Sinta Indonesia

HOME | ABOUT | AUTHORS | SUBJECTS | AFFILIATIONS | SOURCES | REGISTRATION | FAQ | AUTHOR LOGIN

Journal Profile

Indonesian Capital Market Review (ICMR)

eISSN : 23563818 | pISSN :
Economy
Universitas Indonesia

S2 Sinta Score | GARUDA Indexed by GARUDA
8 H-Index | 8 H5-Index
307 Citations | 257 5 Year Citations

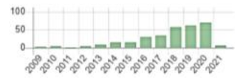
Penerbit:
Management Research Center (MRC), Fakultas Ekonomi dan Bisnis Universitas Indonesia
Website | Editor URL
Address:
Management Research Center FEB UI, Gedung Departemen Manajemen FEB UI Lantai 2, UI Kampus Depok 16424
Depok
Email:
Phone:
(021) 727 2425 Ext. 503

Last Updated :
2021-02-03

2018

Sinta Accreditations

Citation Statistics



Page 1 of 10 | Total Records : 100

Publications	Citation
Volatility Forecasting Models and Market Co-Integration: A Study on South-East Asian Markets E Febrian, A Herwany Indonesian Capital Market Review (ICMR) 1 (1)	22
Volatility Forecasting Models and Market Co-Integration: A Study on South-East Asian Markets E Febrian, A Herwany Indonesian Capital Market Review (ICMR) 1 (1)	21
The Determinant Factors of Real Estate Investment Trust (REIT)'s Performance: Evidence from Asian REITs NEAB Mohamad, IAB Zolkifli Indonesian Capital Market Review (ICMR) 6 (1), 53 - 59	18
The Determinant Factors of Real Estate Investment Trust (REIT)'s Performance: Evidence from Asian REITs NEAB Mohamad, IAB Zolkifli Indonesian Capital Market Review (ICMR) 6 (1), 53 - 59	18
The Effects of Crude Oil Price Changes on the Indonesian Stock Market: A Sector Investigation MH Riga, V Indriana, F Rahmanto Indonesian Capital Market Review (ICMR) 8 (1), 12-22	16
Determinants of financial behaviours among Malaysians Z Ahmad, M Simun, MS Masood Indonesian Capital Market Review	15
Conventional and Islamic Indices in Indonesia: A Comparison on Performance, Volatility, and The Determinants N Pranata, N Nurzanah Indonesian Capital Market Review (ICMR) 7 (2), 113-127	13
Role of Indian Commodity Derivatives Market in Hedging Price Risk: Estimation of Constant and Dynamic Hedge Ratio, and Hedging Effectiveness B Kumar, A Pandey Indonesian Capital Market Review (ICMR) 3 (1)	12
A Study of Financial Performance and Stock Return in IPO Underpricing Phenomenon on the Indonesia Stock Exchange (IDX) A Irfani Indonesian Capital Market Review (ICMR) 4 (2)	9
Bank Income Diversification from Stock Market Perspective: Evidence from ASEAN+3 AH Natalia, MR Kurniawan, RR Firsty Indonesian Capital Market Review (ICMR) 8 (1), 32-45	8

Page 1 of 10 | Total Records : 100

Simlitabmas | Arjuna | Garuda | Rama | Anjani | IdMenulis | PDDIKTI | Risbang

INDONESIAN CAPITAL MARKET REVIEW

e-ISSN 2356-3818 print ISSN 1979-8997

The intent of the Editors of The Indonesian Capital Market Review (p-ISSN: 1979-8997; e-ISSN: 2356-3818) is to discuss, explore, and disseminate the latest issues and developments in Empirical Financial Economics (JEL classification: G), particularly those related to financial frictions in the Emerging Markets. The topics covered include capital markets, financial institutions and services, corporate finance, risk modeling and management, market microstructure in financial markets, Islamic finance, behavioral finance, and financial crisis. We also welcome papers related to Financial Technology (Fintech), such as Peer-to-Peer Lending, Crowdfunding, and Digital Currencies. ICMR has been indexed in EBSCOhost (since 2013), DOAJ (since 2015), CrossRef (since 2016), and ESCI (Web of Science). The submitted manuscripts should have strong empirical and theoretical contributions and highlight the significance of those contributions to the field of finance. Therefore, preference is given to the submissions that examine, extend, or build strong theoretical frameworks while empirically assess the issues with high importance for finance theory and practice.

Guidance for Submission:

The submitted manuscripts should have substantial empirical or theoretical contributions and highlight the significance of those contributions to the field of finance. The journal encourages submissions that pose interesting and essential questions to enhance finance theories and practices.

Read more
Full editorial board
Statistics | Citations

Authors Guide
Submit Paper

Log In
Register

Archives

- Vol 13, No 2 (2021): July 2021
- Vol 13, No 1 (2021): January 2021
- Vol 12, No 2 (2020): July 2020
- Vol 12, No 1 (2020): January 2020
- Vol 11, No 2 (2019): July 2019
- Vol 11, No 1 (2019): January 2019
- Vol 10, No 2 (2018): July 2018
- Vol 10, No 1 (2018): January 2018
- Vol 9, No 2 (2017): July 2017

Vol 13, No 2 (2021): July 2021

Table of Content

Cover
Cover of Issue

Table of Issue
Table of Content Issue

Articles

Determinants in Investment Behaviour During The COVID-19 Pandemic
Angeln S. Kiruba, S. Vasantha

Monetary Policy and Corporate Risk-Taking: Evidence From an Emerging Market
Quoc Trung Tran, Thi Thuy Trang Truong

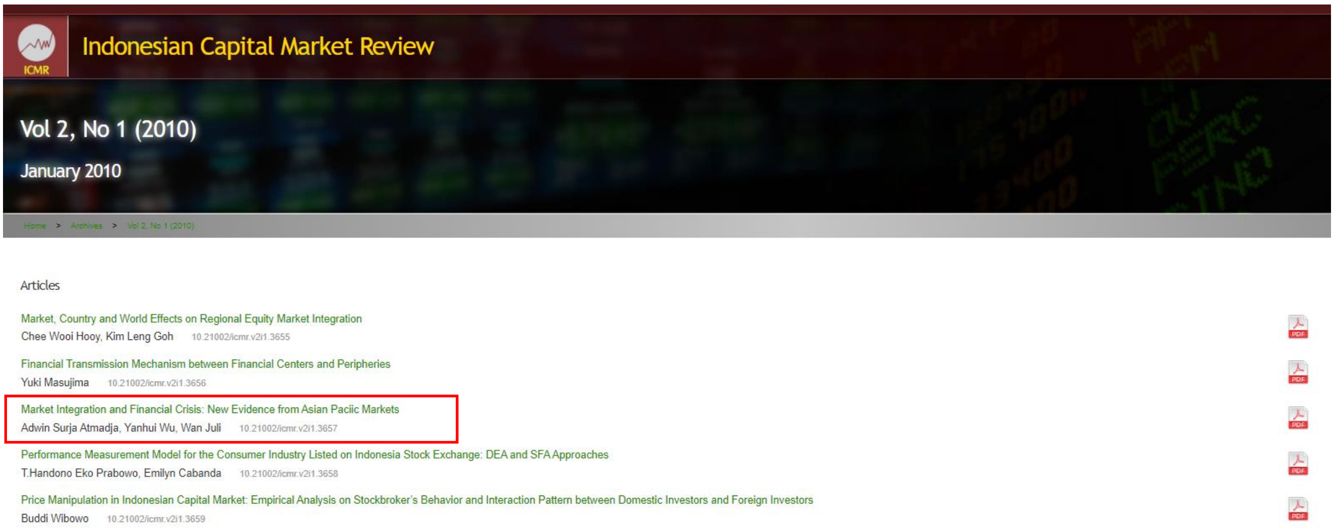
What Information Needed to Present in a Fundraising Campaign through Equity Crowdfunding
Chika Fajarini, Zuliani Dalimunthe, Shalahuddin Haikal

The Influence of Banking Risk on Share Price and the Moderating Role of Inflation Rate
Meliza Meliza

Short-run Dynamics Between Foreign Currency and Jakarta Composite Index During Indonesian Presidential Election
Muhamad Fahri Ridwan, Wee-Yeap Lau

Google Scholar | DOAJ Directory of Open Access Journals | EBSCOhost | Thomson Reuters Emerging Sources Citation Index Web of Science | ISJD

Indonesian Capital Market Review



Indonesian Capital Market Review

Vol 2, No 1 (2010)

January 2010

Home > Archives > Vol 2, No 1 (2010)

Articles

Market, Country and World Effects on Regional Equity Market Integration
Chee Wooi Hooy, Kim Leng Goh 10.21002/icmr.v2i1.3655

Financial Transmission Mechanism between Financial Centers and Peripheries
Yuki Masujima 10.21002/icmr.v2i1.3656

Market Integration and Financial Crisis: New Evidence from Asian Paciic Markets
Adwin Surja Atmadja, Yanhui Wu, Wan Juli 10.21002/icmr.v2i1.3657

Performance Measurement Model for the Consumer Industry Listed on Indonesia Stock Exchange: DEA and SFA Approaches
T.Handono Eko Prabowo, Emilyn Cabanda 10.21002/icmr.v2i1.3658

