“Interactions and three significant international events of the Pacific basin stock markets. Is U.S. stock market still a trail blazer?”

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Interactions and three significant international events of the Pacific basin stock markets. Is U.S. stock market still a trail blazer?

Abstract

This article examines the causality and cointegration relationship of the Pacific basin stock markets. The authors also check whether there exists a structural break during sample time. It is known that U.S. stock market plays a very important role in the whole world stock markets, but U.S. experiences the Asia financial crisis, the burst of Internet bubbles and 911 events, whether still for the whole world stock market's pioneer. From Granger causality tests one can also explain why the global financial crisis in 2008 began to expand from the United States to the Pacific countries also makes a considerable impact on the stock market of this region. This paper proves that U.S. stock market has still gained a leading position in the Pacific basin stock markets gradually even under 3 significant international events.

Keywords: cointegration, causality, structural break, Asia financial crisis, the burst of Internet bubbles, 911 events.
JEL Classification: G15, C32.

Introduction

Asian financial crisis took place in 1997 with the reason of economic recession which was because the value of money was over-evaluated and the external debt was too much. Since the unfavourable balance of the current account was expanded, the terms of trade became bad easily. The exchange rate of essence appreciates excessively and the value of money was over-evaluated. Besides, over depending on the foreign capitals, the flight of capital, initiate and devalue which caused enterprise and personal credit expanded excessively, in debt to increase continuously in a short time. The external debt accounts were too high which made the economic basic side of GDP proportion become worse seriously. That could also bring serious influences on the house market and the stock market. Therefore, the flight of capital was ended up in devaluating.

On Monday, October 27, 1997, a large stock market declined occasionally because of Asian financial crisis in many global financial markets. In the United States, the Dow Jones Industrial Average (DJIA) declined for 554.26 points (-7.2%). Similar decline was observed in New York Stock Exchange (NYSE) index (-6.6%), the American Stock Exchange (AMEX) index (-5.8%), and the NASDAQ index (-7.0%). On Tuesday, October 28, 1997, the U.S. markets experienced a partial recovery with DJIA recovering 337.17 points (4.7%), a record for point rebounds. We can see that financial crisis plays a decisive role for global financial markets indeed.

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With new and quick development of science and technology between 1997 and 2001, the stock price rose in the relevant enterprises of the Internet network in the stock markets in a lot of Asian countries. Because of the high-increased stock price, the investors' speculative activities and unsupported risk fund caused prosperity on environment growing, which also made some new developed enterprises surpassed the traditional ones for a time. A large number of enterprises based on the Internet network was born during this era, but ended up with the subsequent bankruptcy and the network foams right away. The burst of the Internet bubbles made a lot of countries in the world presented in the economic recession in the initial phase in year of 2000.

The U.S. economy became unstable for the first time since 1993, and it also entered the declining phase in 2001. One of the main factors was the influence that was brought by 911. Fed reduced interest rate for 14 times in two years hereafter. The U.S. government implemented the tax reduction plan up to 350 billion dollars of the scale again. These measures have played an important and amazing function in consumption. The economists estimated that the contribution of the tax reduction plan would increase GDP of the USA in only about 1.5 percentage points. By the year of 2002, the sign has appeared and the U.S. economy has recovered, also the lasting growth appeared in the economy of the U.S. in 2003. In 2004, Greenspan pointed out that every material data revealed improvement in economy and has already resumed the motive force on the whole. If the US economic manifestation is improved continuously, the budget deficit could be reduced expectedly. But looking forward to long term, deficit was still needed to be worried about.

Sheng and Tu (2000) used a cointegration and variance decomposition analysis to examine the link-

ages among the stock markets of 12 Asian-Pacific countries, which referred to the period that was before and during the Asian financial crisis. Johansen (1988) multivariated cointegration and error-correction tests to the relationship within the South-East Asian countries seems to be stronger than that within the North-East Asian countries. The variance decomposition revealed that the 'degree of exogeneity' for all indices has been reduced, implied that no countries were 'exogenous' to the financial crisis. In addition, Granger's causality test suggested that the U.S. market still 'brought' influence on some Asian countries during the period of crisis, which reflected the persistent and dominant role of the U.S. market.

Chang (2002) indicated that the volatile exchange rate movement during the Asian financial crisis had led global investors to re-evaluate the importance of currency exposures in Asian stock markets. They examined the industry-level currency risk of Taiwan's stock market during the Asian financial crisis. The results showed that most export-oriented industries, except the electronics industry were positively affected by the depreciation of the New Taiwan Dollars (NTD) against the U.S. Dollars (USD). Their results were consistent with the findings of Chow et al. (1997b) and had important implications for international investors with exposures in stock market of Taiwan.

Ho and Wan (2002) investigated that the stock return series of Australia, Hong Kong, Singapore and the U.S. were covariance stationary adopted by Omran and McKenzie's (1999) testing procedure which comprised the Loretan and Phillips (1994) test and an intervention analysis. The main objective of the procedure was to ascertain the role of structural breaks on the stochastic properties of the stock return series. The intervention due to the Asian financial crisis in 1997 was significant in the case of Hong Kong and Singapore, so the hypothesis of covariance stationary could not be rejected after finding the effects on the financial crisis which had been filtered properly. On the other hand, the evidence suggested that neither Asian crisis nor Russian and Latin America currency crisis of 1998 had any significant impacts on the stock return series of Australia and the U.S., which were found to be covariance stationary and covariance non-stationary, respectively.

