

The Impact of the Global Financial Crisis, Does It Sustain?

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Abstract

This paper studies the short and long term relationship between S&P500 USA stock market index and the stock market indices of 30 countries around the world over the period June 2010-April 2015. We implement OLS regression and use error correction model to examine the short and long term relationship between the variables. Empirically, we find that there is a relationship on the short and long term between S&P500 and the indices of 27 countries from East Asia, Europe, Latin America, Middle East as well as the countries of Australia and Canada. These results conclude that the global financial crisis of 2007-2008 significantly and lengthily increased the already high level of co-movement between the USA financial market and the observed stock market for 27 countries around the world. The findings from our research are important; however, we believe that further research based on our findings is necessary.

Keywords: financial markets, econometrics, global financial crisis

1. Introduction

In the context of liberalization and financial globalization, the contagion in international financial crises became a universal spectrum on the international level. Generally, we suggest economic integration as a determinant factor of the contagion, as long as we estimate that the probability that a given country is in its turn touched by a crisis, is dependent on its level of integration in the world economy.

The integration of US financial market with other world markets remains very much an open question. For example, Burdekin and Siklos (2012) confirmed that the prominence of crises in affecting the insistence of equity returns in the Asia - Pacific region and offers some support for contagion effects. Post-Asian financial crisis quintile regressions yield significant results of long - run relationship between the Shanghai market, the US market and many regional exchanges. Cointegration is particularly prevalent at the higher end of the distribution and their results suggest that the robust growth of the Shanghai market in the new millennium has been attended by a meaningful level of integration with other regional and world markets in spite of ongoing capital controls.

One remarkable feature of the 2008 financial crisis has been the speed and the far reaching effect and the widespread around the world. While it started in the United States, it has affected not only economies that shared comparable vulnerabilities, in specific the exposure of financial systems to real economy, but it spread to virtually all economies, advanced and emerging alike. The impact of the global financial crisis caused a considerable slowdown in both the developed and developing countries. Stock markets were down more than 40% from their recent highs, and the main economic indicators, such as GDP of the global economy was declining (Velde, 2008). As regard the developing countries, the effects of the crisis have lagged the rest of the world in these countries; however, its eventual impact is considered a severe one. Some developing countries witnessed a strong growth rate at the beginning of the crisis, but in a later stage these countries have witnessed a slowdown in their economies.

The main purpose of this paper is to shed new light on the degree of the 2008 USA shock on the financial markets, and the actual extent to which the US financial market has affected other financial markets in the world, by examining short-term as well as long-term relationships between stock market indices. Although there is

already a large literature bearing on the question of financial market integration and the effect of the 2008 global financial crisis, past work has generally neither offered a comprehensive examination of the group of different countries around the world, in particular, from Europe, Far East Asia, MENA and Latin America.

In this paper we focus on the relationship between the U.S.A. and 30 countries' economies, trying to highlight the potential spillovers of the financial crisis. Our paper makes several major contributions to the literature: First, we put emphasis on the magnitude of the responses of the stock market index of different countries around the world to the shock applying econometric techniques. We use the stock market index, in a monthly return, as it is one of the most commonly used indicators that reflect the state of a country's economy. As for our second contribution, this paper is able to include many countries over several years to the analysis. By including a high number of countries and for the most recent period, the analysis can provide a clue whether the global financial crisis which occurred in 2007-2008 only slightly and temporarily increased the already high level of co-movement between the US financial market and the observed stock market for 30 countries around the world.

The rest of the paper is organized as follows: in section two we show the literature review. Section three specifies the methodology, in particular the OLS regression and Error Correction Model. The empirical results are presented in section four, and in section five we proposed the conclusion.

