# THE STUDY OF THE RATE OF CONVERGENCE IN THE STOCK EXCHANGE MARKET OF THE PERSIAN GULF COUNTRIES

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## ABSTRACT

Stock exchange is one of the main pillars and principles of the country's economy and paying attention to this organization not only flourishes and promotes it, but also causes the growth and development of the national economy. For this reason, the factors that affect this organization should be analyzed to develop it through the obtained results. Sudden shocks of the market, global financial crises and the increase of vitality of stock returns at an international level during the past years have created some concerns to managers and investors. The study of the presence and absence of the effectiveness of global financial markets from each other can significantly help the prediction of global crises and timely performance to these crises. This study used the stock price index of the Persian Gulf countries available on formal informational databases for 5 years (2005-2010) as daily in order to study the long-term convergence between the price index of the stock exchange in the Persian Gulf countries. In this study, the relationship between the indices was examined by correlation analysis method and the stationary of series related to each country by the Augmented Dicky Fuller test and the long term convergence by Johansson cointegration method.

The study results show the most of these countries have a high correlation and the relationship between these countries is significant. The results of Johansson cointegration test in the both tested methods of max-Eigenvalue proved 3 long term convergence equations andStatic Trace proved 6 long term convergence equations at 0/05 significance level.

**Keywords:** correlation, long term convergence, cointegration, price index

## 1. INTRODUCTION

The formation of capital is one of the important components of GDP and capital is considered as one of the main inputs in production. Thus, the study of capital and its accumulation in economic growth and development is of great importance. The appropriate guidance of caught funds toward productive investments, increase of production and GDP growth will cause employment and increase of per capital income and finally general (public) welfare. On the other hand, cash has a lost opportunity. In case of keeping cash, the opportunity of obtaining profit though it will be lost and in an inflationatmosphere, the money purchase power will decrease. Thus, the strong mechanisms of these savings should be led to production sectors to provide and meet their financial needs. Since the Tehran stock exchange is one of the main parts of the country's economy and the development of this organization will cause the growth and development of national economy, the study of factors affecting this organization is of great importance because it leads public capitals toward production and gives them to manufacturing and business companies through brokerage firms.

According to what was described, the researcher has entered the area of studying the rate of convergence of financial markets' index in the Persian Gulf and also the convergence of financial markets' index in the Persian Gulf countries. Stock price index shows the general status of economy and the size and value of transactions in the market. The study of the presence or absence of convergence between stock indices can help the prediction and control of price stock and global crises.

The capital market should think of promoting culture and developing public knowledge for its qualitative development and quantitative progress. The growth of the capital market requires the efforts of all stakeholders in the field of economy and culture. The main motivation of the researcher, as the student of management, is to help the national economy and recognize the behavior of investors.

**Problem statement**

Stock exchange is one of the main pillars and principles of the country's economy and paying attention to this organization not only flourishes and promotes it, but also causes the growth and development of the national economy. The important factors which affect the process of decision making in investment are: lack of trust in investment decisions, global nature and investment, investment environment and the market efficiency. Investors should study these factors in order to evaluate information and market decisions.

In this study, the rate of convergence of stock exchange in the Persian Gulf countries is studied. In case of confirmed and approved convergence, it can be concluded that the markets' problems of one country are transmitted to other countries and such a process increases the speed of developing the crisis. Entering the third millennium and the fear of financial crisis has reduced the confidence of shareholders to invest in the stock market.  Thus, by the accurate and systematic analysis of the stock price process, the increase of investors' tendency toward the stock exchange can be seen. The increasing welcome of the stock exchange causes the increase of absorbing capital sources by different industries and finally provides the development and growth of national economy.

The study of the presence and absence of the effectiveness of global financial markets from each other can significantly help the prediction of global crises and timely performance to these crises. According to what was described, the researcher has entered the area of studying the rate of convergence of financial markets' index in the Persian Gulf and also the convergence of financial markets' index in the Persian Gulf countries. No comprehensive study on this subject has been ever carried out in Iran.

**Review of literature**

Many studies have been performed on stock price and market efficiency but according to global crises, no comprehensive study has been done yet on the relationship of stock price indices that show the general status of economy and the size and value of transactions in the market. Some studies have been carried out in the foreign countries on the convergence of indices. Here are some of them:

Michael E.Parker from Louisiana university, studied convergence between the indices of 8 Asian countries. The purpose of this study was to prove the relationship between the index of efficient markets and study the transfer of financial crises from one country o another one.

