CHAPTER V

CONCLUSION

5.1. Conclusion

This study objectives is to examine the stock return volatility in four asian countries from July 1997 until June 2014. 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).

Table 5.1.1.

ARCH-M (July 1997-June 2014)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000436	0.000130	3.342334	0.0008
JKSE	0.010288	0.009409	1.093451	0.2742
HSI	0.110768	0.008282	13.37411	0.0000
KLSE	-0.017226	0.009128	-1.887143	0.0591
NIKKEI	0.057675	0.009989	5.773794	0.0000
Variance Equation				
C	1.69E-06	2.31E-07	7.337127	0.0000

RESID(-1)^2	0.094022	0.006231	15.09013	0.0000
GARCH(-1)	0.893288	0.007006	127.5067	0.0000

R-squared	0.049683	Mean dependent var	0.000182
Adjusted R-squared	0.048825	S.D. dependent var	0.012429
S.E. of regression	0.012122	Akaike info criterion	-6.423924
Sum squared resid	0.650960	Schwarz criterion	-6.412385
Log likelihood	14253.05	Hannan-Quinn criter.	-6.419855
Durbin-Watson stat	2.291270		

Source: Eviews 7 calculation result (appendix B-9)

This result shows the consistency of the analysis results that has been conducted before, in which:

σ_t^2= 0.00000176 + 0.094022 ε_{t-1}^2 + 0.893288 σ_{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:

Table 5.1.2.

E-GARCH (July 1997-June2014)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.074238	0.045348	1.637086	0.1016
C	-0.000167	0.000395	-0.422796	0.6724
JKSE	0.010869	0.009419	1.153964	0.2485
HSI	0.110013	0.008318	13.22667	0.0000
KLSE	-0.017362	0.009134	-1.900705	0.0573
NIKKEI	0.057956	0.009986	5.803748	0.0000

Variance Equation

C	1.70E-06	2.36E-07	7.202256	0.0000
RESID(-1)^2	0.094307	0.006259	15.06637	0.0000
GARCH(-1)	0.892987	0.007053	126.6037	0.0000

R-squared	0.047862	Mean dependent var	0.000182
Adjusted R-squared	0.046787	S.D. dependent var	0.012429
S.E. of regression	0.012135	Akaike info criterion	-6.424062
Sum squared resid	0.652207	Schwarz criterion	-6.411080
Log likelihood	14254.36	Hannan-Quinn criter.	-6.419484
Durbin-Watson stat	2.283795		

Source: Eviews 7 calculation result (appendix C-9)

This result shows the consistency of the analysis results that has been conducted before, in which:

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

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.

5.2. Research Limitation and Suggestion

5.3.1 Research Limitation

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. This study only able to includes 8th period in the research from 1997-2014, 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.

5.3.2 Suggestion

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 and also more samples to differ between the developed and developing countries.
2. Extend the length of research period, as the table 2.1. pointed out, further research could start their analysis starting from 1990 or earlier.

3. Analyse and added more variables that need to be taken into consideration, for example the IT revolution, behavioral responses, etc.

5.3. Research Contribution

This research that has been conducted gives some insights and contribution to some aspects, there are:

5.3.1 Academic Contribution

Readers can understand the impact of volatility to the stock return, and give understanding the condition of market in several global economic events and how it gives impact to the stock price return. Hope there's any future research that will be conducted and this research give benefits to the academic activity.

5.3.2 Managerial Contribution

This research can help financial analyst who invest in Asian markets and give them understanding about the condition of the market during crisis, behavior of the stock return, and the risk of the market to help the analyst in making their international portfolio.

5.3.3 Contribution to Investor

This research helps the investor who interested to invest their money in Asian stock markets and give them some expectation and helping in making decision for future investment.

