STOCK RETURN VOLATILITY AND COINTEGRATION OF U.S. AND ASIAN MARKETS IN ACCORDANCE WITH THE FINANCIAL CRISIS (1997-2014)

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ABSTRACT

Nature of the stock return is one of the important aspect for investor in making their decision to invest their money. The nature of stock could be examined by using three variables, consist of volatility, risk premium, and information asymmetry.This research will used E-GARCH and ARCH-M models, using the data from five counties whichi consist of U.S., Indonesia, Malaysia, Japan, and Hong Kong. These data was taken from 1st July 1997-30th June 2014 which consist of eight periods of global economic events Periods. This research was conducted with seceral objectives, they are: (1) To analyze the effect of global economic conditions to stock return.(2) To investigate the effect of global economic conditions to risk premium. (3) To examine the impact of good nor bad news (asymmetric information) effect to the volatility of stock. (4)To analyze the co-integration between US market and four Asian markets during the global economic events (financial crisis).

Keywords: Global Economic Events, Volatility, Risk Premium, Information Asymmetry, Co-integration

Introduction

The topic of this research is about the economic studies regarding stock returns volatility in relation to the economic cycles. In making investment decision, it was believed the investor will make use all of the available information they can gathered and take this into account to make a logical and rational decision before investing and that would be one of the reason why investor should understand and examine the nature of stock returns toward the economic condition of the country.

In this research primarily the researcher will investigate the response of stock markets of Asian countries and how it behaved toward the global economic shocks or global crisis. Recent studies of Herwany and Febrian (2013) has shown relationship of Indonesian Financial Industry with the same industry of US, UK, Tokyo, Hong Kong, Singapore, and Kuala Lumpur Stock and from the pre and post period of economic crisis which includes the year2nd January 2007 until 30th December 2010. Based on this previous research, Indonesian, US, and several asian countries have become interesting countries that need to be analyzed by the researchers.

This research seeks to examine the cyclicality nature of stock returns in relations toward the economic cycles that happened on the US and four Asian stock markets. There are several questions that has been addressed and used as a guidance to develop this research. This research will relate the global economic phenomenon from 1997-2014. This research is focusing on Asian markets and discussed several issues, consist of: (1) How global economic conditions effect stock return? (2) How global economic conditions effect risk premium? (3) How the impact of good nor bad news (asymmetric information) effect the volatility of stock? (4) Is there any co-integration between US market and four Asian markets during the global economic events?

The main purpose of this research is to examine the nature of stock returns in relations toward the economic cycles. This research will focus on Asian stock markets. There are some others objectives that hopefully can be reach or answer after the research has been conducted, such as; (1) To analyze the effect of global economic conditions to stock return, (2) To investigate the effect of global economic conditions to risk premium, (3) To examine the impact of good nor bad news (asymmetric information) effect to the volatility of stock, (4) To analyze the co-integration between US market and four Asian markets during the global economic events (financial crisis).

Another purpose of this research is to analyze the comparison condition of stock return volatility when a country faced crisis. By making comparison, it will give understanding how each market behave when they deal with this condition and how is the risk premia during bad and good conditions. Hopefully the readers can get better understanding of the correlation between global economic events with stock return volatility, risk premia, and asymmetric information.

Theoretical Background

There are three important variables that need to be consider to understand the connection between economic cycles and stock return volatility there are consist of stock return volatility, risk premium, also information asymmetry. With the globalization and the development in the technology, capital markets of each country are closely interconnected to one another. As a result of global economic events many countries were affected whether it is direct or indirect way. Some countries will become unstable and suffer from the events and that's the reason why the effect of the global economic events that happened need to be analyzed by the researchers. Lukanima and Swaray (2013) have provided the periodical sampling of each global economic event that has happened even since 1990, which shows in the table below.

