# STOCK MARKET LIBERALIZATION, RETURNS AND INTEGRATION IN ASIA

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FACULTY OF BUSINESS AND ACCOUNTANCY

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ABSTRAK

Pihak berkuasa kerajaan dan pembuat dasar bagi empat negara Asia, khususnya Malaysia, Thailand, Indonesia dan Korea Selatan, telah terus memperkenalkan dan melaksanakan dasar-dasar liberalisasi pasaran saham selepas pelaksanaan rasmi liberalisasi pertama. Liberalisasi pasaran saham rasmi pertama bagi negara-negara Asia yang terjejas teruk oleh krisis kewangan Asia - 1997, telah dikuatkuasakan pada lewat 1980-an atau awal 1990-an. Malaysia, Thailand, Indonesia dan Korea Selatan, memutuskan untuk terus meliberalisasikan pasaran saham mereka kepada pelabur-pelabur asing dengan meningkatkan peratusan pemilikan asing dalam ekuiti tempatan. Tesis ini bertujuan untuk menentukan samada peningkatan dalam peratusan pemilikan asing dalam ekuiti tempatan, dapat memberi kesan ke atas pulangan pasaran saham bagi keempat-empat negara Asia. Di samping itu, tahap integrasi pasaran saham di antara empat negara Asia dan dunia (Indeks MSCI-Dunia) selepas perlaksanaan beberapa dasar liberalisasi lanjutan juga disiasat. Liberalisasi lanjutan pasaran saham yang dianalisa dalam tesis ini bermula dari tahun 1997, permulaan krisis kewangan Asia, hingga ke tahun 2009, tahun krisis gadai janji Amerika Syarikat.

Bagi mengkaji kesan-kesan liberalisasi pasaran saham terhadap pulangan pasaran saham, analisis multivariat *ordinary least square* regresi digunakan, dengan mengawal kesan-kesan ciri-ciri pasaran saham dan asas-asas makroekonomi. Pulangan pasaran saham bagi empat negara diukur berdasarkan indeks saham utama negara dan indeks saham sektor. Bagi mengawal kesan-kesan ciri-ciri pasaran saham dan asas-asas makroekonomi, saiz, kecairan dan volatiliti pasaran saham digunakan sebagai proksi kepada ciri-ciri pasaran saham, manakala proksi kepada asas-asas makroekonomi termasuk kadar pertukaran matawang asing, kadar faedah dan harga minyak. Kajian ini juga mengaplikasikan *coefficient correlation*, analisis regresi, ujian kointegrasi dan model vektor autoregresif (VAR) untuk

menguji tahap integrasi pasaran saham dalam jangka pendek dan jangka panjang, antara empat negara-negara Asia dan pasaran dunia.

Hasil kajian empirikal tesis ini mengurangkan keyakinan mengenai signifikannya liberalisasi lanjutan pasaran saham dalam meningkatkan pulangan pasaran saham. Tesis ini, bagaimanapun, tidak bersetuju dengan pernyataan bahawa liberalisasi lanjutan pasaran saham adalah tidak berkesan dalam mempengaruhi pulangan pasaran saham. Sebagai pembolehubah yang dikawal, kedua-dua ciri-ciri pasaran saham dan asas makroekonomi mempunyai kekurangan sokongan bagi meneguhkan keputusan bahawa kedua-dua pembolehubah mempunyai kesan ke atas pulangan pasaran saham. Keputusan bagi ujian integrasi mendapati bahawa pasaran saham bagi empat negara Asia dan dunia berintegrasi bagi jangka pendek tetapi mempunyai bukti yang lemah bagi integrasi jangka panjang.

Secara ringkasnya, tesis ini memberi tumpuan kepada kesan liberalisasi lanjutan pasaran saham yang dilaksanakan dari tahun 1997, yang membezakannya daripada sastera sebelum ini yang kebanyakannya menganalisa mengenai liberalisasi rasmi pasaran saham yang pertama. Penemuan empirikal dari tesis ini akan dapat membantu pembuat dasar dalam menentukan strategi masa depan berkaitan dengan liberalisasi, sama ada liberalisasi atau peraturan yang lebih ketat yang patut dilaksanakan. Penemuan ini dapat membantu pelabur-pelabur antarabangsa untuk membuat pilihan yang betul dalam peruntukan dan pembahagian aset. Pemegang-pemegang saham syarikat dan orang ramai juga dapat meramal kesan dasar liberalisasi pasaran saham pada masa hadapan.

ABSTRACT

The government authorities and policy makers of four Asian countries, specifically, Malaysia, Thailand, Indonesia and South Korea, have been continuously introducing and implementing stock market liberalization policies subsequent to its first official implementation. The first official stock market liberalizations of those badly affected Asian countries by the 1997 Asian financial crisis, were enforced in late 1980s or early 1990s. Malaysia, Thailand, Indonesia and South Korea, decided to continuously liberalize their stock markets to the foreign investors by increasing the percentage of foreign ownership in local equities. This work aims to determine whether an increase in the percentage of foreign ownership in local equities, would provide any impact on stock market returns of those four Asian countries. The level of stock market integration post liberalizations between the Asian countries and the world (MSCI-World Index) are also investigated The subsequent stock market liberalization considered in this work is from 1997, the start of the Asian financial crisis, to 2009, the year of the U.S. subprime mortgage crisis..

To examine the impact of stock market liberalizations on its returns, multivariate ordinary least square regression analyses are utilized, with controlling for the effects of stock market characteristics and macroeconomic fundamentals. The four countries stock market returns are measured based on countries' main and sector stock indices. Controlling for the effects of stock market characteristics and macroeconomic fundamentals, stock market size, liquidity and volatility are used as proxies to stock market characteristics, while the proxies for macroeconomic fundamentals include exchange rates, interest rates and oil prices. This study also applies coefficient correlation, regression analyses, cointegration tests, and vector autoregressive models (VAR) to test the degree of stock market integration in the

short-run and long-run, between the four Asian countries and the world market (MSCI World index).

The empirical findings from this work reduce the confidence that subsequent stock market liberalizations would significantly improve the stock market returns. This work, however, does not agree that subsequent stock market liberalization is ineffective in affecting stock market returns. As controlled variables, both stock market characteristics and macroeconomic fundamentals have lack of support for the robustness of the results on the significant impact of the variables on stock market returns. There is weak evidence of long-run stock market integration for the four countries and the world market. However, results reveal that there is short run integration.

In summary, this work focuses on the impact of subsequent liberalization of the stock market implemented from 1997 onwards, which distinguishes it from previously available literature, mostly concerning the first official stock market liberalization. Empirical findings from this work would assist policy makers in determining future strategies on liberalization, whether should there be greater liberalization or greater regulation to be implemented. This would enable international portfolio investors to make proper assets allocation choices. The firms' shareholders and the public would also be able to forecast the effects of future stock market liberalization policies.

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| | |
|---|---|
| ADR | American Depository Receipt |
| AFMM | ASEAN Finance Ministers Meeting |
| ASEAN | The Association of Southeast Asian Nations |
| BM | Bursa Malaysia |
| CAPM | Capital Asset Pricing Model |
| CMI | Chiang Mai Initiatives |
| EU | European Union |
| FTSE | Financial Times Stock Exchange |
| G-20 | Group of twenty major economies |
| GDP | Gross Domestic Product |
| IAPM | International Asset Pricing Model |
| IMF | International Monetary Fund |
| JCI-IDX | Jakarta Composite Index – Indonesia Stock Exchange |
| KLCI | Kuala Lumpur Composite Index |
| KOSPI | Korean Composite Stock Price Index |
| MSCI | Morgan Stanley Capital International |
| NAFTA | North American Free Trade Agreement |
| RIA-Fin | Roadmap for Monetary and Financial Integration of ASEAN |
| SET | Stock Exchange of Thailand |
| US | The United States |

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# 1. INTRODUCTION

## *1.1* Background of the Research

The Asian financial crisis of 1997-1998 proved to be devastating to the foreign exchange and financial markets of the Asian region, and it had a lasting impact on their respective economic systems. The crisis created awareness for the Asian nations that the region needed to maintain financial stability with a strong and stable equity markets. The progress of the European Union (EU), North American Free Trade Agreement (NAFTA), and the deepening of the market-driven economic integration, also contributed to the need for the regional Asian countries to create economic and political balance with the developed economies of EU and NAFTA.[1]

In order to promote financial stability, to strengthen and stabilize the equity market, and to create an economic and political balance with EU and NAFTA, Asian countries need to strengthen their monetary and financial cooperation.[2] A strong and stable financial system would mobilize savings, assets, and resources at lower transaction costs and provide efficient medium and long-term capital to the money and

1 Kawai, Masahiro (2005). Asian Economic Integration: progress, challenges and opportunities. *Asian Economies Speaker Series*, Vancouver, Canada, October 13.

2 Kuroda, Haruhiko (2002). "Can Asia be economically integrated?" *World Leader Forum*. New York, U.S.A. 2 October.

capital markets.[3] The strengthening of regional financial cooperation, thus regional financial integration, would balance out the greater integration of global financial markets. If Malaysia and its neighboring countries, or more specifically, ASEAN (The Association of Southeast Asian Nations), manage to combine their efforts in strengthening their respective financial markets to drive their respective economies, it would be much easier for these countries to cooperate financially, and integrate effectively.[4] ASEAN was established on August 8, 1967 and comprised of ten countries, namely Malaysia, Brunei, Indonesia, Philippines, Thailand, Singapore, Cambodia, Laos, Myanmar, and Vietnam.

Regional cross-border activities need to be drastically improved in order to strengthen financial cooperation and integrate capital markets within the region. This can be achieved via three main approaches: (a) a transactions platform, (b) a mutual agreement on the common standards and principles, and (c) removal of legal or informal restrictions.[5] The third approach is the main focus of this work, which involves the government's decision in removing legal or informal restrictions on capital inflows and outflows (Henry, 2000a), aptly called stock market liberalization.

Before the Asian financial crisis of 1997-1998, a number of Asian countries, such as Malaysia, Thailand, Indonesia, the Philippines and South Korea, had their first official liberalization of international capital flows, in late 1980s or early 1990s. Table 1.1 shows the dates of official liberalization, the first American Depository Receipt (ADR) issuance and the first country fund in the four Asian countries which were

3 Kuroda, Haruhiko (2002). "How to strengthen banks and develop capital markets in post-crisis Asia". Financial Conference, Tokyo, Japan, 6 June. (Vice Minister of Finance for International Affairs, Japan)

4 Kuroda, H (2002). "How to strengthen banks and develop capital markets in post-crisis Asia". Financial Conference, Tokyo, Japan, 6 June. (Vice Minister of Finance for International Affairs, Japan)

5 Sheng, Andrew (2006). Asian financial integration: next steps. *Public Lecture*, Tun Ismail Ali Chair, Faculty of Economics and Administration. University Malaya, Kuala Lumpur.

obtained from Bekaert, Harvey and Lundblad (2003) report. These policies resulted in large inflows of unhedged, short-term foreign capital that finance long-term domestic lending.[6] Previous studies claim that those initial liberalization of stock markets managed to improve their stock returns and performances (Tai, 2007; Boubakri, Cosset, & Guedhami, 2005; Patro, 2005; Henry, 2000a), strengthen the financial markets (Naceur, Ghazouani, & Omran, 2008), and increase the level of financial cooperation, and stock market integration (Tai, 2007; Baharumshah, Sarmidi, & Hui, 2003; Ragunathan, 1999; Levine & Zervos, 1998).

**Table 1.1: Equity Market Opening in Asian Countries**

| Country | Official liberalization date | First ADR introduction | First country fund |
|---|---|---|---|
| Indonesia | 09/89 | 04/91 | 01/89 |
| Korea | 01/92 | 11/90 | 08/84 |
| Malaysia | 12/88 | 08/92 | 12/87 |
| Thailand | 09/87 | 01/91 | 07/85 |

The 1997 Asian financial crisis started with countries failing to protect their local exchange rates from further depreciation due to the lack of their respective United States (US) dollar reserves. The exchange rates had to be left floating which results in sharp depreciation of Thai Bhat by 75%, Malaysian Ringgit by 83%, Korean Won by 96% and Indonesian Rupiah by 420% by January 1998. Once the exchange rate was no longer in control, these countries experienced massive outflows of capital and an excessive mismatch of currency and maturity.[7] Many sectors and industries in the countries being affected experienced a period of higher production costs due to higher import prices, and higher debt payment due to bonds being issued in US dollars. This automatically affected the performance of each country's stock market, which caused

6 Kuroda, H. "How to strengthen banks and develop capital markets in post-crisis Asia".

7 Kuroda, H (2002). "How to strengthen banks and develop capital markets in post-crisis Asia". Financial Conference, Tokyo, Japan, 6 June. (Vice Minister of Finance for International Affairs, Japan)

their main indices to drop tremendously, driving up inflation, and sharply reducing the gross domestic product, which led to economic recession.

The crisis exposed major weaknesses in the regional financial systems. It has been claimed that imprudent risk management in the financial sector, lack of effective regulatory and supervisory framework, inadequate corporate governance, over-dependence on banks, and underdeveloped capital markets have all contributed to the crisis.[8] It has, however, been claimed that the first official liberalizations in late 1980s and early 1990s in Asia were pushed and adapted too fast for the existing economic system (Stiglitz, 2004). These claims seem to indicate that the first official liberalization was unable to strengthen the stock markets in the long-run, and the region failed to maintain its regional financial stability.

In order to address and curb this problem, the authorities in each country came up with a number of financial and reform policies that helped them recover from the crisis and upgrade their respective performances. This included asking for monetary aid from the International Monetary Fund (IMF) by Indonesia, Thailand and South Korea, implementing capital control, pegging the exchange rate by Malaysia, and implementing subsequent stock market liberalization by all the four countries.

Asian countries continue to implement other stock market liberalization, subsequent to the first official liberalization policy decree, despite the Asian financial crisis. Due to the sharp decrease in the performance of the stock market during the financial crisis, it is believed that subsequent stock market liberalization would reduce the negative impact of the crisis and enhance stock market performances of individual

8 Kuroda, H (2002). "How to strengthen banks and develop capital markets in post-crisis Asia". Financial Conference, Tokyo, Japan, 6 June. (Vice Minister of Finance for International Affairs, Japan)

countries.[9] The subsequent stock market liberalization is defined in this thesis as an increase in the degree of openness in terms of issuance of local share capital and voting stock to foreign investors. The detailed information on the implementation dates of subsequent stock market liberalization, the degree of openness of foreign ownership, and the affected sectors are portrayed in Table 1.2.

Table 1.2: Subsequent Stock Market Liberalization: Dates and Sectors

| Country | Date | degree of openness of foreign ownership | Sectoral Indices |
|---|---|---|---|
| Malaysia | 3 Apr, 1998 | 49% to 61% for local telephone companies | BM Service |
| | 1 June, 2003 | Extension of 100% for manufacturing companies | BM Industrial & Consumer Products |
| | 18 Apr, 2005 | 30% to 49% for investment banks | BM Finance |
| Thailand | 13 Oct, 1997 | Full ownership in financial institutions for up to 10 years | SET Finance |
| | 30 Jan, 1998 | 49% for securities companies was scrapped | SET Finance |
| Indonesia | 4 Sep, 1997 | 49% for IPO and unlimited % for local shares except banks | JCI – IDX Finance |
| | 1 Jan, 1998 | Open up banking sectors and plantation | IDX Finance + Plantation |
| | 31 Mar, 1999 | Ceiling was raised for nonstrategic corporations and equity participation of foreign banks in a joint bank | IDX Finance + Mining + Trade |
| Korea | 11 Dec, 1997 | New 50% foreign investment ceiling | KOSPI |
| | 25 May, 1998 | No restriction for domestic collective investment securities | KOSP Finance |
| | 1 Jul, 1999 | Up to 49% for telecommunication operators | KOSP Service |

The implementation of liberalization policy is expected to generate greater trade and investment from abroad, which, therefore, would allow the stock market price

9 Sheng, Andrew (2006). Asian financial integration: next steps. *Public Lecture*, Tun Ismail Ali Chair, Faculty of Economics and Administration. University Malaya, Kuala Lumpur.

index and returns to rise (Henry, 2000a). Having higher returns and better performances of the stock market would strengthen and stabilize the market, thus, they would facilitate greater monetary and financial cooperation in the region. Regional financial stability would be easier to achieve and maintain when there are monetary and financial cooperation within the region. Thus the level of integration among the countries in the region is expected to be greater. Since the liberalization policy is not just meant for foreign investors from the Asian region but also from the rest of the world, the integration level of those countries with the world is analyzed. Morgan Stanley Capital International (MSCI) World Index is used in the integration analyses to represent stock market performance of developed markets, which consists of stock market indices of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States. It is a free float-adjusted market capitalization weighted index.

The regional financial stability seems apparent during the US subprime mortgage crisis in late 2007. The Asian region has not been badly affected by the crisis as much as those encountered by the European Union region. The lessons obtained from the Asian financial crisis in 1997 and the measures taken to reduce the impact of the crisis and to recover have made the countries in the region become stronger, more stable and more independent.

This thesis investigates the effectiveness of implementing subsequent stock market liberalization in generating greater stock returns. The better performance of a country's stock market is expected to facilitate financial and monetary cooperation in the region, and thus would result in closer integration among the countries. This thesis then explores how much these countries in the region integrate with one another and

with the world market as an evidence of financial and monetary cooperation. The research is conducted on four countries that are most affected by the crisis in the region, namely Malaysia, Thailand, Indonesia and South Korea.

### 1.1.1 Stock Market Liberalization

Stock market liberalization is defined as the government's decision to allow foreigners to purchase shares in that country's stock market (Henry, 2000a). Some others refer to it specifically as the official liberalization policy decree, the establishment of the first country fund, or the establishment of the American Depository Receipts (Henry, 2000a; Bekaert, Harvey & Lundblad, 2003; Patro, 2005; Manova, 2008).

Stock market liberalization, theoretically, allows for greater capital inflows, which would improve the performances and integration of the countries' regional stock markets. According to Henry (2000a), based on International Asset Pricing Model (IAPM), an international version of capital asset pricing model which incorporates the theory that investors from different countries have purchasing power parity and the same consumption basket, it is predicted that the implementation of stock market liberalization policy would reduce the country's cost of equity capital. The net capital inflows should increase when foreign investors are allowed to invest in local equities. Such an increase in the net capital inflows would reduce the risk-free rate. Based on capital asset pricing model (CAPM), the lower the risk-free rate, the lower is the cost of equity capital. The increase in net capital inflow would also induce greater stock market liquidity, which then would reduce the equity premium.

Implementing the stock market liberalization policy would increase risk sharing between local and foreign investors, which would reduce the equity

premium. Having lower cost of equity capital or equity premium would generate higher stock price index, and thus, push stock returns higher. In addition, private physical investment would increase when the cost of equity capital is lower, since the negative net present value (NPV) projects could turn positive at lower cost of capital (Bekaert and Harvey, 2000; Henry, 2000b; Klein & Olivei, 2008; Stulz, 1999). Patro (2005), Boubakri, Cosset and Guedhami (2005), Christoffersen, Chung and Errunza (2006), and Henry (2000a) support that stock market liberalization would generate higher stock market returns, which is consistent with the prediction of International Asset Pricing Model.

The question that is frequently debated, especially pertaining to developing economies such as Malaysia, is whether the liberalization of its stock market would improve its stock market returns. There are arguments that such a move would expose the country to more negative consequences, such as massive outflows of capital and hot money, the excessive mismatch of currency and maturity, and the exposure to uncertainties abroad (Stiglitz, 2004). According to Stiglitz (2004), liberalization would only lead to economic instability, which caused the 1997 Asian financial crisis. After experiencing or seeing another stock market crash due to the credit crunch in the United States of America (U.S.) in late 2007, economic advisors of developed countries have campaigned for tighter financial regulation, contradicting liberalization policies. Germany and France proposed for tougher new regulation of global finance at G-20 (Group of twenty major economies) summit in April 2009.[10]

Since 1997, the Asian-crisis countries continued allowing higher percentage of foreign ownership in domestic firms, despite of having their first official liberalization policy in late 1980s or early 1990s. For example, Malaysia raised its

10 Baldwin, K. (2009). “France and Germany throw down the gauntlet”. The Guardian. U.K. (1st April).

foreign ownership on local telephone companies to 61 percent, Indonesia raised its foreign ownership on Initial Public Offerings to 49 percent and South Korea allowed for up to 50 percent foreign investment. Thailand allowed for full foreign ownership in its financial institution as shown in Table 1.2 in page 5. The concern is that whether such subsequent stock market liberalization could generate similar or greater impact as those of initial liberalization. If there is no significant positive impact generated by those subsequent stock market liberalizations, thus there should be no reason for the liberalization policy to be considered by the authorities.

The issue is whether government authorities or regulators should continue implementing stock market liberalization policies or tighten the financial regulation, and the arguments regarding liberalization continues until today. In order to help decision makers make the right decisions on stock market liberalization policies, this work aims to investigate whether the subsequent implementation of stock market liberalization policies in four Asian countries, namely, Malaysia, South Korea, Thailand and Indonesia, has generated higher stock market returns, consistent with the prediction of IAPM. Such a decision is expected to increase foreign investments into the countries in the region. In addition, since it is much easier for foreign investors to invest locally, mobilize savings, assets and resources at lower transaction costs, it is also expected that the liberalization policy would further integrate regional stock markets.[11] Stock markets are considered fully integrated when two assets of the same risk level from two arbitrarily selected capital markets have the same expected returns (Lin, 2005). In other words, the countries' stock markets are integrated when their stock market returns move

11 Sheng, Andrew (2006). Asian financial integration: next steps. *Public Lecture*, Tun Ismail Ali Chair, Faculty of Economics and Administration. University Malaya, Kuala Lumpur.

together. Such openness of the local markets would encourage more financial cooperation among regional countries.

### .1.2 Stock Market Returns

This thesis focuses on stock market considering its importance as one of main sources of funding for companies. By selling ownership shares of the company in a public market, firms can raise additional capital, or allow businesses to be publically traded. The securities are attractive due to its liquidity, where investors can quickly and easily sell, compared to real estate. The performance of the stock market is also a primary indicator of a country's economic strength and development. The smooth functioning of all stock market activities, which facilitates lower costs and enterprise risks, would promote the production of goods and services, as well as employment.

The stock exchange is the most important component of the stock market, which is the entity of a corporation or mutual organization specializing in the business of bringing buyers and sellers of the organizations to a listing of stocks and securities together. Based on the World Bank data by December 2011, the largest stock exchange in the world is the New York Stock Exchange Euronext (US and Europe), founded in 1790, while the largest stock exchange in Asia is the Tokyo Stock Exchange, which is third on the list. Among the samples of Asian countries selected for this work, South Korea’s stock exchange is the largest, with Malaysia’s stock exchange coming in second, followed by Indonesia’s, and finally, Thailand’s. The selection of the four countries’ stock markets as the sample countries of this work is explained in section 1.1.5.

Table 1.3: Market Capitalization of Stock Exchanges around the World as at December 2011

| No | Exchange | Total Market Capitalization (US$ billion) | No of Listed Companies – Domestic |
|---|---|---|---|
| 1 | NYSE Euronext (US & Europe) | 14,242 | 4171 |
| 3 | Tokyo SE | 3,325 | 3961 |
| 15 | Korea Exchange | 996 | 1792 |
| Nil | Bursa Malaysia | 395 | 941 |
| Nil | Indonesia SE | 390 | 440 |
| Nil | SE of Thailand | 268 | 545 |

(Source: World Bank, 2011)
Note: Nil means the rank number of the stock exchange is not available

The movements of the prices in a market or section of a market, which indicate its performances, are captured in price indices called stock market indices, of which there are many, for example, the Financial Times Stock Exchange (FTSE), the Morgan Stanley Capital International (MSCI), Kuala Lumpur Composite Index (KLCI) and Korean Composite Stock Price Index (KOSPI). Such indices are usually market capitalization weighted, with the weights reflecting the contribution of the stock to the index. The constituents of the index are frequently reviewed to include/exclude stocks, reflecting the ever changing business environment. They are used as a benchmark for comparing individual stocks with the overall market, for measuring the trend in stock prices overtime, and for determining the impact of various economic factors on the market (Brigham, Houston, Chiang, Lee & Ariffin, 2010). In order to measure the performances of the countries' stock markets as a result of stock market liberalization policy implementation, the respective countries'

stock market indices are applied in the analyses. The indices are used to measure stock market returns that represent the performance of the stock market.

The five stock market main indices used in this thesis analyses are KLCI, KOSPI, Stock Exchange of Thailand (SET) Index, Jakarta Composite Index (JCI) of Indonesia Stock Exchange, and MSCI World Index. These four Asian countries stock market indices were affected by the 1997 Asian financial crisis. They are also selected based on the fact that those countries have been implementing stock market liberalization policies since 1997. MSCI World Index consists of stock market indices of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States. It is a free float-adjusted market capitalization weighted index.

The start of the 1997 Asian financial crisis caused the stock market indices of the four Asian countries to experience sharp dips, until they reached the lowest point at around September 1998. The crisis reduced the stock market indices of Malaysia and Thailand by 76 percent, while Indonesia's and South Korea's both dropped by 64 and 62 percents, respectively. The figures indicate that the share prices of equities listed in the stock exchanges had also plunged, which affects stock market returns, the wealth of households and their consumption, business investment and economic growth. The indices, indeed, took longer to recover versus expectations. It took Malaysia's and Thailand's stock markets almost a decade to return to their highest indices points before the crisis. Indonesia's and South Korea's stock markets, however, managed a relatively quick recovery, which are seven years for Indonesia and surprisingly, only two years for South Korea. Due to the

tremendous impact of the crisis on the stock market indices of these four Asian countries, this work explores in detail the performances of the stock markets, specifically on stock market returns.

There are two dimensions that evaluate the performance of equity investments, according to Levich (1998), which are the expected return and risk. The basic incentive for international investment on expected return is to enhance the portfolio returns for the same level of risk, while the other basic incentive on risk is to reduce the riskiness of a portfolio without sacrificing expected returns. The expected value gains could be obtained if the foreign equity markets are inefficient, or if the foreign equity markets may be segmented from other capital markets. In segmented equity markets, the compensation for the bearing equity risk is different, in order to allow it to be received by investors who spot these trading opportunities. The diversification gains are associated with the reduction of risk for a given level of investment return. The gains are obtained when a portfolio is extended to include new investments, whose returns are imperfectly correlated with the original portfolio, even when markets are integrated. In addition to that, most studies have shown that the diversification gains in international investment are greater than the diversification gains from domestic investments (Shapiro, 2005; Bekaert, Harvey & Lundblad, 2003; Raj & Dhal, 2009).

The stock market performances in this work are based on stock market returns, rather than on stock market risks. Stock market returns are analyzed in order to explore how much has it returned to its former levels, how its performance are affected by liberalization policies, and whether stock market returns of those four countries and the world are well integrated with each other.

### *1.1.3* Controlled Variables

Stock market characteristics and macroeconomic fundamentals may have links with the operation and performance of international equities or stock markets. Yang, Lee, Gu and Lee (2010), Chuang, Ou-Yang and Lo (2009), Mobarek and Mollah (2005), and Dey (2005) support the theory that stock market characteristics may be significant determinants of stock returns. There are also quite a number of studies confirming that macroeconomic fundamentals play significant roles in affecting stock market returns (Zhaoxu & Jun, 2009; Kandir, 2008; Abugri, 2008; Fifield, Power, & Sinclair, 2002) and stock market prices (Somoye, Akintoye, & Oseni, 2009; Mahmood & Dinniah, 2009; Rashid, 2008; Yusof & Majid, 2007; Ratanapakor & Sharma, 2007; Ibrahim & Aziz, 2003). In order to obtain the best results on the impact of stock market liberalization on stock market returns, the effects of stock market characteristics and macroeconomic fundamentals are controlled. If those sm characteristics and macroeconomic fundamentals are not accounted for, it would lead to an overstatement of the stock market liberalization effect (Henry, 2000a). This work, therefore, analyzes the relationship between stock market liberalization and stock market returns, with controlling for the effects of stock market characteristics and macroeconomic fundamentals.

Three types of stock market characteristics emphasized in this work are the stock market size, liquidity and volatility. These characteristics are expected to have positive relationships with an increase in stock market liberalization policies and stock returns. Stock market size is normally represented by stock market capitalization or the market capitalization ratio (Mobarek & Mollah, 2005; Levine & Zervos, 1998). According to Levich (1998), an increase in stock market size may

be from three broad trends. The first contributor is the worldwide expansion of GDP and productivity gains, and the second contributor is the entrance of new companies to the market, either through privatization of state-owned enterprises or public offerings of publicly held companies. The final contributor is due to the depreciation of the US$ over the study period, which increased the US$ valuation of foreign shares. Based on the second contributor, this work expects that the stock market size would be greater upon the liberalization of the stock market, since it encourages new investments from abroad.

Stock market liquidity is measured by its trade volume (Mobarek & Mollah, 2005) or value traded ratio (Levine & Zervos, 1998), which reflects liquidity on an economy-wide basis. Liquidity quantifies the level of trading activities in the market; with a high trading volume reducing liquidity risks and trading costs. Stock market volatility, which is represented by the standard deviation of stock market returns, measures the variation or risk of stock market indices over a specified time period. It is expected that the more open the stock market is, the greater the trading activities that is taking place, and the greater the variation of stock market returns will be (Bae, Chin, & Ng, 2004; Levine & Zervos, 1998).

The macroeconomic fundamentals concerned in this work are foreign exchange rates, interest rates, and oil prices, while other macroeconomic fundamentals are not applied in the analyses of this work due to the unavailability of the data on a daily or weekly basis. Two macroeconomic fundamentals, which are commonly used by previous studies, but not in this thesis due to the unavailability of the data on a weekly basis, are the consumer price index (CPI), representing the inflation rate, and industrial production indices (IPI), which represents real economic activity. To accommodate the overall economic condition of the country,

the description on the findings of analyses emphasizes the time period of when the liberalization of the stock market took place, whether it occurred during, or after the crisis period.

### *1.1.4* Stock Market Integration

Once the stock market becomes more liberalized, cross border activities should improve. Financial cooperation of the countries within the region should be strengthened and thus, the markets should be integrated. This work, therefore, further investigates whether having a series of subsequent stock market liberalization in these countries would increase the level of their integration.

Two markets are considered integrated when the rewards for bearing the risk of both countries are similar (Tahai, Rutledge & Karim, 2004). Henry (2000b) states that the stock market are segmented when the equity premium is proportional to the variance of the country's aggregate cash flows; and if the equity premium is proportional to the covariance of the country's aggregate cash flows with those of a world portfolio, then the stock markets are integrated. Based on these claims, stock market returns are used in the stock market integration analyses of this work to represent the rewards of bearing risk and equity premiums. The integration or segmentation of the stock markets would also determine market prices. If the stock markets are integrated, a similar formula is used in all the markets for pricing a stream of cash flow, the investors are rewarded with the same per unit compensation for bearing risk. However, the equity risks can be differently priced across markets if the markets are segmented (Levich, 1998).

The integration shows how the countries in the region assimilate in order to stabilize and strengthen the regional markets. Once the markets have been

integrated, the creation of a common regional market should not be a problem. Indeed, attempts are already underway for an Asian and ASEAN common market.

Indeed, the decoupling theory, which means "breaking the link", has also been discussed in the general media.[12] The decoupling theory emphasizes on having a country's stock market to be not closely integrated with another infected country in order to prevent the transmission of negative consequences. A specific example would be the US sub-prime mortgage crisis in 2008, where decoupling should effectively prevent the Asian emerging economies from being badly affected by the severe recession in the US. Due to some of the measures implemented during the crisis, and the act of being more precautious and having greater regional-level coordination, Asian economies, specifically China and India, manage to be more independent. They work well with other countries in the region and were not fully dependant on the US for economic recovery and growth (Sharma, 2010). Thus, according to Sharma (2010), China and India, remain bullish during severe recession in the US at the end of 2007 and early 2008. Only by the end of 2008, those emerging economies are also affected but not as severe as those encountered by the European countries and the US itself, confirming that their economies are still coupled or integrated with US economy but not fully. This scenario highlights the fact that not all connections are deemed mutually beneficial. The decoupling theory seems to promote an anti-integration idea, and instead, encourages a loose federation between countries.

### *1.1.5* Malaysia, Thailand, Indonesia and South Korea

The four selected Asian countries (Malaysia, Thailand, Indonesia and South Korea) were severely affected by the 1997-1998 Asian financial crisis. The crisis

12 The decoupling debate. (2008). *The Economist*, Mar 6, 2008.

precipitated the sharp dip of stock market indices, and massive capital outflows. In order to strengthen the equity market and to regain market confidence, a number of measures were put in place, which includes implementing stock market liberalization policies. Since this work focuses on the impact of the subsequent stock market liberalization, the countries selected for the analyses must have been implementing the policy during the specified time period. These four countries are the countries which have been implementing the stock market liberalization policy subsequent to the first official decree, and enforced it in the period of 1997 onwards. Therefore, the four countries are valid as sample countries in the context of this work.

In the earlier stage, this study on the impact of stock market liberalization was conducted on five ASEAN countries with the inclusion of Japan, China and South Korea. The five ASEAN countries included in the analyses were Malaysia, Thailand, Indonesia, Singapore and Philippines. The other five ASEAN countries; Laos, Cambodia, Brunei, Myanmar, and Vietnam, were not included in the analysis since they had no stock exchange in 1997. The Philippines had not implemented stock market liberalization policies from 1997 but did so in early 1990s. This is the reason for its exclusion from the sample countries. Japan and China were disqualified as samples when the implementations dates of stock market liberalization in those countries could not be identified or confirmed. In addition, some data on stock market characteristics of those two countries were unavailable, further hindering the work. Singapore was not included in the sample list since some of its data on stock market characteristics were unavailable, even though the implementation dates of the stock market liberalization policies implementation were successfully obtained. Therefore, there are four countries left to represent the

Asian countries, which were badly hit by the Asian financial crisis, and were on the road to recovery by subsequently implementing the stock market liberalization policy.

The four selected countries maintain close economic ties with each other, are excellent trading partners, and work well together in integration initiatives. Malaysia, Thailand and Indonesia are three out of ten members of the Association of South East Asian Nations (ASEAN). A number of initiatives for greater financial co-operation among the members have been implemented along the years. According to the ASEAN's Secretariat website, the ASEAN Finance Ministers Meeting (AFMM) had been held fourteen times by 2010, in which the Finance Ministers of each country had committed to further promotion of financial stability in the region, and to the enhancement of the integration of ASEAN's markets. The ASEAN Surveillance Process was established in 1999 to further discuss economic developments and policy issues. In 2003, AFMM endorsed the Roadmap for Monetary and Financial Integration of ASEAN (RIA-Fin) to specifically focus on capital market development, liberalization of financial services, capital account liberalization and ASEAN currency cooperation.[13] The virtually established ASEAN Free Trade Agreement, which lowers intra-regional tariffs among member countries, is also expected to enhance integration within the region. These initiatives seem encouraging, but their achievements are to be further investigated. This work, therefore, explores how effective those initiatives are in integrating the stock markets of ASEAN countries, as evidenced in Malaysia, Thailand and Indonesia. Specifically, at the same time, this work also explores the effectiveness of the stock

13 ASEAN AFMM. (2012). *Regional Cooperation in* Finance. Retrieved May 15, 2012 from http://www.asean.org/communities/asean-economic-community/category/asean-finance-ministers-meeting-afmm

market liberalization policy implemented by the member countries as one of the measures to enhance the development of equity market.

There are also some initiatives and collaboration between ASEAN and South Korea, especially, through the ASEAN plus three (ASEAN + 3) finance cooperation. South Korea, as well as Japan and China, are the three selected countries that work together with ASEAN for finance cooperation. In 2000, AFMM+3 established Chiang Mai Initiatives (CMI) to manage regional short-term liquidity problems, and to facilitate the work of other international financial arrangements and organizations.[14] In 2003, ASEAN + 3 Research Group is also established to conduct studies focusing on issues of financial stability. In order to have greater integration between ASEAN and South Korea, in 2004, both parties decided to establish the ASEAN-Korea Free Trade Agreement.[15] This work further inspects whether such efforts would actually bring about higher integration between the three ASEAN countries and South Korea.

The collaboration between the ASEAN countries and South Korea will benefit the countries economically. According to the ASEAN Secretariat as of 15 February 2011, the ASEAN confederation, specifically, spans over an area of 4.44 million $km^2$, with a population of approximately 598 million people, which is 8.8 percent of the world's population. Its combined nominal gross domestic product (GDP) had grown to more than USD 1.851 trillion, which is 3 percent of world's GDP. ASEAN would rank as the $9^{th}$ largest economy in the world in terms of

14 ASEAN AFMM. *Regional Cooperation in Finance*.

15 ASEAN Framework Agreement (2005). Retrieved May 15, 2012 from http://www.asean.org/news/item/framework-agreement-on-comprehensive-economic-cooperation-among-the-governments-of-the-member-countries-of-the-association-of-southeast-asian-nations-and-the-republic-of-korea-kuala-lumpur-13-december-2005

nominal GDP if they were a single country. ASEAN also had intra-regional trade of 32.6% exports, and 33.3% imports.[16]

South Korea had a total population of 49.78 million (0.73% of the world population) and a GDP of $1,116 billion (1.8% of world GDP). A combination of ASEAN and South Korea increases the population level to 9.53% of the world's population, in comparison to the European Union's (EU) of 7.4%, and the U.S. 4.6%.[17] Despite having the highest percentage of population, ASEAN's and South Korea's total GDP was only 4.8% of the world's GDP, whereas, the EU's and USA's GDP were 28.4% and 24.5% of the world's GDP, respectively (World Bank data, as of 2011). The big gap between the percentage of population (9.53%), and the percentage of GDP (4.8%) of the ASEAN countries and South Korea, directly shows that there are lots of rooms for the improvement for these countries' economic performance, particularly their stock markets.

The selection of the four countries is also related to their economic developments, representing the integration of the markets in the region. South Korea is a well-developed economy, while Thailand, Malaysia and Indonesia represent newly industrialized countries. Having such different level of economies in the analyses would provide better results, since in reality there are many different levels of economies belonging to the countries in a region.

Socio-cultural, legal and political beliefs of the four countries may contain some differences, and such differences may affect cross border activities, stock market performances and integration. With greater co-operation and communication among the members of ASEAN, as well as greater initiatives and collaboration

16 ASEAN Statistics (2012). Retrieved May 10, 2012 from http://www.asean.org/resources/category/asean-statistics

17 The World Bank. *Data – Countries and Economies*. Retrieved May 10, 2012 from http://data.worldbank.org/country/

between ASEAN and South Korea, the gap or difference is expected to be narrowed, thus having less impact on the stock market performances and integration.

### 1.1.6 Time Period Since 1997

This work focuses on the subsequent stock market liberalizations, which took place after January 1997, instead of the initial stock market liberalization, in late 1980s and early 1990s. Hence, this work analyzes the data from 1997 to 2009.

In order to reduce the tremendous effects of 1997 Asian financial crisis, the authorities, with strong encouragement of the IMF and World Bank, came up with a number of measures, which included stock market liberalization policy.[18] By having greater opening of the stock markets, it was hoped that more of the capital residing abroad will flow into the country to help sustain the local firm's performances.[19] This work shows how much better the stock market performances can be after the implementation of the liberalization policy, and the findings would further elaborate and differentiate the impact of the liberalization of the stock market during the crisis period, versus the impact after the crisis period, in order to observe if there is any difference in the impact of the liberalization in these two periods.

The analyses on integration covers the period of 1997 to 2009, which is the period before the start of the Asian financial crisis till the period of the U.S. subprime mortgage crisis. This work explores if there is any changes or progress in the level of integration in years during the liberalization period, which is from September 1997 to April 2005, and in years after the liberalization period, which is

18 Bello, W. (1998). IMF's role in the Asian financial crisis. *International Forum on Globalization*, April 21, 1998.

19 Bello, W. (1998). IMF's role in the Asian financial crisis. *International Forum on Globalization*, April 21, 1998.

from May 2005 to December 2009.

## *1.2* Problem Statement

The government authorities have to decide whether the subsequent stock market liberalization policy is effective. They are to decide whether the stock market liberalization policy should be progressively implemented, modified or in fact, canceled altogether? Indeed, it is debatable whether the effects of the subsequent stock market liberalization would give positive or negative results. Thus, this study will focus on the impact of the subsequent stock market liberalization on stock market returns and to what extent it is consistent with the prediction of the IAPM. The authorities also need to decide whether the liberalization policy should be applied to specific sector(s) or the whole market for a significant impact. Both the returns for the country's main and sector indices are, therefore, analyzed in this work to clarify the scenario. Stock market liberalization is expected to improve the stock market integration of the East Asian countries and the world (MSCI-World Index) stock markets. The question is whether any financial cooperation, measured by short-run and long-run integration, could be generated after the implementation of a series of stock market liberalization policies.

## *1.3* Research Questions

In order to help the authorities make the right decisions regarding stock market liberalization, this work further explores the impact of the subsequent stock market liberalization using two basic questions.

1. Does the subsequent stock market liberalization affect the stock market returns?
2. How integrated are the stock markets of Malaysia, Thailand, Indonesia and South Korea with the world market (MSCI-World Index) during and after the subsequent

stock market liberalization?

## *1.4* Research Objectives

The two research questions have led this thesis to its research objectives; to explore the impact of the subsequent stock market liberalization on stock market returns and stock market integration of crisis-affected Asian countries.

1. To examine the effect of the subsequent stock market liberalization on stock market returns.

   The subsequent stock market liberalization analyzed in this research took place after 1997, during and after the Asian financial crisis period. There are eight liberalization dates (refer to Table 4.2, p. 91) analyzed in this thesis using an event study method This research analyzes to what extent the changes in the ceiling percentage of foreign ownership would affect the stock returns in Malaysia, Thailand, Indonesia and South Korea and whether they are positively or negatively related. The relationship is expressed in Model 1.

$$\textit{Model 1:}\quad R_{it} = \alpha + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it} \qquad \textit{(Eq 1.1)}$$

   where

   $R_{it}$ is the stock market returns of the main or sector index of country *i* at time *t*;

   $Lib_{it}$ is a dummy variable for stock market liberalization. It takes the value of 1 from -1 week to +12 weeks of the implementation week of stock market liberalization and 0 otherwise.

   $Size_{it}$ is the stock market size, which is measured by market capitalization of

country *i* or the sector's *i* at time *t*;

$Liq_{it}$ is the stock market liquidity, which is measured by traded volume of country *i* or the sector's *i* at time *t*;

$Vol_{it}$ is the stock market volatility for 90 days of country *i* or sector *i* at time *t*. For the sectoral analyses, 10 day volatilities are used.

$ER_{it}$ represents the exchange rates of country *i* at time *t*;

$IR_{it}$ represents the interest rates of country i at time *t*;

$Oil_{it}$ represents oil prices at time *t*.

$\mu_{it}$ is an independently distributed random error term with zero mean and constant variance;

$\alpha, \beta_1, \ldots, \beta_7$ are the parameters to be estimated.

2. To determine the degree of stock market integration between Malaysia, Thailand, Indonesia, South Korea and the world market (MSCI-World Index) during and after the subsequent stock market liberalization.

The integration level of the stock markets in the region with the rest of the world is examined by using the long-run Johansen cointegration test and the short-run vector autoregressive model as well as Regression Model 2 which is used to examine the relationship between the individual Asian country's stock market returns and the MSCI world market returns.

***Model 2:*** $\boldsymbol{R_{it} = \alpha + \beta R_{Wot} + \varepsilon_{it}}$ ***(Eq 1.2)***

where

$R_{it}$ is the stock market returns of the main index of country *i* at time *t*;

$R_{Wot}$ is the MSCI world market returns at time *t*;

$\varepsilon_{it}$ is an independently distributed random error term with zero mean and constant variance*;*

$\alpha$ and $\beta$ are the parameters to be estimated.

## 1.5 Scope of the Study

This research covers the work of investigating the two research questions and research objectives that have been set out. In order to examine the effect of the subsequent stock market liberalization on stock market returns, this study emphasizes the impact of the subsequent stock market liberalization policies implemented since 1997 as shown in Table 1.2 on page 5 and not on the impact of the initial stock market liberalization which took place in the late 1980s or early 1990s. All the details of the stock market liberalization policies, such as the announcement and the implementation dates, the percentage change of foreign ownership in local equities, and the sectors involved in the implementation of the policy crucial to the analysis of Model 1 (Eq 1.1) are in the background in Introduction Chapter One. From eleven liberalization events, three overlapping events are excluded. Only eight events, as shown in Table 4.1 page 88, are analyzed.

Stock market returns are the outcome of the Model 1 analysis, which will identify if there is any significant change in the stock market performance after the liberalization policy is implemented. Thus, the data on countries' stock market main indices are used as proxies for stock market performances. Stock market sector indices are also collected given that the liberalization policies affect certain sectors of the country. The four East Asian countries' stock market main and sector indices selected for the analysis are Malaysia, Indonesia, Thailand and South Korea. These countries are selected due to their active involvement in the implementation of stock market liberalization policies after being badly hit by the 1997 Asian financial crisis. The four countries' stock market main indices include Kuala Lumpur Composite Index, Stock

Exchange of Thailand Composite Index, Jakarta Stock Exchange Composite Index and Korea Composite Stock Price Index.

In order to isolate the impact of stock market liberalization on its returns in the Model 1 regression analysis, stock market characteristics and macroeconomic fundamentals are included in the analysis as controlled variables. Stock market size, liquidity and the volatility of each country's main index are acquired as stock market characteristics variables. For sector analyses, the stock market size, liquidity and volatility of each liberalizing sector index are also acquired and analyzed in the course of this study. Other individual company characteristics are not relevant because this study examines sector and overall market indices. Controlled variables for macroeconomic fundamentals are exchange rate, interest rate and oil price.

The other objective of this work is to discover the degree of integration of the four countries with the world market as a consequence of liberalization implementation. Thus the integration analysis covers all of the four East Asian countries' stock market main indices and the MSCI-World Index from the period of 1997 to 2009. To analyze the integration level during and after the subsequent stock market liberalization, the integration analyses are done over two sample periods: 1) September 1997 to April 2005 for the "during" liberalization period, and 2) May 2005 to December 2009 for the "post" liberalization period, based on the liberalization dates in Table 1.2 page 5. This is to identify if there is any changes or progress in the integration level post liberalization.

## *1.6* Significance of the Findings

This work fills the gap in the literature by exploring the impact of the subsequent stock market liberalization which took place from 1997 onwards. It does not focus on the impact of the initial stock market liberalization, implemented in late 1980s or early

1990s as other previous literature (Phuan, Lim & Ooi, 2009; Boubakri et al., 2005; Patro, 2005, Henry 2000a).

The impact of the subsequent stock market liberalization on the countries' stock markets is very weak. Throughout the whole analysis for both countries' main and sector markets, only a very few events has significant coefficients on the liberalization dummy. Majority of the liberalization coefficients are insignificant. There is not enough evidence to support that there is a significant relationship between the subsequent stock market liberalization and stock market returns. In addition, the impact of stock market liberalization fades to insignificance as more time passes. In the analyses of sector indices, stock market liberalization seems to still have a significant relationship to the stock market returns, even though it happens in a longer event window (T±26 weeks). The results reveal that the impact of stock market liberalization lasts longer in the sector market rather than the country's stock market.

These results reduce the confidence that the subsequent stock market liberalization is related to its returns. This work, however, does not argue that the stock market liberalization is ineffective. Obviously the impact of the subsequent stock market liberalization is not as significant as the impact of the first official liberalization as mentioned in previous literature (Henry, 2000a; Patro, 2005; Boubakri, Cosset & Guedhami, 2005). The impact of the subsequent stock market liberalization fades to insignificant when more variables are added as controlled variables. This shows that the stock returns have been influenced by controlled variables rather than by the liberalization policy. Thus, the implementation of further stock market liberalizations in the future is not recommended. Detailed analyses need to be conducted by the government authorities if the stock market liberalization policy is to be implemented in order to ensure its effectiveness.

As controlled variables, the stock market characteristics are generally found to be weakly related to its returns. Only very few of the events portray significant relationship between stock market characteristics and stock returns. Macroeconomic variables, additional controlled variables, are also found to have a weak relationship to stock market returns but not to argue that they have no effect on stock market returns. Only a few of the events have significant coefficients of macroeconomics fundamentals. The exchange rate and oil price are negatively related to stock market returns, while interest rates have a mixed relationship with stock market returns. Generally, in most of the events, the stock market characteristics and macroeconomic fundamentals can explain more about the changes in stock market returns than can the stock market liberalization, based on the numbers of their significant coefficients.

This work also fills the gap by exploring the integration level of the four Asian and the world markets from 1997 to 2009. The results indicate how integrated the stock markets were during the implementation of a series of liberalization policies from the starts of the Asian financial crisis until after the U.S. subprime mortgage crisis. In order to examine if there is any change or progress in the integration level of the stock markets, the integration analyses are done over two study periods: the period during and the period post liberalization. Based on Table 1.2 in page 5, the subsequent stock market liberalization was started in September 1997 in Indonesia and ended in April 2005 in Malaysia. Thus, the period during liberalization is from April 1997 to April 2005. The period after May 2005 till Disember 2009 is categorized as the post liberalization period. The results of the analyses would show the government authorities how much emphasis should be given to strategizing domestic policies and responding to changes in the world and other countries' markets. The data ends by 2009, and this is deemed adequate to capture the recent findings on stock market integration among the countries

in the region.

In terms of stock market integration, the Johansen cointegration tests reveal that there is a unique cointegrating vector governing the long-run relationship among the five stock markets both during and post liberalization. The null hypothesis of no cointegrating vector is rejected at 5 percent significance level by trace statistics but is not rejected by max-eigenvalue statistics for both periods. Thus there is a unique evidence of rejection that there is a long-term tendency for the stock markets to converge with each other. Therefore, these Asian countries' stock prices are either tied to regional markets, or the world market. There is no difference and no improvement in the long-run integration level of the five stock markets between the period during and post liberalization. In terms of short-run integration between the Asian countries, the results portray greater correlation between any of the two countries in Asia in the post liberalization period. For short-run dynamic interaction, the domestic variations turned out to be the significant contributors to variations in the four Asian and world markets. Indonesia's shocks have increasing effects on variations in other Asian and world markets after the liberalization period. The results indicate that the government authorities should concentrate more on strategizing their domestic policies and responding to the changes in the region and the world.

Generally, the results would be able to assist the authorities of Asian countries and other emerging economies to consider whether they should implement the subsequent stock market liberalization in order to improve the performance of their respective stock market(s). They would also be able to decide whether to modify, or even cancel the liberalization policies if they fail to improve performances.

## *1.7* Limitation of the Study

This research focuses on the impact of the subsequent stock market liberalization. To analyze the impact using the event study method, the implementation dates of the subsequent stock market liberalization are vital in the analyses. The accurate and confirmed implementation dates of the liberalization are difficult to obtain, even though the countries' stock exchanges, central banks and security commissions were contacted. Most of the dates obtained from other sources, such as articles in journals, are generally the announcement dates of the implementation of the stock market liberalization. Previous studies provide the dates of the first official liberalization, but these dates are irrelevant to this research.

Another suggested alternative measure of the liberalization is the liberalization intensity, which is the changes in the levels of foreign equity portfolio holdings in a country that liberalized (Bekaert et al., 2003). The collection of such detailed data is easy when the data belongs to developed countries because of the availability of the data but is not as easy in developing countries like Malaysia, Thailand and Indonesia. The U.S., for example, has its data on its net capital flows to emerging markets on a monthly basis in the U.S. Treasury Bulletin. Finally, most of the liberalization dates were obtained from Bekaert and Harvey (2005).[20]

The data on controlled variables, which include stock market characteristics and macroeconomic fundamentals, are also needed in this research analyses. Unfortunately, most of those data are tabulated quarterly or yearly, but not weekly. The regression

20 Refer to Bakert & Harvey (2005). Chronology of important economic, financial and political events in emerging markets of Malaysia, South Korea, Thailand and Indonesia.

analyses in this research, however, are conducted weekly in order to obtain a more precise and reliable impact of liberalization. Since regression analyses require consistent time intervals, data with the same frequency must be obtained. Thus, only the data which are tabulated daily or weekly could be used in the analyses of this work. For example, to measure the stock market size, this work used the countries' stock market capitalization data, instead of their market capitalization ratios to GDP, since the GDP value is tabulated on a quarterly basis. Changing quarterly or monthly data to weekly data by the interpolation method is inappropriate in the regression analyses, since it will introduce a systematic source of serial correlation in the regressors. Some of the main economic indicators, such as the GDP, consumer price index (CPI) and money supply, were not included in the analyses due to similar problems, which required data with consistent time intervals.