Hsin (2004) investigated the comovement in stock indices among major developed markets in which Morgan Stanley Capital International (MSCI) indices were employed for study purpose. They employed a model that accommodated multilateral international impacts on equity index movements. The empirical results revealed that the existence of significant international transmission effects these major world markets both in returns and volatility, and mostly in a positive direction. The U.S. market, as expected, was the leading market that had the most pervasive and significant impacts on all markets across the continents. However, the U.S. market exhibited a different relationship in European markets from that in Asia-Pacific markets. On the other hand, the U.S. and Asian markets were linked through positive global common forces and positive international contagious effects. The United States, Canada, and the UK were the three markets that still showed contagious influences on all over the countries except on their own.

Lee, Rui and Wang (2004) employed EGARCH models, dynamic causality tests, and VAR-based forecast error decompositions and used daily data of a recent sample that included the Asian financial crisis in 1997 and continued until April 20, 2001. There was strong evidence on lagged returns and volatility spillovers from the NASDAQ market to the Asian second board markets when we excluded the contemporaneous main board market returns. There was also strong evidence on contemporaneous and lagged returns and volatility spillovers from the local main board markets to the corresponding second board markets.

Michayluk and Neuhauser (2006) found that the 1997 stock market decline was clearly preceded by new information which affected fundamental values of U.S. firms. They provided a detailed description of U.S. stock returns during the Asian financial crisis. Consisting with the overreaction hypothesis, they found strong evidence on magnitude effect in short-term return reversals. Additionally, they also found evidence on short-term return predictability in the aftermath. Their results were robust for controlling size, price, risk, and bid-ask bounce effects. Overall, the results were indicative on investors' overreaction in times of market crisis.

Caporale, Pittis, and Spagnolo (2006) examined the international transmission during the South East Asia financial crisis in 1997. They estimated a bivariate GARCH-BEKK model, and carried out LR tests for causality-invariance with bootstrapped critical values. Three pairs of wise model were estimated in the daily stock market returns for the U.S., European, Japanese and South East Asian countries. Volatility spillovers were found in all cases. The dynamics of the conditional volatilities differed but causal links in the variance were found to be strong and bidirectional in normal periods, and indirectly followed the onset of the crisis, consistently with crisis-contingent models.

Joo and Pruitt (2006) presented the first empirical analysis of the impact on bond ratings changes during periods of significant economic instability. Using the Korean financial crisis as the experimental stimulus, the study documents that changes in Korean bond ratings during the financial crisis resulted in dramatically stronger changes in stock prices than ratings changes of identical magnitude announced either before or after the crisis.

Caporale and Spagnolo (2003) investigated the real effects of financial crises. Empirical evidence of the consequences of the East Asian crisis in 1997 for the casual relationship between stock prices and output growth volatility was provided. The effects of the crisis on cross-market volatility spillovers had been taken into account by including a dummy variable in the conditional variance specification.

Liu and Hsu (2006) tried to examine the relationship between financial development and the source of growth for three Asian economies, namely, Taiwan, Korea, and Japan. Particularly, they hoped to emphasize on the role of financial development and structure (including banking and stock markets), monetary and financial policies, as well as the degree of international capital mobility in the economic growth processes. Using the generalized method of moments (GMM) and principal component analysis, they found that Taiwanese economy suffered less from the Asian financial crisis.

Hsu et al. (2009) check the causality and cointegration relationship of the Greater China area stock markets. They found four structural breakpoints during the sample time and divide it to 5 great periods. They prove China stock market has gained a leading position in the Greater China area gradually after Asian financial crisis.

1. Data description

Our data is collected from Taiwan Economic Journal (TEJ) database. The initial sample contains 2,971 stock index source of Taiwan, U.S. DJI (Dow) and NASDAQ, Tokyo, Hongkong, South Korea, China stock markets include Shenzhen Component Index (China1) and Shanghai Composite Index (China2). We have selected samples from 1995 to 2006.

2. Methodology

2.1. Quandt-Andrews breakpoint test. Andrews (1993) and Ploberger (1994) offered the Quandt-Andrews breakpoint test which was tested for one or more unknown structural breakpoints in an equational sample. They used the analyzed structure with extensive and multi methods to change the question assay which included Wald, Lagrange multiplier, likelihood ration-like tests.

2.2. Vector autoregression, VAR (noncointegration). According to Sims (1980) who proposed VAR model, structural model could recognize the question.

$$Y_t = \alpha + \sum_{s=1}^{m} \beta_s Y_{t-s} + \mu_t,$$

$$E(\mu_t) = 0, E(\mu_t \mu_t') = \sum \neq 0,$$

$$E(\mu_t \mu_t') = 0, E(Y_t \mu_s') = 0, \forall t < s,$$

$$\text{cov}(e_t, e_{t-s}) \neq 0, \forall t, s,$$

where Y_t: (n × 1) presents vector to compose jointly covariance stationary linearly stochastic process, β_s: (n × n) is matrix factor, s is lag stage for Y_t, μ_t are structural disturbances.

2.3. Unit root test. In order to stroll (random walk) at random movement trend of the stock price index and nonstationary generally, regression analysis to stock index was made which might produce spurious regression. In order to avoid the problems that would take place before truth analysis, we must probe into stock index of each country to see if it was still stationary. This can examine if the phenomenon of unit root existed. This research adopted Said and Dickey (1984) ADF unit root test which put forward assay parameter normality.

The result assayed by the unit root was found which meant that the stock index for nonstationary was all I (1) and the rate of returns (first order divide) shows competence 1% times; H_0 that refused nonstationary was necessary, namely the parameter, the first order divide made the stationary parameter, i.e., I (0). So all stock index data should explained with the rate of returns.

2.4. Granger causality tests. Before choosing truth analysis model, first we must find out everything about stock index. Use of this research, Granger (1969), the causality put forward assays in the law in order to understand the stock index and what leaded the stock index.