Periodical Sampling of Global Economic Events since 1990

Global Economic Events	Description of Economic Condition
Pre Asian Financial Crisis (02/02/1990 – 01/07/1997)	The period of prelude to the 1997 crisis
The Asian Financial Crisis (02/01/1997 – 30/03/1999)	The beginning crisis in Thailand of Thai Baht financial collapse followed by the Thai government decision.
The Post Asian Economic Crisis (01/04/1999 – 31/12/2002)	The economic recovery where by the end of 2002, countries that were affected by the Asian Financial Crisis had slowly recover.
The Global Economic Boom (02/01-2003 – 31/07/2007)	Economic boom resulted from four major factors consist of high commodity prices, booming international trade, exceptional financing conditions, and high levels of remittances.
The pre Global Financial Crisis (01/08/2007 – 16/03/2008)	The beginning of the U.S. crisis which reverse the global economic boom condition
The Global Financial Crisis (17/03/2008 – 31/03/2009)	US Investment Bank collapsed resulted to the Global Financial Crisis.
The Post Crisis: Economic Recovery (01/04/2009 – 30/04/2010)	The recovery period which shown by the improvement of the stock performance
The Greece Debt Crisis (01/05/2010 – 15/12/2011)	Greek governments have been consistently and deliberately misreported the country's economic statistics and this resulted to the fear from the market.
Post Crisis Period: Greece Crisis (16/12/2011 – 31/06/2014)	The "road to recovery" where many public companies started to recover.

Source: Lukanima and Swaray (2013: 56); Stunda (2014:43)

The first variable which is stock price volatility received great attention for investors and it is important aspect that need to be understand before deciding to invest money in the market. There are several research that has been conducted regarding the behaviour of the stock return volatility Urooj et al. (2009) in their research, they examine the stock volatility of KSE 100/ Karachi stock exchange from period November 1992 to January 2008. By using ARCH/GARCH model, the researcher has found that KSE 100 has volatility clastering, leptokurtosis and asymmetry and they found that there's pattern existed in the stock price returns in this market.

Second, risk premium is one of the great interest that need to be considered by the investor as their bear the risk from the market.

Dictionary of Financial And Business Terms defined risk premium as "the reward for holding rhe risky market portfolio rather than the risk-free asset. The spread between Treasury and non-Treasury bonds of comparable maturity." (p.124)

Third variable, would be infotmation asymmetru. According to Kolb and Rodriguez's (1992) book of Financial Management, information asymmetry or asymmetric information is the situation in which investor has the same information regarding the firm, in which not every information they get are the same or condition where two parties possess information about same subject and the information itself has different value.

This information asymmetry appears anywhere and has been conducted by many researchers. One of the examples is shown by Chang (2003) who analyzes the barriers to information flow in which examined the information asymmetry happened in emerging market by studying and comparing between foreign and expatriate analysts. The researcher uses the daily data of stock price of TSE or Taiwan Stock Exchange and also listed companies data. In this research, it was underlined that the expatriates' trade on their superior information, while foreign does not trade on their information, but by having expatriate recommendations. The result of this research shows that the expatriate analysts outperform foreign on the profitability of portfolios.

Globalization has resulted to the closely interconnection of each countries and it easily influence the economic condition of each countries with this basic, the co-integration test has been conducted by many researchers in order to examine the long run relationship among selected variables. Recent study by Sum (2013) conducted the co-integration test between United States and Europe and in his research, with the changes that happened in the structural policy of one country it can give a direct or indirect effect toward the others that's why by taking this into consideration, Sum also put the economic policy uncertainty that has happened in the countries into account . The research has found the long run interconnections in economic policy uncertainty by looking through the economic conditions between US and European countries.

Royfaizal et al. (2009) investigated the international linkages or relationship between ASEAN and US stock markets. In this research, the sample of ASEAN countries used mainly are Malaysia, Singapore, Philippines, Thailand, Indonesia, China, Japan, and Korea. All of these countries are thoroughly investigated its relation with US markets since the ASIAN financial crisis. Using the co-integration test, they come into conclusion that there's no significant co-integration among ASEAN and US markets on pre-crisis period, meanwhile during crisis and post-crisis period there's long run relationship in those stock markets between those countries.