This study has been done at the time of Asia crisis in 1996-1994. All studies were in the form of bivariate. Thus, 28 pairs of bivariate were studied for 8 countries. The study results show the fact that 5 pairs out of 287 pairs have cointegration vector or stationary convergence and 10 other pairs have stationary correlation or convergence. Thus, 15 pairs out of 28 pairs prove the stationary and non-stationary convergence that is an evidence for markets' inefficiency. Sincetheindex of a market can show the movement of other markets' index; this historical convergence of indices in these 15 pairs may show some explanations about the speed of passing the Asian crisis during the years 1996-1997 in financial markets or future markets.

In another study, SurachiChancharat and Abbas Valadkhani from the faculty of economy at Wollongong University provided an article which examined the presence of cointergration and causality between the stock price index of Thailand and their partners (Australia, Hong Kong, Indonesia, Japan, Korea, Malaysia, Philippine, Singapore, Taiwan, England and America).

According to the study of Phylaktis and Ravazzolo (2005), other unusual crises included and affected the Asian crisis and some other countries that are combined to the crisis as financial and economic. Although Chen et al stated that economic and geographical factors are not considered as causality factor to help the stock exchanges follow the same random movement and a few evidences of the stock exchange combination after the market crisis of the main stock can make the international diversification of the stock exchange market. (Pater et al 2006) in the market of Malaysia, Ibrahim and Aziz (2003) prepared some evidences to show that the Asian crisis causes irregularity in the mechanisms of stock prices and macro economic variables. The tendency to mix international stock markets is a reason for the number of experimental studies to study different aspects of the stock markets. Thesestudies mainly began from the decline of stock markets in October 1987 and the next Asian crisis in 1997.For example the studies of Kanas (1998), Fraser and Power (1997), Susmal and Engle (1994), Fratszcher (2002). In addition to these studies, cointegration test is widely used in the long term studies in the stock markets.

**Research questions**

Do the stock price indices in the stock exchange in the Persian Gulf countries have the long term convergence?

Is there a correlation between the stock price index of the stock exchange in the Persian Gulf countries?

Are the time series of stock price index stationary in the stock exchange of the Persian Gulf countries?

**Research methodology**

According to the research results, the present study can be considered as applied and according to the research questions, the present study is of causal. The first phase:

First step: according to the available quantitative changes in the stock price index of each country in the desired time range, the time series model will be presented. Time series is a set of observations that are ordered in terms of time (or any other quantity) .the change so time series can be due to the changes of some factors that are some normal and some others are due to economic and social factors.

The changes that result from the following four factors are usually considered for the analysis of a time series. This model can be one of the models based on $X_P = T_P * S_P * C_P * I_P$ definition.

T= trend, S= seasonal changes, C=periodical changes and I=irregular changes

Second step: the main function of analyzing time series is prediction. Obviously, if there is a special dependence between data over time, an appropriate opportunity will be made to predict the future trend.

Second step: by considering the obtained lag in the analysis of the first phase, in this step we estimate the vector auto - regressive regression equation to the price index of the studied countries. We enter $X_{jt}$ as the explanatory variable and $X_{it}$ as the dependent variable in the dependent model and then we estimate the regression equation to analyze the cointegration. we use the auto – regressive equationmodel:

$X_{it} = {}_1 + {}_2X_{jt} + {}_3X_{it} + U_{it} (1-1)$

$t' = t + k (1-2)$

K is the time lag obtained from the first phase.

Second step: determine the cointegration equation by Johansson method.

Third phase:

First step: this step performs the Granger causality test. There is uncertainty in all predictions. The fact comes from irregular changes (residue) in time series. The presence of such an element which shows undefined or unpredictable fluctuations in data means that error is always expected in prediction. If irregular changes have a considerable effect, it means that our ability will belittle

in prediction. But if these irregular changes are a few, a prediction with high degree of accuracy can be achieved by determining the trend and periodical –seasonal changes.

The mathematical equation can be estimated and analyzed by using the regression.

By obtaining the equation, we can achieve 3 types of relationship:

- Is there a pattern to show a kind of relationship between observations?
- In  case of the presence of a relationship, is the relationship linear or non-linear?
- If the relationship is linear, what is its type?

**Data collection method**

The research scope is limited to the Tehran stock exchange and formal databases of the stock exchange of the Persian Gulf countries. Since in these studies, the long term convergence is studied between the stock price indices, the duration of study is of great importance. Although in most countries on this subject, daily, weekly, monthly and seasonal data were used, this study includes the time period of 2005/11/25 to 2010/6/25 as daily because the transfer of data is done quickly.

