Lingnan Journal of Banking, Finance and Economics

Volume 5 2014/2015 Academic Year Issue Article 3

January 2015

Empirical study : Shanghai-Hong Kong stock connection sign of efficiency improvement?

Ming Cheung FOK

Empirical Study: Shanghai-Hong Kong Stock Connection Sign of Efficiency Improvement?

Ming Cheung FOK

Abstract

Stock market connection encourages local corporations cross-listing in overseas stock markets which will, theoretically, enhance the information flow between countries and the stock market efficiency. In view of a closed economy like China and a free economy like Hong Kong, the announcement of Shanghai-Hong Kong stock connection program seems to be a great opportunity for testing the well-known Efficiency Market Hypothesis (EMH). Employing Capital Asset Pricing Model (CAPM) and the random walk model suggested by previous studies, this paper will present the comparison of market performance before and after the connection as evidences for the hypothesis testing.

Keywords: Shanghai- Hong Kong stock connection, efficiency market hypothesis.

1. Introduction and Literature Review

Contrasting to the low interest environment over the past few years, the booming economy of developing countries like China attract a lot of foreign investors' attention. Meanwhile, the lacking of investment opportunities due to investment restrictions[3] motivates China investors to raise capital and invest in overseas. Stock connection removes financial barriers between China and the rest of the world would definitely enlarge the flow of information and increase financial interaction between both markets. Previous studies about Multinational Corporations from developing countries cross-listing [4] on developed countries provide some good theoretical understanding of the connection impact.

In particular, cross-listing was found to have no long-term liquidity effect. but it improves the pricing efficiency in home country regardless of the listing locations and the development of home country. (Shinhua Liu 2007). Other studies suggested that the intensity of analyst coverage was negatively related to firm specific return variation of emerging market's companies. Moreover tightening disclosure requirement from developed countries may dilute the benefit of private information collection in the emerging market thus overstating the improvement of the quality of market information (Nuno Fernandes, Miguel A.Ferreira 2008). Similarly, Thierry and Thomas's study (Thierry Focault, Thomas Gehrig 2008) found a trade-off model between the benefit of stringent disclosure rules and the cost of decreasing private information discovery. The paper also discovered that cross-listing would increase the sensitivity of investment decision and stock price that stock price tends to reflect the quality of managerial decision. All the above studies pointed out different effects from cross-listing and stock connection on the market information.

The relevance of market information and market efficiency can be seen from the Efficient Market Hypothesis which was firstly proposed by Fama[5], the implication of the hypothesis is that if the market is "informationally-efficient", then the securities' return will be risk-adjusted to reflect all available information on the market hence consistently achieving higher-than market excessive return is impossible. Different forms of market efficiency will be interpreted by what kind of information was reflected on the return rate. This paper mainly focus on (1) discussing whether

[3] China government restricted the capital inflow and outflow through the China Qualified Foreign Institutional Investors (QFII) and quota imposed on listing in overseas. Therefore, the impact of stock connection on individual investors would be more apparent

[4] For instance, Dodd, Olga 2011. Price, Liquidity, Volatility and Volume of cross-listed stocks, Doctoral Thesis- Durham University. It explains the differences of cross-listed stock price. For the sake of the following discussion, these explanations will be listed at below: Capital market segmentation theory, the information asymmetries theory, the legal bounding theory, the liquidity theory, the signaling theory, the investor recognition theory, the proximity preference theory, the market timing theory and the business strategy theory

[5] Eugene F. Fama May 1970 Efficient Capital Markets: A Review of Theory and Empirical Work, The Journal of Finance

the stock connection is mutually beneficial to both markets[6]; (2) Showing sign of efficiency improvement rather than proving absolute efficiency. The following sections will apply different models suggested by previous studies and the methodology suggested by Shinhua Liu's paper to examine the hypothesis in different efficiency forms.

The structure of the paper is the following. Section 2 will present the description of the samples and criteria for data selection. Section 3 will begin with the weak-form market efficiency examination by applying random-walk model, then the strong form efficiency will be examined by Capital Asset Pricing Model (CAPM) and the semi-strong form model will be tested base on the idea from Fama and French Three Factor Model. Section 4 will conclude and summarize the future improvement of the empirical test.

2. Samples and Data

Since there are nearly than 1,000 stocks listed under the connection program[7], in an attempt to manage an effective discussion on the connection impact,. securities will be selected primarily based on the average exchange volume per trading day and the present trading status.

Following the methodology introduced by Shuhua Liu, daily rate of return of each security starting from 1st of January to 12th of December of 2014 will be covered to demonstrate the change of efficiency before and after the connection. Apart from the securities daily return, other firm specific data which ranges from the leverage ratio, sequential growth of total asset, growth of net income, number of news related to that corporation to the sentiment ratio of that news, as well as the daily country risk free rate and country market return[8]. All data are obtained from Bloomberg Terminal. Table (1) will present notations of the parameters to be included in the model and the full list of sample stocks will be shown in the Appendix (A)

variable name	*storage type*	*display format*	*value label*	*variable label*
Date	*int*	*%td..*		*Date*
r	*double*	*%10.0g*		*Daily rate of return with dividend yield*
hkrf	*double*	*%10.0g*		*Hong Kong risk free rate*

6 In fact, a lot of Hong Kong citizens are blaming the stock connection increases the uncertainty and volatility of the market. Therefore, this paper is trying to examine some reasons behind this phenomenon.
7 Full list of eligible stocks can be found on Hong Kong Stock Exchange (HKEx) web.
8 Some of the data are not daily rate. And the country risk free and market return are provided by Bloomberg rather than using country indexes.

hkrm	*double*	*%10.0g*	*Hong Kong market return*
nss	*double*	*%10.0g*	*Sentiment ratio of daily news related to the corporation*
			=1 if postivite, =0: Neutral, =-1 Negative
nsn	*int*	*%10.0g*	*No. of news related to the corp.*
ag	*double*	*%10.0g*	*Sequestial total asset growth rate*
nig	*double*	*%10.0g*	*Net income growth rate*
chinarf	*double*	*%10.0g*	*China risk free rate*
chinarm	*double*	*%10.0g*	*China Market return*
evt	*float*	*%9.0g*	*Event dummy, =1, if Date => 17 Nov 2014. Else, =0*
chinarp	*float*	*%9.0g*	*China market risk premium*
hkrp	*float*	*%9.0g*	*Hong Kong market risk premium*

Table 1. Data Description

3. Hypothesis Testing

An efficient market implies that returns will be explained by the market risk variation, and the residuals and abnormal returns would be totally random and unpredictable. With this implication in mind, the hypothesis of the following test is that if the stock connection truly enhances the efficiency, then the coefficient of the explanatory variables should increase and the residuals should be close to zero or move toward to zero after addressing autocorrelation and Heteroskedasticity problem.