Hypothesis Development

Based on these theoretical basis and looking through the previous study of stock return volatility and economic cycles that has been conducted, the author develop hypothesis that would like to be analyse which consist of Hypothesis 1 to Hypothesis 4, there are;

H1: If there's good economic condition, then stock return increases.

Hypothesis 1 proposes the positive correlation between economic condition and stock return. It is based on the literature and deductive reasoning. The economic condition is distinct by the news. One of the researches that support this hypothesis is based on the research of Djamil et al. (2013) found that stock returns are mostly determined by external factors that were consist of inflation, exchange rate, socio-economic conditions, etc. Basically the good economic condition appear in correspondence from recovery after the crisis condition, economic booms or expansions.

H2: If there's good economic condition, then the risk premium decreases.

Hypothesis 2 employs the relationship between economic condition and the risk premium (trade off between risk and return). To analyze the risk premium in this research is by looking at the difference between the market rate and the risk free rate (Rm-Rf). There are several conditions regarding risk premium, several research found the increases in risk premium during bad times but not all of the market experience the same, considering each countries has it's own economic condition. This hypothesis is supported from research conducted by Mendonca and Nunes (2011) in their research of Brazilian economic experience, which come to conclusion from their research that good economic condition, with stabilizes public debt and GDP ration resulted to the low risk premium.

H3: Bad news (information asymmetry) increases the volatility of stock return.

Hypothesis 3 proposes negative autocorrelation between information asymmetry and return volatility. It is based on the proposition of the importance of information that would give implication toward investor in making decision. Hypothesis 3 was based on Chiang et al. (2007) who conduct research on five stock markets. In their research, they found that negative news will cause decline in

national stock returns. In which it explained that when bad news hit the markets, the stock return become more volatile and persistent. Volatility of the stock would be determined by examining the standard deviation of each country.

H4:There is co-integration between US market and four Asia markets during financial crisis.

Hypothesis 4 proposes the co-integration between US market and Asia markets. This hypothesis was supported by the research that has been conducted by Royfaizal et al. (2009). Although in each period shows different result in which there's no co-integration on pre-crisis period and yet they also found that there are relationship among markets during crisis period and post-crisis period.

Research Method

As the research questions have been addressed, this research focuses on examining how global economic crisis can influence the stock return of Asian countries. Since there are comparison of stock market return of each countries, the unit of analysis is the US and four Asia countries which consist of Indonesia, Hong Kong, Malaysia, and Japan.

Therefore, the data gathered from period of 1st July 1997 to 30th June 2014 namely consist Asian Financial Crisis, post Asian economic crisis, Global Economic Boom, pre-Global Financial crisis, Global Financial crisis, post- crisis; economic recovery, and Greece debt Crisis, which taking into account the periodical sampling of 8 periods classification by Lukanima and Swaray (2013). Stock market variable is market return based on Jakarta Composit Indices, Malaysia Composite Index, Hong Kong Indices, Japan's and last but not least NYSE. The basic calculation before continue to the data analysis is by calculating the market return.

Returns of stock market index (Lim and Sek 2014: 44) is as the following:

$$R_t = \ln(\frac{P_t}{P_{t-1}}) \tag{1}$$

Where:
R_t= Stock Index daily return
ln= is the logarithm
P_t= daily prices

This study will use sophisticated approach of econometric technique to measure the exchange rate volatility, using EGARCH-M models. According to Nam et al. (2006, p.147), "the main feature of EGARCH-M model is its ability to capture the variations in return dynamics that are associated with the correlation between future volatility and expected return." To investigate the economic cycles relation toward stock return volatility, Lukanima and Swaray (2013) proposed to use the following equation:

