide intothree parts.

i. Develop Economy

ii. Non-develop Economy

iii. Emerging Economy

The develop markets reports contain (Hu, et al 1997), (Chou, 1999), (Ng, 2000), (Baele, 2002), (Wagner & Szimayar, 2004), (Harris & Pisedasalasai, 2006), (Diebold &Yilmaz, 2009) and (Xiao & Dhesi, 2010). Shanghai, Taiwan, Hong Kong, and Shenzhen areemerging markets while USA, Saudi Arab, are develop markets. (Hu, et al 1997) analyze theUSA and Hong Kong markets to find out the volatility spillover effects. Daily data form 5 Oct 1992 to 15 Feb 1996 was considered. He performed the various tests of variance and volatility between Hong Kong and USA he found the volatility transmission among these markets. (Chou, et all 1999) studied the US and Taiwan markets to analyze the volatility transmission. The methodology was based on Engle and Korner and research model

was M-GARCH. Instead of simple daily data he used the closed to open and open to closed data. He intimates the transmission of return and variance among the US and Taiwan markets. (Ng, 2000) analyzed the transmission of volatility from Saudi Arab and US markets to six pacific Basin markets (Thailand, Korea, Hong Kong, Malaysia, Singapore, & Taiwan).

The data in this research was analyzed by ARCH familymodel. The factual report delivers the signal of volatility spillover from develop market i.e.,US, Saudi Arab to under develop markets i.e., Pacific Basin. (Baele, 2002) prolong the literature of movement of volatility among the European Union & USA and 13 other Europe markets. He employed the M-GARCH and BEKK model in this study and taking the weekly data of stock returns. He initiates the growing propensity of shocks from the different stock markets during 1990. He further indicates the suggestion of shocks of transmission to UK, Sweden, and Switzerland from USA. He analyzed the daily data of 1992 to 2002. (Hossein & Asgharian, 2013) analyze the volatility effect of local markets of Qatar, Pacific basin and USA markets and regional markets. He employed the research model of stochastic volatility. Sample data of the study from Jan 1992 to Dec 2000. And he concludes that the US and regional markets have the spillover effects on all over countries except Qatar. (Emenike Kalu, 2014) conducted a study to analyze the volatility spillover among the foreign market and stock market of Nigeria.

The research model in this study was multivariate M-GARCH model with help of BEKK framework. From the January 1996 to March 2013 the total 207 observations of each variable have been analyzed. The result shows the bidirectional shocks from the stock market to foreign exchange market and vise verse. (Kavli, & Kotzé 2014) investigate the develop and emerging markets to analyze the spillover effects of exchange rate and volatility for the data from 1997 to 2011. In this paper the stochastic volatility model is used. In the last he concludes that the emerging markets currencies show less than 20 % spillover effects in 2002 and more than 60% in 2011. (Degiannakis, Floros 2015) investigate the US market and 17 European markets to analyze the volatility among the markets of US and Europe. (Liu & Tu, 2011) to explore the association among the foreign capital and exchange rate and stock prices of Taiwan stock market.

The research model of this study is M-GARCH through which they conclude that the historical information of Taiwan may affected by the foreign capital and stock returns. (Buguk, Hudson, & Hanson, 2015) studied the US catfish market to analyze the price volatility spillover. They investigate the monthly data from 1980 to 2000 with help of research model EGARCH was used analyzed the price volatility spillover in supply chain. In their conclusion they conclude that

there is significant unidirectional spillover effect among soybean, corn, menhaden, and catfish prices. (Ahmed, & Abou-Zaid 2011) arguein their conclusion that the US and UK markets have no spillover effects on Kuwait stock market. A most valuable future study to analyze the spillover of volatility among the Turkish market and rest of Europe markets. (Vaster, & Willum, 2016) analyze the European and Turkish market. They argue that there is no volatility spillover effect among the European stock markets and Turkish, a useful future study to analyze the volatility spillover effect between the US and Kuwait. (Natarajana, et all, 2014) studied the local markets to investigate the mean volatility spillover, they further argue that the future study in this matter to undertake long range data for more stock markets and findings should bebased on diverse samples and use the intra-day (close to open and open to close) foreach market. (Zhang, & Joffrey, 2010) argue that the volatility effects depending on thefrequency of data, diverse type data will provide the different result of the same markets.