Methodology of the efficiency test used in the following sub-sections – The efficiency ratio[9] was introduced by Fama (1965) which compares the abnormal return of the security and the market return before and after the event occurs. If the connection will create an efficient effect on a particular stock then the null hypothesis of the efficient ratio will be rejected.

3.1 Strong and Semi-strong form Efficiency

In the strong and semi-strong form efficiency, it shares the same implication with the Capital asset pricing model and Fama – Frence three factors model which the return rate of a security

9 $ER_i = \left(\frac{(AR_{i,after} - AR_{i,before})}{AR_{market,after} - AR_{market,before}}\right) - 1$

will be closely related the excessive market return or firm-specific risk such that residuals will be close to zero which means the expected value of abnormal return will be close to zero.

The hypothesis of this section is that if there is a sign of efficiency improvement, then there should an increment in the coefficients of explanatory variables which are the excessive market return as well as other firm specific factors and the residuals should show no statistical sign of rejecting the auto-correlation test and the heteroskedasticity (white) test. The function used in the empirical testing will be presented in the following equations.

$$r_i = r_f + \beta_{China}\left(r_{m,china} - r_{f,china}\right) + \beta_{H.K} \times Evt \times \left(r_{HSI} - r_{f,HK}\right) + \mu_i, \mu_i \sim \mathrm{N}(\,0, \sigma_{\mu_i}\,)$$

CAPM was being modified to capture the influence from Hong Kong stock market which is the Hong Kong market risk Premium. Appendix 2 presents the residual error from the CAPM regression, the result shows contradiction with the claim that the connection will only benefit China but damaging Hong Kong stock market's efficiency. But the result did show signs of improvement which residual errors of some stocks decline dramatically after the connection.

However, the CAPM only implies the informational relationship between individual security and the well-diversified market portfolio. Hence, the application of Fama-Frence multi-factor model will examine the informational relationship between firm specific factors and the security's return rate[10].

$$r_i = \alpha + \beta_{1,i} nss_i + B_{2,i} nno_i + \beta_{3,1} goa_i + B_{4,i} gni_i + \mu_i\ , \mu_i \sim \mathrm{N}\left(0.\sigma_{\mu,i}\right)$$

Table of the above regression and the statistical testing result can be seen from the Appendix 2. The semi-strong form testing shows support for the conclusion of the strong form efficiency test which the White test statistic value drops after the connection announcement. However, it is insignificant that the efficiency enhancement is much better in the northern board samples than the southern board.

3.2 Weak form Efficiency

The implication of weak form efficiency is the change of the current return rate is related to its historical changes. Random walk model[11] will be applied to test for this hypothesis. The

[10] Samuelson regard EMH as Micro-efficiency rather than Macro Efficiency, where EMH has a higher applicability in explaining relationship between individual's return and firm specific factors. See: Jung, Jeeman; Shiller, Robert (2005). "Samuelson's Dictum And The Stock Market". Economic Inquiry 43 (2): 221– 228

[11] Kendall, M. G.; Bradford Hill, A (1953). "The Analysis of Economic Time-Series-Part I: Prices". Journal of

model implies if the market is at weak form efficiency then the null hypothesis will not be rejected. Equation of the random walk[12] test is the following:

$$\Delta r_i = (\rho - 1) r_{i,t-1} + \mu_i$$

By comparing the result of Dickin-fuller test before and after the connection will reveal the inefficiency if there is a decline in the tau statistic value[12], otherwise, the change of the test statistic result will be interpreted as efficiency improvement. The result of the testing is presented in the Appendix 3, the dramatic decrease of tau statistic values in both market shows great improvement in weak form efficiency.

4. Conclusion and Future Improvements

Although the above tests show a large change of efficiency ratio before and after the connection which indicates an undergoing process of efficiency improvement, the results about the form of efficiency and whether the connection is or is not mutually beneficial to both markets is far from being conclusive. This paper merely presents a brief idea of market reform, numerous technical and conceptual problems need to be addressed for future research. Some of the problems will be discussed in the following.

There may be selection bias during the sampling process. Firstly, the reliability of the test will be overstated by overly short period of samples after the connection announcement. As there are only 25 observations after the announcement, the testing will be very likely subject to potential contamination (Foerster and Karolyi 2000) from other events impact. Secondly, using trading volume as a criteria to select sample is problematic, as trading volume is positively related to the information available on the market, therefore it’s hard to argue the whole market efficiency has been improved with bias samples.

On the one hand that the definition of market efficiency is subject to large debate in academia and it is hard to disprove EMH due to its reliability on different models. For example, CAPM assumes there is an unrealistic efficient global market portfolio which includes all the securities available on the market and all the information is available in the market so that it can used to test whether the market is strongly efficient[13]. On the other hand, due to limited availability of daily firm specific information, there are not many firm-specific factors being

---

the Royal Statistical Society. A (General) (Blackwell Publishing) 116 (1): 11–34.

[12] Random walk theory implies time series return are independently and identically distributed (IID) which is related to Martingale – probability theory.

[13] Richard ROLL*, A CRITIQUE OF THE ASSET PRICING THEORY’S TESTS Part I: On Past and Potential Testability of the Theory*, Journal of Financial Economics 4 (1977) 129-176.

considered under the three factor model, hence, the efficiency testing result of this paper may be bias. Dodd, Olga's (2011) provides some factors that need to be concerned for future empirical test on similar topic.

Last but not least, a more comprehensive empirical model can be modified by including investment tax impact and different political risk aversion level in both markets. As the implementation of the connection is still at its early stage, investors are still adjusting their psychological condition and getting used to different constraints imposed on the connection program. Hence, it is not unreasonable to believe the benefits of the connection were underestimated.

References

- Asma Mobareka, Angelo Fiorante, (2014). The Prospects of BRIC Countries: Testing Weak-form Market Efficiency Research in International Business and Finance 30 (2014) 217–232
- Eugene F. Fama, (1965). The Behavior of Stock-Market Prices. The Journal of Business, 38(1).pp. 34-105
- Eugene F. Fama (1970) Efficient Capital Markets: A Review of Theory and Empirical Work, The Journal of Finance 25(2), pp. 383-417
- John Fernald and John H. Rogers, (2002). Puzzles in the Chinese Stock Market. The Review of Economics and Statistics 84(3), pp.416-432
- Liu, Shinhua (2007) International Cross-Listing and Stock Pricing Efficiency: An Empirical Study (September 3, 2010). Emerging Markets Review, Vol. 8, No. 4, pp. 251-263, 2007.
- Nuno Fernandes and Miguel A. Ferreira, (2008), Does international Cross-listing Improve the Information Environment, Journal of Financial Economics, 88, (2), 216-244.
- Samuelson, Paul A (1965). Proof That Properly Anticipated Prices Fluctuate Randomly ,Industrial Management Review, 6:2 (1965:Spring) p.41
- Stephen R. Foerster and G. Andrew Karolyi (2000). The Long-Run Performance of Global Equity Offerings. Journal of Financial and Quantitative Analysis, 35, pp 499-528.
- Thierry Foucault, Thomas Gehrig, (2008). Stock Price Informativeness, Cross-listings, and Investment Decision. Journal of Financial Economics, Elsevier, 2008, vol. 88, no.1, pp. 146-168.
- Vitali Alexeev, Francis Tapon (2011). Testing Weak form Efficiency on the Toronto Stock Exchange, Journal of Empirical Finance, 2011, vol. 18, issue 4, pages 661-691

