The Preparation towards Asean Exchange Link between Malaysia Stock Market and Asia Countries Macroeconomics Variables Interdependency

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Abstract

When Asean countries discuss the Asean Exchage link , this includes the initiatives to assess and rank ASEAN public listed companies against international corporate governance standards, harmonized standards relating to disclosure for cross-border offerings, facilitate cross-border offerings of products and the establishment of the ASEAN Exchange link. With this development, we try to investigate the interaction between stock prices and macroeconomic variables in Asia countries (Malaysia, Indonesia, Thailand, Singapore, China, India, South Korea, Japan and Taiwan) with reference to the United States market as a benchmark to view the sensitivity and the interdependacy of our stock market to other Asia countries macroeconomics variables. The methodology used are cointegration, Vector Error Correction Model (VECM), and Sensitivity Analysis to determine the interactions between variables. The data is quarterly data for the period of January 1990 to December 2007. Our findings show that Malaysian stock market is more integrated with other Asia Countries economics variables after the financial crisis 1997. This situation arise because of more economics project cooperation and merger between Asia countries companies to strengthen the business foundations. However, too much independent will jeopardise our stock market from speculation activities, to reduce this risk we use sensitivity analysis to test the level of sensitiveness of the variables testes to our stock market and found out that only stock price and exchange rate of other Asia Countries have the most impact to our stock markets.

Key words: stock price, cointegration, vecm, sensitivity analysis

1. Introduction

To ensure more intergrate market in Asean and to combat speculation, the ASEAN Infrastructure Fund was created to catalyse economic integration and progress ASEAN Connectivity objectives with a target size of US$800million in support of infrastructure projects. Todate, ASEAN states have pledged US$335 million to the fund. Private sector participation and involvement in the ASEAN economic integration agenda is critical for sustainable and inclusive growth in the region. Clearly, ASEAN is now a business formula that is open to all market players and private investors who are encouraged to optimise the opportunities and leverage off the very facilitative regulatory framework. (Securities Commission, Press release)To achieve this agenda we have to examine the interaction of selected Asia Countries macroecomics variables to our stock market such as GDP, Consumer Price Index (CPI), money supply, interest rate, exchange rate and oil prices to the stock prices in nine Asia countries namely Malaysia, Indonesia, Thailand, Singapore, China, India, South Korea, Japan and Taiwan and the United States as our benchmark. There are two areas of research understand the causes and consequences of short-run fluctuations in national income (the business cycle), and second to understand the determinants of long-run economic growth (increases in national income). In macroeconomic models, the long run assumes full factor mobility between economic sectors, and often assumes full capital mobility between nations.

2. Literature Reviews

This section reviews and summarizes the empirical works related to the subject of this research with the view to providing further insight based stock market volatility and macroeconomic interactions in Asia. Earlier studies on the U.S. markets by various researchers, for example, Working (1934), Cowles and Jones (1937), Kendall (1953), Roberts (1959), Osborne (1959), Alexander (1961), Cootner (1965), Fama (1965a), Samuelson (1965), Mandelbrot (1966), and Brealey (1969) showed that the U.S. market returns follow the random walk model. Fama (1965b) analyzed the distribution on a large data set of 30 stocks of the Dow Jones Industrial Average during the period 1957-1962. He shows that empirical evidence seems to confirm the random walk hypothesis: a series of price changes has no memory, i.e. the past cannot be used to predict the future in any meaningful way. The main theoretical explanation that lies behind this observation is the Efficient Market Hypothesis (EMH). The main idea is, if a statistically significant serial dependence exists within a time series of financial security prices, the community of financial analysts will immediately exploit it.