Price Manipulation in Indonesian Capital Market: Empirical Analysis on Stockbroker's Behavior and Interaction Pattern between Domestic Investors and Foreign Investors
Buddi Wibowo 10.21002/icmr.v2i1.3659

Indonesian Capital Market Review e-ISSN 2356-3818 print ISSN 1979-8997

Market Integration and Financial Crisis: New Evidence from Asian Paciic Markets

Adwin Surja Atmadja, Yanhui Wu, Wan Juli

Market Integration and Financial Crisis: New Evidence from Asian Paciic Markets

Adwin Surja Atmadja, Yanhui Wu, Wan Juli

Abstract

We investigated the stock market integration among national equity indices in eight countries from the period of 1995 to 2009, which was then clustered into four sub-sample periods. The multivariate time series analyses were employed to observe the degree and the existence of the integration. We found a cointegrating vector in each of three sub-sample periods. Interestingly, in the 1997 inancial crisis, we found that there was no indication of cointegration relationship among the equity indices. The results of block causality tests and the accounting innovation analysis indicate that the short run dynamic interactions among the stock indices became more intense during the current inancial crisis, and that the U.S. stock market played dominant role in the regional markets. activate javascript

DOI

https://doi/org/10.21002/icmr.v2i1.3657

Full Text: PDF

INDONESIAN
CAPITAL MARKET REVIEW

Market Integration and Financial Crisis: New Evidence from Asian Pacific Markets

Adwin Surja Atmadja*, Yanhui Wu† and Wan Juli‡

We investigated the stock market integration among national equity indices in eight countries from the period of 1995 to 2009, which was then clustered into four sub-sample periods. The multivariate time series analyses were employed to observe the degree and the existence of the integration. We found a cointegrating vector in each of three sub-sample periods. Interestingly, in the 1997 financial crisis, we found that there was no indication of cointegration relationship among the equity indices. The results of block causality tests and the accounting innovation analysis indicate that the short run dynamic interactions among the stock indices became more intense during the current financial crisis, and that the U.S. stock market played dominant role in the regional markets.

Keywords: *stock market integration, financial crisis.*

Introduction

A number of studies have been conducted on stock market integration and financial crisis, which focus on the 1997 Asian Financial Crisis (Yang, Kolari, and Min, 2003; Sheng and Tu, 2000). The general consensus is that the degree of integration among countries tends to change, with a stronger integration during the crises than that before and after the crises. It is also interesting to note that U.S stock market played an important influential role in some Asian countries during the 1998 Crisis period (Sheng and Tu, 2000).

The objective of this paper is to extend the analysis and examination presented in the previous papers on the stock market integration by including the recent financial crises. The emphasis of this paper is on whether there is a significant difference in the stock market integration in the (1997) Asian Financial Crisis and the (2007) Recent Financial Crisis, as well as in the non-crisis periods. This is an interesting issue because those two crises are quite different in terms of the phenomena and factors causing them. The Asian financial crisis indicates a mixture of both crisis and panic as a result of the weakness and collapse of Asia's financial systems (Sheng and Tu, 2000). The recent financial crisis was sparked in the U.S. in 2007. At the time, the US financial market deeply suffered from the

[1] Correspondence to : Adwin Surja Atmadja , Faculty of Economics, Petra Christian University, Indonesia, Email :aplin@peter.petra.ac.id
† School of Economics and Finance, Queensland University of Technology, Australia
‡ Ernst & Young, PSS Consult, Indonesia

most significant economic shocks initiated by the sub-prime mortgage crisis leading to the downturn in housing market, and then worsened by the spike in commodity prices (Yellen, 2008). Webb (2009) mentions that this crisis is a representation of hubris or an overconfidence that the previously smooth system will never fail or even collapse. The devastating effects of the US financial market turmoil then widely spread throughout the world.

In particular, the focus of this paper is on the stock market integration among national equity indices in eight countries from 1995 to 2009. The multivariate time series was employed to analyse the degree and the existence of the integration in the four sub sample periods.

Literature Review

The basic theoretical concept of financial market or stock market integration is adopted from the law of one price. In integrated financial markets, the assets with the same risk in different markets will result in the same yield when measured in a common currency (Stulz, 1981). However, if the yields are different across the markets, the arbitrage process will play an important role in eliminating the differences. Operationally, stock markets integration refers to the extent that markets' participants are enabled and obligated to take notice of events occurring in other markets by using all available information and opportunities, and is defined in terms of price interdependence between markets (Kenen, 1976). Stock market integration is affected by some factors (Roca, 2000), such as economic integration (Eun and Shim 1989), multiple listing of stocks, regulatory barriers and the degree of information barriers, institutionalisation and securitisation, and market contagion (King and Wadwhani, 1990; Climent and Meneu, 2003).

Many research has been conducted, mainly by using a cointegration analytical framework, to find and analyze the existence of integration in stock market across countries. Once a cointegration vector is found among two or more stock markets, the existence of a long run relationship among them can be identified. Thus, stock price movements in one equity market will affect the others. The results, however, are sensitive to different sample selections and model specifications.

A research conducted by Chung and Liu (1994) found two cointegration vectors between the U.S and larger Asia Pacific stock markets. Masih and Masih (1999) report that some of ASEAN countries (Thailand, Malaysia, and Singapore) have a high degree of interdependence with other Asian (Hong Kong and Japan) and developed (the U.S. and the U.K.) stock markets. Furthermore, they also found one cointegration vector among several major Asian stock markets (Hong Kong, Korea, Singapore, and Taiwan) and major developed markets (Masih and Masih, 2001). Interestingly, Pretorius (2002) reports that the degree of bilateral trade and the industrial production growth differential significantly explains the correlation between two equity markets, and that the stock markets of countries in the same region are more interdependent than those in different regions, however, in emerging stock markets, this correlation might be smaller than what is widely perceived (Pretorius, 2002).

Chan, Gup and Pan (1992) and DeFusco, Geppert and Tsetsekos (1996), mention that there was no cointegration between the U.S and several Asian emerging stock markets (Hong Kong, Taiwan, Singapore, Korea, Malaysia, Thailand, and the Philippines) in the 1980s and early 1990s. However, these findings somewhat contradict with those of Chung et al. (1994) and Masih et al. (1999). These imply that the interdependence among stock markets is not stable over time. For example, Hung and Cheung (1995) assert that there is no cointegration among stock markets in some Asia-Pacific countries (Malaysia, Hong Kong, Korea, Singapore, and Taiwan). However, they found that those stock markets were cointegrated after, but not before, the 1987 stock crash, once the stock prices were denominated at US dollars.

Arshanapalli and Doukas (1993) stated the instability of stock market interdependence when they tested the effect of inclusion or omission of the data for the 1987 crisis and revealed that that it affected the results. They concluded that the stock markets were highly integrated during the crisis. Furthermore, Arshanapalli, Doukas and Lang (1995) showed that after the 1987 crisis the stock markets in emerging markets (Malaysia, the Philippines, and Thailand) and developed markets (Hong Kong, Singapore, the U.S., and Japan) were more interdependent as they found cointegration in the post-crisis period, but not in the pre-crisis period. Other researchers, Liu, Pan and Shieh (1998) also confirm that there was an increase in the interdependence within Asian-Pacific regional markets and the stock markets in general post-the 1987 crisis. Similarly, Sheng and Tu (2000) documented one cointegration vector between the U.S. and several Asian stock markets (Taiwan, Malaysia, China, Thailand, Indonesia, South Korea, the Philippines, Australia, Japan, Hong Kong, and Singapore) during the crisis, but none in the year before the crisis, when they observed the stock markets using daily data.

A research conducted by Yang, Kolari and Min (2003), examining the long-run relationship and short-run dynamic causal linkages among the U.S, Japanese, and ten Asian emerging markets using daily data of 1997-1998 periods, confirms that the stock markets of those markets have been more integrated after the 1997 Asian financial crisis than before the crisis. Both long-run cointegration relationship and short-run causal linkages among those markets became more significant during the crisis. Their findings also revealed that the degree of integration among those countries tends to change over time.

In conclusion, several points may be drawn from the literature review. The implication is that liberalization of the financial sector in many countries has caused world stock markets to be more integrated. The degree of integration among international equity markets has increased since the 1987 stock market crash and the 1997 Asian financial crisis. Empirical evidence is given by the presence of cointegration vectors and significant short-run causal linkages. It is also worth noting that the stock markets of countries in the same region may be more interdependent than those in different regions.

Methodology

Data and Samples

A stock market price index or stock market index can be viewed simply as a portfolio of individual stocks. The index level corresponds to some average of the price levels of individual shares. The stock market index can then commonly be used as an indicator of the market performance.

This paper uses the daily closing stock prices indices of the eight stock markets from the period of 1995-2009. The indices are: the NYSE Composite of New York Stock Exchange-USA (NYSEALL); the ASX All Ordinaries Index of Australia (AUSTOLD); the NIKKEI 225 Stock Average of Japan (NIKKEI); HANG SENG of Hong Kong; Korea SE Composite (KOSPI) of Korea; Taiwan SE Weighted of Taiwan (TAIWGHT); the SHANGHAI SE Composite of China (SHANGHAI); and the Jakarta SE Composite of Indonesia

(JAKCOMP). All indices[1] are in natural logarithm forms.