2.5. Cointegration test. Keeping the long-term dynamic relation which meant that the materials were combined together in order to increase the solution of the model express ability. First, plat forming the stock index with cointegration test by proving whether it combined the relation with stock index or not. If cointegration existed, this research would adopt VECM for doing the truth analysis. Without combining cointegration, this research would adopt VAR for doing the truth analysis.

This research adopted Johansen (1988) and Juselius (1990), who put forward maximum-likelihood and traced test to assay one whiff of stock index during every stature with stock index combination. Cointegration, for example, had been in the relation of weighing apparatus for a long time.

2.6. VECM model. By using unit root test and cointegration test above, we confirmed that the stock index combined with cointegration. It was possible to use cointegration regression error (Eit) combined with a revise such as an error in ECM model in order to weigh the balanced relation and book the array parameter of the attitude for dealing with other parameters which was divided into steps for a long time. It was used as the measurement of model in a short time. This research used VECM model to do the truth analysis.

3. Empirical results

3.1. The Pacific Basin stock markets index trend. Asian financial crisis took place from June, 1997 to the end of 1998. It began in Thailand and later brought further influences on currency, stock market and other assets value in Asian countries. Indonesia, South Korea and Thailand were the countries that had been influenced the most by this financial storm. Laos, Malaysia, Philippine and Hong Kong were involved as well. China, Singapore were influenced slightly (China implemented macro adjustments and controls before this financial storm which made losses reduced). On the other hand, Taiwan would be affected and had to face the threatening of "native country type financial storm" in the future. After Japan's economic bust of foam, one's own long-term economic predicament was still influenced by this financial storm but not too seriously. This crisis forced all Southeast Asian principal currencies besides Hong Kong dollar to devalue sharply in a short time. Monetary systems of various countries in Southeast Asia, collapse of the stock market, and the enormous pressure of dismissing from escaping and domestic inflation of large quantities of foreign capitals which was initiated from this shadow economic development of this area.

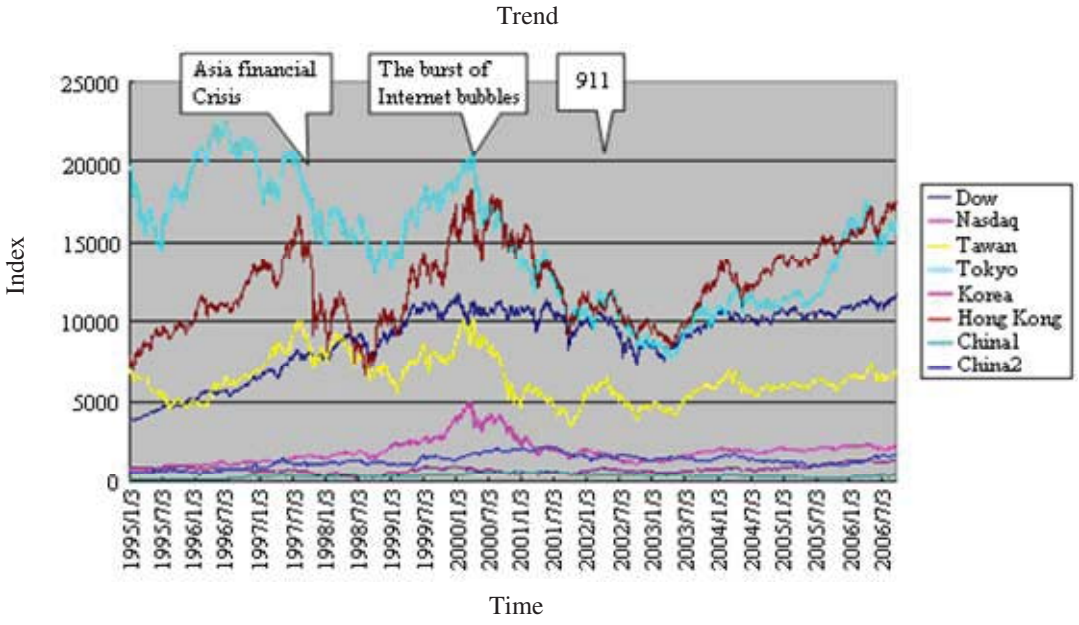

Fig. 1. The Pacific Basin stock markets index trend

From Figure 1, we can see that stock in America and land is not the bursts, but Tokyo and Taiwan have received some impacts. South Korea and Hong Kong are seriously wounded; the cause can be analogous to the breaking out and falling of intensity in the stock market.

We can find that Dow Jones has not dropped obviously but Nasdaq's amount of decrease has been dropped quite seriously when the network presents the foam in 2000 by Figure 1, making the stock market of Hong Kong, Taiwan and Tokyo dropped sharply. South Korea is influenced, but China does not receive great impact actually.

From Figure 1, we can see that maul Wall Street allowed Dow Jones has great amount of decrease as well as when 911 happened, and later on, the U.S. will adopt a succession of newspapers and move to the terrorist organization after the Iraqi war which just got up gradually. But Nasdaq has not been influenced by it obviously because network foam makes those which mainly relied on network science and technology maul heavily and have not recovered so fast, so the influence from 911 is not obvious. Influence has been brought lightly to Taiwan, Tokyo and Hong Kong, but quite obviously to South Korea and China.

3.2. Return of the Pacific Basin stock markets. Figure 2 presents return of the Pacific Basin Stock Markets. We can see that the stock rate of returns have significant fluctuation in Hong Kong until Asian financial storm. When the foam of the network begins, Stark has many remuneration differences, the fluctuation of remuneration of Dow Jones is relatively obvious after 911 incidents.