The research variables are the following indices:

**Statistical results**

After the researcher collects the data, a new step of the research process that is known as data analysis begins. By using the stationary analysis, statistical tests , determination of dependence, determination of the length of lag, Granger causality test, long term convergence test by Johansson method that were done by Eviews 5.0 statisticalsoftware will be presented.

Step 1. Drawing the graph

The first  step to determine the reliability of a variable is to observe the time series graph of that variable.
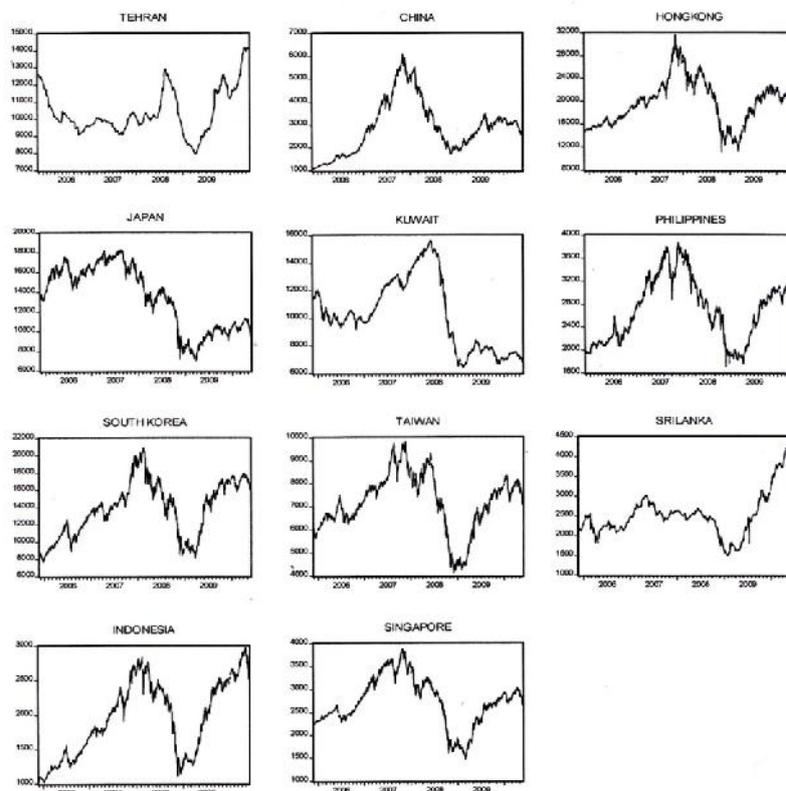
**Fig.1.** The graph of the index changes

Step 2: stationary test

By observing the time series, we find that these time series are not stationary because their mean, variance, and covariance are not constant over time. Thus, it is necessary to test the reliability of time series statistically. For stationary test, the Augmented Dicky Fuller method (ADF) was used. The statistics of T-test that is calculated in this method is called ‡ statistics (tau) and its critical values were calculated by Monte Carlo simulation method by Dicky and Fuller as statistical tables.

H0: the studied time series have a unit root.

H1: the studied time series do not have a unit root.

**Table 1.** Stationary test

| country | Source | t-Static |
|---|---|---|
| China | Appendix A | -1.5310 |
| Hong Kong | Appendix B | -1.8831 |
| Indonesia | Appendix C | -1.2922 |
| Japan | Appendix D | -0.7643 |
| Kuwait | Appendix E | -0.2586 |
| Philippine | Appendix F | -1.6441 |
| Singapore | Appendix G | -1.3693 |
| South Korea | Appendix H | -1.7824 |
| Sri Lanka | Appendix I | 1.3239 |
| Taiwan | Appendix J | -1.5505 |
| Iran | Appendix K | -0.4095 |

In the above model, the critical value ‡ for 1%, 5%, and 10% levels according to the calculations of Mccenyon are respectively -3.436816, -2.864283, and -2.568283. since the absolute value of ‡ (tau) is less than the absolute value of critical value ‡ for 1%, 5%, and 10% levels, thus the null hypothesis as the unit root cannot be rejected, namely the related time series have one root.

Third step: creating stationary

The studied time-series models assume that the time series are stationary. In other words, the mean and variance of stationary time series are constant and their covariance does not change over time. But what should we do if the time series are not stationary?