- Yudong Wang, Li Liu, Rongbao Gu, Jianjun Cao, Haiyan Wang, (2010). Analysis of Market Efficiency for the Shanghai Stock Market Over Time, Physica A: Statistical Mechanics and its Applications, 2010, vol. 389, issue 8, pages 1635-1642
- 畢馬威，稅制安排不明確或影響滬港通交易活躍度，鉅亨網新聞中心 2014-11-28 取自
- http://news.cnyes.com/Content/20141128/20141128082303036215910.shtml (In Chinese)
- Hong Kong Stock Exchange, HKEx. http://www.hkex.com.hk/eng/index.htm

Appendix

Contains data

obs: 347

vars: 35

size: 93,690

Northern Board					Southern Board				
variable name	storage type	display format	value label	variable label	variable name	storage type	display format	value label	variable label
Date	int	%td..		Date	Date	int	%td..		Date
h0868r	double	%10.0g		0868 H1	c0037r	double	%10.0g		600037C1
h0669r	double	%10.0g		0669 H1	c0104r	double	%10.0g		600104 C1
h0494r	double	%10.0g		0494 H1	c0120r	double	%10.0g		600120 C1
h0493	double	%10.0g		0493 H1	c0128r	double	%10.0g		600128 C1
h0027r	double	%10.0g		0027 H1	c0117r	double	%10.0g		600117 C1
h0751r	double	%10.0g		0751 H1	c0373r	double	%10.0g		600373 C1
h2313r	double	%10.0g		2313 H1	c0418r	double	%10.0g		600418 C1
h1833r	double	%10.0g		1833 H1	c0507r	double	%10.0g		600507 C1
h1929r	double	%10.0g		1929 H1	c0633r	double	%10.0g		600633 C1
h0590r	double	%10.0g		0590 H1	c0637r	double	%10.0g		600637C1
h1728r	double	%10.0g		1728 H1	c0658r	double	%10.0g		600658 C1
h3308r	double	%10.0g		3308 H1	c0694r	double	%10.0g		600694 C1
h2238r	double	%10.0g		2238 H1	c0739r	double	%10.0g		600739 C1
h1212r	double	%10.0g		1212 H1	c0741r	double	%10.0g		600741 C1
h0178r	double	%10.0g		0178 H1	c0828r	double	%10.0g		600828 C1
h0308r	double	%10.0g		0308 H1	c0839r	double	%10.0g		600839 C1
h0551r	double	%10.0g		0551 H1	c0859r	double	%10.0g		600859 C1
h0200r	double	%10.0g		0200 H1	c0880r	double	%10.0g		600880 C1
h0511r	double	%10.0g		0511 H1	c1098r	double	%10.0g		601098 C1
h0880r	double	%10.0g		0880 H1	c1238r	double	%10.0g		601238 C1
h1169r	double	%10.0g		1169 H1	c1258r	double	%10.0g		601258 C1
h2333r	double	%10.0g		2333 H1	c1928r	double	%10.0g		601928 C1
h2282r	double	%10.0g		2282 H1	c1929r	double	%10.0g		601929 C1
h0489r	double	%10.0g		0489 H1	c3766r	double	%10.0g		603766 C1
h1928r	double	%10.0g		1928 H1	c0166r	double	%10.0g		600166 C1
h1880r	double	%10.0g		1880 H1	c0729r	double	%10.0g		600729 C1
h0175r	double	%10.0g		0175 H1	c1801r	double	%10.0g		601801 C1
h1128r	double	%10.0g		1128 H1	c0690r	double	%10.0g		600690 C1
h1114r	double	%10.0g		1114 H1	c0060r	double	%10.0g		600060 C1

c0660r	*double*	*%10.0g*	*600660 C1*
chinarf	*double*	*%10.0g*	*China risk free rate*
chinarm	*double*	*%10.0g*	*China market return*
hkrf	*double*	*%10.0g*	*Hong Kong risk free rate*
hkrm	*double*	*%10.0g*	*Hong Kong Market rate*

Table (2) HK CAPM Durbin Watson Test

		r(dw)	r(k)	r(N)	r(N_gaps)
h0868	Before	1.3400	2	203	54
	After	2.2964	3	7	1
h0669	Before	1.5269	2	203	54
	After	2.1341	3	7	1
h0494	Before	1.1735	2	203	54
	After	1.2967	3	7	1
h0493	Before	1.6034	2	203	54
	After	2.8707	3	7	1
h0027	Before	1.3378	2	203	54
	After	1.2549	3	7	1
h0751	Before	1.7195	2	203	54
	After	1.4473	3	7	1
h2313	Before	1.7376	2	203	54
	After	2.9354	3	7	1
h1833	Before	1.7045	2	203	54
	After	1.1975	3	7	1
h1929	Before	1.4111	2	203	54
	After	2.7173	3	7	1
h0590	Before	1.4657	2	203	54
	After	2.5449	3	7	1
h1728	Before	1.2971	3	7	1
	After				
h3308	Before	1.1258	2	203	54
	After	1.9609	3	7	1
h2238	Before	1.7451	2	203	54
	After	1.6471	3	7	1
h1212	Before	1.8453	2	203	54
	After	0.9275	3	7	1
h0178	Before	1.2440	2	203	54
	After	2.6149	3	7	1
h0308	Before	1.3903	2	203	54
	After	2.4868	3	7	1
h0551	Before	1.4561	2	203	54
	After	3.0420	3	7	1
h0200	Before	1.5305	2	203	54
	After	2.5918	3	7	1
h0511	Before	1.6972	2	203	54
	After	2.4237	3	7	1

		r(dw)	r(k)	r(N)	r(N_gaps)
h0880	Before	1.4673	2	203	54
	After	1.1923	3	7	1
h1169	Before	1.8181	2	203	54
	After	2.1771	3	7	1
h2333	Before	1.3998	2	203	54
	After	2.2197	3	7	1
h2282	Before	1.3973	2	203	54
	After	1.8202	3	7	1
h0489	Before	1.5911	2	203	54
	After	0.9527	3	7	1
h1928	Before	1.4926	2	203	54
	After	1.1388	3	7	1
h1880	Before	1.6095	2	203	54
	After	2.8505	3	7	1
h0175	Before	1.6508	2	203	54
	After	0.8581	3	7	1
h1128	Before	1.4122	2	203	54
	After	1.4673	3	7	1
h1114	Before	1.4926	2	203	54
	After	1.9226	3	7	1