Another problem encountered in obtaining the data is that the data is not fully available for the time period of the analyses. Data on the stock market capitalization for individual sectors, for example, are not available prior to May 2000. As a result, the regression analyses for liberalization before 2000 were conducted without the stock market capitalization data. The turnover ratio and traded value are not completely available on a weekly basis. Only the traded volume is fully available throughout the sample period, and is used to measure the liquidity of the stock market.

## *1.8* Organization of the Research

The thesis is divided into eight chapters. This chapter details the background of the research, problem statement, research questions and objectives, scope of the study, significance, limitation, and organization of the research. The next chapter is on the literature review. Chapter three explains the hypothesis development and Chapter four

elaborates upon research methodology. The findings on the impact of stock market liberalization on a country's stock market returns are described in Chapter five, while the findings on the impact of stock market liberalization on market sector returns are explained in Chapter six. Chapter seven discusses the stock market integration. Finally, the last chapter concludes the overall findings of the research and recommends further research in identifying the best policy to be implemented.

# 2. LITERATURE REVIEW

## *1* Introduction

Studies on the impact of financial or stock market liberalization and capital market integration have been carried out by numerous researchers in the last few decades. Those studies generally focus on the impact of the initial stock market liberalizations, implemented in the late 1980s and early 1990s in this region (Henry, 2000a; Bekaert et al., 2003; Patro, 2005; Manova, 2008, Boubakri et al., 2005). This chapter reviews and describes the workings and effects of stock market liberalization and its integration. Empirical studies on the characteristics of the stock market and macroeconomic fundamentals are also illustrated in detail in the course of this chapter.

## *.2* Stock Market Liberalization

To study the impact of the liberalization of the stock market, the first thing taken into consideration in this study is the measurement of stock market liberalization. This section explains how previous literature measures stock market liberalization and how the liberalization of the stock market is defined as well as how the dates of the events are determined. After identifying the concept of stock market liberalization, the literature findings on the impact of the policy are explored.

### 2.2.1 Measures of Stock Market Liberalization

From as early as in 1993, Kim and Singal (1993) had defined stock market liberalization as an increase in the degree of openness in terms of issuance of share capital and voting stock to foreign investors. Grabel (1995) focused on a more comprehensive definition of financial liberalization, which includes five different

measures. Those five measures are: i) reduction or elimination of loan ceilings and interest rate on loans and deposit accounts; ii) dismantlement of government credit grant programs; iii) removal of regulations, diversification and deepening of financial markets and institutions; iv) removal of fixed or multiple exchange rates; and v) establishment of measures to promote competition and free entry in the financial system. Kwan and Reyes, in their 1997 study on stock market liberalization, defined it as a form of foreign direct investment.

Several other studies have been carried out on stock market liberalization from 2000 onwards, in which most of them (Henry, 2000a; Bekaert, Harvey & Lundblad, 2003 & 2005; Christoffersen, Chung & Errunza, 2006; Jayasuriya, 2005; Naceur, Ghazouani & Omran, 2008) defined liberalization of the stock market as the official liberalization policy decree, the establishment or listing of the first country fund (Patro, 2005), or the establishment of the first American Depository Receipts (ADRs) (Manova, 2008), whichever is the earliest, as stock market liberalization. According to Bekaert et al. (2003), the official liberalization policy decree is a formal policy reform that provides foreign investors the right to invest in local equity securities, and vice versa. While the official liberalization policy decree is the direct method of stock market liberalization, country funds and ADRs are indirect ways of opening local markets to foreign investment. Country fund is a fund that is used to invest in a foreign country's portfolio of assets and is also used to locally issue a fixed number of shares. ADRs are the rights to invest in foreign shares that are traded in dollars on U.S. exchange or over the counter. With ADRs, U.S. investors would be able to buy foreign equities traded in the U.S. Those three measures of stock market liberalization, the official liberalization policy decree, country fund and ADRs, represent the availability of the local shares to be traded or

owned by foreign investors, which generally means stock market liberalization. Henry (2000a) defines stock market liberalization as a decision of a country's government or authorities to allow foreign investors to buy and own local companies' shares in that country's stock market. Bekaert, Harvey and Lundblad (2003) further define the opportunity given to invest in local equity securities by foreign investors or investment in foreign equity securities by local investors as equity market liberalization. In summary, the relaxing of policies and allowing capital flow across countries result in the liberalization of the market.

Apart from the first official policy decree, Henry (2000a) also uses an investability index as an indicator of stock market liberalization. He defines the investability index as "a ratio of market capitalization of stocks that can be legally held by foreigners". An increase of at least 10 percent in the investability index is his benchmark to indicate that stock market liberalization has actually taken place. The ratio of market capitalization of stocks available to foreign investors to total market capitalization of stocks is used by Jayasuriya (2005) in her analyses of stock market liberalization, and it was known as the intensity of stock market liberalization. Bekeart et al. (2003) use foreign investability of the market in their analyses, and they define it as "a ratio of market capitalization of the constituent firms comprising the International Finance Corporation (IFC) investable index to those of IFC global index for each country". IFC investable index represents a portfolio of domestic equities that are available to foreign investors, while the IFC global index represents the overall market portfolio for each country. If foreign investors are allowed to own all of the stocks, then the ratio of foreign investability is 1. Instead of the ratio of market capitalization, ratio of the number of firms in the investable and global indices for each country could also be used (Bekaert et al.,

2005). Another suggested alternative measure of the liberalization intensity is the changes in the level of foreign equity portfolio holdings in a country that is liberalized (Bekaert et al., 2003).

Bekaert, Harvey and Lundblad (2005) divide the dating of equity market liberalization into three groups; official equity market liberalization, first sign equity market liberalization, and intensity equity market liberalization. The first sign liberalization dates are assigned based on the earliest year of the three dates: official liberalization, first ADR announcement and first country fund launch.

Patro (2005) defines stock market liberalization as the announcement dates of the listing of new country funds and the relaxation of capital control. According to him, capital control relaxation is a government's decision, allowing for greater ownership of local shares by foreign investors. Such definition is similar to the definition of stock market liberalization in this thesis, which is the percentage change in foreign ownership or greater ownership of local equities. Patro, however, uses closed-end country fund data in his stock market liberalization analyses. Thus, this thesis fills the gap of the existing literature by focusing on the impact of subsequent stock market liberalization implemented from 1997 to 2009, instead of the initial stock market liberalization implemented at the end of 1980s or early 1990s. The results of the analyses would assist the authorities and portfolio investors in making decisions regarding subsequent stock market liberalization in place, and its effectiveness in generating higher returns to the stock markets.

Another issue of concern is to decide on the dates of the event, such as the announcement or implementation dates. Patro (2005) collects the announcement dates of stock market liberalization for his study due to the fact that prices react to the announcement instead of the implementation dates. Henry (2000a) and Bekaert

et al. (2005), however, use the official dates of policy implementation due to an absence of reliable announcement date. Considering the effects of an announcement and a widespread information leakage prior to an official announcement, Henry (2000a) uses an event window, which begins seven months prior to the implementation month, despite the three months prior to implementation month. He states that the announcement proxy of three months is based on the average duration between the announcement and listing for ADRs.

This thesis also focuses on the implementation dates of stock market liberalization, and at the same time, considers the announcement effects. Instead of using the event windows starting seven months or three months prior to the implementation month, the weekly regression analyses on the impact of stock market liberalization in this thesis uses event windows, which begin one week and four weeks before the implementation week. The one week and four weeks before the implementation week are used due to the focus of the study on the impact of subsequent stock market liberalization, in which the impact of it is not as significant as those of initial stock market liberalization. Thus the announcement of the policy might not initiate price reactions as much as those of the initial stock market liberalization. It is also believed that the capital inflows would be greater only upon the approval of greater foreign ownership, which is when the policy is officially launched or implemented. Nevertheless, the results of having the event windows starting one week before the implementation week, as compared to the event windows starting four weeks before the implementation week (refer to Appendix 4-2 and Appendices 5-4 to 5-6) are not much different.

### 2.2.2 Impact of Stock Market Liberalization

Many studies have examined the effects of the stock market liberalization or financial liberalization on many different areas, which include the effects on stock market returns; stock market volatility, size, and liquidity; stock market development and efficiency; stock market integration; investment, real economy and macroeconomic risk. A number of papers explore the impact of stock market liberalization on returns (Henry, 2000a; Patro, 2005; Boubakri, Cosset & Guedhami, 2005; Christoffersen, Chung & Errunza, 2006) but they have been analyzing the impact of the first or initial stock market liberalization, instead of the subsequent stock market liberalization. Unlike those earlier studies, this thesis analyzes the impact of subsequent stock market liberalization, which focuses on policies implemented during the 1997 Asian financial crisis and after the crisis. The thesis also attempts to determine whether the results of the two liberalization policies, initial versus subsequent, are actually consistent. In addition, this thesis takes into consideration the effects of stock market characteristics and macroeconomic fundamentals on stock market returns during liberalization period. The subsequent stock market liberalization policies have been implemented specifically to reduce the impact of the crisis on the stock market and to re-enhance its growth.

#### 2.2.2.1 Stock Market Returns

In terms of relationship between stock market liberalization and stock market returns, Henry (2000a), in his study on twelve emerging markets including Malaysia, Thailand and South Korea, claims that a liberalizing country's stock index generates 3.3 percent abnormal returns per month. His findings on the positive relationship between stock market liberalization and

stock market prices, as well as stock market returns, are consistent with the findings of Patro (2005), Boubakri, Cosset and Guedhami (2005), Christoffersen, Chung and Errunza (2006). These studies analyze the impact of the first stock market liberalization of emerging countries, including at least three of the four sample countries, and support the prediction of international asset pricing model (IAPM).

IAPM predicts that a country's cost of capital would be reduced upon the liberalization of its stock market (Henry, 2000a), and this is, in turn, supported by Tai (2007). The reduction of cost of capital might be due to a greater risk of sharing between domestic and foreign investors when the liberalization takes place. This shows that stock market liberalization allows for a better hedge against exogenous and idiosyncratic financial market risks (Iwata & Wu, 2009).

Studies done by Chandrasekhar (2011), Zurigat and Gharaibeh (2011) in India and Jordan, find that stock market liberalization would be able to increase substantial capital-flows into the country and accumulate large financial reserves. However, at the same time the market is exposed to higher external vulnerability and fragility within the domestic financial sector (Chandrasekhar, 2011).

At the firm-level analysis, the positive impact of the stock market liberalization on its performances is only experienced by smaller firms. According to Christoffersen et al. (2006), large firms experience insignificant changes in stock market performance. These glaring dissimilarities might be due to different price pressures or different economies.

#### 2.2.2.2 Stock Market Characteristics

Any correlation between stock market liberalization and its characteristics, which are stock market size, liquidity and volatility, is also a cause for great concern, as highlighted in previous literature. This thesis, however, focuses on the impact of the stock market characteristics on its returns as controlled variables in order to isolate the impact of stock market liberalization on its returns.

The most studied stock market characteristic is the volatility of stock returns. Other than measuring stock market volatility by using an adjusted standard deviation of stock returns (Levine & Zervos, 1998), volatility is mostly measured by using the GARCH method (Tai, 2007; Jayasuriya, 2005; Laopodis, 2004; Kwan & Reyes, 1997). There are two contrasting results revealed by those past studies. After the implementation of stock market liberalization, stock market returns are found to be less volatile (Ndako, 2012; Eizaguirre, Biscarri & Hidalgo, 2009; Tai, 2007; Jayasuriya, 2005; Christoffersen et al., 2006; Kwan & Reyes, 1997; Kim & Singal, 1993) or more volatile (Bae, Chin & Ng, 2004; Levine & Zervos, 1998; Grabel, 1995). According to Bley and Saad (2011), stock market liberalization induces greater impact on total volatility but no impact on idiosyncratic volatility. Stock market liberalization is also found to be not significantly related to stock market volatility in Athens Stock Exchange (Laopodis, 2004), and in 16 emerging markets, after twelve months of the implementation of stock market liberalization policies (Kim & Singal, 1993). In the study of Eizaguirre et al. (2009), Latin American countries experience lower volatility, while at the same time, Asian countries suffers from an increase in

market instability, or greater volatility.

Eizaguirre et al. (2009) and Jayasuriya (2005) state that stock market liberalization of emerging markets might induce changes in stock market volatility behavior, but not always in the same direction, since it depends on the country. Jayasuriya (2005) claims that the quality of accounting standard and investors protection laws, restriction on repatriation of foreign income and capital, and the quality of institutions play important roles in determining the behavior of stock market volatility. The better the quality of institutional framework, and the more favorable the market characteristics are, the lower the volatility of the stock market. The liberalization of the stock market might also induce greater stock market volatility, due to the greater exposure of the country's stock market to uncertainties abroad. On the other hand, stock market volatility would be reduced when its liberalization manages to attract new investors from more developed countries, thus increasing the stock market size and its trading volume, which in turn, leads to lower stock market volatility (Bekaert & Harvey, 1997). Stock market liberalization would not significantly affect volatility when the competing effects offset each other.

There are not many studies conducted on the effects of stock market liberalization on stock market size and liquidity, compared to studies on stock market volatility. Levine and Zervos (1998), in their studies, find that the stock markets of 16 emerging markets become larger and more liquid, in addition to becoming more volatile, after liberalizing capital and dividend flows. When liberalization plays its role in attracting more foreign investors to invest in the country, there would be an increase in the size of domestic markets through issuance of new shares or higher number of listed firms (Bekaert & Harvey,

1997). A bigger market size would induce higher trading volume in the stock market, thus increasing the stock market liquidity (Pagano, 1989). According to Lee and Wong (2012), stock market liberalization stimulates closer financial link with the rest of the world. Greater market participation would generate higher trading activities and market liquidity. Thus, there is a significant positive relationship between stock market liberalization and stock market volatility.

#### 2.2.2.3 Stock Market Development and Efficiency

Stock market liberalization, on the other hand, is found to have a negative relationship with stock market development by Naceur, Ghazouani and Omran (2008), in their studies of eleven Middle East and North Africa (MENA) countries and by Odhiambo (2011), in his study of the Kenyan financial market. Naceur et al. (2008) measure stock market development by three key indicators, namely the stock market size (market capitalization), its activity (value traded) and efficiency (turnover ratio). They further explain that there is a negative relationship between stock market liberalization and stock market size, its activity and efficiency in the short-run, but in the long run, the two variables are positively related. They also find that stock market liberalization would reinforce a greater impact on more developed stock markets with less government intervention and less trade opening, prior to liberalization. They suggested that reforms should be initially and effectively implemented in a domestic economy before fully opening the market to foreigners. Odhiambo (2011) finds that the liberalization of the stock market leads to a fragile financial sector and market failures, in which prudential regulations are needed.

In terms of the efficiency of the stock market, Laopodis (2004),

Kawakatsu and Morey (1999) find that the liberalization of the stock market has failed to enhance the efficiency of Greece, along with sixteen other emerging markets. Laopodis (2004) claims that the policy announcements and its implementation have failed to gain the attention of the private sector, which evoked skepticism among investors. According to him, the Greece's stock market was weak in terms of efficiency and was operating as a random walk, with no extraordinary profit. Kawakatsu and Morey (1999) blame it on the gradual process of liberalization and well-advance announcement on liberalization, which does not significantly affect forward-looking investors. Indeed, according to them, the markets are already efficient before liberalization. Boubakri et al. (2005), on the other hand, assert that their analyses on 230 firms in thirty-two developing countries have shown significant improvements in the stock market efficiency. The greater efficiency occurred in more developed stock market with better protection and enforcement of property rights.

#### 2.2.2.4 Stock Market Integration

The findings on the impact of the stock market liberalization on stock market integration show that the Asian markets are closely linked to one another, and with world capital markets after liberalization (Kuo, 2011; Tai, 2007; Baharumshah, Sarmidi & Hui, 2003). Those studies focused on the first official liberalization period, from 1988 to 1994 and 1999, respectively. Sixteen emerging countries and Australia, studied by Levine and Zervos (1998) and Ragunathan (1999), respectively, experience greater integration upon liberalizing their stock markets. Ragunathan asserts that stock market in

Australia was integrated after the financial deregulation, but was segmented before the deregulation. Baharumshah et al. (2003) state that the degree of integration between Asian emerging markets and U.S. markets increased following liberalization, and was actually strengthened during the beginning of the Asian financial crisis. In addition, the U.S. dominates the Asian equity market more than that of Japan. According to Hunter (2006), the Argentinian, Chilean and Mexican markets, are found to be more divided after liberalizations. He claims that the currency crisis temporarily increased the level of segmentation of those markets, especially the Mexican market. Hence, liberalization could lead these countries to more negative results. This effect may be due to both direct and indirect barriers of local factors.

#### 2.2.2.5 Investment

Investment is also observed to be positively affected by liberalizations of the stock market (Bekaert, Harvey & Lundblad, 2010; Boubakri, et al., 2005; Bae et al., 2004). This is supported by Henry (2000b), who discovers that 82 percent of eleven liberalizing developing countries experience greater growth rates of private investment than the growth rates of non-liberalized countries in the first year after liberalization. The exogenous decrease in the cost of equity capital upon the liberalization of the stock market (Tai, 2007) would increase private physical investment. Naceur et al. (2008) find that the liberalization of eleven MENA countries' stock markets has no effect on their investment growth, which might be due to the small amount of funds invested in the region in short time period.

#### 2.2.2.6 Economic Growth and Macroeconomic Risks

Findings of previous studies show that financial liberalization is significantly and positively related to real economic growth (Klien & Oliver, 2008; Boubakri et al., 2005; Bekaert et al., 2001 & 2003). Bekaert, Harvey and Lundbland further prove that on average, equity market liberalization could increase its country's real economic growth by one percent. They also claim in their 2001, 2005 and 2011 articles that the economic growth of countries with high education levels, high-quality institutions and more developed financial markets, respectively, would be able to gain greater positive and permanent effects of stock market liberalization. In their 2011 article, they add that the factor productivity growth is positively related to market liberalization, and that the economic growth upon liberalization outweighs the banking crises detrimental loss.

Naceur et al. (2008) however, could not find any significant relationship between stock market liberalization and real economic growth in the eleven countries of MENA. Klein and Oliver (2008), in their study of OECD (Organization for Economic Co-operation and Development) and non-OECD countries, also discover no significant relationship between stock market liberalization and economic growth in developing countries, however, for developed countries, the relationship between the two variables is quite significant. The strength of the liberalization impact on developing countries is very much dependent on a constellation of economic, legal and social institutions. Thus, they suggest that financial reforms should precede liberalization policies in order to generate greater impact. Stiglitz (2004) also contends that stock market liberalization leads to greater economic instability instead of economic growth. The developing countries will only suffer greater

risks, instead of faster growths (Stiglitz, 2002).

Other than economic growth and factor productivity growth, stock market liberalization is found to affect country's export (Manova, 2008). Manova, in her panel and event-study analyses of 91 countries, added that liberalization policies would be more effectively implemented in a country that is having less active stock market and high trade costs. She finds that in financially vulnerable sectors, where more outside finance is needed, the exports increase disproportionately more.

Stock market liberalization leads to higher risk sharing between countries that liberalized and developed countries. This shows that stock market liberalization allows for a better hedge against exogenous and idiosyncratic financial market risks (Iwata & Wu, 2009). Iwata and Wu add that the liberalization of the stock market should be accompanied by other measures of economic integration for an enhanced effect, since the other macroeconomic risks are poorly shared across the countries. The macroeconomic risks, which have not been fully shared, are exogenous shocks to output growth, inflation and monetary policies.

## 2.3 Characteristics of Stock Market

Stock market characteristics, also known as stock market indicators, have been considered as determinants of stock market returns (Yang, Lee, Gu & Lee, 2010; Tudor, 2009; Mobarek & Mollah, 2005; Dey, 2005; Irfan & Nishat, 2002). The stock market characteristics that have been studied include stock market size, liquidity, volatility, earning-price ratio, price-to-book ratio, and dividend yield. This thesis fills in the literature gap by focusing on the effects of stock market characteristics on its returns

during the liberalization period, which is more of a short-term effect, rather than long-term one. Three major characteristics of the stock market used in this analysis are the stock market size, stock market liquidity, and stock market volatility. Bekaert, Harvey and Lundblad (2001) use stock market size and liquidity, as well as a number of domestic companies that are categorized as equity market development in their studies on the relationship between stock market liberalization and economic growth. Levine and Zervos (1998) apply six stock market indicators, which consist of market capitalization ratio measures of stock market size, value traded ratio and turnover ratio measure of stock market liquidity, IAPM and ICAPM measures of integration, and stock return volatility in their study on the impact of stock market liberalization on its development.

### 2.3.1 Stock Market Size

Stock market size represents an aggregate value of a company or a stock. It is measured by using market capitalization, which shows the overall size of the stock market in US$ or respective local currencies. It is calculated by multiplying the share price with the number of outstanding shares (Mobarek & Mollah, 2005). Market capitalization represents the public consensus on the value of a company's equity, and is used to discover whether an overall market is undervalued or overvalued (Levine & Zervos, 1998). Naceur et al. (2008), Bekaert et al. (2001), Levine and Zervos (1998) define market capitalization as a percentage of the Gross Domestic Product (GDP), in order to determine whether an overall market is undervalued or overvalued in comparison analyses. Another measure of market size is the number of listed domestic companies in the stock exchange (Bekaert et al., 2001).

Stock market size is found to have significant positive impact on the variation of share prices and index returns. The finding is consistent with those obtained by Mobarek and Mollah (2005) in the study of Bangladesh's market of 123 nonfinancial companies from 1988 to 1997, Irfan and Nishat (2002) in the study of Karachi's stock exchange from 1981 to 2000, Levine and Zervos (1998) in the study of 16 developing countries stock markets from 1980 to 1993, and Homsud, Wasunsakul, Phuangnark and Joongpong (2009) in the study of Thailand's stock exchange from 2002 to 2007.

On the other hand, Wang (2000) concluded that the smaller the size of the firm, the higher the returns, in his study on the New York Stock Exchange (NYSE) and American Exchange (AMEX) nonfinancial firms from 1975 to 1994. Such negative association between size and stock returns is also supported by Fama and French (1992), who focused on the association between market size and common risk factor, and Patel (2012), who focused on size effect, in which small firms generate higher risk-adjusted returns than large firms.

The studies of Yang, Lee, Gu and Lee (2010) on Taiwan's market from 2003 to 2005, Moshirian, Ng and Wu (2009) on 13 emerging markets and Tudor (2009) on Romania's market, however, do not contain enough evidence to show any significant association between stock market size and stock market returns.

### 2.3.2 Stock Market Liquidity

Stock market liquidity shows whether the securities are easily bought or sold. Having a liquid market will enhance the allocation of capital, and strengthen long-term economic growth. It is measured by the total value of shares traded, divided by the GDP (Bekaert et al., 2001). It complements market capitalization ratio by clearly

demonstrating whether the stock market size is matched by trading (Levine & Zervos, 1998). The turnover ratio can also be used as a measure of liquidity as well as of transaction costs (Yang et al., 2010; Levine & Zervos, 1998). Turnover ratio is the value of shares traded as a percentage of market capitalization, and a high turnover signals low transaction costs. The turnover ratio is related to the size of the market, whereas the value traded ratio is related to the size of the economy. Both methods complement each other. A market with a high turnover ratio but a low value of shares traded ratio is a small liquid market (Levine & Zervos, 1998). Jun, Marathe and Shawky (2003) measured liquidity in three ways, via trading value, turnover ratio, and turnover-volatility ratio. Turnover-volatility ratio is the turnover ratio divided by standard deviation, and it is a volatility adjusted measure of a market turnover ratio. It is appropriate for emerging markets with a relatively high-level of market volatility. Another common market liquidity indicator is the trading volume or volume of shares traded (Mobarek & Mollah, 2005; Chuang, Ou-Yang & Lo, 2009). Chuang et al. (2009) claimed that the dynamic return-volume relationship would be able to help in investment decision-making, risk reduction and prediction of future market returns.

Jun, Marathe and Shawky (2003), Mobarek and Mollah (2005), Dey (2005), Levine and Zervos (1998), and Chuang et al. (2009) reveal that there is a positive relationship between stock market liquidity and stock returns. On the other hand, Yang et al. (2010) proved that stock market liquidity and stock returns are negatively related in Taiwan's stock market due to the relative cost of trading. Despite having a positively related liquidity and stock market returns, Moshirian et al. (2009) could not prove the significance of the relationship between the two variables.

### 2.3.3 Stock Market Volatility

A measurement of dispersion around the mean or average return of stock market index is called stock market volatility. It is the rise and fall in prices of broad stock market indices over a defined period, and is most often referred to as the standard deviation of continuously compounded returns within a specific time horizon. It is used to quantify the risk of the financial instrument over the mentioned time period. Market volatility is one of the characteristics of a stock market or determinants of market returns. Levine and Zervos (1998) used a 12-month rolling standard deviation of returns. Another measure of market volatility is stock beta (Mobarek & Mollah, 2005). Beta is used to compare stock volatility to market volatility. The greater the beta is, the higher the volatility. Long-term traders and investors normally favor beta value. Beta value does not signal anything on short-term stock volatility. Some researchers use the GARCH method to measure the volatility of stock returns (Tai, 2007; Jayasuriya, 2005; Laopodis, 2004; Kwan & Reyes, 1997).

In relation to the impact of stock market volatility on stock market returns, Lai and Lau (2010), Dey (2005), Levine and Zervos (1998) claim there is a positive relationship between these two variables. However, Mobarek and Mollah (2005) countered this by proving that there is a negative relationship between both variables in Dhaka's stock market. Mobarek and Mollah (2005) further clarified that the result is consistent with other emerging markets, but not always consistent with the developed economies' market. This may be due to the lack of a homogeneous expectation regarding risk returns characteristics, and the differences in the markets' microstructure. Tudor (2009) claimed that the relationship between stocks returns

and beta is insignificant for Bucharest's stock exchange. The findings of Tudor (2009), Mobarek and Mollah (2005) contradicts the Capital Asset Pricing Model, which believes that beta should be positively related to stock returns. Bekaert and Harvey (1997) stated that volatility is different across emerging markets, particularly with respect to the timing of capital market reforms. According to them, capital market liberalizations often increase the correlation between local market returns and the world market, but do not drive up the local market volatility.

### 2.3.4 Other Stock Market Characteristics

Other than those three stock market characteristics, the value of stocks is also found to be one of the major indicators of stock returns. The values of the stocks are represented by market to book value, price earnings ratio, dividend yield, earning yield, and cash flow yield. Those variables are also taken into consideration as firms' generally expect and brace for growth prospects. In general, stock value is positively related to its returns. This has been affirmed by Lai and Lau (2010), Yang et al. (2010), Tudor (2009), Homsud (2009), Moshirian et al. (2009), Irfan et al. (2002), Wang (2000), Dontoh, Livnat and Todd (1993), Mobarek and Mollah (2005). Despite market to book value and stock return having a positive relationship, Mobarek and Mollah (2005), Wang and Lim (2010) found that an increase in the dividend yield leads to a simultaneous drop in stock prices. Thus, the dividend yield and stock returns are negatively related. As a stock price is the present value of all future expected cash flows, an increase in dividend yield implies a higher dividend paid today and thus reduces the value of future possible cash flows.

Somoye, Akintoye and Oseni (2009), on the other hand, proved that the

dividend per share and earnings per share are insignificant to the Nigerian capital market, the positive relationship between the two variables notwithstanding. In addition to that, Chen (2009) figures out that the dividend yield is only able to predict stock market returns during 1946 to 1989. For long periods, controlling the effects of structural breaks, it seems that the dividend yield does not showcase significant forecasting power. Dontoh, Livnat and Todd (1993) also find that interest rates, dividend yield, growth and estimation risk are the variables which can affect variation in price-earnings ratios.

Other market characteristics, which have been previously analyzed, are leverage and payout ratio. Both variables have a positive relationship with stock returns (Yang et al., 2009; Mobarek & Mollah, 2005; Irfan & Nishat, 2002).

## 2.4 Macroeconomic Fundamentals

Many studies are conducted on the relationship between stock market returns and macroeconomic fundamentals. Major macroeconomic fundamentals that have been rigorously studied include the exchange rate, interest rate, crude oil prices, consumer price index (CPI), industrial production index (IPI) or gross domestic or national product (GDP or GNP), and money supply. This thesis pays attention to the degree of influence by three macroeconomic fundamentals as controlled variables, on stock market returns during subsequent stock market liberalization period. The three macroeconomic fundamentals analyzed in this thesis are the exchange rates, interest rates and oil prices.

### 2.4.1 Exchange Rates

In terms of the impact of exchange rate, previous findings show that the

exchange rate is significantly related to stock market returns of emerging countries (Bilson, Brailsford & Hooper, 2001), Malaysia (Yusof & Majid, 2007), four Latin American countries (Abugri, 2008), Pakistan (Rashid, 2008), five Asian countries and Australia (Mahmod & Dinniah, 2009), the U.S. (Chen, 2009) and Korea (Kwon & Shin, 1999). Entorf, Moebert and Sonderhof (2009), after analyzing the foreign exchange rate exposure of 27 countries, stresses that the exposure depends positively on the share of national exports and negatively on the share of national imports relative to the GDP.

The exchange rate is found to be negatively related to stock prices by Ibrahim and Wan Yusoff (2001) for Malaysian market, Somoye, Akintoye and Oseni (2009) for Nigerian market, Pal and Mittral (2011) for Indian market. The negative relationship is due to the high dependence of the country on international trade. On top of having higher exports due to currency depreciation, it increases the cost of production and intermediate goods (Ibrahim & Aziz, 2003), which leads to a lesser expected coefficient. Ibrahim and Wan Yusoff (2001) also added that the negative effect due to the driven-out of portfolio investments is caused by the expectations of future depreciation. Somoye et al. (2009) argued that investors, local and foreign, are interested in investing in a country with a high currency exchange rate to foreign currencies for higher purchasing power, thus affecting the stock prices and returns. In other words, Abugri (2008), Bilson et al. (2001), Pebbles and Wilson (1996) reveal that the appreciating currency reduces the cost of capital and imported inputs, which would then lead to higher returns. Wickremasinghe (2011) claims that exchange rate is the only macroeconomic fundamental that is influenced by the Sri Lankan stock price index.

However, other studies pointed out that in Turkey (Kandir, 2008), U.S.

(Ratanapakor & Sharma, 2007) and Japan (Mukherjee & Naka, 1995), the exchange rates and stock prices are positively related. According to Kandir (2008), it is due to the overwhelming volume of exports caused by currency depreciation, which then generates greater stock returns. Mookerjee and Yu (1997) find that there is no long-run relationship between the exchange rate and Singapore's stock returns. The same argument has been put forth by Bailey and Chung (1996) for the Philippines stock market. They added that financial fluctuation and political changes do not have a significant impact on the Philippines stock returns. Yang, Kolari and Min (2003), however, argue that there is no significant short-run dynamic interaction between exchange rate and stock returns but both are cointegrated in the long-run. The findings of Owusu-Nantwi and Kuwornu (2011), claim that there is no significant relationship between exchange rate and stock returns in Ghana's market.

Major indicators on the impact of foreign exchange rate, according to Entorf et al. (2009), are the current account surplus and the financial account. He stresses that the higher the current account surplus, the higher the estimated foreign exchange rate exposure coefficient would be. He also adds that the higher the financial account, the lower the foreign exchange rate exposure.

### 2.4.2 Interest Rates

In analyzing the effect of interest rates, previous researchers used different types of interest rates, ranging from short-term to long term. For example, Chen (1991) uses one-month Treasury bill rate, Kandir (2008) employs one-month time deposit rate, Abugri (2008) applies three-month Treasury bill rate, Chen (2009), Yusof and Majid (2007) used the federal funds rate, Abugri (2008) and Somoye et al. (2009) employ a nominal lending interest rate. For long-term interest rates,

Mukherjee and Naka (1995) use a long-term government bond rate.

In terms of the impact of interest rates on stock returns, the majority of researchers claim that the two variables are negatively related. Among those who claim that higher interest rates would lead to lower stock returns are Abugri (2008) in four Latin American markets, Kandir (2008) in the Turkish market, Somoye et al. (2009) in the Nigerian market, Chen (2009) in the U.S. market, and Yusof and Majid (2007) in the Malaysian market. Al- Qenae, Li and Wearing (2002), Gjerde and Saettam (1999), Soydemir (2000), Mukherjee and Naka (1995), Clare and Thomas (1994), and Chen (1991) also discovered that the two variables are negatively related. Higher interest rates would lead to lower market returns, which may be due to inflationary or discounted factor effect of higher interest rates (Mukherjee & Naka, 1995). In addition, interest rates are also an alternative investment opportunity. The higher the interest rate, the lesser the investment is, due to the lower present value of financial securities, which resulting in the reduction of the stock prices and returns (Gjerde & Saettam, 1999).

Pal and Mittal (2011), Bilson et al. (2001), Asprem (1989), Mandelker and Tandon (1985) determined that the interest rate and stock returns are positively related. Stock returns are positively related to the interest rate when money supply is backed by foreign reserves (Bilson et al., 2001; Asprem 1989). When the index deals primarily with government bonds, which are less risky, then the interest rate would be positively related to stock returns (Pal & Mittal, 2011). Ratanapakor and Sharma (2007) managed to differentiate the impact of interest rate between the short-term and long-term. They reveal that the short term interest rate is positively related to the U.S. stock returns, and vice versa for the long term interest rate. There are also findings of insignificant relationship between the two variables (Owusu-

Nantwi & Kuwornu, 2011; Wickremasinghe, 2011).

### 2.4.3 Oil Prices

Oil prices can be another macroeconomic variable that may affect stock prices and stock returns of a country. To analyze the impact of oil prices, most studies used the price of crude oil in their analyses. For oil importing countries, the increase in the price of oil would increase the cost of production, lessen the aggregate economic activities and thus, lower the countries' stock prices and its returns (Somoye et al., 2009). Therefore, there is a negative relationship between oil price and stock returns. Oberndorfer (2009), in his study on European energy corporations from 2002 to 2007, revealed that the two variables are negatively related in European countries. Gjerde and Saettem (1999), on the other hand, claim that oil prices and stock returns are positively related. It seems that the positive relationship between the two variables is possible when the country is an oil exporting country. An oil exporting country could earn higher stock returns because of the higher demands of oil at higher prices. Cheung and Ng (1998), Clare and Thomas (1994) also claim that there is a relationship between oil prices and stock returns.

Owusu-Nantwi (2011), Chen (2009), Kandir (2008), Chen, Roll and Ross (1986), claim that there is no relationship between stock prices and oil prices. This does not hold for oil importing countries like the U.S. and Turkey, as they do not have a significant relationship between the two variables (Kandir, 2008). Somoye et al. (2008), in their study on the Nigerian markets from 2001 to 2007, have dropped the oil price variable and the inflation variable from their models. It is found that oil prices is strongly related to the GDP, since the Nigerian economy is very much

dependant on oil revenues. Other than identifying the impact of oil prices on stock returns, Oberndorfer (2009) further clarifies that changes in the price of gas does not affect stock returns, while changes in the price of coal have smaller impact to stock returns.

### 2.4.4 Other Macroeconomic Fundamentals

Other macroeconomic fundamentals that have been considered significant to stock returns are consumer price index (CPI), industrial production index (IPI), and money supply. Instead of using CPI, some researchers are using country's inflation rate to explore the impact of changes in country's price level on its stock returns. In measuring the impact of a country's economic activities, researchers commonly used IPI, gross domestic product (GDP) or GDP per capita. These macroeconomic fundamentals are not included in the analyses of this thesis due to the unavailability of those data on weekly and daily basis.

The relationship between stock returns and consumer price index is found to be contradictory. There are evidences that the two fundamentals are positively related in Malaysian market (Ibrahim & Aziz, 2003), U.K. market (Clare & Thomas, 1994), the U.S. market (Ratanapakor & Sharma, 2007), Turkish market (Kandir, 2008) and Ghana market (Owusu-Nantwi & Kuwornu, 2011). This positive relationship may be due to the inadequate hedging role of stocks against inflation. Thus, there is a tradeoff between inflation and return (Owusu-Nantwi & Kuwornu, 2011). In other words, higher expected return is required for higher inflation rates (Chen, Roll & Ross, 1986).

Flannery and Protopapadakis (2002), Chen, Roll and Ross (1986), however, discovered that the CPI is negatively related in the U.S. stock market. This is similar

to the Japanese market (Mukherjee & Naka, 1995) and ASEAN-5 markets (Wongbangpo & Sharma, 2002). Fifield, Power and Sinclair (2002), Chen (2009) and Rashid (2008) figured that there is a significant relationship between consumer price index and stock returns in their analyses of 13 emerging markets, the U.S. market and the Pakistani markets, respectively. There are also studies done showing no significant relationship between inflation and stock returns in the Norwegian market (Gjerde & Saettem, 1999) and emerging markets (Bilson et al., 2001).

Many findings show that there is a significant positive relationship between stock returns and economic activities. GDP or IPI are positively related to stock returns in 5-ASEAN countries (Wongbangpo & Sharma, 2002), Malaysia (Ibrahim & Aziz, 2003; Yusof & Majid, 2007), Nigeria (Somoye et al., 2009), China (Zhaoxu & Jun, 2009), the U.S. (Ratanapakor & Sharma, 2007; Chen, 1991; Chen, Roll & Ross, 1986), Norway (Gjerde & Saettem, 1999), Korea (Kwon & Shin, 1999), Japan (Mukherjee & Naka, 1995), Canada, Germany, Italy, Japan and the U.S. (Cheung & Ng, 1998).

There are also a few who claim that there is no relationship between the two variables of economic activities and stock returns. Flannery and Protopapadakis (2002) in their study on the U.S. market, Bilson et al. (2001) in their study on emerging markets and Kandir (2008) in his study on Turkey's market are examples of such propagators of such theories. The result of their research raises the question on the role of a country's stock market in transferring resources to the real sector (Kandir, 2008).

Money supply is also considered as another macroeconomic variable that affects stock returns. Ibrahim and Aziz (2003), Mookerjee and Yu (1997) claims that money supply is negatively related to stock returns in Malaysia and Singapore.

Similar conditions are also observed in Korea (Kwon & Shin, 1999), Japan (Mukherjee & Naka, 2002), the U.S. (Flannery & Protopapadakis, 2002; Ratanapakor & Sharma, 2007), China (Zhaoxu & Jun, 2009), emerging markets (Bilson et al., 2001), Canada, Germany, Italy, Japan and the U.S. (Cheung & Ng, 1998). Kandir (2008), on the other hand, could not find any significant relationship between money supply and stock returns in Turkey.

Other macroeconomic fundamentals that have been analyzed in previous studies, but not analyzed as common as the variables discussed above are the consumption level (Chen et al., 1986), balance of trade (Flannery & Protopapadakis, 2002; Kwon & Shin, 1999), and unemployment rate (Chen, 2009; Flannery & Protopapadakis, 2002).

## 2.5 Stock Market Integration

Many studies have focused on the integration or segmentation of financial or stock markets during pre and post liberalization and financial crisis, mainly for developing or emerging countries. This thesis differs from earlier studies since it focuses on the level of integration of the four Asian countries and the world stock markets from 1997 to 2009, the period in which a number of subsequent stock market liberalization have been implemented. The main focus of the previous studies, however, is on the stock market integration after the implementation of the first official decree of stock market liberalization. The cointegration analyses conducted in this thesis would reveal the current level of stock market integration after undergoing the 1997-1998 Asian financial crisis, and being in the midst of world recession in the early and end of 2000s. In fact, shorter periods of five-year cointegration analyses are done to get a better understanding on the progress of stock market integration level in the region.

### 2.5.1 Stock Market Liberalization

The findings of previous literature on the impact of stock market liberalization on stock market integration of emerging countries, reveal that there is little to no evidence of market segmentation, but there is an increasing level of market integration after the first stock market liberalization. Tai (2007), in his study of six Asian countries, including Malaysia, Thailand and South Korea, from 1980s to March 2003, finds that those countries ware segmented before liberalization, but were fully integrated after the first stock market liberalization. Baharumshah, Sarmidi and Hui (2003), who divide the sample period into pre-liberalization, post-liberalization and post-crisis, determined that Malaysia, Thailand, South Korea and Taiwan are closely linked to one another and with the world market in the post liberalization period. The findings of Lin (2005) on 16 OECD (Organization for Economic Co-operation and Development), Hong Kong and five Asian emerging countries, Guo (2005) on eight East Asia emerging markets, Gerard, Thanyalakpark and Batten (2003) on five East Asian countries, and Levine and Zervos (1998) on 16 emerging countries, are consistent with Baharumshah et al.'s finding that the emerging stock markets are increasingly integrated, even though they are not highly or fully integrated as the developed countries' stock markets. Guo (2005), indeed, adds that despite having greater stock market integration following liberalization by these emerging markets, the increase in integration is not as high as before the financial crisis.

The studies on Bangladesh's stock market by Hoque (2007), and fifteen emerging markets, including Malaysia, Indonesia and South Korea by Taskin and Muradoglu (2003) also proved that the stock market liberalization manages to

integrate its market with the rest of the world. Errunza and Losq (1985) claim that the removal of capital flow restrictions, and the introduction of different types of index funds managed to increase the integration of stock markets. Chuah (2005), who focuses on both developed and emerging markets, states that country risk, trade openness and stock market development are important determinants in explaining the different level of integration of emerging markets.

There are few findings highlighted in previous literature claiming that the liberalization of stock market does not sufficiently signify deeper integration (Ravenhill, 2008; and Hunter, 2006). Ravenhill, who focuses on the ASEAN economic community, states that there is a slow progress in economic cooperation and a failure for deeper integration. Studies conducted in Brazil, Mexico, Argentina and Chile from 1992 to 1999 by Hunter suggests that the pricing of securities for those stock markets is still influenced by local factors, both direct and indirect barriers. Currency crises, indeed, are found to have caused temporarily increase in the level of segmentation of those Latin America.

Developed countries are found to have a full or high integration following liberalization by Chuah (2005). This finding is consistent with the findings of Gultekin, Gultekin and Penati (1989) between the U.S. and Japan, Bayoumi and Lipworth (1998) between Japan and the world, and Ragunathan (1999) between Australia and the world market.

### 2.5.2 Financial Crisis

Other than analyzing the impact of stock market liberalization on stock market integration, many studies also focused on the impact of the financial crisis on stock market integration. Click and Plummer (2005), in their study from 1998 to

2002, that is after 1997-1998 Asian financial crisis, find that the five ASEAN countries are cointegration, and are not completely segmented. The benefits of an international portfolio diversification seemed reduced, but not eliminated. Studies by Yang, Kolari and Min (2003) on ten Asian emerging markets and Mahani (2005) on the ASEAN markets, claim that the currency crisis significantly influenced the progress of financial and economic integration in Asia both in the short run and long run. This statement is supported by Yi and Tan (2009) study on Singaporean and Malaysian markets, and Ravenhill (2008), study on ASEAN markets, that the financial crisis has strengthened ASEAN, due to the emergence and success of their new regional co-operation arrangements. Wang and Moore (2008) also claim that the Asian and Russian crises have made the stock market cointegration level of three emerging Central Eastern European countries higher. Phylaktis and Ravazzolo (2002) assert that even if there is a presence of foreign exchange control, the Pacific-Basin region still experiences a higher degree of stock market integration.

On the other hand, studies of Ibrahim (2004a) on ASEAN, U.S. and Japan, Ibrahim (2009) on ASEAN + three countries, state that there is no significant improvement in stock market integration after the Asian financial crisis. Due to the impact of the crisis, Guo (2005) finds out that the degree of financial integration in East Asia emerging markets, except for Hong Kong, has not returned to the level before the Asian crisis. Currency crisis, indeed, temporarily increases the level of segmentation of Argentina and Chile, and provides a more persistent effect on Mexico's level of integration (Hunter, 2006). The claim that the financial crisis has a negative impact on stock market integration is supported by Wang, Yang and Bessler (2003), who claim that the regional integration between the African stock market is significantly weakened after 97-98 financial crisis. The findings of Patev,

Kanryan and Lyroudi (2006) reveal that there is a decrease of portfolio benefits during the crisis, followed by an increase of portfolio diversification benefits after the crisis period. This indicates that before the crisis, the Central and Eastern European stock markets are more integrated, and markets after the crisis are more segmented.

The 2007 sub-prime mortgage crisis is found to have influenced on the nature of integration among the sector markets of Malaysia, U.S. and Japan. Different from the findings of Patev et al. (2006), Kassim, Abd. Majid and Hamid (2011) claim that there are diversification benefits at the initial stage of the 2007 crisis, but no diversification benefits during the prolonged downturn. This finding is consistent with the findings of Nikkinen, Piljak and Aijo (2012) on the integration of the developed European stock markets and the emerging stock markets.

### 2.5.3 Capital Control

The impact of capital control on stock market integration is examined by Raghavan, Dark and Maharaj (2010) and Ibrahim (2004b). Their studies focused mainly on Malaysian capital control, implemented in late 1998 due to mass capital outflow during crisis period. Raghavan et al. (2010) affirmed that the capital control implemented during the crisis period significantly affects the integration between Malaysia, U.S. and Japan. After capital control, the level of stock market integration between Malaysia and Singapore seems to have been reduced, while the integration between Malaysia and Japan is positive, and the integration between Malaysia and the U.S remain significant. Ibrahim (2004b), however, finds no long-run stock market integration between Malaysia, U.S. and Japan after the imposition of capital control. Indeed, he asserts that capital control play a role in segmenting the

Malaysian market from international disturbances.

### 2.5.4 Progress of Stock Market Integration

The findings of previous literature are compiled in order to identify the progress of stock market integration for the emerging markets, especially those relevant to Malaysia, Thailand, Indonesia and South Korea. Taskin and Muradoglu (2003) in their Granger causality analysis since 1976, finds that the stock markets of emerging countries already have a significant positive relationship with world stock returns, and liberalization has made the markets interact more strongly with world returns. By applying the Johansen cointegration test and vector autoregressive analyses on the ASEAN main indices from 1978 to 1999, Ibrahim (2004b), however, finds that there is no long-run cointegration, regardless of the time period before or after Asian financial crisis and capital control.

Phylaktis and Ravazzolo (2002), in their covariance analyses since 1980, claim that the level of stock market integration has been increasing. Six Asian countries are found segmented in 1980s, but fully integrated by 1990s, after the liberalization of stock market by Tai (2007), using GARCH analysis. Gerard et al. (2003) and Tsouma (2007), in their GARCH analysis of 1985 to 1998 and 1991 to 2001, respectively, find little to no evidence of stock market segmentation in East Asian countries, but they are not fully integrated. The Gregory and Hansen cointegration analysis of ASEAN-5 + 3 countries in 1991 to 1997, however, records that regional stock market is partially integrated at lower levels (Ibrahim, 2009). The findings of Raghavan et al. (2010) from 1994 to 2007, Yang et al. (2003) from 1995 to 2001, and Batareddy, Gopalaswamy and Huang (2012) from 1998 to 2008, support the findings of Phylaktis and Ravazzolo (2002), Gerard et al. (2003) and

Tsouma (2007) that markets are integrated to each other but not completely integrated.

Generally, there are some contradictory findings on the level of stock market integration in the region, as even more of the findings support an increase in stock market integration. This thesis would further contribute to the literature by exploring the degree of stock market integration, short-run and long-run, after the countries had gone through the official or first stock market liberalization, Asian financial crisis, capital control, and numbers of subsequent stock market liberalization and other financial reforms. This thesis also examines the stock market integration level in shorter periods of five-years, 2000-2004 and 2005-2009, in order to obtain more specific results on the progress of stock market integration.

In terms of the relationship between a country's stock return and world's stock return, Kandir (2008), Tai (2007), Bekaert, Harvey and Lundblad (2001), Bilson et al, (2001), Ferson and Harvey (1998), Harvey (1991) state that there is a positive relationship between the two market returns. Countries under studies are emerging markets (Bilson et al., 2001), Asian emerging markets (Tai, 2007), and Turkey (Kandir, 2008). The U.S, however, has no relationship with the world market in 1986 (Chen, Roll & Ross, 1986). Indeed, China turns up to be the target market for global stock fund managers and international investors (Lai & Tseng, 2010).

## 2.6 Chapter Summary

Many previous studies pay more attention to the impact of official liberalization policy decree, listing of country funds or the establishment of the first ADR (Henry, 2000a and 2000b; Bekaert et al., 2003; Iwata & Wu, 2009; Tai, 2007; Hunter, 2006;

Baharumshah et al., 2003). They have been comparing the results before and after the implementation of the first market liberalization. However, many countries, which have already opened up their stock markets to foreign investors, need to decide whether they should open up more of their markets, or retighten the regulations. Therefore, there is a need to also focus on the effect of further or subsequent liberalization of the stock markets. Due to lack of attention given on analyzing the effectiveness of the subsequent stock market liberalization, this thesis aims to place more emphasis on it.

Stock market liberalization has been defined as the official policy decree, listing of country fund and the establishment of the ADR. These definitions of stock market liberalizations are only suitable to be applied in analyzing the impact of initial stock market liberalization. To analyze the impact of further or subsequent liberalization, the change in foreign ownership on local equities is more appropriate to define stock market liberalization. The subsequent stock market liberalizations are not normally imposed to the whole country's stock market; instead, it is only imposed on certain industries. Therefore, the use of percentage change of foreign ownership in local equities of certain industries is adequate in identifying the impact of stock market liberalization.

In analyzing the impact of stock market liberalization, many researchers have been focusing on the impact in many different areas. Bekaert et al. (2010, 2003), Naceur et al. (2008), Klein and Olivei (2008) and Stiglitz (2004) focus on the impact of stock market liberalization on the real economy. Bekaert et al. (2010), Henry (2000b) and Bae et al. (2004) highlighted the effects of stock market liberalization on investment and investability. Tai (2007), Hunter (2006), Lin (2005), Baharumshah et al. (2003), Ragunathan (1999), and Levine and Zervos (1998) emphasizes the impact of stock market liberalization on stock market integration. The impact of stock market

liberalization on stock market prices or returns are studied by Patro (2005), Bae et al. (2004), Henry (2000a), Levine and Zervos (1998), Kwan and Reyes (1997), and Grabel (1995), which is also to be the main focus of this thesis. However, those researchers mainly use monthly or yearly time-series analyses. Such method may be suitable for the impact of initial stock market liberalization, since the impact should be greater. However, in analyzing the impact of subsequent stock market liberalization, shorter time analyses such as the weekly basis should be more appropriate. Knowing that the stock market liberalization is a gradual process, in which it normally involves quite a number of liberalization subsequent to the first (Henry, 2000a), people may already expect for the next liberalization to take place. Thus, the effect of the subsequent liberalization should be significantly lesser than the effect of the initial liberalization. Therefore, the weekly analysis would be able to better capture the effects of the liberalization.