The mean equation:

$$\log R_t = \mu + \varepsilon_t; \qquad\qquad \varepsilon_t | \Omega_{t-1} = (0, h_t) \qquad\qquad (2)$$

Where:
R_t= daily stock returns
ε_t = error term
$h_t; \Omega_{t-1}$= random information at time t-1

The variance equation:

$$\log h_t^2 = \omega + \pi_1 \frac{\overline{\overline{\varepsilon_{t-1}}}}{h_{t-1}^2} + \pi_2 \frac{\varepsilon_{t-1}}{h_{t-1}^2} + \beta \log(h_{t-1}^2) \qquad\qquad (3)$$

Where:
π_1= magnitude of conditional shock on conditional variance
β = measure volatility persistence, In which;
       $\beta < 1$; the smaller abs. β , the less volatility persistence after shock.
$\varepsilon_{t-1}/h_{t-1}$ add with π_2 used to capture asymmetric information volatility to see how good and bad news give impact. In which;

If $\pi_2 = 0$	; positive and negative shock give the same effect on volatility
If $-1 < \pi_2 < 0$	; negative shock increases volatility more than positive shocks
If $\pi_2 > 0$	; positive shocks cause higher volatility than negative shocks, vice versa

And the last equation to measure the risk premium, Lukanima and Swaray (2013) followed the formulas from the Engle, Lilien, and Robins (1987) which is:

$$\log R_t = \mu + \lambda h_t^2 + \varepsilon_t; \qquad\qquad \varepsilon_t | \Omega_{t-1} = (0, h_t) \qquad\qquad (4)$$

Where:
λ= estimation coefficient reflecting risk premium

To examine the integration among stock markets and study the nature of the stock, Kassim (2012) proposed to conduct the co-integration test to examine the long run relationship existences. And to test this co-integration, He proposed to use Johansen-Juselius co-integration test:

$$Y_t = \delta + \Pi_i Y_{t-1} + \Pi_k \Delta Y_{t-k} + \varepsilon_t \qquad (5)$$

Where:
Y_t= n x 1 vector of non-stationary variables integrated of the same order
δ= n x 1 vector of constant
Π_i= n x n matrix of coefficients
ε_t= n x 1 vector of white noise error term
k= order of auto regression
And to test the rank of the long run information Π using the Osterwald-Lenum's λ_{trace} and λ_{max} statistics, which proposed these formulas, namely;
Trace statistics formula;

$$\lambda_{trace}\ r\ = -T\ \ _{i=r+1}^{n} \ln(1 - {^\wedge}\lambda_i) \qquad (6)$$

Maximal Eigenvalue statistics;

$$\lambda_{max}\ r, r+1\ = -T \ln(1 - {^\wedge}\lambda_i + 1) \qquad (7)$$

Where the rank of Π is equal to the number of Eigenvalues that are different from zero. If Eigenvalues λ_i are all zero, then both λ_{trace} and λ_{max} will be zero.

DATA ANALYSIS

In this research the researcher examined the data gathered from five stock markets, consist of JKSE, HSI, KLSE, NIKKEI, and NYSE. The data gathered accordingly follow with the classification that were categorized on table 2.1. in which the data is started from 1st July 1997 classified in the second period until the last period, with these consideration, the period consist of: (1) The Asian Financial Crisis, (2) The Post Asian Economic Crisis, (3) The Global Economic Boom, (4) The pre Global Financial Crisis, (5) The Global Financial Crisis, (6) The Post Crisis: Economic Recovery, (7) The Greece Debt Crisis, (8) Post Crisis Period: Greece Crisis.