China CAPM Durbin Watson Test

		r(dw)	r(K)	r(N)	r(N_gaps)
c0037	Before	1.0422	3	11	2
	After	1.5018	3	11	2
c0660	Before	1.6312	2	199	50
	After	1.1581	3	11	2
c0104	Before	1.4558	2	199	50
	After	1.6226	3	11	2
c0120	Before	1.4323	2	199	50
	After	1.6596	3	11	2
c0128	Before	1.5000	2	199	50
	After	1.4587	3	11	2
c0117	Before	1.1434	2	177	46
	After	1.3759	3	11	2
c0373	Before	1.4647	2	140	34
	After	1.6311	3	6	2
c0418	Before	1.1619	2	145	37
	After	1.8074	3	11	2
c1801	Before	0.3109	2	110	70
	After	1.2221	3	6	1
c0507	Before	1.1213	2	196	50
	After	1.8423	3	11	2
c0633	Before	1.4117	2	199	50
	After	1.9021	3	11	2
c0637	Before	1.5082	2	84	24
	After	2.8635	3	6	1
c0658	Before	1.6168	2	198	50
	After	1.7952	3	11	2
c0060	Before	1.6048	2	199	50
	After	1.0690	3	11	2
c0690	Before	1.1872	2	197	51
	After	1.0098	3	11	2
c0694	Before	1.5766	2	199	50
	After	2.0991	3	11	2
c0739	Before	1.4391	2	181	47
	After	2.0099	3	11	2
c0741	Before	1.3278	2	199	50
	After	1.4213	3	11	2
c0828	Before	1.7854	2	199	50
	After	2.0004	3	11	2

		r(dw)	r(K)	r(N)	r(N_gaps)
c0729	Before	0.6739	2	107	70
	After	0.6739	2	107	70
c0839	Before	1.2133	2	172	42
	After	1.5227	3	11	2
c0859	Before	1.3960	2	199	50
	After	1.3362	3	11	2
c0880	Before	1.4599	2	195	49
	After	2.1541	3	11	2
c1098	Before	1.5239	2	199	50
	After	1.3031	3	11	2
c1238	Before	1.3579	2	199	50
	After	1.3758	3	11	2
c1258	Before	1.4401	2	199	50
	After	1.5977	3	11	2
c1633	Before	0.6510	2	95	65
	After	1.2824	3	8	3
c1929	Before	1.4759	2	198	50
	After	0.9762	3	11	2
c3555	Before	1.0814	2	99	66
	After	0.0350	3	5	3
c0166	Before	1.5392	2	199	50
	After	1.0422	3	11	2

Table (4) Southern Board CAPM - White test

	H0868		h0669		h0494		h0493		h0027		h0751		h2313		h1833		h1929		h0590		h1728		h3308	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	9.868	9.706	5.586	8.396	2.940	10.808	9.009	7.417	6.828	11.476	7.245	14.620	9.283	8.434	7.719	9.118	5.628	7.516	9.269	9.443	11.142	15.331	9.306	8.820
r(chi2_r)	0.245	0.014	1.850	1.605	1.169	0.208	5.715	0.590	3.656	0.012	3.017	4.224	5.994	0.143	3.629	0.415	1.573	0.818	2.031	0.138	2.166	4.975	2.144	1.308
r(chi2_s)	2.976	2.896	0.036	0.037	1.653	4.489	2.564	1.873	2.608	4.723	2.903	3.620	1.042	1.312	1.657	2.268	2.170	0.041	0.133	3.207	2.741	3.646	2.382	0.518
r(chi2_h)	6.647	6.796	3.699	6.753	0.119	6.111	0.730	4.954	0.563	6.741	1.326	6.776	2.247	6.979	2.432	6.434	1.886	6.658	7.104	6.098	6.236	6.710	4.780	6.995
r(p)	0.248	0.236	0.157	0.240	0.942	0.296	0.694	0.422	0.755	0.241	0.515	0.238	0.325	0.222	0.296	0.266	0.390	0.247	0.029	0.297	0.044	0.243	0.092	0.221
r(df)	5.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000
r(chi2)	6.647	6.796	3.699	6.753	0.119	6.111	0.730	4.954	0.563	6.741	1.326	6.776	2.247	6.979	2.432	6.434	1.886	6.658	7.104	6.098	6.236	6.710	4.780	6.995

	h2238		h1212		h0178		h0308		h0551		h0200		h0511		h0880		h1169		h1114		h2333		h2282	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	6.879	8.324	15.396	9.460	22.048	10.003	8.976	8.478	7.655	8.337	8.045	8.713	3.388	8.724	12.899	12.421	10.311	9.287	6.801	9.868	24.842	9.807	12.669	8.492
r(chi2_r)	1.995	0.027	6.639	2.299	8.233	2.405	2.133	0.643	4.713	0.655	3.698	0.626	1.357	0.195	3.540	0.034	7.199	0.786	1.754	0.245	1.861	0.006	4.731	0.360
r(chi2_s)	3.780	1.628	0.320	0.208	5.226	0.605	3.771	0.871	0.187	0.977	3.347	1.498	1.661	1.580	7.175	6.381	1.519	1.598	1.341	2.976	11.950	2.814	4.422	1.436
r(chi2_h)	1.104	6.669	8.437	6.954	8.590	6.993	3.072	6.965	2.755	6.705	0.999	6.589	0.370	6.949	2.183	6.006	1.593	6.903	3.707	6.647	11.031	6.988	3.516	6.696
r(p)	0.576	0.246	0.015	0.224	0.014	0.221	0.215	0.223	0.252	0.244	0.607	0.253	0.831	0.224	0.336	0.306	0.451	0.228	0.157	0.248	0.004	0.222	0.172	0.244
r(df)	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000
r(chi2)	1.104	6.669	8.437	6.954	8.590	6.993	3.072	6.965	2.755	6.705	0.999	6.589	0.370	6.949	2.183	6.006	1.593	6.903	3.707	6.647	11.031	6.988	3.516	6.696

	h0489		h1928		h1880		h0175		h1128	
	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	5.227	9.705	5.836	12.568	6.740	10.310	3.392	10.945	18.095	7.989
r(chi2_r)	1.809	2.126	2.514	0.024	2.618	0.017	1.078	0.955	2.334	1.405
r(chi2_s)	1.847	0.602	2.614	6.201	1.946	5.069	1.907	3.444	5.394	0.145
r(chi2_h)	1.571	6.977	0.709	6.342	2.176	5.224	0.407	6.546	10.367	6.438
r(p)	0.456	0.222	0.702	0.274	0.337	0.389	0.816	0.257	0.006	0.266
r(df)	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000	2.000	5.000
r(chi2)	1.571	6.977	0.709	6.342	2.176	5.224	0.407	6.546	10.367	6.438