Keeping in view of the above literature the missing points in the field of financial markets integration, is that to examine the volatility spillover effect of US stock market on Gulfstock markets. Based on the above literature the following hypothesis are formulated.

H_0: There is no volatility spillover effect among the US stock market and Gulf Stock markets.

H_{01}: There is bidirectional volatility spillover effect among the US stock market and GulfStock markets.

H_{02}: There is unidirectional volatility spillover effect US stock market and Gulf Stock market.

Methodology

The sample period of the data consists of 01st, Jun 2005 to 30th, Jun 2015. For complete anddetail analysis the study 15 years of data has been taken into consideration and all the data value have been downloaded from Yahoo finance. The observation of the data containing the daily closing stock index. Form Monday to Friday the five days of a week consistingof closing stock price index are concluding in this study for analysis.

The data consist of daily stock indices in which there are some missing values in some stocks. The interpolation method is used for the missing observations. The daily volatility spillover is used for the calculating the missing observation of the different stocks. The West, East, South Gulf countries and US are included in this study. From the south side countries are Dubai and Oman have been taken, From East side the countries are Saudi Arab, and Qatar, and from the west Asia

Kuwait and US is selected from the rest of the world in this study. The Oman stock exchange is main market form Oman, Dubai stock exchange form Dubai, the Doha Stock Exchange form Qatar, Tadawul stock exchange is selected from Saudi Arab, NYSE from US and Kuwait stock exchange from Kuwait are selected in this study. The datain this study is time series data which need to analyze the stationarity of data. To verify stationarity of data the mostly useable tests are (Dickey & Fuller, 1979) (ADF, Phillips & Perron, 1988) (PP). The regression model for ADF test is as under.

(1) $\Delta U_t = \beta_0 + \mathbf{6}\, U_{t-1} + \gamma_i \sum U_{t-1} + \mu_t$

U is the variable for estimation and U, γ & 6 are the coefficients in above eq (1). The equation for (Phillips &Perron 1988) is autoregressive model of first order.

(2) $\Delta U_t = \beta_0 + U_{t-1} + \mu_t$

Coefficient of equation is β, differences are represented by Δ, and the slope of equation is Uwhile the variable of estimation is U in this study the econometric model for measuring the volatility spillover is M-GARCH model. The time series data may have the heteroscedasticity and auto-correlation property for which the M-GARCH model has been used for analysis. To know about the heteroscedasticity and auto-correlation property among the variables I use the ARCH model of econometric. The result of ARCH model for theunderlying variables of this research are shown in table no 3. The significance of ARCH effect of underlying variables of the data are analyzed by chi-square. Eq (3) and (4) are representing the M-GARCH model of the study. The equation (3) shows the value of mean of the variables while the variance is represented by equation (4). The volatility spillover ofthe equation is measured by equation (4). 1st a single M-GARCH model is estimatedfor individual sequence. The positive volatility is presumed in the M-GARCH modelfor which the volatility residuals are squared. For each market indices the produced volatility residuals are used as a proxy of shocks and in eq (4) the result has been used.

$R_t = c + \delta U_{t-1} + \rho_{t-1} + \varepsilon_t$ (3)

$h_{t-1} = \alpha_0 + \delta\beta_1\varepsilon_2 + \alpha_1 h_{t-1} + \partial$ (*Squared of residual*stock *indices) (4)*

For measuring the spillover of return among the different markets the mean equation (3) is used in this study, While the volatility spillover among the markets is measured by eq (4). R_t denotes return for stock indices, the logged of return of stock indices are measured by

parameter δ and effect of lagged of return of the underlying stock are measured by ρ. The mean function of conditional variances of stock are measured by hₜ. is first difference of residual square of mean equation. Estimated variance of previous period is denoted by h_{t-1}. The volatility spillover of the stock market is measured by ∂ in eq (4). A single M-GARCHmodel for individual stock market has been used for (squared residual stock indices).

Results and Discussion.

At the initial step to examine the stationarity data of the research. Unit root test is used for the investigation of the stationarity of the all-selected markets. There are two mostly useable test for the examiner of the data stationarity are (Dickey & Fuller, 1979) & (Phillips & Perron, 1988). Table No 1 indicate the outcomes of the ADF and PP tests and it has been concededto take the logarithms of all stock markets. The results show the clear sign of non-stationarity of the data while the stationarity showed in first lag. The stationarity results of ADF and PP are the same.