Economic Condition and Stock Returns

In analyzing the correlation between economic condition and stock return. Researcher has examined the standard deviation and the means of the stock return, for each period respectively.
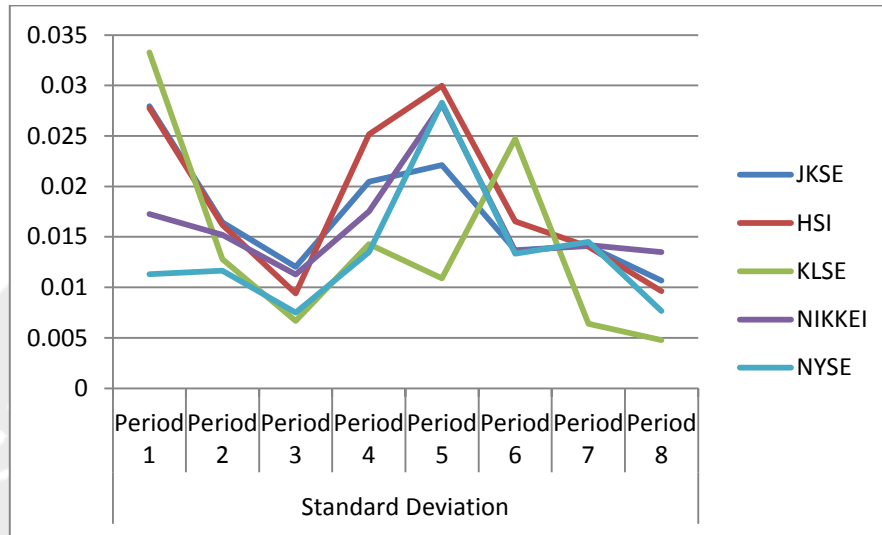
The Alley of periodical standard deviation of stock returns

The figure above shows the condition of standard deviation of stock returns in each period in which the global stocks followed an identical volatility with a few exceptions in some of the market. The biggest or highest peak regarding volatility is shown on the period 1 and 5, respectively the Asian financial crisis 1997-1999 and the global financial crisis 2008-2009. There are also some exception where all the market risk rises except the KLSE which decreases when global financial crisis happened and rise at the post crisis, economic recovery period. This might happened because of some other variables that might influenced the country or the regulation that has been taken by the government.
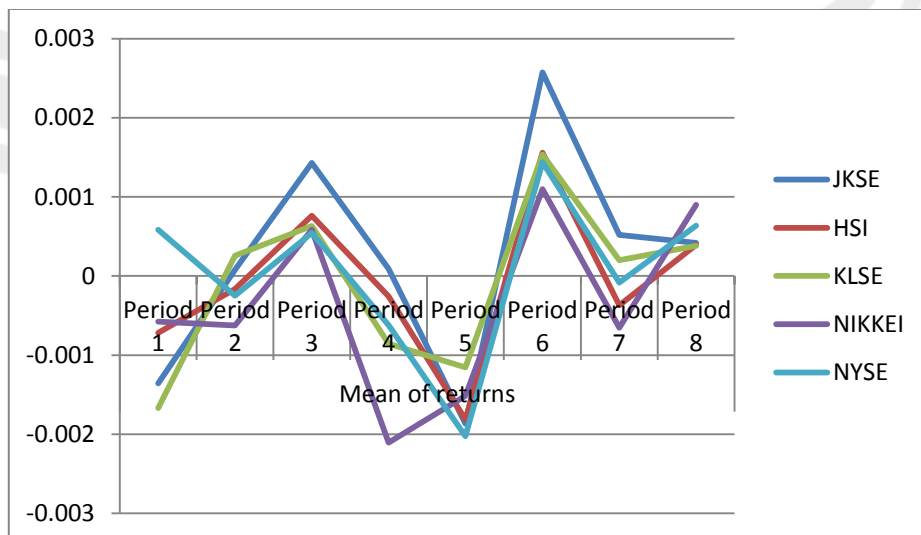
The Alley of periodical mean of stock returns

The figure above shows the mean of stock returns in each period in which the global stocks followed an identical volatility with a few exceptions in some of the market. The lowest peak shown on period 5 when global financial crisis happened, meanwhile the biggest or highest peak regarding mean of stock returns shown on the period 6, the revocery period of post global financial crisis.