Table(5) Northern Board CAPM white test

	c0037		c0660		c0104		c0120		c0128		c0117		c0373		c0418		c1801		c0507		c0633		c0637	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	7.1669	8.8180	9.7749	8.1517	6.7306	14.0517	10.5424	8.4578	10.1505	16.6808	4.3323	7.1660	21.5486	8.2139	13.5413	4.6261	6.9515	8.6229	5.5672	10.6279	9.2113	7.6711	8.0264	9.6801
r(chi2_k)	1.5423	0.5606	2.5733	3.1175	1.3623	0.8000	6.1892	0.0722	0.9026	0.4261	2.0500	4.2937	11.8724	0.9401	5.3150	0.3317	1.7608	2.4023	1.3353	2.1552	4.3467	0.4524	2.3577	0.0009
r(chi2_s)	1.7660	4.4447	5.4681	0.6115	1.5667	3.7673	3.9059	4.8486	6.1186	6.3917	1.7027	0.6998	2.2558	1.2738	6.9061	1.0463	3.5599	0.2205	1.6344	0.2372	3.5067	2.2117	0.3857	3.6792
r(chi2_h)	3.8586	3.8127	1.7336	4.4227	3.8015	9.4844	0.4473	3.5370	3.1293	9.8629	0.5797	2.1726	7.4205	6.0000	1.3202	3.2482	1.6308	6.0000	2.5975	8.2355	1.3580	5.0070	5.2830	6.0000
r(p)	0.5699	0.5767	0.4203	0.4903	0.1495	0.0912	0.7996	0.6178	0.2092	0.0792	0.7484	0.8248	0.0245	0.3062	0.5168	0.6618	0.4425	0.3062	0.2729	0.1437	0.5071	0.4150	0.0713	0.3062
r(df)	5.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000
r(chi2)	3.8586	3.8127	1.7336	4.4227	3.8015	9.4844	0.4473	3.5370	3.1293	9.8629	0.5797	2.1726	7.4205	6.0000	1.3202	3.2482	1.6308	6.0000	2.5975	8.2355	1.3580	5.0070	5.2830	6.0000

	c0658		c0060		c0690		c0694		c0739		c0741		c0828		c0729		c0839		c3555		c0859		c0880	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	4.9387	12.8361	9.2843	7.9090	12.0781	8.5664	5.6388	7.6855	20.3728	7.0014	14.5098	11.3841	4.7571	5.6775	5.7904	5.7904	25.6174	10.4376	3.7758	9.1680	20.6847	7.8311	4.5591	7.1038
r(chi2_k)	1.5978	0.7848	3.9146	0.6572	1.4998	1.2185	1.8857	0.3089	2.5596	2.2151	7.0489	0.7393	2.4653	1.8261	1.1077	1.1077	13.0921	0.6759	1.0675	0.1325	3.1762	0.2881	3.8017	0.9931
r(chi2_s)	1.9688	2.7243	4.9101	2.8871	2.1017	0.9355	1.5567	2.7465	2.9085	1.1181	5.8725	3.4783	0.0174	0.3362	2.6882	2.6882	10.8245	0.7283	1.8427	4.0355	7.1708	2.7219	0.6099	1.2241
r(chi2_h)	1.3721	9.3270	0.4597	4.3646	8.4766	6.4123	2.1963	4.6301	14.9048	3.6682	1.5884	7.1665	2.2745	3.5152	1.9945	1.9945	1.7008	9.0334	0.8657	5.0000	10.3377	4.8211	0.1474	4.8866
r(p)	0.5036	0.0967	0.7947	0.4982	0.0144	0.2681	0.3335	0.4627	0.0006	0.5981	0.4519	0.2085	0.3207	0.6211	0.3689	0.3689	0.4272	0.1077	0.6487	0.2873	0.0057	0.4381	0.9290	0.4299
r(df)	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	2.0000	2.0000	5.0000	2.0000	4.0000	2.0000	5.0000	2.0000	5.0000
r(chi2)	1.3721	9.3270	0.4597	4.3646	8.4766	6.4123	2.1963	4.6301	14.9048	3.6682	1.5884	7.1665	2.2745	3.5152	1.9945	1.9945	1.7008	9.0334	0.8657	5.0000	10.3377	4.8211	0.1474	4.8866

	c1098		c1238		c1258		c1633		c1929		c0166	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	7.4100	7.0583	18.6842	7.5521	6.0590	13.7931	21.1948	4.7771	24.0480	10.9274	13.1920	7.1669
r(chi2_k)	2.9337	0.6563	2.5990	0.0191	1.6983	2.7269	4.5588	0.2474	7.8418	2.9192	2.8987	1.5423
r(chi2_s)	1.0800	4.0596	5.9351	3.2771	0.3330	2.0498	13.8423	1.0205	0.5000	0.4185	6.4404	1.7660
r(chi2_h)	3.3963	2.3424	10.1501	4.2559	4.0277	9.0164	2.7938	3.5092	15.7062	7.5897	3.8529	3.8586
r(p)	0.1830	0.8000	0.0063	0.5132	0.1335	0.1084	0.2474	0.6220	0.0004	0.1803	0.1457	0.5699
r(df)	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000	2.0000	5.0000
r(chi2)	3.3963	2.3424	10.1501	4.2559	4.0277	9.0164	2.7938	3.5092	15.7062	7.5897	3.8529	3.8586