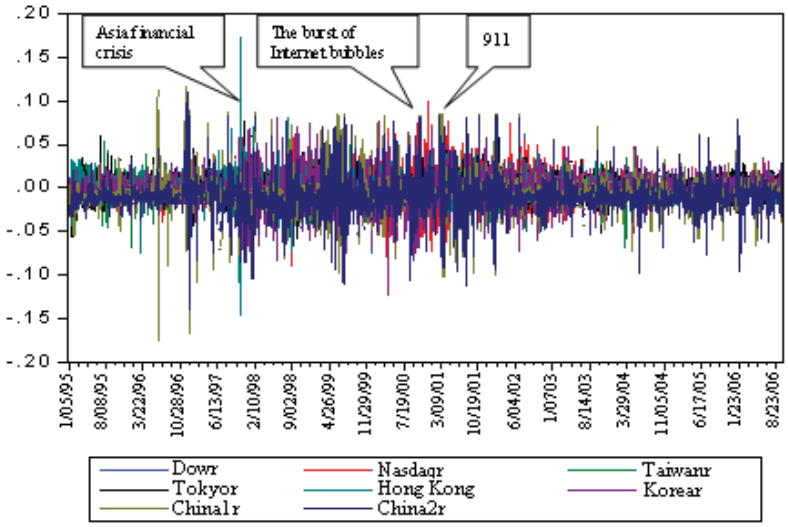

Fig. 2. Return of the Pacific Basin stock markets

Notes: Taiwanr is return of Taiwan stock, Dowr is return of Dow Jones stock, Nasdaqr is return of Nasdaq stock, Tokyor is return of Tokyo stock, Korear is return of Korea stock, Hong Kongr is return of Hong Kong, China1r is return of China1 stock, China2r is return of China2 stock.

3.3. Unit root test. Regarding Taiwan, Dow Jones, Nasdaq, Tokyo, South Korea, stock price of Hong Kong, that are dependent variable, measurement has stored unit root separately and finally found that there is unit root. Regarding China1, meeting an emergency, count, making a return journey, measurement, having unit root, and finding residual in which unit root situation appears finally. The unit root situation is needed in order to make China1's residual examined in Table 1.

Table 1. Unit root test

Augmented Dickey-Fuller test statistic		t-statistic	Prob.*
		-4.135927	0.0056
Test critical values:	1% level	-3.962321	
	5% level	-3.411902	
	10% level	-3.127848	

Result that has been found in China1 which states the residual that it does not have unit root, so we can keep going to the next step. Regarding Taiwan as a dependent variable, Dow Jones, Nasdaq, Tokyo, Korea, Hong Kong, China1, China2 and China1's residuals are considered to be the independent variable and all are in t - 1 stages. The result shows that residual still does not have unit root in Table 2, so the next step is Cointegration test.

Table 2. Unit root test

Augmented Dickey-Fuller test statistic		t-statistic	Prob.*
		-44.39641	0.0000
Test critical values:	1% level	-3.962466	
	5% level	-3.411973	
	10% level	-3.127890	

3.4. Cointegration test. Table 3 presents the cointegration test.

Table 3. Cointegration test

Taiwan & Dow		
	Max-L	Trace
$H_0: \gamma = 0$	6.638377	7.199022
$H_1: \gamma = 1$	0.560645	0.560645
Taiwan & Nasdaq		
	Max-L	Trace
$H_0: \gamma = 0$	12.21715	14.37389*
$H_1: \gamma = 1$	2.156737	2.156737
Taiwan & Tokyo		
	Max-L	Trace
$H_0: \gamma = 0$	3.811093	3.830783
$H_1: \gamma = 1$	0.019691	0.019691
Taiwan & Korea		
	Max-L	Trace
$H_0: \gamma = 0$	7.023896	7.126891
$H_1: \gamma = 1$	0.102995	0.102995
Taiwan & Hong Kong		
	Max-L	Trace
$H_0: \gamma = 0$	5.674488	5.675974
$H_1: \gamma = 1$	0.001487	0.001487
Taiwan & China1		
	Max-L	Trace
$H_0: \gamma = 0$	15.03183**	17.97413**
$H_1: \gamma = 1$	2.942298*	2.942298*
Taiwan & China2		
	Max-L	Trace
$H_0: \gamma = 0$	18.36210**	22.58989***
$H_1: \gamma = 1$	4.227789**	4.227789**

From Table 3, we can find that Taiwan's stock index among Dow, Nasdaq, China1, China2 combines cointegration. In order to solve cointegration problem, we use VECM to analyze.

3.5. Granger causality tests. We will consider the exogenous variable for $t - 1$ stage in Table 2 which shows the results in residual of form. Therefore, the impact comes to run in VECM model reactions and analysis by Granger causality tests.

Assayed by Granger Causality Tests from Table 4, we find that Dow Jones has caused an effect on Taiwan, Tokyo, South Korea, Hong Kong and China2. Nasdaq has caused an effect on Taiwan, Tokyo, South Korea, Hong Kong, China1 and China2. As to the Asia stock markets, Tokyo is a cause, while Taiwan is an effect. South Korea and Taiwan play a role of cause and effect each other, so do Taiwan and Hong Kong. As to Taiwan and China, Taiwan is a cause to China1 and China2 while Hong Kong is a cause to Tokyo. Tokyo and China play a role of cause and effect each other. China2 is a cause to South Korea, Hong Kong and China play a role of cause and effect each other. China2 is cause to China1.