2. Literature Review

For the past decade, there has been an extensive empirical research testing the contagion relationship between stock markets around the globe. This section passes through the most important articles in this topic; Tai (2007) highlighted the importance of liberalization in figuring the importance of crisis on the stock market; the empirical results showed that the Stock Market for India, Korea, Malaysia, Philippines, and Thailand were segmented from the world capital markets before their liberalization dates, but all six markets have become fully integrated since then. From his side, Syllignakis and Kouretas (2011) indicated that there is a statistically significant increase in conditional correlations between the US on the one hand and German stock returns and the CEE stock returns on the other, particularly during the 2007-2009 financial crises, implying that these emerging markets are exposed to external shocks with a substantial regime shift in conditional correlation. Burdekin and Siklos (2012) confirmed that the significance of crises in affecting the persistence of equity returns in the Asia Pacific region and offers some support for contagion effects. Their results show that the enormous growth of the Shanghai market in the new millennium has been accompanied by a meaningful level of integration with both the regional and world markets in spite of tight capital controls.

In comparison between the effect of international crisis and country specific crisis, Kenourgios et al. (2011) confirmed a contagion effect from the crisis country to all others (Brazil, Russia, India, China, US, and UK) for each of the examined financial crises. The results also suggest that emerging BRIC markets (Brazil, Russia, India, and China) are more prone to financial contagion, while the industry-specific turmoil has a larger impact than country-specific crises. However, Dungey et al. (2010) proved that financial crises are indeed alike, as all linkages are statistically important across all crises such as Russia and LTCM in the second half of 1998, Brazil in 1999, Argentina in 2001-2005, and the recent U.S. financial in late 2007. However, the strength of these linkages does vary across crises.

Highlighting the impact of crisis and the issue of co-movement in the Latin American countries, Simpson (2005) provided evidence of interdependence and cointegration between the Latin American banking systems and the major Euro banking systems interacting with the major Latin American systems (they used the banking stock price indices as a proxy). In the short-term, the Latin America exogeneity lies primarily with the countries of Brazil, followed by Mexico, Argentina and Chile. The evidence indicated that there are minimal contributions by the systems in Peru and Colombia. As regard the relationships between the Latin American countries' banking systems and the European countries' banking systems shows that exogeneity lies primarily with the USA, Canada, the European Monetary Union, the United Kingdom and Japan and the strength of the exogeneity is in the respective order. In addition, Canova (2005) showed that US monetary shocks produce significant fluctuations in Latin America, but real demand and supply shocks do not. Guesmi et al. (2013) findings showed that the degrees of trade openness and stock market development are among the most important drivers of regional integration in selected Latin America context countries whatever the measure of the exchange rate risk. Nevertheless, Graham et al. (2012) showed that the strength of co-movement, however, differs by country after studying 22 emerging market. For example, they report a high degree of co-movement between the U.S. and Brazil, Mexico and Korea, but low co-movement with and Egypt and Morocco.

Moving to the Arab countries, Elfakhani et al. (2008) results showed that within Arab markets, Kuwait cointegrates individually with Jordan, Tunisia, and Saudi Arabia. The results also indicated the existence of

cointegration between Tunisia and Jordan, thus offering investors possible continued diversification opportunities. On the other hand, the results illustrated that three countries (Jordan, Kuwait, and Morocco) are cointegrated with the U.S. general market index, implying that these markets offer a potential substitute for those investing in the U.S. markets. In studying the co-movement in the short and long term, Akoum et al. (2012) indicate lack of market dependencies in the short term in the Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) and two non-oil producing countries in the region (Egypt and Jordan), indicating that oil and stock returns are not strongly linked in the short term. However, the results show that both oil returns and stock market returns move together over the long term. The results also indicated an increasing strength in the market dependencies after 2007, signifying enhanced diversification benefit for investors in the short term relative to the long term. Aloui, C. and Hkiri, B. (2013) confirmed these findings; their results revealed frequent changes in the pattern of the co-movements especially after 2007 for all the selected GCC Countries markets at relatively higher frequencies. They further note an increasing strength of dependence among the GCC stock markets during the last financial crisis signifying strong portfolio benefits for investors in the short term relative to the long term. On the financial side, the results uncover that the strength of co-movement between GCC markets is quite obvious and may impact the multi-country portfolio's value at risk (VaR) levels. The findings provide potential implications for financial investors operating in the GCC markets who are invited to think through co-movement at both frequencies and time levels when designing their portfolios.