The data were then separated into four sub-sample periods, as follows:

1. The period of January 1995 – June 1997 (1st non crisis period)
2. The Asian (1997) financial crisis period: from July 1997 – June 1998, as suggested by Sheng et al (2000) and Yang et al (2003).
3. The period of July 1998 – June 2007 (2nd non crisis period)
4. The recent (2007) financial crisis period from July 2007 – May 2009, as it is stated in several publications (http://en.wikipedia.org, www.globalissues.org, www.atypon-link.com)

Empirical Framework

We employed a multivariate time series analysis to examine the presence of long run equilibrium and dynamic relationships among the indices. The two most appropriate models that one of which may suitable for this study are VAR and VECM.

In the Vector autoregressive model (VAR) all of the variables are endogenous, and symmetrically treated. The general form of a VAR model is as follows:

$$Bx_t = \Gamma_o + \sum_{i=1}^{p} \Gamma_i x_{t-i} + \varepsilon_t$$

The VAR requires that all variables be stationary[2], and the appropriate lag length is data driven. Thus, in order to define the appropriate lag length, some tests of information criteria that were applied in this study included the likelihood ratio (LR) test; Akaike Information Criterion (AIC); and Schwarz Bayesian Criterion (SC).

The likelihood ratio test is based on asymptotic theory and is an F-type approximation. This test actually compares a restricted VAR (less lags) to an unrestricted VAR (more lags). However, the shortcoming of this test is that it may not be useful in small samples. In addition, the likelihood ratio test is valid when the restricted model is tested. Considering the limitations of the likelihood ratio test, multivariate generalization of AIC and SC may be the most suitable alternatives. The minimum values of AIC and/or SC may validly indicate the appropriate lags length, as long as the model's residual has no serial correlation problem. Otherwise, the lag length may be too short. Thus, it is necessary to re-estimate the model using lag length that does not suffer from serially correlated problem.

It is also possible to employ cointegration analysis within a vector error correction model (VECM) in this research. Although cointegration refers to a linear combination of non-stationary series, or I(1), it is a VAR augmented by the error correction term. The VECM, in general, takes the form as

$$\Delta x_t = \Gamma_o + \sum_{i=1}^{p} \Gamma_i \Delta x_{t-i} + \alpha\beta' x_{t-1} + v_t$$

Thus, if the parameters of error correction term (ECT), called speed of adjustments (α) in VECM, are zero, then VECM reverts to a VAR in first differences. However, if the speed of adjustments is not zero, the larger the speed of adjustments, the greater the response to previous periods' deviation from the long run equilibrium. A cointegration relationship is a long term or equilibrium phenomenon, although it is possible that cointegrating variables may

[1]The daily data are collected from the Thompson Financial electronic database.

[2]There are several available tests for testing for a unit root, the most common is the Augmented Dicky-Fuller (ADF) test. Non-stationary variables may be made stationary by differencing or de-trending process.

deviate from their relationship in the short run. The VECM result is also sensitive to its lags length. Thus, it is essential to use appropriate lag length to obtain the appropriate outcomes by conducting the lag order selection criteria (LR, AIC, or SC) tests, as it is used in VAR.

Cointegration requires that all variables in a model to be integrated of the same order. In order to test the existence of cointegrated variable, one may use the Engle-Granger (EG) test, which is a residuals-based approach, or the Johansen Cointegration test. In case a cointegration relationship did not exist, a VAR analysis in first difference would then be the correct specification to conduct the estimation.

Both in VAR and VECM, a block causality test was applied to examine whether the lags of one variable enter into the equation for another variable. A variable (y1) is said to be a granger-cause of another (y2) if the present value of y2 can be predicted with greater accuracy by using past values of y1, all other information being identical (Thomas, 1997). The null hypothesis of $\beta i = 0$ (i=1,2,…..n) was then tested by using Wald-statistic[3]. However, it is worth noting that granger-causality means a correlation between the current value of one variable and the past (lags) value of others. It does not mean that movements of one variable physically cause movements of another (Brooks, 2002). Thus, Granger causality simply implies a chronological ordering of movements of the series.

A direct interpretation of the cointegration relations as well as a traditional VAR analysis may be difficult or misleading (Lutkepohl and Reimers, 1992; Runkle, 1987). Accounting innovation analyses, consisting of impulse responses and variance decomposition analyses, can provide a solution to the interpretation problem, and might be the most suitable method to explain the short run dynamic structure of market linkages (Yang et al, 2003). The analyses provide an insight on whether changes in the value of a given variable have a positive or negative effect on other variables in the models, or how long it would take for the effect of that variable to work through the models.

An impulse response analysis traces out the responsiveness of the dependent variables in VAR to shocks on individual error terms. Since Cholesky factorization to orthogonalized VAR innovations is sensitive to the ordering of the variables in the VAR model when the residual covariance matrix is non-diagonal, the generalized impulse responses analysis is then employed. The Generalized Impulses as described by Pesaran and Shin (1998) constructed an orthogonal set of innovations that does not depend on the VAR ordering. The generalized impulse responses from an innovation to the j-th variable are derived by applying a variable specific Cholesky factor computed with the j-th variable at the top of the Cholesky ordering. Dekker, Sen and Young (2001) found that the generalized approach provided more accurate results than the traditional orthogonalized approach for both impulse response and forecast error variance decomposition analysis.

Forecast error variance decomposition, meanwhile, separates the variation in an endogenous variable into the component shocks to the system. Thus, the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the system. It determines how much of the s-step ahead forecast error variance of a given variable is explained by innovations to each explanatory variable. To some extent, the analyses, impulse responses and variance decompositions offer very similar information.

[3]The Wald statistic has a chi-square distribution.

Result and Discussion

The ADF tests applied on the series in all the sub-sample periods to reveal the existence of unit root in the series result in that all series of the sub-sample periods contained unit root, meaning that the series were non stationary. The results were largely consistent with Masih et al. (1999, 2001).

The examination then continued with determining the appropriate lag length of the series to get the correct outcomes. The information criteria (LR, AIC, and SC) tests used to check the series, however, gave some conflicting results. The lag lengths, suggested by AIC and SC, mostly suffered from serial correlation problem in their model's residual. We then used the appropriate lag lengths given by the LR test, since their residuals were not serially uncorrelated or white noise. The appropriate lag lengths are reported in Table 1.

Considering the number of appropriate lags, the number of cointegrating vectors was tested by using the maximum likelihood based λmax and λtrace statistics introduced by Johansen (1988, 1991). If there were conflicting results between λmax and λtrace statistic, Johansen and Juselius (1990) also suggest that the λtrace tends to have more power than the λmax because λtrace takes into account all degrees of freedom (n-r) of the smallest eigenvalues, then the number of cointegration vectors suggested by the λtrace statistic would be employed. With exclusion of linear trend and 95% critical values, Table 1 presents the test outcomes.

Table 1 shows that all indices had long run equilibrium in both non-crisis periods. Our findings showed supportive evidence for Liu et al (1998), and indicated that the cointegration analysis would validly estimate to the series of the periods.

Interestingly, we explored two sets of results in two different crisis periods. First, the cointegration relationship did not appear in the series during the Asian financial crisis period, which is inconsistent with that of Yang et al (2003) and Sheng et al (2000). This fact might happen because the 1997 financial crisis, originally emerged in South East Asia region, might significantly affect the Asian stock markets, mainly the ASEAN markets, but not the US and Australia markets. Some differences in macro-economic; stock market characteristics; geographical condition most likely reduce the contagious effect of the 1997 financial crisis (Euan et al., 1989; King et al., 1990; Pretorius, 2002). As a consequence of the absence of cointegrating vector, the cointegration analysis framework was not possible to estimate the series. Instead, the VAR in first difference would validly be applied.

Second, during the recent financial crisis period, we found a cointegrating relationship among the observed indices indicating that all of the indices would converge to their long run equilibrium, even though some dispersion might exist in the short run period. The result impliesd that the 2007 financial crisis had greater impact on the countries' stock indices than that of the 1997 financial crisis.

Considering the outcomes of the Johansen Cointegration test, the

Table 1. Lags Order and Number of Cointegrating Vector Tests

Periods	Lag Order	Number of Cointegrating Vector(s)
2 jan 95 -30 jun 97	2	1
1 jul 97 - 30 jun 98	6	0
1 jul 98 - 30 jun 07	6	1
1 jul 07 - 11 may 09	6	1

Note: the tests based on sequential modified LR test statistic (each test at 5% level) cointegration analysis would then only validly be applied to estimate the series in three sub-sample periods, which were both non-crisis periods and the recent financial crisis period. The NYSE Composite would be treated as the world index in these analyses. Based on t-statistic at the 5% level of significance, Table 2 shows that all variables, except KOSPI and TAIWGHT, had significant influence in the cointegrating relation in the first non crisis period, while NYSEALL; NIKKEI; KOSPI; SHANGHAI; and JAKCOMP significantly impacted on the cointegrating vector in the second period of non crisis. In addition, NYSEALL; AUSTOLD; HANGSENG; KOSPI; SHANGHAI; and TAIWGHT significantly contributed to the long run equilibrium of the observed indices in the current financial crisis period. The significant contributions from NIKKEI and JAKCOMP to the cointegrating relation, however, vanished during the recent crisis period.