Table (6) Southern Board FF model Durbin Watson Test

		r(dw)	r(K)	r(N)	r(N_gaps)			r(dw)	r(K)	r(N)	r(N_gaps)			r(dw)	r(K)	r(N)	r(N_gaps)
h0027	Before	1.8594	3	4	1	h1728	Before	1.4992	2	155	50	h0880	Before	1.2270	3	132	49
	After	1.3980	3	9	4		After	2.3379	2	12	4		After	1.1220	3	8	3
h0175	Before	1.6466	3	140	48	h1833	Before	1.5962	2	161	46	h1114	Before	0.8457	3	85	40
	After	1.8135	3	11	4		After	1.1844	2	14	4		After	1.3149	3	7	2
h0178	Before	0.1043	3	20	14	h1880	Before	1.3932	3	88	44	h1128	Before	1.3380	1	163	44
	After	0.0000	3	3	1		After	0.0002	3	6	4		After	1.7605	1	16	3
h0308	Before	0.0764	3	20	15	h1928	Before	1.5431	3	161	47	h1169	Before	0.9983	3	70	34
	After	0.6568	3	3	1		After	0.8809	3	14	4		After	1.3522	3	4	2
h0489	Before	1.5902	2	141	46	h1929	Before	1.3668	4	69	35	h1212	Before	1.6170	2	133	55
	After	0.8955	2	8	3		After	0.6850	3	11	4		After	0.4307	2	9	6
h0493	Before	1.2935	3	22	11	h1928	Before	1.5431	3	161	47						
	After	0.0000	3	3	2		After	0.8809	3	14	4						
h0494	Before	1.0134	2	89	46	h2020	Before	1.2487	3	37	20						
	After	1.0996	2	10	4		After	0.8621	3	3	1						
h0511	Before	1.6508	2	162	44	h2238	Before	1.0704	3	42	20						
	After	2.4188	2	15	3		After	0.8415	3	7	3						
h0590	Before	1.0133	4	54	32	h2282	Before	1.0655	3	95	51						
	After	1.3619	3	7	2		After	0.9824	3	6	3						
h0669	Before	1.2522	3	34	22	h2313	Before	1.4870	2	125	53						
	After	0.0000	3	3	1		After	0.4982	2	14	4						
h0751	Before	1.5167	3	46	28	h2333	Before	1.2613	3	133	50						
	After	1.6716	3	8	2		After	0.8568	3	12	3						
h0868	Before	0.9547	3	48	28	h3308	Before	1.0364	3	79	35						
	After	0.0346	3	4	2		After	1.8594	3	4	1						

Table (7) Northern Board - FF model Durbin Watson Test

		r(dw)	r(K)	r(N)	r(N_gaps)			r(dw)	r(K)	r(N)	r(N_gaps)			r(dw)	r(K)	r(N)	r(N_gaps)
c0037	Before	1.495	2.000	15.000	3.000	c0880	Before	0.885	3.000	90.000	46.000	c0741	Before	1.065	3.000	127.000	57.000
	After	1.804	2.000	15.000	3.000		After	2.061	2.000	10.000	5.000		After	0.700	2.000	9.000	5.000
c0739	Before	1.198	3.000	101.000	45.000	c0177	Before	1.078	3.000	141.000	42.000	c1258	Before	1.649	2.000	149.000	48.000
	After	0.708	2.000	11.000	3.000		After	1.055	2.000	15.000	3.000		After	1.060	2.000	14.000	4.000
c0729	Before	1.106	3.000	106.000	54.000	c0507	Before	0.436	2.000	84.000	46.000	c0859	Before	1.350	4.000	165.000	44.000
	After	1.880	2.000	10.000	4.000		After	0.015	2.000	7.000	5.000		After	1.538	2.000	15.000	3.000
c0104	Before	1.514	3.000	165.000	44.000	c1098	Before	1.367	2.000	145.000	48.000	c3555	Before	0.983	2.000	81.000	55.000
	After	1.778	2.000	15.000	3.000		After	2.102	2.000	12.000	4.000		After	1.328	2.000	6.000	2.000
c1633	Before	1.454	2.000	164.000	45.000	c1238	Before	1.630	2.000	73.000	19.000	c0138	Before	1.487	3.000	164.000	45.000
	After	1.715	2.000	14.000	3.000		After	1.756	2.000	15.000	3.000		After	1.174	2.000	15.000	3.000
c0690	Before	1.342	3.000	161.000	46.000	c0060	Before	1.324	3.000	146.000	56.000	c0658	Before	1.635	3.000	158.000	45.000
	After	1.977	2.000	15.000	3.000		After	2.593	2.000	11.000	4.000		After	1.495	2.000	15.000	3.000
c0418	Before	1.395	3.000	117.000	32.000	c0373	Before	1.073	3.000	81.000	32.000	c0633	Before	1.270	4.000	145.000	53.000
	After	1.268	2.000	15.000	3.000		After	1.348	2.000	7.000	4.000		After	1.316	2.000	10.000	3.000
c1801	Before	1.013	2.000	97.000	51.000	c0828	Before	0.552	2.000	58.000	39.000	c0660	Before	1.530	3.000	144.000	48.000
	After	0.738	2.000	12.000	3.000		After	0.126	2.000	6.000	3.000		After	1.534	2.000	13.000	3.000
c0839	Before	1.463	2.000	137.000	38.000	c0166	Before	1.647	3.000	121.000	32.000	c1929	Before	1.330	2.000	105.000	45.000
	After	1.468	2.000	14.000	4.000		After	1.505	2.000	15.000	3.000		After	2.595	2.000	9.000	3.000
c0637	Before	1.456	2.000	68.000	22.000	c0120	Before	1.256	3.000	121.000	51.000	c0694	Before	1.117	2.000	92.000	51.000
	After	2.940	2.000	11.000	2.000		After	1.275	2.000	13.000	3.000		After	0.671	2.000	11.000	4.000

Table(8) Southern Board Ffmodel White Test

	h0175		h0178		h0308		h0489		h0493		h0494		h0511		h0590		h0669		h0751		h0868		h0880	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	56.111	6.489	11.813		9.931		5.821	1.695	7.480		30.177	3.273	4.090	2.715	20.656	9.578	29.135		10.656	4.903	12.929	5.521	15.624	5.711
r(chi2_k)	1.074	0.362	1.458		1.146		0.076	0.024	0.045		1.215	1.100	1.410	0.948	1.331	2.802	3.657		1.289	1.381	0.007	0.969	1.134	0.093
r(chi2_s)	14.547	0.393	2.695		2.495		1.091	0.180	1.358		8.161	0.841	1.517	1.611	14.332	0.135	1.817		2.991	0.573	2.627	0.552	2.166	2.014
r(chi2_h)	40.489	5.734	7.660		6.290		4.654	1.491	6.077		20.801	1.333	1.162	0.155	4.992	6.640	23.661		6.376	2.949	10.296	4.000	12.323	3.604
r(p)	0.000	0.333	0.176	0.223	0.279	0.223	0.098	0.475	0.299	0.223	0.000	0.514	0.559	0.925	0.545	0.249	0.000	0.223	0.271	0.708	0.067	0.261	0.031	0.608
r(df)	5.000	5.000	5.000	2.000	5.000	2.000	2.000	2.000	5.000	2.000	2.000	2.000	2.000	2.000	6.000	5.000	5.000	2.000	5.000	5.000	5.000	3.000	5.000	5.000
r(chi2)	40.489	5.734	7.660	3.000	6.290	3.000	4.654	1.491	6.077	3.000	20.801	1.333	1.162	0.155	4.992	6.640	23.661	3.000	6.376	2.949	10.296	4.000	12.323	3.604