Table 4. Granger causality tests

Null hypotheses:	Obs.	F-statistic	Probability
H_0: Dow does not Granger-cause Taiwan	2601	69.8215	2.9E-30
H_0: Taiwan does not Granger-cause Dow		0.14082	0.86865
H_0: Nasdaq does not Granger-cause Taiwan	2579	49.1005	1.2E-21
H_0: Taiwan does not Granger-cause Nasdaq		2.33097	0.09741
H_0: Tokyo does not Granger-cause Taiwan	2252	4.37925	0.01264
H_0: Taiwan does not Granger-cause Tokyo		0.91916	0.39900
H_0: Korea does not Granger-cause Taiwan	2393	6.92703	0.00100
H_0: Taiwan does not Granger-cause Korea		3.13326	0.04375
H_0: Hong-Kong does not Granger-cause Taiwan	2426	11.3465	1.2E-05
H_0: Taiwan does not Granger-cause Hong Kong		3.28550	0.03759
H_0: China1 does not Granger-cause Taiwan	2430	0.58855	0.55521
H_0: Taiwan does not Granger-cause China1		5.00349	0.00678
H_0: China2 does not Granger-cause Taiwan	2441	1.13944	0.32017
H_0: Taiwan does not Granger-cause China2		4.96005	0.00708
H_0: Nasdaq does not Granger-cause Dow	2935	2.13618	0.11829
H_0: Dow does not Granger-cause Nasdaq		0.30921	0.73405
H_0: Tokyo does not Granger-cause Dow	2536	1.11496	0.32809
H_0: Dow does not Granger-cause Tokyo		116.876	2.8E-49
H_0: Korea does not Granger-cause Dow	2620	0.06445	0.93758
H_0: Dow does not Granger-cause Korea		91.3371	4.5E-39
H_0: Hong Kong does not Granger-cause Dow	2628	0.93417	0.39304
H_0: Dow does not Granger-cause Hong Kong		223.286	2.8E-90
H_0: China1 does not Granger-cause Dow	2661	0.32410	0.72321
H_0: Dow does not Granger-cause China1		1.64794	0.19264
H_0: China2 does not Granger-cause Dow	2672	0.00886	0.99118
H_0: Dow does not Granger-cause China2		3.61831	0.02696
H_0: Tokyo does not Granger-cause Nasdaq	2523	1.88637	0.15184
H_0: Nasdaq does not Granger-cause Tokyo		121.321	5.0E-51
H_0: Korea does not Granger-cause Nasdaq	2595	1.84254	0.15862
H_0: Nasdaq does not Granger-cause Korea		94.1095	3.5E-40
H_0: Hong Kong does not Granger-cause Nasdaq	2608	0.37735	0.68571
H_0: Nasdaq does not Granger-cause Hong Kong		225.914	3.4E-91
H_0: China1 does not Granger-cause Nasdaq	2640	0.33941	0.71222
H_0: Nasdaq does not Granger-cause China1		4.45643	0.01169
H_0: China2 does not Granger-cause Nasdaq	2651	0.46034	0.63112
H_0: Nasdaq does not Granger-cause China2		4.35583	0.01292
H_0: Korea does not Granger-cause Tokyo	2284	1.99563	0.13617
H_0: Tokyo does not Granger-cause Korea		0.99381	0.37032
H_0: Hong Kong does not Granger-cause Tokyo	2266	2.54795	0.07847

Table 4 (cont.). Granger causality tests

Null hypotheses:	Obs.	F-statistic	Probability
H_0: Tokyo does not Granger-cause Hong Kong		4.82826	0.00808
H_0: China1 does not Granger-cause Tokyo	2328	3.26509	0.03837
H_0: Tokyo does not Granger-cause China1		5.13612	0.00595
H_0: China2 does not Granger-cause Toyko	2339	3.33021	0.03596
H_0: Tokyo does not Granger-cause China2		3.89146	0.02055
H_0: Hong Kong does not Granger-cause Korea	2418	1.10612	0.33101
H_0: Korea does not Granger-cause Hong Kong		2.21343	0.10955
H_0: China1 does not Granger-cause Korea	2445	0.22504	0.79850
H_0: Korea does not Granger-cause China1		1.71574	0.18005
H_0: China2 does not Granger-cause Korea	2456	0.51695	0.59640
H_0: Korea does not Granger-cause China2		3.34065	0.03558
H_0: China1 does not Granger-cause Hong Kong	2440	4.53203	0.01085
H_0: Hong Kong does not Granger-cause China1		4.84631	0.00793
H_0: China2 does not Granger-cause Hong Kong	2451	4.70948	0.00909
H_0: Hong Kong does not Granger-cause China2		6.09010	0.00230
H_0: China2 does not Granger-cause China1	2661	0.77087	0.46271
H_0: China1 does not Granger-cause China2		2.80478	0.06070

We can see from Table 5 that the stock market in the Pacific area will be influenced mainly by stock in America, while China1 has not been influenced by Dow Jones but will be influenced by Nasdaq. This phenomenon can be interpreted as integration with the world and relation with high Dow Jones which has a limited effect on stock market in China1 of main continent. Nasdaq of high high-tech stocks will influence on China1 instead. Besides China's own fund, it also has foreign capitals, so it is still influenced by Dow Jones.

Table 5. Narrative causality

	Taiwan	Dow	NASDAQ	Tokyo	Hong Kong	Korea	China1	China2
Taiwan							○	○
Dow	○			○	○	○		○
Nasdaq	○			○	○	○	○	○
Tokyo	○							
Hong Kong				○				
Korea								○
China1							○	
China2						○		

Note: ○ is row cause to column.