Security prices can therefore be only explained by the arrival of new information, which, by definition, cannot be forecasted. After 1970, most academics had convinced themselves that there were no exploitable patterns in stock price time series, and little further work was published. Chin and Isa (2007) evaluated the most restrictive IID random walk under the conditions of drift and structural break. They implemented the runs and sequences-reversals tests to examine the presence of IID increments for nine Malaysian stock exchanges. With the inclusion of drift and structural break, the empirical results evidenced IID random walk processes in all the indices. Other study by Mukherjee and Naka (1995) employed the vector error correction model to examine the relationship between monthly stock market returns and macroeconomic variables in Japan. They find that the stock market is indeed cointegrated with a number of macroeconomic variables, although they find an ambiguous relationship between the stock market and interest rates. According to Poterba and Summers (1986) a significant impact of volatility on the stock prices can only take place if shocks to volatility persist over a long time. The stock prices are not affected by the volatility movement if shocks to volatility are transitory. Malkiel (1979) and Pindyck (1984) employed that the increase in the variance of the real gross marginal return on capital, assert that the upward trend in the US volatility has been the major reason behind the decline in the US stock prices to the increase in the relative riskiness of the investor's net real return.

On October 19, 1987 major stock market indices fell by a dramatic amount; for example the US' S&P 500 index fell over 20 percent and the Dow Jones Industrial average fell over 22 percent. According to Schwert (1990) and Engle and Mustafa (1992) stock volatility increased extensively after the crash; however, according to Engle and Mustafa the persistence of shocks to volatility was much weaker after the 1987 crash. The effect of macroeconomic variables investigated by Poon and Taylor (1991) are similar to those of Chen et al. (1986) on the U.K. stock market and conclude that the interrelationship between the macroeconomic variables and the stock prices in the U.K. are different from those of the U.S. as described by Chen et al. (1986).Cheng (1995) also analyzes U.K. stock price returns and macroeconomic factors by using canonical correlation analysis. The results indicate that the U.K. security returns are significantly influenced by a number of systematic economic factors. This finding is in-line with Chen et al. (1986), but contradicts that of Poon and Taylor (1991). Praphan Wongbangpo, Subhash C. Sharma (2002) investigate the interdependence between stock markets and fundamental macroeconomic factors in the ASEAN-5 countries, i.e., Indonesia, Malaysia, Philippines, Singapore and Thailand.

They examine the existence of long and short run relationships between stock price index and a set of selected macroeconomic variables: GNP, consumer price index, the money supply, the interest rate, and the exchange rate, from 1985 to 1996. Detection of interrelationships between stock markets and macroeconomic variables hold implications for investors, as well as for policy makers. The short run analysis reveals fundamental functions of stock markets in recognizing changes in economic conditions, or in signalling the future performance of the macroeconomic. They find that ASEAN economies are likely to hold implications for other small emerging economies.Hamilton (1983), among many others, has documented a negative and significant relation between oil price changes and future GDP growth. This result, however, breaks down in data after 1986. The unstable relation possibly reflects that Hamilton has implicitly assumed a symmetric effect of oil shocks in his linear specification: An increase (decrease) in oil prices reduces (increases) future GDP growth. Based on the above studies and findings we tried to re-visit the relationship between stock prices and macroeconomics variables with more variables and bigger markets to detect the possible pattern and to see whether stock markets prices pattern can be exploited and support technical analysis opponent.

3. Data Collection and Methodology

The data set consists of daily stock indices between 1990 and 2007. We considered a number of other variables to be potentially relevant for forecasting stock market volatility in the real-time macroeconomic data. The main source used to collect the data is DataStream. Our lists of variables are the following Gross Domestic Product (GDP), the Consumer Price Index (CPI), the money supply (MS), the interest rate (IR), the exchange rate (ER) on the stock prices (SP) and also the oil prices (OG) in nine ASEAN countries (Malaysia (MY), China (CH), India (IN), Japan (JP), Korea (KO), Singapore (SP), Taiwan (TW) and Thailand (TH)) and also United States (US). Data collected from this survey analyzed using E-Views and @Risk. As this survey looks the cointegration between the various indices overtime, time series analysis is most suited for this purpose. We use quarterly data series for the period of 17 years from 1990 to 2007. The data divided into three sub periods as follows:

i) The pre-crash period: 1990 to 1996 (28 observations).
ii) The post-crash period: 1998 to 2007 (40 observations).

For the long term analysis, the data will cover a whole period from the start of pre-crash period to the post-crash period.