3. Data and Research Methodology

3.1 Description of the Data

This paper investigates the relationship between SP500 stock market index and stock market index for 30 countries from the regions of East Asia (South Korea, Hong Kong, Singapore, Indonesia, Sri Lanka, China, Japan, India and Taiwan), Middle East (Saudi Arabia, Bahrain, Kuwait, Oman, UAE (Dubai, and Abu Dhabi), and Jordan), Europe (United Kingdom, France, Germany, Netherland, Switzerland, Spain, Italy, Belgium and Russia), Latin America (Brazil, Argentina, Mexico), North America (Canada) and Australia. The data spread over the time period between June 2010 and April 2015. The financial data comprised of the monthly closing prices of the stock market index. The source of data is from the Quandl Site (Note 1) and from the International Monetary Fund (IMF).

3.2 The Research Methodology

3.2.1 MonthlyReturns for Market Stock Index

Monthly returns for Market Stock Index were measured as following:

$$R_m = \frac{GI_t - GI_{t-1}}{GI_{t-1}} \quad (1)$$

Where, R_m is the monthly return of the market index, GI_t is the General Index for time t , and GI_{t-1} is General Index for time $t-1$. The analytical framework of the study is based on the dependent variable of SP500 Index, and the independent variable which is the market stock index for each country.

3.2.2 Regression Model

Regression model is implemented in order to examine the relationship between each country stock market index and SP500 stock market index. Regression of non-stationary time series on another non-stationary time series may cause a spurious regression or non-sense regression. The symptom of a spurious regression is R-Squared value would be greater than Durbin- Watson statistic, where R^2 is practically zero, as it should be, where $0 \leq R^2 \leq 1$. On the other hand, the Durbin-Watson (d) is about 2, where Durbin-Watson is used for detecting serial correlation (Gujarati, 2004). Since $d \approx 2(1 - \hat{\rho})$, where $\hat{\rho}$ is an estimator of ρ and which is the first-order coefficient of autocorrelation, and as $-1 \leq \rho \leq 1$, it can be implied that $0 \leq d \leq 4$. The two values 0 and 4 are the bounds of d , and any estimated d value must lie within these limits. Where:

If $\hat{\rho} = 1$, then $d \approx 0$, and one may assume that there is no first-order autocorrelation.

If $\hat{\rho} = 0$, then $d = 2$, indicating perfect positive serial correlation in the residuals.

If $\hat{\rho} = -1$, then $d \approx 4$, indicating that there is perfect negative serial correlation in the residuals.

The case of spurious and not spurious regression for the tests may be written as:

The first case: $R\text{-Squared} > \text{Durbin-Watson statistic}$.

The second case: R-Squared < Durbin-Watson statistic.

Where under the first case, the model is spurious or non-sense regression, while under the second case; the model is not spurious or has sense regression.

Engle and Granger (1987) note that even though economic or financial time series may be described as a random walk process, it is possible that the linear combinations of the series or variables would over time converge to equilibrium.

We performed ADF test on the error term, ε_t from the following linear combinations between the each country stock market index and SP500 stock market index:

$$y_t = \beta_1 + \beta_2 x_t + \varepsilon \quad (2)$$

Where:

y_t : is the dependent variable (each country stock market index).

x_t : is the independent variable (SP500 stock market index).

β_1 : is the intercept.

β_2 : is the coefficient of the independent variable / or the long-run coefficient.

ε_t : is the residual of the model /or equilibrium error.

The residual of the model is found stationary by testing the t-statistic against Engle- Granger 5% and 10% critical value (equal to -3.34 and -3.04, respectively). The null and the alternative hypotheses for the tests may be written as:

H_0 : t-statistic < Engle-Granger critical value.

H_1 : t-statistic > Engle-Granger critical value.

Where under the null hypothesis, there is a unit root, while under the alternative, there is no unit root. In order to test the validity of the model whether the model is spurious or not, the R-Squared testing was implemented; where the symptom of a spurious regression is R-Squared value would be greater than Durbin-Watson statistic.