	h1114		h1169		h1212		h1728		h1833		h1880		h1928		h1929		h1928		h3308		h2020		h2238	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	6.794	7.915	22.946	5.785	7.770	3.885	21.064	2.733	11.126	1.944	53.459	8.037	70.371	4.304	45.665	11.995	70.371	4.304	4.469	2.681	19.620		8.796	8.256
r(chi2_k)	0.871	1.700	3.396	0.535	0.336	0.278	2.352	2.177	6.603	0.383	2.746	0.094	2.013	1.655	3.558	2.479	2.013	1.655	0.108	1.563	1.644		0.860	0.490
r(chi2_s)	1.386	0.441	3.524	1.250	6.622	1.440	13.596	0.362	1.555	0.464	6.983	1.943	17.921	1.996	0.501	5.469	17.921	1.996	3.406	0.181	9.350		3.436	0.985
r(chi2_h)	4.536	5.774	16.026	4.000	0.812	2.168	5.117	0.195	2.968	1.097	43.730	6.000	50.437	0.653	41.605	4.047	50.437	0.653	0.956	0.937	8.626		4.500	6.781
r(p)	0.475	0.329	0.007	0.261	0.666	0.338	0.077	0.907	0.227	0.578	0.000	0.306	0.000	0.985	0.000	0.543	0.000	0.985	0.812	0.626	0.125	0.223	0.480	0.237
r(df)	5.000	5.000	5.000	3.000	2.000	2.000	2.000	2.000	2.000	2.000	5.000	5.000	5.000	5.000	6.000	5.000	5.000	5.000	3.000	2.000	5.000	2.000	5.000	5.000
r(chi2)	4.536	5.774	16.026	4.000	0.812	2.168	5.117	0.195	2.968	1.097	43.730	6.000	50.437	0.653	41.605	4.047	50.437	0.653	0.956	0.937	8.626	3.000	4.500	6.781

	h2282		h2313		h2333		h3308		h0027		h1114	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	27.228	9.592	10.234	7.284	92.530	9.427	44.434	5.819	62.353	8.191	6.794	7.915
r(chi2_k)	5.551	0.096	2.927	0.278	2.919	0.055	2.062	0.340	4.754	0.017	0.871	1.700
r(chi2_s)	0.859	3.496	0.639	1.273	15.210	1.274	3.402	1.479	3.695	2.265	1.386	0.441
r(chi2_h)	20.818	6.000	6.667	5.733	74.401	8.097	38.971	4.000	53.904	5.909	4.536	5.774
r(p)	0.001	0.306	0.036	0.057	0.000	0.151	0.000	0.261	0.000	0.315	0.475	0.329
r(df)	5.000	5.000	2.000	2.000	5.000	5.000	5.000	3.000	5.000	5.000	5.000	5.000
r(chi2)	20.818	6.000	6.667	5.733	74.401	8.097	38.971	4.000	53.904	5.909	4.536	5.774

Table(8) Northern Board FFmodel white test

	c0037		c0739		c0633		c0729		c0104		c1633		c0690		c0633		c0418		c1801		c0839		c0637	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	12.169	1.654	6.755	4.530	33.810	5.739	2.476	5.259	17.414	1.693	54.572	4.091	1.983	4.729	33.810	5.739	5.863	5.775	6.757	4.576	48.022	12.306	2.635	5.465
r(chi2_k)	2.994	0.104	0.993	0.026	2.434	0.263	1.731	0.753	1.459	0.465	6.581	1.209	0.870	1.858	2.434	0.263	0.447	0.860	2.239	1.307	9.517	2.376	1.796	0.221
r(chi2_s)	0.591	1.154	0.800	0.357	8.881	1.171	0.384	1.740	4.335	0.987	18.658	0.969	0.257	1.276	8.881	1.171	0.644	1.839	1.189	1.345	5.921	2.712	0.215	0.609
r(chi2_h)	8.585	0.395	4.961	4.147	22.495	4.305	0.361	2.766	11.619	0.242	29.332	1.913	0.857	1.594	22.495	4.305	4.772	3.076	3.330	1.924	32.584	7.218	0.624	4.635
r(p)	0.035	0.821	0.175	0.126	0.000	0.116	0.948	0.251	0.009	0.886	0.000	0.384	0.836	0.451	0.000	0.116	0.189	0.215	0.189	0.382	0.000	0.027	0.732	0.099
r(df)	3.000	2.000	3.000	2.000	4.000	2.000	3.000	2.000	3.000	2.000	2.000	2.000	3.000	2.000	4.000	2.000	3.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
r(chi2)	8.585	0.395	4.962	4.147	22.495	4.305	0.361	2.766	11.619	0.242	29.332	1.913	0.857	1.594	22.495	4.305	4.772	3.076	3.330	1.924	32.584	7.218	0.624	4.635

	c0880		c0177		c0507		c0373		c0660		c1098		c1238		c1929		c0694		c0060		c0138		c0658	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	13.256	5.530	29.595	9.057	2.736	2.351	7.892	5.560	9.971		6.200	5.282	2.189	6.409	9.631	9.565	1.834	6.689	68.718	6.290	4.469	2.681	7.539	2.767
r(chi2_k)	2.222	2.283	1.096	1.186	1.158	0.039	3.715	0.470	1.050		1.585	2.315	0.303	0.378	3.647	1.030	0.064	0.204	3.143	2.469	0.108	1.563	1.415	0.102
r(chi2_s)	1.585	2.127	12.970	1.441	1.296	0.140	1.153	2.848	5.218		4.031	2.587	0.410	2.392	5.898	4.326	1.198	3.291	19.775	3.030	3.406	0.181	2.189	2.578
r(chi2_h)	9.450	1.120	15.529	6.430	0.282	2.171	3.023	2.241	3.703		0.584	0.380	1.477	3.640	0.086	4.210	0.572	3.194	45.800	0.791	0.956	0.937	3.936	0.087
r(p)	0.024	0.571	0.001	0.040	0.868	0.338	0.388	0.326	0.295		0.747	0.827	0.478	0.162	0.958	0.122	0.751	0.202	0.000	0.673	0.812	0.626	0.268	0.957
r(df)	3.000	2.000	3.000	2.000	2.000	2.000	3.000	2.000	3.000		2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	3.000	2.000	3.000	2.000	3.000	2.000
r(chi2)	9.450	1.120	15.529	6.430	0.282	2.171	3.023	2.241	3.703		0.584	0.380	1.477	3.640	0.086	4.210	0.572	3.194	45.800	0.791	0.956	0.937	3.936	0.087

	c0166		c0120		c0741		c1258		c0859		c3555		c0828	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
r(chi2_t)	3.616	2.125	25.387	7.618	14.764	4.286	5.257	2.991	40.123	4.035	3.395	2.013	3.616	2.419
r(chi2_k)	1.672	0.006	5.896	2.095	6.773	2.346	3.855	0.197	1.801	0.768	1.089	0.444	1.358	0.833
r(chi2_s)	1.337	2.059	5.774	3.482	4.040	0.062	1.206	2.530	13.691	3.175	1.491	0.201	1.412	1.565
r(chi2_h)	0.607	0.060	13.717	2.040	3.951	1.877	0.195	0.264	24.630	0.091	0.816	1.367	0.847	0.021
r(p)	0.895	0.970	0.003	0.361	0.267	0.391	0.907	0.876	0.000	0.955	0.665	0.505	0.655	0.884
r(df)	3.000	2.000	3.000	2.000	3.000	2.000	2.000	2.000	4.000	2.000	2.000	2.000	2.000	1.000
r(chi2)	0.607	0.060	13.717	2.040	3.951	1.877	0.195	0.264	24.630	0.091	0.816	1.367	0.847	0.021