A common way to convert a non-stationary series to stationary is to obtain the first difference of the non-stationary series. First difference means the calculation of the difference of the two consecutive observations. If a time series is not stationary and integrated of the first order is one I (1), its first order difference will be stationary I (0). In general, if the time series is I (d), the first order differencing of the time series is obtained I (0) after d orders.

Thus, the T-test values are obtained for the first order difference of the series. In this case, the null hypothesis and alternative hypothesis are as follows:

H0: the first order difference of the studied time series have unit root.

H1: the first order difference of the studied time series do not have unit root.

**Table 2.** Creating stationary

| country | Source | t-Static |
|---|---|---|
| China | Appendix l | -33.7280 |
| Hong Kong | Appendix m | -35.3555 |
| Indonesia | Appendix n | -30.6321 |
| Japan | Appendix o | -35.1538 |
| Kuwait | Appendix p | -26.4012 |
| Philippine | Appendix q | -31.0580 |
| Singapore | Appendix r | -34.8324 |
| South Korea | Appendix s | -31.2162 |
| Sri Lanka | Appendix t | -37.9222 |
| Taiwan | Appendix u | -32.4023 |
| Iran | Appendix v | -13.2738 |

The critical of ‡ for 1%, 5%, and 10% levels according to the calculations of Mccenyon are respectively -3.436818, -2.864283, and -2.568283. since the absolute value of ‡ (tau) is less than the absolute value of‡ (tau) for dt-1 is bigger than the critical values, the null hypothesis can be rejected namely the first order difference of the studied series do not have a unit root. Thus, they are stationary in the first order difference.

Since ADF or DF statistics can show the integration of a time series, it is called cointegration test.

Forth step: determination of correlation coefficient

To determine the relationship of indices and correlation between the stock price indices of the two countries, the correlation coefficient was calculated by Pearson linear correlation coefficient, that shows the linear relationship of the two quantitative variables and was given in the following table:

**Table 3.** Correlation coefficient

| country | China | Hong Kong | Indonesia | Japan | Kuwait | Philippine | Singapore | South Korea | Taiwan | Iran | Sri Lanka |
|---|---|---|---|---|---|---|---|---|---|---|---|
| China | 1.000 | 0.871 | 0.760 | 0.204 | 0.448 | 0.854 | 0.751 | 0.785 | 0.750 | -0.104 | 0.335 |
| Hong Kong | 0.871 | 1.000 | 0.799 | 0.323 | 0.535 | 0.844 | 0.866 | 0.839 | 0.888 | 0.124 | 0.478 |
| Indonesia | 0.760 | 0.799 | 1.000 | -0.088 | 0.212 | 0.796 | 0.600 | 0.955 | 0.702 | 0.375 | 0.695 |
| Japan | 0.204 | 0.323 | -0.088 | 1.000 | 0.616 | 0.390 | 0.648 | 0.048 | 0.535 | -0.158 | 0.054 |
| Kuwait | 0.448 | 0.535 | 0.212 | 0.616 | 1.000 | 0.404 | 0.578 | 0.276 | 0.543 | -0.080 | -0.048 |
| Philippine | 0.854 | 0.844 | 0.796 | 0.390 | 0.404 | 1.000 | 0.860 | 0.838 | 0.853 | 0.163 | 0.634 |
| Singapore | 0.751 | 0.866 | 0.600 | 0.648 | 0.578 | 0.860 | 1.000 | 0.654 | 0.935 | 0.062 | 0.519 |
| South Korea | 0.785 | 0.839 | 0.955 | 0.048 | 0.276 | 0.838 | 0.654 | 1.000 | 0.749 | 0.292 | 0.640 |
| Taiwan | 0.750 | 0.888 | 0.702 | 0.535 | 0.543 | 0.853 | 0.935 | 0.749 | 1.000 | 0.122 | 0.567 |
| Iran | -0.104 | 0.124 | 0.375 | -0.158 | -0.080 | 0.163 | 0.062 | 0.292 | 0.122 | 1.000 | 0.679 |
| Sri Lanka | 0.335 | 0.478 | 0.695 | 0.054 | -0.048 | 0.634 | 0.519 | 0.640 | 0.567 | 0.679 | 1.000 |

The correlation analysis examines the dependence of a variable on other variables but causality is not necessarily determined by it. However, sometimes two variables affect each other according to specific distributed lags. Now we should see if the changes of one variable casus the changes of other variables or is there any feedback between them or not? In other words, cam we statistically discover the direction and causality (cause and effect relationship) when there is a transposition between the two variables? For this purpose, the Granger causality test is used.