Henry (2000a) analyzes the stock market reactions to the first stock market liberalization with controlling for the effects of foreign stock market fluctuations and concurrent economic reforms. The foreign stock markets considered in the analyses are the returns of emerging market funds index, Standard and Poors (S&P) 500 index and Morgan Stanley's Europe, Asia and Far East stock market index (MSCI EAFE). The economic reforms that have been controlled in Henry's (2000a) analyses are macroeconomic stabilization, trade liberalization, privatization and the easing of exchange control. There are no analyses on the impact of stock market liberalization, having the effects of stock market characteristics and macroeconomic fundamentals controlled. Instead, there are studies mainly emphasizes the impact of those stock market characteristics and macroeconomic fundamentals on stock returns. Thus, this thesis focuses on the impact of the subsequent stock market liberalizations on the stock

market performances after controlling for the effect of stock market characteristics and macroeconomic fundamentals. Market size, market liquidity and market volatility are the three stock market characteristics used in the analyses of this thesis, while the macroeconomic fundamentals used in the analyses are the exchange rate, interest rate and oil price.

A number of previous studies include Malaysia, Thailand, Indonesia and South Korea, as their scope of studies together with other emerging or developing countries (Henry, 2000a; Bekaert et al., 2003; Levine & Zervos, 1998; Tai, 2007; Baharumshah et al., 2003; Manova, 2008; Boubakri et al., 2005; Roland, 2005). Among the four countries, Indonesia is the least selected as a sample country by previous researchers. There is not much focus into these four countries, but the results explain the average performances of the emerging countries as compared to developed countries. On the other hand, this thesis mainly focuses on these four countries as a representative to other Asian countries. These countries are the four major countries that have been directly affected by the Asian financial crisis in 1997. Furthermore, the analyses in this thesis began from 1997, the time in which the policies of subsequent stock market liberalization have been actively imposed in the selected countries.

# 3. HYPOTHESIS DEVELOPMENT

## *3.1* Introduction

In order to ensure a proper guidance of the research, determine what to measure and what statistical relationship to look for, a theoretical framework is needed. Focusing on the theoretical framework, this chapter covers a collection of interrelated concepts on stock market liberalization and stock market integration.

## *3.2* Theoretical Framework

This work investigates the effects of the subsequent liberalization of the stock market, while controlling for the effects of stock market characteristics and macroeconomic fundamentals, on improving stock markets returns, i.e. stock market performances. Any improvement in the degree of stock market integration upon the liberalization of the stock markets is also focused in this research. Thus, interrelated concepts on stock market liberalization, stock market characteristics and macroeconomic fundamentals as controlled variables, and stock market integration are discussed in this section, to serve as guidance to this research.

### 3.2.1 Stock Market Liberalization

The implementation of stock market liberalization policy allows foreign investors to invest in domestic markets and vice versa. The achievement of such implementation is further explored by looking into some related concepts, such as standard International Asset Pricing Model (IAPM) and international diversification.

#### 3.2.1.1 International Asset Pricing Model

Theoretically, based on standard international asset pricing model (IAPM), liberalization of stock market would reduce country's cost of equity capital (Henry, 2000a; Bekaert & Harvey, 2000; Errunza & Losq, 1985). The reduction of country's cost of equity capital may due to higher risks sharing between domestic and foreign agents. An increase in risk sharing reduces equity premium. If the liberalization of stock market reduces the cost of equity capital or equity premium, which holds expected future cash flows constant, then there should be a reduction in required returns and thus, an increase in country's equity price index.

The reduction of country's cost of equity capital may also be due to an increase in net capital inflow generated from easier flows of foreign investment. Higher net capital inflow would increase the total stock of loanable fund, which is negatively related to risk-free rates. Based on capital asset pricing model (CAPM), the lower the risk free rate is, the lower the cost of its equity capital. The reduction of country's cost of equity capital should reduce the required return and raise country's equity price index.

An increase in net capital inflow would also lead to more liquid stock markets, since trading equities become less costly. The increase in stock market liquidity reduces equity premium, decreases cost of capital or required returns and thus, raises equity price index (Levine & Zervos, 1998).

#### 3.2.1.2 International Diversification

Another relevant theory that is related to the impact of stock market liberalization is the international diversification, which is the diversification

across nations whose economic cycles are not perfectly in sync (Shapiro, 2005). International diversification would push out the efficient frontier, which is a set of portfolios with the smallest possible standard deviation for its level of expected return, and the maximum expected return for a given level of risk. Such higher efficient frontier would allow investors to reduce risk, and at the same time, increase expected return. As foreign investors easily access the equity market of a country when stock market liberalization policy is implemented, they are allowed for international diversification. The claim that stock market liberalization has led to greater diversification is supported by Henry (2000b). Through international diversification, foreign investors would bid-up local prices, thus heightening the domestic equity market value in order to attain the superior benefits of diversification (Bekaert et al., 2003).

The benefits of international portfolio diversification, however, could be weakened in the long run when stock markets are cointegrated. As stock markets in the region become more liberalized, investment in the region would be easier and more justifiable, shares become more liquid, and the countries' stock markets would be more integrated. Integrated stock markets are moving together and they have strong correlations between one another. Thus, there would be less benefit to acquire from portfolio diversification across countries in the region since the benefits of international diversification arise from the relatively low level of correlation among countries' stock markets (Raj & Dhal, 2009; Click & Plummer, 2005). Integrated regional stock markets might not be appealing to investors in the region but be more appealing to investors from outside the region. This would enhance capital inflows from abroad and link the regional stock markets closer to the world stock market.

#### 3.2.1.3 Other Concepts

Based on the Keynesian perspective on the role of finance in economic growth, investment decisions are primarily determined by the level of confidence, expected demand and the "animal spirits" of private investors. It is believed that the removal of controls in foreign ownership would increase the level of confidence and the expected demand of foreign investors on domestic equities, driving up country's price index and its returns (Oshikoya & Ogbu, 2003).

According to Modigliani-Miller's irrelevance prepositions (as cited in Oshikoya & Ogbu, 2003), stock-market valuation of the firm does not depend on its financing or dividend pay-out decisions. In fact, the earnings prospects and risk of its underlying real assets are the determinants of a firm's market value. Since stock market liberalization policy would decrease the cost of equity capital consisting of risk-free rate and risk premium of market assets, the stock market value should be higher.

According to Errunza and Losq (1985), certain entry barriers could result in a mildly segmented market structure. According to them, the equilibrium price of a security is jointly determined by its international and national risk premiums in a mildly segmented market structure. Since the local price of risk (the variance) is greater than the global price of risk (the covariance), the lifting of entry barriers, such as foreign ownership, would cause a drop in the equity premium. This drop would reduce the aggregate cost of equity capital, and initiate the burst of aggregate equity price index and its returns.

Henry (2000a) clarifies further that subsequent stock market liberalization should generate positive impact on stock market returns when the world is in State 2. He claims that there are two states, State 1 and State 2, of the world on probable anticipation at the time of the first stock market liberalization. State 2 asserts that "when the first stock market liberalization occurs, future liberalizations are anticipated, but there is some positive probability that each of the subsequent liberalization will not occur." If state 2 is in place, then the implementation or announcement of stock market liberalization would cause greater stock market returns.

On the contrary, there are arguments that liberalization of stock market may trigger financial instability instead of faster growth. According to Stiglitz (2004), implementation of capital market liberalization in developing markets may not lead to welfare improvement, but to higher consumption and output variability. The greater output and consumption variability would generate higher risk premium and higher cost of equity premium. Such higher cost would discourage investment, diminish equity price index and its returns. Therefore, there is a possibility that the liberalization of stock market may negatively affect country's stock market returns.

The argument is consistent with the findings of Naceur et al. (2008), Laopodis (2004), Kawakatsu and Morey (1999), which states that stock market liberalization is negatively related to, or has yet to enhance stock market returns, development, as well as stock market efficiency. Such impact of stock market liberalization may be due to lack of proper attention from private sectors and skeptic perception of investors on policy announcements and implementation, which may also be due to the gradual nature of liberalization. The gradual

process of liberalization may not be able to influence forward-looking investors, since they have already anticipated the outcome during the first liberalization period. Henry (200a) supports the argument that the positive impact of stock market liberalization may be realized when the first stock market liberalization occurs, that is when future liberalizations are anticipated with a probability of 1. He describes such condition as State 1. If such condition is true, then, there should be no significant relationship between stock market liberalization and stock market returns.

It is important to figure out the direction imposed by the subsequent stock market liberalization in the four selected Asian countries since the direction of the theoretical effect is quite ambiguous. This work tries to determine whether an increase in the percentage of foreign ownership on local equities, which occurred after January 1997, affects stock market returns, as specified in the research hypothesis one ($H_1$).

$H_1$: Subsequent stock market liberalization has significant relation with stock market returns

#### 3.2.1.4 Controlled Variables

The aim of this work is to examine the effect of an increase in the percentage of foreign ownership in local equities on stock market returns. The stock market returns, on the other hand, may have been affected by other variables. To isolate the effect of stock market liberalization on stock market returns, the effect of some other variables need to be controlled. Two main controlled variables considered in this work are stock market characteristics and macroeconomic fundamentals. This is an attempt to determine whether there is any change in the impact of the subsequent stock market liberalization on its

returns when the effects of stock market characteristics and macroeconomic fundamentals are taken into consideration.

Stock market characteristics may play an important role in determining stock market returns. Three types of stock market characteristics, which are mentioned mostly in literature, are stock market size, stock market liquidity and stock market volatility.

Stock market capitalization is a measurement of the overall size of a stock market and the number of publically listed domestic companies. The total market capitalization is the current stock prices of all listed companies in the stock exchange, multiplied by the number of outstanding shares of all the listed companies in the stock exchange. According to Wang (2000), Fama and French (1992), there is a negative relationship between stock market size and stock return. The result is based on the concept of the greater the risk, the greater the return. Fama and French (1992) also assert that size is associated with a common risk factor, which contributes to the negative relationship between size and stock returns. Wang (2000), in his study, excludes the small firms that perform poorly, since small stock returns are more volatile, and have higher chances of bankruptcy, and have a tendency to not meet the stock exchange minimum capitalization requirements. On the other hand, market capitalization is reported to have a positive effect on industry returns (Mobarek & Mollah, 2005; Wang & Lim, 2010). This finding on emerging markets contradicts the findings on the developed markets. Levine and Zervos (1998) support the finding and emphasize further that the greater the market size, the better the performances of the stock markets, and the more integrated the markets will be internationally.

There is a positive relationship between stock market liquidity and stock market returns (Jun et al., 2003; Levine & Zervos, 1998). Stock market liquidity has been represented by turnover ratio, trading values and turnover volatility multiplier by Jun et al. (2003). Levine and Zervos (1998), Jun et al. (2003) and Henry (200b) assert that the more liquid the market is, the lower its equity premium will be, which results in lower cost of capital. Having lower cost of capital would lead to higher market value and stock market performances. Taskin and Muradoglu (2003) state that the lack of liquidity in the market would just discourage foreign investors, since liquidity is considered as essential for the effective spread of information. Stock market liquidity is one of the important elements of economic activity, as transmission channel of information across different markets, and as mechanism that grant optimal ownership structures in the economy. Having a market with a low volume of trade and few major dominant securities would just restrict stock market development. However, Yang et al., (2010) find that stock market liquidity is negatively related to stock returns. This may due to compensation for liquidity risk. The result is ambiguous, and may be related to other factors of stock returns.

Stock market volatility is a measure of dispersion around the mean return of a security. It is measured by the standard deviation. The larger the standard deviation, the greater the spread of the stock prices, and the higher the risk of a security is. This condition describes the Modern Portfolio Theory, which stresses that when volatility rises, the stock market will experience losses, and when volatility declines, there is a higher likelihood of a rising market. This is supported by Mobarek and Mollah (2005).

Dividends, required returns, and expected future dividends are the three

main items that determine the value of a stock or stock price. This is based on the stock value formula that $P_0 = (D_1 + P_1)/(1 + R)$ (Ross, Westerfield & Jordon, 2001). The main concern is on the expected future dividend. The increase in the expected future dividend would lead to an increase in stock prices, thus increasing the stock returns. To determine how much is the expected future dividend is not easy, as it is related to how people perceived the riskiness of the stocks. There are many things that can contribute to how people perceive the risk and value of the stocks, which include macroeconomic variables. How the economy performs, whether the GDP is growing or declining, whether the exchange rate is appreciating or depreciating, whether the value of the interest rate is rising or falling, affect the performance of stock markets. Thus, the theories related to macroeconomic variables and stock returns are discussed further.

Stock market performances may also affect the economy despite of having stock market performances be affected by macroeconomics variables (Case & Fair, 2004). The increase in stock prices would lead to an increase in households' wealth. This increase in wealth would contribute to an increase in consumer spending and investment, which then leads to economic growth. An example of this case is the economic boom between 1995 and 2000. It is understood that the economic boom is fueled by the stock market boom. Since the macroeconomic fundamentals are only acted as controlled variables, reverse causality effects are not addressed in this work.

Theoretically, there is a relationship between the exchange rate and stock market returns. Entorf et al. (2009) claim that the relationship of exchange rate and stock returns depends positively on the share of national exports and

negatively on the share of national imports, relative to the GDP. According to Case and Fair (2004), the depreciation of a country's exchange rate signifies a cheaper currency, making local products more competitive on world markets, which would lead to an overwhelming volume of exports (Kandir, 2008). Wang and Lim (2010) also add that the depreciation of the local currency strengthens the international competitiveness of the industry. Thus, it increases the demand for the local stocks, and increases the country's price index. If the country is an export-dominated country, the earnings for the firms and the country would be higher.

On the other hand, currency depreciation would make imported inputs and intermediate goods to be more expensive (Ibrahim & Aziz, 2003), driving the cost of production higher (Case & Fair, 2004), which would lead to lower returns. If the country is an import-dominated country, the reduction in income due to more expensive imports is greater than the increase in income due to cheaper exports. In other words, currency appreciation would reduce the cost of capital and imported inputs, which would then lead to higher returns (Abugri, 2008; Bilson et al., 2001; Pebbles & Wilson, 1996).

Interest is the fee that borrowers pay to tenders for the use of money, and interest rate is the annual interest payment on a loan expressed as a percentage of the loan (Case & Fair, 2004). Some of the different types of interest rates available are three-month Treasury bill rate, government bond rate, federal funds rate, commercial paper rate, prime rate and AAA corporate bond rate. Interest rate is another macroeconomic fundamental that can affect stock market performances, which would in turn, affect the economy. Case and Fair (2004) came up with the scenario that if the stock prices increase, firms can raise more

money per share to finance investment projects. Higher investment means higher GDPs, since investment is one of the four components of GDP.

Since interest is the fee to be paid to the lender, the lower the fee or the interest rate, the higher the chances that the investment would take place. With higher rates of investment, the stock will be more in demand, which will increase its prices and its demands. Therefore, there should be a negative relationship between stock market returns and interest rates. Case and Fair (2004) support this theory, and state that when the interest rate rises, borrowing becomes more expensive, resulting in less investment projects due to inflationary or discounted factor effect (Mukherjee & Naka, 1995). In addition, the interest rate is an alternative investment opportunity. The higher the interest rate, the lesser the investment, which results in reduced stock prices (Gjerde & Saettam, 1999). Stock return is positively related to the interest rate when money supply is backed by foreign reserves, as affirmed by Bilson (2001), Asprem (1989), Mandelker and Tandon (1985). Wang and Lim (2010) went further and proved that Treasury bill yield has a significant positive effect on industry returns.

The relationship between oil prices and stock market returns should be negative if oil turns up to be the intermediate good. The higher the oil prices, the higher the cost of production, which would then reduce the firms' profits, lessen the aggregate economic activities, and lower a country's stock prices and returns (Somoye et al., 2009; Oberndorfer, 2009). Such outcome does not happen to oil producing and exporting countries. Gjerde and Saettem (1999), Cheung and Ng (1998), Clare and Thomas (1994) state that due to the inelastic demand of oil, an increase in oil prices would generate greater revenue and profit for the oil

producing and exporting country.

### 3.2.2 Stock Market Integration

Investment in foreign assets can be done by domestic investors, and vice versa. The same expected returns are anticipated from assets of identical risks, regardless of trading location. These are the conditions of financially integrated markets.

According to Henry (2000b), stock markets are fully integrated when equity premium is proportional to the covariance of a country's aggregate cash flows with those of the world's portfolio. When equity premium is proportional to the variance of a country's aggregate cash flows, the stock markets are segmented. Therefore, in terms of the impact of stock market liberalization on market integration, the equity premium of a country with liberalized stock market is expected to fall. It is the condition in which the variance, which is the local price of risk, is greater than the covariance, which is the global price of risk (Henry, 2000b; Bekaert & Harvey, 2000). Lin (2005) defines integrated stock markets as when two assets of the same risk level from two arbitrarily selected capital markets have the same expected returns. According to Tahai, Rutledge, and Karim (2004), the rewards for bearing risk should be similar in integrated markets. Hunter (2006) measures integration based on equality of risk prices on American Depository Receipts. Ragunathan (1999) states that in an integrated market, the value-weighted industry portfolio is priced solely according to the global index.

In Errunza and Losq (1985) "mild" segmentation model, capital markets are neither completely segmented nor fully integrated. There are a multi-country model and two-country model, in which a multi-country model heads to a significantly different valuation and welfare results than those of a two-country model. A move

toward market integration is favored among all investors. This is due to the reduction of risk by means of international diversification. Other than through stock market liberalization, the introduction of different types of index funds in the barrier-free (core) segment of the market would also boost the world market integration and investor welfare.

The correlation between emerging markets and the world is greater when more foreign investors invest in local markets to obtain superior diversification benefits (Bekaert & Harvey, 2000). Therefore, the implementation of stock market liberalization, which would initiate greater foreign investment on local equity, will cointegrate the market with the world to the higher degree.

As stated in hypothesis two ($H_2$), this work explores whether there is any improvement in the level of integration between Malaysia, Thailand, Indonesia, South Korea with the world's stock markets after going through a number of liberalization policies and other financial reforms. The hypothesis two is:

$H_2$: Stock markets of Malaysia, Indonesia, Thailand, South Korea and the world (MSCI-World Index) are integrated with each other during and after the subsequent stock market liberalization.

## *3.3* Research Framework

Figure 3.1 is the research framework used in identifying the impact of the subsequent stock market liberalization on stock market returns. Stock market characteristics and macroeconomic fundamentals which may also play important roles in affecting stock market returns during the same time period, act as controlled variables. This research investigates how effective the subsequent stock market market liberalization policy is in improving the performances of the stock markets as detailed

by Research Objective One, using Model 1. After identifying the relationship between the subsequent stock market liberalization and the stock market returns, the degree of integration of the four countries and the world stock markets are examined for both short-run and long-run.

***Model 1:***

$$R_{it} = \alpha_1 + \beta_1 Lib_{it} + \beta_2 Size_{it} + \beta_3 Liq_{it} + \beta_4 Vol_{it} + \beta_5 ER_{it} + \beta_6 IR_{it} + \beta_7 Oil_{it} + \mu_{it} \quad (Eq\ 1.1)$$

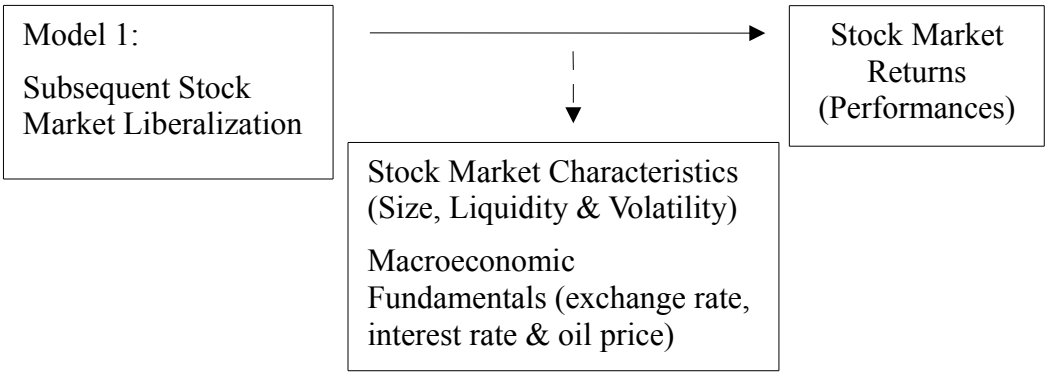



Figure 3.1: Research Frameworks on Relationship between Stock Market Liberalization and Stock Market Returns, controlling for the effects of Stock Market Characteristics and Macroeconomic Fundamentals

## *3.4* Research Hypotheses

Based on the proposed relationship in the literature, this work considers the following hypotheses:

$H_1$: Subsequent stock market liberalization is significantly related to stock market

returns

$H_2$: Stock markets of Malaysia, Indonesia, Thailand, South Korea and the world (MSCI-World Index) are integrated with each other during and after the subsequent stock market liberalization.

The first hypothesis, $H_1$, conjectures that the implementation of stock market liberalization policies, would positively affect returns, which is consistent with the predictions of the IAPM. The second hypothesis, $H_2$, infers that the liberalizing countries are expected to be more open and integrated with each other during and after the subsequent stock market liberalization.

## 3.5 Chapter Summary

The implementation of the subsequent stock market liberalization policy is expected to generate greater stock market returns, according to the predictions of the International Asset Pricing Model, international diversification, Keynesian's, Modigliani-Miller's (1958), Errunza's and Losq's (1985) perspectives on stock market liberalization. However, there are also arguments against the implementation of stock market liberalization. The level of stock market integration between the four Asian countries and the world stock markets are expected to be much higher.

Based on these theories and concepts, this work considers two research hypotheses: $H_1$: Stock market liberalization is significantly related to stock market returns; $H_2$: Stock markets of Malaysia, Indonesia, Thailand, South Korea and the world are integrated with each other during and post subsequent stock market liberalization.

# 4. METHODOLOGY

## 4.1 Research Design

The specification of methods and procedures for acquiring information and analyzing data are important in order to achieve the objectives of the research, to answer the research questions and to test the research hypotheses. Such approach on how research is carried out is called research design, which is the main focus of this methodology section. The research design section starts with data collection and sources of data. The econometric tests on the data and the methods used in analyzing data are in the following sections. The last section covers data analysis.

### 4.1.1 Stock Market Liberalization

Stock market liberalization is defined in this work as an increase in the percentage of foreign ownership on local companies. Subsequent stock market liberalization has been the main emphasis of this work, in order to differentiate it from the study of previous researchers. Most of the previous literature discusses the initial stock market liberalization, which has been defined as the first official liberalization, first launch of American Depository Receipt (ADR) or country fund. The details of the stock market liberalization policies imposed in the four countries, which took place in 1997 onwards, are acquired mainly from Bekaert and Harvey's

(BH) data on major political and economic events in emerging markets.[21] The data from 2004 onwards is acquired from Lexis-Nexis (LN), after not being able to obtain data from countries' stock exchanges, central banks and securities commissions. The details of those data on implementation dates, percentage change in foreign ownership on local firms, sources of data and events analyzed in this study are available in Table 4.1.

Table 4.2: Implementation Dates of Subsequent Stock Market Liberalization

| Country | Date | % Change in foreign ownership | Sources | Analyze |
|---|---|---|---|---|
| Malaysia | 3 Apr, 1998 | 49% to 61% for local telephone companies | BH | √ |
| | 1 June, 2003 | Extension of 100% for manufacturing companies | BH | √ |
| | 18 Apr, 2005 | 30% to 49% for investment banks | LN | √ |
| Thailand | 13 Oct, 1997 | Full ownership in financial institutions for up to 10 years | BH | √ |
| | 30 Jan, 1998 | 49% for securities companies was scrapped | BH | X |
| Indonesia | 4 Sep, 1997 | 49% for IPO and unlimited % for local shares except banks | BH | √ |
| | 1 Jan, 1998 | Open up banking sectors and plantation | BH | X |
| | 31 Mar, 1999 | Ceiling was raised for nonstrategic corporations and equity participation of foreign banks in a joint bank | BH | √ |
| Korea | 11 Dec, 1997 | New 50% foreign investment ceiling | BH | √ |
| | 25 May, 1998 | No restriction for domestic collective investment securities | BH | X |
| | 1 Jul, 1999 | Up to 49% for telecommunication operators | BH | √ |

*Note. √ indicates that the event date is used in the regression analysis.*
*X indicates that the event date is not included in the regression analysis due to overlapping problem with the earlier event.*
*BH is Bekaert and Harvey's data on major political and economic events in emerging markets.*
*LN is Lexis Nexis data*

21 Bekaert, G. & Harvey, C. R. (2004). A Chronology of Important Financial, Economic and Political Events in Emerging Markets. *Country Risk Analysisfor Malaysia, Indonesia, Thailand and Korea.*
http://www.duke.edu/~charvey/Country_risk/chronology/chronology_index.htm

Table 4.1 reveals that Malaysian authorities have not allowed for high equity ownership of local companies by foreign investors. Increase in ownership is approximately 12 percent to 19 percent, and it is only meant for one sector for each policy. The 100 percent ownership given in 2003 is an extension of the policy which was set, earlier, to expire in 2000, but was extended to December 2003. In June 2003, the policy was extended again to an unannounced date. On the other hand, Thailand, Indonesia, and South Korea, have opened up their markets completely. For example, in Thailand, stock market liberalization in October 1997 allowed for full foreign ownership in financial institutions for up to ten years; while, in Indonesia, stock market liberalization in 1997 allowed for an unlimited percentage of foreign ownership of local shares except banks; furthermore, stock market liberalization in January 1998 forced Indonesia open up its banking and plantation sectors to foreign investors. In South Korea, stock market liberalization in May 1998 allowed for no restrictions on foreign ownership of investment securities. In addition, Indonesia and South Korea opened up more than one market sectors to foreign investors. These conditions are incumbent to the International Monetary Fund (IMF)-led aid package acquired by those three countries, which was formally announced in October 1997. Thus, the results of the analyses enable discover of differences in the stock market performances between countries with or without IMF aid.

From eleven events in Table 4.1, three overlapping events need to be omitted from the analysis. Those events overlapped earlier events, which would result in the use of the same data in the event window (T±12 weeks and T±26 weeks) of each event analysis. As a result, only eight of eleven events are analyzed. The excluded events are Thailand's stock market liberalization in January 1998 which overlaps

with Thailand's stock market liberalization in October 1997, Indonesia's stock market liberalization in January 1998 which overlaps with stock market liberalization in September 1997, and South Korea's stock market liberalization in May 1998 which overlaps with stock market liberalization in December 1997. Those excluded events are marked 'X' in the last column of Table 4.1. The total eight events analyzed in this work are summarized in Table 4.2.

These stock market liberalization policies have been implemented on specific sectors, rather than on the overall stock market of a country. Therefore, analyses on the impact of stock market liberalization on performances of those affected sectors are also carried out. The selection of the sectors is based upon the sectors in which the policy is enforced. A list of selected sectors is shown in the last column in Table 4.2. Data on such sectoral indices which are summarized in Table 4.3 are collected and further measured for sector market performances.

Stock market liberalization in Malaysia in April 1998 has allowed foreign investors to own a higher percentage of local telecommunications companies. An example of a local telecommunication company in Malaysia is Telekom. In reference to Bursa Malaysia website, Telekom is categorized into service sector. Therefore, Bursa Malaysia (BM) service sector index is used in measuring sectoral market returns. In April 2003, Malaysia's manufacturing companies were allowed an extension of the policy, in which foreign investors were allowed full ownership. Since manufacturing companies could be producing industrial products, consumer products, or both, industrial products sector and consumer products sector indices are added together to represent the manufacturing sector. The finance sector index is collected to represent investment banks for the liberalization that took place in April 2005. For liberalization in Thailand in October 1997 which allowed for full foreign

ownership in financial institutions for up to 10 years, the Stock Exchange of Thailand (SET) financial sector index is used in the analyses.

Table 4.3: Stock Market Liberalization and the Affected Sectors Stock Markets

| Country | Event Date | % Change in foreign ownership | Sectoral Indices |
|---|---|---|---|
| Malaysia | Apr, 1998 | 49% to 61% for local telephone companies | BM Service Sector |
| | 1 June, 2003 | Extension of 100% for manufacturing companies | BM Industrial & Consumer Products Sectors |
| | 18 Apr, 2005 | 30% to 49% for investment banks | BM Finance |
| Thailand | 13 Oct, 1997 | Full ownership in financial institutions for up to 10 years | SET Finance |
| Indonesia | 4 Sep, 1997 | 49% for IPO and unlimited % for local shares except banks | JCI - IDX Finance |
| | 31 Mar, 1999 | Ceiling was raised for nonstrategic corporations and equity participation of foreign banks in a joint bank | IDX Finance + Mining + Trade |
| Korea | 11 Dec, 1997 | New 50% foreign investment ceiling | KOSPI |
| | 1 Jul, 1999 | Up to 49% for telecommunication operators | KOSP Service |

Note: BM is Bursa Malaysia; SET is Stock Exchange of Thailand; JCI is Jakarta Stock Exchange Composite Index; IDX is Indonesia Stock Exchange; KOSPI is Korea Composite Stock Price Index

Indonesia's stock market liberalization in 1997 allowed for a 49 percent foreign ownership on initial public offerings, and a 100 percent foreign ownership on all local shares, except banks. Therefore, the Indonesia Stock Exchange (IDX) finance sector index is deducted from the Jakarta Composite Index (JCI) to represent changes in foreign ownership of other sectors other than banks or finance sectors. Indonesia's stock market liberalization policy in 1999 has allowed for higher foreign ownership on non-strategic corporations, which belonged to the mining and trade sectors. The same liberalization policy has also allowed for equity participation of foreign banks in a joint bank in Indonesia. Thus, the three sectors'

indices of mining, trade and finance are added together for further analyses on sector performances.

The Korea Composite Stock Price Index (KOSPI) is used in sectoral analyses for the liberalization that took place in December 1997 which allowed for up to 50 percent foreign investment. In July 1999, the liberalization policy allowed for 49 percent foreign ownership in the telecommunication industry, thus, the KOSP service sector index is used in the sectoral analyses.

### 4.1.2 Stock Market Returns

For stock market performances, this work uses stock market returns as its proxy. The stock market returns are measured from main indices and sector indices of the respective countries' stock exchanges. The collected stock market main and sector indices of Malaysia, Indonesia, Thailand, South Korea and MSCI World are shown in Table 4.3.

The data were obtained from Bloomberg and Datastream. Data on the MSCI world index are collected and used in the regression and cointegration analyses to examine the integration level of the four countries' stock markets with the world stock market. All the collected data are weekly based which are, in turn, based on the closing index of the week. Weekly data are applied in the analyses instead of monthly or yearly data, since it permits more precise measurement of market returns and more informative studies of implementation effects. Many of the previous studies analyze monthly or yearly data (Wang & Lim, 2010; Naceur et al., 2008; Tai, 2007; Hunter, 2006; Christoffersen et al., 2006; Henry, 2000a; Levine & Zervos, 1998). These data are more appropriate to run in the analyses of measuring the impact of initial stock market liberalization, due to a bigger impact, as compared

to the smaller impact by the subsequent stock market liberalization. The smaller impact of subsequent stock market liberalization is related to its role on certain sector(s), instead of on the overall stock market. Using the weekly data instead of the daily data can circumvent the problem of having infrequent and non-synchronous trading (Fuss, 2006).

Table 4.4: Data Collected on Main and Sectoral Stock Market Indices

| Country | Stock Market Indices | Source |
|---|---|---|
| Malaysia | Kuala Lumpur Composite Index (KLCI); Bursa Malaysia (BM) Service Sector Index, Industrial Products Sector Index, Consumer Products Sector Index, Finance Sector Index | Bloomberg and Datastream |
| Thailand | Stock Exchange of Thailand Composite Index (SET); Financial Sector Index | Bloomberg and Datastream |
| Indonesia | Jakarta Stock Exchange Composite Index (JCI); Indonesia Stock Exchange (IDX) Finance Sector Index, Mining Sector Index, Trade Sector Index | Bloomberg and Datastream |
| South Korea | Korea Composite Stock Price index (KOSPI); Korea Stock Price (KOSP) Service Sector Index | Bloomberg and Datastream |
| World | Morgan Stanley Capital International (MSCI) World Index | Bloomberg and Datastream |

Stock market returns are used as a proxy to stock market performances (Wang & Lim, 2010; Abugri, 2008; Tai, 2007; Henry, 2000a; Levine & Zervos, 1998). To measure country and sector(s) stock market returns, an individual country's main index (Abugri, 2008; Tai, 2007) and its affected sector indices (Wang & Lim, 2010) are used respectively. Country stock market main index is chosen in measuring stock market returns, since the index robustly represents the national economy with a growing linkage to the global economy. The country's main index also provides a platform for a wider range of investable and appealing opportunities (Bank Negara website, 2011), which are good characteristics for a proxy of stock market performances.

Despite the use of country stock market main indices, their sector indices are also analyzed in order to identify the impact of stock market liberalization on sectoral performances, due to the enforcement of the policy only on certain sector(s), rather than to the whole market. Therefore, the analyses of both country' stock market main indices and sector indices would provide stronger evidence or support on the impact of stock market liberalization on both returns.

To examine the reaction of stock market returns on the implementation of stock market liberalization, the weekly stock market returns of a country's index *i* at time *t* are measured as follows.

$$R_{it} = Ln(P_1) - Ln(P_0) \qquad \text{(Eq 4.1)}$$

where
$Ln(P_1)$ is the natural logarithm (log) of current stock price index (excluding dividends);
$Ln(P_0)$ is the natural log of previous stock price index;
$R_{it}$ is the rate of stock market returns of country *i* at time *t*.

This measurement is also applied by Wang and Lim (2010), Abugri (2008), Tai (2007) and Fuss (2005). The dividend yield is not included in the measurement of stock market returns due to the availability of the dividend data, which is only on a yearly basis, whereas, the returns are calculated on a weekly basis. In addition, Henry (2000a), Bekaert and Harvey (2000) and Errunza and Miller (1998) report that the dividend yield is not significant in measuring stock market returns.

Abnormal returns, which are measured by using a Capital Asset Pricing Model (CAPM), are also used by other studies (Henry, 2000a, Levine & Zervos, 1998). This measurement of returns is appropriate to the analyses of a security, rather than of a country index due to the need of beta and market risk premium.

### *4.1.3* Controlled Variables

Other than the data on stock market liberalization and stock market indices, data on stock market characteristics and macroeconomic fundamentals are needed as controlled variables. Those data are collected on a weekly basis, which are based on the closing value of the week, as the data on stock market indices. Table 4.4 summarizes the detail information on the data collected for stock market characteristics, which are represented by stock market size, liquidity and volatility. Those data are acquired from Bloomberg and CEIC Data (A Euromony Institution Investor Company). The detailed data on macroeconomic fundamentals, which are represented by exchange rate, interest rate and oil price, appear in Table 4.5.

#### 4.1.3.1 Stock Market Characteristics

The choice of stock market characteristics are based on the article by Levine and Zervos (1998), listing four stock market developments. Those stock market developments are stock market size, liquidity, volatility, and integration. Thus, this work focuses on all four, in which three are in regression estimation, while integration is seen in the cointegration analyses.

Table 4.5: Data on Stock Market Characteristics

| Stock Market Characteristics | Measurement | Definition | Source |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Stock Market Size | Weekly stock market capitalization | Number of listed domestic companies in country's stock market main and sector indices. Shows overall size of the market | Bloomberg & CEIC |
| Stock Market Liquidity | Weekly trade volume | Total number of shares traded in country's stock market main and sector indices. Shows ability to easily buy and sell securities | Bloomberg & CEIC |
| Stock Market Volatility | Weekly stock market 90-day volatility for main indices;<br>10-day volatility for sector indices | Measure for variation of country's stock market main and sector indices calculated from standard deviation of day-to-day historical index change | Bloomberg |

To measure stock market size, the weekly stock market capitalization of each country's index is used. Stock market capitalization shows the overall size of the stock market and the number of listed domestic companies in the stock market. Market capitalization ratio to the gross domestic product (GDP), which is applied by Levine and Zervos (1998), cannot be used as a measurement for market size in this work due to the unavailability of GDP, or even industrial production index (IPI) weekly data.

Stock market liquidity shows the ability to easily buy and sell securities which, in this work, is indicated through trade volume. Trade volume represents total number of shares of a security being traded in the market. Chuang et al. (2009), Mobarek and Mollah (2005) also utilize trade volume as a proxy for stock market liquidity in their study. Yang et al. (2010), Dev (2005), Jun et al. (2003), Levine and Zervos (1998), however, utilize traded value ratio and turnover ratio as a proxy to stock market liquidity. Traded value ratio could not be used in this work as a measurement to stock market liquidity, due to unavailability of traded value data from January 1997 to May 2000. In addition, turnover ratio and GDP data are only available on a monthly and quarterly basis, respectively.

Market volatility is measured by weekly 90-day volatility of the country's index, obtained from Bloomberg; this is a measure for variation of a country's stock market main index calculated from standard deviation of logged day-to-day historical index change. Since 90-days is quite a long duration for the measurement of volatility, a 5-day week rolling standard deviation of market returns was also calculated and used in the analysis. The results of the two volatilities when compared, were found to be similar. As a result, the analyses concentrate on 90-day volatility to represent a stock market's volatility. Levine and Zervos (1998) use a 12-month rolling standard deviation estimate to measure volatility. For sector indices, 10-day volatility is used in sector indices analysis, instead of 90-day volatility, due to the availability of the data.

#### *4.1.3.2* Macroeconomic Fundamentals

Data on macroeconomic variables for each country are obtained from Bloomberg, CEIC, DataStream, and South Korea central bank. Table 4.5 summarizes the data collected on macroeconomic fundamentals, which are represented by exchange rates, interest rates and oil prices. As shown in the table, those data are specifically the weekly foreign exchange rates of local currency to the U.S. dollar, weekly three-month interbank offer rates, and weekly spot crude oil prices of Non-OPEC countries in U.S. dollars. These data enable clarification of how the changes in the foreign exchange rates, interest rates, and oil prices influence stock returns.

Table 4.6: Data on Macroeconomic Fundamentals

| Macroeconomic Fundamentals | Description | Source |
|---|---|---|
| Exchange rate | Weekly foreign exchange rates of local currency vis-à-vis U.S. dollar | Datastream |
| Interest rate | Weekly three month interbank offer rate | CEIC, Bloomberg, Korea central bank |

| | | |
|---|---|---|
| Oil price | Weekly crude oil price (spot price: non-OPEC countries) | CEIC |

Exchange rates and interest rates are common macroeconomic fundamentals used by other researchers that might significantly affect stock market returns (Chen, 2009 and Abugri, 2008). For interest rates, the three-month interbank offer rate is applied in this analysis. Other than the interbank interest rates, the Treasury bill yields and official cash rate may also act as proxies for the interest rate (Wang & Lim, 2010); however, those data are not fully available. The consumer price index, which would indicate the inflation rate of a country and industrial production index, and the economic growth of a country, are only available on a monthly basis. Since the regression analysis is conducted on a weekly basis, it is not possible to analyze such variables simultaneously.

Changes in oil prices would also affect the change in inflation rate. Since oil prices are available on a daily and weekly basis, this work focuses on the degree of relationship between oil prices and stock market returns in which the results would also indirectly indicate the impact of inflation on stock market returns. Oberndorfer (2009) also focuses on energy prices, specifically on crude oil, gas and coal prices, in his study. In terms of the effect of economic growth, it is identifiable when the results are compared in two scenarios: during and after the crisis period, with 1997 to 1998 as the period during crisis, while post-1999 is considered the period after the crisis.

### *4.2* Econometrics

After collecting series of data, they are viewed and analyzed by examining their

summary statistics and graphs, which are described in detail in the last section of this chapter. It is important to transform the series of raw data and to conduct econometric tests in order to have sound application of regression analyses and valid interpretation of the results. For the econometric tests, the series are tested for unit roots, auto correlation, heteroskedasticity and multicollinearity.

The series are first converted to natural logarithm. Taking the natural logarithm of the series effectively linearizes the exponential trend or any non-linearity in the parameters (Asteriou and Hall, 2007). The logged series are then tested for unit roots or stationarity by using augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. To run the regression analyses, the regression models should meet certain criteria in order to be valid. Those criteria are the auto correlation, heteroskedasticity and multicollinearity tests, which are discussed in detail in this section.

### 4.2.1 Stationarity

Stationarity test is conducted to test if the series contain shocks, which will be temporary, and their effects will be eradicated over time, as the series revert to their long-run mean values. If the series are non-stationary or contain unit roots, it means that the series contain permanent components, which lead to cases where the series have no long-run mean, and the variance will depend on time. Running standard ordinary least square (OLS) regression by using non-stationary data would easily lead to incorrect conclusions. Results would show very high values of $R^2$ and t-ratios. In addition, the variables in the analysis would show no interrelationships (Brooks, 2002; Asteriou & Hall, 2007).

Consider the AR(1) model:

$$y_t = \varphi y_{t-1} + u_t \qquad \text{(Eq 4.2)}$$

The series is stationary if $|\varphi| < 1$; the series explodes if $|\varphi| > 1$; and the series contains a unit root and is non-stationary if $|\varphi| = 1$ (Asteriou and Hall, 2007).

There are four main unit root tests, which are the Dickey-Fuller (DF), augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS). The DF test is based on the assumption that the error terms are statistically independent, and have a constant variance, whereas the ADF test assumes that the error terms are uncorrelated and the variance is constant. PP test allows for fairly mild assumptions concerning the distribution of errors, ADF test adds lagged differenced terms on the right-hand side to adjust for higher order serial correlation, whereas PP makes corrections to the *t* statistics of the coefficient $\gamma$ from the AR (1) regression to account for serial correlation in $e_t$. To complement the unit root tests above, the KPSS test is a test of null hypothesis that an observable series is trend stationary (stationary around a deterministic trend). The series is expressed as the sum of deterministic trend, random walk, and stationary error. Among the four, only two common tests, ADF and PP are applied for the unit root analyses in this study.

The ADF test equation for series with intercept is:

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \sum \beta_i \Delta y_{t-i} + u_t \qquad \text{(Eq 4.3)}$$

The PP test is the AR(1) process:

$$\Delta y_{t-1} = \alpha_0 + \gamma y_{t-1} + e_t \qquad \text{(Eq 4.4)}$$

Both ADF and PP tests are used in the analysis to eliminate autocorrelation. The lag length for the ADF is determined by Schwartz Bayesian Criterion (SBC), whereas the band width for the PP is based on Newey-West using Bartlett kernel.

All series are logged and tested for unit roots by using the ADF and PP tests. The unit root tests are tested for all the series. Table 4.6 exhibits the results of unit

root tests for stock market indices of the four Asian and world markets. The unit root test results for market characteristics and macroeconomic variables are displayed in Table 4.7 and Table 4.8 respectively.

Table 4.7: The Unit Root Tests using ADF and PP models for Countries' Stock Market Indices

| | | Level | | 1st Difference | |
|---|---|---|---|---|---|
| Country | Test Statistics | t-Statistic | *Prob.** | t-Statistic | *Prob.** |
| Msia | Augmented Dickey-Fuller (ADF) | -1.480 | *0.544* | -25.174 | *0.000* |
| | Phillips-Perron (PP) | -1.936 | *0.316* | -25.890 | *0.000* |
| Thai | Augmented Dickey-Fuller (ADF) | -2.011 | *0.282* | -15.406 | *0.000* |
| | Phillips-Perron (PP) | -1.895 | *0.335* | -25.291 | *0.000* |
| Indo | Augmented Dickey-Fuller (ADF) | -0.028 | *0.955* | -27.191 | *0.000* |
| | Phillips-Perron (PP) | -0.281 | *0.925* | -27.450 | *0.000* |
| Kor | Augmented Dickey-Fuller (ADF) | -1.128 | *0.707* | -28.105 | *0.000* |
| | Phillips-Perron (PP) | -1.279 | *0.641* | -28.114 | *0.000* |
| World | Augmented Dickey-Fuller (ADF) | -2.053 | *0.264* | -26.261 | *0.000* |
| | Phillips-Perron (PP) | -2.148 | *0.226* | -26.296 | *0.000* |

Results in Table 4.6 reveal that for stock market indices, the null hypothesis, that the series contains a unit root, is rejected at first difference in both ADF and PP tests. Therefore, the series for all four countries and the world stock markets are stationary at first difference, and are integrated of order 1, I(1). The first difference of stock market indices is also the stock market returns, in which the returns are measured as Equation 4.1, $R_{it} = Ln(P_1) – Ln(P_0)$. Therefore, the stock market returns have no unit root and are stationary. Those stationary series of stock market returns are used in the OLS regression analyses.

For stock market characteristics (refer to Table 4.7), only trade volume series, which represents stock market liquidity, has no unit root at level. The other two stock market characteristics; market capitalization, which represent stock market size and 90-day volatility, which represent stock market volatility, have unit roots at level, but not at the first difference. Therefore, trade volume is stationary at level,

and integrated of order zero, I(0), whereas, market capitalization and 90-day volatility series are stationary after first difference, and integrated of order one, I(1). Thus, in the OLS regression analyses, the first difference of natural log market capitalization and 90-day volatility are applied as stock market size and stock market volatility variables. Stock market liquidity is represented by the natural log of the trade volume at level, as summarized in Table 4.13.

Table 4.7: The Unit Root Tests using ADF and PP models for Stock Market Characteristics

| | | Market Capitalization | | | | Trade Volume | | 90-Day Volatility | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Level | | 1st Difference | | Level | | Level | | 1St Difference | |
| | | t-Stat | *Prob.* | t-Stat | *Prob.* | t-Stat | *Prob.* | t-Stat | *Prob.* | t-Stat | *Prob.* |
| Msia | ADF | -0.99 | *0.76* | -26.24 | *0.00* | -4.71 | *0.00* | -1.93 | *0.32* | -19.41 | *0.00* |
| | PP | -1.34 | *0.61* | -26.76 | *0.00* | -8.56 | *0.00* | -1.92 | *0.33* | -19.40 | *0.00* |
| Thai | ADF | -0.91 | *0.78* | -15.51 | *0.00* | -2.90 | *0.05* | -1.60 | *0.48* | -10.82 | *0.00* |
| | PP | -0.86 | *0.80* | -25.43 | *0.00* | -3.45 | *0.01* | -2.95 | *0.04* | -22.91 | *0.00* |
| Indo | ADF | -0.79 | *0.82* | -8.29 | *0.00* | -3.11 | *0.03* | -3.34 | *0.01* | -18.50 | *0.00* |
| | PP | -0.43 | *0.90* | -27.59 | *0.00* | -6.32 | *0.00* | -3.21 | *0.02* | -19.26 | *0.00* |
| Kor | ADF | -0.97 | *0.77* | -28.20 | *0.00* | -3.41 | *0.01* | -2.27 | *0.18* | -16.33 | *0.00* |
| | PP | -1.07 | *0.73* | -28.32 | *0.00* | -6.76 | *0.00* | -2.73 | *0.07* | -17.78 | *0.00* |

The outcomes of the unit root tests for macroeconomic fundamentals are shown in Table 4.8 and 4.9. Table 4.8 indicates that each of the countries' exchange rates series is stationary at level. Both results of ADF and PP tests in the levels of exchange rate reported that the null hypothesis of non-stationarity is rejected at five percent significance level. On the other hand, for the interest rate series, the null hypothesis of the presence of a unit root is rejected only after first-differencing. Such similar unit root tests results are obtained for oil price series. Therefore, both interest rates and oil price are stationary at their first differences or integrated of

order one, I(1), whereas exchange rates are stationary at levels or integrated of order zero, I(0). For the OLS regression analyses, exchange rates at level, interest rates and oil prices at first difference are applied as shown in Table 4.13.

Table 4.8: The Unit Root Tests using ADF and PP models for Countries' Exchange Rates and Interest Rates

| | | Exchange Rate | | Interest Rate | | | |
|---|---|---|---|---|---|---|---|
| | | Level | | Level | | 1st Difference | |
| | | t-Stat | *Prob.* | t-Stat | *Prob.* | t-Stat | *Prob.* |
| Msia | ADF | -3.849 | *0.003* | -1.566 | *0.500* | -10.296 | *0.000* |
| | PP | -3.617 | *0.006* | -1.483 | *0.542* | -28.890 | *0.000* |
| Thai | ADF | -3.251 | *0.018* | -1.121 | *0.709* | -25.789 | *0.000* |
| | PP | -3.127 | *0.025* | -1.190 | *0.680* | -25.894 | *0.000* |
| Indo | ADF | -4.130 | *0.001* | -1.105 | *0.715* | -37.224 | *0.000* |
| | PP | -3.740 | *0.004* | -1.280 | *0.640* | -36.420 | *0.000* |
| Kor | ADF | -3.420 | *0.011* | -1.544 | *0.511* | -11.039 | *0.000* |
| | PP | -2.946 | *0.041* | -1.542 | *0.512* | -30.504 | *0.000* |

| | Oil Price | | | |
|---|---|---|---|---|
| | Level | | 1St Difference | |
| | t-Statistic | *Prob.* | t-Statistic | *Prob.* |
| ADF | -0.910 | *0.785* | -20.186 | *0.000* |
| PP | -0.887 | *0.792* | -20.203 | *0.000* |

Table 4.9: The Unit Root Tests using ADF and PP models for Oil Price

4.2.2. Autocorrelation

The relationships of stock market performances with stock market liberalization, controlling for the effects of stock market characteristics and macroeconomic fundamentals, are measured by using ordinary least square (OLS) regression method. The use of such method requires the error terms of the variables to be independently distributed or serially independent. Autocorrelation or serial correlation can be detected by applying the Durbin-Watson test and Breusch-Godfrey LM test.

According to Asteriou and Hall (2007), the Durbin-Watson (DW) test is the most frequently used statistical test for the presence of serial correlation when the regression model includes a constant, serial correlation is assumed to be of the first-order, and the equation does not include a lagged dependent variable as an explanatory variable. In other word, it tests only for a relationship between an error and its immediately previous value (Brooks, 2002). The DW test null and alternative hypotheses are:

$H_0$: $\rho = 0$, no evidence of autocorrelation (the current error

$H_1$: $\rho \neq 0$, evidence of autocorrelation

The DW test statistic formula is $d = \frac{\sum_{t=2}^{n} (\hat{u}_t - \hat{u}_{t-1})^2}{\sum_{t=2}^{n} \hat{u}_t^2}$ (Eq 4.5)

A rule of thumb for the DW test are:

a) $p = 0$, $d = 2$: therefore, a value of $d$ near to 2 indicates that there is no evidence of serial correlation.

b) $p = 1$, $d \simeq 0$: a strong positive autocorrelation.

c) $p = -1$, $d \simeq 4$: a strong negative serial correlation.

DW test can also be used to detect spurious regression; a condition detected when running for the OLS regression results in a very high $R^2$ and significant estimates of $t$ statistics, but has no economic meaning. These regressions are called spurious regressions. To detect for spurious regression, Granger and Newbold

proposed the 'rule of thumb' that if $R^2$ > Durbin-Watson (DW)-statistics or if $R^2 \approx 1$, then the regression must be spurious (as cited in Asteriou and Hall, 2007).

Another appropriate method in detecting autocorrelation, which allows for relationship examination between $\hat{u}_t$ and several of its lagged values at the same time, is the Breusch-Godfrey LM (LM) test. The null and alternative hypotheses of LM are:

$$H_0: \rho_1 = 0 \text{ and } \rho_2 = 0 \text{ and } \ldots \text{ and } \rho_r = 0$$

$$H_1: \rho_1 \neq 0 \text{ or } \rho_2 \neq 0 \text{ or } \ldots \text{ or } \rho_r \neq 0$$

The LM statistic formula is $(n-p)R^2$. If LM statistic is larger than the $x_p^2$ critical value for a given level of significance, then the null hypothesis of serial correlation is rejected, and concludes that serial correlation is present.

The results of DW test statistics, ds, of the regression equation Model 1 are near to 2. Therefore, there is no evidence of serial correlation. In addition to that, all $R^2$s are less than the DW test statistics, which ensure that the regressions are not spurious.

The results of LM test show that the null hypothesis of serial correlation of the regression equation Model 1 needs to be rejected, since the LM statistic is larger than the $x_p^2$ critical value at one and five percents significant level. Therefore, serial correlation is present in those regression equations. Table 4.10 exhibits the results of LM tests for regression equation Model 1 runs in the analyses.