Table(9) Southern Board - Dicken Fuller test

		Before	After			Before	After
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h0868	r(N)	75.000	8.000	h3308	r(N)	75.000	8.000
	r(Zt)	-3.713	-1.676		r(Zt)	-4.274	-0.677
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h0669	r(N)	75.000	8.000	h2238	r(N)	75.000	8.000
	r(Zt)	-5.857	-1.689		r(Zt)	-5.019	-3.130
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h0494	r(N)	75.000	8.000	h1212	r(N)	75.000	8.000
	r(Zt)	-1.911	-1.581		r(Zt)	-4.291	-0.970
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h0493	r(N)	75.000	8.000	h0178	r(N)	75.000	8.000
	r(Zt)	-7.543	-2.003		r(Zt)	-5.424	-3.890
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h0027	r(N)	75.000	8.000	h0308	r(N)	75.000	8.000
	r(Zt)	-5.642	-1.604		r(Zt)	-2.635	-0.042
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h0751	r(N)	75.000	8.000	h0551	r(N)	75.000	8.000
	r(Zt)	-5.489	-1.900		r(Zt)	-4.088	-1.288
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h2313	r(N)	75.000	8.000	h0200	r(N)	75.000	8.000
	r(Zt)	-4.275	-1.906		r(Zt)	-4.966	-1.015
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h1833	r(N)	75.000	8.000	h0511	r(N)	75.000	8.000
	r(Zt)	-4.782	-1.455		r(Zt)	-7.391	-4.140
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h1929	r(N)	75.000	8.000	h0880	r(N)	75.000	8.000
	r(Zt)	-6.047	-1.765		r(Zt)	-6.026	-1.260
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h2282	r(N)	75.000	8.000	h1169	r(N)	75.000	8.000
	r(Zt)	-4.058	-1.278		r(Zt)	-5.188	-3.370
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
h0489	r(N)	75.000	8.000	h2333	r(N)	75.000	8.000
	r(Zt)	-4.279	-1.138		r(Zt)	-6.903	-0.854
	r(lags)	2.000	2.000				
h1928	r(N)	75.000	8.000				
	r(Zt)	-6.798	-2.531				
	r(lags)	2.000	2.000				
h1880	r(N)	75.000	8.000				
	r(Zt)	-7.201	-0.138				
	r(lags)	2.000	2.000				
h0175	r(N)	75.000	8.000				
	r(Zt)	-7.198	-2.660				
	r(lags)	2.000	2.000				
h1128	r(N)	75.000	8.000				
	r(Zt)	-6.015	-2.015				
	r(lags)	2.000	2.000				
h1114	r(N)	75.000	8.000				
	r(Zt)	-5.980	-2.989				
	r(lags)	2.000	2.000				
h0590	r(N)	75.000	8.000				
	r(Zt)	-5.751	-0.552				
	r(lags)	2.000	2.000				
h1728	r(N)	75.000	8.000				
	r(Zt)	-3.045	-0.423				

Table (10) Northern Board Dicken Fuller Test

		Before	After			Before	After
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0037	r(N)	78.000	7.000	c0828	r(N)	78.000	7.000
	r(Zt)	-7.783	-1.752		r(Zt)	-4.914	-1.833
	r(lags)	2.000	2.000		r(lags)	2.000	1.000
c0660	r(N)	78.000	7.000	c0729	r(N)	6.000	2.000
	r(Zt)	-4.659	-3.968		r(Zt)	-0.475	
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0104	r(N)	78.000	7.000	c0839	r(N)	68.000	7.000
	r(Zt)	-3.975	-1.561		r(Zt)	-5.533	-6.480
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0120	r(N)	78.000	7.000	c0859	r(N)	78.000	7.000
	r(Zt)	-5.239	-1.734		r(Zt)	-6.621	-1.527
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0128	r(N)	78.000	7.000	c0880	r(N)	75.000	7.000
	r(Zt)	-7.572	-2.120		r(Zt)	-4.459	-3.000
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0117	r(N)	69.000	7.000	c1098	r(N)	78.000	7.000
	r(Zt)	-5.904	0.361		r(Zt)	-5.531	-2.869
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0373	r(N)	54.000	3.000	c1238	r(N)	78.000	7.000
	r(Zt)	-5.054			r(Zt)	-7.635	-1.147
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
d0418	r(N)	55.000	7.000	c1258	r(N)	78.000	7.000
	r(Zt)	-8.173	-1.670		r(Zt)	-6.018	-0.865
	r(lags)	2.000	2.000		r(lags)	2.000	1.000
c1801	r(N)	7.000	2.000	c1633	r(N)	5.000	3.000
	r(Zt)	-1.008			r(Zt)	-0.039	0.695
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0507	r(N)	75.000	7.000	c1929	r(N)	77.000	7.000
	r(Zt)	-3.692	-0.881		r(Zt)	-3.378	-0.425
	r(lags)	2.000	2.000		r(lags)	2.000	1.000
c0633	r(N)	78.000	7.000	c3555	r(N)	2.000	3.000
	r(Zt)	-5.233	-2.198		r(Zt)		0.621
	r(lags)	2.000	2.000		r(lags)	2.000	2.000
c0637	r(N)	30.000	5.000	c0166	r(N)	78.000	7.000
	r(Zt)	-4.974	-5.161		r(Zt)	-6.740	-3.093
	r(lags)	2.000	2.000				
c0658	r(N)	77.000	7.000				
	r(Zt)	-3.347	-2.693				
	r(lags)	2.000	2.000				
c0060	r(N)	78.000	7.000				
	r(Zt)	-6.327	-5.141				
	r(lags)	2.000	2.000				
c0690	r(N)	75.000	7.000				
	r(Zt)	-6.281	-3.149				
	r(lags)	2.000	2.000				
c0694	r(N)	78.000	7.000				
	r(Zt)	-6.642	0.651				
	r(lags)	2.000	2.000				
c0739	r(N)	70.000	7.000				
	r(Zt)	-4.965	0.689				
	r(lags)	2.000	2.000				
c0741	r(N)	78.000	7.000				
	r(Zt)	-6.119	-3.997				