Table 3 presents the speed of adjustment coefficients of the error correction term (αi) that had important implications for the dynamics of the system. The negative value of the significant speed of adjustment indicated a downward long run adjustment, while the positive one implied an upward long run adjustment.

With the critical value of 5%, the speed of adjustment coefficients of the first non crisis period's cointegrating vector for KOSPI; SHANGHAI; and JAKCOMP were statistically zero. This means that the cointegrating vector had no contribution to the convergence of those variables to their long run path, although SHANGHAI and JAKCOMP had significant contribution to the cointegrating vector.

In the second non crisis period, all indices, except AUSTOLD; NIKKEI; and JAKCOMP, had insignificant speed of adjustment coefficients, which implied that the cointegrating vector significantly contributed only to those three indices to their long run equilibrium.

As can be seen in Table 2 and Table 3, JAKCOMP had no significant impact on the cointegrating vector, and the cointegrating vector did not contribute to the convergence of the index in the long run. Though the cointegrating vector had no contribution to the convergence of HANGSENG in long

Table 2. Estimates of Cointegrating Vector

Cointegrating Equation:	PERIODS		
	January 1995 – June 1997	July 1998 – June 2007	July 2007 – May 2009
NYSEALL	1.0000000	1.000000	1.000000
AUSTOLD	-0.444534	-0.143217	1.875325
	[-3.21638]	[-0.73931]	**[2.10655]**
HANGSENG	-0.465916	0.039991	-1.833022
	[-5.60886]	[0.34768]	**[-2.76454]**
NIKKEI	-0.071050	-0.513153	-0.917174
	[-1.83821]	**[-4.86966]**	[-1.51312]
KOSPI	-0.032609	0.359709	5.182223
	[-0.62209]	**[4.63194]**	**[5.00913]**
SHANGHAI	-0.054542	-0.091178	-0.458509
	[-2.19389]	**[-1.64441]**	**[-2.56436]**
TAIWGHT	-0.036218	0.194391	-2.776947
	[-1.14175]	[1.53470]	**[-4.59515]**
JAKCOMP	-0.111738	-0.335629	-0.456625
	[-1.76087]	**[-3.84782]**	[-1.01414]
C	1.864440	-4.401370	-4.423218

Note: cointegration with unrestricted intercepts and no trends in CE and VAR.
t-statistics in [ ], level of significance 5%

Table 3. Speed of Adjustment Parameter of the Error Correction Term

Error Correction:	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
Period of January 1995 – June 1997								
ecm1(α1)	-0.019989	0.031587	0.088466	0.079622	0.001114	0.041859	0.103617	0.010265
	[-1.71100]	**[2.87946]**	**[4.65464]**	**[3.48827]**	[0.04894]	[0.81607]	**[4.14436]**	[0.67242]
Period of July 1998 – June 2007								
Ecm3 (α3)	-0.002232	0.003448	-0.002639	0.011923	-0.004348	0.003584	0.005639	0.018740
	[-0.82492]	**[2.10632]**	[-0.75266]	**[3.43824]**	[-0.87203]	[0.91654]	[1.38669]	**[4.68909]**
Period of July 2007 – May 2009								
ecm1 (α4)	-0.023340	-0.001743	-0.002773	-0.009036	-0.015075	0.018077	-0.010770	-0.003188
	[-3.83663]	[-0.52343]	[-0.43330]	**[-1.90515]**	**[-2.97232]**	**[2.81831]**	**[-2.32388]**	[-0.62293]

Note : t-statistics in [ ], 5% Level of significance

run path, the index significantly influenced the cointegrating vector. In comparison, NIKKEI reacted to a disequilibrium within the cointegrating vector, even though the index had no significant impact on the cointegrating vector.

As discussed above, a VECM was not appropriate to estimate the series in the period of Asian financial crisis, due to the absence of cointegration vector in the series. A VAR analysis in first difference would then be employed to estimate the series. A VAR analysis, however, requires that all variable must be stationary. Therefore, it was necessary to alter the non stationary series into the stationary one by differencing process. Following the alteration, re- identifying the appropriate lag length was a must. Three lag lengths were then found to be the most suitable one for the VAR in first difference to estimate the series during the period.

It is needed to search the existence of granger causality among variables for each model. This study conducts the causality tests for the series in all sub sample periods. For the both periods of non-crisis and the recent financial crisis period, the Pairwise Granger Causality based on Vector Error Correction (VEC) test was employed. Alternatively, the Pairwise Granger Causality based on VAR would test the series during the period of Asian financial crisis. The results are presented in Table 4.

The results of granger causality test demonstrated that NYSEALL granger caused most of the other indices in all observation periods. It suggested that changes or movements in most of the observed indices appeared to lag those of NYSEALL. However, during January 1995 – June 1997, NYSEALL did not granger-cause SHANGHAI (as well as in the Asian financial crisis period and during July 1998 – June 2007); KOSPI; and TAIWGHT. In the Asian financial crisis period, the NYSEALL did not significantly granger-cause JAKCOMP and SHANGHAI. Thus, the past value of NYSEALL could not be used to precisely forecast the present value of both indices during the first crisis. In the current crisis, all of the indices were granger caused, mostly in uni-directional forms, by the NYSE Composite.

In Asia scope, the current values of the Asian indices mostly correlated with the past value of NIKKEI during the 2007 financial crisis. Moreover, NIKKEI was the only Asian index that performed bi-directional causality with NYSEALL in the both period of crises. Meanwhile, movements of JAKCOMP would be incorrectly forecasted by using the past values of the other Asian indices, although it was still granger caused by NYSEALL in the crisis periods. Interestingly, JAKCOMP, as well as HANGSENG, significantly granger-caused NYSEALL in the period of the Asian financial crisis.