The stationarity of the residual which is an indication of the validity of the model means that SP500 stock market index and each country's stock market index are cointegrated or have a long-term relationship – the model is not spurious. On the other hand, if the residual is found to be non-stationary, then there is an existence of no long-term equilibrium relationship between SP500 stock market index and each country's stock market index. So the model is spurious or has no sense regression.

3.2.3 Unit Root Test

Before conducting estimation and in order to avoid possible spurious regression, it is necessary to distinguish stationary from non-stationary variables. The first step undertaken would be to establish the order of integration of variables used in the model. This is accomplished by applying the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979; 1981) on each of the series in the estimated equations, standard unit root tests. The well-known ADF test for a unit root in y_t , omitting a linear deterministic trend is:

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum \delta_i \Delta y_{t-i} + \varepsilon_t \quad (3)$$

Where Δ is the difference operator, ε_t is a white noise disturbance term with variance σ^2 , and $t = 1, \dots, T$ indexes time. The Δy_{t-i} terms allow for serial correlation and are designed to ensure that ε_t is white noise. The empirical evidence suggests that there is no time trend in the data. The ADF test has a null hypothesis of non-stationarity against an alternative of stationarity.

The appropriate number of lagged difference (k) is determined by Akaike Information Criteria (AIC) as in Akaike (1970). Optimal choice of lag length removes autocorrelations in the error term.

3.2.4 Error Correction Model

The Granger representation theorem, states that if two variables such as, SP500 stock market index and each country stock market index are cointegrated, then the relationship between the two can be expressed as Error Correction Mechanism (ECM). Engle and Granger (1987) state that "For a two variable system a typical error correction model would relate the change in one variable to past equilibrium errors, as well as to past changes in both variables." ECM states that the past change in dependent variable (y_{t-1}) depends on past change in independent variable (x_{t-1}) and also on the equilibrium error term.

If the equilibrium error term is non-zero, then the model is out of equilibrium. When $D(x_t)$ is zero and U_{t-1} is positive, this means that $D(y_t)$ is above its equilibrium value of $(\beta_3 + \beta_4 D(x_t))$. Since β_5 is expected to be negative, the term $\beta_5 U_{t-1}$ is negative and, therefore, y_t will be negative to restore the equilibrium. That is, if y_t is above its equilibrium value, it will start falling in the next period to correct the equilibrium error. The absolute value of β_5 will decide how quickly the equilibrium is restored. The Error Correction Model is calculated as following:

$$D(y_t) = \beta_3 + \beta_4 D(x_t) + \beta_5 U_{t-1} + v \quad (4)$$

Where:

D : is the first difference operator.

y_t : is the dependent variable.

x_t : is the independent variable.

β_3 : is the intercept.

β_4 : is the short-run coefficient.

β_5 : is the coefficient of the speed of adjustment, and it should be negative.

U_{t-1} : is the error correction term (one-period lagged value of the error from the cointegrating regression).

v : is the white noise (random) error term.

Finally, in order to test the validity of the model and whether if the model is spurious or not, the R-Squared testing is implemented; where the symptom of a spurious regression is R-Squared would be greater than Durbin-Watson statistics. Breusch (1978) and Godfrey (1978) known as Breusch-Godfrey Serial Correlation LM (Lagrange Multiplier) Test also conducted for testing whether the residual of the Error Correction Model is serially correlated. The null hypothesis is no serial correlation. In addition, Jarque-Bera (1980) test of normality was utilized for testing whether the residual of the Error Correction Model is normally distributed. This test is asymptotic or large-sample test, and it has a chi-square distribution. The null hypothesis is normal distribution.

4 Results

4.1 Regression Results

East Asia Countries

The results in Table 1 indicate that the coefficient of South Korea, Hong Kong, Singapore, Indonesia, Japan, India and Taiwan are statistically significant at 1%, where P value equal to zero which is less than 1%. While for Sri Lanka and China, the coefficient is statistically significant at 10%, where P value equal to 0.0954 and 0.096 respectively, which is less than 10%. Granger and Newbold (1974) assume that the model is spurious if R square is greater than Durbin-Watson statistic, where the null hypothesis of the model is spurious and the alternative hypothesis of the model is non-spurious or sense regression. We reject the null hypothesis for test which assumes spurious regression and accept the alternative hypothesis of non-spurious or sense regression, where R-Squared value is less than Durbin-Watson statistic for all the Far East countries.