Table 1

	ADF			]]
Variables	Level	1st diff.	Level	1st diff.
DubaiOmanQatar	−1.935986	−58.58964**	−1.235698	−72.56874**
	−0.598642	−48.56982**	−0.158964	−59.25874**
	−0.956785	−60.52314**	−1.092361	−63.14569**
Kuwait	−1.359685	−59.23569**	−1.423679	−60.48965**
United State	−1.556389	−70.23564**	−0.197631	−56.28974**
Saudi Arab	−0.986574	−78.56894**	−0.912345	−52.36589**
Critical values				
1 %	−2.568974			
5 %	−3.986532			
10 %	−1.478965			

In the second stage, with the help of descriptive statistics the data behavior has been analyzed. The descriptive statistics of the selected markets has been shown in Table no 2. The result of descriptive statistics shows signs the high value of daily return's mean among the selected sample which is 0.0989 % of Oman stock market, while the lowest of daily mean return is 0.0038 % of the Saudi Arab stock exchange. The highest value of standard deviation is of Dubai stock market is 2.69 % and the lowest value of SD of Kuwaitstock market is 1.13 %.

Table 2

Independent Variable	Mean	Std. dev.	Skewness	Kurtosis	Jarque-Bera
		Maximum	Minimum		
Dubai	0.0008560.026845	−0.25478	9.258745	0.216589	−0.015987845.159
Oman	0.0009890.015789	−0.10469	4.158972	0.019745	−0.235682159.532
Qatar	0.0007090.020965	−0.25478	9.256876	0.097452	−0.094582589.541
Kuwait	0.0005290.01130	−0.34589	31.57480	0.359875	−0.246312589.785
United State	0.0002390.024789	−0.01589	20.24712	0.314589	−0.0785418596.25
Saudi Arab	3.79E−030.023598	−0.47896	4.256985	0.094756	−0.145877015.569

Table3

Variables	Constant	AR (1)	ARCH test
Oman	0.076321 (0.02)	0.012458 (0.04)	149.2546 (0.01)
Qatar	0.017895 (0.34)	0.254789 (0.49)	82.58974 (0.00)
Dubai	0.025689 (0.09)	0.156987 (0.29)	263.2545 (0.00)
Saudi Arab	0.026587 (0.85)	−0.248962 (0.19)	210.3458 (0.02)
US	0.026897 (0.49)	−0.231812(0.56)	458.5698 (0.00)
Kuwait	0.048975 (0.29)	0.245890(0.19)	501.2547(0.00)

Stock indices of all markets are skewed to negative side. And the result of Jarque- Bera figure is significant at entire markets. The M-GARCH model has been employed to analyze the volatility spillover transmission. For the calculation of conditional variance of stochastic components of returns, the data of the research is transformed to continuous compounding returns. The data converted to the continuous compounding return to calculate the stochastic component of conditional variance. The M-GARCH model is also a part of ARCH family network. And it's the presumption of the ARCH model that the data may have the problem of autocorrelation and heteroskedasticity, the data should have the ARCH effect. The autoregressive model has been used for examining the ARCH effect in the data and all the variables are converted to first lag and after that the ARCH testis employed for the examination of the ARCH effect, the probability of chi-square is checked for ARCH effect. The table no 3 indicate the result of autoregressive model. The test outcomes show the effect of ARCH at all stock markets. With help of

this result the M- GARCH model can be employed due to the existence of autocorrelation and heteroskedasticity of all the variables.

Table no 4 representing the result of mean equation. The mean equation was used to analyzethe spillover of return among the selected stock indices. The first lag is statistically significant of the spillover of own return of Dubai, Kuwait, Oman, and Saudi Arab, and it seems that they are depending on their own first lag. The lag result of US and Qatar are insignificant, and they are depending on their own lag. In the markets of Saudi Arab and Qatar the bidirectional spillover has been found. And it's the sign that they are dependent markets on each other. Moreover, the outcomes of these markets effecting the return of each other negatively. No other bidirectional effect among the remaining stock markets. The US and Dubai stock markets shows the unidirectional return spillover. The outcomes expose that the Dubai stock returns are enhanced by Kuwait stock market. Moreover, the figure indicates that unidirectional return spillover effect from Qatar to US and Oman stock market individually. The adverse effect of Qatar stock market to US and a positive effect on Oman stock market. The market of Dubai significantly affects the returns of Saudi Arab and US. The Oman stock market have adverse effect from the market of US. Finally, the scale of returns spillover of all the markets was initiate bigger among the marketof Saudi Arab and Dubai (0.3089) while the Kuwait and Dubai have the lowest value of (0.0265).