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APPENDIX

APPENDIX A-1 Periodical standard deviation of stock returns

Global Stock Market Zones		*Period 1*	*Period 2*	*Period 3*	*Period 4*	*Period 5*	*Period 6*	*Period 7*	*Period 8*
JKSE	Indonesia	0.027949	0.016444	0.012034	0.020471	0.022107	0.01367	0.014083	0.010674
HSI	Hong Kong	0.027758	0.016194	0.009411	0.025166	0.029978	0.01654	0.014022	0.009619
KLSE	Malaysia	0.033259	0.012795	0.006673	0.014272	0.010907	0.024704	0.006398	0.004767
NIKKEI	Japan	0.017272	0.0152	0.01128	0.017529	0.028132	0.013587	0.014192	0.013487
NYSE	USA	0.011303	0.011658	0.007513	0.013476	0.028287	0.013321	0.014511	0.007648

Notes: Periods: (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

APPENDIX A-2 Periodical mean of stock returns

Global Stock Market Zones		*Period 1*	*Period 2*	*Period 3*	*Period 4*	*Period 5*	*Period 6*	*Period 7*	*Period 8*
JKSE	Indonesia	-0.00136	7.82E-05	0.001431	-9.01E-05	-0.00187	0.002574	0.000518	0.000418
HSI	Hong Kong	-0.00072	-0.00016	0.000763	0.00026	-0.00181	0.00156	-0.00037	0.000392
KLSE	Malaysia	-0.00167	0.000256	0.000631	-0.00086	-0.00116	0.001533	0.000198	0.00038
NIKKEI	Japan	-0.00058	-0.00063	0.000584	-0.0021	-0.00151	0.001096	-0.00065	0.000898
NYSE	USA	0.000583	-0.00025	0.000542	-0.00062	-0.00202	0.001436	-8.3E-05	0.000635

Notes: Periods: (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

APPENDIX B-1. ARCH-M 1st period (the Asian Financial Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 08:57
Sample: 7/01/1997 3/31/1999
Included observations: 457
Convergence achieved after 21 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.001353	0.000467	2.899359	0.0037
JKSE	-0.021354	0.018733	-1.139910	0.2543
HSI	0.112927	0.017297	6.528660	0.0000
KLSE	-0.004820	0.019480	-0.247452	0.8046
NIKKEI	0.058432	0.027927	2.092305	0.0364
Variance Equation				
C	6.12E-06	2.55E-06	2.397727	0.0165
RESID(-1)^2	0.177576	0.034965	5.078637	0.0000
GARCH(-1)	0.786265	0.038289	20.53482	0.0000

R-squared	0.044992	Mean dependent var	0.000583
Adjusted R-squared	0.036541	S.D. dependent var	0.011303
S.E. of regression	0.011095	Akaike info criterion	-6.324583
Sum squared resid	0.055636	Schwarz criterion	-6.252378
Log likelihood	1453.167	Hannan-Quinn criter.	-6.296143
Durbin-Watson stat	2.195754		

APPENDIX B-2. ARCH-M 2nd period (the post Asian Economic Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 10:31
Sample: 4/01/1999 12/31/2002

Included observations: 979
Convergence achieved after 12 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-8.34E-05	0.000338	-0.246511	0.8053
JKSE	0.002194	0.018933	0.115877	0.9077
HSI	0.045436	0.021762	2.087879	0.0368
KLSE	-0.030711	0.024064	-1.276178	0.2019
NIKKEI	0.098895	0.020571	4.807550	0.0000
Variance Equation				
C	4.23E-06	1.24E-06	3.408224	0.0007
RESID(-1)^2	0.094800	0.017620	5.380287	0.0000
GARCH(-1)	0.873899	0.020333	42.97951	0.0000

R-squared	0.021568	Mean dependent var	-0.000249
Adjusted R-squared	0.017549	S.D. dependent var	0.011658
S.E. of regression	0.011555	Akaike info criterion	-6.223765
Sum squared resid	0.130056	Schwarz criterion	-6.183834
Log likelihood	3054.533	Hannan-Quinn criter.	-6.208573
Durbin-Watson stat	2.008249		

APPENDIX B-3. ARCH-M period 3 (the Global Economic Boom)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:46
Sample: 1/01/2003 7/31/2007
Included observations: 1195
Convergence achieved after 15 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000474	0.000201	2.358820	0.0183
JKSE	0.008668	0.019625	0.441662	0.6587
HSI	0.099729	0.025092	3.974600	0.0001