European Countries

As indicated in Table 1, the coefficients of United Kingdom, France, Germany, Netherland, Switzerland, Spain, Italy, Belgium and Russia are statistically significant at 1% level, where P value is equal to zero. In Europe, we also reject the null hypothesis for the test which assumes spurious regression and accept the alternative hypothesis of non-spurious or sense regression, where R-Squared value is less than Durbin-Watson statistic for all the European countries.

Latin America

Similarly, Table 1 indicates that the coefficients for Brazil, Argentina, and Mexico are statistically significant at 1% level, where P value is equal to zero. Granger and Newbold (1974) assume that the model is spurious if R square is greater than Durbin-Watson statistic, where the null hypothesis of the model is spurious and the alternative hypothesis of the model is non-spurious or sense regression. We reject the null hypothesis for the test which assumes spurious regression and accept the alternative hypothesis of non-spurious or sense regression, where R-Squared value is less than Durbin-Watson statistic for all the Latin American countries

North America, Australia

The results in Table 1 indicate that the coefficients of North America (Canada), Australia are statistically significant at 1% level, where P value is equal to zero which is less than 1%. As for testing the spurious

regression model, the results indicate rejecting the null hypothesis and accepting the alternative one, where R-Squared value is less than Durbin-Watson statistic for both Canada, and Australia.

Middle East Countries

Finally, the results in Table 1 show that the coefficient of Jordan is statistically significant at 1% level, where P value is equal to zero. While for Saudi Arabia and Kuwait the coefficient are statistically significant at 5% level, where P value is equal to 0.0256 and 0.0191 respectively. As for Dubai, the coefficient is statistically significant at 10% level, where P value is equal to 0.08. On the other hand, the coefficients for the countries of Oman, Abu Dhabi and Bahrain are statistically insignificant at 1%, 5% and 10%, where P value for these countries is more than 10%. Testing spurious regression for the MENA countries, the results indicate rejecting the null hypothesis for the test which assumes spurious regression and accept the alternative hypothesis of non-spurious or sense regression, where R-Squared value is less than Durbin-Watson statistic for all the sample countries in the Middle East region.

Table 1. Regression results

$y_t = \beta_1 + \beta_2 x_t + \varepsilon$									
Country	β_2	P val.	R ²	D-W	Country	β_2	P val.	R ²	D-W
East Asia					Europe				
South Korea	0.610***	0.000	0.313	2.241	UK	0.801***	0.000	0.697	2.618
Hong Kong	0.906***	0.000	0.374	2.032	France	0.906***	0.000	0.542	1.774
Singapore	0.606***	0.000	0.378	2.029	Germany	0.902***	0.000	0.451	2.188
Indonesia	0.592***	0.0001	0.236	1.670	Netherland	0.806***	0.000	0.547	1.878
Srilinka	0.370*	0.0954	0.048	1.638	Switzerland	0.528***	0.000	0.386	2.010
China	0.402*	0.096	0.0479	1.576	Spain	0.916***	0.000	0.304	1.992
Japan	0.748***	0.000	0.291	1.869	Italy	1.032***	0.000	0.353	1.982
India	0.622***	0.0003	0.210	2.085	Belgium	0.659***	0.000	0.442	1.615
Taiwan	0.712***	0.000	0.441	2.074	Russia	1.663***	0.000	0.453	1.477
Latin America					North America				
Brazil	0.989***	0.000	0.399	1.467	Canada	0.554***	0.000	0.500	1.910
Argentina	1.1456***	0.0026	0.149	1.704	Australia				
Mexico	0.585***	0.000	0.386	1.701	Australia	0.603***	0.000	0.415	2.286
Middle East									
Saudi Arabia	0.398**	0.0256	0.084	1.675	Dubai	0.437*	0.0800	0.053	1.549
Kuwait	0.324**	0.0191	0.093	1.613	Abu Dhabi	0.202	0.1515	0.036	1.369
Oman	0.181	0.1297	0.040	2.064	Bahrain	0.109	0.2195	0.026	1.506
Jordan	0.265***	0.0029	0.146	1.873					

Note. Significance at 10% * at 5% ** at 1% ***.