Table 4.10: Results of Breusch-Godfrey LM Test for Regression Model 1

| | Regression Model 1: $R_{it} = \alpha_1 + \beta_1 Lib_{it} + \beta_2 Size_{it} + \beta_3 Liq_{it} + \beta_4 Vol_{it} + \beta_5 ER_{it} + \beta_6 IR_{it} + \beta_7 Oil_{it} + \mu_{it}$ | |
|---|---|---|
| Event | Obs*R-squared | Prob. Chi-Square(2) |
| Indo 9/97 | 4.674 | *0.097 |

| | | |
|---|---|---|
| Thai 10/97 | 2.869 | 0.238 |
| Kor 12/97 | 8.399 | **0.015 |
| Msia 4/98 | 2.004 | 0.367 |
| Indo 3/99 | 5.977 | *0.050 |
| Kor 7/99 | 6.005 | **0.050 |
| Msia 6/03 | 3.066 | 0.216 |
| Msia 4/05 | 2.585 | 0.275 |

Notes: *, **, *** denotes 10, 5 and 1 percents significant respectively

In order to resolve the serial correlation problem, HAC (Newey-West) estimation method is applied in those regression estimations with serial correlation. HAC (Newey-West) estimation is a variance-covariance estimator (modified standard error estimates), developed by Newey and West (1987) (cited by Brooks, 2002) that is consistent in the presence of both heteroscedasticity and autocorrelation.

### 4.2.3 Heteroscedasticity

The regression analysis is also tested for heteroscedasticity by applying White's general test to all regression estimations. Heteroscedasticity is a systematic pattern in the errors where the variances of the errors are not constant, which causes the standard errors of the OLS coefficients estimates to be incorrect. The OLS, however, assumes that all observations are equally reliable, that is, the variance of the errors is constant, which is known as homoscedasticity. Therefore, in order to obtain consistent estimators of the variances and covariances of the OLS estimators, in other word, corrected standard error, White (1980) proposed the Heteroscedasticity-consistent standard error estimation method (as cited in Brooks, 2002). This heteroscedasticity-consistent (White, 1980) standard error estimation is applied to heteroscedastic regression estimations. The null and alternative

hypotheses are

$H_0$: $\sigma_1^2 = \sigma_2^2$; there is no heteroscedasticity

$H_1$: $\sigma_2^2 > \sigma_1^2$; there is heteroscedasticity

The White (1980) test statistic from the auxiliary regression formula is $nR^2 \sim \chi^2$d.f. The decision rule states that if test statistic is greater than the $\chi^2$ value, then the null hypothesis of no heteroscedasticity is rejected.

Table 4.11: Results of White Heteroscedasticity Test for Regression Model 1

| | Regression Model 1: $R_{it} = \alpha_2 + \beta_1 Lib_{it} + \beta_2 Size_{it} + \beta_3 Liq_{it} + \beta_4 Vol_{it} + \beta_5 ER_{it} + \beta_6 IR_{it} + \beta_7 Oil_{it} + \mu_{it}$ | |
|---|---|---|
| Event | Obs*R-squared | Prob. Chi-Square |
| Indo 9/97 | 18.935 | ***0.001 |
| Thai 10/97 | 0.814 | 0.937 |
| Kor 12/97 | 5.146 | 0.273 |
| Msia 4/98 | 7.860 | *0.097 |
| Indo 3/99 | 7.044 | 0.134 |
| Kor 7/99 | 2.293 | 0.682 |
| Msia 6/03 | 14.430 | ***0.006 |
| Msia 4/05 | 17.565 | ***0.002 |

Notes: *, **, *** denotes 10, 5 and 1 percents significant respectively

The results of the White heteroscedasticity test of the equation Model 1 are shown in Table 4.11, which indicate that few of the estimations are heteroscedastic. The null hypotheses of the events with *s in the Probability Chi-squared columns are rejected, thus, for those events regression estimations, there are significant evidence of heteroscedasticity. Therefore, in analyzing the relationship among variables, heteroscedasticity-consistent (White) standard error estimation is applied to those regression estimations with heteroscedasticity.

### *4.2.4* Multicollinearity

An implicit assumption applied when using the OLS estimation method is that the explanatory variables are not correlated (Brooks, 2002). If there is such a problem, in which the $X_k$ (independent variable) become more highly correlated with the other independent variables in the model, then it becomes more difficult to determine which X is actually producing the effect on Y. This problem is known as multicollinearity. Multicollinearity would result in having high $R^2$ in the regression estimation, and also very high standard errors of individual coefficients.

#### 4.2.4.1 Variance Inflation Factor

Since this work deals with OLS regression analysis, the variance inflation factor (VIF) is applied to quantify the severity of multicollinearity. The VIF is an index that shows the increase in the variance of an estimated regression coefficient, due to collinearity.

The formula for VIF is:

$$VIF = 1 / (1 - R^2_i) \qquad \text{(Eq. 4.6)}$$

where
$R^2_i$ is the coefficient of determination of the regression equation in step one;
$1 - R^2_i$ is a tolerance

VIF is the reciprocal of tolerance, in which the greater the value of VIF, the greater the issue of multicollinearity. Table 4.12 exhibits the VIF indices of regression equation Model 1, in which the multicollinearity issue may exist in independent variables, that is, when the adjusted square of multiple correlation coefficients ($R^2$s) are very high. According to Neter et al. (as cited in Maditinos, Ševic and Theriou, 2009) and Judge et al. (as cited in Caramanis and Spathis, 2006), a VIF in excess of 10 is often taken as an indicator of severe

multicollinearity, while a VIF in between 5 and 10 indicates the existence of mild multicollinearity, with a VIF lower than 5 indicate that multicollinearity does not exist. The reported VIF shown in Table 4.12 are all less than 5. Therefore, the multicollinearity does not exist in those regression estimations.

Table 4.12: Variance Inflation Factors of Regression Model 1

$R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_{it} + \beta_3 Liq_{it} + \beta_4 Vol_{it} + \beta_5 ER_{it} + \beta_6 IR_{it} + \beta_7 Oil_{it} + \mu_{it}$

| | VIF | | | | |
|---|---|---|---|---|---|
| | Thai10/97 | Kor12/97 | Msia4/98 | Kor7/99 | Msia6/03 |
| Lib | 1.935 | 2.153 | 1.966 | 1.538 | 1.264 |
| Size | 1.126 | 2.389 | 4.611 | 1.713 | 1.505 |
| Liq | 1.305 | 1.137 | 1.241 | 1.293 | 1.685 |
| Vol | 1.732 | 1.628 | 1.455 | 1.647 | 1.417 |
| ER | 1.283 | 3.035 | 3.747 | 1.340 | nil |
| IR | 1.139 | 1.564 | 1.203 | 2.420 | 1.226 |
| Oil | 1.659 | 1.876 | 1.278 | 1.794 | 1.432 |

Note: nil is when the ER series is not included in the equation due to no change in the values of the rate (Malaysia implemented pegged exchange rate from September 1998 – July 2005)

4.2.4.2 Correlation Coefficient

Multicollinearity may also be detected through the correlation coefficient for two variables. The correlation coefficient is a basic statistics that measure the extent of the linear relationship between two variables. It is designated as *r*, a special covariance measure that takes care of the scale problem. The multicollinearity might emerge when the value of the correlation coefficient is large. The formula is as follows (Makridakis, Wheelwright & Hyndman, 1998):

$$r_{xy} = \frac{Cov_{xy}}{S_x S_y} = \frac{X}{\sqrt{\sum (¿¿i - \acute{X})^2 \sqrt{\sum (Y_i - \acute{Y})^2}}} \quad \frac{\sum (X_i - \acute{X})(Y_i - \acute{Y})}{¿}$$

(Eq 4.7)

where
$r_{xy}$ is correlation coefficient between X and Y;
$Cov_{xy}$ is covariance of X and Y;
$S_x$ and $S_y$ is standard deviation of X and standard deviation of Y

T-test formula is:

$$\text{t-test} = \frac{b_j}{se(b_j)}$$

(Eq 4.8)

where
$b_j$ is estimated *j*th coefficient; and
$se(b_j)$ is standard error of $b_j$.

This work covers the correlation coefficients between two countries stock market indices and returns in order to detect the inter-correlations levels between the two stock markets. The inter-correlations among the variables in each country are already detected through VIF analyses. The results of the correlation coefficients would indicate the level of relationship of the four Asian countries and the world stock markets. This method is also applied by Click and Plummer (2005).

## *4.3* Regression Estimations

In order to figure out the impact of the subsequent stock market liberalization on stock market performances, ordinary least square (OLS) regression estimation method is used in the analyses. The major concern in this study is on the stock market liberalization, an event of a change in the policy of foreign investors' ownership on local equities. Since the study investigates the effect of such event on the performances of the stock market, the event study method is the best method to be utilized.

### 4.3.1 Event study

The regression estimations consist of a 25-trading week event window, which is from 12 weeks before, to 12 weeks after the implementation of week T*. The event time T* is the implementation week of the subsequent stock market liberalization, the implementation week of policy changes on the percentage ceilings of foreign ownership on local equity in the period between 1997 to 2009. In other words, T* denotes the week in which stock market is liberalized.

The event window is applied to benefit from the event study approach, which would be able to segregate an independent effect for a sample of markets experiencing a common type of event (Campbell, Lo & MacKinlay, 1997), which would be the stock market liberalization. The results would provide evidence on whether stock market liberalization would have any significant impact on stock market returns, and whether the correlations are positively or negatively related. Since stock market liberalization is an event of a regulatory ruling being implemented or announced, an event study is the best method to investigate whether such an event would result in a significant reaction in the financial markets.

The ± three-month of policy implementation week T* event window is applied due to its relatively straightforward and trouble free method. Such a short-horizon event window provides the cleanest evidence of efficiency (Fama, 1991), and is more reliable. Since this work focuses on the impact of the subsequent stock market liberalization, and not on the impact of the initial implementation of stock market liberalization, it is believed that the impact would not be as great as the initial implementation. Therefore, the impact would be more prevalent if the analysis is to be done in a shorter-horizon event window. This is different in comparison to those studies on the initial stock market liberalization, which is done

in a longer-horizon event window (Henry, 2000a; Levine & Zervos, 1998). For example, Jayasuria (2005) applies the ± sixty-month event window; Kim and Singal (1993) utilize ± twelve and twenty–month event window.

The regression analyses of 53-trading week event window are also conducted in order to investigate if there is any difference in the impact of liberalization in a longer time horizon. The 53-trading week event window is the event study of the period twenty six-weeks (six months), before the event T* to twenty-six weeks (six months) after the event T*. This analysis would indicate whether the impact of liberalization would change upon the changes in time horizon.

The data of the variables are collected on a weekly basis, that is, the closing price index of the week. Thus, the sampling interval of the event study is on a weekly basis. There are a few of the timing of the events that are not precisely known, but can be reliably estimated, which made it not reliable enough to employ in a daily interval. According to Campbell et al. (1997), the impact of the event, if it is done in a shorter sampling interval, would be statistically identified. Based on their findings of comparison on the analytical formula for the power of the test statistic, with a daily sampling interval to the power with a weekly and a monthly interval, they concluded that there is a substantial payoff in terms of increased power from reducing the length of the event window. Therefore, the weekly interval is applied instead of its monthly or yearly counterpart, which has been applied by most of researchers.

Stock market liberalization is a dummy variable for the event window, which begins 1 week prior to the implementation week, to the implementation week T* onwards. The dummy 1 begins 1 week prior to the implementation week T*, is to take into consideration the absence of reliable implementation and announcement

dates, the average time between announcement and implementation, and information leakage prior to the official announcement or implementation (Henry, 2000a). Errunza and Miller (1998) also supported the fact that in the emerging market, the widespread information leakage prior to an official announcement is highly likely. In fact, Henry (2000a) applies dummy 1, which begins seven months prior to the implementation month, and ends during the implementation month. He asserts that the average time between the announcements and implementation dates is three months prior to the implementation dates.

Since this work studies the impact of the subsequent stock market liberalization, and not the impact of the initial stock market liberalization, the average time of the information leakage should be shorter, that is, around one week. In addition, Campbell et al. (1997) also state that while there is a cost to expand the event window, it is still worth bearing the cost in order to avoid the risk of missing the event. Thus, the result of the analyses would be able to statistically identify the relationship or coefficient of the series between the period before and after the implementation date of the stock market liberalization accurately.

The dummy 1, which begins 4 weeks prior to the implementation week T*, is also analyzed. This is to compare if there is any significant difference between the results of having dummy 1, beginning 1 week prior to T*, and those of with dummy 1 beginning 4 weeks prior to T*. Henry (2000a) also uses a different event window for dummy 1 in his study to reestimate the relationship between equity prices and liberalization. The other two different periods of dummy 1 to begin with are T-4 (four-months prior), and T only (during the implementation month itself). His results indicate that the relationship between equity prices and liberalization is relatively robust to the choice of the window length.

### 4.3.2 OLS Regression

In an attempt to examine the nature and form of the relationship between a variable and one or more other variables, regression analysis is the method conducted (Asteriou & Hall, 2007; Brooks, 2002).

#### *4.3.4.1* Stock market liberalization and returns

In order to investigate the association of the subsequent stock market liberalization and stock market returns, the magnitude and statistical significance of stock market returns during stock market liberalization window are evaluated by estimating the following regression of Model 1:

$$\text{Model 1: } R_{it} = \alpha_1 + \beta_1 Lib_{it} + \beta_2 Size_{it} + \beta_3 Liq_{it} + \beta_4 Vol_{it} + \beta_5 ER_{it} + \beta_6 IR_{it} + \beta_7 Oil_{it} + \mu_{it} \quad \text{(Eq 1.1)}$$

where
$R_{it}$ is the stock market returns of main or sector index of country *i* at time *t*;
$Lib_{it}$ is a dummy variable for stock market liberalization. It takes the value of 1 from -1 week to +12 weeks of the implementation week of stock market liberalization and 0 otherwise.
$Size_{it}$ is the stock market size, which is measured by market capitalization of country *i* or sector's *i* at time *t*;
$Liq_{it}$ is the stock market liquidity, which is measured by traded volume of country *i* or sector's *i* at time *t*;
$Vol_{it}$ is the stock market volatility for 90-day of country *i* or sector *i* at time *t*. For the sectoral analyses, 10-day volatilities are used.
$ER_{it}$ represents exchange rates of country *i* at time *t*;
$IR_{it}$ represents interest rates of country i at time *t*;
$Oil_{it}$ represents oil prices at time *t*.
$\mu_{it}$ is independently distributed random error term with zero mean and constant variance;
$\hat{}_1, \beta_1, \ldots, \beta_7$ are the parameters to be estimated.

Model 1 is the multivariate least square regression model used to verify the impact of stock market liberalization on stock market performances after controlling the effects of the three stock market characteristics and the three macroeconomic fundamentals.

The impact of the liberalization on stock market returns without

controlling for the effects of all those variables is also analyzed. Other regression models applied in the analysis are the univariate regression model ($R_{it} = \alpha_1 + \beta_1 Lib_{it} + \varepsilon_{it}$ (Eq 4.9)), the multivariate regression model with stock market characteristics ($R_{it} = \alpha_1 + \beta_1 Lib_{it} + \beta_2 Size_{it} + \beta_3 Liq_{it} + \beta_4 Vol_{it} + \varepsilon_{it}$ (Eq 4.10)), and regression model with macroeconomic fundamentals ($R_{it} = \alpha_1 + \beta_1 Lib_{it} + \beta_5 ER_{it} + \beta_6 IR_{it} + \beta_7 Oil_{it} + \varepsilon_{it}$ (Eq 4.11)).

These models are applied to eight events, which are briefly described in Table 4.2. Three of the events are Malaysia's subsequent stock market liberalization, which occurred in April 1998, June 2003 and April 2005. Indonesia and South Korea each has two events. Indonesia's liberalizations are in September 1997 and March 1999, while South Korea's are in December 1997 and July 1999, respectively. Thailand has only one event, in October 1997.

The stock market returns, $R_{it}$, are measured based on the difference of natural log of the main or sector indices, as shown in Table 4.13. The returns are also known as the growth of stock market, and could also be measured as $((P_1 - P_0) / P_0)$. Table 4.13 also exhibits the measurement of controlled variables used in the regression model, together with their expected results in terms of their relationships with stock market returns. All those variables are stationary or having no unit root.

Table 4.13: Variables, Measurements and Expected Results

| Variable | Unit of Measurement | Formula | Expected Result |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Stock Market Size (Size) | Market capitalization | $Ln(Size_1) – Ln(Size_0)$ | Positive |
| Stock Market Liquidity (Liq) | Trade Volume | $Ln(Liq_1)$ | Positive |
| Stock Market Volatility (Vol) | 90-Day Volatility | $Ln(Vol_1)– Ln(Vol_0)$ | Positive |
| Exchange Rate (ER) | Local currency vis-à-vis US Dollar | $Ln(ER_1)$ | Negative |
| Interest Rate (IR) | 3-month interbank offer rates | $Ln(IR_1) – Ln(IR_0)$ | Negative |
| Oil Price (Oil) | Crude oil prices | $Ln(Oil_1) – Ln(Oil_0)$ | Positive |
| Stock Market Returns ($R_{it}$) | Country's Stock Market Main or Sector Index (P) | $Ln(P_1) – Ln(P_0)$ | Positive |

Note: Ln = natural logarithm; $X_1$ = current data of variable X; $X_0$ = previous data of variable X

For the robustness of the results, the analyses are divided into three sections. The first analysis uses stationary controlled variables. The second analysis uses logged controlled variables, which are controlled variables at level. The third analysis uses stationary controlled variables excluding stock market size.

The second analysis is done due to the point that the stock market size used in the first analysis, which is at first difference, equals stock market returns. The stock market size, which is measured by market capitalization, the monetary value of all outstanding shares stated in pricing currency, is stationary at the first difference. Such analysis of using Size variable at first difference as independent variable and stock market returns as dependent variable would generate very significant results for the Size variable and lead to very high $R^2$. Thus, the use of Size variable at level is recommended and constructed in the second analysis. The third analysis is constructed by using stationary controlled variables but with the omission of Size variable. The stationarity of the variables in the regression analysis is remained since the assumptions of the classical linear regression model require both $y_t$ and $x_t$ to be stationary (Asteriou & Hall, 2007).

#### *4.3.4.2* World and counties' stock market returns

The relationships between individual country's stock market returns and the world stock market returns are examined by using Model 2 as in Equation

1.2 below. The results focus on to what extend the world stock market would influence the emerging Asian stock market performances. For the OLS regression with the effects of world market, MSCI World Index data are used in measuring the world stock market returns. The formula of the world stock market returns is the same as measuring the stock market returns of the other four countries:

$$R_{Wot} = Ln(P_1) - Ln(P_0) \qquad \text{(Eq 4.12)}$$

where
$R_{Wot}$ is MSCI-World stock market returns at time *t*

The OLS regression Model 2 used to examine the relationship between individual country's stock market returns, and MSCI world market returns is:

$$\text{Model 2:} \qquad R_{it} = \alpha_i + \beta R_{Wot} + \varepsilon_{it} \qquad \text{(Eq 1.2)}$$

where
$R_{it}$ is the stock market returns of main index of country *i* at time *t*;
$R_{Wot}$ is the MSCI world market returns at time *t*;
$\varepsilon_{it}$ is independently distributed random error term with zero mean and constant variance*;*
$\hat{}_1$ and $\beta$ are the parameters to be estimated.

## 4.4 Cointegration

This work continues examining the level of integration of the four Asian countries and the world markets, after getting to know the kind of relationship between subsequent stock market liberalization and its stock market returns. The concern is whether there is any improvement in the level of stock market integration between the period during and after liberalization. Both short-run and long-run integration levels are measured to find the degree of integration and in which particular periods those countries becoming more integrated. To acquire more detailed information on level of integration, tests on cointegration are conducted in three sample periods as follows:

a) full study period: Jan 1997 to Dec 2009,

b) during liberalization period: September 1997 to April 2005, and

c) post liberalization period: May 2005 to December 2009.

The integration analyses on the full study period of 1997 to 2009 would portray the integration level of the five countries within the study period, which is from exactly before the start of the Asian financial crisis to after the U.S. credit crunch. In order to discover the changes in the integration level during and after the implementation of series of subsequent stock market liberalization, further analysis on integration is done over the other two sample periods: during and post liberalization. The determination of the two periods is based on the liberalization dates in Table 1.2, page 5. Since the liberalization was started in September 1997 in Indonesia and ended in April 2005 in Malaysia, the period during liberalization is from September 1997 to April 2005. The period after April 2005 is considered as the post liberalization period. Two types of analyses are carried out to examine the level of integration of those four Asian countries' and world stock markets. Those are:

1) Long-run Johansen Cointegration;

2) Short-run VECM or VAR

### 4.4.1 Long-run Johansen Cointegration

A statistical measure of cointegration is used in the analyses in order to examine the existence of long-run relationship between variables. If the results indicate that the variables are co-integrated, it means that the variables are moved together over time. Therefore, short-term disturbances from the long-term trend will be corrected (Manning & Andrianacos, 1993). A lack of cointegration means that

those variables can wander arbitrarily far away from each other, indicating no long-run relationship.

To test for the cointegration relationships among those four Asian countries and the world stock markets series, Johansen cointegration test is applied. Hoque (2007), Click and Plummer (2007), Ibrahim (2004b) and Wang et al. (2003) apply the same cointegration test in their analyses. Engle-Granger approach focuses on the cointegration in a single equation (as cited in Asteriou & Hall, 2007) instead of multiple equations. Since this work analyzes five series of the countries' stock markets, which is a cointegration in multiple equations, the Johansen approach is preferred over the Engle-Granger approach.

The Johansen test is a maximum-likelihood cointegration test, attributed to Johansen (1988) and Johansen and Juselius (1990) (as cited in Asteriou & Hall, 2007). According to Baharumshah et al. (2003), the Johansen approach is to prove the number of linearly independent co-integrating vectors in the system, which is determined by the rank (r) of the matrix $\pi$. If $\pi$ has a full rank ($r = n$), there are n linearly independent columns, thus variables in $Z_t$ are I(0). When the rank of $\pi$ is zero, where there is no linearly independent column, then there are no co-integrating relationships. If $\pi$ has a reduced rank, where there are $r \leq (n - 1)$ linearly independent columns, then there are $r \leq (n - 1)$ co-integrating relationships (Asteriou & Hall, 2007). Johansen's (1991, 1995, as cited in Eviews 7 User's Guide) formula to derive VAR-based cointegration tests using an estimated VAR object is as in Equation 4.13 (Hoque, 2007).

Consider a VAR of order p:

$$y_t = A_1 y_{t-1} + \ldots\ldots + A_p y_{t-p} + \varepsilon_t \qquad \text{(Eq 4.13)}$$

where
$y_t$ is a $k$-vector of non-stationary I(1) variables: Stock market main indices of World ($P_W$), South Korea ($P_K$), Malaysia ($P_M$), Thailand ($P_T$) and Indonesia ($P_I$);
$A_t$ is a $d$-vector of deterministic variables; and
$\varepsilon_t$ is a vector of innovations.

The VAR is rewritten as,

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \qquad \text{(Eq 4.14)}$$

where

$$\Pi = \sum_{i=1}^{p} A_i - I;$$

$$\Gamma_i = -\sum_{j=i+1}^{p} A_j$$

The VAR is then specifically written as,

$$\begin{pmatrix} \Delta P_{Wt} \\ \Delta P_{Kt} \\ \Delta P_{Mt} \\ \Delta P_{Tt} \\ \Delta P_{It} \end{pmatrix} = \Pi \begin{pmatrix} P_{Wt-1} \\ P_{Kt-1} \\ P_{Mt-1} \\ P_{Tt-1} \\ P_{It-1} \end{pmatrix} + \sum_{i=1}^{p-1} \Gamma_i \begin{pmatrix} \Delta P_{Wt-i} \\ \Delta P_{Kt-i} \\ \Delta P_{Mt-i} \\ \Delta P_{Tt-i} \\ \Delta P_{It-i} \end{pmatrix} + \varepsilon_t \qquad \text{(Eq 4.15)}$$

Where
$P_{Wt}$ = MCSI-World index
$P_{Kt}$ = Korea Composite Stock Price Index (KOSPI)
$P_{Mt}$ = Kuala Lumpur Composite Index (KLCI)
$P_{Tt}$ = Stock Exchange of Thailand Composite Index (SET)
$P_{It}$ = Jakarta Stock Exchange Composite Index (JCI)

According to Johansen and Johansen-Juselius as cited in Asteriou and Hall (2007), there are two methods to determine the number of cointegrating relations. One is the test statistic, based on a likelihood ratio test, which is called the trace statistic. It considers whether the trace is increased by adding more eigenvalues beyond the $r^{th}$ eigenvalue. The formula used to do this is:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1-\hat{\lambda}_i) \qquad \text{(Eq 4.16)}$$

where
r is the number of cointegrating vectors under the null hypothesis
$\lambda$ is the estimated value for the *i*th ordered eigenvalue from the $\Pi$ matrix

The second test statistic is based on the characteristic roots, called the maximal eigenvalue. This test consists of ordering the largest eigenvalues in descending order. It considers whether they are significantly different from zero. The formula used for max eigenvalue statistic is:

$$\lambda_{max}(r, r+1) = -T \ln(1 - \lambda_{r+1}) \qquad \text{(Eq 4.17)}$$

Before the series are tested for Johansen cointegration test, the order of integration of each series are determined by using the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests (Refer to Table 4.6 in page 101). The series are required to have the same order of integration in order for it to be co-integrated. Based on Table 4.6, all of the countries' stock market indices are integrated of order 1 or I(1), which means that their stock market returns are integrated of order 0 or I(0).

Then, the lag lengths for the vector autoregression (VAR) model are also determined (Ibrahim & Wan Yusoff, 2001). The lag length is determined based on Akaike information criterion (AIC), as it is commonly used in time series (Asteriou & Hall, 2007). Click and Plummer (2005) also use AIC in determining the number of lags in the VAR. Once the lag length is determined, the appropriate model

regarding the deterministic components in the multivariate system is chosen. Since there are no linear trends in the levels of the data, but allowing specifications to drift around an intercept, Model 3 is used in the cointegration test. Model 3 is intercepted in cointegrating equation (CE) and VAR, with no trends in CE and VAR ($\beta_1 = \beta_2 = 0$).

### 4.4.2 Short-Run VECM or VAR Model

Johansen cointegration test explores the long-run relationship among the variables. To capture the short-run dynamics and interaction among the four Asian countries and the world stock markets, vector error-correction model (VECM) or vector autoregressive (VAR) model need to be carried out. Granger causality, variance decomposition and impulse response analyses based on the VECM by Engle and Granger, are to be carried out when Johansen cointegration results exhibit that there is cointegration. However, if the results reveal no cointegration, then the analyses are conducted based on standard VAR model, with variables expressed in first difference (as cited in Ibrahim & Wan Yusoff, 2001).

According to Baharumshah et al. (2003), the variance decomposition analyses show how the proportion of the changes in the price of one market is affected by the random shock of other markets. The impulse response's functions are to quantify the magnitude of responses to unanticipated shocks, and to predict the direction and momentum of market responses to a shock in other markets.

According to Asteriou and Hall (2007), when two variables are cointegrated, the relationship between the two variables can be expressed with an ECM specification as:

$$\Delta Y_t = a_0 + b_1 \Delta X_t - \pi \hat{u}_{t-1} + Y_t \qquad \text{(Eq 4.18)}$$

where
$b_1$ = impact multiplier (the short-run effect), that measures the immediate impact of a change in $X_t$ on a change in $Y_t$;
$\pi$ = feedback or adjustment effect, that shows how much the disequilibrium is being corrected;
$\hat{u}_{t-1} = Y_{t-1} - \beta_1 - \beta_2 X_{t-1}$, where $\beta_2$ is the long-run response

The specification above has included both long-run and short-run information, which is the advantage of the error correction model (ECM) specification. In addition to that, ECM measures the correction from disequilibrium of the previous period. ECM also eliminates trends in the series, which resolve the spurious regression problem by formulating the first differences. The disequilibrium error term, in fact, is a stationary variable, which indicates that the errors in the long-run relationship will not be any larger.

VAR is useful in evaluating the strength and the direction of the transmission of shocks across the markets. However, the standard VAR model with variables expressed in the first difference is used only when the variables are non-stationary, and are not cointegrated. According to Ibrahim (2004a), a VAR model specification is:

$$X_t = A_0 + \sum_{k=1}^{p} A_k X_{t-k} + e_t \qquad \text{(Eq 4.19)}$$

where
$X_t$ = a vector of n variables to be specified later;
$A_0$ = n x 1 vector of constant terms,
$A_k$ = n x n matrix of coefficients,
$e_t$ = an n x 1 vector of error terms, and
p = the order of autoregression.

The lag order of VAR is set based on AIC. The model is then interpreted based on its moving average representation, which further generates variance decomposition and impulse response functions. Variance decomposition tracks

down the proportion of the movements in the dependent variables, the returns of the five stock markets, which are due to their own shocks, versus shocks to the other stock market returns. Impulse response tracks down the responsiveness of the returns of the five stock markets, in the VAR to shocks to each of those stock market returns.

## 4.5 Data Analysis

Once the data of the relevant variables have been collected and econometrically tested, it is important to gain a more precise idea of the distribution of the variables. Other than obtaining a basic feel for the data, exploring the behaviors of those variables through computing descriptive statistics and constructing line charts would provide necessary background for the sound application of regression analysis and interpretation of results.

The analyzed variables in this work are the weekly countries' stock market main indices, stock market returns, stock market size, liquidity and volatility, exchange rates, interest rates and oil prices from January 1997 to December 2009. The data are acquired from Bloomberg and CEIC. Tables 4.14 to 4.18 show the descriptive statistics of those variables for respective countries: Malaysia, Thailand, Indonesia, South Korea and the world. The descriptive statistics provide details on mean, median, maximum, minimum, standard deviation, skewness, kurtosis and Jarque-Bera of the variables. The movements of the stock market indices of individual countries are portrayed in the Figures 4.1 to 4.5, while the movements of other variables for each country are in the appendices. The details of the daily stock market returns of the KLCI, SET, JKSE, and KOSPI in terms of descriptive statistics and graphs are also available in Table 4.19 and Figure 4.6. In order to compare between the period during and post liberalization, the

descriptive statistics and graphs of the five stock market indices in the two sample periods are shown in Tables 4.20 and 4.21, and Figures 4.7 and 4.8. The data and quotations of the relevant sources on stock market characterics are available in Appendix 8-1, in order to avoid and prevent doubts and suspicions on the data.

The descriptive statistics tables of those raw variables portray rejection of the null of normality at the 5 percent significance level. Such rejection of the normality assumptions is common to the economic and financing modeling but the sample is sufficiently large. For sufficiently large sample sizes, violation of the normality assumption is virtually inconsequential (Brooks, 2002). The variables used in the OLS regression analysis, however, are for 25 weeks event window, thus, the normality test is applied. The Jarque-Bera and Kurtosis results in Appendices 4-13 to 4-14, show that those variables are not significant, thus, are normally distributed for regression analysis.

### 4.5.1 Malaysia

The Kuala Lumpur Composite Index, the main stock index in Malaysia, significantly plummeted from April 1997, with 28$^{th}$ August 1998 being its lowest point, before starting to slightly increase to higher levels. 1997 to 1998 is the period of the Asian financial crisis, in which Malaysia and three other Asian countries - Thailand, Indonesia and South Korea - were badly affected. The minimum point (302.91) of the index, as shown in Figure 4.1 and Table 4.14, occurred on 28th August 1998. The crisis caused the country's index to drop by 76% from the highest point of 1270.67 on 28th February 1997, before the start of the crisis.

The recovery stage was inadequate when the index stopped increasing once it touched 1013 in mid February 2000, which was still not back to its highest point before the crisis took place. Subsequently, the index declined following the

downturn of the U.S. and world's stock markets in 2001, at lower impact. The index continued to gradually rise, and finally managed to regain its highest index point (1270) before the crisis ended in February 2007, a decade later. The maximum point of the index was at point 1516, which was obtained in mid-January 2008, before it plummeted due to the contagious effect of the U.S. subprime mortgage crisis. The U.S. financial crisis had dropped the country's index by 44 percent. Until the end of 2009, the KLCI index only managed to regain the same points as in early 1997.

Figure 4.1: Malaysia's Kuala Lumpur Composite Index Weekly Performance (Jan 1997 – Dec 2009)

Generally, as shown in Table 4.14, the mean stock market index of Malaysia is 872.36, with a standard deviation of 242.56, skewed to the right and flatter than normal distribution, with a wider peak, due to less than three kurtosis.

Table 4.14: Descriptive Statistics of Variables in Malaysia

| | SM main index | SM returns % | Mkt Cap (MYR bil) | Trade Volume (mil) | Volatility | ExcR | IntR |
|---|---|---|---|---|---|---|---|
| Mean | 872.36 | 0.06 | 410.04 | 508.00 | 20.08 | 3.63 | 3.99 |
| Median | 853.91 | 0.13 | 390.64 | 355.00 | 15.67 | 3.80 | 3.22 |
| Maximum | 1516.22 | 27.86 | 813.80 | 3420.00 | 85.03 | 4.59 | 11.88 |
| Minimum | 302.91 | -17.33 | 118.34 | 45.98 | 5.34 | 2.48 | 2.06 |
| Std. Dev. | 242.56 | 3.40 | 153.03 | 445.00 | 15.30 | 0.32 | 2.15 |
| Skewness | 0.44 | 0.71 | 0.56 | 2.56 | 2.49 | -1.99 | 2.05 |
| Kurtosis | 2.69 | 13.46 | 2.50 | 11.96 | 9.72 | 7.72 | 6.20 |
| Jarque-Bera | 24.34 | 3145.44 | 43.24 | 3036.02 | 2005.20 | 1091.26 | 765.24 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

The time plots of Malaysia stock market returns, market capitalization, trade volume, stock market volatility, exchange rate and interest rate are revealed in Appendix 4.2. The returns of KLCI from 1997 to 2009 have a mean of 0.06 which shows that, generally, the returns are scattered around zero. However, the maximum and minimum points are quite large figures. Such large changes occurred during the 1997-1998 Asian financial crisis. The returns are dispersed around 3.4, which shows that it is volatile, skewed to the right, with a high return distribution (13.46 kurtosis).

Market capitalization, which represents stock market size, has the same movement as the KLCI stock price index with a mean of 410 billion. The market size deteriorated considerably in 1998 to the minimum of 188 billion, managed to recover in 2000, but the achievement did not reach the same level as the capitalization incurred before the Asian 1997-1998 crisis. The capitalization was then affected by the 2001 recession, before it climbed back to a new peak of 814 billion. Overall, the market capitalization is deviated by 153 billion.

Traded volume of stocks in Bursa Malaysia has been widely dispersed (445 million), achieving, from the lowest volume, 46 million, to the highest volume of 3420 million, with a mean of 508 million. Generally, there is greater liquidity in later stages, even though it was affected by the U.S. mortgage subprime crisis in 2008-2009, which is shown by its right skewness and tall traded volume distribution.

The stock market volatility plummeted from 1999 to 2005. It reached the highest volatility in 1998, and the lowest volatility in 2005, with a mean value of 20. The main contributors of high volatility in Malaysia's stock markets are the two

peak volatility periods at the beginning and end of 1998, which was the year of the Asian economic crisis. The volatility of Malaysia's stock market returns seems to be most skewed to the right, and has the sharpest distribution compared to the other three countries' stock market volatility.

All four countries experienced abrupt currency depreciation in late 1997, which led to the Asian financial crisis. The Malaysian ringgit (MYR) experienced a depreciation of 85 percent before being pegged to the U.S. dollar (USD) at MYR 3.80 per USD. In 1998, Malaysia was the only country in the region that implemented such a policy in order to reduce the impact of the crisis. The ringgit was pegged to the U.S. dollar from September 1998 to July 2005. Since then, the ringgit has been determined by the market forces and is left floating. From MYR 3.8 per USD, the ringgit had been appreciated by 17.3 percent to its lowest rate at MYR 3.142 per USD in April 2008.

The three month interbank offer rates in Malaysia went through to the highest interest rate of 11 percent in 1998, which was the lowest interest rate offered during the Asian crisis period, as compared to the other three affected countries. Thailand offered up to 26 percent interest rate, 31 percent by South Korea and 57 percent by Indonesia. Such an increase in the interest rate, from 7 to 11 percent in Malaysia, was expected to re-attract the inflow of money and deposits after the massive outflows in late 1997. In 1999, the interest rates started to stabilize at lower rates of 3 percent. The rate was dispersed by 2.14 percent, with a mean of 3.99 percent.

### *4.5.2* Thailand

Stock market index of Thailand, SET, performed almost similar to Malaysia's as shown in Figure 4.2. Due to 1997-1998 Asian financial crisis, the index plunged

to its minimum point of 207.31 in early September 1998, from its highest point (848.56) at the end of January 1997, before the start of the crisis. This 76 percent drop was only recovered a decade later, in July 2007. At the end of October 2007, the index managed to increase by only 5 percent, before it dropped together with the U.S. stock market, due to its subprime mortgage crisis, by 56 percent.

Figure 4.2: Stock Exchange of Thailand Composite Index Weekly Performance (Jan 1997 – Dec 2009)

The mean index of Thailand's stock market, as shown in Table 4.15, is 537.93, with the dispersion of 180, which is lower than Malaysia's. Its skewness (0.06) is very close to zero; its distribution is flatter than the normal distribution (kurtosis less than three) and is not normally distributed. In comparison to other countries' stock market index performances, Thailand's has the lowest mean, maximum and minimum points, lowest standard deviation, skewness, and kurtosis (refer to Appendix 4-3). Its political troubles may contribute to its lowest performance in the region.

Table 4.15: Descriptive Statistics of Variables in Thailand

| | SM main index | SM returns % | Mkt Cap (tril) | Trade Volume (mil) | Volatility | ExcR | IntR |
|---|---|---|---|---|---|---|---|
| Mean | 537.93 | 0.08 | 3.14 | 6010.00 | 27.24 | 38.39 | 5.27 |
| Median | 531.98 | 0.31 | 2.57 | 4190.00 | 25.13 | 38.87 | 3.55 |
| Maximum | 894.57 | 24.41 | 6.66 | 35300.00 | 52.89 | 53.75 | 26.50 |
| Minimum | 207.31 | -23.40 | 0.64 | 104.00 | 10.92 | 23.95 | 1.31 |
| Std. Dev. | 179.98 | 4.18 | 1.75 | 6020.00 | 10.12 | 4.60 | 5.57 |
| Skewness | 0.06 | 0.16 | 0.32 | 1.37 | 0.71 | -0.50 | 2.30 |
| Kurtosis | 1.63 | 7.00 | 1.59 | 5.16 | 2.66 | 3.77 | 7.41 |
| Jarque-Bera | 53.58 | 454.12 | 68.29 | 346.88 | 60.69 | 45.66 | 1146.08 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Figures on Thailand's other variables are available in Appendix 4-3. In terms of Thailand's stock market returns, its mean is 0.08, which is the second lowest among the four Asian countries, after Malaysia. Its maximum point is 24, and its minimum point is negative 23, which occurred during the crisis period of the 1997-1998 Asian crisis, and 2008 US subprime mortgage crisis, respectively. The returns are dispersed by 4 points, and skewed to the right, with a kurtosis of 7.

The stock market size in Thailand, which is represented by market capitalization, is highly correlated with the country's stock price index. The movements of the two series; market capitalization and stock price index, are closely similar. In 1998, the stock market size badly plunged to its lowest dip due to the Asian crisis. Once the economy recovered, the stock market size continued to increase up to its highest point by early 2008. However, the U.S. subprime mortgage crisis dragged it back down by late 2008.

Stock market liquidity of Thailand has been increasing, as shown in Appendix 4-3. Its traded volume of stocks has been improving from a minimum of 104 million in January 1997, to a maximum of 35,300 million in September 2009, with a mean of 6,010 million and a standard deviation of 6.020 million. The movements of Thailand's stock market liquidity and its size from 1999 to 2009 are almost similar.

Thailand's stock market volatility, on the other hand, has shown a plummeting trend from 1998 to 2005, which indicates a lower risk in the market. From 2006 onwards, the market volatility escalates, but at lower rates, with higher dispersion.

Unlike Malaysia, which implemented the pegged exchange rate system, Thailand floated its currency, making its foreign exchange rate wholly dependent on

the market. Just like the other three currencies in 1997, Thailand baht (THB) also tremendously depreciated, by 124 percent, from THB 23.95 per USD in early June 1997 to THB 53.75 per USD in late January 1998. Only from the middle of 2001, the Thai baht started to appreciate from THB 45 per USD to THB 33 per USD, in 2009. After thirteen years, the rate has not yet been able to reach the rates of early 1997, before the Asian financial crisis.

The 1997-1998 Asian financial crisis caused Thailand's three month interbank offer rates to reach 26.5 percent, the highest level in the country, from a rate of 10.7 percent in May 1997. The country remains with high interest rate (above 20 percent) only in seven months when in June 1998, the interest rate starts to abruptly drop to less than 10 percent in October 1998. From 1999 onwards, the interest rate fluctuates between 5.0 and 1.3 percents, with the lowest rate recorded in 2003 and 2004.

### *4.5.3.* Indonesia

Indonesia's economy was also badly affected by the 1997-1998 Asian financial crisis, which resulted in riots and chaos, skyrocketed inflation, and banking crises. The crisis has caused a 64 percent drop of Indonesia's stock market index as portrayed in Figure 4.3. Despite such calamities, the index managed to bounce back to the highest point before the crisis (736.6) by early January 2004, which took them only six years to recover as compared to Malaysia and Thailand, which recovered in ten years. In addition to that, the index consistently escalates till it reaches the peak at 2830 in January 2008. Touching such point indicates an increase of 284 percent, from the highest point (736) in 1997, before the crisis. Due

to the impact of the U.S. subprime mortgage crisis, Indonesia's stock market index decreased by 59% in ten months before it starts to rise again.

Figure 4.3: Indonesia's Jakarta Stock Exchange Composite Index Weekly Performance (Jan 1997 –Dec 2009)

The descriptive statistics in Table 4.16, column two, shows that the Jakarta Composite Index has a mean of 1004.7, a maximum point of 2830, and standard deviation of 698, which are the highest points among the four Asian countries. Such condition is totally the opposite of Thailand's performance, which obtained the lowest points among the four countries. Both countries have opened up their economy to foreign investors during 1997-1998 Asian crisis, and sought out the International Monetary Fund (IMF) aid. The distribution of the index is rightly skewed and flatter, but closer to a normal distribution, with the highest points of 1.07 skewness and 2.85 kurtosis among the four countries.

Indonesia's stock market returns, as indicated in Table 4.16 above, have a mean of 0.3, which is the highest mean return among the four countries. The volatility of the returns have been greater and higher during the 1997-1998 Asian crisis, with a maximum return of 20.69, and during the 2008 U.S subprime crisis, with the minimum return of negative 20.78. The distribution is very close to symmetrical around the mean, with the skewness of 0.003, and sharper than normal distribution with values concentrated around the mean and thicker tails (kurtosis of 6.61). The graphs of the market returns and other variables are shown in the Appendix 4-4.

Table 4.16: Descriptive Statistics of Variables in Indonesia

| | SM main | SM returns | Mkt Cap (mil) | Trade Volume | Volatility | ExcR | IntR |
|---|---|---|---|---|---|---|---|

| | index | % | | (mil) | | | |
|---|---|---|---|---|---|---|---|
| Mean | 1004.71 | 0.30 | 676.00 | 6910.00 | 26.94 | 8812.13 | 15.47 |
| Median | 672.72 | 0.38 | 412.00 | 3820.00 | 23.69 | 9123.00 | 12.72 |
| Maximum | 2830.26 | 20.69 | 2060.00 | 84700.00 | 64.33 | 15300.00 | 57.59 |
| Minimum | 263.23 | -20.78 | 110.00 | 120.00 | 12.15 | 2362.00 | 6.97 |
| Std. Dev. | 698.09 | 4.36 | 550.00 | 8890.00 | 11.14 | 2045.74 | 10.92 |
| Skewness | 1.07 | 0.00 | 1.07 | 3.53 | 1.24 | -1.50 | 2.28 |
| Kurtosis | 2.85 | 6.61 | 2.85 | 21.12 | 4.05 | 6.81 | 7.73 |
| Jarque-Bera | 130.16 | 368.37 | 131.44 | 10778.72 | 206.03 | 672.89 | 1217.35 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Similar to other countries' stock market size, Indonesia's movement resembles the country's stock market index movement. The growth in the stock market index corresponds to the growth in the stock market size. The downfall of the country's stock index during the Asian crisis period has also brought along the downfall of the stock market capitalization. Indonesia's stock market capitalization has touched the highest level of around 2,000 million in two periods, one in late 2007 and early 2008, which is before experiencing the contagious effect from the U.S. subprime mortgage crisis, and the other is after the U.S, crisis effect in late 2009 onwards.

Indonesia's stock market liquidity has generally shown an increasing trend throughout the study period. There were numbers of falls, however, in late 2002 and late 2008. The 1997-1998 Asian financial crisis does not seem to significantly impact the liquidity of Indonesia's stock market. The series has a mean of 6,910

million, with high standard deviation of 8,890 million in trade volume.

The 90-day volatility of Indonesia's stock market graph in Appendix 4-4 portrays a U-shape like curve in general. It started with very low volatility in a very short time in 1997, but by the end of 1997, it sky-rocketed until it touches the highest volatility point of 64.33 in March 1998. The series continued declining at slower rates, which indicates a lower market risk, until 2007 before it got back to its high volatility from late 2007 until January 2009. After going through the impact of the U.S. subprime mortgage crisis, the market manages to decrease its risk.

Due to the 1997 Asian foreign exchange attack, Indonesian rupiah (IDR) depreciated by 500 percent, which is the highest depreciation in the region. Until 2009, the exchange rates remain at a lower rate of around U.S. Dollar (USD) 0.0107 per IRD100 (IRD9304/USD), as compared to the rate before the currency attack, which were at around USD 0.0423 per IRD100 (IRD2362/USD). The Indonesian rupiah has also been affected by the U.S. subprime crisis, in which the rupiah has depreciated to the minimum of USD 0.00826 per IRD100 (IRD12100/USD).

The Indonesia three-month interbank offer rates series are not much different from the interbank offer rates of the other three countries. The rates increased during the 1997-1998 Asian crisis, but dropped to much lower rates in 1999, and remains low throughout the period. Its highest rate touched up to 57 percent in July 1998, and in October 2009, it obtained the lowest rate of 6.97 percent, with an average rate of 15.5 percent. The rates standard deviation is 11 percent.

### *4.5.3* South Korea

Generally, the movements of South Korea's stock market index and Malaysia's stock market index are almost similar, except that South Korea's has

started at lower points in 1997, and after 2005, South Korea stock market index began to increase at higher rates than those of Malaysia's. During 1997-1998 Asian financial crisis, South Korea stock market deteriorated by 62 percent. The market, however, has managed to recover, and sprang back to its early 1997 points in eight months. It continues to rise with high volatility until it reaches the peak (index point 2028.06) in October 2007, with an increase of 573 percent from its trough (index point 301.23) in September 1998. In 2008, country's stock market has dwindled by 54 percent in response to the U.S. subprime mortgage crisis, before it escalated back (refer to Figure 4.4). The mean of the stock market index is 965.06, with a standard deviation of 421.75, the second highest index after Indonesia's. The index series are positively skewed and flatter than a normal distribution, with a wider peak (refer to Table 4.17).

Figure 4.4: South Korea's Composite Stock Price Index Weekly Performance (Jan 1997 – Dec 2009)

Table 4.17: Descriptive Statistics of Variables in South Korea

| | SM main index | SM returns % | Mkt Cap (mil) | Trade Volume (mil) | Volatility | ExcR | IntR |
|---|---|---|---|---|---|---|---|
| Mean | 965.06 | 0.25 | 405.00 | 1800.00 | 30.57 | 1141.15 | 6.63 |
| Median | 840.58 | 0.54 | 308.00 | 1660.00 | 29.07 | 1164.00 | 5.05 |
| Maximum | 2028.06 | 18.57 | 991.00 | 8350.00 | 64.82 | 1810.00 | 31.37 |
| Minimum | 301.23 | -20.49 | 55.52 | 133.15 | 12.48 | 843.40 | 2.72 |
| Std. Dev. | 421.75 | 4.61 | 261.00 | 1120.00 | 12.10 | 163.41 | 4.32 |
| Skewness | 0.68 | -0.12 | 0.59 | 1.52 | 0.57 | 0.44 | 2.78 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kurtosis | 2.46 | 4.81 | 2.07 | 8.34 | 2.48 | 3.41 | 12.04 |
| Jarque-Bera | 60.41 | 94.47 | 64.00 | 1079.54 | 44.71 | 27.03 | 3179.56 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

The time plots of the South Korean stock market returns, market capitalization, trade volume, volatility, exchange rate and interest rate are revealed in the Appendix 4-5. The stock market mean returns (0.25) of South Korea, as presented in column three, Table 4.17, is also the second highest after Indonesia's, but it has the highest standard deviation among the four. Its minimum and maximum indices are -20.49 and 18.57. The returns distribution is negatively skewed, whereas, the others are all positively skewed. Having leptokurtic distribution, the return series are sharper than the normal distribution.

Market capitalization, which represents stock market size, showed almost similar movement as the stock price index. The market size terribly deteriorated in 1998 to a minimum index point of 55.52 million, but managed to recover later, and achieved the maximum index point of 991 million in 2007, which is a change of 1680 percent. Such a huge change is the second highest in the region, after Indonesia's. In comparison to the stock market size in early 1997 (107 million) before the Asian currency attack, South Korea has managed to increase its stock market size by 826 percent. It took around fifteen months for South Korea's market size to get back to the size it was before the crisis. This high achievement shows that South Korea's stock market size continues to aggressively grow without significantly being affected by the crisis. The market capitalization then dropped by 44 percent in the 2008 recession, before starting to climb back. Overall, market capitalization was deviated by 261 million.

South Korean's stock market liquidity, which is represented by traded volume, has been widely dispersed (1,120 million). It goes from the lowest volume of 133 million at the beginning of 1997, to the highest volume of 8,350 million in August 2002, with a mean of 1,800 million. Generally, the series portrays an increasing trend of stock market liquidity from 1997 (137 million) to 2002 with high volatility. There is only a little drop in South Korea's stock market liquidity at the end of 1997. From 2003 onwards, the series seem to have 'U-shaped' curve, with a declining trend from 2003 to 2006, and eventually increases with greater volatility throughout. South Korea's stock market liquidity seems to have less correlation with its stock market composite index.

South Korea's stock market volatility has been plummeting since 1998 to 2007. In 2008 and early 2009, however, the stock market volatility seems to slightly increase before its sharp downfall. After a drop to a point of 15.35 in September 1997, the start of the crisis period, the volatility reached its highest level at point 64.82 in February 1998. Since then, the stock market volatility continues to gradually sink to the lowest volatility level of 12.48 in December 2006. In January 2009, the volatility touches the second highest volatility level (59.19), after more than a decade. The stock market 90-day volatility has a mean of 30.57, which is the highest volatility mean in the region, and a standard deviation of 12.10. The series seem to be most skewed to the right, and has the sharpest distribution as compared to the other three countries' volatility. The volatility of South Korea's stock market seems to be the opposite of the movement of the stock market composite index. The volatility generally goes high, due to the impact of the Asian financial crisis in early 1998, and the U.S. subprime mortgage crisis in early 2009.

All the four countries experienced currency attack in late 1997, which led to

the Asian financial and economic crisis. Due to the impact of the currency attack, the South Korean won (KRW) experienced a depreciation of 115 percent within one year period, from KRW 843.4 per USD in Jan 1997 to KRW 1810 per USD in January 1998. The currency gradually appreciated by 50 percent to the lowest of KRW 906.7 per USD after the crisis. However, due to the U.S subprime mortgage crisis, the won has depreciated by 71 percent (KRW 1550 per USD) by the end of 2008. The currency is implementing the floating exchange rate system, where its rate is decided by the supply and demand of the currency in the market.