KLSE	0.029873	0.030751	0.971439	0.3313
NIKKEI	0.048482	0.022568	2.148284	0.0317
Variance Equation				
C	1.24E-06	4.04E-07	3.076556	0.0021
RESID(-1)^2	0.041583	0.009529	4.363826	0.0000
GARCH(-1)	0.932670	0.015582	59.85642	0.0000

R-squared	0.037795	Mean dependent var	0.000542
Adjusted R-squared	0.034561	S.D. dependent var	0.007513
S.E. of regression	0.007382	Akaike info criterion	-7.077380
Sum squared resid	0.064845	Schwarz criterion	-7.043332
Log likelihood	4236.735	Hannan-Quinn criter.	-7.064552
Durbin-Watson stat	2.267215		

APPENDIX B-4. ARCH-M period 4 (the pre Global Financial Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:50
Sample (adjusted): 8/01/2007 3/14/2008
Included observations: 163 after adjustments
Convergence achieved after 21 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.000648	0.001098	-0.590340	0.5550
JKSE	0.180209	0.098888	1.822361	0.0684
HSI	-0.043687	0.079871	-0.546967	0.5844
KLSE	-0.076717	0.089282	-0.859269	0.3902
NIKKEI	0.037066	0.076307	0.485753	0.6271
Variance Equation				
C	1.76E-05	8.12E-05	0.216810	0.8284
RESID(-1)^2	0.002053	0.043711	0.046974	0.9625
GARCH(-1)	0.894326	0.480435	1.861492	0.0627

R-squared	0.037996	Mean dependent var	-0.000620

Adjusted R-squared	0.013641	S.D. dependent var	0.013476
S.E. of regression	0.013384	Akaike info criterion	-5.724676
Sum squared resid	0.028303	Schwarz criterion	-5.572835
Log likelihood	474.5611	Hannan-Quinn criter.	-5.663030
Durbin-Watson stat	2.411913		

APPENDIX B-5. ARCH-M period 5 (the Global Financial Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:53
Sample: 3/17/2008 3/31/2009
Included observations: 272
Convergence achieved after 34 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.001043	0.001054	-0.989556	0.3224
JKSE	0.078549	0.068783	1.141972	0.2535
HSI	0.162973	0.058437	2.788871	0.0053
KLSE	-0.031903	0.109160	-0.292257	0.7701
NIKKEI	0.014887	0.078548	0.189532	0.8497
Variance Equation				
C	4.98E-06	4.42E-06	1.127180	0.2597
RESID(-1)^2	0.138236	0.044132	3.132307	0.0017
GARCH(-1)	0.864602	0.038971	22.18595	0.0000

R-squared	0.105263	Mean dependent var	-0.002025
Adjusted R-squared	0.091858	S.D. dependent var	0.028287
S.E. of regression	0.026956	Akaike info criterion	-4.789321
Sum squared resid	0.194011	Schwarz criterion	-4.683268
Log likelihood	659.3477	Hannan-Quinn criter.	-4.746745
Durbin-Watson stat	2.455876		

APPENDIX B-6. ARCH-M period 6 (the Post Crisis: Economic Recovery)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:58
Sample: 4/01/2009 4/30/2010
Included observations: 283
Convergence achieved after 16 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000867	0.000701	1.236099	0.2164
JKSE	0.023524	0.069043	0.340717	0.7333
HSI	0.266694	0.051864	5.142218	0.0000
KLSE	-0.023157	0.020161	-1.148593	0.2507
NIKKEI	-0.087098	0.061465	-1.417035	0.1565
Variance Equation				
C	3.93E-06	2.11E-06	1.862594	0.0625
RESID(-1)^2	0.063007	0.027190	2.317335	0.0205
GARCH(-1)	0.905251	0.032742	27.64825	0.0000

R-squared	0.084218	Mean dependent var	0.001436
Adjusted R-squared	0.071041	S.D. dependent var	0.013321
S.E. of regression	0.012839	Akaike info criterion	-5.967282
Sum squared resid	0.045823	Schwarz criterion	-5.864230
Log likelihood	852.3703	Hannan-Quinn criter.	-5.925961
Durbin-Watson stat	2.362004		

APPENDIX B-7. ARCH-M period 7 (the Greece Debt Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 12:01
Sample: 5/03/2010 12/15/2011
Included observations: 424
Convergence achieved after 28 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.