4. Methodology

This involves determining the order of the model required to capture the dynamic features of the data. Graphical procedures are used to display the pattern of stock prices for all the countries tested and Augmented Dickey Fuller (ADF) Test is used to confirm the non-stationary behaviour.

4.1 Johansen's Cointegration Test: The basic idea of cointegration is that the two series move closely together in the long run, even though the series themselves are trended, and the difference between them is constant. We estimate the dynamic error correction model by using trace test or Maximum Eigen value Test (Lambda-max test).

4.2 Vector Error Correction Model: VECM is used to analyze the interactions between the stock markets and macroeconomic variables for selected Asia country. This method is used to investigate the lead lag relationship among the variables tested for selected Asia country. From this investigation, we can used to forecast the movements of the variables tested.The system of the short run dynamic of the stock price series can be written as:

$$\Delta SP_t = \alpha_t + \beta_1 EC_{t-1} + \sum_{i=1}^{K} \delta_{1i} \Delta SP_{t-i} + \sum_{i=1}^{K} \theta_{1i} \Delta CPI_{t-i} + \sum_{i=1}^{K} \xi_{1i} \Delta GDP_{t-i} + \sum_{i=1}^{K} \rho_{1i} \Delta MS_{t-i}$$

$$\sum_{i=1}^{K} \omega_{1i} \Delta ER_{t-i} + \sum_{i=1}^{K} \tau_{1i} \Delta IR_{t-i} + \sum_{i=1}^{K} \vartheta_{1i} \Delta OG_{t-i} + \varepsilon_t SP$$

Error correction mechanisms are useful for representing the short run relationships between variables.In the Error Correction Test the significant long run causal market will be identified form their dependent market.

4.3 Sensitivity Analysis: The sensitivity analysis is used to determine which inputs significantly affect the output. This analysis will bring changes in various items in the analysis of financial statements or the projects which in turn might lead to different conclusions regarding the implementation of projects. In general, Sensitivity Analysis is performed jointly by executing the model repeatedly for combination of factor values sampled with some probability distribution. The following steps can be listed:

1. Specify the target function and select the input of interest
2. Assign a probability density function to the selected factors
3. Evaluate the model and compute the distribution of the target function
4. Select Sensitivity Analysis for assessing the influence or relative importance of each input factor on the target function.

We need to recognize that the target function in the normal distribution is the familiar bell-shaped curve defined by two parameters: the mean and the standard deviation. We develop model for a portfolio of stocks with correlated prices and show how to evaluate the return for such a portfolio and compare the return to a portfolio with independent asset values. The Best Fit (part of @RISK) can be used to find the distribution that best fits the data.

5. Analysis

5.1 Graphical Plot: From the following time series plot we can detect whether there is trend or seasonal movement, mean changes over time and variance not constant over time which is the presence of the non-stationary series. From this plot we apply unit root test to see if the time series plot shows any pattern of non-stationary.

Table1: Non-stationary plot of stock price

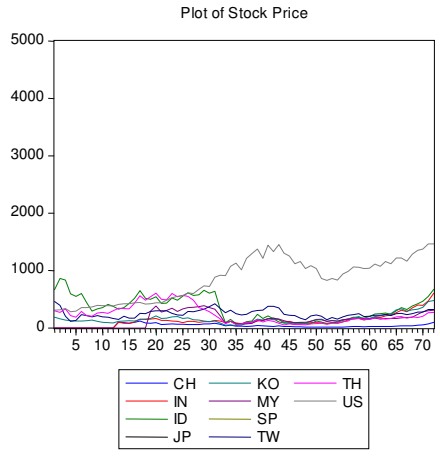

Figure 5.1: Plot of Stock Price

From the above time series plots, we can conclude that all of the series are non-stationary since all the plots show the mean wanders, and the variance (or standard deviation) is not reasonably constant over time. Trends, or other non-stationary patterns in the level of a series, result in positive autocorrelations that dominate the autocorrelation diagram.

5.2: The Augmented Dickey Fuller Test: The Augmented Dickey Fuller Test used to detect and eliminate the non-stationary series by differentiated the series once to make it stationary. The results are shown in the Table 2.