ARCH-M

In measuring the risk premium, researched conduct the analysis using the ARCH-M models. λ will reflecting the risk premium. If the coefficient of risk premium is positive and significant, thus it means that the market carry a risk premium. Meanwhile ε_t is the ARCH and it's represent the volatility. To understand the movement of the market return, each period need to be analyzed thoroughly.

ARCH-M (July 1st 1997-June 30th 2014)

	Period (1)	Period (2)	Period (3)	Period (4)	Period (5)	Period (6)	Period (7)	Period (8)
RESID(-1)^2	0.177576*	0.0948*	0.041583*	0.002053****	0.138236*	0.063007**	0.095593*	0.105702*
GARCH(-1)	0.786265*	0.873899*	0.93267*	0.894326***	0.864602*	0.905251*	0.8978*	0.772912*

Source: Eviews 7 calculation result

Based on the analysis of each periods it can be concluded that the there's volatility in stock return happened from 1997 until 2014, meanwhile the highest volatility happened the third period, the Global Economic Boom with GARCH coefficients is 0.932670 and GARCH probability values is 0.0000 and also the second highest volatility happened in the sixth period of the Post Crisis: Economic recovery with GARCH coefficient is 0.905251 and GARCH probability value is 0.0000. this shows that the greatest volatility occured in this two period of time.

The result of the calculation although not all the coefficients are statistically significant, it still shows the existence of markets who carried risk premia and it's relation with the volatility. From the calculation, it also shows the positive relationship between volatility and risk premia in the first two period and followed with the negative correlation in the remaining periods.

E-GARCH

In measuring how the markets reacted toward the news of stock return, the information asymmetry (π_2) and the volatility persistence (β) need to be examined using E-GARCH models. The smaller the β, means the less volatility persistence. By examining each periods the research can have a picture, how the market react on each news and how it affects the stock market.

E-GARCH (July 1st 1997-June 30th 2014)

Period (1)	Period (2)	Period (3)	Period (4)	Period (5)	Period (6)	Period (7)	Period (8)

RESID(-1)^2	0.177585*	0.094753*	0.042052*	-0.13993*	0.137564*	-0.0194*	0.097389*	0.097405*
GARCH(-1)	0.786259*	0.872541*	0.932236*	0.276471****	0.865291*	1.004707*	0.896221*	0.789439*

Source: Eviews 7 calculation result

Based on the analysis, the informatio, mostly shows th assymetry tends to show the positive results and meanshwile the volatility persistence were less than 1, with those consideration it can be concluded that most of the time, the positive news influece the increases in volatility more than the negative news. As the results showing, the hypothesis were subject to evolution, as the positive shocks increases volatility more than the negative

Cointegration

Another important aspect that need to be analyzed is the cointegration among the market. Cointegration is used in order to examine the long run relationship among selected variables, in this case the variables consist of JKSE, KLSE, NIKKEI, HSI and NYSE.

Johansen Cointegration Test Result

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.229489	4542.259	69.81889	1.0000
At most 1 *	0.192708	3387.350	47.85613	1.0000
At most 2 *	0.180068	2439.018	29.79707	1.0000
At most 3 *	0.172592	1559.511	15.49471	1.0000
At most 4 *	0.150049	720.2137	3.841466	0.0000

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Eviews 7 calculation result

By looking at the trace statistics and compared it with the critical value or probability values, compared with 0.05, it can be concluded that there is cointegration in the hypothesis of at most 4 in which the probability values of at most 4 is 0.0000 which less than 0.05.

Hypothesis Testing

Research that has been conducted were meant to determine the result of the addressed hypothesis that has been proposed by the researcher. Thus, the following hypothesis presented:

H1: If there's good economic condition, then stock return increases.

The first hypothesis were meant to measure and monitor the condition of stock return throughout the years. Results of the analysis indicated that there's increases on the returns during good times, and also show's the decreases in returns during bad times. It is also concluded that the increases in returns that happened in good times resulted to the decreases in volatility, and the return decreases during bad times resulted to the increases in volatility. Thus hypothesis 1 is supported.