The three month interbank offer rates in South Korea reached the highest interest rate in that thirteen-year analysis period. The highest interest rate of 31.37 percent in March 1998 is the second highest interest rate offered during the Asian crisis period, after Indonesia's. The rate, which is represented by three-month interbank offer rate, rises by 141 percent due to the Asian crisis before plunging back to the lowest rates of 3.48 percent in November 2004, and 2.72 percent in August 2009. After 2004, the interest rate started rising until it reaches 7.25 percent in May 2009, before it abruptly slumps down due to the U.S subprime mortgage crisis. Generally, the mean three-month interbank offer rate in South Korea is 6.63 percent, with standard deviation of 4.32 percent.

### *4.5.5* World

Morgan Stanley Capital International (MSCI) World Index is used in the integration analyses to represent stock market performance of developed markets. Figure 4.5 portrays a more obvious market cycle of the MSCI World Index. The 1997-1998 Asian financial crisis does not affect the world market as much as the Asian markets. There is only a drop of 19 percent in less than three months by October

1998. The rest of the time, until end of 1999, the world market has been enjoying its stock market growth of 73 percent. Beginning 2000, the index starts plummeting, due to the crash of the dot.com bubble and the U.S. September 11 attacks, by 49 percent in 2003. It began to recover and reached the maximum index of 1675 in October 2007; a growth of 130 percent. The growth eventually turns to the Great Recession in 2008 and 2009 due to the U.S. subprime mortgage crisis, which has led to tightening credit around the world and slowing the economic growth in the U.S. and Europe. Within fifteen months, the index has plummeted by 58 percent to the lowest index of 697.5 in March 2009. The Asian countries have not been tremendously affected by the U.S subprime mortgage crisis. This could be due to the lessons learnt from the Asian financial crisis in 1997.[22]

Figure 4.5: MSCI World Index Weekly Performance (Jan 1997 – Dec 2009)

Generally, in thirteen years, the world index has a mean of 1137, and a standard deviation of 226. Among the five indices, the world index mean is the highest and second goes to Indonesia's, followed by South Korea's, Malaysia's and the lowest is Thailand's. The skewness and kurtosis are almost similar to other countries'.

Table 4.18 also describes the details of the world stock market returns and the crude oil price of Non-OPEC countries in US dollars. The world returns look almost similar to the other four Asian countries. The mean return is 0.09, a little higher that the mean return of Thailand, with a standard deviation of 2.52, which is the lowest

22 Eldon, David (2009). Asia: The Rhetoric and the Reality. *Vital Speeches of the Day.*, Vol. 75 ( 10), 471-475. Eldon is a Chairman, Dubai International Financial Centre, Senior Advisor, PricewaterhouseCoopers. *Delivered at FundForum Asia, Singapore, April 29, 2009*

dispersion among the five market returns. The return distribution is skewed to the left and its kurtosis is 10.66.

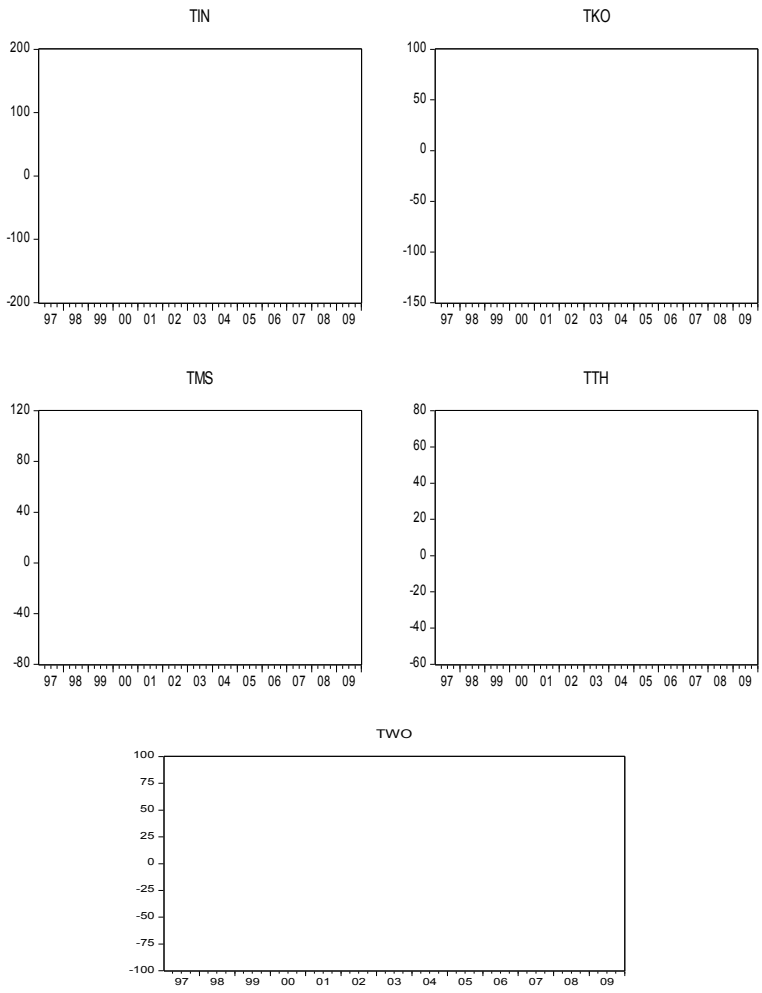
Crude oil price seems to have an increasing trend from the end of 1998 to 2008. It reaches the minimum point of US$8.787 per barrel in 1998, due to high oil production in Iraq, and low demand from Asia as a result of the Asian financial crisis. The oil prices continue to climb to a maximum of US$137 per barrel in 2008. It then rose by 1460% in a matter of a decade. Such oil shock is due to its lower production than expected, changes in U.S. Federal oil policies, pipeline attacks in Mexico, tensions in eastern Turkey and the depreciation of the U.S. dollar. However, after it reaches the peak, the price dives abruptly to US$40 per barrel in the same year when the ban of offshore drilling has been removed by the U.S. government, and the demand for oil has been declining following the downfall of global equities. The oil price starts increasing back in the following year, 2009. During thirteen years of the sample period, the oil mean price is US$40 per barrel, with a standard deviation of US$26. The oil price distribution is almost moderately skewed, not normally distributed and is sharper than the normal curve.

Table 4.18: Descriptive Statistics of Variables in the World

| | SM main index | SM returns % | Oil Price |
|---|---|---|---|
| Mean | 1137.44 | 0.09 | 40.07 |
| Median | 1121.92 | 0.27 | 29.02 |
| Maximum | 1675.29 | 12.34 | 137.03 |
| Minimum | 697.50 | -20.05 | 8.79 |
| Std. Dev. | 226.03 | 2.52 | 25.99 |
| Skewness | 0.34 | -0.80 | 1.26 |
| Kurtosis | 2.29 | 10.66 | 4.34 |
| Jarque-Bera | 27.33 | 1728.63 | 233.22 |
| Probability | 0.00 | 0.00 | 0.00 |

### *4.5.6* Daily Stock Market Returns

In addition to the weekly stock market returns, data on stock market returns for the four Asian countries are further analyzed by using the daily stock market indices. The daily return is defined as the difference of the daily close stock market index, $R_{it} = (Close_t - Close_{t-1})$. Throughout the thirteen years period, the daily returns of the four stock markets are scattered around zero, in which the highest mean is Indonesia's and the lowest is Thailand's. While obtaining the highest daily returns, Indonesia is suffered from the greatest lost too. In addition, Indonesia's returns have been dispersed the widest. Thailand, on the other hand, has earned and suffered the lowest among the four stock markets, despite of obtaining the lowest mean returns. Figure 4.6 portrays the movements of the daily returns of the four Asian stock markets, while Table 4.19 shows descriptive statistics.




Note: TIN: Daily returns of JCI, TKO: Daily returns of KOSPI, TMS: Daily returns of KLCI, TTH: Daily returns of SET, TWO: Daily returns of MSCI-World Index

Figure 4.6: Daily Stock Market Returns of KLCI, SET, JCI, KOSPI & MSCI-World Index (Jan 1997 – Dec 2009)

Table 4.19: Descriptive Statistics of Daily Stock Market Returns (Jan 1997 – Dec 2009)

| | Kor | Msia | Thai | Indo | World |
|---|---|---|---|---|---|
| Mean | 0.32 | 0.02 | -0.01 | 0.56 | 0.10 |
| Median | 0.27 | 0.00 | 0.00 | 0.00 | 0.71 |
| Maximum | 85.75 | 90.47 | 59.52 | 132.95 | 86.69 |
| Minimum | -126.50 | -66.87 | -53.33 | -183.77 | -86.84 |
| Std. Dev. | 17.76 | 10.43 | 8.74 | 19.16 | 11.32 |
| Skewness | -0.54 | 0.04 | 0.11 | -0.94 | -0.39 |
| Kurtosis | 7.35 | 11.49 | 7.19 | 16.25 | 8.55 |
| Jarque-Bera | 2831.27 | 10148.25 | 2473.60 | 25213.31 | 4423.48 |
| Probabilit | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | |
|---|---|---|---|---|---|
| y | | | | | |

### *4.5.7* Stock Market Indices During and Post Liberalization Periods

The behavior of the country stock market indices are explored further by dividing the sample period into two: the period during and the period post liberalization. Thus, the behaviors of the indices in the period during and after liberalization could be compared. The descriptive statistics of the five indices for the periods during and post liberalization are shown in Tables 4.20 and 4.21. Figures 4.7 and 4.8 portray the movements of the indices.

The tables and figures, generally, show some improvements in the indices performances in the period post liberalization. The stock indices are having greater means, medians, maximum and minimum values and even the standard deviation, in the post liberalization period than those during liberalization period. Therefore, the countries' stock market indices perform better in the post liberalization period than during liberalization period.

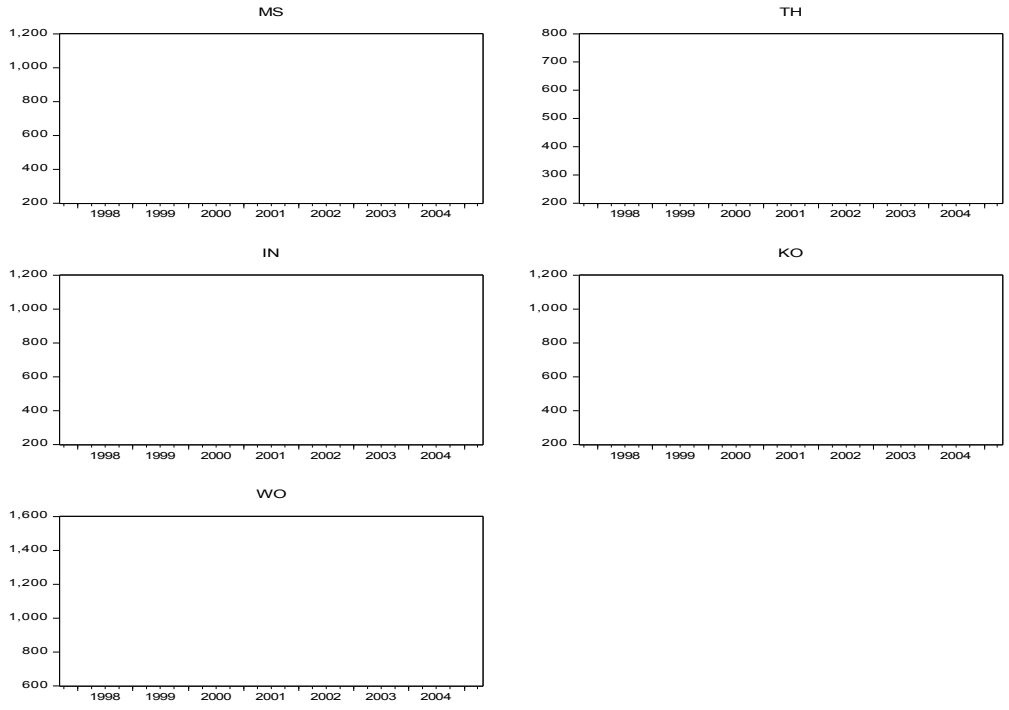


Figure 4.7: Stock Market Indices – During Liberalization Period

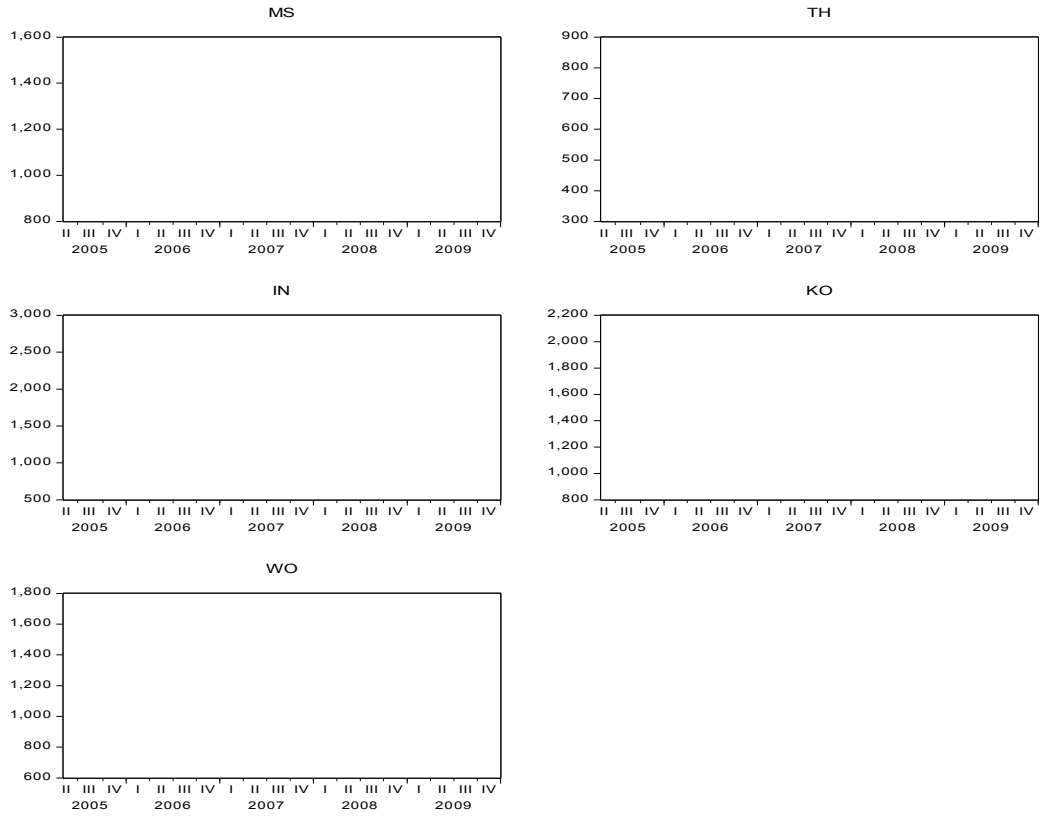



Figure 4.8: Stock Market Indices – Post Liberalization Period

Table 4.20: Descriptive Statistics of Stock Market Indices – During Liberalization Period

| | Msia | Thai | Indo | Korea | World |
|---|---|---|---|---|---|
| Mean | 716.25 | 434.68 | 543.66 | 689.96 | 1069.31 |
| Median | 724.27 | 383.84 | 488.65 | 704.33 | 1057.37 |
| Maximum | 1013.27 | 783.44 | 1147.87 | 1028.07 | 1447.93 |
| Minimum | 302.91 | 207.31 | 263.23 | 301.23 | 727.58 |
| Std. Dev. | 134.66 | 140.36 | 181.93 | 177.43 | 167.98 |
| Skewness | -0.46 | 0.79 | 1.40 | -0.26 | 0.16 |
| Kurtosis | 3.14 | 2.43 | 4.53 | 2.33 | 2.40 |
| Jarque-Bera | 14.35 | 46.52 | 169.46 | 11.86 | 7.66 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |

Table 4.21:

| | Msia | Thai | Indo | Korea | World |
|---|---|---|---|---|---|
| Mean | 1094.28 | 689.77 | 1811.61 | 1454.57 | 1286.63 |
| Median | 1067.76 | 698.63 | 1785.76 | 1419.65 | 1319.93 |
| Maximum | 1516.22 | 894.57 | 2830.26 | 2028.06 | 1675.29 |
| Minimum | 838.28 | 392.87 | 1012.85 | 923.19 | 697.50 |
| Std. Dev. | 185.64 | 117.24 | 535.97 | 265.30 | 237.33 |
| Skewness | 0.36 | -0.85 | 0.16 | 0.19 | -0.45 |
| Kurtosis | 1.68 | 3.35 | 1.63 | 2.32 | 2.31 |
| Jarque-Bera | 22.63 | 30.32 | 19.94 | 6.21 | 13.11 |
| Probability | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 |

Descriptive Statistics of Stock Market Indices – Post Liberalization Period

## 4.6 Chapter Summary

To examine the impact of stock market liberalization on stock market returns, multivariate ordinary least square regression analysis, controlling for the effects of stock market characteristics and macroeconomic fundamentals, are carried out after going through the econometric tests. The four Asian countries' main and sectors stock indices are the data used in the analyses. This study also applies coefficient correlation, univariate regression analyses, cointegration tests, and vector autoregressive models (VAR) to test the degree of stock market integration between the four Asian countries and the world market (MSCI World index). Before analyzing the related variables, the

behaviors or the performances of those variables are also explored in detail through descriptive statistics and time series graphs.

# 5. FINDINGS ON STOCK MARKET LIBERALIZATION AND STOCK MARKET RETURNS

## 5.1 Introduction

The first objective of this work is to examine the effect of subsequent stock market liberalization on the performance of stock market indices in Malaysia, Thailand, Indonesia and South Korea. This objective is linked to the first alternative hypothesis, that is, the subsequent stock market liberalization is significantly related to stock market returns. Thus, univariate and multivariate OLS regression analyses were conducted to identify the outcome of the relationship between stock market liberalization and returns, with and without controlling for the effects of stock market characteristics and macroeconomic fundamentals. In order to isolate the effect of liberalization on returns after all other potential drivers of returns are controlled for, Model 1 is the main model used in the analysis.

$$\text{Model 1: } R_{it} = \alpha_1 + \beta_1 Lib_{it} + \beta_2 Size_{it} + \beta_3 Liq_{it} + \beta_4 Vol_{it} + \beta_5 ER_{it} + \beta_6 IR_{it} + \beta_7 Oil_{it} + \mu_{it} \quad \text{(Eq 1.1)}$$

The model with an event window of 25 weeks (±12 weeks) of implementation of stock market liberalization, is applied to all eight events of stock market liberalization occurring from 1997 onwards, in which $Lib_{it}$ is the dummy variable. Three of Malaysia's stock market liberalizations were in April 1998, Jun 2003 and April 2005. Thailand's stock market liberalization was in October 1997, Indonesia's liberalizations were in September 1997 and March 1999, and South Korea's liberalizations were in December 1997 and July 1999.

For the robustness of the results, the analyses are divided into three sections. The first analysis uses stationary controlled variables. The second analysis uses log controlled variables, which are controlled variables at level. The third analysis uses stationary controlled variables excluding stock market size.

## 5.2 Controlling for Stationary Variables

The OLS regression Model 1 results, shown in Table 5.1, first column in each event, reveal that only one out of eight events has significant stock market liberalization. This belonged to Malaysia's stock market liberalization in April 1998. Of the eight liberalization events, only one is proven to be effective, for being significantly and positively related to its stock market returns. The result obtained by Malaysia's liberalization in April 1998 is consistent with Bekaert et al. (2010), Tai (2007), Patro (2005), Boubakri et al. (2005) and Henry (2000a), claiming that the financial markets would be able to gain greater positive effect from stock market liberalization. This is the case when stock market liberalization would allow for greater capital inflow, which would then generate greater returns through lower cost of capital. Having better stock market returns would enable financial development and better economic growth.

The coefficients on the liberalization dummy in Model 1 are significantly reduced relative to the coefficients with less or no controlled variables. The number of significant coefficients on the liberalization dummy with less or no controlled variables, however, is still too few to imply a significant impact of liberalization on stock market returns. Overall, the results show that the majority of the liberalization coefficients are insignificant, thus the findings of stock market liberalization are not consistent with the prediction of the IAPM. The liberalization of foreign ownership on local equities is not able to significantly increase the equity market returns of emerging ASEAN countries.

The results reduce the confidence that an increase in the percentage of foreign ownership in local equities would improve stock market returns. This work, however, does not argue that stock market liberalization is not related to stock market returns. This result is supported by Klein and Olivei (2008) and Kawakatsu and Morray (1999). Klein and Olivei (2008) found that there was little impact of stock market liberalization in developing countries as compared to developed countries. According to them, it was due to lack of adequate institutions and sound macroeconomic policies in the developing countries. South Korea was the most developed country in a sample study, having a better stock market and financial institutions, as well as macroeconomic policies. The results show that it was still not possible for the benefits of stock market liberalization to be fully realized in South Korea. The insignificant impact of stock market liberalization may be due to the gradual process of liberalization and plans to liberalize are usually announced well in advance (Kawakatsu & Morray, 1999). The results show the effect of having forward-looking investors.

Table 5.1: OLS Regression of Stock Market Liberalization and Stock Market Returns (Stationary Controlled Variables)

| | C | Lib | Size | Liq | Vol | ER | IR | Oil | Adj $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Indo 97 | -112.92 | -6.96 | -23.96 | 3.00 | 13.30 | 6.44 | -23.15 | 19.90 | 0.15 |
| | *0.67* | *0.51* | *0.14* | *0.65* | *0.56* | *0.80* | *0.16* | *0.56* | |
| | 26.17 | -0.44 | **-31.31 | -1.40 | 12.63 | | | | 0.01 |
| | *0.78* | *0.83* | *0.04* | *0.76* | *0.65* | | | | |
| | -10.50 | -4.38 | | | | 1.43 | -21.27 | 30.91 | 0.10 |
| | *0.94* | *0.51* | | | | *0.93* | *0.11* | *0.19* | |
| | -1.65 | -0.56 | | | | | | | -0.04 |
| | *0.43* | *0.84* | | | | | | | |
| Thai 97 | 3.65 | 0.78 | *** 68.16 | 0.41 | -6.41 | -3.46 | 3.58 | 18.88 | 0.89 |
| | *0.91* | *0.57* | *0.00* | *0.76* | *0.68* | *0.43* | *0.43* | *0.25* | |
| | -20.30 | -1.82 | 5.30 | 0.58 | 31.57 | | | | -0.15 |
| | *0.54* | *0.52* | *0.57* | *0.96* | *0.37* | | | | |
| | -20.30 | -1.82 | | | | 5.30 | 0.58 | 31.57 | -0.15 |
| | *0.54* | *0.52* | | | | *0.57* | *0.96* | *0.37* | |
| | -1.44 | -1.58 | | | | | | | -0.02 |
| | *0.41* | *0.50* | | | | | | | |
| Kor 97 | 4.27 | 2.74 | *** 82.15 | -0.21 | 8.05 | -0.31 | ** 8.55 | 16.01 | 0.80 |
| | *0.94* | *0.57* | *0.00* | *0.79* | *0.46* | *0.97* | *0.03* | *0.42* | |
| | 12.97 | **2.33 | *** 78.50 | -0.74 | 2.41 | | | | 0.80 |
| | *0.18* | *0.05* | *0.00* | *0.15* | *0.79* | | | | |
| | 109.99 | *16.34 | | | | -16.70 | 0.56 | 30.10 | 0.04 |
| | *0.39* | *0.08* | | | | *0.37* | *0.97* | *0.54* | |
| | **-4.63 | **6.91 | | | | | | | 0.12 |
| | *0.01* | *0.04* | | | | | | | |
| Msia 98 | ***-102.91 | *** 3.33 | 113.83 | **4.57 | *6.55 | 9.19 | -28.97 | 2.85 | 0.97 |
| | *0.00* | *0.00* | *0.00* | *0.00* | *0.09* | *0.14* | *0.03* | *0.60* | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ***-76.82 | *** 3.10 | 114.79 | *** 3.87 | *** 5.73 | | | | 0.96 |
| | *0.00* | *0.01* | *0.00* | *0.00* | *0.00* | | | | |
| | 44.24 | **-8.39 | | | | -29.32 | -36.35 | 7.05 | 0.08 |
| | *0.25* | *0.03* | | | | *0.29* | *0.54* | *0.79* | |
| | 2.75 | *-6.16 | | | | | | | 0.11 |
| | *0.24* | *0.06* | | | | | | | |
| Indo 99 | **623.89 | -0.32 | *** 50.83 | -0.10 | -26.93 | **- 68.49 | * 99.07 | 0.91 | 0.61 |
| | *0.02* | *0.87* | *0.00* | *0.93* | *0.11* | *0.02* | *0.05* | *0.95* | |
| | -13.57 | -0.18 | ***48.1 38 | 0.67 | -4.57 | | | | 0.58 |
| | *0.44* | *0.91* | *0.00* | *0.44* | *0.59* | | | | |
| | 578.66 | 4.83 | | | | -63.67 | 142.0 6 | 3.85 | 0.13 |
| | *0.26* | *0.11* | | | | *0.26* | *0.21* | *0.84* | |
| | 0.02 | **4.04 | | | | | | | 0.09 |
| | *0.99* | *0.02* | | | | | | | |
| Kor 99 | -9.56 | 0.11 | ***97.1 42 | -0.77 | -3.46 | 3.57 | 2.21 | -1.46 | 0.99 |
| | *0.91* | *0.77* | *0.00* | *0.28* | *0.64* | *0.77* | *0.77* | *0.82* | |
| | 15.44 | 0.12 | ***96.1 08 | -0.76 | -3.37 | | | | 0.99 |
| | *0.19* | *0.69* | *0.00* | *0.18* | *0.50* | | | | |
| | 723.86 | 0.88 | | | | - 101.94 | **- 100.0 1 | 4.45 | 0.21 |
| | *0.21* | *0.73* | | | | *0.21* | *0.02* | *0.91* | |
| | 2.52 | -1.49 | | | | | | | -0.03 |
| | *0.18* | *0.54* | | | | | | | |
| Msia 03 | -6.52 | -0.08 | ***92.1 92 | 0.34 | 2.36 | nil | -0.51 | *- 2.368 | 0.97 |
| | *0.14* | *0.68* | *0.00* | *0.15* | *0.24* | | *0.89* | *0.06* | |
| | -7.16 | -0.17 | ***89.8 54 | 0.38 | 3.01 | | | | 0.96 |
| | *0.13* | *0.34* | *0.00* | *0.13* | *0.20* | | | | |
| | 0.30 | 0.60 | | | | nil | 31.23 | 4.58 | 0.00 |
| | *0.51* | *0.34* | | | | | *0.29* | *0.45* | |
| | 0.22 | 0.75 | | | | | | | 0.03 |
| | *0.62* | *0.21* | | | | | | | |
| Msia 05 | 5.15 | 0.09 | **69.57 | -0.27 | 1.63 | nil | 16.92 | -0.59 | 0.61 |
| | *0.60* | *0.70* | *0.02* | *0.59* | *0.61* | | *0.44* | *0.88* | |
| | 5.49 | 0.12 | **68.98 | -0.29 | 1.59 | | | | 0.65 |
| | *0.37* | *0.55* | *0.01* | *0.36* | *0.61* | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | -0.62 | **1.11 | nil | -31.77 | -1.65 | 0.07 |
| | *0.14* | *0.05* | | *0.72* | *0.81* | |
| | *-0.66 | **1.09 | | | | 0.14 |
| | *0.08* | *0.04* | | | | |

Note: Regression model 1, the first row in each event, as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it}$ where $R_{it}$ is the market returns of main index of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Event window is T-12 to T+12 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+12 week of stock market liberalization and ends; All controlled variables are stationary: $Size_{it}$ is the stock market size at 1st difference, measured by market capitalization of country *i* or sector's *i* at time *t*; $Liq_{it}$ is the stock market liquidity at level, measured by traded volume of country *i* or sector's *i* at time *t*; $Vol_{it}$ is the stock market volatility at 1st difference for 90-day of country *i* or sector *i* at time *t*; $ER_{it}$ is the exchange rates of local currency vis-à-vis US$ at level of country *i* or sector's *i* at time *t*; $IR_{it}$ is the interest rates at 1st difference, measured by three-month interbank offer rates of country *i* or sector's *i* at time *t*; $Oil_{it}$ is the crude oil prices at 1st difference of country *i* or sector *i* at time *t*;$\mu_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated. Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.
nil means nothing due to no changes in the exchange rate figures (local currency was pegged to USD).
Probabilities of t-statistics are in italic.
*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

In Model 1 of T±26 week event window, as in Appendix 5-1, none of the stock market liberalization coefficients are significant. This proves that the impact of subsequent stock market liberalization on stock market returns is in a shorter time period (T±12 week event window). This analysis further proves the insignificant effect of stock market liberalization on its returns.

Stock market characteristics and macroeconomic fundamentals may have significant impact on stock market returns, knowing how complex the true scenario of stock markets is. Thus, the effects of those variables need to be controlled so that the impact of stock market liberalization on stock market returns could be isolated. Table 5.1 reveals the coefficients of controlled variables on stock market returns.

Among the three stock market characteristics, stock market size is the major determinant of stock market performances to all events, except for Indonesia's 1997

liberalization. Seven events have positive and significant coefficients at 1 and 5 percents significance levels. Indeed, the inclusion of stock market size as controlled variable dramatically improves the regression fit. Therefore, the results provide greater confidence that the greater the stock market size, the better the stock market returns (Homsud et al., 2009; Mobarek & Mollah, 2005; Irfan & Nishat, 2002). Wang (2000) and Fama and French (1992), however, claim that the size is associated with a common risk factor. Therefore, the greater the size of the stock market, the lower the risk and the lower the returns. Mobarek and Molah (2005) state that the results might not always be consistent with the developed markets, due to the lack of homogenous expectation on risk return characteristics and different microstructures in the country. Contrary to the above findings, Yang et al. (2010) and Moshirian et al. (2009) found that the relationship between stock market size and its returns are insignificant.

Both stock market liquidity and volatility have only one positive significant coefficient which belongs to Malaysia's April 1998 stock market liberalization. The results show that the more liquid and volatile the stock market, the greater the performance of the stock market. The positive relationship between stock market liquidity and returns is supported by Chuang et al. (2009), Mobarek and Mollah (2005), Dey (2005) and Jun et al. (2003). The other seven events do not prove to be of significance for stock market liquidity and volatility on returns (Moshirian et al., 2009). Having only one significant positive coefficient in each stock market characteristic shows lack of support for the robustness of the results that the greater the liquidity or volatility of the stock market, the greater its returns would be. This thesis, however, does not argue that there is no significant relationship between stock market volatility and stock market returns. Tudor (2009), Mobarek and Mollah (2005) support that the

results might not always be significant, due to lack of homogenous expectation on risk return characteristics.

In Model 1 of the T±26 week event window, as in Appendix 5-1, the results show greater evidence of the significance of the impact of stock market liberalization on stock market returns. Only Indonesia's 1997 stock market size had a negative impact on stock market returns. The overall results show stronger support regarding the positive relationship between stock market size and returns. There are very few significant coefficients of stock market liquidity and volatility. Thus, the results imply lack of support for the possibility that stock market liquidity and volatility has a significant relationship with stock market returns.

The inclusion of macroeconomic fundamentals as controlled variables does not dramatically improve the regression fit as much as those of stock market characteristics. Thus, the impact of macroeconomic fundamentals on stock market returns is less than those of stock market characteristics. Of the three macroeconomic fundamentals, interest rate has the greatest evidence of significant impact on stock returns. Even so, the number of its significant coefficients is not a majority. There is only one significant negative coefficient for exchange rate and oil price. Thus, the results reduce the confidence that exchange rates, interest rates and oil prices are significantly related to stock market returns. This work, however, does not argue that there is no relationship between macroeconomic fundamentals and stock market returns.

Malaysia's stock market liberalization in 2003 and 2005 had no exchange rates variable in the regression estimations, due to the pegged exchange rates system implemented by the country from September 1998 to July 2005. Since there had been no change in the exchange rates figures during the period, the exchange rates series could not be applied in the regression analyses. The results show that of six event

windows, only one coefficient of exchange rate (Indonesia's in 1999) is significant and has negative impact on stock market returns. This might be due to the high dependence of Indonesia during that period on international trade. The depreciation of rupiah increased its overall exports, but the increase in its cost of production and intermediate goods through its imports had greater impact, which reduced its stock market returns (Somoye et al., 2009; Ibrahim & Aziz, 2003). Five other coefficients of exchange rate are insignificant, which, indicates lack of support for the robustness of the results. This insignificant finding might be due to the country's low current account surplus, which might lower the exposure of the foreign exchange rates' coefficient (Entorf et al., 2009; Bailey & Chung, 1996).

Table 5.1 reveals three out of eight significant coefficients of interest rates affect stock market returns. The results neither fully support the existence of a relationship between interest rates and stock market returns nor argue that interest rates are not related to stock returns. Of three significant coefficients, one (Malaysia's April, 1998) has a negative effect on stock market returns, supporting the findings of Kandir, (2008), Somoye et al., (2009), Chen, (2009), Gjerde and Saettam (1999), Mukherjee and Naka (1995) which Mukherjee and Naka (1995) claim, could be due to the inflationary or discounted factor effect. The three month interbank interest offer rates are found to significantly and positively affect the returns of the stock markets of two countries, i.e. South Korea in December, 1997 and Indonesia in March 1999. Two of the significant coefficients were positive, consistent with Bilson (2001), Asprem (1989) and Mandelker and Tandon (1985) findings. The positive relationship between interest rates and stock returns is possible when money supply is backed by foreign reserves (Bilson, 2001; Asprem, 1989; Mandelker & Tandon, 1985).

There is only one significant coefficient of oil price, the weekly crude oil price for non-OPEC countries, in Model 1, which belongs to Malaysia's 2003 stock market liberalization. The result indicates that oil prices are negatively related to stock market returns, which is supposed to be the condition of a net oil importing country. Malaysia was an oil exporting country and had been subsidizing the oil prices of the local market. The results should portray the positive effect of oil price on stock market returns but it indicates the opposite. During that period, the increase in the price of oil would create a greater inflationary effect to the country, which would incur greater cost of capital and cost of production, reducing firms' and stock market returns (Somoye et al., 2009; Oberndorfer, 2009). The overall results, however, reduce confidence that oil prices could affect the returns of the stock market.

Exchange rates and interest rates are both found insignificant in a longer event window (T±26 week event window) of Model 1 (Refer to Appendix 5-1). The results imply that these two macroeconomic fundamentals might affect the stock market returns in a very short time period. Oil price, however, has a significant negative relationship with stock market returns in only two events. Those significant coefficients belonged to Indonesia in 1999 and Malaysia in 2003. Thus, there remains lack of support to prove that oil prices would cause inflation and, thus, increase the cost of production, and provide lesser returns to the firms regardless of whether it is an oil exporting country or whether the oil prices are subsidized.

The inclusion of the controlled variables, mainly stock market characteristics, has dramatically improved the regression fit of the regression models. Thus stock market characteristics, specifically stock market size, play a greater role in affecting stock market returns than that of stock market liberalization.

## 5.3 Controlling for Variables at Level

To confirm the robustness of the results, another regression analysis of Model 1 was constructed. Instead of using stationary controlled variables as in Table 5.1, this analysis uses log controlled variables, which are variables at level.

Results from the univariate regression model in Table 5.2, show that half events have significant coefficients of stock market liberalization. However, not accounting for the controlled variables at all might lead to an overstatement of the effects of stock market liberalization. As more controlled variables are added into the regression models, coefficients on the liberalization dummy are significantly reduced relative to the univariate regression model. Indeed, after controlling for both stock market characteristics and macroeconomic fundamentals at level, the stock market liberalization had no significant relation to stock market returns. The results imply that the run-up in the four Asian countries' stock indices is the result of macroeconomic shocks and stock market characteristics.

While the results in Table 5.1 reveal that stock market liberalization had a weak relation to stock market returns, results in Table 5.2 disclose that stock market liberalization is not significantly related to stock returns. These further reduce the confidence that an increase in the percentage of foreign ownership in local equities would improve the stock market returns. The results contradict the prediction of IAPM and are inconsistent with the findings of Bekaert et al. (2010), Tai (2007), Patro (2005), Boubakri et al. (2005) and Henry (2000a).

The inclusion of macroeconomic fundamentals and stock market characteristics as controlled variables in the multivariate regression model has not only diminished the effects of stock market liberalization, it has also improved the regression fit. The

regression fit, however, is not as much as the regression fit obtained in Table 5.1 using stationary controlled variables. Thus, the macroeconomic fundamentals and stock market characteristics can further explain the changes in stock returns more.

Although the stock market characteristics and macroeconomic fundamentals can better explain the changes in stock market returns, the variables contain only a few significant coefficients. Thus the relations between those controlled variables and stock market returns are weakly significant. The impact of stock market size on returns is weak with only three positive significant coefficients. Among the three stock market characteristics, stock market size has the largest beta. Among the three macroeconomic fundamentals, interest rate has three significant coefficients with mixed signs. There are two negative significant coefficients of oil price and one negative significant coefficient of exchange rate.

Table 5.2: OLS Regression of Stock Market Liberalization and Stock Market Returns (Controlled Variables at Level)

| | C | Lib | Size | Liq | Vol | ER | IR | Oil | $R^2$ | Adj $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Indo 97 | 170.03 | 2.53 | -1.18 | 6.13 | 8.34 | -39.76 | **-9.483 | 14.33 | 0.20 | -0.14 |
| | *0.69* | *0.79* | *0.94* | *0.35* | *0.62* | *0.26* | *0.03* | *0.83* | | |
| | *197.40 | *8.64 | | | | -28.79 | **-6.24 | 15.62 | 0.14 | -0.04 |
| | *0.06* | *0.07* | | | | *0.19* | *0.02* | *0.70* | | |
| | -185.07 | 2.25 | 7.49 | 2.11 | -1.46 | | | | 0.03 | -0.16 |
| | *0.64* | *0.90* | *0.57* | *0.80* | *0.93* | | | | | |
| | -1.64 | -0.56 | | | | | | | 0.00 | -0.04 |
| | *0.43* | *0.84* | | | | | | | | |
| Thai 97 | **-667.25 | 4.76 | ***31.07 | 4.10 | -5.85 | 11.93 | ***27.51 | 15.02 | 0.41 | 0.17 |
| | *0.01* | *0.36* | *0.01* | *0.38* | *0.69* | *0.53* | *0.01* | *0.44* | | |
| | 1.92 | 2.86 | | | | -23.15 | ***21.05 | 5.38 | 0.18 | 0.02 |
| | *0.98* | *0.52* | | | | *0.17* | *0.01* | *0.73* | | |
| | -164.09 | -0.42 | 3.25 | 4.15 | 9.86 | | | | 0.10 | -0.09 |
| | *0.25* | *0.91* | *0.73* | *0.31* | *0.63* | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | -1.44 | -1.57 | | | | | | | 0.02 | -0.02 |
| | *0.41* | *0.50* | | | | | | | | |
| Kor 97 | -464.14 | 11.71 | *56.74 | 1.69 | 11.49 | 29.72 | -13.10 | 60.98 | 0.36 | 0.10 |
| | 0.13 | 0.31 | 0.07 | 0.80 | 0.33 | 0.45 | 0.36 | 0.25 | | |
| | 209.96 | 14.41* | | | | -19.42 | -7.53 | -20.92 | 0.21 | 0.06 |
| | *0.40* | *0.06* | | | | *0.39* | *0.62* | *0.53* | | |
| | -327.38 | 8.48 | 16.62 | 0.76 | 0.88 | | | | 0.23 | 0.08 |
| | *0.25* | *0.21* | *0.19* | *0.91* | *0.93* | | | | | |
| | 4.630** | 6.91** | | | | | | | 0.16 | 0.12 |
| | *0.01* | *0.04* | | | | | | | | |
| Msia 98 | -62.18 | 0.80 | 27.13 | 6.78 | -17.63 | -73.09 | -97.14 | -2.75 | 0.44 | 0.22 |
| | *0.87* | *0.92* | *0.41* | *0.33* | *0.27* | *0.34* | *0.13* | *0.91* | | |
| | *319.85 | -4.61 | | | | 78.03** | -80.67 | -8.24 | 0.32 | 0.18 |
| | *0.10* | *0.22* | | | | *0.04* | *0.12* | *0.69* | | |
| | -373.42 | 0.11 | 21.75 | 6.75 | -7.09 | | | | 0.30 | 0.15 |
| | *0.21* | *0.99* | *0.31* | *0.41* | *0.54* | | | | | |
| | 2.75 | 6.16* | | | | | | | 0.15 | 0.11 |
| | *0.24* | *0.06* | | | | | | | | |
| Indo 99 | 404.32 | -5.69 | 6.84 | 3.35 | -23.91 | *-75.35 | 47.35*** | -0.55 | 0.49 | 0.27 |
| | *0.46* | *0.17* | *0.64* | *0.35* | *0.17* | *0.09* | *0.00* | *0.98* | | |
| | 423.71 | -0.43 | | | | *-62.62 | **28.46 | 17.21 | 0.31 | 0.17 |
| | *0.13* | *0.93* | | | | *0.07* | *0.04* | *0.15* | | |
| | 136.96 | -1.73 | -10.34 | *5.63 | -14.68 | | | | 0.24 | 0.08 |
| | *0.22* | *0.59* | *0.19* | *0.09* | *0.14* | | | | | |
| | 0.02 | 4.037* | | | | | | | 0.13 | 0.09 |
| | *0.99* | *0.08* | | | | | | | | |
| Kor 99 | -2022.82 | -1.84 | **86.72 | 13.94* | 90.59* | 83.11 | -41.58 | 69.88** | 0.38 | 0.12 |
| | *0.11* | *0.77* | *0.02* | *0.09* | *0.07* | *0.51* | *0.21* | *0.03* | | |
| | 524.16 | 1.65 | | | | -69.00 | -5.62 | -8.38 | 0.10 | -0.08 |
| | *0.48* | *0.75* | | | | *0.52* | *0.83* | *0.69* | | |
| | -256.72 | -6.23 | 15.61 | 0.96 | -15.76 | | | | 0.08 | -0.10 |
| | *0.53* | *0.35* | *0.42* | *0.87* | *0.52* | | | | | |
| | 2.52 | -1.49 | | | | | | | 0.02 | -0.03 |
| | *0.18* | *0.54* | | | | | | | | |
| Msia | -74.24 | -1.24 | 4.01 | *1.88 | -3.28 | nil | 15.67 | *-6.18 | 0.23 | - |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 03 | | | | | | | | | | 0.02 |
| | *0.70* | *0.36* | *0.81* | *0.07* | *0.61* | | *0.63* | *0.06* | | |
| | -10.32 | 0.87 | | | | nil | 19.26 | -3.03 | 0.10 | -0.02 |
| | *0.82* | *0.27* | | | | | *0.62* | *0.48* | | |
| | 0.41 | -0.77 | -1.32 | 1.44 | -4.36 | | | | 0.15 | -0.02 |
| | *1.00* | *0.56* | *0.93* | *0.11* | *0.46* | | | | | |
| | 0.22 | 0.75 | | | | | | | 0.07 | 0.03 |
| | *0.62* | *0.21* | | | | | | | | |
| Msia 05 | -118.17 | -0.07 | 10.07 | -4.38 | 7.56 | nil | 49.93 | 1.45 | 0.36 | 0.14 |
| | *0.46* | *0.95* | *0.44* | *0.15* | *0.36* | | *0.53* | *0.82* | | |
| | -38.74 | 0.68 | | | | nil | 34.85 | 0.60 | 0.22 | 0.11 |
| | *0.43* | *0.32* | | | | | *0.58* | *0.92* | | |
| | -181.49 | 0.82 | *16.87 | -2.39 | 4.36 | | | | 0.31 | 0.17 |
| | *0.14* | *0.14* | *0.09* | *0.30* | *0.57* | | | | | |
| | *-0.66 | 1.09 | | | | | | | 0.18 | 0.14 |
| | *0.08* | *0.04* | | | | | | | | |

Note: Regression model 1, the first row in each event, as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it}$ where $R_{it}$ is the market returns of main index of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Event window is T-12 to T+12 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+12 week of stock market liberalization and ends; All controlled variables are at level (log): $Size_{it}$ is the stock market size, measured by market capitalization of country *i* or sector's *i* at time *t*; $Liq_{it}$ is the stock market liquidity, measured by traded volume of country *i* or sector's *i* at time *t*; $Vol_{it}$ is the stock market volatility for 90-day of country *i* or sector *i* at time *t*; $ER_{it}$ is the exchange rates of local currency vis-à-vis US$ of country *i* or sector's *i* at time *t*; $IR_{it}$ is the interest rates, measured by three-month interbank offer rates of country *i* or sector's *i* at time *t*; $Oil_{it}$ is the crude oil prices of country *i* or sector *i* at time *t*;$\mu_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated. Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.

nil means nothing due to no changes in the exchange rate figures (local currency was pegged to USD).

Probabilities of t-statistics are in italic.

*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

## 5.4 Controlling for Stationary Variables without Stock Market Size

For the robustness of the results, another regression analysis is constructed with the omission of stock market size. The results in Table 5.3, generally, disclose the weak impact of stock market liberalization on stock market returns. The results of the

univariate regression model show that half of the events acquire significant coefficients of liberalization dummy. The inclusion of macroeconomic fundamentals has reduced the significant liberalization coefficients to three. After controlling for the effects of both stock market characteristics and macroeconomic fundamentals, there is only one significant positive coefficient of liberalization dummy – that of Korea's 1997 liberalization. This liberalization coefficient is consistent with the prediction of IAPM.

The effects of stock market liberalization are substantially diminished by adding more controlled variables to the right-hand side of the regression model. The remaining liberalization coefficients are insignificant which reduce confidence that an increase in the percentage of foreign ownership in local equities would improve stock market returns. This work, however, does not argue that stock market liberalization is not related to stock returns.

Between stock market characteristics and macroeconomic fundamentals, the effects of macroeconomic fundamentals on stock returns are greater, even though the evidence of a significant relationship between the two variables is not strong. Among the three macroeconomic fundamentals, interest rate plays a greater role in affecting stock returns. Oil price has no impact on stock returns. Without the inclusion of stock market size as a controlled variable, the relationship between stock market liquidity and stock returns remains weak with one significant positive coefficient. The stock market volatility coefficient is no longer significant in all eight events.

Table 5.3: OLS Regression of Stock Market Liberalization and Stock Market Returns
(Stationary Controlled Variables without Market Size)

| | C | Lib | Liq | Vol | ER | IR | Oil | $R^2$ | Adj $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Indo 97 | -164.33 | -8.43 | 4.67 | 8.51 | 8.72 | **-26.15 | 35.58 | 0.30 | 0.07 |
| | *0.49* | *0.30* | *0.50* | *0.64* | *0.70* | *0.03* | *0.47* | | |
| | -11.97 | -0.79 | 0.49 | 4.10 | | | | 0.01 | -0.14 |
| | *0.92* | *0.76* | *0.93* | *0.91* | | | | | |
| | -10.50 | -4.38 | | | 1.43 | -21.27 | 30.91 | 0.25 | 0.10 |
| | *0.94* | *0.51* | | | *0.93* | *0.11* | *0.19* | | |
| | -1.65 | -0.56 | | | | | | 0.00 | -0.04 |
| | *0.43* | *0.84* | | | | | | | |
| Thai 97 | -101.62 | -2.47 | 4.03 | 4.63 | 6.47 | -0.24 | 38.01 | 0.09 | -0.21 |
| | *0.34* | *0.59* | *0.37* | *0.93* | *0.66* | *0.99* | *0.49* | | |
| | -73.89 | -2.27 | 3.79 | -0.97 | | | | 0.06 | -0.07 |
| | *0.36* | *0.42* | *0.37* | *0.98* | | | | | |
| | -20.30 | -1.82 | | | 5.30 | 0.58 | 31.57 | 0.04 | -0.15 |
| | *0.54* | *0.52* | | | *0.57* | *0.96* | *0.37* | | |
| | -1.44 | -1.58 | | | | | | 0.02 | -0.02 |
| | *0.41* | *0.50* | | | | | | | |
| Kor 97 | 116.82 | *16.67 | 3.05 | -28.08 | -25.84 | 0.23 | 26.76 | 0.22 | -0.04 |
| | *0.36* | *0.10* | *0.61* | *0.50* | *0.36* | *0.99* | *0.66* | | |
| | 12.43 | 6.79 | -0.83 | -12.58 | | | | 0.17 | 0.05 |
| | *0.90* | *0.29* | *0.87* | *0.71* | | | | | |
| | 109.99 | *16.34 | | | -16.70 | 0.56 | 30.10 | 0.20 | 0.04 |
| | *0.39* | *0.08* | | | *0.37* | *0.97* | *0.54* | | |
| | **-4.63 | **6.91 | | | | | | 0.16 | 0.12 |
| | *0.01* | *0.04* | | | | | | | |
| Msia 98 | -114.67 | -0.51 | 6.98 | 29.57 | -15.82 | -59.11 | 9.89 | 0.45 | 0.27 |
| | *0.32* | *0.90* | *0.19* | *0.29* | *0.42* | *0.32* | *0.28* | | |
| | -111.35 | 0.75 | 5.65 | 32.85 | | | | 0.38 | 0.29 |
| | *0.26* | *0.86* | *0.25* | *0.22* | | | | | |
| | 44.24 | **-8.39 | | | -29.32 | -36.35 | 7.05 | 0.24 | 0.08 |
| | *0.25* | *0.03* | | | *0.29* | *0.54* | *0.79* | | |
| | 2.75 | *-6.16 | | | | | | 0.15 | 0.11 |
| | *0.24* | *0.06* | | | | | | | |
| Indo 99 | 332.78 | 2.76 | **3.60 | -13.39 | -44.76 | *160.38 | 16.92 | 0.35 | 0.13 |
| | *0.52* | *0.30* | *0.04* | *0.64* | *0.43* | *0.09* | *0.42* | | |
| | -16.66 | 2.42 | 0.84 | 19.81 | | | | 0.18 | 0.07 |
| | *0.60* | *0.24* | *0.59* | *0.36* | | | | | |
| | 578.66 | 4.83 | | | -63.67 | 142.06 | 3.85 | 0.27 | 0.13 |
| | *0.26* | *0.11* | | | *0.26* | *0.21* | *0.84* | | |
| | 0.02 | **4.04 | | | | | | 0.13 | 0.09 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *0.99* | *0.02* | | | | | | | |
| Kor 99 | *730.17 | 0.70 | 2.11 | -1.10 | *-109.08 | **-103.26 | -0.30 | 0.35 | 0.13 |
| | *0.09* | *0.70* | *0.61* | *0.99* | *0.09* | *0.03* | *1.00* | | |
| | -39.63 | -1.27 | 1.99 | -45.47 | | | | 0.05 | -0.08 |
| | *0.75* | *0.64* | *0.74* | *0.37* | | | | | |
| | 723.86 | 0.88 | | | -101.94 | **-100.01 | 4.45 | 0.34 | 0.21 |
| | *0.21* | *0.73* | | | *0.21* | *0.02* | *0.91* | | |
| | 2.52 | -1.49 | | | | | | 0.02 | -0.03 |
| | *0.18* | *0.54* | | | | | | | |
| Msia 03 | -17.16 | -0.29 | 0.93 | 9.54 | | 23.29 | 5.91 | 0.25 | 0.05 |
| | *0.39* | *0.77* | *0.37* | *0.26* | | *0.44* | *0.33* | | |
| | -13.99 | 0.01 | 0.76 | 10.50 | | | | 0.19 | 0.08 |
| | *0.46* | *0.99* | *0.45* | *0.18* | | | | | |
| | 0.30 | 0.60 | | | | 31.23 | 4.58 | 0.13 | 0.00 |
| | *0.51* | *0.34* | | | | *0.29* | *0.45* | | |
| | 0.22 | 0.75 | | | | | | 0.07 | 0.03 |
| | *0.62* | *0.21* | | | | | | | |
| Msia 05 | 0.61 | 1.01 | -0.06 | 5.03 | | -29.06 | -1.92 | 0.21 | 0.00 |
| | *0.99* | *0.13* | *0.98* | *0.56* | | *0.76* | *0.82* | | |
| | 10.87 | 0.93 | -0.58 | 5.54 | | | | 0.20 | 0.08 |
| | *0.77* | *0.13* | *0.76* | *0.50* | | | | | |
| | -0.62 | **1.11 | | | | -31.77 | -1.65 | 0.19 | 0.07 |
| | *0.14* | *0.05* | | | | *0.72* | *0.81* | | |
| | *-0.66 | **1.09 | | | | | | 0.18 | 0.14 |
| | *0.08* | *0.04* | | | | | | | |

Note: Regression model 1, the first row in each event, as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Liq_i + \beta_3 Vol_i + \beta_4 ER_i + \beta_5 IR_i + \beta_6 Oil_i + \mu_{it}$ where $R_{it}$ is the market returns of main index of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Event window is T-12 to T+12 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+12 week of stock market liberalization and ends; All controlled variables are stationary: measured by market capitalization of country *i* or sector's *i* at time *t*; $Liq_{it}$ is the stock market liquidityat level, measured by traded volume of country *i* or sector's *i* at time *t*; $Vol_{it}$ is the stock market volatility at 1st difference for 90-day of country *i* or sector *i* at time *t*; $ER_{it}$ is the exchange rates of local currency vis-à-vis US$ at level of country *i* or sector's *i* at time *t*; $IR_{it}$ is the interest rates at 1st difference, measured by three-month interbank offer rates of country *i* or sector's *i* at time *t*; $Oil_{it}$ is the crude oil prices at 1st difference of country *i* or sector *i* at time *t*;$\mu_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated. Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.

nil means nothing due to no changes in the exchange rate figures (local currency was pegged to USD).