C	0.000406	0.000551	0.736251	0.4616
JKSE	0.095400	0.058659	1.626364	0.1039
HSI	0.235646	0.056472	4.172801	0.0000
KLSE	-0.002996	0.107774	-0.027802	0.9778
NIKKEI	0.021655	0.043498	0.497829	0.6186

Variance Equation

C	1.78E-06	1.05E-06	1.694992	0.0901
RESID(-1)^2	0.095593	0.016090	5.941037	0.0000
GARCH(-1)	0.897800	0.016997	52.81970	0.0000

R-squared	0.055621	Mean dependent var	-8.26E-05
Adjusted R-squared	0.046605	S.D. dependent var	0.014511
S.E. of regression	0.014169	Akaike info criterion	-5.956396
Sum squared resid	0.084122	Schwarz criterion	-5.879986
Log likelihood	1270.756	Hannan-Quinn criter.	-5.926207
Durbin-Watson stat	2.527297		

APPENDIX B-8. ARCH-M period 8 (Post Crisis Period: Greece Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 12:09
Sample: 12/16/2011 6/30/2014
Included observations: 662
Convergence achieved after 15 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000621	0.000270	2.301613	0.0214
JKSE	0.046330	0.027145	1.706743	0.0879
HSI	0.155350	0.031787	4.887168	0.0000
KLSE	-0.122494	0.058289	-2.101498	0.0356
NIKKEI	0.040075	0.023897	1.676975	0.0935

Variance Equation

C	6.47E-06	2.69E-06	2.401376	0.0163

RESID(-1)^2	0.105702	0.037161	2.844444	0.0044
GARCH(-1)	0.772912	0.075886	10.18516	0.0000

R-squared	0.067825	Mean dependent var	0.000634
Adjusted R-squared	0.062150	S.D. dependent var	0.007642
S.E. of regression	0.007401	Akaike info criterion	-7.005114
Sum squared resid	0.035982	Schwarz criterion	-6.950791
Log likelihood	2326.693	Hannan-Quinn criter.	-6.984061
Durbin-Watson stat	2.290659		

APPENDIX B-9. ARCH-M (July 1997-June 2014)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/16/14 Time: 15:01
Sample: 7/01/1997 6/30/2014
Included observations: 4435
Convergence achieved after 12 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(6) + C(7)*RESID(-1)^2 + C(8)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000436	0.000130	3.342334	0.0008
JKSE	0.010288	0.009409	1.093451	0.2742
HSI	0.110768	0.008282	13.37411	0.0000
KLSE	-0.017226	0.009128	-1.887143	0.0591
NIKKEI	0.057675	0.009989	5.773794	0.0000
Variance Equation				
C	1.69E-06	2.31E-07	7.337127	0.0000
RESID(-1)^2	0.094022	0.006231	15.09013	0.0000
GARCH(-1)	0.893288	0.007006	127.5067	0.0000

R-squared	0.049683	Mean dependent var	0.000182
Adjusted R-squared	0.048825	S.D. dependent var	0.012429
S.E. of regression	0.012122	Akaike info criterion	-6.423924
Sum squared resid	0.650960	Schwarz criterion	-6.412385
Log likelihood	14253.05	Hannan-Quinn criter.	-6.419855
Durbin-Watson stat	2.291270		

APPENDIX C-1. E-GARCH 1st period (the Asian Financial Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:56
Sample: 7/01/1997 3/31/1999
Included observations: 457
Convergence achieved after 113 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	-9.40E-05	0.208515	-0.000451	0.9996
C	0.001353	0.001899	0.712608	0.4761
JKSE	-0.021352	0.018804	-1.135537	0.2562
HSI	0.112931	0.017391	6.493809	0.0000
KLSE	-0.004828	0.019508	-0.247485	0.8045
NIKKEI	0.058434	0.027932	2.092025	0.0364
Variance Equation				
C	6.12E-06	2.58E-06	2.377123	0.0174
RESID(-1)^2	0.177585	0.035239	5.039465	0.0000
GARCH(-1)	0.786259	0.039072	20.12311	0.0000