Fifth step: determination of the appropriate length of lag to estimate VAR

To determine the appropriate lag, the following indices are studied and the obtained results are as follows:

**Table 4.** Determination of the optimal lag

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -72185.73 | NA | 3.04e+42 | 129.0379 | 129.0873* | 129.0566 |
| 1 | -71926.39 | 513.1156 | 2.38e+42 | 128.7907 | 129.3829 | 129.0145* |
| 2 | -71836.97 | 175.1688 | 2.51e+42 | 128.8471 | 129.9822 | 129.2762 |
| 3 | -71726.05 | 215.0868 | 2.56e+42 | 128.8652 | 130.5430 | 129.4994 |
| 4 | -71584.77 | 271.2013 | 2.47e+42 | 128.8289 | 131.0496 | 129.6683 |
| 5 | -71432.13 | 290.0010 | 2.34e+42* | 128.7724* | 131.5359 | 129.8170 |
| 6 | -71335.10 | 182.4445 | 2.44e+42 | 128.8152 | 132.1216 | 130.0650 |
| 7 | -71247.01 | 163.9030 | 2.59e+42 | 128.8740 | 132.7233 | 130.3290 |
| 8 | -71158.72 | 162.5325 | 2.75e+42 | 128.9325 | 133.3246 | 130.5926 |
| 9 | -71025.09 | 243.3681 | 2.69e+42 | 128.9099 | 133.8449 | 130.7753 |
| 10 | -70922.04 | 185.6554 | 2.78e+42 | 128.9420 | 134.4198 | 131.0125 |
| 11 | -70822.71 | 177.0099 | 2.90e+42 | 128.9807 | 135.0014 | 131.2565 |
| 12 | -70710.01 | 198.6015 | 2.95e+42 | 128.9956 | 135.5590 | 131.4765 |
| 13 | -70617.85 | 160.6052 | 3.12e+42 | 129.0471 | 136.1534 | 131.7332 |
| 14 | -70510.20 | 185.4770 | 3.21e+42 | 129.0710 | 136.7201 | 131.9623 |
| 15 | -70406.99 | 175.8085 | 3.33e+42 | 129.1027 | 137.2948 | 132.1992 |
| 16 | -70314.83 | 155.1623 | 3.52e+42 | 129.1543 | 137.8892 | 132.4560 |
| 17 | -70160.05 | 257.5410 | 3.33e+42 | 129.0939 | 138.3716 | 132.6008 |
| 18 | -70069.24 | 149.3326 | 3.54e+42 | 129.1479 | 138.9684 | 132.8599 |
| 19 | -69990.91 | 127.2471 | 3.85e+42 | 129.2242 | 139.5876 | 133.1414 |
| 20 | -69888.64 | 164.1498* | 4.02e+42 | 129.2576 | 140.1639 | 133.3801 |

Sixth step: to estimate the vector auto regressive equation

VAR model is estimated for the dependent variable and explanatory variable by determining a time lag, and the results of the regression coefficient were given in Appendix GH.

Seventh step: Granger causality test

**Table 5.** Granger causality test

| متغیرهای مستقل | متغیرهای وابسته | | | | |
|---|---|---|---|---|---|
| | D(CHINA) | D(HONGKONG) | D(INDONESIA) | D(JAPAN) | D(KUWAIT) |
| D(CHINA) | * | 0.596 | 0.3651 | 0.0366 | 0.5229 |
| D(HONGKONG) | 0.5347 | * | 0.2634 | 0.0073 | 0.3198 |
| D(INDONESIA) | 0.8787 | 0.1898 | * | 0 | 0.8349 |
| D(JAPAN) | 0.5679 | 0.7755 | 0.3122 | * | 0.9867 |
| D(KUWAIT) | 0.3243 | 0.0878 | 0.2943 | 0.457 | * |
| D(PHILIPPINES) | 0.2971 | 0.9679 | 0.07 | 0.1419 | 0.0254 |
| D(SINGAPORE) | 0.793 | 0.3295 | 0.6363 | 0.0086 | 0.8934 |
| D(SOUTH_KOREA) | 0.3248 | 0.2442 | 0.7322 | 0.5139 | 0.7412 |
| D(SRILANKA) | 0.8156 | 0.6251 | 0.8546 | 0.4278 | 0.5587 |
| D(TAIWAN) | 0.0996 | 0.475 | 0.103 | 0.9664 | 0.4896 |
| D(TEHRAN) | 0.1446 | 0.5597 | 0.587 | 0.5397 | 0.4834 |