H2: If there's good economic condition, then the risk premium decreases.

To test the second hypothesis, ARCH-M (ARCH in mean) model were used. From the results through out the eight periods of time, it is shown that there's volatility in stock return in july 1997 until june 2014. As for the risk premia, from the models it shows that not all the coefficients are statistically significant and the result shows different condition in each period and each countries, but it does indicates the presence of risk premium in several country in some period of time and also the dropped of risk premia in some markets. From the result of the calculation shows that there's positive relationship between volatility and risk premia in the first two period, which in line with the hypothesis. But from the third period until eighth the result followed with the negative correlation between the volatility and risk premium, thus the hypothesis 2 is not supported.

H3: Bad news (information asymmetry) increases the volatility of stock return.

To test the third hypothesis, E-GARCH model were used to determine the result. From the eviews 7 calculation results, it shows that it's not really the case that the bad news increases the volatility in stock returns, although in some period of time the bad news seems to give more implication in the volatility. But mostly, in other period, the positive news influece the increases in volatility more than the negative. As the results showing, the hypothesis were subject to evolution, as the positive shocks increases volatility more than the negative, thus the hypothesis 3 is not supported.

H4: There is co-integration between US market and four Asia markets during financial crisis.

To test the forth hypothesis, the Johansen Cointegration test were performed. As the results unfolded, the proposed hypothesis were supported, that there's co-integration between the US market and the four Asian markets during crisis from1997-2014.

Conclusion

By employed the GARCH models as the tool, the cyclical nature of the stock can be examined. Based on the results it can be concluded that there's increases in return during good times is connected with the decreases in volatility and the

decreases in return during bad times is connected with the increases in volatility. And also based on the analysis it shows that there's a cointegration among the markets in Asia with the US. This also helps to understand how this countries could give effect to one another. And the last but not least, regarding the volatility which could be examined using the ARCH-M models. Here is the ARCH-M results throught out the year (July 1997-June 2014):

$$\sigma_t^2 = 0.00000176 + 0.094022\ \varepsilon_{t-1}^2 + 0.893288\ \sigma_{t-1}^2$$

GARCH coefficients 0.893288 shows that there's volatility happened in asian markets through out the year from july 1997 unil june 2014 and also that there's indication of risk premium although JKSE is not significant and all the others are significant and KLSE is significant at 10%.

Meanwhile in examining the effect of bad or good news to the market return and the volatility persistence, researcher using the E-GARCH models:

$$\sigma_t^2 = 0.00000176 + 0.094307\ \varepsilon_{t-1}^2 + 0.892987\ \sigma_{t-1}^2$$

Based on the results above, the information asymmetry 0.094307 which the result is positive, it means that the positive shocks cause higher volatility compared to negative shocks, this result is unanticipated and differ from what expected as written in the hypothesis, but then this study only focus on several countries in Asian, through analysis need to be conducted.

Research Limitation and Suggestion

There were several limitation placed in this research due several reasons. Below are the list of the research limitation in this study: (1)Limitation in the object of study, this study only includes the volatility, risk premia and information asymmetry as the scope of investigation, there are many other variables that actually could be examined for example the economic condition of the country, polical condition,etc. Other varibles also could be included to give better understanding about the topic and how it effect one another. (2) The number of samples for this study is limited, in which only includes of 4 country in asian and US. (3)Length of research period, is limited because of the availability of data and also time constrain, considering the topic which is about the volatility, the needs of the length of research period is one of the important issue that need to be highlight.

For further research, there are several points that can be suggested: (1) It would be more representative if the research object is wider, added more country and not limited into Asian countries, (2) Extend the length of research period which in this research only limted from 1997 to 2014, (3) Analyse and added more variables that need to be taken into consideration, for example the IT revolution, behavioral responses, etc.

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