Table 4

DV	Dubai	Kuwait	United State	Oman	Saudi Arab	Qatar
C	0.0009**	0.0002	0.00041	0.0031**	0.0019	−0.0004
	(3.29E−04)	(0.0005)	(0.0006)	(0.0005)	(0.0006)	(0.0005)
Dubai (−1)	0.0956**	0.0642	0.0265**	0.2196	0.3089**	−0.1834
	(0.0265)	(0.0356)	(0.0284)	(0.0259)	(0.0265)	(0.0263)
Kuwait (−1)	0.02471**	0.2498**	0.01960	0.02469	0.03145	0.03045
	(0.00256)	(0.04569)	(0.0356)	(0.0278)	(0.0213)	(0.0206)
United State (−1)	−0.0028	−0.0059	−0.0092	−0.0459*	0.0569	0.0291
	(0.0265)	(0.0275)	(0.0352)	(0.0169)	(0.0256)	(0.0205)
Oman (−1)	0.0094	0.0031	0.0187	0.0209**	0.0157	−0.0278
	(0.0051)	(0.0156)	(0.0482)	(0.0347)	(0.0251)	(0.0229)
Saudi Arab (−1)	0.0248	0.00125	−0.0256	−0.0315	−0.0569*	−0.0195*
	(0.0164)	(0.0265)	(0.0354)	(0.0258)	(0.0371)	(0.0312)
Qatar (−1)	−0.0059	−0.01456	−0.0934*	0.0562*	−0.0419*	−0.0209
	(0.0075)	(0.02456)	(0.0452)	(0.0291)	(0.0204)	(0.032)

Table 5 representing the volatility spillover results of the markets. The breaks down have been calculated individually for each one market taking for a dependent variable quantity, and altogether the additional

stock market volatility has been admitted being analyzed forblow of spillover. For each market the volatility series have been formed and this is also used a proxy for the spillover of the shock of the other market. The overall scaleof the spillover of the market is highest in the case of Dubai (0.639) and the lowest value of the stock of Kuwait which is (0.0061)

Table 5.

DV	Dubai	Kuwait	United State	Oman	Saudi Arab	Qatar
β_o	−6.28E−10	0.0020**	0.0019**	0.0008**	0.0009**	0.0028**
	(3.49E−05)	(1.95E−03)	(3.12E−06)	(4.99E−05)	(3.29E−03)	(1.92E−07)
∪ ε^2t-1	−0.3045**	0.3169**	0.0521**	0.03029	0.3456**	0.2189**
	(0.2461)	(0.05129)	(0.1509)	(0.0816)	(0.0706)	(0.2465)
β1ht − 1	0.2710**	0.3829**	0.7126**	−0.1943	0.5294**	0.3187**
	(0.2031)	(0.0892)	(0.3169)	(0.3980)	(0.02498)	(0.0247)
RSD_Dubai	0.639**	−0.0020	−0.0092	−0.0059	−0.0034	−0.0409**
	0.319	(0.0019)	(0.0164)	(0.0052)	(0.0069)	(0.0081)
RSD_Kuwait	0.0027	0.0061**	−0.0529**	0.0248	−0.0417**	−0.0205**
	(0.0026)	(0.0059)	(0.0046)	(0.0037)	(0.0059)	(0.0016)
RSD_United State	0.0052**	−0.0060*	0.0196*	−0.0029	0.0056	0.0057
	(0.0014)	(0.0079)	(0.0024)	(0.0081)	(0.0034)	(0.0039)
RSD_Oman	0.0037	−0.0021**	−0.050**	0.0051**	−0.0167**	−0.0258
	(0.0031)	(0.0050)	(0.0092)	(0.0308)	(0.0064)	(0.0523)
RSD_Saudi Arab	−7.216E−07	−0.0038	0.0049	−0.0049	0.0359*	−0.0067**
	(0.0009)	(0.0067)	(0.0256)	(0.0037)	(0.0056)	(0.0356)
RSD_Qatar	9.30E−04	−0.0197**	−0.0228	0.0027	−0.02490**	0.0496**
	(0.0021)	(0.0075)	(0.0052)	(0.00198)	(0.0057)	(0.0037)

H_O: There is no volatility spillover effect among the US stock market and Gulf Stock markets.