| متغیرهای مستقل | متغیرهای وابسته | | | | | |
|---|---|---|---|---|---|---|
| | D(PHILIPPINES) | D(SINGAPORE) | D(SOUTH_KOREA) | D(SRILANKA) | D(TAIWAN) | D(TEHRAN) |
| D(China) | 0.2506 | 0.5755 | 0.1439 | 0.7676 | 0.0095 | 0.4713 |
| D(Hongkong) | 0.7946 | 0.4215 | 0.869 | 0.3527 | 0.4166 | 0.6274 |
| D(Indonesia) | 0.0037 | 0.3373 | 0.1065 | 0.631 | 0.138 | 0.6722 |
| D(Japan) | 0.2517 | 0.7272 | 0.0011 | 0.8355 | 0.0922 | 0.0758 |
| D(Kuwait) | 0.2692 | 0.5979 | 0.5814 | 0.1687 | 0.9565 | 0.7915 |
| D(Philippines) | * | 0.4729 | 0.5408 | 0.3652 | 0.3429 | 0.3193 |
| D(Singapore) | 0.6651 | * | 0.7651 | 0.9931 | 0.6924 | 0.3213 |
| D(South_Korea) | 0.0007 | 0.284 | * | 0.1407 | 0.1465 | 0.9622 |
| D(Srilanka) | 0.9743 | 0.7286 | 0.4263 | * | 0.9621 | 0.3561 |
| D(Taiwan) | 0.1244 | 0.2092 | 0.4326 | 0.7275 | * | 0.1811 |
| D(Tehran) | 0.0535 | 0.3329 | 0.7869 | 0.6879 | 0.5422 | * |

In this study, HQ index was experimentally sued for the estimate of the vector auto regressive equation due to the more real results of the Granger test and the optimal time lag was considered as one day.

Johansson test: to determine the number of the long term convergence equation, the Johansson cointegration test is used.

**Table 6.** Johansson test

| Hypothesized | | Computed statistic (trace/Eigen) for trends | | 0.05 Critical Value |
|---|---|---|---|---|
| **Computed statistic (trace)** | | | | |
| No. of CE(s) | | Eigenvalue | Trace Statistic | 0.05 Critical Value |
| None * | 1 | 0.12581 | 562.4586 | 285.1425 |
| At most 1 * | 2 | 0.101271 | 409.4459 | 239.2354 |
| At most 2 * | 3 | 0.073779 | 287.937 | 197.3709 |
| At most 3 * | 4 | 0.04363 | 200.7185 | 159.5297 |
| At most 4 * | 5 | 0.037289 | 149.9521 | 125.6154 |
| At most 5 * | 6 | 0.033322 | 106.7061 | 95.75366 |
| At most 6 | 7 | 0.025652 | 68.13998 | 69.81889 |
| At most 7 | 8 | 0.019791 | 38.56649 | 47.85613 |
| At most 8 | 9 | 0.009143 | 15.81903 | 29.79707 |
| At most 9 | 10 | 0.004282 | 5.366322 | 15.49471 |
| At most 10 | 11 | 0.000424 | 0.482861 | 3.841466 |
| Hypothesized | | Computed statistic | | 0.05 Critical Value |
| **Computed statistic (Max-Eigen)** | | | | |
| No. of CE(s) | | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value |
| None * | 1 | 0.12581 | 153.0128 | 70.53513 |
| At most 1 * | 2 | 0.101271 | 121.5088 | 64.50472 |
| At most 2 * | 3 | 0.073779 | 87.21853 | 58.43354 |
| At most 3 | 4 | 0.04363 | 50.76635 | 52.36261 |
| At most 4 | 5 | 0.037289 | 43.24606 | 46.23142 |
| At most 5 | 6 | 0.033322 | 38.56609 | 40.07757 |
| At most 6 | 7 | 0.025652 | 29.57349 | 33.87687 |
| At most 7 | 8 | 0.019791 | 22.74746 | 27.58434 |
| At most 8 | 9 | 0.009143 | 10.45271 | 21.13162 |
| At most 9 | 10 | 0.004282 | 4.88346 | 14.2646 |
| At most 10 | 11 | 0.000424 | 0.482861 | 3.841466 |

## 2. DISCUSSION AND CONCLUSION

Recently, many studies have used cointegration method to examine the long-term relationship between international stock price and integrity of stock market. Taylor and Tonks (1989) provided some evidence to prove the convergence relationships between stock pricesin England, Germany, New Zealand,and Japan. Jeon and Chiang (1991) found a convergence vector in the stock price of 4 main stock exchange markets. Among the five indices of the stock market (America, Canada, Germany, Japan and England), Kasa (1992) obtained 4 convergence vectors. Arshanpalli and Doukas (1993) obtained some evidence of cointegration between the stock price of America, Germany, England, France and Japan.