Table 4. Pairwise Granger Causality/Block Exogeneity Wald Tests

Dependent variable	Exclude	Jan 1995 – Jun 1997 (df 2) *		Jul 1997 – Jul 1998 (df 3)#		Jul 1998 – Jun 2007 (df 6) *		Jul 2007 – May 2009 (df 6) *	
		Chi-sq	Prob.	Chi-sq	Prob.	Chi-sq	Prob.	Chi-sq	Prob.
NYSEALL	AUSTOLD	1.4741	0.4785	0.0509	0.9970	6.5999	0.3594	8.1156	0.2298
	HANGSENG	2.0641	0.3563	29.462	0.0000	10.996	0.0885	3.6959	0.7177
	NIKKEI	1.2403	0.5379	9.8919	0.0195	5.2807	0.5083	14.141	0.0281
	KOSPI	3.8811	0.1436	2.3364	0.5056	8.9712	0.1752	6.8842	0.3317
	SHANGHAI	4.2976	0.1166	3.9984	0.2616	6.7527	0.3443	6.1120	0.4108
	TAIWGHT	0.2530	0.8812	0.4945	0.9201	14.734	0.0224	7.3918	0.2861
	JAKCOMP	6.6019	0.0368	13.628	0.0035	6.5800	0.3614	7.5358	0.2741
AUSTOLD	NYSEALL	186.63	0.0000	153.99	0.0000	1006.7	0.0000	373.21	0.0000
	HANGSENG	3.1010	0.2121	23.653	0.0000	11.216	0.0819	17.166	0.0087
	NIKKEI	0.2056	0.9023	8.1922	0.0422	10.924	0.0907	13.902	0.0307
	KOSPI	1.0785	0.5832	2.6404	0.4504	5.3171	0.5038	12.177	0.0581
	SHANGHAI	4.2108	0.1218	4.6346	0.2006	5.7611	0.4505	24.456	0.0004
	TAIWGHT	0.3310	0.8474	1.3265	0.7228	5.2583	0.5111	8.6151	0.1964
	JAKCOMP	2.0204	0.3641	4.6359	0.2005	3.2625	0.7752	24.605	0.0004
HANGSENG	NYSEALL	142.07	0.0000	37.042	0.0000	470.48	0.0000	150.01	0.0000
	AUSTOLD	8.8643	0.0119	0.3603	0.9483	4.9762	0.5469	7.8487	0.2494
	NIKKEI	3.6403	0.1620	1.7397	0.6281	20.229	0.0025	22.962	0.0008
	KOSPI	0.3417	0.8430	8.7142	0.0333	11.782	0.0670	12.881	0.0450
	SHANGHAI	1.6670	0.4345	17.330	0.0006	5.7323	0.4538	8.5893	0.1980
	TAIWGHT	0.4223	0.8096	2.5604	0.4645	3.0328	0.8047	10.203	0.1164
	JAKCOMP	5.0911	0.0784	12.271	0.0065	2.6789	0.8479	7.0103	0.3199
NIKKEI	NYSEALL	28.056	0.0000	25.514	0.0000	326.33	0.0000	302.81	0.0000
	AUSTOLD	1.9535	0.3765	4.4681	0.2151	6.7417	0.3454	9.0001	0.1736
	HANGSENG	1.0095	0.6037	0.08916	0.9931	4.2599	0.6415	3.3811	0.7597
	KOSPI	1.3216	0.5164	3.9724	0.2645	4.9848	0.5458	15.742	0.0152
	SHANGHAI	2.6499	0.2658	5.4959	0.1389	9.1521	0.1652	10.698	0.0982
	TAIWGHT	0.8930	0.6399	1.5205	0.6775	2.5358	0.8644	5.3348	0.5016
	JAKCOMP	0.9502	0.6218	1.2414	0.7431	6.9162	0.3287	10.605	0.1013
KOSPI	NYSEALL	4.6055	0.1000	12.135	0.0069	260.15	0.0000	117.14	0.0000
	AUSTOLD	0.0650	0.9680	7.9567	0.0469	11.053	0.0867	13.618	0.0342
	HANGSENG	1.7507	0.4167	2.3723	0.4988	7.8753	0.2474	5.2492	0.5123
	NIKKEI	4.2936	0.1169	8.0526	0.0449	5.8270	0.4428	24.736	0.0004
	SHANGHAI	0.3999	0.8188	4.6072	0.2029	2.4567	0.8733	8.0162	0.2369
	TAIWGHT	1.3482	0.5096	10.787	0.0129	7.4375	0.2823	5.2527	0.5118
	JAKCOMP	0.1490	0.9282	3.7390	0.2911	3.1459	0.7903	9.1916	0.1631
SHANGHAI	NYSEALL	3.3662	0.1858	2.0251	0.5672	4.8839	0.5588	29.675	0.0000
	AUSTOLD	1.0537	0.5905	2.4837	0.4782	2.7951	0.8341	5.4642	0.4858
	HANGSENG	0.1812	0.9134	8.9524	0.0299	5.5268	0.4782	4.3986	0.6229
	NIKKEI	2.7344	0.2548	0.6674	0.8808	3.8906	0.6915	9.1805	0.1637
	KOSPI	1.3309	0.5140	1.3699	0.7126	5.4329	0.4896	1.8424	0.9336
	TAIWGHT	0.0049	0.9976	1.6757	0.6423	4.2977	0.6365	0.8907	0.9894
	JAKCOMP	0.9621	0.6181	3.7130	0.2942	2.3430	0.8856	11.211	0.0820
TAIWGHT	NYSEALL	0.0635	0.9688	21.502	0.0001	124.28	0.0000	101.19	0.0000
	AUSTOLD	1.8241	0.4017	3.2430	0.3556	4.1513	0.6562	11.614	0.0711
	HANGSENG	0.2320	0.8905	4.1792	0.2427	10.413	0.1083	4.4170	0.6204
	NIKKEI	1.3115	0.5191	5.1192	0.1633	5.5154	0.4796	11.691	0.0692
	KOSPI	3.0874	0.2136	6.2124	0.1017	10.968	0.0894	7.3980	0.2856
	SHANGHAI	0.1129	0.9451	2.2327	0.5255	7.0574	0.3156	6.7103	0.3485
	JAKCOMP	4.0394	0.1327	2.6863	0.4426	18.702	0.0047	11.754	0.0677
JAKCOMP	NYSEALL	48.367	0.0000	4.9693	0.1741	118.81	0.0000	85.982	0.0000
	AUSTOLD	5.3443	0.0691	1.2304	0.7457	13.454	0.0364	8.1020	0.2307
	HANGSENG	9.9209	0.0070	6.3102	0.0975	8.6803	0.1924	8.9418	0.1769
	NIKKEI	0.4588	0.7950	0.7539	0.8605	13.649	0.0338	5.6031	0.4691
	KOSPI	3.1972	0.2022	23.644	0.0000	22.422	0.0010	11.471	0.0749
	SHANGHAI	0.6151	0.7353	5.1603	0.1604	3.7174	0.7149	2.2576	0.8945
	TAIWGHT	0.7135	0.6999	3.9994	0.2615	7.8170	0.2518	21.732	0.0014

Note : * Pairwise Granger Causality based on VEC
Pairwise Granger Causality based on VAR

The tests also found that more indices were significantly granger-caused by another in the crisis periods compared to those in non-crisis periods, implying that short run causal linkages among these stock markets were strengthened during the crises.

Appendix 1 presents the complete results of the generalized impulse responses analysis for each observation period. The results generally explained that contemporaneous responses of an observed index to a unit shock to another continuously increased for the time periods, especially during the 2007 financial crisis when the responses rocketed. NYSEALL became the most influential index that played a dominant role in the regional equity market, predominantly during the recent financial crisis, since a shock to NYSEALL resulted in the greatest contemporaneous reaction by most of the observed indices.

In Asia – Australia perspective, a shock to HANGSENG greatly affected AUSTOLD and SHANGHAI movements after the Asian financial crisis period. In addition, although its position had been taken over by NYSEALL in the current crisis period, HANGSENG became the most influential index for JAKCOMP during the Asian financial crisis. This confirmed the research conducted by Bhattacharyya and Banerjee (2004) that Hong Kong capital market leads the other Asian markets.

Appendix 2 shows the complete results of the forecast error variance decomposition for the eight stock indices in each sub sample period. The variance decomposition basically showed that a shock to the i-th variable would not only affect that variable, but also could be transmitted to all of other variables in the system. In general, the percentage value of the error variance attributable to own shocks continuously declined during the observation periods. In the 2007 crisis period, the percentage values were even lower for all indices compared to those in the other periods. This indicated that movements of an index were more likely influenced by the innovations in other indices than by its own shocks.

NYSEALL apparently had more explanatory power to the movements of the others in the 2007 crisis period than in the period of July 1998 – June 2007. Moreover, in several markets' indices, such as AUSTOLD; HANGSENG; NIKKEI; and KOSPI, the proportion of the movement in an index caused by its own shock was less than that caused by shock to NYSEALL. This occurrence was different from the one during January 1995 – June 1997, when the proportion of the movement in a sequence was mainly due to its own shocks.

Conclusion

This study examined the stock market integration among national equity indices in eight countries from 1995 to 2009, separated into four sub periods: before the (1997) Asian financial crisis, during the Asian financial crisis, after the crisis, and during the recent financial crisis.

The Johansen Cointegration Test revealed the existence of a cointegrating vector in three sub-samples implying that the stock markets were interdependent and have long run equilibrium. The VECM estimation results also showed that most indices had significant contribution to the cointegrating relationship during the sub-sample periods. In contrast, the test showed that there was no indication of cointegrating relationship among the indices during the 1997 financial crisis. These different findings somewhat confirmed those of Arshanapalli et al (1993) and Yang et al (2003) that the market interdependent is unstable and tends to change overtime.

The accounting innovation analysis together with block causality tests' results gave evidences that NYSEALL played dominant role in most of the indices' movements during the observation periods, and its role became even stronger during the recent financial crisis. The block causality tests' results also confirmed that the number of causal linkage among the indices increased during the crisis periods. These outcomes clarified that the short run dynamic interactions among the indices seemed to be more intense during the observation periods, especially in the recent financial crisis.

References

Arshanapalli, B., and Doukas, J. (1993), International Stock Market Linkages, Evidence from the Pre- and Post-October 1987 Period, *Journal of Banking and Finance*, 17 (1), 193-208.

Arshanapalli, B., Doukas, J., and Lang, L. (1995), Pre and Post-October 1987 Stock Market Linkages between U.S and Asian markets, *Pacific-Basin Finance Journal*, 3 (1), 57-73.

Bhattacharyya, M., and Banerjee, A. (2004), Integration of Global Capital Markets, An Empirical Exploration, *International Journal of Theoretical & Applied Finance*, 7 (4), 385-405.

Brooks, C. (2002), *Introductory Econometrics for Finance*, Cambridge: Cambrige University Press.

Chan, K.C., Gup, B.E., and Pan, M. (1992), An Empirical Analysis of Stock Prices in Major Asian Markets and the United States, *Financial Review*, 27 (2), 289-307.

Chung, P., and Liu, D. (1994), Common Stochastic Trend in Pacific Rim Stock Markets, *Quarterly Review of Economics and Finance*, 34, 241-259.

Climent, F., and Meneu, V. (2003), Has 1997 Asian Crisis Increased Information Flows between International Markets, *International Review of Economics and Finance*, 12(1), 111-143.

DeFusco, R.A., Geppert, J.M., and Tsetsekos, G.P. (1996), Long-run Diversification Potential in Emerging Stock Markets, *Financial Review*, 31(2), 343-363.

Dekker, A., Sen, K., and Young, M. (2001), Equity Market Linkage in the Asia Pacific Region, A Comparison of the Orthogonalized and Generalized VAR Approaches, *Global Finance Journal*, 12, 1-33.

Enders, W. (2004), *Applied Econometric Time Series, Second Edition*, USA: John Wiley & Sons.

Engle, R. F., and Granger, C.W.J. (1987), Cointegration and Error Correction, Representation, Estimation, and Testing', *Econometrica*, 55, 251-76.

Engle, R.F., and Kozicki, S. (1993), Testing for Common Features, *Journal of Business and Economic Studies*, 11, 83-113.

Eun, C.S., and Shim, S. (1989), International Transmission of Stock Market Movements, *Journal of Financial and Quantitative Analysis*, 24 (2), 241-56.

Hung, B., and Cheung, Y. (1995), Interdependence of Asian Emerging Equity Markets, *Journal of Business Finance and Accounting*, 22 (2), 281-88.