R-squared	0.044995	Mean dependent var	0.000583
Adjusted R-squared	0.034408	S.D. dependent var	0.011303
S.E. of regression	0.011107	Akaike info criterion	-6.320207
Sum squared resid	0.055636	Schwarz criterion	-6.238976
Log likelihood	1453.167	Hannan-Quinn criter.	-6.288211
Durbin-Watson stat	2.195764		

APPENDIX C-2. E-GARCH 2nd period (the post Asian Economic Crisis)

Dependent Variable: NYSE

Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 10:32
Sample: 4/01/1999 12/31/2002
Included observations: 979
Convergence achieved after 14 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.321184	0.142316	2.256842	0.0240
C	-0.003226	0.001427	-2.261388	0.0237
JKSE	0.006827	0.019058	0.358238	0.7202
HSI	0.040095	0.022053	1.818160	0.0690
KLSE	-0.026884	0.023995	-1.120414	0.2625
NIKKEI	0.096062	0.020833	4.611017	0.0000
Variance Equation				
C	4.35E-06	1.34E-06	3.236376	0.0012
RESID(-1)^2	0.094753	0.018339	5.166593	0.0000
GARCH(-1)	0.872541	0.021528	40.53117	0.0000

R-squared	0.028144	Mean dependent var	-0.000249
Adjusted R-squared	0.023150	S.D. dependent var	0.011658
S.E. of regression	0.011522	Akaike info criterion	-6.227217
Sum squared resid	0.129182	Schwarz criterion	-6.182294
Log likelihood	3057.223	Hannan-Quinn criter.	-6.210125
Durbin-Watson stat	2.012309		

APPENDIX C-3. E-GARCH period 3 (the Global Economic Boom)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:47
Sample: 1/01/2003 7/31/2007
Included observations: 1195
Convergence achieved after 21 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.

@SQRT(GARCH)	0.143114	0.153780	0.930641	0.3520
C	-0.000471	0.001054	-0.446524	0.6552
JKSE	0.008996	0.019836	0.453542	0.6502
HSI	0.099832	0.025024	3.989426	0.0001
KLSE	0.030002	0.030791	0.974356	0.3299
NIKKEI	0.048531	0.022521	2.154929	0.0312

Variance Equation

C	1.24E-06	4.08E-07	3.050244	0.0023
RESID(-1)^2	0.042052	0.009695	4.337437	0.0000
GARCH(-1)	0.932236	0.015790	59.04009	0.0000

R-squared	0.037517	Mean dependent var	0.000542
Adjusted R-squared	0.033470	S.D. dependent var	0.007513
S.E. of regression	0.007386	Akaike info criterion	-7.076321
Sum squared resid	0.064864	Schwarz criterion	-7.038017
Log likelihood	4237.102	Hannan-Quinn criter.	-7.061889
Durbin-Watson stat	2.266005		

APPENDIX C-4. E-GARCH period 4 (the pre Global Financial Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 12:11
Sample (adjusted): 8/01/2007 3/14/2008
Included observations: 163 after adjustments
Failure to improve Likelihood after 67 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.434507	0.166276	2.613174	0.0090
C	-0.006445	0.001854	-3.475536	0.0005
JKSE	0.158603	0.093001	1.705402	0.0881
HSI	-0.089399	0.078577	-1.137733	0.2552
KLSE	-0.038431	0.073925	-0.519860	0.6032
NIKKEI	0.055021	0.077813	0.707093	0.4795

Variance Equation

C	0.000151	0.000107	1.422418	0.1549
RESID(-1)^2	-0.139932	0.039662	-3.528124	0.0004
GARCH(-1)	0.276471	0.602361	0.458979	0.6462