The present study examined the long term convergence between the stock price index of the stock exchange in Asian countries from 2005 to 2010. It used the Augmented Dicky Fuller test to study the stationary of time series and also used Granger causality  test and Johansson method (that is sensitive to the time lag related to VAR model). To calculate the lag, the indices of Hannan-Quinn and Schwartz were considered.

In this study, the relationship between indices and long term convergence between the stock price indices of Asian countries, that their daily price index was available in the formal stock exchange database of that country, were studied. The results of correlation analysis show that some of these countries have a high correlation and the relationship between these countries is statistically significant. Among these countries, the highest correlation is in China, Hong Kong, Indonesia, Singapore, South Korea and Taiwan. Iran has the lowest correlation coefficient with other countries and its correlation with some countries like China, Japan and Kuwait is hidden. After Iran, Japan, and Kuwait have the lowest correlation with other markets. Thus, it can be concluded that the countries which are geographically closer and have a closer business relationships have a higher correlation between their stock markets. However, correlation coefficient only shows the relationship between countries and the orientation and causal relationship between countries are studied by Granger test. Since the purpose of this study is the long term convergence test, first the vector auto regressive model was estimated and the optimal lag with Hannan-Quinn index was considered as the zero lag.

The results of Johansson cointegration test with statistic Trace index proves the presence of 6 long term convergence equations at 0/05 significance level and 3 long term convergence by max-Eigenvalue method.

The maximum of 11 convergence equations can be obtained from cointegration test and since the change of the order of putting countries in convergence equation changes the matrix elements and the coefficients of convergence equation. Thus, there is the probability of studying 11!=39916800 convergence equations. The best way to determine the estimated coefficient is Granger causality test and the cause and effect relationships between these countries were completely studied according to the Appendix G.

Granger test (1969) answers the question that how can variable x be the cause of variable y and also how can we explain variable y by its past and variable x and its past lags. However, it is very important to say that causality means that x can help variable y to predict the future and coefficients with lag x should be statistically coefficient and the sentence that variable x is the Granger causality of y means that y is not the result or effect of x but only shows the priority and size of information.

In this study, all 11 countries were studied as two by two by some regressions.

$$y_t = \Gamma_o + \Gamma_1 y_{t-1} + .... + \Gamma_1 y_{t-1} + S_1 x_{t-1} + .... + S_1 x_{-1} + V_t$$

$$x_t = \Gamma_o + \Gamma_1 x_{t-1} + .... + \Gamma_1 x_{t-1} + S_1 y_{t-1} + .... + S_1 y_{-1} + u_t$$

The null hypothesis after the first equation as x is not the Granger causality of y and the null hypothesis of the second equation y is not the Granger causality of x.

The last output column of the tables in Appendix G shows the figures of T-statistics test that are known as p-value by which the null hypothesis of Granger test can be rejected or accepted. Through this test, the correct coefficients should be determined and at 0/05 and 0/01 levels, only 6 relationships between these countries are significant as follows. It should be noted that the results of Johansson cointegration test at 0/05 significant level with Trace Statistics index show 6 long term convergence equations and 3 long term convergence equations by Max Eigenvalue.

| متغیر های مستقل | D(CHINA) | D(HONGKONG) | D(INDONESIA) | D(JAPAN) | D(KUWAIT) متغیر های وابسته |
|---|---|---|---|---|---|
| D(CHINA) | * | 0.596 | 0.3651 | (0.0366) | 0.522 |
| D(HONGKONG) | 0.5347 | * | 0.2634 | (0.0073) | 0.319 |
| D(INDONESIA) | 0.8787 | 0.1898 | * | 0 | 0.834 |
| D(JAPAN) | 0.5679 | 0.7755 | 0.3122 | * | 0.985 |
| D(KUWAIT) | 0.3243 | 0.0878 | 0.2943 | 0.457 | - |
| D(PHILIPPINES) | 0.2971 | 0.9679 | 0.07 | 0.1419 | (0.0254) |
| D(SINGAPORE) | 0.793 | 0.3295 | 0.6363 | (0.0086) | 0.893 |
| D(SOUTH_KOREA) | 0.3248 | 0.2442 | 0.7322 | 0.5139 | 0.742 |
| D(SRILANKA) | 0.8156 | 0.6251 | 0.8546 | 0.4278 | 0.558 |
| D(TAIWAN) | 0.0996 | (0.0475) | 0.103 | 0.9664 | 0.489 |
| D(TEHRAN) | 0.1446 | 0.5597 | 0.587 | 0.5397 | 0.483 |