Johansen, S. (1988), Statistical Analysis of Cointegration Vector, *Journal of Economic Dynamics and Control*, 12(2-3), 231-54.

Johansen, S., and Juselius, K. (1990), The Full Information Maximum Likelihood Procedures for Inference on Cointegration with Applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.

Kasa, K. (1992), Common Stochastic Trends in International Stock Markets, *Journal of Monetary Economics*, 29, 95-124.
Kenen, P.B. (1976), Capital Mobility and Integration, A Survey, *Princeton Studies in International Finance No. 39*, Princeton University - USA.
King, M., and Wadwhani, S. (1990), Transmission of Volatility between Stock Markets, *Review of Financial Studies*, 3 (1), 5-33.
Liu, Y.A., Pan, M.S., and Shieh, J.C.P. (1998), International Transmission of Stock Price Movements, Evidence from the U.S. and Five Asian-Pacific Markets, *Journal of Economics and Finance*, 22 (1), 59-69.
Lutkepohl, H., and Reimers, H.E. (1992), Impulse Response Analysis of Cointegrated System, *Journal of Economic Dynamics and Control*, 16, 53-78.
Masih, A.M.M., and Masih, R. (1999), Are Asian Stock Markets Fluctuations Due to Mainly to Intra-regional Contagion Effects? Evidence Based on Asian Emerging Markets, *Pacific-Basin Finance Journal*, 7 (3), 251-82.
Masih, R., and Masih, A.M.M. (2001), Long and Short-term Dynamic Causal Transmission amongst International Stock Markets, *Journal of International Money and Finance*, 20, 563-87.
Pretorius, E. (2002), Economic Determinants of Emerging Market Stock Market Interdependence, *Emerging Markets Review*, 3, 84-105.
Reilly, F.K., and Brown, K.C. (2003), *Investment Analysis and Portfolio Management, Seventh Edition*, Ohio: Thomson Learning.
Roca, E.D. (2000), *Price Interdependence among Equity Markets in the Asia-Pacific Region, Focus on Australia and ASEAN*, Aldershot: Ashgate.
Runkle, D.E. (1987), Vector Autoregressions and Reality, *Journal of Business and Economic Statistics*, 5(4), 437-442.
Serletis, A., and King, M. (1997), Common Stochastic Trends and Convergence of European Union Stock Markets, *The Manchester School*, 65(1), 44-57.
Sheng, H., and Tu, A. (2000), A Study of Cointegration and Variance Decomposition among National Equity Indices before and during the Period of the Asian Financial Crisis, *Journal of Multinational Financial Management*, 10 (3), 345-65.
Stulz, R. (1981), On the Effects of Barriers to International Investment, *Journal of Finance*, 36, 923-934.
Thomas, R.L (1997), *Modern Econometrics, an Introduction*. Harlow: Addison-Wesley.
Webb, Allen P. (2009), Management lessons from the financial crisis: A conversation with Lowell Bryan and Richard Rumelt. *The McKinsey Quarterly*, June 2009
Yang, J., Kolari, J.W., and Min, I. (2003), Stock Market Integration and Financial Crises, the Case of Asia, *Applied Financial Economics*, 13, 477-486.
Yellen, Janet L. (2008), Economic Prospects for the US Economy from a Monetary Policymaker's Perspective, *CFA Institute Annual Conference Vancouver*, www.cfapubs.org.
http://en.wikipedia.org/wiki/Financial_crisis_of_2007%E2%80%932009, visited June 2009
http://www.globalissues.org/article/768/global-financial-crisis, visited June 2009
http://www.atypon-link.com/AEAP/doi/abs/10.1257/aer.98.2.339, visited June 2009

Appendix 1

The Generalized Impulse Responses

Sample Period : January 1995 – June 1997

Period	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
Response of NYSEALL:								
1	0.006194	0.000680	0.000560	7.67E-05	0.000470	-0.000237	9.84E-05	0.000410
2	0.006875	0.000872	0.000597	0.000394	0.000346	-0.000740	2.62E-05	0.001038
6	0.006579	0.000865	0.001138	0.000420	0.000914	-0.000713	4.07E-05	0.000882
Response of AUSTOLD:								
1	0.000638	0.005816	0.001216	0.000648	0.000315	-0.000344	0.000465	0.000890
2	0.003978	0.006249	0.001112	0.000699	0.000674	-0.000746	0.000495	0.001079
6	0.003415	0.005690	0.000682	0.000692	0.000989	-0.000686	0.000220	0.000491
Response of HANGSENG:								
1	0.000911	0.002107	0.010077	0.001608	0.000206	-0.000278	0.001364	0.002669
2	0.006252	0.002209	0.010315	0.001046	0.000347	-0.000100	0.001140	0.003606
6	0.007126	0.002365	0.009741	0.000461	0.000713	-0.001138	0.000646	0.002795
Response of NIKKEI:								
1	0.000150	0.001349	0.001932	0.012102	-0.000129	-4.73E-06	0.000679	0.001088
2	0.002996	0.000612	0.001302	0.011023	0.000318	6.24E-05	0.000247	0.001273
6	0.004263	5.63E-05	0.000686	0.010765	0.000924	-1.84E-05	-0.000309	0.000820
Response of KOSPI:								
1	0.000915	0.000653	0.000246	-0.000128	0.012065	0.000892	0.000311	-0.000517
2	0.002025	0.000816	0.000541	0.000404	0.013789	0.000977	0.000944	-0.000629
6	0.002136	0.000844	0.001097	-0.000402	0.014013	0.000488	0.001010	-0.000466
Response of SHANGHAI:								
1	-0.001040	-0.001606	-0.000751	-1.06E-05	0.002011	0.027196	0.001054	-0.000121
2	-0.000706	-0.001336	-4.50E-05	0.001748	0.003266	0.028184	0.001252	0.000922
6	-0.001378	-0.001052	-0.000966	0.000921	0.003448	0.028612	0.001150	0.001037
Response of TAIWGHT:								
1	0.000211	0.001059	0.001794	0.000743	0.000341	0.000514	0.013256	0.000820
2	0.001042	0.001272	0.001521	0.001165	0.001212	0.000533	0.012699	0.001241
6	0.002086	-0.000467	-0.000232	0.000443	0.001309	-6.92E-05	0.012942	0.001298
Response of JAKCOMP:								
1	0.000535	0.001239	0.002144	0.000727	-0.000347	-3.60E-05	0.000501	0.008094
2	0.002856	0.001532	0.003201	0.000773	-0.000652	-0.000256	0.000439	0.010481
6	0.003652	0.002469	0.004423	0.000736	0.000149	-0.000300	0.000615	0.010604

Sample Period : July 1997 – June 1998

Period	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
				Response of NYSEALL:				
1	0.009015	0.000751	0.001817	0.001177	0.001911	-0.001207	-0.000278	3.91E-05
2	-6.72E-05	-0.000461	-0.000595	-0.001735	0.000234	-0.000751	-0.000356	0.001179
3	-0.000349	0.001535	0.003053	0.000931	4.37E-05	0.001363	0.000326	-5.12E-05
6	7.58E-05	-0.000336	4.15E-05	-0.000128	-0.000166	-0.000291	0.000233	-4.50E-05
				Response of AUSTOLD:				
1	0.000630	0.007560	0.003100	0.002471	0.000959	0.000219	3.26E-05	0.001269
2	0.006053	0.000713	0.000810	-0.000237	0.001462	-0.000790	-0.000239	0.000787
6	-0.000500	-0.000674	-0.000482	-5.39E-05	-0.000346	0.000355	-0.000360	-8.96E-05
				Response of HANGSENG:				
1	0.005130	0.010439	0.025458	0.008067	0.001481	0.002055	0.005885	0.008047
2	0.010688	0.000271	0.001057	-0.000520	0.004295	-0.006243	-0.001656	0.004461
6	-0.000200	-0.001200	-0.001342	-0.000867	-4.39E-05	0.001494	-0.001151	0.000378
				Response of NIKKEI:				
1	0.002092	0.005237	0.005077	0.016024	0.000665	-0.000196	0.001430	0.002927
2	0.005312	-0.001794	0.000253	-0.001265	0.001867	-0.000697	0.000275	-0.000150
6	0.000726	-0.000343	-0.000268	-9.57E-05	-0.000110	0.000594	-0.000453	-0.000125
				Response of KOSPI:				
1	0.006448	0.003860	0.001769	0.001262	0.030418	0.000114	0.002564	0.000629
2	0.004839	0.001547	0.003267	0.005412	0.005459	0.000208	0.004540	0.002517
6	-0.001125	-0.001167	-0.000434	-0.000747	-0.000567	-0.000485	-0.001122	5.03E-05
				Response of SHANGHAI:				
1	-0.002049	0.000443	0.001235	-0.000187	5.73E-05	0.015303	-0.000107	-0.000729
2	0.000904	-0.000186	0.001947	0.001130	-0.000328	-0.000392	-0.000612	0.000725
6	0.000405	0.000109	0.000189	-5.67E-05	8.78E-05	6.92E-05	5.82E-05	-7.58E-05
				Response of TAIWGHT:				
1	-0.000462	6.46E-05	0.003467	0.001339	0.001264	-0.000105	0.014998	0.001616
2	0.004591	0.001717	0.001739	0.000659	0.001221	-0.000536	-0.001078	0.000925
6	-0.000501	-0.000419	0.000268	8.26E-05	-0.000843	0.000349	-0.000633	-5.84E-05
				Response of JAKCOMP:				
1	0.000119	0.004613	0.008684	0.005018	0.000568	-0.001309	0.002960	0.027472
2	0.006497	0.001857	0.004096	0.002152	0.007895	-0.003766	-0.000938	0.006421
6	-0.000244	-0.001082	-0.000749	-0.000299	-0.000431	0.001187	-0.001227	0.000304