Probabilities of t-statistics are in italic.

*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

## 5.5 Chapter Summary

In analyzing the effects of stock market liberalization on stock market returns, while controlling for the effects of stock market characteristics and macroeconomic fundamentals, the results of the first and third analyses reveal that there is only one event with a significant positive relationship between subsequent stock market liberalization and its returns. This result is consistent with the prediction of the standard IAPM, in which the liberalization policy would increase risk sharing, liquidity and inflows of investment, reduce the cost of capital and, thus, increase stock market returns. The other seven events have no significant coefficients of liberalization dummy. Thus, the results show insufficient evidence to reject the null hypothesis that there is no relationship between stock market liberalization and returns.

The results of the second analysis, using controlled variables at level, reveal no significant coefficient of liberalization dummy. This further proves that stock market liberalization has very little or no impact on stock market returns.

The results of the OLS regression estimations with a longer event window (53-week event window) show that the implementation of the stock market liberalization policies is insignificant. All countries experience insignificant impact of subsequent stock market liberalization on returns. Thus, the results prove further that there is no relationship between stock market liberalization and its returns.

Therefore, the implementation of the subsequent stock market liberalization policy is expected not to have a strong impact on stock market returns. There was lack of support for the robustness of the results that an increase in the percentage of foreign ownership in local equity would improve its stock market returns. This thesis, however,

does not argue that the subsequent stock market liberalization is ineffective in improving returns. If it needs to be implemented, the government authorities should first decide on the time period of the outcome. It seems that the policy might only be effective in a very short time period.

The impact of the subsequent stock market liberalization might have already been anticipated when the announcement was made, or much earlier due to insider information. In addition, according to Henry (2000a), the impact of subsequent stock market liberalization might have been anticipated during the first stock market liberalization (late 1980s or early 1990s), rendering some of the policies insignificant. The authorities should also analyze the effects of stock market characteristics and macroeconomics fundamentals earlier before deciding on implementing the policy. Implementation of the policy is targeted towards better performance of the stock market; however, if this is not the case, then it would be prudent not to implement it at all.

# 6. FINDINGS ON SECTORAL MARKET RETURNS

## *6.1* Introduction

The use of the countries' stock market indices as a proxy for stock market performances would clearly showcase the effects of stock market liberalization policy on the overall countries' stock market performances. However, it may not provide specific indication of the effects on sectors. Some sectors may be more drastically affected than the others. It is therefore important to acknowledge the effects of liberalization policies on specific sectors, since the subsequent stock market liberalization policy has normally been enforced on specific sector(s), rather than to the whole country's stock market. This thesis further analyzes the impact of the liberalization on stock market returns of the specific liberalized sectors. Data on related sector indices are used to measure the weekly stock market returns, which are in turn used as a proxy to gauge the specific sector performances. Similar to Chapter five, the impact of stock market liberalization on the sector(s) returns is analyzed in three ways for the robustness of the results.

Similar to the analysis done in Chapter five, the analysis on the relationship between stock market liberalization and stock market returns for sector indices is also done in three sections, with and without controlling for the effects of sectoral market characteristics and macroeconomic fundamentals. The three sections of using stationary controlled variables, log controlled variables and stationary controlled variables without stock market size, are applied for the robustness of the results.

## 6.2 Controlling for Stationary Variables

Table 6.1 portrays the effect of stock market liberalization on sectoral market returns by using univariate and multrivariate regression models. The univariate regression model shows four significant coefficients of liberalization dummy. However, as more controlled variables added to the right-hand side of the model, the number of significant coefficients of liberalization dummy has been reduced. Indeed, there is only one significant coefficient of liberalization dummy shown in the regression equation Model 1, taken into consideration the impact of all related variables such as sectoral market characteristics and macroeconomic fundamentals. Thus, there is lack of support for the robustness of the results that stock market liberalization would affect sectoral market returns. This thesis, however, does not argue that stock market liberalization is ineffective in influencing the performance of its sectoral market.

The only evidence of a significant relationship between the subsequent stock market liberalization and sectoral market returns, after controlling for the effects of both sectoral market characteristics and macroeconomic fundamentals, belongs to Malaysia's in April 1998, but with a negative relationship. Although the result is significant, it contradicts the findings of Tai (2007), Patro (2005), Christoffersen et al. (2006), and Henry (2000a). According to them, liberalization policies should be positively related to sectoral stock market returns, which is consistent with the prediction of IAPM.

The coefficient of Malaysia's 1998 liberalization, supports the fact that the liberalization of the stock market msy negatively affect returns, as claimed by Stiglitz (2004). He asserts that capital market liberalization, generally, may not lead to a welfare improvement, but to increase the variability of consumption and output, with lower growth.

Malaysia's 1998 liberalization policy is also the only significant dummy coefficient in Model 1 for T±26 week event window sectoral market analyses (Appendix 6-1). The results continuously indicate the possibility of the subsequent stock market liberalization to not effectively enhancing the performance of the sectoral market. The negative impact of the liberalization is more severe in shorter time period, (coefficient of -9.626) in T±12 week event windows as compared to the result (coefficient of -3.877) in T±26 week event windows. The negative impact of Asian financial crisis might overshadow the positive impact of the liberalization on the Malaysian service sector. The investors' confidence on the impact of liberalization might be too little, thus empower the impact of the crisis. This is supported by the results of the liberalization dummy show significant negative sign when controlling for macroeconomic fundamentals.

The evidence, however, is weak since there is only one significant negative coefficient of the liberalization dummy. This reduces the confidence that the subsequent stock market liberalization would affect the sectoral market returns negatively. This thesis, however, does not argue that the liberalization would not be able to affect the sectoral returns.

Table 6.1: OLS Regression of Stock Market Liberalization and Sectoral Market Returns (Stationary Controlled Variables)

| | C | Lib | Size | Liq | Vol | ER | IR | Oil | $R^2$ | Adj $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Indo 97 | 13.94 | -2.90 | nil | -0.31 | 3.23 | -0.93 | -20.91 | 32.38 | 0.27 | 0.03 |
| | *0.94* | *0.74* | | *0.94* | *0.16* | *0.97* | *0.20* | *0.31* | | |
| | 1.36 | -3.55 | | | | -0.06 | -19.68 | 30.95 | 0.22 | 0.06 |
| | *0.99* | *0.57* | | | | *1.00* | *0.14* | *0.14* | | |
| | 66.01 | 3.20 | nil | -3.54 | 2.89 | | | | 0.07 | -0.06 |
| | *0.11* | *0.17* | | *0.10* | *0.15* | | | | | |
| | -1.22 | -0.38 | | | | | | | 0.00 | -0.04 |
| | *0.56* | *0.89* | | | | | | | | |
| Thai 97 | -52.09 | 0.22 | nil | 3.99 | 9.34 | -5.43 | -0.38 | 53.88 | 0.28 | 0.04 |
| | *0.46* | *0.97* | | *0.14* | *0.13* | *0.78* | *0.98* | *0.47* | | |
| | 29.01 | -0.15 | | | | -8.92 | 5.75 | 12.74 | 0.04 | -0.15 |
| | *0.58* | *0.98* | | | | *0.55* | *0.74* | *0.80* | | |
| | *-79.15 | -2.48 | nil | *4.48 | 7.72 | | | | 0.24 | 0.13 |
| | *0.07* | *0.41* | | *0.08* | *0.16* | | | | | |
| | -2.11 | -2.42 | | | | | | | 0.02 | -0.02 |
| | *0.40* | *0.47* | | | | | | | | |
| Kor 97 | 4.27 | 2.74 | ***82.15 | -0.21 | 8.05 | -0.31 | **8.55 | 16.01 | 0.86 | 0.80 |
| | *0.94* | *0.57* | *0.00* | *0.79* | *0.46* | *0.97* | *0.02* | *0.42* | | |
| | 109.99 | 16.34 | | | | -16.70 | 0.55 | 30.10 | 0.20 | 0.04 |
| | *0.46* | *0.12* | | | | *0.45* | *0.96* | *0.56* | | |
| | 12.96 | **2.33 | ***78.50 | -0.74 | 2.41 | | | | 0.84 | 0.80 |
| | *0.18* | *0.05* | *0.00* | *0.15* | *0.79* | | | | | |
| | *-4.63 | **6.91 | | | | | | | 0.16 | 0.12 |
| | *0.08* | *0.05* | | | | | | | | |
| Msia 98 | -37.42 | ***-9.63 | nil | 2.36 | 9.94 | -1.21 | -92.86 | 26.81 | 0.49 | 0.30 |
| | *0.64* | *0.00* | | *0.43* | *0.10* | *0.96* | *0.20* | *0.26* | | |
| | 4.14 | **-8.97 | | | | 0.83 | -51.36 | -1.94 | 0.31 | 0.16 |
| | *0.86* | *0.01* | | | | *0.96* | *0.30* | *0.89* | | |
| | -40.18 | -5.16 | nil | 2.19 | 4.21 | | | | 0.22 | 0.10 |
| | *0.49* | *0.15* | | *0.47* | *0.47* | | | | | |
| | 2.58 | *-6.37 | | | | | | | 0.15 | 0.12 |
| | *0.28* | *0.05* | | | | | | | | |
| Indo 99 | -171.67 | 4.15 | nil | 1.43 | **9.83 | 15.84 | 24.03 | -17.08 | 0.58 | 0.44 |
| | *0.60* | *0.14* | | *0.34* | *0.02* | *0.65* | *0.70* | *0.30* | | |
| | 332.23 | **7.04 | | | | -36.56 | 130.82 | -9.90 | 0.33 | 0.20 |
| | *0.48* | *0.03* | | | | *0.48* | *0.26* | *0.57* | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **10.22 | | | | | |
| | -11.47 | 3.11 | nil | 0.57 | 0 | | | | 0.52 | 0.45 |
| | *0.61* | *0.26* | | *0.62* | *0.01* | | | | | |
| | -0.47 | **4.47 | | | | | | | 0.18 | 0.14 |
| | *0.76* | *0.04* | | | | | | | | |
| | | | | *5.8 | | - | **- | - | | |
| Kor 99 | 393.83 | 0.75 | nil | 76 | -2.46 | 69.10 | 123.51 | 14.68 | 0.43 | 0.24 |
| | *0.55* | *0.78* | | *0.08* | *0.49* | *0.44* | *0.01* | *0.66* | | |
| | | | | | | - | ***- | | | |
| | 675.14 | 1.43 | | | | 95.18 | 108.70 | -3.04 | 0.33 | 0.19 |
| | *0.18* | *0.50* | | | | *0.18* | *0.00* | *0.90* | | |
| | -73.10 | -2.35 | nil | 4.55 | -3.97 | | | | 0.11 | -0.02 |
| | *0.15* | *0.34* | | *0.14* | *0.34* | | | | | |
| | 1.68 | -1.28 | | | | | | | 0.01 | -0.03 |
| | *0.38* | *0.61* | | | | | | | | |
| Msia | | | *** | - | | | | | | |
| 03 | 4.51 | 0.28 | 100.1 | 0.26 | -0.26 | nil | -14.52 | -1.52 | 0.85 | 0.79 |
| | *0.39* | *0.41* | *0.00* | *0.38* | *0.29* | | *0.13* | *0.37* | | |
| | *0.47 | 0.50 | | | | | 8.43 | -0.34 | 0.08 | -0.06 |
| | *0.05* | *0.21* | | | | | *0.46* | *0.90* | | |
| | | | *** | - | | | | | | |
| | 3.64 | 0.20 | 95.59 | 0.20 | -0.23 | | | | 0.82 | 0.78 |
| | *0.47* | *0.54* | *0.00* | *0.47* | *0.38* | | | | | |
| | 0.43 | 0.55 | | | | | | | 0.08 | 0.04 |
| | *0.15* | *0.17* | | | | | | | | |
| Msia | | | *** | | | | | | | |
| 05 | -3.95 | 0.03 | 94.29 | 0.20 | 0.52 | nil | 29.17 | -6.81 | 0.91 | 0.88 |
| | *0.72* | *0.93* | *0.00* | *0.73* | *0.18* | | *0.51* | *0.17* | | |
| | **- | | | | | | | | | |
| | 0.84 | *1.09 | | | | | -29.66 | 1.50 | 0.10 | -0.03 |
| | *0.03* | *0.09 | | | | | *0.78* | *0.87* | | |
| | | | *** | - | | | | | | |
| | 2.92 | 0.10 | 91.66 | 0.17 | 0.54 | | | | 0.89 | 0.87 |
| | *0.70* | *0.63* | *0.00* | *0.68* | *0.13* | | | | | |
| | *-0.94 | *1.15 | | | | | | | 0.12 | 0.08 |
| | *0.06* | *0.09* | | | | | | | | |

Note: Regression model 1, the first row in each event, as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it}$ where $R_{it}$ is the sectoral market returns of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Controlled Variables are stationary: Size at 1st difference, Liq at level, Vol at 1st difference, ER at level, IR at 1st difference, & Oil at 1st difference. Event window is T-12 to T+12 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+12 week of stock market liberalization and ends; $\mu_{it}$ is independently distributed random error term with zero mean and constant variance; $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated. Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.

nil = data not available
Probabilities of t-statistics are in italic.
*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

The effects of controlled variables; sectoral market characteristics and macroeconomic fundamentals, on sectoral market returns during the liberalization periods are also explored in the regression analysis of Model 1. The results in Table 6.1 show that the inclusion of sectoral market characteristics and macroeconomic fundamentals has improved the regression fit, the adjusted $R^2$, of the models. Thus, the controlled variables have some significant relationship with sectoral market returns. The main controlled variable affecting sectoral market returns is its sectoral market size.

Data on sectoral market capitalization, which represents stock market size for each sector, was generally available only from year 2002 onwards. Thus, only three out of eight liberalization periods had sectoral market size data, which are Malaysia's stock market liberalizations in 2003 and 2005, and South Korea's liberalization in 1997, which require country's main index, (KOSPI). All the three liberalization periods with a sizeable sectoral market size have significant positive coefficients at one percent significance level. This positive relationship between stock market size and sectoral market returns is consistent with the results on country's stock market returns and the findings of Mobarek and Mollah (2005), Levine and Zervos (1998). The coefficients of stock market size in Malaysia's sectoral market are greater than those of country's stock market. All three events obtained significant and positive coefficients of sectoral market size. The results are almost similar to those obtained in Model 1 T±26 week event window.

Sectoral market liquidity and volatility both have only one significant positive coefficient. Thus, there is lack of evidence to state that sectoral market liquidity and volatility are positively related to its returns. The sectoral market returns are significantly affected by sectoral market liquidity in South Korea in 1999, while, the returns are significantly affected by sectoral market volatility in Indonesia in 1999. Sectoral market liquidity and volatility, however, are both found to have significant positive impact on Malaysia's main stock market returns, even though not on its sectoral market returns. In the regression analysis of T±26 week event window, Malaysia's sectoral market returns remain significantly affected by its sectoral market liquidity and volatility despite of being insignificant in the regression analyses of T±12 week event window. The results indicate that the duration of the event window plays an important role in identifying the impact of those variables on sectoral market returns. The positive coefficient indicates that the greater the liquidity of sectoral market, the better the performances of sectoral markets, which is consistent with the findings of Yang et al. (2010), Chuang et al. (2009), Mobarek and Mollah (2005), and Jun et al. (2003). Having greater liquidity would enhance the allocation of capital, thus increasing the returns of the sectoral market. Moshirian et al. (2009) support the findings that stock market liquidity is rather insignificant to sectoral market returns.

Numbers of previous studies figure out that macroeconomic fundamentals have significant relationships with stock market performances (Abugri, 2008; Rashid, 2008; Kandir, 2008; Ibrahim & Aziz, 2003; Fifield et al., 2002), indeed, they could be used to predict recession in the stock market (Chen, 2009) and to stabilize stock market (Yusof & Majid, 2007). Results in Table 6.1 reveal that among the three macroeconomic fundamentals, the one that has significant coefficient is interest rates. None of the coefficients of both exchange rates and oil prices are found significant. Thus, both

exchange rates and oil prices have no significant impact on sectoral market returns even though they might have an impact on countries' stock market returns.

There are two significant coefficients of interest rate, both belong to South Korea in 1997 and 1999, respectively. To have only two significant coefficients of interest rate would reduce the confidence that interest rate plays important role in determining the sectoral returns. The significant coefficients of interest rates, however, are consistent with the findings of of Chen (2009), Somoye et al. (2009), Abugri (2008), Rashid (2008), and Fifield et al. (2002). The results portray that the interest rate in 1997 was positively related to South Korea's sectoral market returns, whereas the interest rate in 1999 was negatively related. The negative coefficient of interest rate was consistent with the claim that the higher the interest rate, the lower the investment and thus the lower the sectoral market returns (Ratanapakorn & Sharma, 2007). The results show that the relationship between interest rate and sectoral market returns in a country might not be consistent, due to the different response by the investors or another different strategy implemented in the market, such as a change in money supply. In a longer event window of T±26 week, there is only one significant coefficient of interest rate with a negative sign, which belonged to South Korea's liberalization in 1999.

Exchange rate and oil price are both found to be insignificant in determining the returns of sectoral market. In T±26 week event window regression analysis of Model 1, both exchange rate and oil price, however, have significant relationships with sectoral market returns. The results imply that both macroeconomic fundamentals did not affect the performances of sectoral markets in a very short time period. Exchange rate and oil price are negatively related to sectoral market returns in Indonesia in 1999. Currency depreciation in a country would reduce sectoral market returns, due to its higher cost of

production when the market is highly dependent on international trade (Somoye et al., 2009; Yusof & Majid, 2007; Ibrahim & Aziz, 2003).

The regression Model 1 of T±26 week event window results (Appendix 6-1) show that oil prices are negatively related to sectoral stock market returns in Indonesia during the March 1999 liberalization. Knowing that Indonesia was an oil exporter country and a member of Organization of Petroleum Exporting Countries, it should have a positive coefficient of oil price. In fact, the mining sector index is included in the sectoral market indices used in the analyses, and that the mining sector is the sector with the highest proportion of the countries' index. Thus, to have a negative coefficient of oil price is inconsistent with the expected theory. There should be other factors, politically or economically, that contribute to such an outcome. On the other hand, in the same T±26 week event window (Appendix 6-1), oil price is positively related to South Korea's service sector in 1999. The results indicate that an increase in the price of oil would generate higher returns to South Korea's service sector. This is another outcome which is inconsistent with the expected theory, knowing that South Korea was a net oil importer country. The reason for such outcome could be due to greater percentage increase in their service charge than the percentage increase in oil price itself. As a result, this sector could earn higher stock returns at the hike of oil price.

## 6.3 Controlling for Variables at Level

Similar to Chapter 5 analysis, this sector analysis also uses log controlled variables to confirm the robustness of the results. The results in Table 6.2 show that as more controlled variables are added into the regression models, coefficients on the liberalization dummy are significantly reduced relative to the univariate regression model. Indeed, after controlling for both stock market characteristics and

macroeconomic fundamentals at level, the stock market liberalization had only one significant relation to stock market returns. Thus, there is lack of significant evidence on the effectiveness of the liberalization policy on sector returns.

Although there is no strong evidence, this thesis could not argue that stock market liberalization is not related to sector returns. The significant coefficient of the liberalization dummy belongs to Malaysia's in 2005. The positive result indicates that the liberalization manages to increase the performance of the sectoral market. Unlike the earlier analysis of using stationary controlled variables, the result is consistent with the prediction of the IAPM and the findings of Bekaert et al. (2010), Tai (2007), Patro (2005), Boubakri et al. (2005) and Henry (2000a).

The inclusion of macroeconomic fundamentals and stock market characteristics as controlled variables in the multivariate regression model has not only diminished the effects of stock market liberalization, it has also improved the regression fit. The regression fit, however, is not as much as the regression fit obtained in Table 6.1 using stationary controlled variables.

The results in Table 6.2 show that sector market characteristics and macroeconomic fundamentals contain only a few significant coefficients, except for market size. Of the three coefficients of sector market size, two are significant and positively related to sector returns. Thus, the results imply that the run-up in the four Asian sector indices is the result of stock market size. The relations between other controlled variables and sector returns are weakly significant.

Table 6.2: OLS Regression of Stock Market Liberalization and Sectoral Market Returns (Controlled Variables at Level)

| | C | Lib | Size | Liq | Vol | ER | IR | Oil | $R^2$ | Adj $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|
| Indo 97 | **184.33 | 2.79 | nil | -2.03 | 6.29 | -24.03 | -7.75 | 16.22 | 0.18 | -0.10 |
| | *0.04* | *0.55* | | *0.63* | *0.20* | *0.17* | *0.34* | *0.67* | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *188.76 | *7.93 | | | | -28.04 | -4.28 | 14.75 | 0.09 | -0.09 |
| | *0.08* | *0.10* | | | | *0.18* | *0.11* | *0.70* | | |
| | **95.16 | -1.43 | nil | **-5.89 | 5.71 | | | | 0.11 | -0.02 |
| | *0.02* | *0.64* | | *0.02* | *0.14* | | | | | |
| | -1.22 | -0.38 | | | | | | | 0.00 | -0.04 |
| | *0.56* | *0.89* | | | | | | | | |
| Thai 97 | -24.10 | 8.47 | nil | -0.78 | 8.04 | -47.57 | **37.18 | 20.89 | 0.36 | 0.15 |
| | *0.92* | *0.27* | | *0.86* | *0.17* | *0.18* | *0.03* | *0.62* | | |
| | 100.39 | 9.44 | | | | *-59.84 | **37.07 | -0.85 | 0.28 | 0.13 |
| | *0.61* | *0.18* | | | | *0.06* | *0.02* | *0.98* | | |
| | -78.44 | -1.16 | nil | 3.12 | 5.66 | | | | 0.16 | 0.04 |
| | *0.21* | *0.73* | | *0.45* | *0.34* | | | | | |
| | -2.11 | -2.42 | | | | | | | 0.02 | -0.02 |
| | *0.40* | *0.47* | | | | | | | | |
| Kor 97 | -464.14 | 11.71 | *56.74 | 1.69 | 11.49 | 29.72 | -13.10 | 60.98 | 0.36 | 0.10 |
| | 0.13 | 0.31 | 0.07 | 0.80 | 0.33 | 0.45 | 0.36 | 0.25 | | |
| | 209.96 | *14.41 | | | | -19.42 | -7.53 | -20.92 | 0.21 | 0.06 |
| | *0.40* | *0.06* | | | | *0.39* | *0.62* | *0.53* | | |
| | -327.38 | 8.48 | 16.62 | 0.76 | 0.88 | | | | 0.23 | 0.08 |
| | *0.25* | *0.21* | *0.19* | *0.91* | *0.93* | | | | | |
| | **-4.63 | **6.91 | | | | | | | 0.16 | 0.12 |
| | *0.01* | *0.04* | | | | | | | | |
| Msia 98 | 392.92 | -0.16 | | -0.96 | 8.62 | **-105.638 | -96.93 | -13.51 | 0.48 | 0.31 |
| | *0.11* | *0.95* | | *0.69* | *0.15* | *0.05* | *0.11* | *0.47* | | |
| | *359.35 | -4.68 | | | | **-82.11 | *-89.57 | -13.42 | 0.33 | 0.20 |
| | *0.07* | *0.22* | | | | *0.03* | *0.09* | *0.53* | | |
| | -40.18 | -5.16 | | 2.19 | 4.21 | | | | 0.22 | 0.10 |
| | *0.46* | *0.17* | | *0.43* | *0.37* | | | | | |
| | 2.58 | *-6.37 | | | | | | | 0.15 | 0.12 |
| | *0.28* | *0.05* | | | | | | | | |
| Indo 99 | -284.78 | -2.71 | | 2.13 | 1.08 | 12.81 | 17.20 | *24.89 | 0.43 | 0.24 |
| | *0.31* | *0.51* | | *0.46* | *0.80* | *0.69* | *0.30* | *0.05* | | |
| | -65.41 | -2.19 | | | | -6.36 | 15.47 | 28.21 | 0.35 | 0.22 |
| | *0.81* | *0.70* | | | | *0.85* | *0.21* | *0.10* | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | -9.94 | 3.53 | | -0.17 | 2.82 | | | | 0.21 | 0.09 |
| | *0.69* | *0.22* | | *0.92* | *0.46* | | | | | |
| | -0.47 | **4.47 | | | | | | | 0.18 | 0.14 |
| | *0.76* | *0.04* | | | | | | | | |
| Kor 99 | -8.61 | 0.60 | | 3.38 | -5.37 | 0.28 | -22.11 | 4.89 | 0.19 | -0.07 |
| | *0.99* | *0.92* | | *0.48* | *0.20* | *1.00* | *0.45* | *0.82* | | |
| | 234.89 | 1.42 | | | | -28.74 | -26.55 | 7.12 | 0.11 | -0.07 |
| | *0.75* | *0.79* | | | | *0.79* | *0.32* | *0.74* | | |
| | -71.48 | -2.38 | | 5.76 | -5.84 | | | | 0.16 | 0.04 |
| | *0.22* | *0.35* | | *0.13* | *0.13* | | | | | |
| | 1.68 | -1.28 | | | | | | | 0.01 | -0.03 |
| | *0.38* | *0.61* | | | | | | | | |
| Msia 03 | -139.61 | -0.45 | 12.47 | -0.07 | 0.20 | nil | 5.57 | -2.66 | 0.23 | -0.03 |
| | *0.13* | *0.70* | *0.11* | *0.93* | *0.78* | | *0.84* | *0.40* | | |
| | -9.10 | 0.57 | | | | | 13.04 | -1.31 | 0.10 | -0.03 |
| | *0.76* | *0.29* | | | | | *0.62* | *0.65* | | |
| | *-119.08 | -0.36 | **10.59 | -0.12 | -0.03 | | | | 0.20 | 0.03 |
| | *0.08* | *0.74* | *0.04* | *0.85* | *0.96* | | | | | |
| | 0.43 | 0.55 | | | | | | | 0.08 | 0.04 |
| | *0.15* | *0.17* | | | | | | | | |
| Msia 05 | ***-615.24 | *1.79 | **46.75 | -0.60 | 1.34 | nil | 78.10 | -3.09 | 0.46 | 0.28 |
| | *0.01* | *0.10* | *0.01* | *0.59* | *0.34* | | *0.29* | *0.66* | | |
| | -89.42 | 0.28 | | | | | 96.07 | -2.68 | 0.21 | 0.10 |
| | *0.16* | *0.75* | | | | | *0.24* | *0.72* | | |
| | -596.97 | 2.61 | 50.48 | -0.27 | 1.24 | | | | 0.42 | 0.30 |
| | *0.01* | *0.00* | *0.01* | *0.78* | *0.36* | | | | | |
| | *-0.94 | *1.15 | | | | | | | 0.12 | 0.08 |
| | *0.06* | *0.09* | | | | | | | | |

Note: Regression model 1, the first row in each event, as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it}$ where $R_{it}$ is the sectoral market returns of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. All controlled variables are at level (log). Event window is T-12 to T+12 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+12 week of stock market liberalization and ends; $\mu_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated. Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.
nil = data not available

Probabilities of t-statistics are in italic.
*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

## 6.4 Controlling for Stationary Variables without Stock Market Size

Due to an argument that stock market size at the first difference equals stock market returns, which would lead to high $R^2$, another regression analysis is constructed with the omission of stock market size for the robustness of the results. There is not much difference in the results between Table 6.1 and Table 6.3 because there are only three events that have been adjusted for the omission of sector market size. The three events include South Korea's 1997 liberalization, Malaysia's 2003 and 2005 liberalizations. The other events have no sector market size from the beginning.

The results in Table 6.3, disclose the weak impact of stock market liberalization on stock market returns, with only one significant coefficient of liberalization dummy – that of Malaysia's 1998 liberalization, after controlling for the effects of both sector market characteristics and macroeconomic fundamentals. Just like the results obtained in Table 6.1, Table 6.3 discloses the negative impact of Malaysia's 1998 liberalization on sectoral market. This work, however, does not argue that stock market liberalization is not related to sector returns. Thus, Malaysia's service sector is believed to be badly affected by the Asian financial crisis, which reduces the confidence of foreign investors to invest in the sector, specifically. The result is consistent with the claim by Stiglitz (2004).

The effects of stock market liberalization are substantially diminished by adding more controlled variables to the right-hand side of the regression model. The remaining liberalization coefficients are insignificant which reduce confidence that an increase in the percentage of foreign ownership in local equities would improve sector market

returns. This work, however, does not argue that stock market liberalization is not related to stock returns.

The evidence of a significant relationship between any of the controlled variables and sectoral returns is not strong. There are very few significant coefficients of those variables displayed in Table 6.3. Between sector market characteristics and macroeconomic fundamentals, sector market characteristics play greater role in affecting sector returns. Among the three macroeconomic fundamentals, interest rate shows negative relationship with sector returns, while oil price shows no impact on sector returns.

Table 6.3: OLS Regression of Stock Market Liberalization and Sectoral Market Returns (Stationary Controlled Variables without Sector Market Size)

| | C | Lib | Liq | Vol | ER | IR | Oil | $R^2$ | Adj $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Indo 97 | 13.94 | -2.90 | -0.31 | 3.23 | -0.93 | -20.91 | 32.38 | 0.27 | 0.03 |
| | *0.94* | *0.74* | *0.94* | *0.16* | *0.97* | *0.20* | *0.31* | | |
| | 1.36 | -3.55 | | | -0.06 | -19.68 | 30.95 | 0.22 | 0.06 |
| | *0.99* | *0.57* | | | *1.00* | *0.14* | *0.14* | | |
| | 66.01 | 3.20 | -3.54 | 2.89 | | | | 0.07 | -0.06 |
| | *0.11* | *0.17* | *0.10* | *0.15* | | | | | |
| | -1.22 | -0.38 | | | | | | 0.00 | -0.04 |
| | *0.56* | *0.89* | | | | | | | |
| Thai 97 | -52.09 | 0.22 | 3.99 | 9.34 | -5.43 | -0.38 | 53.88 | 0.28 | 0.04 |
| | *0.46* | *0.97* | *0.14* | *0.13* | *0.78* | *0.98* | *0.47* | | |
| | 29.01 | -0.15 | | | -8.92 | 5.75 | 12.74 | 0.04 | -0.15 |
| | *0.58* | *0.98* | | | *0.55* | *0.74* | *0.80* | | |
| | 79.15 | *-2.48 | *4.48 | 7.72 | | | | 0.24 | 0.13 |
| | *0.07* | *0.41* | *0.08* | *0.16* | | | | | |
| | -2.11 | -2.42 | | | | | | 0.02 | -0.02 |
| | *0.40* | *0.47* | | | | | | | |
| Kor 97 | 116.82 | 16.67 | 3.05 | -28.08 | -25.84 | 0.23 | 26.76 | 0.22 | -0.04 |
| | *0.36* | *0.10* | *0.61* | *0.50* | *0.36* | *0.99* | *0.66* | | |
| | 12.43 | 6.79 | -0.83 | -12.58 | | | | 0.17 | 0.05 |
| | *0.90* | *0.29* | *0.87* | *0.71* | | | | | |
| | 109.99 | *16.34 | | | -16.70 | 0.56 | 30.10 | 0.20 | 0.04 |
| | *0.39* | *0.08* | | | *0.37* | *0.97* | *0.54* | | |
| | **-4.63 | **6.91 | | | | | | 0.16 | 0.12 |
| | *0.01* | *0.04* | | | | | | | |
| Msia 98 | | ***-9.63 | 2.36 | 9.94 | -1.21 | -92.86 | 26.81 | 0.49 | 0.30 |
| | -37.42 | *0.00 | *0.43* | *0.10* | *0.96* | *0.20* | *0.26* | | |
| | *0.64* | **-8.97 | | | 0.83 | -51.36 | -1.94 | 0.31 | 0.16 |
| | 4.14 | *0.01 | | | *0.96* | *0.30* | *0.89* | | |
| | *0.86* | -5.16 | 2.19 | 4.21 | | | | 0.22 | 0.10 |
| | -40.18 | *0.15 | *0.47 | *0.47* | | | | | |
| | *0.49* | *-6.37 | | | | | | 0.15 | 0.12 |
| | 2.58 | *0.05 | | | | | | | |
| | *0.28* | | | | | | | | |
| Indo 99 | -171.67 | 4.15 | 1.43 | **9.83 | 15.84 | 24.03 | -17.08 | 0.58 | 0.44 |
| | *0.60* | *0.14* | *0.34* | *0.02* | *0.65* | *0.70* | *0.30* | | |
| | 332.23 | **7.04 | | | -36.56 | 130.82 | -9.90 | 0.33 | 0.20 |
| | *0.48* | *0.03* | | | *0.48* | *0.26* | *0.57* | | |
| | -11.47 | 3.11 | 0.57 | **10.22 | | | | 0.52 | 0.45 |
| | *0.61* | *0.26* | *0.62* | *0.01* | | | | | |
| | -0.47 | **4.47 | | | | | | 0.18 | 0.14 |
| | *0.76* | *0.04* | | | | | | | |
| Kor 99 | 393.83 | 0.75 | *5.876 | -2.46 | -69.10 | **-123.51 | -14.68 | 0.43 | 0.24 |

Note: Regression model 1, the first row in each event, as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Liq_{it} + \beta_3 Vol_{it} + \beta_4 ER_{it} + \beta_5 IR_{it} + \beta_6 Oil_{it} + \mu_{it}$ where $R_{it}$ is the sectoral market returns of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Controlled Variables are stationary: Liq at level, Vol at 1st difference, ER at level, IR at 1st difference, & Oil at 1st difference. Event window is T-12 to T+12 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+12 week of stock market liberalization and ends; $\mu_{it}$ is independently distributed random error

term with zero mean and constant variance; $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated. Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.
nil = data not available
Probabilities of t-statistics are in italic.
*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

## 6.5 Chapter Summary

The subsequent stock market liberalization policies analyzed in this work, generally, were implemented or enforced upon specific sector(s) instead of to the whole market. The effects of the liberalization are expected to be greater due to the direct association between the sector(s) that had been liberalized, and its returns. However, this is not fully supported by empirical evidence found in this research. Despite of obtaining more significant relationship between stock market liberalization and its sectoral returns, the results still show only one significant coefficient of stock market liberalization. The impact of the liberalization on sector returns does not vary from its impact on country's main returns. Thus, there is lack of support for the robustnessof the results. It reduces the confidence that an increase in the percentage of foreign ownership in local equities would generate greater returns to the sectors.

Controlling for the effects of stationary stock market characteristics and macroeconomic fundamentals, with and without market size, Malaysia's 1998 liberalization generated negative impact on sectoral market returns. Table 6.1 and 6.3 show that the liberalization policy enforced on telecommunication sector in Malaysia during crisis period is negatively related to the sectoral returns, which is not the case for country's main market returns. Its impact on sectoral market contradicts the prediction of the standard IAPM. The liberalization policy enforced on telecommunication sector

might not give enough confidence to foreign investors to invest more in the local sector. Indeed there might be more capital outflow from the sector as claim by Stiglitz (2004). The government authorities and policy makers have to analyze further the different kind of impact could be encountered by the sectoral market when liberalization policy is implemented. The liberalization might not be effective in generating greater sectoral returns but might also create losses to the sectors.

Table 6.2, using controlled variables at level, also portrays one significant coefficient of liberalization but with a positive sign. The liberalization in Malaysia 2005 is positively related to sectoral market returns. Thus, the result is consistent with the prediction of IAPM.

For controlled variables, only sector market size has significant impact on sector returns. The greater the market capitalization is, the greater the returns of the sectors. There is lack of support for the robustness of the results that sectoral market liquidity and volatility, as well as interest rate, have significant impact on sectoral market returns. Exchange rate and oil price are ineffective in influencing the sectoral market returns in the shorter time period. Indeed, there is still lack of evidence in supporting that exchange rate and oil price are related to sectoral returns in the longer time period.

Throughout the two major analyses; country and sector, some of the variables provide similar impact on both sector and country's stock market returns. The difference is only in terms of the degree of the impact, in which the sector returns experienced greater coefficient impact but the difference is only minor. There are also few variables which are significant in the country's analysis but not in the sectoral analysis, such as the impact of exchange rate and oil price. The duration of the impact in terms of the event window might also influence the level of significance of the variables. Macroeconomic effects are more significant in the longer duration. Results

from this section should provide understanding of the effects of stock market liberalization, macroeconomic fundamentals and stock market characteristics on different sectors of the economy. This should enable the authorities to better implement liberalization policies in the future.

# 7. Stock Market Integration

## 7.1 Introduction

After analyzing the effects of subsequent stock market liberalization on stock market performances, this thesis explores how integrated with the world the stock markets in the region are. The analyses of integration level of the four Asian countries and the world (MSCI-World Index) stock markets were divided into two groups. The first group analyzes the integration level of full sample period from 1997 to 2009. This thirteen year integration analysis covers the period before, during and after the Asian financial crisis and the period of the U.S. subprime mortgage crisis. The time frame includes the period in which numbers of subsequent stock market liberalization policies were implemented in the region. The second group analyzes, further, the integration level during and after the subsequent stock market liberalization. This integration analysis is done over two sample periods: 1) during liberalization - the period from September 1997 to April 2005 and 2) post liberalization - the period from May 2005 to December 2009. The division of the periods is based on the liberalization dates implemented in the countries as in Table 1.2 page 5. This two-period analysis would enable comparison of changes or improvements in the integration levels between the periods during and post liberalization. The study period starts in January 1997, hence, the pre-liberalization period could not be analyzed in such a short time frame, from January to August 1997.

The integration levels of the Asian countries and the world (MSCI-World Index) stock markets could not be measured based on the time period pre- and post- stock market liberalization using the event window as the dates in which the series of

liberalizations took place (from 1997 to 2005) by the four Asian countries - Malaysia, Thailand, Indonesia and South Korea - may overlap each other.

The data used for the integration analyses were the countries' weekly stock market main indices in terms of log, and the first difference of countries' main indices, which were also the countries' weekly stock market returns. The integration analyses carried out in this thesis were the coefficient of correlation, OLS regression estimations controlling for world effect, Johansen cointegration test, and vector error correction model (VECM) or VAR of variance decomposition and impulse response. The findings of those integration analyses are illustrated in detail in the following sections.

## 7.2 Coefficient Correlation

### 7.2.1 Introduction

The coefficient correlations were carried out to measure the extent of linear relationship between the two variables. In this section, the linear relationships between any two countries' stock market indices and stock market returns were analyzed. The analyses involved the stock market performances of South Korea, Malaysia, Thailand, Indonesia, and the world. The relationships between countries were explained in two time periods; the full sample period of 1997 – 2009, and two periods during and after the stock market liberalization. The indices used were in natural logarithm to allow for a better comparison between the different countries.

### 7.2.2 Countries' Stock Market Indices

The coefficient correlations and t-statistics probabilities between the countries' stock market indices during the full sample period of 1997 - 2009 are portrayed in Table 7.1. The results in the table reveal that the four Asian countries

were closely linked to each other with significant correlations of more than 77 percent. Throughout the thirteen year period, the stock markets of South Korea and Indonesia were highly related to each other. Indeed, their correlation was the highest with a coefficient correlation (r) equals 0.925. The second highest was the association between South Korea and Malaysia (0.870). The relationship between South Korea and Thailand, however, had the lowest correlation (0.775) among the four Asian countries. The correlations between the world stock market and the other Asian countries' were obviously quite low. The highest integration of the world market was with South Korea at 55.9 percent, and the lowest correlation (39.5 percent) was with Thailand.

Table 7.8: Coefficient Correlation of the Four Asian Countries and the World (MSCI-World Index) Stock Market Main Indices (1997 to 2009)

| | World | Korea | Msia | Thai |
|---|---|---|---|---|
| Korea | ***0.559<br>*0.000* | | | |
| Msia | ***0.470<br>*0.000* | ***0.870<br>*0.000* | | |
| Thai | ***0.395<br>*0.000* | ***0.775<br>*0.000* | ***0.813<br>*0.000* | |
| Indo | ***0.531<br>*0.000* | ***0.925<br>*0.000* | ***0.852<br>*0.000* | ***0.812<br>*0.000* |

Note: Probabilities of t-statistics are in italic.
*, **, and *** denote rejection of the hypothesis at 10%, 5%, and 1% levels respectively

The coefficient correlations of the five stock markets for during and post liberalization periods are shown in Table 7.2 and Table 7.3. The tables reveal how the countries were related to each other during versus after the series of liberalization policies were implemented. During the liberalization period, as shown in Table 7.2, the four Asian stock markets were highly correlated to each other,

indeed, greater than the correlations with the world stock market. Thailand's stock market had the highest correlation (87 percent) with Indonesia, but had the lowest correlation (63 percent) with South Korea's stock market. The other correlations of the two Asian stock markets were around 64 to 84 percent.

Table 7.9: Coefficient Correlation of the Four Asian Countries and the World (MSCI-World Index) Stock Market Main Indices – During Liberalization Period

| | World | Korea | Msia | Thai |
|---|---|---|---|---|
| Korea | ***0.261 | | | |
| | 0.000 | | | |
| Msia | ***0.309 | ***0.844 | | |
| | 0.000 | 0.000 | | |
| Thai | 0.005 | ***0.628 | ***0.644 | |
| | 0.924 | 0.000 | 0.000 | |
| Indo | ***0.288 | ***0.706 | ***0.729 | ***0.873 |
| | 0.000 | 0.000 | 0.000 | 0.000 |

Note: Probabilities of t-statistics are in italic.
*, **, and *** denote rejection of the hypothesis at 10%, 5%, and 1% levels, respectively

The correlations between the world and any Asian stock markets remained low. As a result of the lower correlations of those Asian stock markets with the world, the impact of the world economic downturn, starting year 2000 till 2003, had not generated tremendous effects on the four Asian stock markets. In fact, Thailand had an insignificant relationship with the world. The movements of the two indices offset each other as shown in Appendix 4-16. The world stock market had the highest association, 31 percent with Malaysia's stock market.

Table 7.10: Coefficient Correlation of the Four Asian Countries and the World (MSCI-World Index) Stock Market Main Indices – Post Liberalization Period

| | World | Korea | Msia | Thai |
|---|---|---|---|---|
| Korea | ***0.648<br>*0.000* | | | |
| Msia | ***0.630<br>*0.000* | ***0.893<br>*0.000* | | |
| Thai | ***0.883<br>*0.000* | ***0.662<br>*0.000* | ***0.602<br>*0.000* | |
| Indo | ***0.419<br>*0.000* | ***0.889<br>*0.000* | ***0.915<br>*0.000* | ***0.440<br>*0.000* |

Note: Probabilities of t-statistics are in italic.
*, **, and *** denote rejection of the hypothesis at 10%, 5%, and 1% levels, respectively

In the post liberalization period, the association between the world stock market and any of the four Asian stock markets had significantly improved. Indeed, Thailand, Malaysia and South Korea's stock markets had coefficient correlations of more than 60 percent with the world market. Only Indonesia had the lowest association (42 percent) with the world in this post liberalization period, even though the association was greater than those during the liberalization period. The results demonstrated that the integration level of the world and the four Asian stock markets had been continuously increasing. Thailand, in fact, had a greater relationship with the world than with the other three Asian countries after the series of liberalizations.

Additionally, the associations between the two Asian countries, generally, had improved, except for Thailand when its stock market lessened its relationships with Indonesia while boosting its relationship with the world. After liberalization, Thailand moved its focus more to world matters than regional. Indonesia's relationships with South Korea and Malaysia increased to 89 and 91 percents, respectively. Generally, the associations of the three Asian stock markets with each other remained greater than their associations with the world stock market. This

higher level of regional integration is expected as the outcome of implementing numbers of subsequent stock market liberalizations. After going through the regional or Asian financial crises together, those stock markets in the region should be stronger and more willing to work together for better financial stability.

### 7.2.3 Countries' Stock Market Returns

In terms of countries' weekly stock market returns, the coefficient correlations between the two countries' stock market returns were much lower than the coefficient correlations between their weekly stock market indices. Indeed, only a very few of the stock market returns correlations were greater than 0.5.

Table 7.4 exhibits the association between the two countries' stock market returns for a full-sample period of 1997 to 2009. The correlations were less than 50 percent, in the range of 23.5 percent to 49 percent. Those highest and lowest correlations belonged to the associations of the world stock market with the South Korea and Indonesia stock markets, respectively. The results indicate that the stock market returns of the Asian countries were the most and least related to the world returns. The associations between the two Asian stock markets, therefore, were somewhere in between the range. Thailand's correlation with the other two Asian countries - South Korea and Malaysia - and the world returns were quite high, at more than 40 percent. The correlations of Indonesia's stock market returns with the other two Asian countries and the world returns were quite low, at less than 28 percent. Generally, there were not many differences between the correlation of any two Asian countries' stock market returns, and the correlation of the world returns with any of the Asian countries' returns. Such small differences and low correlations

of stock market returns reveal that the benefits of portfolio diversification still have a lot to acquire.

Table 7.11: Coefficient Correlations of the Four Asian Countries and the World (MSCI-World Index) Stock Market Returns (1997 to 2009)

| | World | Korea | Msia | Thai |
|---|---|---|---|---|
| Korea | ***0.490<br>*0.000* | | | |
| Msia | ***0.306<br>*0.000* | ***0.304<br>*0.000* | | |
| Thai | ***0.406<br>*0.000* | ***0.473<br>*0.000* | ***0.407<br>*0.000* | |
| Indo | ***0.235<br>*0.000* | ***0.239<br>*0.000* | ***0.278<br>*0.000* | ***0.335<br>*0.000* |

Note: Probabilities of t-statistics are in italic.
*, **, and *** denote rejection of the hypothesis at 10%, 5%, and 1% levels, respectively

The results of coefficient correlations between the countries' stock market returns during the liberalization period are shown in Table 7.5. The highest coefficient correlation of 0.486 belonged to the association of South Korea and Thailand, which was the association between the two Asian countries. The second highest correlation (0.44), on the other hand, belonged to the association between Indonesia and Thailand's stock markets. Indonesia's coefficient correlation of 0.264 with the world stock market returns was the lowest in the table.

Table 7.12: Coefficient Correlations of the Four Asian Countries and the World Stock Market Returns – During Liberalization Period

| | World | Korea | Msia | Thai |
|---|---|---|---|---|
| Korea | ***0.430<br>*0.000* | | | |
| Msia | ***0.272<br>*0.000* | ***0.265<br>*0.000* | | |
| Thai | ***0.352<br>*0.000* | ***0.486<br>*0.000* | ***0.405<br>*0.000* | |
| Indo | *0.264<br>*0.000* | ***0.267<br>*0.000* | ***0.333<br>*0.000* | ***0.441<br>*0.000* |

Note: Probabilities of t-statistics are in italic.
*, **, and *** denote rejection of the hypothesis at 10%, 5%, and 1% levels, respectively

Table 7.13: Coefficient Correlations of the Four Asian Countries and the World Stock Market Returns – Post Liberalization Period

| | World | Korea | Msia | Thai |
|---|---|---|---|---|
| Korea | ***0.678<br>0.000 | | | |
| Msia | ***0.497<br>*0.000* | ***0.542<br>*0.000* | | |
| Thai | ***0.618<br>*0.000* | ***0.549<br>*0.000* | ***0.538<br>*0.000* | |
| Indo | ***0.210<br>*0.001* | ***0.172<br>*0.007* | 0.075<br>*0.246* | *0.112<br>*0.082* |

Note: Probabilities of t-statistics are in italic.
*, **, and *** denote rejection of the hypothesis at 10%, 5%, and 1% levels, respectively

Table 7.6 portrays some improvement in the coefficient correlations between the countries in the post liberalization period as compared to during the liberalization period, except for Indonesia's correlations. The correlation between the world stock market returns and South Korea's returns remained the highest as in the full-sample period. Those two stock market returns correlated at 68 percent. The second highest was the association between the world and Thailand's stock market returns (62 percent). Among the four Asian countries, Indonesia had the least and declining correlations with the other countries' returns. Indeed, its correlation with Malaysia's returns was insignificant. Its 11 percent correlation with Thailand's stock market returns was the second lowest in the table at 10 percent significance level. As time goes by, the results reveal that the stock market returns of individual Asian countries are more closely integrated with the rest of the world, and only Malaysia, Thailand and South Korea were more integrated with their neighboring countries in the region but not Indonesia.

### 7.2.4 Summary

In summary, the associations within the five stock markets of South Korea, Malaysia, Thailand, Indonesia and the world seemed lower during the liberalization period and higher in the post liberalization period. The thirteen-year correlations, generally, were the average. These results reveal that those markets are closely linked to each other, more in the post - compared to during liberalization period, except for the association with Indonesia's stock markets. The closer link might be due to the implementation of liberalization policies, and advances in information and communication technology.

The correlations between the Asian countries' stock market indices were greater than the correlations between the world and any of the Asian countries' stock market indices. These findings were proven in the correlation analyses within the thirteen-year period of 1997-2009, and during liberalization period. Only in the post liberalization period, the correlations between the world and any of the Asian countries' stock markets seemed to be stronger, especially between the world and Thailand's stock markets.

The correlations of the countries' stock market returns, on the other hand, seemed lower than the correlations of the countries' stock market indices. Almost similar to the correlations of the countries' stock market indices, the correlations of countries' stock market returns post liberalization period were higher than those during liberalization period, while the correlation during the thirteen-year period were overall average. There was not much difference between the correlations of the Asian countries' stock market returns, and the correlations between the world and any of the Asian countries' stock market returns. Indonesia's correlations of stock

market returns with other countries seemed to be the lowest among all, while the world's correlations with South Korea and Thailand seemed to be among the highest.

## 7.3 Ordinary Least Square Regression

Ordinary least square regression estimation is a short-run integration indicator, in which the beta of the country to integrate with is measured. The country to integrate with in this context is the world market. Thus, in this section, the OLS regression analyses were conducted to measure the relationships of the four Asian countries' with the MSCI world stock market. The OLS regression Model 2, as described in Chapter 3, was applied in three periods: the full-year period of 1997-2009, during liberalization period, and post liberalization period. This regression analysis is to compare the relationship of the world (MSCI-World Index) with the four Asian countries between the period of during and post liberalization.