| متغیر های مستقل | D(PHILIPPINES) | D(SINGAPORE) | D(SOUTH_KOREA) | D(SRILANKA) | D(TAIWAN) | D(TEHRAN) متغیر های وابسته |
|---|---|---|---|---|---|---|
| D(China) | 0.2506 | 0.5755 | 0.1439 | 0.7676 | (0.0095) | 0.471 |
| D(Hongkong) | 0.7946 | 0.4215 | 0.869 | 0.3527 | 0.4166 | 0.62 |
| D(Indonesia) | (0.0037) | 0.3373 | 0.1065 | 0.631 | 0.138 | 0.672 |
| D(Japan) | 0.2517 | 0.7272 | (0.0011) | 0.8355 | 0.0922 | 0.07 |
| D(Kuwait) | 0.2692 | 0.5979 | 0.5814 | 0.1687 | 0.9565 | 0.79 |
| D(Philipines) | * | 0.4729 | 0.5408 | 0.3652 | 0.3429 | 0.31 |
| D(Singapore) | 0.6651 | * | 0.7651 | 0.9931 | 0.6924 | 0.32 |
| D(South_Korea) | (0.0007) | 0.284 | * | 0.1407 | 0.1465 | 0.96 |
| D(Srilanka) | 0.9743 | 0.7286 | 0.4263 | * | 0.9621 | 0.35 |
| D(Taiwan) | 0.1244 | 0.2092 | 0.4326 | 0.7275 | * | 0.18 |
| D(Tehran) | 0.0535 | 0.3329 | 0.7869 | 0.6879 | 0.5422 | - |

Thus, the coefficients of the long term convergence equations at 0/05 significant level between the studied countries by Johansson cointegration test can be obtained as follows:

Normalized cointegrating coefficients (standard error in parentheses)

| KUWAIT | CHINA | HONGKONG | INDONESIA | JAPAN | SINGAPORE | SOUTH_KORE A | SRILANKA | TAIWAN | TEHRAN | PHILIPPINES |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.655383 |
| | | | | | | | | | | (3.02876) |

Normalized cointegrating coefficients (standard error in parentheses)

| JAPAN | KUWAIT | PHILIPPINES | SOUTH_KOREA | SRILANKA | TAIWAN | TEHRAN | CHINA | HONGKONG | INDONESIA | SINGAPORE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.5 | 0.286898 | 8.613057 | -9.01 |

Normalized cointegrating coefficients (standard error in parentheses)

| HONGKONG | CHINA | INDONESIA | JAPAN | KUWAIT | PHILIPPINES | SINGAPORE | SOUTH_KOREA | SRILANKA | TEHRAN | TAIWAN |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.53 |

Normalized cointegrating coefficients (standard error in parentheses)

| PHILIPPINES | JAPAN | KUWAIT | HONGKONG | CHINA | SINGAPORE | SRILANKA | TAIWAN | TEHRAN | INDONESIA | SOUTH_KOREA |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | 1.933774 | -0.54 |
| | | | | | | | | (0.05930) | (0.46250) | (0.07614) |

Normalized cointegrating coefficients (standard error in parentheses)

| SOUTH_KOREA | CHINA | HONGKONG | INDONESIA | KUWAIT | PHILIPPINES | SINGAPORE | SRILANKA | TAIWAN | TEHRAN | JAPAN |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.46 |

Normalized cointegrating coefficients (standard error in parentheses)

| TAIWAN | HONGKONG | INDONESIA | JAPAN | KUWAIT | PHILIPPINES | SINGAPORE | SOUTH_KOREA | SRILANKA | TEHRAN | CHINA |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.429355 |

**Suggestions**

According to the research results of Taiwan, Honk Kong, Japan, Indonesia, Singapore, Kuwait and Philippine that is convergent and investors can use the results of this study in investing and predicting the stock prices. This study can be also useful for the investors who invest in other Asian stock exchanges. It is suggested to study the political and economic validity and eliminate its effect on the index as much as possible in order to increase the accuracy of convergence relationships at the time of studying the trend of sudden changes in the index.

It is suggested to use time varying vitality and causality in variance methods to prove and study the rate of accuracy used in this study.

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