Sample Period : July 1998 – June 2007

Period	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
				Response of NYSEALL:				
1	0.009913	0.001281	0.001441	0.001472	0.001103	8.22E-05	0.001055	0.000474
2	0.010142	0.001285	0.001508	0.001223	0.001225	0.000312	0.001368	0.000543
6	0.009509	0.001357	0.001264	0.001161	0.000686	-0.000267	0.001513	0.000392
				Response of AUSTOLD:				
1	0.000775	0.005997	0.002133	0.002108	0.001767	0.000502	0.001061	0.001089
2	0.004666	0.005539	0.002449	0.001996	0.001753	0.000544	0.001041	0.000945
6	0.005245	0.005275	0.002027	0.001900	0.001613	3.71E-05	0.000993	0.000715
				Response of HANGSENG:				
1	0.001867	0.004570	0.012845	0.004858	0.005439	0.001400	0.003295	0.003351
2	0.007495	0.004577	0.013076	0.004412	0.005788	0.001135	0.003321	0.003413
6	0.009058	0.004791	0.012211	0.004012	0.005680	0.001186	0.003842	0.002894
				Response of NIKKEI:				
1	0.001887	0.004466	0.004804	0.012704	0.004716	0.000821	0.003076	0.002131
2	0.006714	0.004737	0.005146	0.012050	0.005057	0.000396	0.003397	0.002066
6	0.007532	0.004168	0.004649	0.011285	0.004634	0.000843	0.003104	0.001177
				Response of KOSPI:				
1	0.002032	0.005384	0.007735	0.006782	0.018267	0.000179	0.005534	0.004029
2	0.008068	0.005292	0.008752	0.006738	0.018631	0.000139	0.005892	0.004714
6	0.010018	0.005828	0.009647	0.006288	0.016501	0.000631	0.005778	0.004349
				Response of SHANGHAI:				
1	0.000119	0.001199	0.001561	0.000926	0.000140	0.014326	0.000725	0.000765
2	0.000333	0.001723	0.001938	0.001133	0.000497	0.014441	0.001099	0.000959
6	0.001119	0.002474	0.003443	0.001786	0.000562	0.015056	0.002170	0.001500
				Response of TAIWGHT:				
1	0.001586	0.002636	0.003822	0.003607	0.004513	0.000754	0.014898	0.002374
2	0.005268	0.003174	0.005495	0.004993	0.005843	0.000744	0.015216	0.002691
6	0.007731	0.003545	0.005899	0.004983	0.006094	0.000882	0.015266	0.000796
				Response of JAKCOMP:				
1	0.000700	0.002659	0.003819	0.002456	0.003229	0.000781	0.002333	0.014641
2	0.004149	0.002906	0.005076	0.002463	0.004424	0.001173	0.002800	0.016557
6	0.006487	0.002786	0.005040	0.003615	0.006893	0.000168	0.003227	0.016336

Sample Period : July 2007 – May 2009

Period	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
Response of NYSEALL:								
1	0.022384	0.006687	0.008853	0.007134	0.007739	0.002501	0.005077	0.006164
2	0.018882	0.004773	0.007497	0.006242	0.007564	0.001375	0.005150	0.006884
3	0.015740	0.002521	0.005964	0.003171	0.005064	0.001453	0.004760	0.006942
6	0.014606	0.004437	0.006466	0.003156	0.002989	-4.26E-05	0.002765	0.004973
Response of AUSTOLD:								
1	0.003661	0.012255	0.006833	0.005976	0.006429	0.002711	0.005288	0.005144
2	0.014180	0.011604	0.008347	0.006149	0.007340	0.001808	0.005343	0.008009
6	0.014257	0.010417	0.007488	0.005363	0.005042	-0.000180	0.004524	0.007105
Response of HANGSENG:								
1	0.009312	0.013128	0.023547	0.012679	0.014815	0.011686	0.012032	0.012687
2	0.020806	0.010848	0.020791	0.010433	0.015340	0.006980	0.009626	0.013771
6	0.017886	0.009225	0.018278	0.005273	0.009728	0.006091	0.008278	0.011813
Response of NIKKEI:								
1	0.005562	0.008509	0.009396	0.017451	0.010914	0.004197	0.007958	0.006340
2	0.019454	0.009195	0.011940	0.016427	0.012890	0.002831	0.007848	0.009529
6	0.016469	0.007834	0.010855	0.012387	0.008382	0.002815	0.007322	0.009990
Response of KOSPI:								
1	0.006452	0.009790	0.011741	0.011671	0.018661	0.006404	0.011806	0.008802
2	0.014637	0.009285	0.011978	0.009306	0.018417	0.004653	0.010324	0.010726
6	0.013315	0.010130	0.011989	0.006978	0.015589	0.005247	0.010117	0.008881
Response of SHANGHAI:								
1	0.002637	0.005221	0.011712	0.005676	0.008099	0.023601	0.007620	0.005587
2	0.008637	0.005245	0.012858	0.004652	0.009057	0.022849	0.007364	0.008367
6	0.012386	0.006312	0.014810	0.004095	0.010950	0.022813	0.006349	0.009355
Response of TAIWGHT:								
1	0.003868	0.007358	0.008714	0.007776	0.010789	0.005505	0.017052	0.007624
2	0.012108	0.008017	0.011713	0.008173	0.012124	0.005525	0.016693	0.011231
6	0.012044	0.008241	0.010242	0.005345	0.008772	0.006134	0.015125	0.010044
Response of JAKCOMP:								
1	0.005185	0.007904	0.010145	0.006840	0.008881	0.004458	0.008418	0.018829
2	0.013321	0.007727	0.012011	0.007101	0.010295	0.004685	0.007378	0.022031
6	0.017393	0.009726	0.013428	0.008452	0.013030	0.006716	0.009443	0.021935

Appendix 2

The Forecast Error Variance Decomposition

Sample Period : January 1995 – June 1997

Period	S.E.	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
				Variance Decomposition of NYSEALL:					
1	0.006194	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.009292	99.17938	0.016098	0.002844	0.109948	0.035834	0.247278	0.006124	0.402492
6	0.016302	98.51518	0.018154	0.222759	0.142410	0.227675	0.525292	0.037192	0.311339
				Variance Decomposition of AUSTOLD:					
1	0.005816	1.204985	98.79501	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.009173	19.29139	80.36502	0.220173	0.004704	0.013354	0.098454	0.001302	0.005603
6	0.015971	24.63076	74.06983	0.597171	0.065913	0.339972	0.139103	0.041896	0.115349
				Variance Decomposition of HANGSENG:					
1	0.010077	0.816499	4.016338	95.16716	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.015420	16.78499	2.702666	80.04008	0.133267	0.026477	0.060823	0.026146	0.225556
6	0.028496	28.48382	2.852033	67.63347	0.549329	0.023906	0.121153	0.172783	0.163511
				Variance Decomposition of NIKKEI:					
1	0.012102	0.015319	1.226750	1.951982	96.80595	0.000000	0.000000	0.000000	0.000000
2	0.016663	3.241498	0.676302	1.389189	94.57807	0.025835	0.003258	0.031339	0.054513
6	0.028826	9.285180	0.262027	0.742794	89.06903	0.280072	0.035970	0.261288	0.063642
				Variance Decomposition of KOSPI:					
1	0.012065	0.574716	0.212443	0.001950	0.030924	99.17997	0.000000	0.000000	0.000000
2	0.018366	1.463571	0.197504	0.018544	0.037124	98.18485	4.29E-06	0.088375	0.010030
6	0.033635	1.973245	0.192060	0.225890	0.122923	97.26890	0.066540	0.144863	0.005577
				Variance Decomposition of SHANGHAI:					
1	0.027196	0.146340	0.304698	0.017985	0.006727	0.638859	98.88539	0.000000	0.000000
2	0.039236	0.102670	0.250539	0.013711	0.234836	1.068244	98.28161	3.16E-05	0.048358
6	0.069702	0.247519	0.119700	0.017580	0.197913	1.432351	97.81891	3.75E-05	0.165987
				Variance Decomposition of TAIWGHT:					
1	0.013256	0.025221	0.617792	1.466435	0.094518	0.044114	0.190557	97.56136	0.000000
2	0.018411	0.333475	0.720364	1.201456	0.270132	0.375563	0.192175	96.83364	0.073195
6	0.032576	1.457554	0.299219	0.469140	0.227939	0.685615	0.087538	96.15644	0.616554
				Variance Decomposition of JAKCOMP:					
1	0.008094	0.437474	2.152389	5.533751	0.164787	0.304879	0.018193	0.041379	91.34715
2	0.013435	4.676810	1.614536	6.244318	0.086459	0.597803	0.007164	0.015418	86.75749
6	0.026118	8.060609	2.953230	10.11134	0.025285	0.260310	0.005884	0.004884	78.57846