Table 7.7 shows that the world stock market returns were significantly and positively related to each of the four Asian stock market returns. Studies done on emerging markets (Bilson et al., 2001) and Asian emerging markets (Tai, 2007) also convey that there is a positive relationship between a country's stock market returns and world stock market returns. The table reveals that for every one percent increase in the returns of world market, it would increase the Asian stock market returns by 0.4 to 0.89 percentage points. South Korea had the greatest relationship with the world stock market returns, while Indonesia had the lowest. The $R^2$s, with a range of 5 percent to 24 percent, implied that the regression model still does not fit well with the data. There should be other factors that contribute to the performances of those four Asian countries' stock markets. The world stock returns - being the independent variable in

the model - however, were able to explain the variation in *y* due to the significant probabilities of F-statistics.

Table 7.14: Countries' and World Market Returns in OLS Regression Model 2 (1997 – 2009)

| | Korea | Msia | Thai | Indo |
|---|---|---|---|---|
| C | 0.0010 | -0.0002 | -0.0005 | 0.0018 |
| | *0.5406* | *0.8873* | *0.7537* | *0.2691* |
| World | ***0.8886 | ***0.4047 | ***0.6653 | ***0.4011 |
| | *0.0000* | *0.0000* | *0.0000* | *0.0000* |
| $R^2$ | 0.2403 | 0.0939 | 0.1646 | 0.0550 |
| Adjusted $R^2$ | 0.2392 | 0.0925 | 0.1634 | 0.0536 |

Note: Regression model 2 as $R_{it} = \alpha_i + \beta R_{Wot} + \varepsilon_{it}$, where $R_{it}$ is the market returns of main index of country *i* at time *t*; $R_{Wot}$ is the MSCI world market returns at time *t*; $\varepsilon_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_1$ and $\beta$ are the parameters to be estimated. Data is stationary. Probabilities of t-statistics are in italic.
*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

Table 7.8 indicates that during the liberalization period, all four Asian countries were significantly related to the changes in the world stock market. Among the four countries, the impact of the world stock market on Thailand was the greatest during this period. Malaysia experienced the least impact of world stock. The regression fits of those countries prove, further, the impact of the world stock market returns on their returns. Thailand's regression model fits best with the adjusted $R^2$ of 28 percent, while Malaysia fits the worst with 6 percent adjusted $R^2$.

Table 7.15: Countries' and World Market Returns in OLS Regression Model 2 - During Liberalization Period

| | Korea | Msia | Thai | Indo |
|---|---|---|---|---|
| C | 0.0035 | 0.0005 | -0.0077 | -0.0081 |
| | *0.6163* | *0.7835* | *0.5240* | *0.2644* |
| World | ***1.4070 | ***0.3904 | ***1.7743 | ***1.7127 |
| | *0.0000* | *0.0000* | *0.0024* | *0.0000* |
| $R^2$ | 0.1938 | 0.0684 | 0.3126 | 0.2606 |
| Adjusted $R^2$ | 0.1844 | 0.0658 | 0.2851 | 0.2519 |

Note: Regression model 2 as $R_{it} = \alpha_i + \beta R_{Wot} + \varepsilon_{it}$, where $R_{it}$ is the market returns of main index of country *i* at time *t*; $R_{Wot}$ is the MSCI world market returns at time *t*; $\varepsilon_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_1$ and $\beta$ are the parameters to be estimated. Data is stationary. Probabilities of t-statistics are in italic.
*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

Table 7.16: Countries' and World Market Returns in OLS Regression Model 2 - Post Liberalization Period

| | Korea | Msia | Thai | Indo |
|---|---|---|---|---|
| C | 0.0012 | 0.0014 | 0.0004 | 0.0032 |
| | *0.4156* | *0.2412* | *0.7855* | *0.0373* |
| World | ***0.8457 | ***0.3520 | ***0.6574 | ***0.2473 |
| | *0.0000* | *0.0000* | *0.0000* | *0.0000* |
| $R^2$ | 0.2916 | 0.2467 | 0.1949 | 0.0307 |
| Adjusted $R^2$ | 0.2903 | 0.2436 | 0.1936 | 0.0290 |

Note: Regression model 2 as $R_{it} = \alpha_i + \beta r_{wt} + \varepsilon_{it}$, where $R_{it}$ is the market returns of main index of country *i* at time *t*; $r_{wt}$ is the MSCI world market returns at time *t*; $\varepsilon_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_1$ and $\beta$ are the parameters to be estimated. Data is stationary. Probabilities of t-statistics are in italic.
*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

In the post liberalization period, South Korea was the country with the highest world market influence while Indonesia was the lowest. The results are similar to those of the full sample period. The highest South Korea/world relationship might be contributed by its overwhelming commitment in overseas expansion. In comparison to during the liberalization period, South Korea and Malaysia had a greater relationship with the world returns after the implementation of the stock market liberalization. Those countries, however, had the lowest world impact during the liberalization period. OppositeIn contrast to those two countries, Thailand and Indonesia had greater relationships with the world during liberalization but worse in the post liberalization period. The results reveal lack of support on the role of liberalization in strengthening the relationship between the four Asian countries and the world stock market returns.

7.4 Long-Run Cointegration

Long-run integration among the four Asian countries and the world stock markets is analyzed by applying the Johansen cointegration test. Tables 7.10 to 7.12 report on cointegration test results for the five stock markets in three periods of 1997 to 2009, during and post liberalization periods.

| Hypothesized No. of CE(s) | Trace Statistic | Prob.+ | Max-Eigen Statistic | Prob.+ |
|---|---|---|---|---|
| None | 68.32045 | 0.0654 | *38.6197 | 0.0126 |
| At most 1 | 29.70075 | 0.7341 | 16.34586 | 0.6363 |
| At most 2 | 13.35489 | 0.8747 | 7.546967 | 0.9292 |
| At most 3 | 5.807928 | 0.7181 | 5.782883 | 0.6412 |
| At most 4 | 0.025045 | 0.8742 | 0.025045 | 0.8742 |

Note: Equation 3.13 as $\begin{pmatrix}\Delta P_{Wt}\\ \Delta P_{Kt}\\ \Delta P_{Mt}\\ \Delta P_{Tt}\\ \Delta P_{It}\end{pmatrix} = \Pi \begin{pmatrix}P_{Wt-1}\\ P_{Kt-1}\\ P_{Mt-1}\\ P_{Tt-1}\\ P_{It-1}\end{pmatrix} + \sum_{i=1}^{p-1} \Gamma_i \begin{pmatrix}\Delta P_{Wt-i}\\ \Delta P_{Kt-i}\\ \Delta P_{Mt-i}\\ \Delta P_{Tt-i}\\ \Delta P_{It-i}\end{pmatrix} + \varepsilon_t$

Trace test indicates no cointegration at the 0.05 level

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level

* and ** denotes rejection of the hypothesis at the 0.10 and 0.05 levels, respectively

+ MacKinnon-Haug-Michelis (1999) p-values

Table 7.17: Johansen Cointegration Tests – Malaysia, Thailand, Indonesia, South Korea and World Stock Markets (1997 – 2009)

Based on Table 7.10, the trace test results suggest that there was an absence of cointegration among the five stock markets, since none of the probabilities obtained less than 0.05 significant levels. The critical value at 5 percent significance level was applied in the analyses as it was frequently applied in other studies (Misra & Mahakud, 2009; Ibrahim, 2004b; Tahai et al., 2004; Yang et al., 2003). Max-eigenvalue test results, however, exhibit one cointegrating equation among the region at the 5 percent significance level. Both trace and max-eigenvalue tests produced two different results. In comparison between the two tests, trace test power performance was found superior to that of max-eigenvalue test (Lutkepohl, Saikkonen & Trenkler, 2001). These results reduces the confidence to conclude that there is a unique cointegrating vector that governs the long-run relationship among the stock markets due to the weak power of the cointegration tests. However, it is not to argue that in the full-year period of 1997 to 2009, the five stock markets had no long-term tendency to converge with each other.

The results in Table 7.11 portray one cointegration equation at the 0.05 significance level for trace test and no cointegration equation for max-eigenvalue tests during liberalization period. There is evidence of one cointegrating vector that governs the long-run co-movements of the stock markets. The null hypothesis that there is no cointegrating vector is rejected at 5 percent significance level for during liberalization period. This finding is consistent with Yang et al. (2003). These results suggest that the long-run integration was intensified during liberalization period.

There is also one cointegrating equation among the five stock markets in the post liberalization period (refer to Table 7.12). Thus, the null hypothesis of no cointegration could be rejected at the 5 percent significance level for post liberalization period. The

| Hypothesized No. of CE(s) | Trace Statistic | Prob.** | Max-Eigen Statistic | Prob.** |
|---|---|---|---|---|
| None | 73.0231 | 0.0271 | 31.7140 | 0.0886 |
| At most 1 | 41.3091 | 0.1790 | 28.3705 | 0.0396 |
| At most 2 | 12.9386 | 0.8944 | 5.9896 | 0.9831 |
| At most 3 | 6.9490 | 0.5836 | 5.6768 | 0.6550 |
| At most 4 | 1.2723 | 0.2593 | 1.2723 | 0.2593 |

Note: Equation 3.13 as $\begin{pmatrix} \Delta P_{Wt} \\ \Delta P_{Kt} \\ \Delta P_{Mt} \\ \Delta P_{Tt} \\ \Delta P_{It} \end{pmatrix} = \Pi \begin{pmatrix} P_{Wt-1} \\ P_{Kt-1} \\ P_{Mt-1} \\ P_{Tt-1} \\ P_{It-1} \end{pmatrix} + \sum_{i=1}^{p-1} \Gamma_i \begin{pmatrix} \Delta P_{Wt-i} \\ \Delta P_{Kt-i} \\ \Delta P_{Mt-i} \\ \Delta P_{Tt-i} \\ \Delta P_{It-i} \end{pmatrix} + \varepsilon_t$

Trace test indicates one cointegration at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

results suggest that the four Asian countries and the world stock markets share long run equilibrium.

Table 7.18: Johansen Cointegration Tests – Malaysia, Thailand, Indonesia, South Korea and World Stock Markets – During Liberalization Period

Table 7.19: JohansenCointegration Tests – Malaysia, Thailand, Indonesia, South Korea and World Stock Markets – Post Liberalization Period

| Hypothesized No. of CE(s) | Trace Statistic | Prob.** | Max-Eigen Statistic | Prob.** |
|---|---|---|---|---|
| None | 70.5073 | 0.0440 | 30.2777 | 0.1267 |
| At most 1 | 40.2295 | 0.2144 | 22.7763 | 0.1832 |
| At most 2 | 17.4532 | 0.6065 | 11.9681 | 0.5508 |
| At most 3 | 5.4851 | 0.7553 | 3.6159 | 0.8975 |
| At most 4 | 1.8692 | 0.1716 | 1.8692 | 0.1716 |

Note: Equation 3.13 as $\begin{pmatrix}\Delta P_{Wt}\\ \Delta P_{Kt}\\ \Delta P_{Mt}\\ \Delta P_{Tt}\\ \Delta P_{It}\end{pmatrix} = \Pi \begin{pmatrix}P_{Wt-1}\\ P_{Kt-1}\\ P_{Mt-1}\\ P_{Tt-1}\\ P_{It-1}\end{pmatrix} + \sum_{i=1}^{p-1} \Gamma_i \begin{pmatrix}\Delta P_{Wt-i}\\ \Delta P_{Kt-i}\\ \Delta P_{Mt-i}\\ \Delta P_{Tt-i}\\ \Delta P_{It-i}\end{pmatrix} + \varepsilon_t$

Trace test indicates one cointegration at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Since both periods, during and after liberalization, reveal a unique cointegrating vector there is a unique cointegrating vector governing the

long-run relationships among the stock markets during and post liberalization periods. The five stock markets move together over time and the short-term disturbances from the long-term trend would be corrected. The integration of the five stock markets, on the other hand, would limit the benefits of portfolio diversification by investors. In addition, having such similar numbers of cointegrating vector for both periods, it is inferred that there is no difference or improvement in the level of integration between during and post liberalization periods. Even though the long-run integration was intensified during and post liberalization, the subsequent stock market liberalization could not significantly alter the degree of market integration in the region and with the world over time.

This finding is consistent with the findings of others, which generally find that the emerging markets were integrated, especially after relaxing foreign investment restrictions (Phuan et al., 2009; Tai, 2007; Lin, 2005; Guo, 2005, Ragunathan, 1999), introduction of different types of index funds (Errunza & Losq, 1985), trade openness and stock market development (Chuah, 2005; Wang & Moore, 2008). Ibrahim (2009) and Ibrahim (2004a), however, claim that there was no significant integration in the long run. Ibrahim (2009) studied the cointegration of ASEAN-5 + South Korea, Japan and China from 1990 to 2005, on a monthly basis, whereas, Ibrahim (2004a) studied the cointegration of the ASEAN-5 (Malaysia, Indonesia, Thailand, Singapore, and the Philippines) and the cointegration of Malaysia, Japan and the U.S. from 1988 to 2003, using monthly data. Ibrahim (2009) emphasizes the insignificance of the measures implemented in the aftermath of the 1997 crisis to integrate the financial market. The measures include capital control (Ibrahim, 2009) and stock market liberalization (Ravenhill, 2008). Indeed, currency crisis was found to temporarily increase the level of segmentation (Hunter, 2006).

## 7.5 Vector Error Correction Model (VECM)

This work continues to examine the short-run dynamic interactions among the five stock markets of South Korea, Malaysia, Thailand, Indonesia and the world after discovering that there is long-run co-movement among those stock markets. To do so, vector error correction (VECM) models were applied. The VECM was performed based on the descending order, from the most to the least developing countries, which was consistent with the ordering done by Baharumshah et al. (2003). The orders were as follows: South Korea, Malaysia, Thailand and Indonesia, which was based on the GDP per capita for each country. According to World Bank, GDP per capita in 2010 in current US$ for South Korea, Malaysia, Thailand and Indonesia were as follows:

| | |
|---|---|
| South Korea: | US$ 20,757 |
| Malaysia: | US$ 8,373 |
| Thailand: | US$ 4,608 |
| Indonesia: | US$ 2,946 |

To further examine the influences of the world, other Asian countries and its own domestic disturbances on a country's stock market returns, the variance decompositions and impulse responses based on a VECM specification were carried out on those five countries' stock market returns. The variance decomposition was analyzed to estimate the percentage of variation due to shocks or innovations in other countries' stock markets. It portrayed the strength of the effect. Impulse response was applied in order to trace the responses of one country's stock market to shocks in other countries' stock markets, and to capture the direction, magnitude and persistence of response. Just like earlier analyses, these analyses were done on three different sample periods, which

were the full period of 1997-2009, during liberalization period and post liberalization period.

### 7.5.1 Variance Decomposition

The results of variance decomposition for a full period of 1997 to 2009 are shown in Table 7.13. The graphs of the five stock markets' variations are available in Appendix 7-2. The results reveal the importance of various shocks of other countries, and of itself, in explaining the performance of the concerned country's stock market. Generally, it was found that the variations in all five stock market returns were mostly attributed to domestic fluctuations. Among the five stock markets, the world stock market was the most affected by its own disturbances, which was around 88 percent of its stock market returns variation. For Indonesia, Malaysia and South Korea, the influences of their own disturbances on their stock markets were also high, at more than 70 percent. Thailand attained the lowest percentage (64 percent) of affection by its own local disturbances. This implied that those countries should better focus on their own micro level decisions, in order to improve the performances of their stock markets.

For the four Asian countries, other than their own local disturbances to attribute to their own variations, the world market variation was revealed as the second contributor to these countries' movements. World market innovation explained 20 percent and 16 percent of South Korean and Thailand's variations, respectively. Only about 9 percent and 8 percent of the world market variance was attributed to Indonesian and Malaysian shocks, respectively. These results were consistent with the regression analyses conducted in section 7.2, that there was a

significant relationship between an Asian country's stock markets and the world stock market.

Table 7.20: Variance Decomposition of MSCI World, South Korea, Malaysia, Thailand and Indonesia Stock Market Returns (Jan 1997 – Dec 2009)

| Variance Decomposition of World: | | | | | | |
|---|---|---|---|---|---|---|
| Period | S.E. | World | Korea | Msia | Thai | Indo |
| 5 | 2.595 | 88.176 | 1.529 | 0.395 | 0.337 | 9.563 |
| 10 | 2.599 | 88.071 | 1.553 | 0.427 | 0.376 | 9.574 |
| 15 | 2.599 | 88.068 | 1.555 | 0.427 | 0.376 | 9.573 |
| 20 | 2.599 | 88.068 | 1.555 | 0.427 | 0.376 | 9.573 |
| Variance Decomposition of Korea: | | | | | | |
| 5 | 4.697 | 20.806 | 73.486 | 0.452 | 0.918 | 4.339 |
| 10 | 4.709 | 20.850 | 73.196 | 0.479 | 0.975 | 4.501 |
| 15 | 4.709 | 20.852 | 73.190 | 0.480 | 0.977 | 4.501 |
| 20 | 4.710 | 20.852 | 73.190 | 0.481 | 0.977 | 4.501 |
| Variance Decomposition of Msia: | | | | | | |
| 5 | 3.417 | 8.269 | 6.119 | 78.277 | 0.842 | 6.492 |
| 10 | 3.434 | 8.640 | 6.293 | 77.671 | 0.850 | 6.546 |
| 15 | 3.434 | 8.644 | 6.307 | 77.653 | 0.850 | 6.546 |
| 20 | 3.434 | 8.644 | 6.308 | 77.652 | 0.850 | 6.546 |
| Variance Decomposition of Thai: | | | | | | |
| 5 | 4.232 | 15.861 | 9.838 | 5.311 | 64.783 | 4.208 |
| 10 | 4.247 | 16.006 | 9.981 | 5.365 | 64.431 | 4.218 |
| 15 | 4.247 | 16.010 | 9.984 | 5.367 | 64.422 | 4.218 |
| 20 | 4.247 | 16.010 | 9.984 | 5.367 | 64.421 | 4.218 |
| Variance Decomposition of Indo: | | | | | | |
| 5 | 4.431 | 9.591 | 2.319 | 6.205 | 3.417 | 78.468 |
| 10 | 4.446 | 9.664 | 2.512 | 6.196 | 3.407 | 78.222 |
| 15 | 4.446 | 9.666 | 2.523 | 6.197 | 3.406 | 78.208 |
| 20 | 4.446 | 9.666 | 2.523 | 6.197 | 3.406 | 78.207 |

Note: Cholesky Ordering: World, South Korea, Malaysia, Thailand, and Indonesia
Variance Decompositions at 5-, 10-, 15-, 20-week horizons

For the world market, among the four Asian countries' variations, Indonesia's variation had the highest influence on the world forecast error variance, but only around 9.6 percent. Other countries variations accounted for less than two percent.

Other than the significant influence of its own domestic and world variations, the influence of Indonesia's disturbances on South Korea and Malaysia's stock markets was quite significant (4.5 and 6.5 percent respectively) but not to

Thailand's stock market. Variations in Thailand were 10 percent contributed to by South Korea's shocks, 5 percent by Malaysia's shocks, and another 4 percent by Indonesia's shocks. Variations in Thailand and Malaysia, however, account for less than 1 percent in South Korea's stock market. Innovations in Indonesia explained about 6.5 percent and innovations in South Korea explained about 6.3 percent of the Malaysia forecast error variance. Comparatively, the disturbances in Malaysia's (6.2 percent) stock market had the highest explanatory power in accounting for the variations in the Indonesia stock market.

Results of variance decomposition for the period during liberalization, as displayed in Table 7.14 and Appendix 7-3, revealed almost similar findings as those for a full sample period variance decomposition analyses, in terms of the main contributor for each country's variations. All five countries' stock market variations were mostly accounted for by domestic innovations, which were explained by more than 56 percent (Indonesia's) to 91 percent (Malaysia's). Generally, variations in Malaysia predominantly attributed the most to its own disturbances. The variations with the least attribution to its domestic disturbances were Indonesia's (56 percent). In fact, other countries' innovations also played significant roles in explaining the movement of the Indonesia forecast error variance.

In the full sample periods of 1997-2009, world market variations were revealed to be the second contributor to all four Asian countries' movements; it was no different during the liberalization period. For Indonesia's stock market, more than 30 percent of the forecast error variance of its returns was attributed to shocks in the world market, the highest percentage among the four countries. Only 6 percent of Malaysia's variance was attributed to shocks in the world market. The

fraction that was accounted for by the world to South Korea's variation was 12 percent which was lower than that in the thirteen year period, and to Thailand, the variation was 17 percent which was a point higher than that in the thirteen year period.

Innovations in South Korea played role number three in both Thailand and Indonesia's stock markets, after the innovations in the world market (14 percent), to explain the fractions of the two countries' forecast error variance. Other than the significant influence of its own domestic and world variations, the influence of Indonesia's disturbances on Malaysia's stock markets was quite significant too.

During the liberalization period, world market variations were mainly attributed to their own variations, which was around 84 percent. The four Asian countries' shocks contributed the least to variations in the world market, except for Indonesia's shock which explained about 12 percent.

In comparison to the full sample period of 1997 to 2009, for each country's stock market forecast error variance, the fraction that was accounted for by domestic variations increased quite substantially during the liberalization period, except for that of Indonesia's. Those countries had been experiencing a rise of 6 percent to 13 percent.

Table 7.21: Variance Decomposition of the World, South Korea, Malaysia, Thailand and Indonesia Stock Market Returns - During Liberalization Period

| *Variance Decomposition of DWO:* | | | | | | |
|---|---|---|---|---|---|---|
| Period | S.E. | DWO | DKO | DMS | DTH | DIN |
| 2 | 0.025 | 94.352 | 1.361 | 0.008 | 0.647 | 3.632 |
| 5 | 0.030 | 84.014 | 2.218 | 0.296 | 0.979 | 12.493 |
| 8 | 0.034 | 79.986 | 2.588 | 0.255 | 1.090 | 16.080 |
| 10 | 0.037 | 78.195 | 2.772 | 0.231 | 1.142 | 17.660 |
| Variance Decomposition of DKO: | | | | | | |
| 2 | 0.057 | 14.402 | 83.116 | 0.783 | 0.746 | 0.953 |
| 5 | 0.071 | 12.059 | 80.905 | 0.793 | 1.360 | 4.884 |
| 8 | 0.081 | 10.971 | 80.698 | 0.675 | 1.615 | 6.040 |
| 10 | 0.087 | 10.447 | 80.695 | 0.609 | 1.662 | 6.587 |
| Variance Decomposition of DMS: | | | | | | |
| 2 | 0.045 | 5.506 | 0.959 | 91.586 | 0.145 | 1.804 |
| 5 | 0.058 | 5.845 | 1.182 | 91.249 | 0.147 | 1.577 |
| 8 | 0.069 | 5.857 | 1.173 | 91.291 | 0.147 | 1.532 |
| 10 | 0.075 | 5.865 | 1.156 | 91.323 | 0.147 | 1.509 |
| Variance Decomposition of DTH: | | | | | | |
| 2 | 0.049 | 15.331 | 10.260 | 3.519 | 70.777 | 0.112 |
| 5 | 0.064 | 16.956 | 9.575 | 3.477 | 69.840 | 0.152 |
| 8 | 0.076 | 17.560 | 9.203 | 3.254 | 69.869 | 0.115 |
| 10 | 0.083 | 17.842 | 9.062 | 3.125 | 69.871 | 0.100 |
| Variance Decomposition of DIN: | | | | | | |
| 2 | 0.048 | 14.627 | 5.330 | 4.903 | 3.127 | 72.013 |
| 5 | 0.061 | 29.581 | 8.051 | 3.787 | 2.740 | 55.841 |
| 8 | 0.070 | 35.478 | 9.402 | 3.000 | 2.481 | 49.639 |
| 10 | 0.075 | 38.038 | 9.948 | 2.656 | 2.367 | 46.991 |

Note:
Cholesky Ordering of World, South Korea, Malaysia, Thailand & Indonesia
Variance Decompositions at 2-, 5-, 8-, 10-week horizons

Table 7.22: Variance Decomposition of the World, South Korea, Malaysia, Thailand and Indonesia Stock Market Returns – Post Liberalization Period

| Variance Decomposition of DWO: | | | | | | |
|---|---|---|---|---|---|---|
| Period | S.E. | DWO | DKO | DMS | DTH | DIN |
| 2.000 | 0.035 | 76.760 | 0.031 | 0.891 | 0.000 | 22.317 |
| 5.000 | 0.044 | 76.205 | 0.935 | 3.071 | 2.126 | 17.663 |
| 8.000 | 0.050 | 79.019 | 0.952 | 3.101 | 2.273 | 14.655 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10.000 | 0.054 | 79.755 | 0.966 | 3.317 | 2.472 | 13.491 |
| Variance Decomposition of DKO: | | | | | | |
| 2.000 | 0.042 | 31.023 | 44.615 | 0.007 | 0.424 | 23.933 |
| 5.000 | 0.056 | 41.610 | 38.086 | 1.309 | 1.466 | 17.529 |
| 8.000 | 0.066 | 45.643 | 35.435 | 1.306 | 1.189 | 16.427 |
| 10.000 | 0.071 | 46.703 | 34.983 | 1.178 | 1.014 | 16.122 |
| Variance Decomposition of DMS: | | | | | | |
| 2.000 | 0.024 | 13.365 | 1.356 | 49.513 | 0.678 | 35.087 |
| 5.000 | 0.031 | 23.923 | 2.849 | 42.440 | 0.830 | 29.958 |
| 8.000 | 0.036 | 27.809 | 3.117 | 38.962 | 0.857 | 29.255 |
| 10.000 | 0.039 | 28.956 | 3.128 | 38.043 | 0.815 | 29.059 |
| Variance Decomposition of DTH: | | | | | | |
| 2.000 | 0.037 | 23.599 | 0.161 | 0.973 | 52.089 | 23.178 |
| 5.000 | 0.048 | 28.273 | 0.602 | 1.363 | 51.443 | 18.319 |
| 8.000 | 0.056 | 31.277 | 0.587 | 1.456 | 50.338 | 16.342 |
| 10.000 | 0.061 | 32.105 | 0.534 | 1.403 | 50.404 | 15.554 |
| Variance Decomposition of DIN: | | | | | | |
| 2.000 | 0.044 | 7.822 | 1.202 | 0.464 | 0.861 | 89.650 |
| 5.000 | 0.053 | 5.749 | 3.003 | 1.771 | 2.924 | 86.553 |
| 8.000 | 0.061 | 5.221 | 2.823 | 1.459 | 3.492 | 87.005 |
| 10.000 | 0.065 | 4.879 | 2.825 | 1.354 | 3.606 | 87.336 |

Note: Cholesky Ordering: World, South Korea, Malaysia, Thailand, and Indonesia
Variance Decompositions at 5-, 10-, 15-, 20-week horizons

For the post liberalization period, Table 7.15 exhibits the reduction of the importance of the domestic shocks to variations of the five stock market returns. Even so, the domestic variations remained as significant contributors to the variations in those stock markets. Variations in three of the countries - Thailand, Malaysia and South Korea, were attributed to their own variations for a maximum of 51 percent. The fraction that was accounted for by domestic shocks was substantially reduced by 19 to 49 percent (Thailand and Malaysia, respectively). Variations in Indonesia, on the other hand, were predominantly attributed to its own variations by 87 percent, which had increased to 31 percent when compared to those during the liberalization period. The significance of domestic variations in accounting for movements in South Korea's variation dropped significantly from 81

percent to 38 percent. Thus, the domestic shocks had become the second contributor to variations in South Korea's stock market. For the world market, 76 percent of its variations were attributed to its own shocks, in which the fraction had reduced by 8 percent. These results, generally, reveal the reducing level of segmentation of those countries in this period post liberalization.

Surprisingly, Table 7.15 also reveals that Indonesian shocks, instead of world shocks, had become the second main contributor to variations in Malaysia, Thailand and the world stock markets. The fractions that were accounted for by Indonesia shocks increased substantially to 30 percent to Malaysian variations, 28 percent to Thailand's variations, and 18 percent to the world's variations. World market shocks were revealed as the second contributor to variations in Indonesia only. Indeed, the fraction had decreased from 30 percent to 6 percent. Overall, these results showed the increasing significance of Indonesia's variations in accounting for movements in the other countries' stock markets. Due to its recent rapid economic growth, today Indonesia is uncovered as one of the main countries in the region on which to concentrate, to deal with, and to invest in.

Innovations in the world stock markets also explain the quite sizeable fractions of the individual countries' forecast error variances. The decreasing influence of domestic shocks to variations of individual stock markets increased the influence of world shocks than those during liberalization periods. The world shocks acted for about 42 percent, 24 percent and 18 percent respectively of the forecast error variances in South Korea, Malaysia and Thailand. In comparison to the results of during liberalization period, those percentages of world influences substantially increased by 30 percent in the South Korean stock market, 18 percent in the Malaysian stock market, and 1 percent in Thailand's stock market.

Apparently, the impact of the world stock market had recently become increasingly important to the Asian region. Indeed, world shocks had become the first contributor to variations in South Korea. Variations in Indonesia, on the other hand, were predominantly attributed to its own variations by 87 percent, thus, decreased the influence of world shocks to 6 percent.

Overall, the results of the three sample periods indicat that the movements in the four Asian stock markets, at large, were domestically driven. However, the impact factor of the domestic shocks for those countries had been declining ever since. Indeed, three of the countries, South Korea, Malaysia and Thailand, had fractions that were accounted for by the domestic shocks and were reduced substantially to less than 51 percent in the post liberalization period. Domestic shocks used to affect the variations of the three stock market returns from 70 to91 percent during the liberalization period. Unlike other Asian countries, Indonesia's domestic shocks had predominant and consistent effects on its country's stock market returns. Generally, the domestic shocks had the greatest impact during the liberalization period, the lowest after the liberalization period and average at the full sample period of 1997-2009.

The variations in these Asian countries were also attributed to the world stock market variations. Throughout the full period of 1997-2009, world shocks were the second contributor to the variations in the Asian countries after their own respective domestic shocks. The fractions, accounted for in the world shocks, were in the range of a minimum of 9 percent (Malaysia) to a maximum of 20 percent (South Korea). However, the in post liberalization period, the world shocks were the third contributor to the variations in Asian countries. Even though they were the number three contributor, the innovations in the world stock market explained the highest

sizeable fractions of the Asian stock markets forecast error variances in comparison to the other two periods of the during liberalization period and full sample period. The impact of the world innovations ranges from 6 percent to 42 percent. The Indonesian stock market, however, remained having the world shocks as its second contributor.

Innovations in Indonesia explained quite sizeable fractions of the world and other Asian countries' forecast error variances. Those innovations in Indonesia turned up to be the second contributor to stock market variations in the world, Malaysia and Thailand in the post liberalization period. Indonesia's shock played an 18 to 30 percent role in other countries' stock market variations as compared to only a 0.2 to 12 percent role during the liberalization period. It seemed that Indonesia was one of the countries in the region, other than China and India, for new investment to take place, due to its land and labor availability. For Indonesia's stock market itself, other Asian countries' shocks did not exhibit significant impact on its variations. Among the three Asian countries, there was a maximum of 8 percent impact of South Korea on the variations in Indonesia, during the liberalization period.

Therefore, there was evidence to reject the null hypothesis that there was no short-run integration between the four Asian countries and the world stock markets. In the short-run, Asian countries and the world stock markets became more integrated. The results of the variance decompositions also depicted an increasing short-run integration between the Asian countries and a decreasing impact of domestic shocks. Variations in Indonesia have greater contribution to variations in other Asian countries and the world stock markets.

### 7.5.2 Impulse Response

Impulse response is tested to further examine the dynamic interactions among the five stock markets. It traces the response of one variable to shocks in other variables, and captures the direction, magnitude and persistency of response. For a full sample period of 1997-2009, Table 7.16 portrays the results of the impulse response of five countries' stock market returns at 6-week horizon. A 6-week horizon was applied when the impulse response of 25-week horizons, as in Appendix 7-7, displayed insignificant responses of stock market returns in week seven onwards. The graphs of the impulse response of a group and individual countries at 6-week horizon were in Appendix 7-5 and Appendix 7-6, respectively. The response functions in the multiple graphs of analytic response of standard errors were plotted with two standard deviations as the bands. When the bands did not encompass zero, the responses were considered significantly different from zero (Ibrahim, 2004a).

Table 7.23: Impulse Response of MSCI World, South Korea, Malaysia, Thailand and Indonesia Stock Market Returns (Jan 1997 – Dec 2009)

| Response of World: | | | | | |
|---|---|---|---|---|---|
| Period | World | Korea | Msia | Thai | Indo |
| 1 | 2.428 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.033 | -0.224 | -0.032 | 0.016 | 0.778 |
| 3 | 0.157 | 0.063 | -0.150 | 0.022 | -0.116 |
| 4 | -0.120 | 0.066 | 0.051 | 0.014 | 0.150 |
| 5 | -0.018 | 0.211 | -0.018 | -0.148 | 0.046 |
| 6 | 0.086 | -0.033 | 0.042 | 0.039 | 0.006 |
| Response of South Korea: | | | | | |
| 1 | 2.010 | 3.933 | 0.000 | 0.000 | 0.000 |
| 2 | 0.405 | -0.647 | -0.194 | 0.316 | 0.838 |
| 3 | 0.611 | -0.089 | 0.112 | 0.246 | -0.084 |
| 4 | -0.112 | 0.436 | -0.056 | -0.183 | 0.438 |
| 5 | 0.033 | 0.349 | 0.215 | -0.094 | -0.237 |
| 6 | 0.158 | -0.076 | 0.065 | 0.049 | 0.181 |
| Response of Malaysia: | | | | | |
| 1 | 0.763 | 0.474 | 3.013 | 0.000 | 0.000 |
| 2 | 0.317 | 0.049 | -0.155 | 0.245 | 0.849 |
| 3 | 0.400 | 0.365 | -0.023 | 0.023 | 0.063 |
| 4 | 0.316 | 0.335 | 0.183 | 0.167 | 0.171 |
| 5 | -0.154 | 0.492 | 0.052 | 0.100 | -0.056 |
| 6 | 0.207 | 0.033 | 0.104 | 0.026 | 0.080 |
| Response of Thailand: | | | | | |
| 1 | 1.488 | 1.209 | 0.839 | 3.363 | 0.000 |
| 2 | 0.505 | -0.139 | -0.186 | 0.021 | 0.858 |
| 3 | 0.474 | 0.353 | 0.414 | 0.310 | -0.008 |
| 4 | 0.298 | 0.331 | 0.100 | 0.139 | 0.104 |
| 5 | -0.243 | 0.216 | 0.179 | -0.415 | 0.083 |
| 6 | 0.201 | 0.123 | 0.123 | 0.076 | -0.002 |
| Response of Indonesia: | | | | | |
| 1 | 1.188 | 0.527 | 0.840 | 0.798 | 3.889 |
| 2 | 0.386 | 0.167 | -0.578 | 0.099 | -0.404 |
| 3 | 0.428 | 0.261 | 0.083 | 0.145 | 0.156 |
| 4 | 0.208 | 0.220 | 0.284 | -0.056 | 0.300 |
| 5 | 0.310 | 0.182 | 0.301 | 0.015 | 0.064 |
| 6 | 0.118 | 0.019 | -0.044 | -0.018 | 0.230 |

Note: Cholesky Ordering: World, South Korea, Malaysia, Thailand, and Indonesia
Impulse Response at 6-week horizons

Results in Table 7.16 and Appendix 7-6 indicate that some of the individual stock market returns in the period of 1997-2009 had immediate responses to the innovations of other countries' stock markets, especially of their own. However, those responses subsided towards zero rather quickly after week 6. Domestic disturbances had an abrupt positive impact to all those five countries' stock market returns fluctuations for the first two weeks. After week two, however, the responses of the countries stock markets on their domestic shocks were already touching or approaching zero.

Other than the domestic disturbances, the disturbances in the world market also needed to be concentrated upon. The results show that the reactions of those four Asian stock markets to innovations in the world market were significant and positive in the first two weeks. These results further proved how the disturbances in the world market would be able to affect the variations in the four open Asian countries. Therefore, designing the appropriate financial and equity policies would not be easy, due to the significant impact of both domestic and international disturbances on the variations in countries' stock markets.

Regarding the dynamic interactions between the Asian markets, shock in Indonesia caused stock markets of the other three Asian countries and the world to be positive in the first three weeks but subsided towards zero soon after that. These results implied the importance of Indonesian market to the three Asian stock markets as well as to the world market. Shocks in Malaysia and South Korea only managed to positively affect the other two Asian countries in the first two weeks. Thailand stock market reacted positively to shocks in Malaysia and South Korea. Malaysia stock market reacted positively to shocks in South Korea, while Indonesia's stock market reacted positively to shock in Malaysia. World stock

market only reacted positively to its domestic shock and Indonesia's. Thailand's shock only affected Indonesia's stock market but Thailand's stock market was positively affected by the other four markets. Therefore, in addition to focusing on domestic policies for attaining better performances of stock markets, the authorities were advised to also focus on the disturbances from abroad, especially Indonesia. Improving the policies with Indonesia would improve the countries' stock market performances. However, the impact of the responses was immediate.

In reference to Table 7.17 and Appendix 7-9, the responses of the five countries stock markets during liberalization period were almost similar to those in the full sample period. The responses of these markets to their domestic and other stock markets innovations were positive but immediate, and subsided toward zero rather quickly, which was generally after week 3. Obviously, in the first two weeks, there were positive significant responses of the countries' stock markets to their domestic disturbances. Only domestic shock in South Korea caused its stock market to be negative in its second week and subsided to zero in week three onwards.

The innovations in the world market led to positive responses by the four Asian stock markets, especially Thailand and Indonesia. Generally, the responses were significant in the first three weeks. Other than the world variations, variations in Indonesia and South Korea managed to positively affect the stock markets of Malaysia and Thailand in the first two to three weeks. Only Thailand's stock market had been positively affected by the shocks of the other three Asian countries and the world post liberalization period analyses. However, none of the shocks of Asian countries managed to affect the world stock market.

Table 7.24: Impulse Response of MSCI World, South Korea, Malaysia, Thailand and Indonesia Stock Market Returns - During Liberalization Period

| Response of World: |
|---|

| Period | World | Korea | Msia | Thai | Indo |
|---|---|---|---|---|---|
| 1 | 2.252 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.101 | -0.274 | -0.049 | 0.244 | 0.249 |
| 3 | 0.015 | 0.058 | -0.001 | 0.028 | -0.010 |
| 4 | 0.017 | -0.015 | -0.006 | 0.004 | 0.012 |
| 5 | -0.001 | 0.002 | 0.000 | 0.002 | -0.001 |
| 6 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Response of Korea: | | | | | |
| 1 | 1.935 | 3.768 | 0.000 | 0.000 | 0.000 |
| 2 | 0.995 | -0.975 | -0.243 | 0.354 | 0.642 |
| 3 | -0.044 | 0.118 | 0.007 | 0.133 | -0.039 |
| 4 | 0.040 | -0.025 | -0.018 | 0.000 | 0.028 |
| 5 | -0.001 | 0.002 | 0.000 | 0.006 | -0.004 |
| 6 | 0.001 | -0.001 | -0.001 | 0.000 | 0.001 |
| Response of Msia: | | | | | |
| 1 | 0.411 | 0.359 | 2.154 | 0.000 | 0.000 |
| 2 | 0.312 | -0.072 | 0.184 | 0.091 | 0.653 |
| 3 | 0.147 | 0.041 | 0.039 | 0.094 | 0.068 |
| 4 | 0.047 | -0.021 | -0.006 | 0.027 | 0.041 |
| 5 | 0.008 | 0.002 | -0.001 | 0.008 | 0.003 |
| 6 | 0.002 | -0.001 | -0.001 | 0.001 | 0.002 |
| Response of Thai: | | | | | |
| 1 | 0.745 | 1.241 | 0.702 | 2.832 | 0.000 |
| 2 | 0.816 | -0.394 | -0.251 | 0.216 | 0.753 |
| 3 | 0.087 | 0.040 | -0.004 | 0.142 | -0.015 |
| 4 | 0.031 | -0.024 | -0.017 | 0.013 | 0.031 |
| 5 | 0.002 | 0.003 | -0.001 | 0.005 | -0.003 |
| 6 | 0.001 | -0.001 | -0.001 | 0.000 | 0.001 |
| Response of Indo: | | | | | |
| 1 | 0.303 | 0.322 | 0.151 | 0.461 | 3.098 |
| 2 | 0.741 | 0.191 | 0.100 | 0.334 | 0.082 |
| 3 | 0.153 | -0.126 | -0.041 | 0.105 | 0.168 |
| 4 | 0.019 | 0.019 | -0.001 | 0.029 | 0.000 |
| 5 | 0.010 | -0.007 | -0.004 | 0.004 | 0.007 |
| 6 | 0.000 | 0.001 | 0.000 | 0.001 | -0.001 |

Note: Cholesky Ordering: World, South Korea, Malaysia, Thailand, and Indonesia
Impulse Response at 6-week horizon

Table 7.25: Impulse Response of MSCI World, South Korea, Malaysia, Thailand and Indonesia Stock Market Returns - Post Liberalization Period

| Response of World: |
|---|

| Period | World | Korea | Msia | Thai | Indo |
|---|---|---|---|---|---|
| 1 | 2.433 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.281 | -0.193 | 0.071 | -0.072 | 1.722 |
| 3 | 0.276 | 0.006 | -0.194 | 0.411 | -0.486 |
| 4 | -0.282 | 0.086 | 0.157 | -0.017 | 0.210 |
| 5 | -0.035 | 0.170 | 0.223 | -0.111 | 0.026 |
| 6 | 0.150 | -0.127 | 0.011 | 0.077 | 0.124 |
| Response of Korea: | | | | | |
| 1 | 1.467 | 2.415 | 0.000 | 0.000 | 0.000 |
| 2 | 0.605 | -0.549 | 0.033 | -0.018 | 1.841 |
| 3 | 0.818 | -0.335 | -0.371 | 0.633 | -0.295 |
| 4 | -0.109 | 0.084 | -0.089 | -0.336 | 0.498 |
| 5 | -0.269 | 0.213 | 0.334 | 0.062 | -0.220 |
| 6 | 0.014 | -0.059 | 0.085 | 0.128 | 0.112 |
| Response of Msia: | | | | | |
| 1 | 0.361 | 0.228 | 1.550 | 0.000 | 0.000 |
| 2 | 0.562 | -0.099 | -0.053 | -0.119 | 1.229 |
| 3 | 0.602 | -0.118 | 0.073 | 0.008 | -0.003 |
| 4 | 0.143 | 0.118 | -0.083 | -0.110 | 0.080 |
| 5 | -0.107 | 0.114 | 0.222 | -0.036 | 0.131 |
| 6 | 0.042 | -0.029 | -0.019 | 0.074 | -0.023 |
| Response of Thai: | | | | | |
| 1 | 1.196 | 0.326 | 0.287 | 2.368 | 0.000 |
| 2 | 0.726 | 0.023 | -0.245 | -0.530 | 1.790 |
| 3 | 0.480 | -0.229 | -0.022 | 0.406 | -0.028 |
| 4 | 0.195 | 0.078 | 0.193 | 0.125 | 0.210 |
| 5 | -0.077 | 0.170 | 0.259 | -0.189 | 0.429 |
| 6 | 0.188 | -0.068 | 0.069 | 0.135 | -0.042 |
| Response of Indo: | | | | | |
| 1 | 1.248 | 0.379 | 0.127 | 0.005 | 3.587 |
| 2 | 0.726 | -0.328 | -0.131 | 0.199 | -0.393 |
| 3 | -0.003 | 0.093 | 0.150 | 0.133 | 0.318 |
| 4 | -0.114 | 0.380 | 0.504 | -0.384 | 0.333 |
| 5 | 0.186 | -0.165 | 0.040 | 0.197 | 0.080 |
| 6 | 0.251 | 0.015 | 0.051 | -0.110 | 0.125 |

Note: Cholesky Ordering: World, South Korea, Malaysia, Thailand, and Indonesia
Impulse Response at 5-, 10-, 15-, 20-, and 25-week horizons

In post liberalization period, as portrayed in Table 7.18 and Appendix 7-11, domestic and world shocks still remained as significant factors affecting countries' stock market returns. The responses on domestic shocks were positive in the first two weeks but at lower magnitude than those during liberalization period. The

world shock had its longer positive impact on the Asian stock markets, in which the impact could be up to the forth week.

In this period, shocks in Indonesia had led to the greatest positive responses from all four stock markets, including the world. The results indicate that the Asian stock markets were highly influenced by the innovations in Indonesia. Unfortunately, the innovations of the other three Asian countries had no significant influence on the responses of neighboring stock markets. Thus, other than domestic and world shocks, shocks in Indonesia should be looked into by the government authorities within this recent period in monitoring the performances of the stock market and before deciding on the policies to improve its stock market performances.

In summary, the impulse response analyses further proved the significance of domestic disturbances, and the innovations in the world and Indonesian markets to the responses by the four Asian stock markets. The results show that there were substantial short-run dynamic interactions between each of the four Asian stock markets and the world's. In terms of the short run dynamic interactions among the four Asian countries, Indonesian market played increasingly significant role in accounting for fluctuations in the other three Asian countries. The four Asian and world stock markets reacted positively to domestic, world, and Indonesian shocks but then subsided toward zero rather quickly. Generally, the authorities had to keep track of what was happening in the world, and the Indonesian markets, as well as domestic affairs in deciding on the policies.

## 7.6 Chapter Summary

Generally, other studies found that stock market liberalization or financial deregulation managed to enhance the degree of integration of the developed markets (Chuah, 2005; Tahai et al., 2004; Phylaktis, 1997) as well as the emerging markets (Tai, 2007; Lin, 2005; Guo, 2005; Ragunathan, 1999). However, other findings state that those deregulations were not sufficiently significant in deepening the degree of integration (Ravenhill, 2008; Mahani 2002). The lack of integration or an increased level of segmentation was also being blamed on the currency or financial crisis and economic recession (Hunter, 2006 and Mahani, 2002).

Ravenhill's (2008) and Mahani's (2002) findings were consistent with the findings of this work, especially for the long-run integration. Johansen cointegration tests provided weak evidence to reject the null hypothesis that there was no long-run integration among the Asian and world markets. Therefore, these Asian countries stock markets were neither tied to regional markets, nor to the world market in the long-run. They could drift arbitrarily away from other markets. The results conveyed that those stock market liberalization policies implemented earlier were not effectively playing their roles in the long-run financial integration among the Asian and the world markets. Such impact might be due to the financial crisis and economic recession in the region, as mentioned by Hunter (2006) and Mahani (2002).

For short-run dynamic interactions between Asian countries and the world markets, both variance decompositions and impulse response functions results documented that the interaction between those Asian countries and the world markets had been increasing. These findings of significant and positive relationships between the Asian and the world markets were also supported by coefficient correlations and

OLS regression analyses, and other studies (Tai, 2007; Bilson et al., 2001). South Korea's interaction with the world market had been the highest among the four Asian stock markets. Its interaction with the world had been consistent in years 2000 onwards but had shown some improvement as compared to its world interaction in late 1990s. Generally, the innovations in the world stock market explained greater sizeable fractions of the Asian stock markets forecast error variances in the later years. However, the world innovations were the third contributor to the fluctuations in the four Asian markets after domestic disturbances and innovation in Indonesia. World innovations remained as the second contributor to the fluctuations in Indonesia market with the maximum percentage of 13 percent post liberalization period.

In terms of short-run integration between the Asian countries, the results of the four analyses portrayed greater positive correlation between the two countries in Asia post liberalization period. Indonesia's market managed to account for 27 to 31 percents of fluctuations in the other three Asian markets and became the second contributor. In early 2000s, innovation in Indonesia only accounted for 1 to 8 percents of the other four stock market movements. Indeed, Indonesia's market even contributed one third of the world market fluctuations. Fluctuations in Indonesia, on the other hand, had been substantially dominated by its own domestic sources and world shocks.

The domestic variations turned up to be the first significant contributors to variations in the four Asian and world markets. Even so, the fraction that was accounted for by the domestic variations reduced substantially in post liberalization period by 10 to 42 percents. The influence of domestic shocks in accounting for domestic aggregate fluctuations had reduced to less than 50 percent to the three Asian markets, not including Indonesia. Indonesia's domestic shocks accounted up to 80 percents still,

which implied that a strong or stable economic environment in Indonesia was crucial for better performance of its stock market.

As a whole, in the short-run, the four Asian countries are highly integrated to their own domestic shocks and are increasingly influenced by the world market. Thus, policy makers should focus in stabilizing and enhancing the economic conditions of their own country policy. At the same time, some international financial diversification strategies are also needed in order to encounter international disturbances. In addition, due to an increasing importance of Indonesia's market in the region, any matters arise in that country, should be looked into, possibly is to align with its policies. The implementation of stock market liberalization policies is considered successful in integrating regional stock markets and with the world market but only in the short-run, not in the long-run.

# 8. CONCLUSION AND RECOMMENDATION

## 8.1 Introduction

The subsequent stock market liberalizations analyzed in this thesis are those implemented after January 1997, which is almost a decade after the implementation of the first official stock market liberalization. The subsequent stock market liberalization is normally implemented on specific sector(s), and for smaller change in the percentage

of foreign ownership on local equities. Previous studies focus on the first official stock market liberalization, whereas, this work examines whether subsequent stock market liberalizations have any significant influence on stock market returns. This work analyzes eight events of stock market liberalization policies in Malaysia, Thailand, Indonesia and South Korea. In line with the research objectives, the issues investigated are:

(a) whether the implementation of the subsequent stock market liberalization, specifically in terms of an increase in the percentage of foreign ownership in local equities, can generate greater stock market returns, which is consistent with International Asset Pricing Model,

(b) whether the stock markets of the four Asian countries and the world (MSCI-World Index) are integrated with each other in the short-run and long-run.

The investigation on the impact of the subsequent stock market liberalization on stock market returns, with and without controlling for the effects of stock market characteristics and macroeconomic fundamentals, was done on countries' main indices and sectoral indices. The conclusions on each of the findings are described in this chapter together with the implications of the work and its recommendations. The results of the findings could assist in the liberalization policies' decision making of the respective countries. They could identify how effective an increase in the percentage of foreign ownership in local equities is in enhancing the growth of the sectoral and country's main stock markets. The results indicate how much the opening of a stock market contributes to the integration level of those countries with the world market. Somehow, the availability of the details on the percentage change, the sectors involved in the liberalization process, the conditions of the stock markets and countries' economy

would assist the government authorities and policy makers in their decision making process. Finally, the government authorities could make better decisions on whether to continue implementing the subsequent stock market liberalization policy, or should the policy be amended or cut off altogether.

## 8.2 Stock Market Liberalization and Stock Market Returns

The findings show lack of support to reject the null hypothesis that there is no significant relationship between subsequent stock market liberalization and stock market returns for both countries' main and sector indices. This work, however, does not argue that an increase in the percentage of foreign ownership in local equities is ineffective in generating greater stock market returns.

Generally, the results of the analysis indicate that of eight liberalization events, a maximum of one event shows significant relationship with stock market returns, that is after controlling for the effects of some relevant variables. Indeed, the results from the analyses of T±26 week event window did not reveal any significant relationship between stock market liberalization and a country's stock market returns. The result of having a maximum of one significant coefficient of stock market liberalization, at least, is consistent with the theoretical prediction of the standard International Asset Pricing Model (IAPM), which states that the liberalization of foreign ownership on local equities would increase the equity price index of a country, thus resulting in an increase in its equity market returns due to reduction in the cost of equity capital (Henry, 2000a). Since the rest of other liberalization events do not show any significant relationship with the country's main stock returns, the results reduce confidence on the relationship of the two.