R-squared	0.026171	Mean dependent var	-0.000620
Adjusted R-squared	-0.004843	S.D. dependent var	0.013476
S.E. of regression	0.013509	Akaike info criterion	-5.755179
Sum squared resid	0.028651	Schwarz criterion	-5.584359
Log likelihood	478.0471	Hannan-Quinn criter.	-5.685828
Durbin-Watson stat	2.358921		

APPENDIX C-5. E-GARCH period 5 (the Global Financial Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:54
Sample: 3/17/2008 3/31/2009
Included observations: 272
Convergence achieved after 39 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.046374	0.136827	0.338924	0.7347
C	-0.001751	0.002400	-0.729550	0.4657
JKSE	0.082797	0.071238	1.162265	0.2451
HSI	0.160863	0.059489	2.704065	0.0068
KLSE	-0.037357	0.111962	-0.333660	0.7386
NIKKEI	0.016056	0.080119	0.200396	0.8412
Variance Equation				
C	4.92E-06	4.50E-06	1.091770	0.2749
RESID(-1)^2	0.137564	0.044218	3.111022	0.0019
GARCH(-1)	0.865291	0.039311	22.01151	0.0000

R-squared	0.103775	Mean dependent var	-0.002025
Adjusted R-squared	0.086928	S.D. dependent var	0.028287
S.E. of regression	0.027029	Akaike info criterion	-4.782424
Sum squared resid	0.194333	Schwarz criterion	-4.663114

Log likelihood	659.4096	Hannan-Quinn criter.	-4.734525
Durbin-Watson stat	2.451869		

APPENDIX C-6. E-GARCH period 6 (the Post Crisis: Economic Recovery)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 11:58
Sample: 4/01/2009 4/30/2010
Included observations: 283
Convergence achieved after 16 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.324046	0.245741	1.318649	0.1873
C	-0.002535	0.002760	-0.918350	0.3584
JKSE	0.036581	0.071009	0.515158	0.6064
HSI	0.269741	0.055913	4.824286	0.0000
KLSE	-0.025430	0.018997	-1.338660	0.1807
NIKKEI	-0.133032	0.056065	-2.372817	0.0177
Variance Equation				
C	1.20E-06	2.82E-07	4.276646	0.0000
RESID(-1)^2	-0.019396	0.004745	-4.087942	0.0000
GARCH(-1)	1.004707	0.003034	331.1949	0.0000

R-squared	0.083476	Mean dependent var	0.001436
Adjusted R-squared	0.066932	S.D. dependent var	0.013321
S.E. of regression	0.012867	Akaike info criterion	-5.990411
Sum squared resid	0.045860	Schwarz criterion	-5.874478
Log likelihood	856.6431	Hannan-Quinn criter.	-5.943926
Durbin-Watson stat	2.322446		

APPENDIX C-7. E-GARCH period 7 (the Greece Debt Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 12:02
Sample: 5/03/2010 2/15/2011
Included observations: 424
Convergence achieved after 144 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.045023	0.137217	0.328112	0.7428
C	-2.42E-05	0.001489	-0.016230	0.9871
JKSE	0.093444	0.058230	1.604740	0.1086
HSI	0.237420	0.058031	4.091287	0.0000
KLSE	-0.002959	0.108705	-0.027223	0.9783
NIKKEI	0.022431	0.043465	0.516076	0.6058
Variance Equation				
C	1.79E-06	1.11E-06	1.603947	0.1087
RESID(-1)^2	0.097389	0.016841	5.782794	0.0000
GARCH(-1)	0.896221	0.017326	51.72625	0.0000

R-squared	0.054847	Mean dependent var	-8.26E-05
Adjusted R-squared	0.043542	S.D. dependent var	0.014511
S.E. of regression	0.014192	Akaike info criterion	-5.951950
Sum squared resid	0.083396	Schwarz criterion	-5.624670
Log likelihood	1207.554	Hannan-Quinn criter.	-5.653558
Durbin-Watson stat	2.459366		