4.2 Unit Root Results for Residuals

Before conducting estimation and in order to avoid any possibility of spurious regression, it is necessary to distinguish stationary from non-stationary residuals. This is accomplished by applying the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979; 1981) on each of the residual series in the estimated equations. The ADF test has a null hypothesis of non-stationarity against an alternative of stationarity.

The stationarity of the residual and the validity of its model, mean that SP500 stock market index and each country stock market index in the model are cointegrated or they have long-term relationship between them and the model is not spurious or has sense regression. The residual of the model is found stationary by testing the t-statistic against Engle-Granger 5% and 10% critical value (equal to -3.34 and -3.04, respectively). The null and the alternative hypotheses for the tests may be written as follows:

H_0 : t-statistic < Engle-Granger critical value.

H_1 : t-statistic > Engle-Granger critical value.

Where under the null hypothesis, there is a unit root, while under the alternative, there is no unit root.

Table 2. Unit root test results for residuals

Augmented Dickey-Fuller test statistic for residuals					
Country	T - statistic	P value	Country	T - statistic	P value
East Asia Countries			Europe		
South Korea	-4.53***	0.0006	UK	-10.423***	0.000
Hong Kong	-8.113***	0.000	France	-6.836***	0.000
Singapore	-8.383***	0.000	Germany	-8.513***	0.000
Indonesia	-6.629***	0.000	Netherland	-7.233***	0.000
Srilanka	-6.572***	0.000	Switzerland	-7.520***	0.000
China	-5.960***	0.000	Spain	-7.559***	0.000
Japan	-7.009***	0.000	Italy	-7.55***	0.000
India	-8.256***	0.000	Belgium	-6.156***	0.000
Taiwan	-7.977***	0.000	Russia	-5.689***	0.000
Latin America			Middle East		
Brazil	-5.596***	0.000	Saudi Arabia	-6.259***	0.000
Argentina	-6.449***	0.000	Kuwait	-6.147***	0.000
Mexico	-6.436***	0.000	Oman	-7.821***	0.000
North America			Dubai	-6.094***	0.000
Canada	-7.171***	0.000	Abu Dhabi	-5.792***	0.000
Australia			Bahrain	-5.819***	0.000
Australia	-8.657***	0.0000	Jordan	-7.024***	0.000

Note. Significance at 10% * at 5% ** at 1% ***.

As indicated in Table 2, all the unit root tests for residuals in all the equations reject the null hypothesis that there is a unit root and accept the alternative one, meaning that there is no unit root as the t-statistic is greater than Engle - Granger at 5% and 10% levels (equal to -3.34 and -3.04, respectively). Based on these results, the SP500 stock market index and each country stock market index in the model are cointegrated or they have long-term relationship, and the models is not spurious or has sense regression except for Oman, Abu Dhabi and Bahrain where the relationship is statistically insignificant.

4.3 Error Correction Model (ECM) Results

All the above results indicated that the residuals are stationary and there is a long-term relationship between each stock market index and S&P500 stock market index except for Oman, Abu-Dhabi and Bahrain. Based on these results, we employ Engle-Granger (1987) Error Correction Model to reveal at what rate it corrects the previous period disequilibrium for the long term relationship and illustrate if there is a short term relationship between the variables. Our results of ECM are depicted in Table 3.

East Asia Countries

As shown in Table 3, the results of South Korea, Hong Kong, Singapore, Indonesia, Sri-Linka, China, Japan, India and Taiwan indicate that the coefficient of the speed of adjustment is statistically significant at 1%, where β_5 is negative and P value is equal to zero. In addition, there is a statistically significant short-term relationship at 1%, where β_4 is positive for all the countries and P value is equal to zero. The β_5 value indicates that the system in the countries corrects its previous period disequilibrium at certain speed annually. The value of β_5 for East Asia countries ranged between -0.84 and -1.19 indicating that the financial market in these countries adjust the previous period disequilibrium at a speed of 84% - 119% annually.