From Figure 3 (impulse response) we find some conditions:

1. Taiwan will receive influence from itself, Dow Jones and Nasdaq, but others will not be influenced.
2. Regarding to the reward of Dow Jones, it is not influenced by the stock markets in Pacific countries; even Nasdaq has no great influence on Dow Jones.
3. Nasdaq will be influenced by Dow Jones and itself, but others will not be influenced.
4. Tokyo will receive itself, Dow Jones and Nasdaq influence, Taiwan has slight influence, but other Pacific countries do not influence Tokyo stock index too much.
5. Korea will receive itself, Dow Jones and Nasdaq influence, Taiwan has slight influence, but other Pacific countries do not influence Korea stock index too much.
6. Hong Kong except (China1, China2) which has not been influenced, others will be influenced.
7. China1 receives itself and some influences from Hong Kong, Taiwan, Dow, but other influences are not strong (China2 has not been influenced).
8. China2 receives influence from itself, China1, Hong Kong, Dow, and Taiwan, but other Pacific countries do not influence China2 too much.

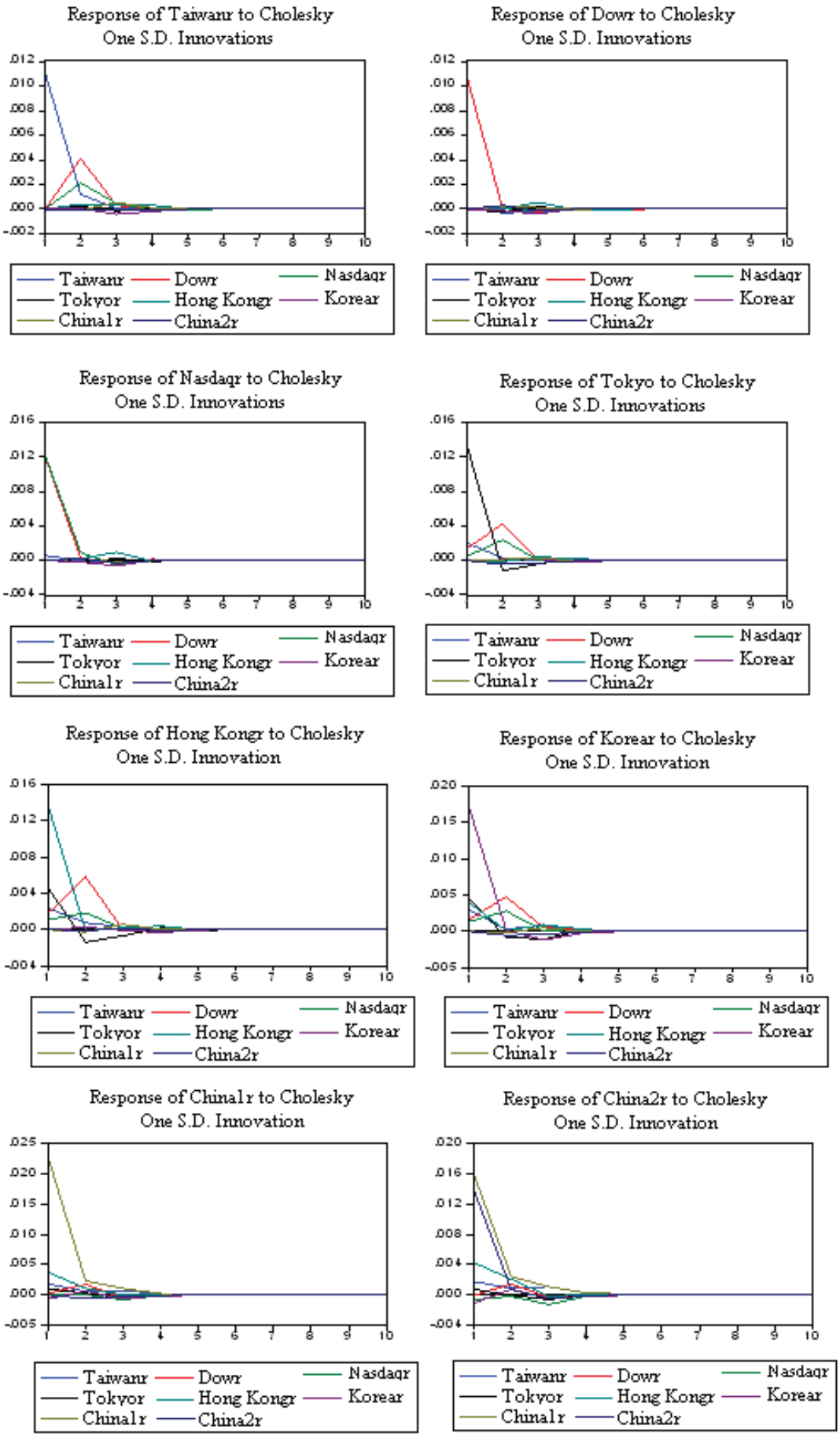

Fig. 3. Impulse response

From Table 6, we understand variance decomposition more clearly in the following relationships:

1. In Taiwan's variance decomposition of stock index return, we find that it is influenced by itself which has accounted for 84.52833%, and Dow Jones has accounted for 11.56208%, Nasdaq has accounted for 3.224450%, the influence of the other areas is quite low, so we do not need to consider these regional impacts on stock index return of Taiwan.
2. From variance decomposition of the stock index return of Dow Jones, it is influenced by itself and goes up to 99.18519%, which is hardly influenced by other return of stock index in the Pacific area, which is only 0.009738%. We do not need to consider this influence even if it is influenced by Nasdaq as in America.
3. And the stock index return of Nasdaq is from variance decomposition which is 48.90508% and to receive influence from Dow Jones, one's own influence is 50.41189%, and the other impacts on Nasdaq of the stock return in the Pacific area can be neglected.
4. In variance decomposition of the index stock return of Tokyo in Japan, the biggest influence comes from itself which is 85.44814%, the second influence is 9.390210% of Dow Jones, and then 2.787938% of Nasdaq, 1.998525% of Taiwan, but other stock return in Pacific area do not really influence it.
5. In variance decomposition of South Korea index stock return, the biggest influence is from itself which is 82.12302%, the second influence is 6.559166% of Dow Jones, and then 2.462212% of Nasdaq, 5.857503% of Tokyo of Japan, 2.433451% of Taiwan, while other stock return in Pacific area do not really influence it.
6. In variance decomposition of Hong Kong index stock return, the biggest influence comes from itself which is 68.62390%, the second influence is 14.26021% of Dow Jones, and then 1.791119% of Nasdaq, 2.392267% of Taiwan, 9.045959% of Tokyo of Japan, 3.729089% of South Korea, but China1 and China2 influence just a little.
7. In variance decomposition of China1 stock return, the biggest influence comes from itself which is 95.23214%, the second influence is 2.768509% of Hong Kong, but other stock return in the Pacific area do not really influence it.
8. In variance decomposition of China2 index stock return, the biggest influence comes from itself which is 39.39882% and it also brings a tremendous influence, the greatest influence is 53.49395% that is coming from China1, 4.690612% of Hong Kong, 1.046594% of Taiwan, but the other stock return in the Pacific area do not really influence it.

From impulse response and variance decomposition, it is known that U.S. stock markets still play an important role to the Pacific basin stock markets even if behind the 3 significant international events. From Table 6, we found an interesting phenomenon; the impact of U.S. stock market response to China is quite small enough to be ignored. Perhaps this explains why in 2008 the global financial crisis, China can cause rapid recovery.

In order to solve the problem that has been mentioned above, namely, cointegration, we should probe into the structural change. If the return of Taiwan stock, return of Tokyo stock, return of Hong Kong stock and return of South Korea stock is regarded as dependent variable separately now, stock index return of Dow Jones (t – 1) is independent variable. Making structural breakpoint test, we find that Taiwan has some structural changes that have been emerged after 911 incident of the USA. Taking Table 7 for example, no matter Maximum LR F-statistic or Maximum Wald F-statistic was in its value which was 36.19171 in total or not, there were still structural changes on September 20, 2001 which was very apparent.

Table 6. Variance decomposition

Variance decomposition of Taiwanr:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.011045	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10	0.012081	84.52833	11.56208	3.224450	0.054831	0.100337	0.297148	0.213771	0.019051
Variance decomposition of Dowr:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.010706	0.019246	99.98075	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10	0.010750	0.146016	99.18519	0.009738	0.085984	0.074030	0.346766	0.055484	0.096797
Variance decomposition of Nasdaqr:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.017164	0.105269	49.33593	50.55880	0.000000	0.000000	0.000000	0.000000	0.000000
10	0.017251	0.120487	48.90508	50.41189	0.024655	0.057435	0.397915	0.029350	0.053189

Table 6 (cont.). Variance decomposition

Variance decomposition of Tokyor:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.013576	2.234325	1.087566	0.125011	96.55310	0.000000	0.000000	0.000000	0.000000
10	0.014499	1.998525	9.390210	2.787938	85.44814	0.054677	0.105983	0.061409	0.153118
Variance decomposition of Korear:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.018794	2.477075	0.691768	0.472443	5.971317	90.38740	0.000000	0.000000	0.000000
10	0.019746	2.433451	6.559166	2.462212	5.857503	82.12302	0.382446	0.069165	0.113032
Variance decomposition of Hong Kongr:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.014858	2.530041	1.530772	0.552244	9.651260	4.383473	81.35221	0.000000	0.000000
10	0.016191	2.392267	14.26021	1.791119	9.045959	3.729089	68.62390	0.150009	0.007440
Variance decomposition of China1r:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.023240	0.623362	0.012777	0.000211	0.192747	0.007966	2.676373	96.48656	0.000000
10	0.023544	0.777900	0.610980	0.112060	0.222447	0.204656	2.768509	95.23214	0.071306
Variance decomposition of China2r:									
Period	S.E.	Taiwanr	Dowr	Nasdaqr	Tokyor	Korear	Hong Kongr	China1r	China2r
1	0.021813	0.660205	0.000810	0.078832	0.115739	0.001133	4.134347	54.16489	40.84404
10	0.022253	1.046594	0.442581	0.404439	0.177414	0.345594	4.690612	53.49395	39.39882

Table 7. Quandt-Andrews breakpoint test (Taiwan to Dow Jones)

Statistic	Value	Prob.
Maximum LR F-statistic (9/20/2001)	36.19171	0.0000
Maximum Wald F-statistic (9/20/2001)	36.19171	0.0000
Exp LR F-statistic	13.55005	0.0000
Exp Wald F-statistic	13.55005	0.0000
Ave LR F-statistic	15.03943	0.0001
Ave Wald F-statistic	15.03943	0.0001

In Figure 4, LR and Wald all gave the demonstration on September 20, 2001. It shows value that its structural breakpoint test has reached the highest point, and then glided sharply just like presenting the slide and slipped away.