APPENDIX C-8. E-GARCH period 8 (Post Crisis Period: Greece Crisis)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/05/14 Time: 12:09
Sample: 12/16/2011 6/30/2014
Included observations: 662
Convergence achieved after 35 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.495744	0.276665	1.791858	0.0732
C	-0.002779	0.001951	-1.424627	0.1543
JKSE	0.044035	0.027107	1.624481	0.1043
HSI	0.157370	0.032050	4.910113	0.0000
KLSE	-0.124108	0.059383	-2.089944	0.0366
NIKKEI	0.036521	0.024130	1.513504	0.1302
Variance Equation				
C	5.97E-06	2.57E-06	2.319711	0.0204
RESID(-1)^2	0.097405	0.034253	2.843689	0.0045
GARCH(-1)	0.789439	0.072717	10.85627	0.0000

R-squared	0.074038	Mean dependent var	0.000634
Adjusted R-squared	0.066980	S.D. dependent var	0.007642
S.E. of regression	0.007381	Akaike info criterion	-7.007176
Sum squared resid	0.035742	Schwarz criterion	-6.946063
Log likelihood	2328.375	Hannan-Quinn criter.	-6.983492
Durbin-Watson stat	2.283294		

APPENDIX C-9. E-GARCH (July 1997-June2014)

Dependent Variable: NYSE
Method: ML - ARCH (Marquardt) - Normal distribution
Date: 11/16/14 Time: 15:02
Sample: 7/01/1997 6/30/2014
Included observations: 4435
Convergence achieved after 15 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.074238	0.045348	1.637086	0.1016
C	-0.000167	0.000395	-0.422796	0.6724
JKSE	0.010869	0.009419	1.153964	0.2485
HSI	0.110013	0.008318	13.22667	0.0000
KLSE	-0.017362	0.009134	-1.900705	0.0573
NIKKEI	0.057956	0.009986	5.803748	0.0000

Variance Equation

C	1.70E-06	2.36E-07	7.202256	0.0000
RESID(-1)^2	0.094307	0.006259	15.06637	0.0000
GARCH(-1)	0.892987	0.007053	126.6037	0.0000

R-squared	0.047862	Mean dependent var	0.000182
Adjusted R-squared	0.046787	S.D. dependent var	0.012429
S.E. of regression	0.012135	Akaike info criterion	-6.424062
Sum squared resid	0.652207	Schwarz criterion	-6.411080
Log likelihood	14254.36	Hannan-Quinn criter.	-6.419484
Durbin-Watson stat	2.283795		

APPENDIX D-1. Johansen Cointegration Test Result

Date: 11/05/14 Time: 11:23
Sample (adjusted): 7/08/1997 6/30/2014
Included observations: 4430 after adjustments
Trend assumption: Linear deterministic trend
Series: JKSE HSI KLSE NIKKEI NYSE
Lags interval (in first differences): 1 to 4

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

None *	0.229489	1154.909	33.87687	1.0000
At most 1 *	0.192708	948.3318	27.58434	0.0001
At most 2 *	0.180068	879.5073	21.13162	0.0001
At most 3 *	0.172592	839.2973	14.26460	0.0001
At most 4 *	0.150049	720.2137	3.841466	0.0000

Max-eigenvalue 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

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

JKSE	HSI	KLSE	NIKKEI	NYSE
-21.10821	-84.20387	20.95034	-103.2211	252.9836
-123.6950	-4.643916	130.3595	45.14988	-30.11592
-37.51875	-18.57352	-76.01662	144.2967	58.05576
-30.28299	153.1081	0.041813	-65.37057	41.53965
-66.40164	74.89552	-93.77202	-58.63086	-38.74057

Unrestricted Adjustment Coefficients (alpha):

D(JKSE)	0.003163	0.004299	0.002495	-0.000487	0.004292
D(HSI)	0.004898	-8.01E-05	-4.12E-05	-0.005514	0.001092
D(KLSE)	0.000601	-0.004401	0.002845	-0.000950	0.003753
D(NIKKEI)	0.004654	-0.001072	-0.003813	0.000477	0.002470
D(NYSE)	-0.002808	0.000947	-0.002958	-0.003023	0.002616