European Countries

Table 3 shows that the coefficients of the speed of adjustment for the United Kingdom, France, Germany, Netherland, Switzerland, Spain, Italy, Belgium and Russia are statistically significant at 1% level, where β_5 is negative and P value is equal to zero. In addition, there is a statistically significant short-term relationship at 1% level, where β_4 is positive for all the countries and P value is equal to zero. The value of β_5 for European countries ranged between -0.78 and -1.34 indicating that the financial market in these countries adjust the previous period disequilibrium at a speed of 78% - 134% annually. This means that European countries corrected the previous disequilibrium at a higher speed than the East Asia countries indicating strong linkages between Europe and USA.

Latin American Countries

As indicated in Table 3, the results of Brazil, Argentina and Mexico show that the coefficient of the speed of adjustment is statistically significant at 1% level, where β_5 is negative and P value is equal to zero. Furthermore, there is a statistically significant short-term relationship at 1% level, where β_4 is positive for all the countries and P value is equal to zero. The value of β_5 for Latin American countries ranged between -0.76 and -0.85 indicating that the financial market in these countries adjust the previous period disequilibrium at a speed of 76% - 85% annually.

North America, Australia

Staying in Table 3, the results of North America (Canada), Australia, indicate that the coefficient of the speed of adjustment is statistically significant at 1%, where β_5 is negative and the P value equal to zero. In addition, there is a statistically significant short-run relationship at 1%, where β_4 is positive for all the countries and the P value equal to zero. The value of β_5 for North American countries and Australia ranged between -0.97 and -1.15 indicating that the financial market in these countries adjust the previous period disequilibrium at a speed of 97% - 115% annually which is relatively higher than the countries of the Latin America but lower than the European countries.

Middle East Countries

Table 3 indicates that the coefficient of the speed of adjustment results for Saudi Arabia, Bahrain, Kuwait, Oman, Dubai, Abu Dhabi and Jordan (Middle East), are statistically significant at 1% level, where β_5 is negative and the P value is equal to zero. Moreover, there is a statistically significant short-term relationship at 1% level, where β_4 is positive for Saudi Arabia, Kuwait and Jordan and the P value is equal to zero. As for Oman, there is a statistically significant short-term relationship at 5%, where β_4 is positive and the P value is equal to 0.0192. Moving to Dubai, there is a statistically significant short-term relationship at 10% level, where β_4 is positive and the P value is equal to 0.0819. On the contrary, the results for Abu Dhabi and Bahrain indicate that there is a statistically insignificant short-term relationship at 10% level, where β_4 is positive and P value is greater than 10%.

Finally, we reject the null hypothesis for test which assumes spurious model and accept the alternative hypothesis of non-spurious or sense model at level, where R-Squared value is less than Durbin-Watson statistic for all the sample countries.

The value of β_5 for the countries in the Middle East ranged between -0.71 and -1.04 indicating that the financial market in these countries adjust the previous period disequilibrium at a speed of 71% - 104% annually indicating a high range of adjustment in these countries as some countries. Abu Dhabi has the lowest speed of correction among all the countries studied in this paper.

Table 3. Error correction model results

$D(y_t) = \beta_3 + \beta_4 D(x_t) + \beta_5 U_{t-1} + v$						
Country	β_4	P value	β_5	P value	R ²	Durbin-Watson
Asia Far East Countries						
South Korea	0.654***	0.000	-1.193***	0.000	0.710	2.034
Hong Kong	0.997***	0.000	-1.149***	0.000	0.747	1.801
Singapore	0.656***	0.000	-1.075***	0.000	0.743	2.075
Indonesia	0.627***	0.000	-0.899***	0.000	0.627	1.882
Srilinka	0.451***	0.0016	-0.851***	0.000	0.489	1.995
China	0.325**	0.037	-0.846***	0.000	0.440	1.803
Japan	0.741***	0.000	-0.933***	0.000	0.615	2.008
India	0.796***	0.000	-1.117***	0.000	0.681	1.922
Taiwan	0.763***	0.000	-1.073***	0.000	0.743	2.008
Europe						
United Kingdom	0.848***	0.000	-1.342***	0.000	0.899	1.961
France	0.928***	0.000	-0.905***	0.000	0.775	2.000
Germany	0.873***	0.000	-1.122***	0.000	0.722	1.905
Netherland	0.860***	0.000	-0.972***	0.000	0.796	1.972
Switzerland	0.510***	0.000	-1.001***	0.000	0.678	1.975
Spain	1.040***	0.000	-1.018***	0.000	0.692	2.040