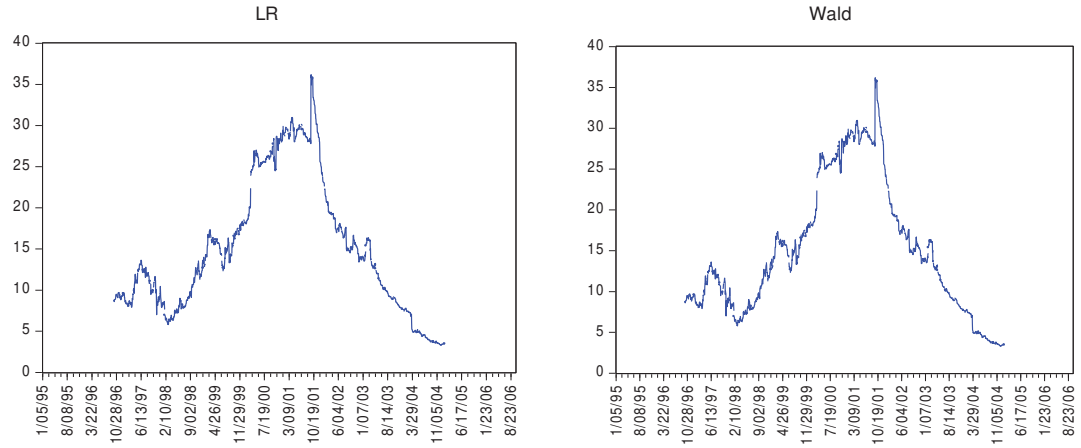

Fig. 4. LR & wald (Taiwan to Dow Jones)

Having no structural rule to examine the rule for making structural breakpoint return of Tokyo stock and South Korea stock, but Hong Kong had structural changes on January 20, 1998. Hong Kong was in Asian financial storm at this moment. We could see that Hong Kong had some structural changes that had been emerged after Asian financial storm at this moment. Example shown in Table 8, no matter Maximum LR F-statistic or Maximum Wald F-statistic was in its value which was 38.48598 in total; there were still structural changes on January 20, 1998 which was very apparent.

Table 8. Quandt-Andrews breakpoint test (Hong Kong to Dow Jones)

Statistic	Value	Prob.
Maximum LR F-statistic (1/20/1998)	38.48598	0.0000
Maximum Wald F-statistic (1/20/1998)	38.48598	0.0000
Exp LR F-statistic	14.88614	0.0000
Exp Wald F-statistic	14.88614	0.0000
Ave LR F-statistic	12.41985	0.0004
Ave Wald F-statistic	12.41985	0.0004

In Figure 5, LR and Wald, they gave demonstration on January 20th, 1998. The value of that was its

structural breakpoint test has reached the highest point, and then glided sharply just like presenting the slide and slipped away.

It is interesting that we find a structural breakpoint after 911 events in Taiwan, beside, we still find a structural breakpoint during Asia financial crisis in Hong Kong. This time spot may be a different investment strategy behind 911 events in Taiwan and after Asia financial crisis in Hong Kong, will provide a new direction to the investment strategy.

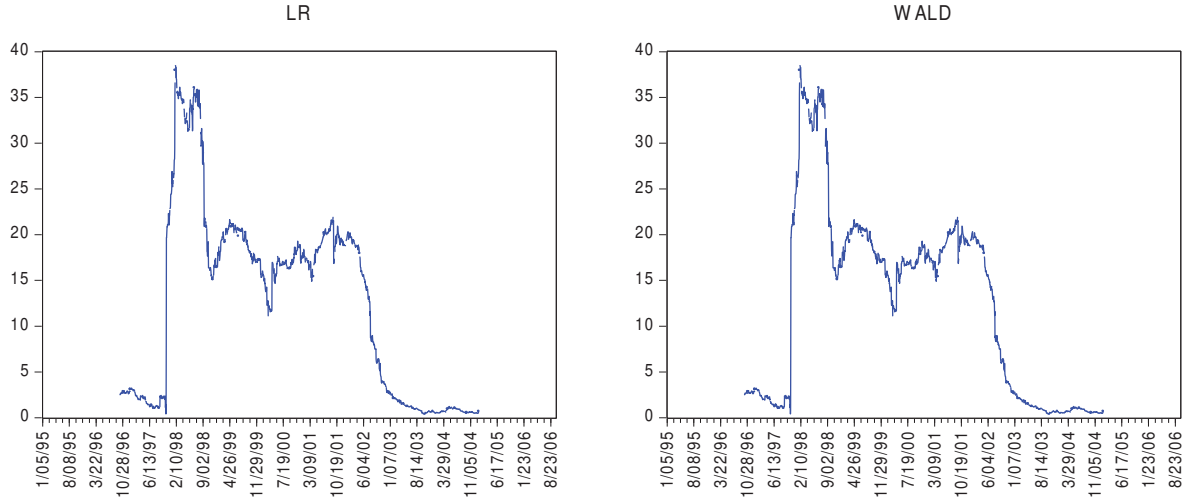

Fig. 5. LR & Wald (Hong Kong to Dow Jones)

Conclusions

The results show that the U.S. stock market still play an important role to the Pacific basin stock markets even during the Asia financial crisis, the burst of Internet bubbles and 911 events. There is no denying that U.S. stock market still has the very formidable economic potential, therefore it is not influenced by 3 significant international events. From this we understand that American with its formidable economy toughness has a immeasurably deep strength, this also can explain why the global financial crisis in 2008 began to expand from the United States to the Pacific countries. But from variance decomposition we find that the impact of U.S. stock market to China is small enough to be ignored, this can explain China stock market quickly recovery in 2009 after the global financial crisis. Although, 3 significant international events do not affect the U.S. stock market but still influence the Pacific basin stock markets. We find a structural breakpoint after 911 events in Taiwan, beside, we still find a structural breakpoint during Asia financial crisis in Hong Kong. This time spot may be a different investment strategy behind 911 events in Taiwan and after Asia financial crisis in Hong Kong, and provide a new direction to the investment strategy. We hope that our results can provide suggestion to investment strategy in the following research.

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