1 Cointegrating Equation(s):	Log likelihood	62359.92

Normalized cointegrating coefficients (standard error in parentheses)

JKSE	HSI	KLSE	NIKKEI	NYSE
1.000000	3.989154	-0.992521	4.890094	-11.98508
	(0.24318)	(0.22460)	(0.26423)	(0.34896)

Adjustment coefficients (standard error in parentheses)

D(JKSE)	-0.066773
	(0.00540)
D(HSI)	-0.103386

	(0.00517)	
D(KLSE)	-0.012686	
	(0.00498)	
D(NIKKEI)	-0.098248	
	(0.00451)	
D(NYSE)	0.059267	
	(0.00424)	

2 Cointegrating Equation(s): Log likelihood 62834.08

Normalized cointegrating coefficients (standard error in parentheses)

JKSE	HSI	KLSE	NIKKEI	NYSE
1.000000	0.000000	-1.054462	-0.414937	0.359650
		(0.04103)	(0.04927)	(0.06182)
0.000000	1.000000	0.015527	1.329864	-3.094574
		(0.05486)	(0.06588)	(0.08267)

Adjustment coefficients (standard error in parentheses)

D(JKSE)	-0.598578	-0.286335
	(0.03104)	(0.02086)
D(HSI)	-0.093483	-0.412050
	(0.03075)	(0.02067)
D(KLSE)	0.531732	-0.030165
	(0.02844)	(0.01911)
D(NIKKEI)	0.034392	-0.386946
	(0.02674)	(0.01797)
D(NYSE)	-0.057824	0.232028
	(0.02517)	(0.01692)

3 Cointegrating Equation(s): Log likelihood 63273.84

Normalized cointegrating coefficients (standard error in parentheses)

JKSE	HSI	KLSE	NIKKEI	NYSE
1.000000	0.000000	0.000000	-1.818222	0.230943
			(0.06715)	(0.08460)
0.000000	1.000000	0.000000	1.350528	-3.092679
			(0.06500)	(0.08188)
0.000000	0.000000	1.000000	-1.330806	-0.122059
			(0.05626)	(0.07087)

Adjustment coefficients (standard error in parentheses)

D(JKSE)	-0.692185	-0.332675	0.437076
	(0.03202)	(0.02111)	(0.03725)
D(HSI)	-0.091937	-0.411285	0.095307
	(0.03209)	(0.02116)	(0.03733)
D(KLSE)	0.424999	-0.083003	-0.777411
	(0.02915)	(0.01922)	(0.03390)
D(NIKKEI)	0.177434	-0.316133	0.247543
	(0.02688)	(0.01772)	(0.03127)
D(NYSE)	0.053153	0.286967	0.289425
	(0.02562)	(0.01689)	(0.02980)

4 Cointegrating Equation(s):	Log likelihood	63693.49

Normalized cointegrating coefficients (standard error in parentheses)

JKSE	HSI	KLSE	NIKKEI	NYSE
1.000000	0.000000	0.000000	0.000000	-2.670476
				(0.07820)
0.000000	1.000000	0.000000	0.000000	-0.937581
				(0.03623)
0.000000	0.000000	1.000000	0.000000	-2.245686
				(0.06941)
0.000000	0.000000	0.000000	1.000000	-1.595745
				(0.03955)

Adjustment coefficients (standard error in parentheses)

D(JKSE)	-0.677422	-0.407312	0.437055	0.259463
	(0.03285)	(0.04296)	(0.03723)	(0.04751)
D(HSI)	0.075050	-1.255558	0.095076	-0.154656
	(0.03099)	(0.04053)	(0.03512)	(0.04482)
D(KLSE)	0.453755	-0.228390	-0.777450	0.211815
	(0.02985)	(0.03904)	(0.03383)	(0.04317)
D(NIKKEI)	0.162986	-0.243082	0.247563	-1.110184
	(0.02757)	(0.03606)	(0.03125)	(0.03988)
D(NYSE)	0.144698	-0.175876	0.289299	0.103358
	(0.02557)	(0.03344)	(0.02898)	(0.03698)