Table 2: The Augmented Dickey Fuller Test Result for Stock Prices

SP	CH	IN	ID	JP	KO	MY	SP	TW	TH	US
LEVEL										
ADF	-1.998297	-3.471745	-1.668492	-2.901879	-1.413982	-1.678726	-0.72211	-3.830525	-1.337554	-0.675568
CV	-2.902953	-2.902953	-2.902953	-2.902953	-2.902953	-2.902953	-2.902953	-2.902953	-2.902953	-2.902953
1ST DIFF										
ADF	-8.883701	-5.773826	-7.430638	-9.353332	-7.591803	-6.985525	-7.225273	-6.776077	-8.668105	-10.84146
CV	-2.903566	-2.903566	-2.903566	-2.903566	-2.903566	-2.903566	-2.903566	-2.903566	-2.903566	-2.903566

ADF: Augmented Dickey Fuller Test Statistic
CV : Critical value at 5% significant level
Blue:prob≈0.0001

From all the series in the unit root test we can conclude that the series become stationary after we difference once.

5.3: Johansen's Cointegration Test: Johansen's Cointegration Test is used to detect if the two series move closely together in the long run and in testing hypothesis concerning the relationship between two variables having unit roots, i.e. integrated of at least order one. To show that at least one cointegrating exists in the pair variable, the value of maximum Eigen value must be more than the critical value. Table 3(a), (b), (c) display the results for cointegrations test for pre crisis period between Malaysia stock price and other macroeconomics variables of Asia Countries.

Table 3(a): Cointegration of Malaysian Stock Price and Macroeconomics Variables in Asia (Pre-Crisis Period)

	SP	CPI	GDP	MS	ER	IR
CH	NO	YES	NO	NO	NO	NO
IN	YES	NO	NO	NO	NO	YES
ID	NO	NO	NO	YES	YES	NO
JP	YES	YES	YES	NO	YES	YES
KO	YES	YES	YES	NO	NO	NO
MY	-	YES	YES	NO	YES	YES
SP	YES	NO	YES	NO	YES	NO
TW	NO	NO	YES	YES	YES	NO
TH	NO	NO	YES	NO	NO	NO
US	NO	YES	YES	NO	YES	YES

Table 3(b): Cointegration of Malaysian Stock Price and Macroeconomics Variables in Asia (Post-Crisis Period)

	SP	CPI	GDP	MS	ER	IR
CH	YES	YES	YES	NO	YES	NO
IN	YES	NO	NO	YES	YES	YES
ID	YES	NO	NO	YES	YES	YES
JP	YES	YES	NO	NO	YES	YES
KO	YES	YES	YES	NO	YES	NO
MY	-	YES	YES	NO	YES	NO
SP	YES	YES	YES	NO	NO	NO
TW	YES	NO	NO	NO	NO	NO
TH	YES	NO	YES	NO	YES	NO
US	YES	NO	YES	NO	YES	YES

Notes: Dependent (Malaysian stock price), independent variable (Asia Countries macroeconomics Variables)

As display by table 3(a) and (b), we conclude that the test for Malaysian stock price and Asia macroeconomic variables are significant for some of the markets before the crisis and significant for almost all of the markets during the post-crisis. This proves financial markets are more integrated and predictable and less volatile after the crisis. We also can see that stock price in Malaysia follows and integrates with all the tested countries CPI and GDP. These conditions support that the development of Asia countries will give impact to certain level to the development of our stock markets. Furthermore US GDP and CPI also influence our stock price movement. One of the reasons for this dependent is because of the tightening of the regulation and merger after the crisis to strengthen our financial market. In the environment with regulations of interest rates and lending volumes, banking became a protected industry whose general profitability was in fact a government responsibility. Before and during the economic crisis on 1997 there is no cointegration since all markets at this time do not stable and the main focus of financial institutions and other economic entities was more focus on saving.