Italy	1.072***	0.000	-1.007***	0.000	0.683	2.024
Belgium	0.655***	0.000	-0.810***	0.000	0.705	2.010
Russia	1.695***	0.000	-0.787***	0.000	0.736	1.850
Latin America						
Brazil	1.063***	0.000	-0.767***	0.000	0.717	1.868
Argentina	1.156***	0.000	-0.858***	0.000	0.512	1.965
Mexico	0.590***	0.000	-0.852***	0.000	0.713	1.982
North America						
Canada	0.501***	0.000	-0.966***	0.000	0.753	1.942
Australia						
Australia	0.610***	0.000	-1.149***	0.000	0.750	2.000
Middle East						
Saudi Arabia	0.425***	0.0004	-0.881***	0.000	0.452	1.829
Kuwait	0.308***	0.0007	-0.806***	0.000	0.461	1.967
Oman	0.184**	0.0192	-1.040***	0.000	0.541	1.962
Dubai	0.270*	0.0819	-0.788***	0.000	0.411	1.979
Abu Dhabi	0.099	0.2345	-0.715***	0.000	0.387	1.988
Bahrain	0.046	0.4131	-0.722***	0.000	0.353	2.054
Jordan	0.256***	0.000	-0.936***	0.000	0.549	2.010

Note. Significance at 10% * at 5% ** at 1% ***.

5. Conclusion

This study examines whether there is a short term and long term relationship between the USA S&P500 Index and 30 stock market indices around the world. Therefore testing for the contagion effect during the period June 2010 till April 2015. The results indicate that 27 countries from the regions of Far East, Europe, Latin America, Middle East as well as the countries of Australia and Canada displayed contagion.

The contagion places downward pressure on economic growth because fewer or more expensive loans decrease investment by businesses and consumer spending. The financial crisis caused the US stock market to decline significantly; also causes the countries around the world to suffer contagion effect. In an economic perspective, these results can provide an important clue that the global financial crisis of 2007-2008 significantly and lengthily increased the already high level of co-movement between the USA financial market and the observed stock market for 27 countries around the world.

The apparent positive long term coefficients during this study period implies that investors do not gain from diversification by holding investment portfolio consisting of diverse stocks from these suffering contagion countries. In other words, if the increase in the long term coefficients during market crashes exists and positive, investors should consider asset allocation and portfolio composition. However, the benefits of portfolio diversification will be severely limited during periods with high volatility and positive short-term and long-term coefficients, when, in fact, international portfolio diversification is needed most.

Furthermore, the results showed that the USA on the one hand and the European countries on the other are each other's main financial partners (taking stock market); the financial markets in Europe adjust the previous period disequilibrium with the US financial market at a speed of 78%-134% annually which is the highest in comparison with the other regions. The transnational relationship defines the shape of the international economy as a whole as either the European countries or the USA is also the largest investment and trade partner for almost all other countries in the world. The strong linkages between the financial markets in the EU and USA provide consistent evidence that the bilateral trade and investment is huge which illustrates the high degree of interdependence of the two economies.

The results have important implications. That is, when the international major crisis takes place, majority of all the developing and developed markets are easily affected. And the contagion effect of financial crisis may result from funds of the world can freely flow through international trades and investment in the economic globalization countries around the world stock market.

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Note

Note 1. https://www.quandl.com/data/YAHOO/INDEX_GSPC-S-P-500-Index

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