The outcomes expose that the Dubai stock market has no spillover effect of volatilitywith the markets of Kuwait, US, Saudi Arab and Oman. Moreover, the result further illustrate that the Kuwait stock market has no effect of volatility spillover with the markets of Dubai and Oman. There is no evidence of volatility spillover effect of US stock market to Qatar, Saudi Arab and Oman. And Oman stock market have no volatility spillover on the markets of Dubai and Qatar. And the result further indicate that Saudi Arab stock market have no spillover of volatility effect on the markets of Oman, US, Kuwait, and Dubai. And Qatar market has also no effect on US, Oman, and Dubai. Finally, the result indicates that there is no volatility spillover among the Gulf stock markets and with US market, furthermore these outcomes intimate that these equity markets of Asia are independent form the shocks of local topographical markets, and free from the

shocks of US stock market. And no volatility spillover is an important sign for the portfolio diversification. These markets provide the opportunities for investors to the diversify their portfolio, due to the nonrelation among these markets the investors can enhance their return with mim risk.

H_{01}: There is bidirectional volatility spillover effect among the US stock market and Gulf Stock markets.

The result further illustrates that significant effect of bidirectional volatility among US and Kuwait stock markets. The tenacity of volatility spillover of Kuwait is greater. Qatar and Kuwait have also bidirectional effect. And the result further indicates the Saudi Arab and Qatar have the effect of bidirectional effect. The indication of bidirectional effect means that these markets are integrated. Moreover, the incorporation of the markets is clear sign for investors that there is fever divergence benefit. And these market integrations maybe due to their topographical positions. And the stockholders are in search of such an integrated market to reduce the transportation cost. The reasons of market integration are weak limitations on capital inflows, trade etc.

H_{02}: There is unidirectional volatility spillover effect US stock market and Gulf Stock markets.

The linkages of unidirectional volatility are found among the following countries: From themarket of Dubai to Qatar, from Kuwait to Saudi Arab, from US to Dubai, from Oman to Kuwait, from Oman to US, from Oman to Saudi Arab. The volatility of unidirectional means that shocks generated in one market and transformed to the other market while receiver of the shock don't reply to sender in terms of volatility spillover. The highest value of the unidirectional volatility among these markets are between Oman and US which is (-0.0411) and the lowest value among the US to Kuwait is (-0.0061).

Conclusion.

This paper was an effort to investigate the spillover effect of return, volatility among the US stock market and Gulf stock markets. The sample period consists of 1st Jun 2005 to 30th Jun 2015 and daily data was taken to account to analyze the daily shocks among the markets.

The study consists of diverse countries from Gulf region i.e. From the south side countries are Dubai and Oman have been taken and from East side the countries are Saudi Arab, and Qatar. From the west Kuwait is selected and US is selected in this study. The Unit root test was engaged to analyze the stationarity of the variables. Andthe

GARCH-M model was employed to analyze the transmission of the volatility. The realistic result exposed the significant spillover of return and volatility among the Gulf countries and the US stock market. Only Qatar and Saudi Arab stock markets show the bidirectional spillover of return. Kuwait to Dubai, and to stock market of Oman from Qatar and US and to stock market of Qatar from US stock markets indicate the unidirectional spillover of return.

The result signifies the flow of bidirectional volatility is initiated amongthe following markets: Saudi Arab and Qatar, Kuwait and Qatar, Kuwait, and US. The unidirectional spillover of volatility is launch to the stock market of Qatar from the stock market of Dubai, from the stock market of US and Dubai, from Oman to Kuwait and to the stock market of Saudi Arab from the stock market of US. Saudi Arab and Chinese stock markets show the sign of transmission of bidirectional of return and volatility. Oman stock market receiving non volatility spillover from all selected countries. The outcomes of this investigation have the significant suggestion for investors and economists.

The information regarding volatility spillover among the financial markets have the superior importance for the policy maker of the economy. The economist may suggest such a policyto safe the financial zone from the shock of international financial markets. If the economists have the historical information about the integration of the markets, they may have the ability to forecast any upcoming crisis. The knowledge about the financial market integration would able the economist to make some successful policies. The findings of this research are also significant for the investors, who have the information regarding the spillover effect of the return and volatility will make a better decision to diversify their portfolioto invest at non-correlated markets and make safeguard their investment from the global shocks.

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