5.4 Vector Error Correction

To analyze the short term and lead-lag relationship between Malaysian stock markets and macroeconomic variables for selected Asia country we used VECM. The investigation whether there is uni-directional or bi-directional also important in this method. There is uni-directional when the variables or the series only significant during the pre-crisis period, however, there is a bi-directional causality runs between the pre-crisis period and the post crisis period when the variables or the series have lead relationship for both period.The Vector Error Correction Model (VECM) is a model designed for use with a non-stationary series (which is determined earlier in the Unit Root Test) that are known to be cointegrated. From the pairs that cointegrated, we identify the independent market that significantly affect (95% confidence level) that particular dependent market. Results from pairs that do not cointegrate from Johansen's Cointegration Test are ignored (the blackened out in table below). The summary result of Vector Error Correction (VEC) Test is shown in Table 4 (a) and (b).

Table 4(a): Lead-Lag relationship between Malaysian Stock Market and Asia macroeconomic variables. (Pre Crisis)

	SP	CPI	GDP	MS	ER	IR
CH						
IN						
ID						
JP			YES			YES
KO			YES		YES	YES
MY	YES*	YES	YES*			YES*
SP			YES		YES	
TW			YES			
TH			YES		YES	
US			YES		YES	YES

Table 4(b): Lead-Lag relationship between Malaysian Stock Market and Asia macroeconomic variables. (Post Crisis)

	SP	CPI	GDP	MS	ER	IR
CH	YES	YES	YES		YES	
IN	YES*				YES	
ID					YES	
JP	YES		YES			YES
KO			YES		YES	
MY	YES*	YES	YES*			YES*
SP	YES*	YES				
TW					YES	
TH	YES*	YES	YES		YES	
US	YES		YES	YES		YES

Notes: YES: Significant to the dependent variable (independent variables lead the dependent variable) at 5% significance level.
YES*: Significant to the dependent variable at 5% significance level and represent the bi-directional relationship.

As display by table 4 (a) and (b) which tested the lead-lag relationship between Malaysian Stock prices and selected Asia countries macroeconomic variables, we can conclude that during pre crisis period only GDP from Japan, Korea, Singapore, Taiwan, Thailand and US Markets lead our stock price without feedback. This shows that our stock prices are prone to follow the development of our neighbor economics. However, this relationship is more spreadable to other macroeconomics variables dependence after the crisis as this is a normal feature for more integrated economics.

This finding also proven that Malaysia stock markets are not efficient and do not follow random walk. This will make technical analysis more active in predicting our stock price. The interdependency among our neighbor stock prices also has increased in the post crisis period as the result shown bi-directional relationship.

5.5 Sensitivity Analysis

The sensitivity analysis applied in this study to compare with the previous method that to find which explanatory variables are relates to the dependent variables. In this analysis, the explanatory variables refer as input that we used and the dependent variable is output. For this study, the inputs are stock prices for China, India, Indonesia, Japan, Korea, Singapore, Taiwan, Thailand and United States, while the output is Malaysia stock price. The distribution of output is shown in Figure 5.5.1 and the Tornado graph of the output when stock price tested shows in Figure 5.5.2 as below:

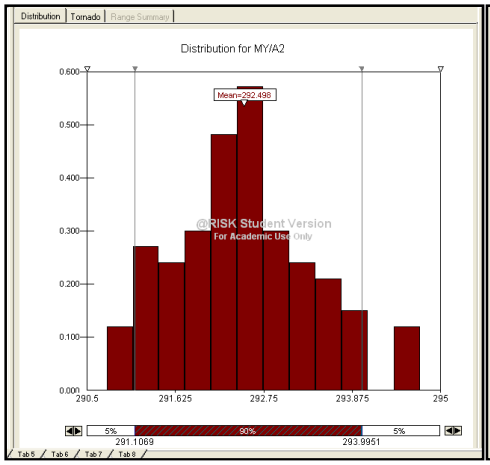

Figure 5.5.1: Distribution of Output

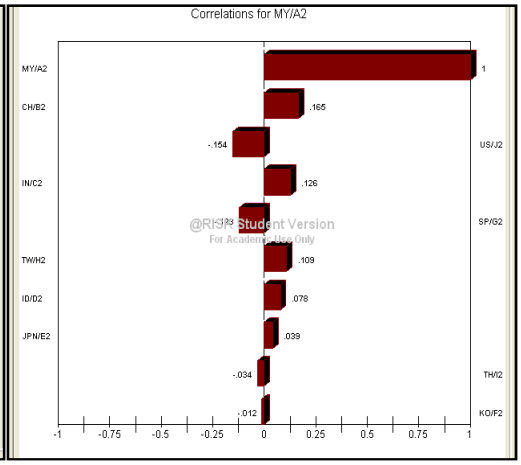

Figure 5.5.2: Tornado Graph of Output

The tornado graph in Figure 5.5.2 shows the correlation between the China, India, Indonesia, Japan, Korea, Singapore, Taiwan, Thailand and United States stock price and also Malaysia stock price. From the tornado graph, we can conclude that China stock price has more significant effect than the other markets since the value of this sensitivity is the highest. This is because China has become the most larget and active stock market is Asia. The Tornado graph already arrange that the best influence is arrange at the top of the graph.

The Figure 5.5.3 below shows the tornado graph for the exchange rate:

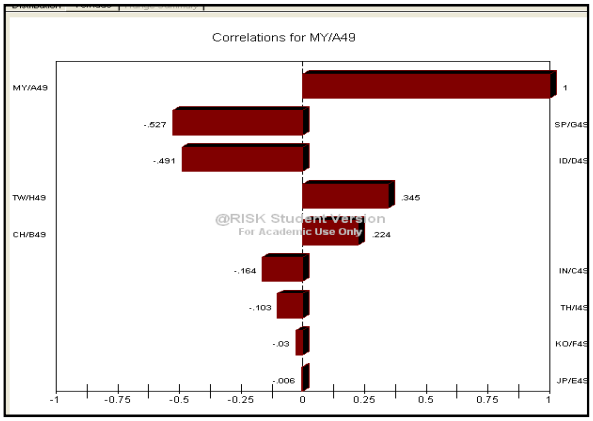

Figure 3 Tornado Graph of Output

From this tornado graph, we can conclude that Singapore exchange rate market have significant effect to Malaysia stock price variable. Japan is the bottom of the graph, and can conclude that the market is very independent with Malaysia stock price . Since the U.S not display in this graph, so the U.S market is not significant to Malaysia exchange rate market or has little impact. Other variables have been tested but no concluded results as the tornado graphs do not shows any significant effect.

6. Conclusions

This research explores the long and short run relationship between the stock markets and macroeconomic variables such as CPI, GDP, money supply, exchange rate, interest rate and oil gas price for Asia markets such as China, India, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan, Thailand and the United States.

Some of the markets such as India, Korea, Malaysia, Singapore and Taiwan markets do seem to have financial market linkages among the market analyzed. These linkages are tested by using cointegration, vector error correction model, and sensitivity analysis. In particular, it was shown that Malaysian stock market is considered become more internationally integrated with other Asia countries macroeconomics variables after the crisis. This is because of the tighten regulation and merger. A tighten of the regulation needs because bank crisis will tend to focus regulators' minds and lead to stricter regulations and also cycles in regulation tend to interact with the economic cycle, in the sense that the rationale for strong regulation tends to become somewhat blurred during upturns. Merger need to combine the profit.

Although economics integration is good to certain level, too much dependant also is not good as small changes in Asia Countries macroeconomics variables will affect our stock markets. To confirm and to test this dependency we use sensitivity analysis to see the degree of sensitivity of our stock prices compare to other Asia countries stock prices. According to sensitivity analysis, only stock price and exchange rate variable have relationship between the output and the input. The output that we use is Malaysia stock price and inputs are China, India, Indonesia, Japan, Korea, Singapore, Taiwan, Thailand and the United State stock prices and exchange rates. Our investigation shows that the Malaysia stock market is sensitive for the changes from China stock market and Singapore exchange rate. This analysis is more sensitive when we compared to another method because the result that we get is only a few variables have effect to the output. For the country to country perspective, there are no relationships we can obtain.

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