Sample Period : July 1997 – June 1998

Period	S.E.	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
				Variance Decomposition of NYSEALL:					
1	0.009015	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.009352	92.93434	0.238949	0.228985	3.027967	0.080326	0.664825	0.060774	2.763829
6	0.010247	78.08793	2.780301	9.005478	2.667366	1.249408	1.975436	0.416317	3.817762
				Variance Decomposition of AUSTOLD:					
1	0.007560	0.694231	99.30577	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.009818	38.41590	58.93001	0.313060	1.203292	0.016286	0.001191	0.018591	1.101671
6	0.011088	32.30768	46.91468	12.60169	2.079629	1.112044	1.269224	0.770880	2.944175
				Variance Decomposition of HANGSENG:					
1	0.025458	4.060832	15.57397	80.36520	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.028640	17.13373	12.35228	63.60706	0.341836	0.538970	2.905598	0.264076	2.856448
6	0.031635	16.93172	11.00085	57.78684	0.448963	2.368988	4.293953	0.692481	6.476208
				Variance Decomposition of NIKKEI:					
1	0.016024	1.703637	10.05038	3.406071	84.83991	0.000000	0.000000	0.000000	0.000000
2	0.017122	11.11775	10.52167	2.985250	74.94795	0.338434	0.000248	0.058803	0.029899
6	0.017909	11.08457	9.901071	4.651812	70.25523	1.761051	1.406072	0.546516	0.393676
				Variance Decomposition of KOSPI:					
1	0.030418	4.492974	1.201581	0.096192	0.027263	94.18199	0.000000	0.000000	0.000000
2	0.031779	6.435486	1.231219	0.504903	1.928104	88.36456	0.034604	1.322035	0.179094
6	0.033875	6.635730	3.791601	0.827585	2.799723	79.67788	2.241125	3.188841	0.837512
				Variance Decomposition of SHANGHAI:					
1	0.015303	1.793138	0.162096	1.049052	0.082243	0.098236	96.81523	0.000000	0.000000
2	0.015550	2.074283	0.185315	2.811583	0.325582	0.170191	93.84144	0.584583	0.007019
6	0.015934	2.567206	0.307936	3.624809	0.354760	0.549599	90.66811	0.640568	1.287016
				Variance Decomposition of TAIWGHT:					
1	0.014998	0.095076	0.004760	6.852547	0.215868	1.039631	0.165679	91.62644	0.000000
2	0.015804	8.524715	0.722129	6.212289	0.279082	0.940830	0.149469	82.97618	0.195305
6	0.017207	9.873514	1.277837	8.803114	3.170052	2.860845	1.103867	70.66806	2.242711
				Variance Decomposition of JAKCOMP:					
1	0.027472	0.001877	2.826669	7.706248	0.708729	0.013650	0.664707	0.071727	88.00639
2	0.029950	4.707069	2.572607	7.196304	0.619394	4.949460	1.893140	0.675527	77.38650
6	0.031359	4.512003	2.728344	8.177699	0.819770	7.721429	2.540346	1.538694	71.96171

Sample Period : July 1998 – June 2007

Period	S.E.	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
Variance Decomposition of NYSEALL:									
1	0.009913	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.014192	99.85527	0.000321	0.001070	0.051336	0.014845	0.028986	0.047765	0.000411
6	0.024122	99.58857	0.020057	0.027242	0.100928	0.054423	0.050541	0.121293	0.036944
Variance Decomposition of AUSTOLD:									
1	0.005997	1.668848	98.33115	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.009100	27.01747	72.63128	0.008712	0.227085	0.022434	0.008416	0.062548	0.022062
6	0.016722	45.18760	53.88239	0.155786	0.454097	0.056325	0.074618	0.096979	0.092203
Variance Decomposition of HANGSENG:									
1	0.012845	2.111999	11.54925	86.33875	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.019225	16.14125	8.739210	74.75900	0.301628	0.023056	0.009797	0.025352	0.000711
6	0.034880	30.33162	7.302988	61.36308	0.910314	0.034414	0.010422	0.032832	0.014326
Variance Decomposition of NIKKEI:									
1	0.012704	2.205923	11.23300	6.820926	79.74015	0.000000	0.000000	0.000000	0.000000
2	0.018211	14.66393	10.05740	6.144973	69.05869	0.024150	0.044032	0.001044	0.005786
6	0.031240	26.03709	8.054914	5.534785	60.16333	0.013162	0.053299	0.001191	0.142220
Variance Decomposition of KOSPI:									
1	0.018267	1.237432	7.993513	11.21724	3.731656	75.82016	0.000000	0.000000	0.000000
2	0.026817	9.626084	6.263194	11.24293	2.720872	70.10443	0.000314	0.001824	0.040353
6	0.046838	20.62652	6.468741	12.24928	1.453173	59.14575	0.005496	0.022139	0.028891
Variance Decomposition of SHANGHAI:									
1	0.014326	0.006883	0.694438	0.730742	0.021716	0.281125	98.26510	0.000000	0.000000
2	0.020352	0.030257	1.036968	0.845105	0.017232	0.226890	97.83140	0.011952	0.000195
6	0.036074	0.168222	1.572637	1.774955	0.015381	0.370257	95.81347	0.248465	0.036617
Variance Decomposition of TAIWGHT:									
1	0.014898	1.132549	2.707822	3.970049	1.779548	3.049807	0.070402	87.28982	0.000000
2	0.021661	6.449474	2.628143	5.585196	2.229690	3.426409	0.047750	79.62735	0.005986
6	0.039437	14.31585	2.369982	6.432948	2.158967	2.941321	0.067124	70.91497	0.798832
Variance Decomposition of JAKCOMP:									
1	0.014641	0.228882	3.129781	4.350264	0.275875	0.958072	0.062711	0.396545	90.59787
2	0.022397	3.530388	2.476535	4.953731	0.117960	1.423160	0.132464	0.303079	87.06268
6	0.041260	8.330199	1.747070	4.572215	0.172835	3.564479	0.080245	0.291000	81.24196

Sample Period : July 2007 – May 2009

Period	S.E.	NYSEALL	AUSTOLD	HANGSENG	NIKKEI	KOSPI	SHANGHAI	TAIWGHT	JAKCOMP
Variance Decomposition of NYSEALL:									
1	0.022384	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.029435	98.97472	0.095510	0.036787	0.034269	0.283885	0.136297	0.052235	0.386299
6	0.044249	96.28553	0.417163	0.112111	0.538917	0.577646	0.341883	0.495357	1.231398
Variance Decomposition of AUSTOLD:									
1	0.012255	8.924588	91.07541	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.020502	51.02541	46.72477	0.250977	0.577619	0.011392	0.217105	0.003599	1.189128
6	0.036945	70.00838	23.32919	0.515421	1.192940	0.578133	0.599648	0.611409	3.164885
Variance Decomposition of HANGSENG:									
1	0.023547	15.64154	21.19853	63.15993	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.034773	42.97299	11.66866	42.92437	0.431433	0.654875	0.668941	0.243702	0.435032
6	0.059569	56.21145	5.105615	32.93672	3.294654	0.704657	0.500855	0.168005	1.078050
Variance Decomposition of NIKKEI:									
1	0.017451	10.15854	16.90781	7.879068	65.05459	0.000000	0.000000	0.000000	0.000000
2	0.028443	50.60479	7.918168	4.302209	36.18269	0.097855	0.409146	0.136535	0.348609
6	0.047369	67.71325	3.551609	4.080711	20.49641	0.738574	0.240250	0.255615	2.923574
Variance Decomposition of KOSPI:									
1	0.018661	11.95328	19.49261	13.23750	8.241590	47.07502	0.000000	0.000000	0.000000
2	0.028118	32.36224	11.93637	8.751410	3.898691	42.09979	0.242105	0.157246	0.552154
6	0.048865	42.84736	7.244340	9.502184	1.434213	38.17870	0.134341	0.073762	0.585105
Variance Decomposition of SHANGHAI:									
1	0.023601	1.248141	3.874734	20.68633	0.002121	0.607395	73.58128	0.000000	0.000000
2	0.033663	7.196824	2.592517	19.46235	0.616069	0.948652	68.59203	0.045063	0.546499
6	0.060675	14.48247	1.255730	20.21763	1.334720	1.526496	60.04693	0.581896	0.554131
Variance Decomposition of TAIWGHT:									
1	0.017052	5.144398	14.52840	9.565980	3.019913	10.61745	0.445090	56.67877	0.000000
2	0.025610	24.63307	9.682474	9.806372	1.460969	8.555006	0.200821	44.64906	1.012220
6	0.046923	36.06649	5.580263	8.308020	0.740887	6.204122	0.778341	40.08782	2.234056
Variance Decomposition of JAKCOMP:									
1	0.018829	7.584436	12.50558	11.29323	0.196759	1.546823	0.091584	1.752568	65.02903
2	0.030307	22.24796	6.505714	8.555757	0.118150	1.410176	0.091400	0.684540	60.38630
6	0.059941	36.52147	3.260214	7.117998	0.049351	2.590014	0.121923	0.251370	50.08766