For sectoral market, there is also a maximum of one significant coefficient of stock market liberalization on sectoral market returns, after controlling for the effects of stock market characteristics and macroeconomic fundamentals in both the T±12 and T±26 week event windows. Despite having only one significant coefficient of liberalization, two analysis of using either stationary or log controlled variables, reveal mixed signs. One reveals a positive relationship and the other reveals a negative. The negative coefficient contradicts the theoretical prediction of the standard International Asset Pricing Model (IAPM). Indeed, it shows that there is a possibility for the market to incure a loss instead of greater returns upon the implementation of stock market liberalization as claimed by Stiglits (2004). Stiglitz (2004) even blames capital market liberalization in the 1980s and 1990s, which was enforced by the International Monetary Fund (IMF), as one of the main contributing factors of the economic crisis. According to him, capital market liberalization has led to greater output or consumption instability, higher risk premium, thus lowering investment and greater economic instability, as evidenced by Malaysia's stock market liberalization in 1998 on its sectoral returns. The negative impact of Malaysia's liberalization in 1998 on its sector returns might be contributed by the Asian financial crisis, which reduced the confidence of foreign investors in investing in the service sector, but not to the other sectors.

For that matter, before deciding on the implementation of stock market liberalization, government authorities and policy makers should have analyzed the stock market, both sectoral and country, more carefully to ensure the effectiveness of the policy in generating higher stock market returns. The sensitivity of the markets on any announcement and implementation of the liberalization policies should be identified earlier. The overall results may be insignificant due to the conditions of the subsequent stock market liberalization policy itself, in which the percentage change in foreign

ownership on local equities may be small, or the stock market liberalization policy is implemented on specific sector(s) only, or in which country and time period the policy is implemented. It is expected that the impact of the subsequent stock market liberalization may not have as great an impact compared to the first official stock market liberalization when the percentage increase of foreign ownership is smaller, and when the liberalization is meant for certain sector(s) only.

Generally, the percentage increase of foreign ownership analyzed in this thesis is from 12 to 51 percent, except for Thailand's 1997 equity liberalization, which allows for full foreign ownership on financial sectors, and Indonesia's 1997 liberalization which allows for an unlimited percentage of foreign ownership on local shares other than banks. Even so, stock market liberalization in Thailand and Indonesia in 1997 could not significantly generate greater stock market returns, despite allowing for full foreign ownership on local equities. There may be competing effects of the crisis and stock market liberalization which offset each other, that has no significant effect on stock market liberalization found in the stock markets of Indonesia and Thailand during the crisis period. Such results may also be due to lack of confidence among foreign investors in investing in the countries during the financial and economic crisis.

In addition, further implementation of stock market liberalization may already be anticipated and is known to take place, at the time of the first stock market liberalization, which may be the cause for insignificant impact of subsequent stock market liberalization on the stock market returns (Henry, 2000a). Having this scenario in place, the impact of the first stock market liberalization on stock market returns should be greater and certain, but the impact of subsequent stock market liberalization should be insignificant. On the other hand, there is also a condition in which further liberalization is anticipated but with a possibility that it may not occur at the time of the

first stock market liberalization which Henry (2000a) refers to as 'State 2'. The liberalization would significantly affect stock market returns, when this scenario is in place.

The implication of the study is that the government authorities in the region should reconsider their decisions in imposing new stock market liberalization policy. The government authorities should study the impact of other factors before deciding on the policy. Other variables to consider in making liberalization decisions are the economic and financial conditions of the country, the percentage change in foreign ownership of local companies, the affected sector(s), and duration of the impact. If some of those factors play important roles in affecting stock market returns, the policy should be amended or cancelled. If it is proven that such liberalization would not be able to improve stock market returns and strengthen capital markets, the government authorities are advised to look at other measures which could be effective in achieving country' or regional objectives. The opening of the country's stock market may or may not generate greater stock market returns. The findings of this thesis also help international portfolio investors in making the right choice of assets allocation. In addition, firms' shareholders and the public may predict the outcomes of the newly announced stock market liberalization policy.

## 8.3 Controlled Variables and Stock Market Returns

Stock market characteristics and macroeconomic fundamentals are treated as controlled variables in the multivariate regression analysis. This is to isolate the effects of stock market liberalization on stock market returns. Stock market characteristics include stock market size, liquidity and volatility, while macroeconomic fundamentals include exchange rate, interest rate and oil price. The inclusion of those controlled

variables improves the regression fit, as evidenced by some increase in the adjusted $R^2$ as compared with that of the univariate regression model. This indicates the role played by those controlled variables on stock market returns. The role played, however, is not powerful enough to significantly affect the returns. Of eight events, less than half of their coefficients have significant impact on stock market returns. This shows lack of support for the robustness of the results. Thus, the results reduce the confidence that both stock market characteristics and macroeconomic fundamentals are related to stock market returns.

In terms of the relationship of those controlled variables with stock market returns, the results of the analyses, generally, reveal that only stock market size, measured at first difference for stationarity, is significantly and positively related to both country and sectoral stock market returns. Almost all coefficients of stock market size in both country and sectoral analyses indicate full support for the robustness of the results. Indeed, the inclusion of the stock market size dramatically improves the regression fit of the model by having a sharp increase in adjusted $R^2$. However, it is argued by the examiner that the difference in the logs of stock market size (capitalization) equals stock market returns, which would lead to very significant results for the market size variable and very high $R^2$. Thus, two other regression analyses are constructed. One regression analysis uses stock market size at level (log) and the other omits stationary stock market size and uses only stationary stock market liquidity and volatility to represent stock market characteristics. When the stock market size is measured at level (log), the results show that only a few size coefficients are significant and positively related to stock returns. Thus, the results reduce the confidence that stock market size has an impact on market returns.

There is lack of support that stock market liquidity and volatility are positively related to stock market returns, but not to state that those two stock market characteristics have no relationship with stock market returns at all. It is expected that the more liquid the market, the greater the allocation of capital and thus, the greater the stock returns (Yang et al., 2010; Chuang et al., 2009; Mobarek & Mollah, 2005; Dey, 2005; Jun et al., 2003). The positive coefficient of stock market volatility is consistent with risk/return tradeoff, which states that the higher the risk, the higher the potential returns.

All three macroeconomic fundamentals provide lack of support for the robustness of the results. There are only three and two significant coefficients of interest rates in country and sectoral analyses, respectively; only one significant coefficient of exchange rate and oil price in country analyses but none is significant in sectoral analyses. However, it could not be argued that those variables are not related to stock market returns.

The three significant coefficients of interest in Model 1 portray a mixed relationship between interest rate and stock returns. The negative coefficient justifies the expectation that the higher the interest rate, the lesser the investment could be attributed to higher cost of investment, the lesser the demand for stocks and, thus, the lower the stock returns (Jayasuriya, 2005, Gjerde & Saettam, 1999; Somoye et al., 2009). However, if such higher interest rate is followed by an increase in money supply backed by foreign reserves, then the investment and consumption would be higher, and generate better stock market returns (Bilson et al., 2001; Asprem, 1989; Mandelker & Tendon, 1985). Thus, the decision to be made by the central banks on whether to increase or decrease the interest rate should comprehend country objectives in improving stock market returns.

## 8.4 Stock Market Integration

Having stronger financial cooperation among Asian countries would strengthen its equity market, promote financial stability and create economic and political balance with EU and NAFTA from the regionally developed countries.[23] Therefore, there is a need for stock market integration among the region in the short- and long-run. This work determines how different the integration level of the four Asian and world stock markets could be after going through a number of subsequent stock market liberalizations.

The results of the Johansen cointegration tests reveal that there is a unique cointegrating vector governing the long-run relationship among the stock markets of the four Asian countries and the world, during and post liberalization periods. Those Asian countries' stock prices are either tied to regional markets, or to the world market. They are not drifting arbitrarily away from other markets in the long-run. The results also convey that stock market liberalization manages to play its role in the long-run financial integration among the Asian and the world markets. The results support the findings of Tai (2007), Lin (2005), Guo (2005), Baharumshah et al. (2003), Taskin and Muradoglu (2003), Levine and Zervos (1998), who state that the liberalization would integrate the stock markets. However, the results could not significantly prove the increase in the level of stock market integration following liberalization, when both during and post liberalization integration tests result in one cointegrating vector.

The integration level during and post liberalization periods are the same. It is expected that the level of integration should be greater, following liberalization. This might be contributed to by the 1997 Asian financial crisis. The bad experience of the

23 Kuroda, Haruhiko (2002). "Can Asia be economically integrated?" *World Leader Forum*. New York, U.S.A. 2 October.

financial crisis encountered by the four countries might have awakened them and made them become more cautious, stringent and independent. They emerged to be stronger with improved local and regional mechanisms, which released them from being totally dependent on U.S and world markets. While continuing to integrate with the world markets in the globalization era, those countries managed to control their stock markets and the economy from being badly affected by the U.S. subprime mortgage crisis, unlike the European countries.

These results reveal that the subsequent stock market liberalization is not as sufficiently significant as the first stock market liberalization, in deepening the integration levels of the stock markets in the region and the world. The findings of Ibrahim (2004a) and Ibrahim (2009), however, indicate that there is no long run stock market integration. Both studies include Malaysia, Thailand and South Korea in their analyses of 1988-2003 and 1999-2004, respectively. It seems that the implementation of subsequent stock market liberalization could not promise deeper stock market integration of the Asian and world stock markets.

The results on short-run dynamic interaction, as shown in variance decomposition and impulse response tables in Chapter 7, indicate that the domestic variations are the most significant contributors to variations in the four Asian and world markets. Generally, the domestic variations accounted for 64 percent (Thailand) to 88 percent (world) of fluctuations throughout the full sample period. Even so, the fraction that is accounted for by domestic variations is substantially reduced in the post liberalization period to the range of 38 percent (South Korea) and 76 percent (world). Indonesia's domestic shocks, on the other hand, still had the highest control of 87 percent on its own stock market. Thus, the domestic matters, economically, politically and socially, remain as the major factors determining the performance of the stock

markets. Proper control and management of the local markets would make it easier to control and manage the regional and world market.

Indonesia's shocks, then, became the second contributor to variations in the other Asian and world markets. It contributed from 18 percent (South Korea and world) to 30 percent (Malaysia) of the fluctuations in those countries' stock markets post liberalization period. It is such a great increase compared to during the liberalization period. These results prove that there is a short-run integration between the Asian countries' stock markets, mainly Indonesia's. Stock market fluctuations in Thailand had also been influenced by South Korea and Malaysia by less than 10 percent each during liberalization periods. The relationship among those Asian countries, other than Indonesia, had been declining tremendously, which at the same time, indicates the insignificant short-run integration in the region post liberalization period. Indonesia has been another country to which investors are looking after China. Thus, any matters on the Indonesian stock market should be looked into by the other Asian markets.

Based on coefficient correlation analyses of main indices, short-run relationships between the two Asian countries, especially Malaysia-Indonesia, Malaysia-South Korea, and South Korea-Indonesia, had been improving in the post liberalization period. However, Thailand's relationships with the other three Asian countries had been deteriorating. These results are a little different as compared to the relationships portrayed in variance decomposition analyses. In terms of country stock market returns, South Korea's relationships with the other three Asian countries and the Malaysia-Thailand relationship has been closer.

Based on variance decomposition and impulse response, the short-run dynamic integration between the four Asian countries and the world stock market is also improving recently. The world market becomes the third contributor to stock market

fluctuations in South Korea, Malaysia and Thailand, after Indonesia. In Indonesia, the world market plays significant role in affecting its stock market after its own domestic shocks. The results from coefficient correlation and OLS regression Model 5 in Chapter 7 are consistent with the findings in VAR analyses that the four Asian countries are becoming closely related or integrated with the world market. Being positively related, the growth in the world market would initiate the growth in the region, however, any crisis which affects the world market, such as the U.S. subprime mortgage crisis, would badly affect the region too. Therefore, it is important to identify the factors contributing to the link with the world market and how to go about extricating the link at the time of world crisis.

The full stock market integration among the countries in the region would come together with regional financial cooperation. This would make countries' financial and equity markets stable and strong, and could initiate economic and political balance with the EU and NAFTA. Thus, creation of an ASEAN or Asian currency would also be possible.

## 8.5 Recommendation

There is lack of evidence in the findings of this thesis to prove that subsequent stock market liberalization would be able to improve the stock market returns of a country or a sector; however, this does not mean that there is no relationship between stock market liberalization and stock market returns

There is a possibility that the impact of subsequent stock market liberalization on stock market returns is consistent with the prediction of IAPM, that the liberalization would initiate greater risk sharing and higher net capital inflow, which would reduce a country's cost of capital and, thus, lead to an increase in the country's stock market

index and its returns. However, the results also portray the possibility of subsequent stock market liberalization to generate lower sectoral market returns as experienced by Malaysia in the 1998 liberalization. The economic downturn due to the crisis may be the reason that contributes to the negative impact of the liberalization policy. Therefore, it is suggested to add country specific economic activity such as GDP or Industrial Production Index (IPI) into the analyses. This thesis could not add in such variables due to the unavailability of the data on a weekly basis..

The results also portray the possibility of subsequent stock market liberalization to produce insignificant results. Therefore, the authorities should analyze in detail the country, sector, percentage change in foreign ownership and impact of other variables such as stock market characteristics and macroeconomic fundamentals before deciding on the policy. The results reveal the importance of those factors in determining the effectiveness of the liberalization policy in generating higher stock returns.

The government authorities of emerging countries, especially in Asia, are recommended to also focus on other measures which may produce greater and certain outcome. Trade liberalization and other financial reforms may be more effective in generating better stock market performances as well as integration of the Asian countries. Therefore, further studies on the impact of trade liberalization and other financial reforms on stock market returns are recommended.

The results reveal that the stock markets of Malaysia, Thailand, Indonesia, South Korea and the world are found to be integrated in the long-run for the full thirteen-year period and even during and post liberalization periods. However, implementing further stock market liberalizations might not be effective enough in improving the integration level of the stock markets. The results of the findings also imply that the international

portfolio diversification benefits become less relevant in these four Asian markets in the long-run.

Other financial measures should be in place, instead of the subsequent stock market liberalization, if the objectives of having regional and world integrations are to be achieved in order to enhance financial cooperation and financial stability. Thus, further studies on the determinants of stock market integration are recommended. Due to the negative impact of the U.S. subprime mortgage crisis on the European economy and its financial markets, countries try to be isolated from the U.S. and the world markets. Indeed, France and Germany had also been demanding a tough new regulation for global finance at G20 in April, 2009, instead of demanding the deregulation of global finance in order to avoid a repeat of the financial crisis. As a result, there is a question whether the countries should integrate with each other or should they not. Therefore, getting to know the factor(s) that play significant roles in integrating and segmenting markets would be a great advantage, which should be explored further.

The international portfolio diversification benefits in these four Asian markets, however, might be limited in the short-run since there are substantial short-run dynamic interactions among the four Asian and the world markets. Post liberalization period, Indonesia and world markets have big influenced on the stock market fluctuations of Malaysia, South Korea and Thailand. Therefore, the Indonesian market has less potential for short-run diversification when compared to the other three Asian countries'. It is suggested to explore further the factors that contribute to greater interaction with the Indonesia market and factors that contribute to lesser interaction with the Malaysia, South Korea and Thailand markets.

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SUPPLEMENTARY

*1.* List of Publications and Papers Presented

Publications

1. Noor Azryani Auzairy, Rubi Ahmad, Catherine S F Ho, Ros Zam Zam (2012). Integration of Asian Stock Markets, *World Academy of Science, Engineering and Technology*, vol 72, no 112, pp: 625-631.

   http://www.waset.org/journals/waset/v72/v72-112.pdf
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2. Noor Azryani Auzairy, Rubi Ahmad, Catherine S F Ho (2011). Stock Market Deregulation, Macroeconomic Variables and Stock Market Performances, *International Journal of Trade, Economics and Finance,* vol 2, no 6, pp: 495-500.

   ISSN: 2010-023X
   http://www.ijtef.org/papers/155-W10046.pdf
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3. Noor Azryani Auzairy, Rubi Ahmad (2009). The Impact of Subsequent Stock Market Liberalization on the Integration of Stock Markets in ASEAN-4 + South Korea, *World Academy of Science, Engineering and Technology*, vol 34, no 63, pp: 348-359.

Conferences

1. International Conference on Business, Banking and Finance – WASET 2012
   December 6 – 7, 2012, Penang, Malaysia
   Paper title: Relationship and Integration of Asian Stock Markets

2. International Conference on Financial Management and Economics – ICFME 2011
   July 2 – 3, 2011, Hong Kong
   Paper title: The Impact of Stock Market Liberalization and Macroeconomic Variables on Stock Market Performances

International Proceeding of Economic Development and Research: Financial Management and Economics, ISSN: 2010-4626 (Indexed by Thompson ISI Proceedings)

3. International Accounting & Finance Conference 2010
   December 8 – 9, 2010, Kota Kinabalu, Sabah, Malaysia
   Paper title: The Impact of Subsequent Stock Market Liberalization on Malaysia Stock Market Returns

4. 12th Malaysian Finance Association Conference
   June 8 – 10, 2010, Sunway, Selangor, Malaysia
   Doctoral Colloquium
   Paper title: The Impact of Subsequent Stock Market Liberalization

5. WCKS 2009: World Congress on the Knowledge Society
   October 28-30, 2009, Venice, Italy
   Paper title: The Impact of Subsequent Stock Market Liberalization on the Integration of Stock Markets in ASEAN-4 + South Korea

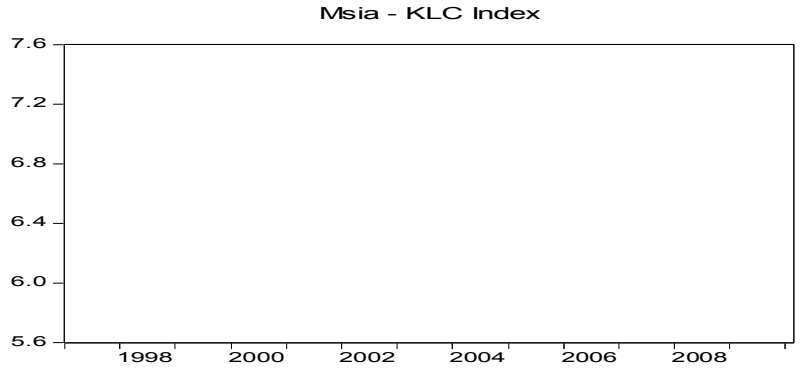
Poster

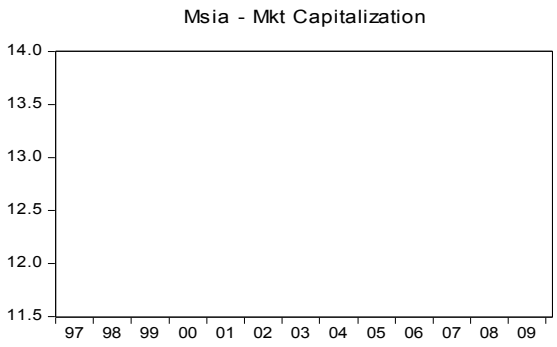
Poster Competition 2013 – FEP, UKM (Bronze)
23-25 April, 2013
Poster title: Stock Market Liberalization and Returns in Asia: Evidence from Malaysia, Thailand, Indonesia and South Korea

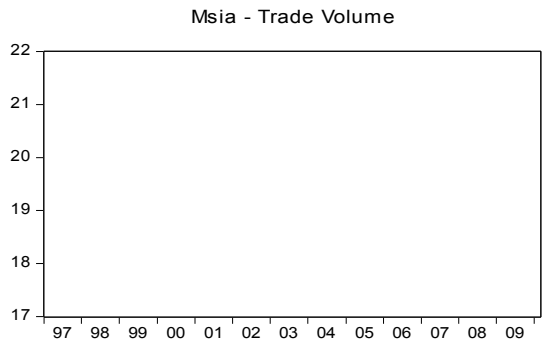
2. Appendices

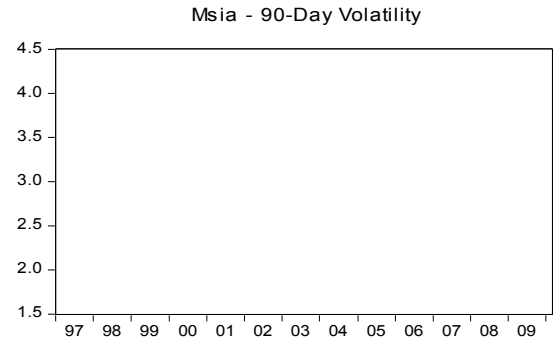
Appendix 4- 1: Malaysia, Thailand, Indonesia and South Korea Stock Price Indices (Jan 1997 – Dec 2009)

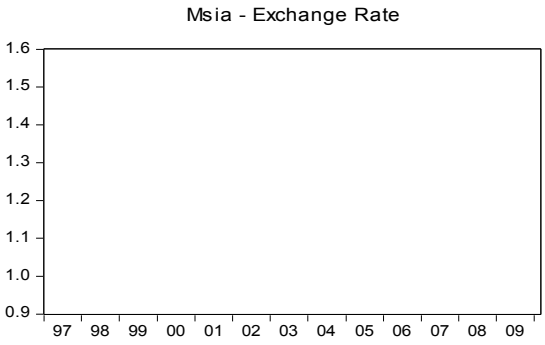
Appendix 4- 2: Weekly Time Series of Malaysia's Variables (Jan 1997 – Dec 2009)

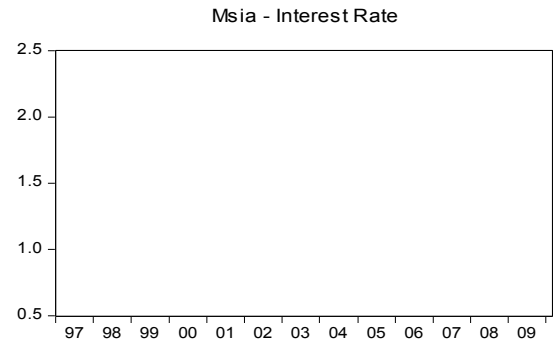




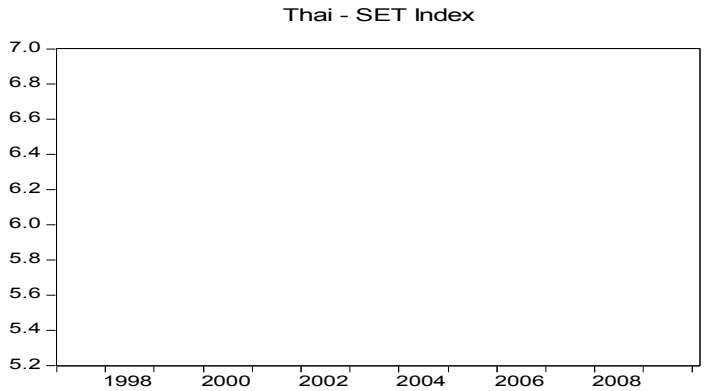



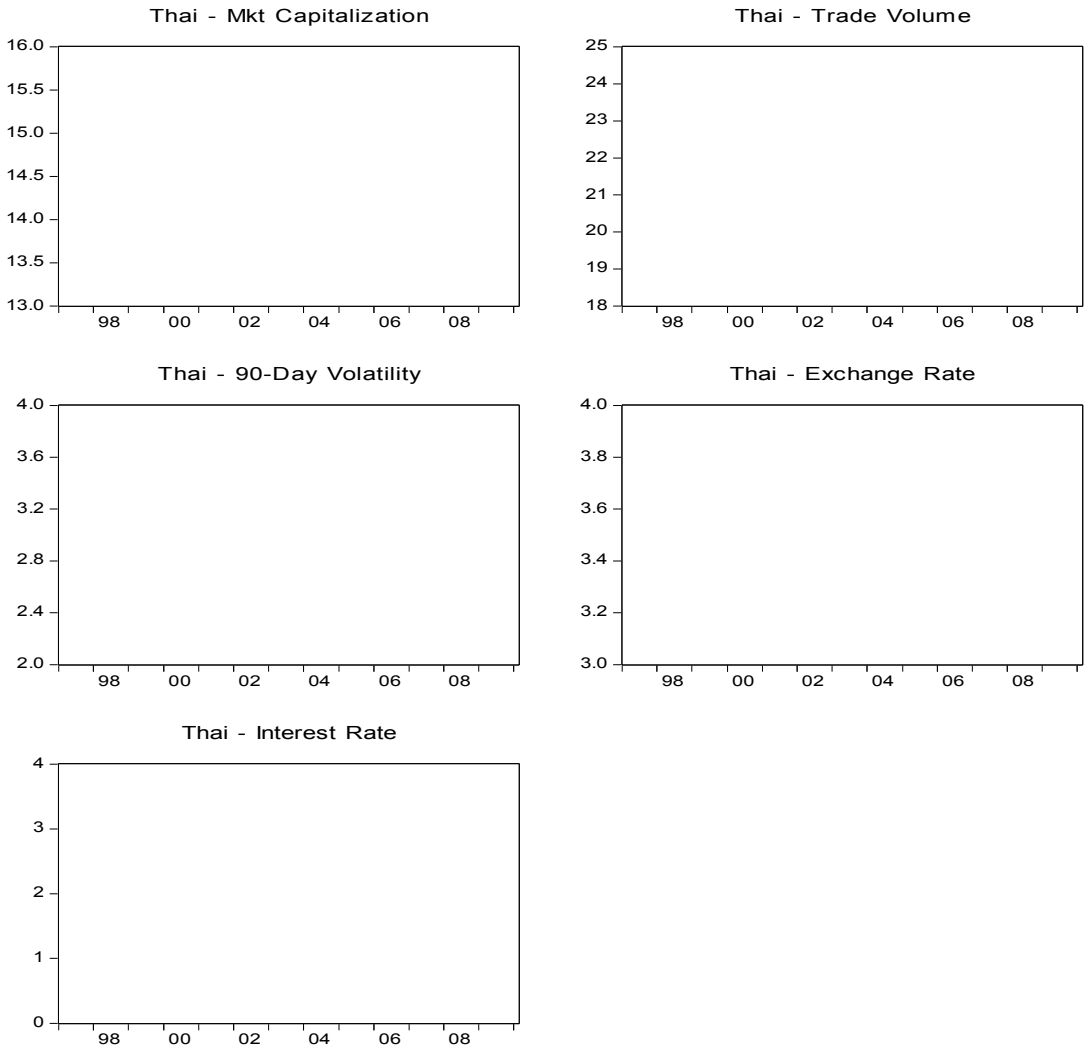



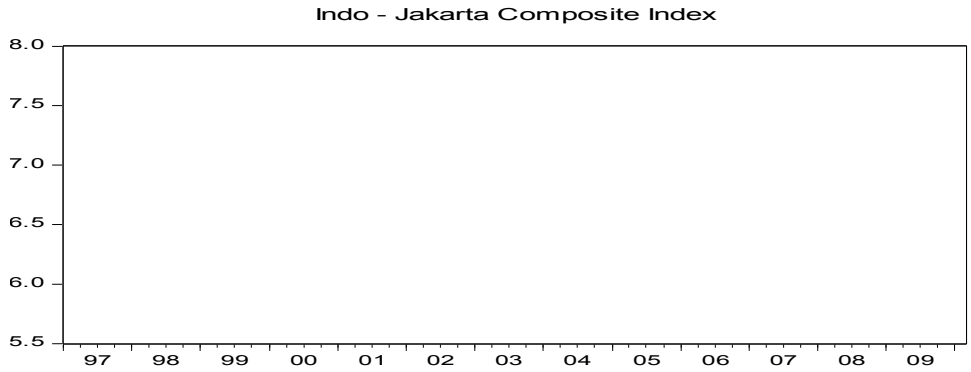



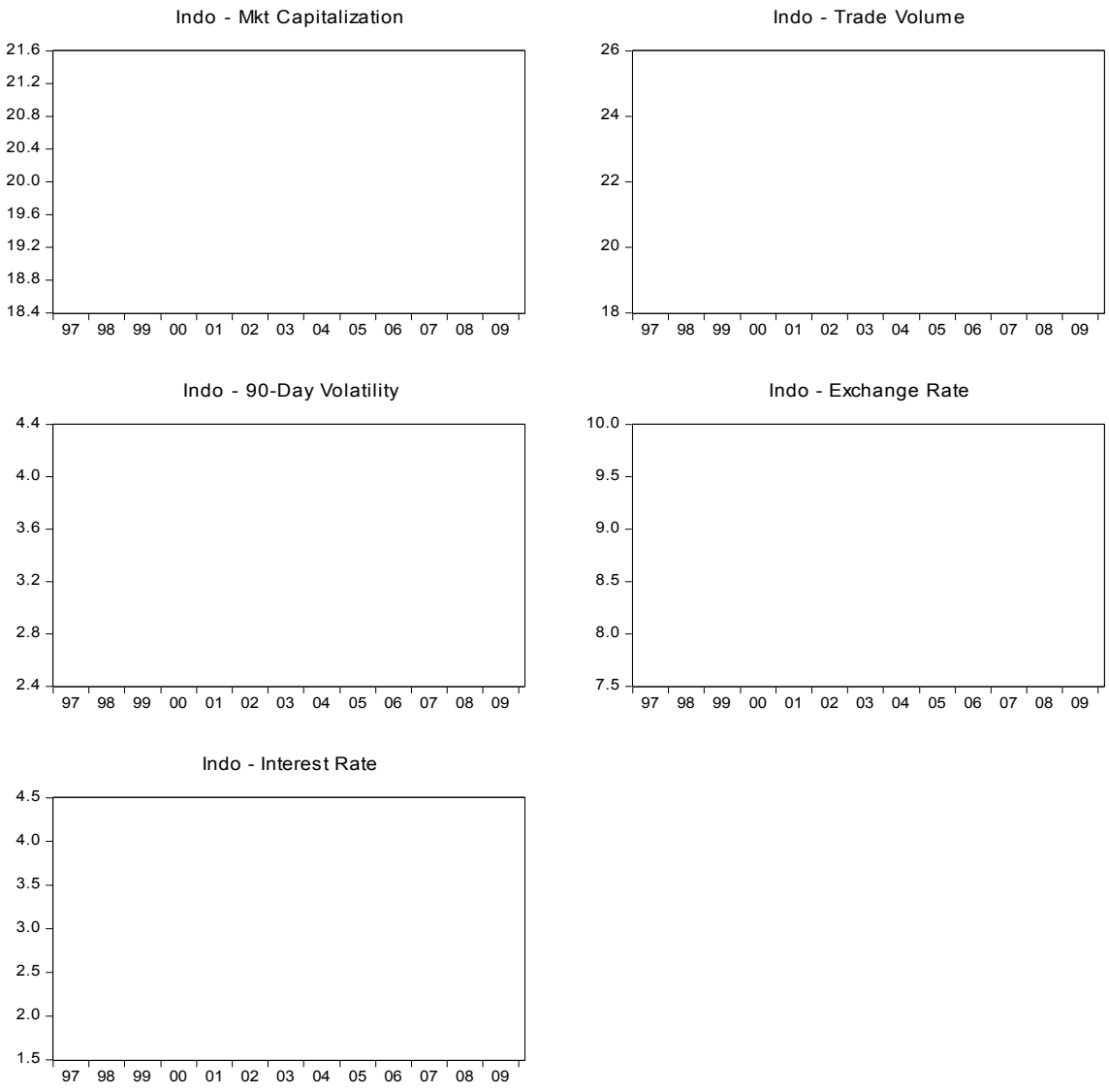

Appendix 4- 3: Weekly Time Series of Thailand's Variables in Log (Jan 1997 – Dec 2009)



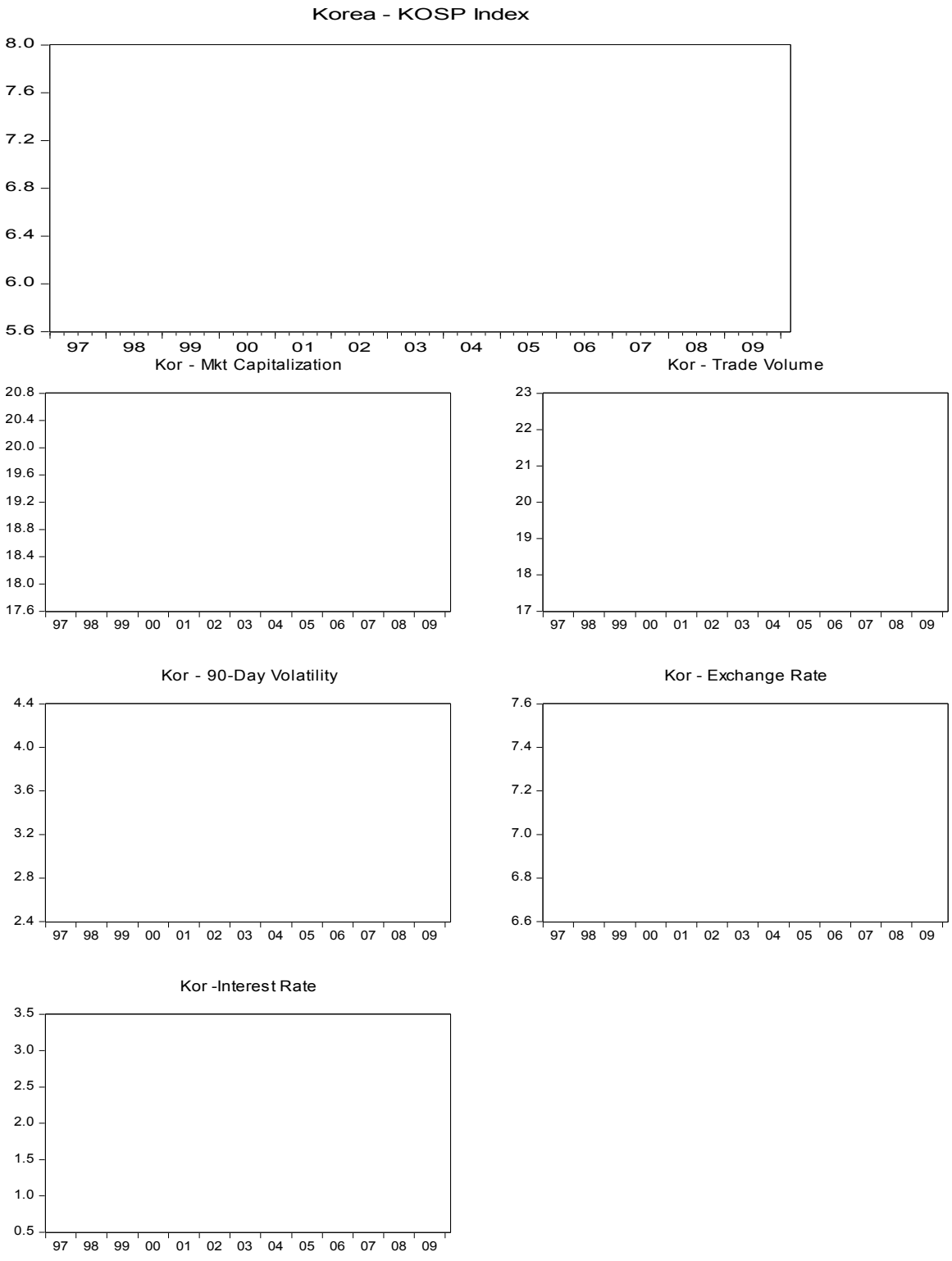



Appendix 4- 4: Weekly Time Series of Indonesia's Variables in Log
(Jan 1997 – Dec 2009)

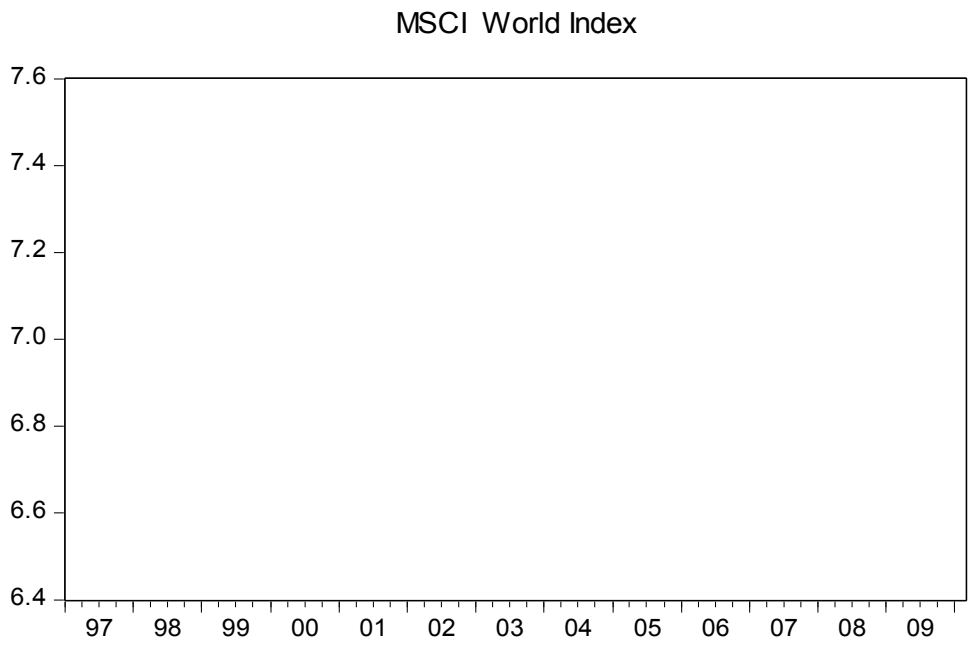


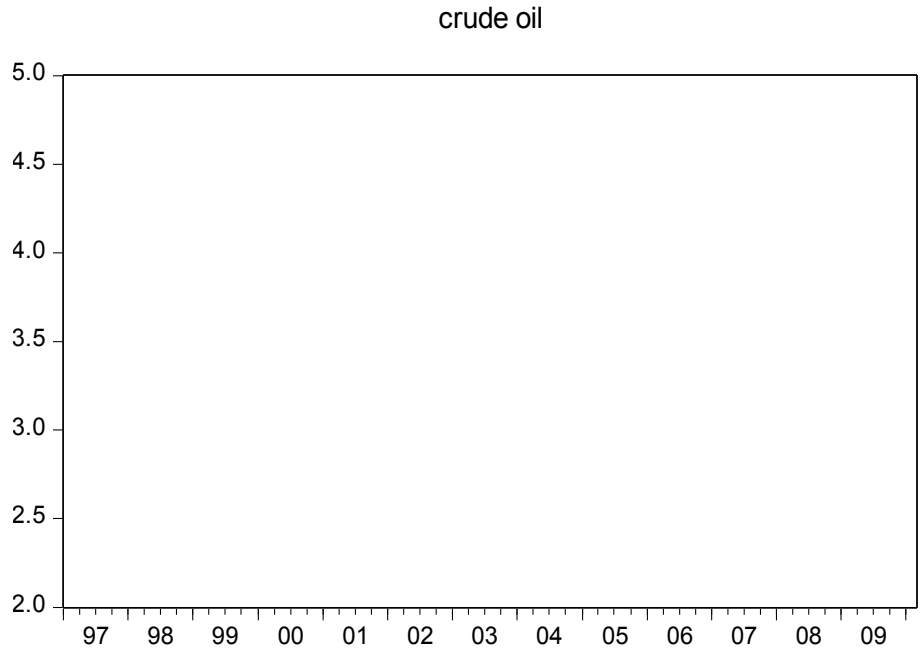



Appendix 4- 5: Weekly Time Series of South Korea's Variables in Log
(Jan 1997 – Dec 2009)

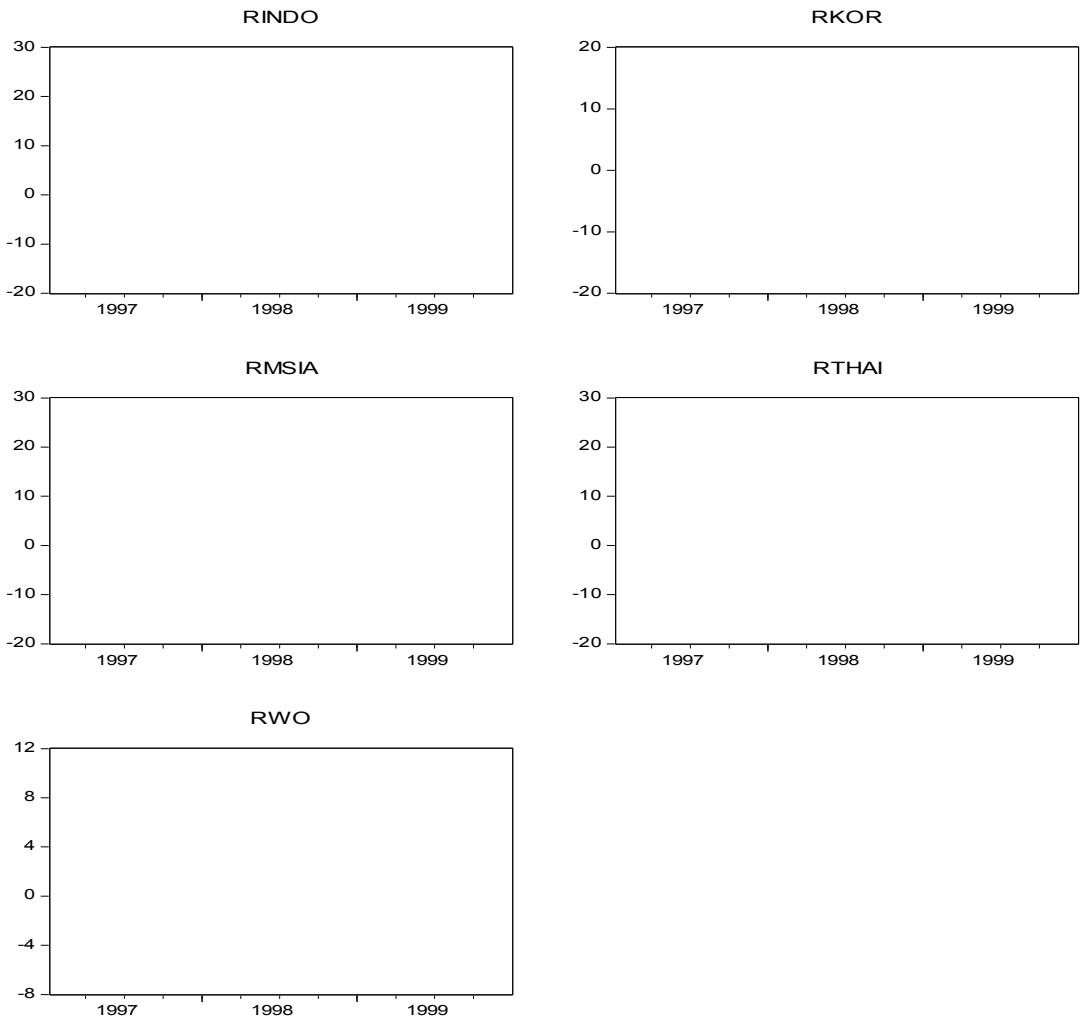



Appendix 4- 6: Weekly Time Series of World's Variables in Log (Jan 1997 – Dec 2009)



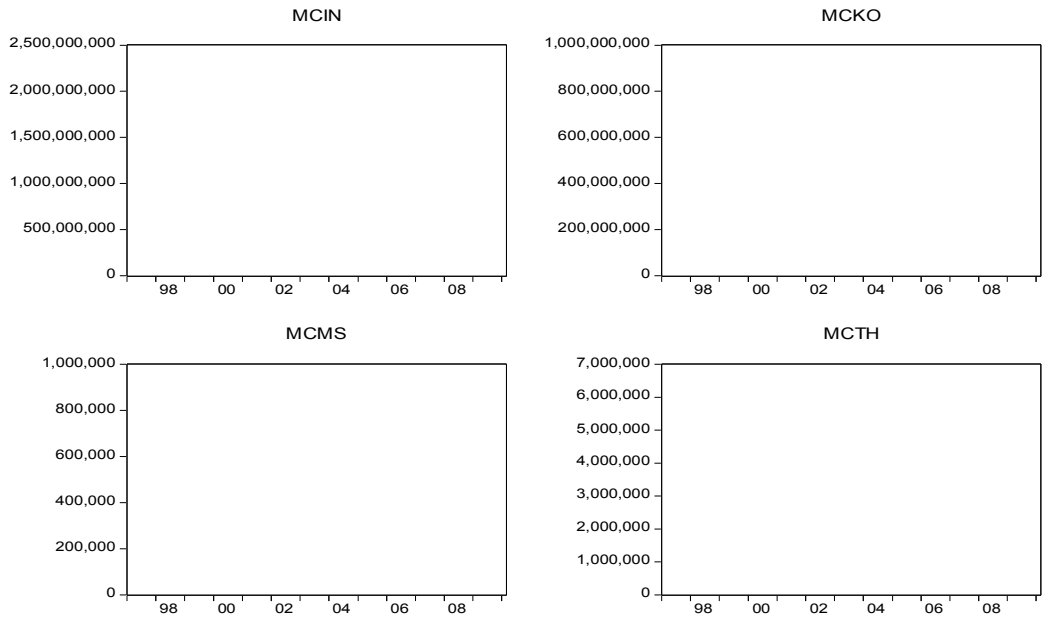




Appendix 4- 7: Weekly Countries' Stock Market Returns (Jan 1997 – Dec 2009)



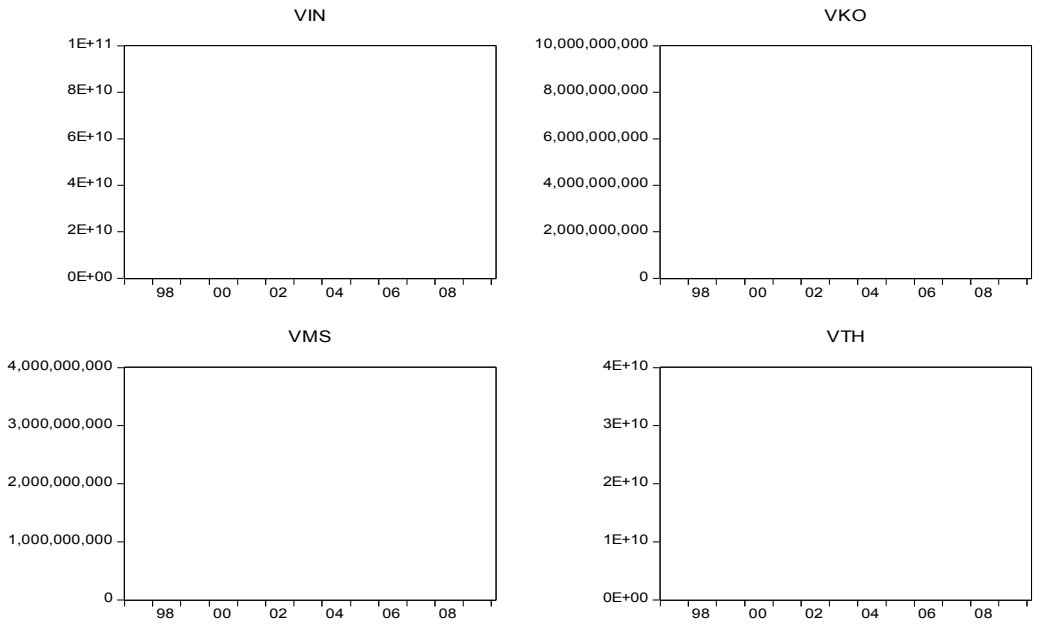

Note. RINDO: Indonesia's stock market returns; RKOR: South Korea's stock market returns; RMSIA: Malaysia's stock market returns; RTHAI: Thailand's stock market returns; RWO: World's stock market returns

Appendix 4- 8: Countries' Stock Market Size: Weekly Stock Market Capitalization (Jan 1997 – Dec 2009)



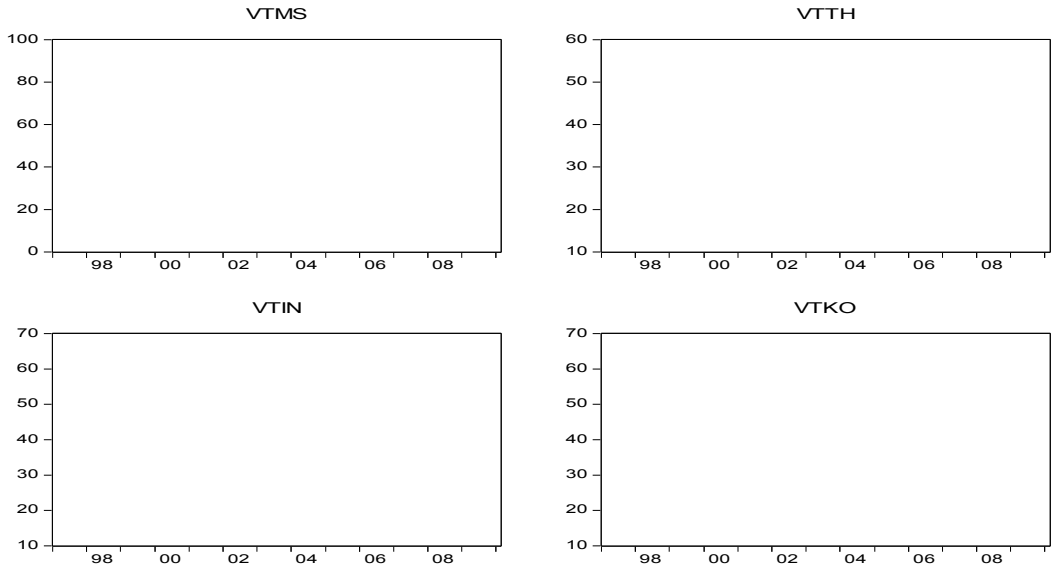

Note: MCIN: maket capitalization for Indonesia, MCKO: market capitalization for South Korea, MCMS: market capitalization for Malaysia, MCTH: market capitalization for Thailand

## Appendix 4- 9: Countries' Stock Market Liquidity: Weekly Traded Volume (Jan 1997 to Dec 2009)



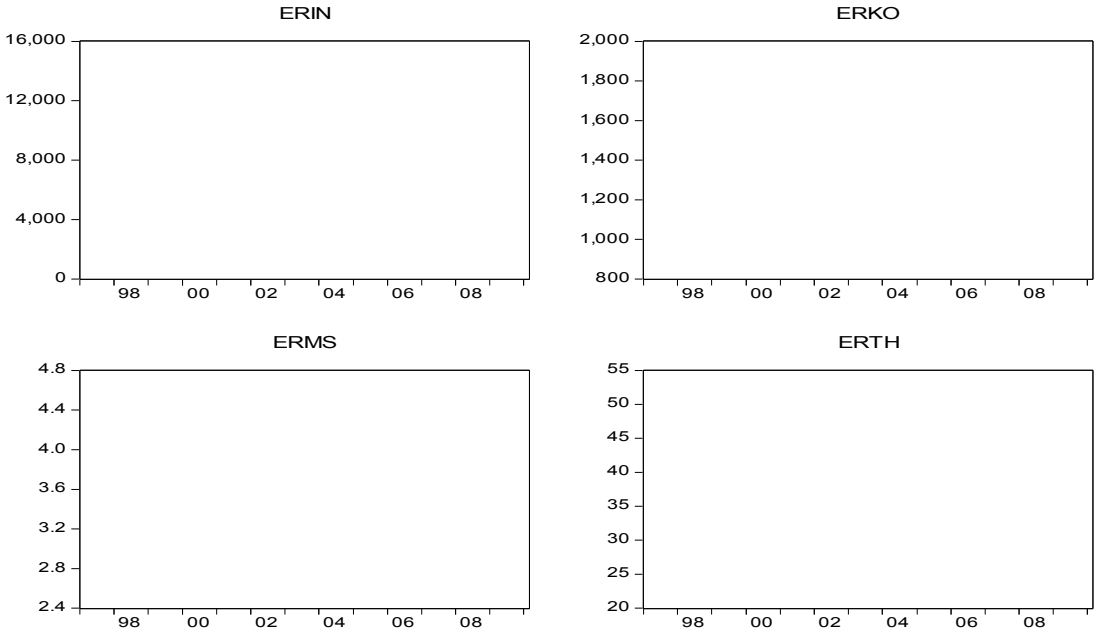

Note: VIN: trade volume for Indonesia, VKO: trade volume for South Korea, VMS: trade volume for Malaysia, VTH: trade volume for Thailand

## Appendix 4- 10: Countries' Stock Market Volatility: Weekly 90-day volatility (Jan 1997-Dec 2009)



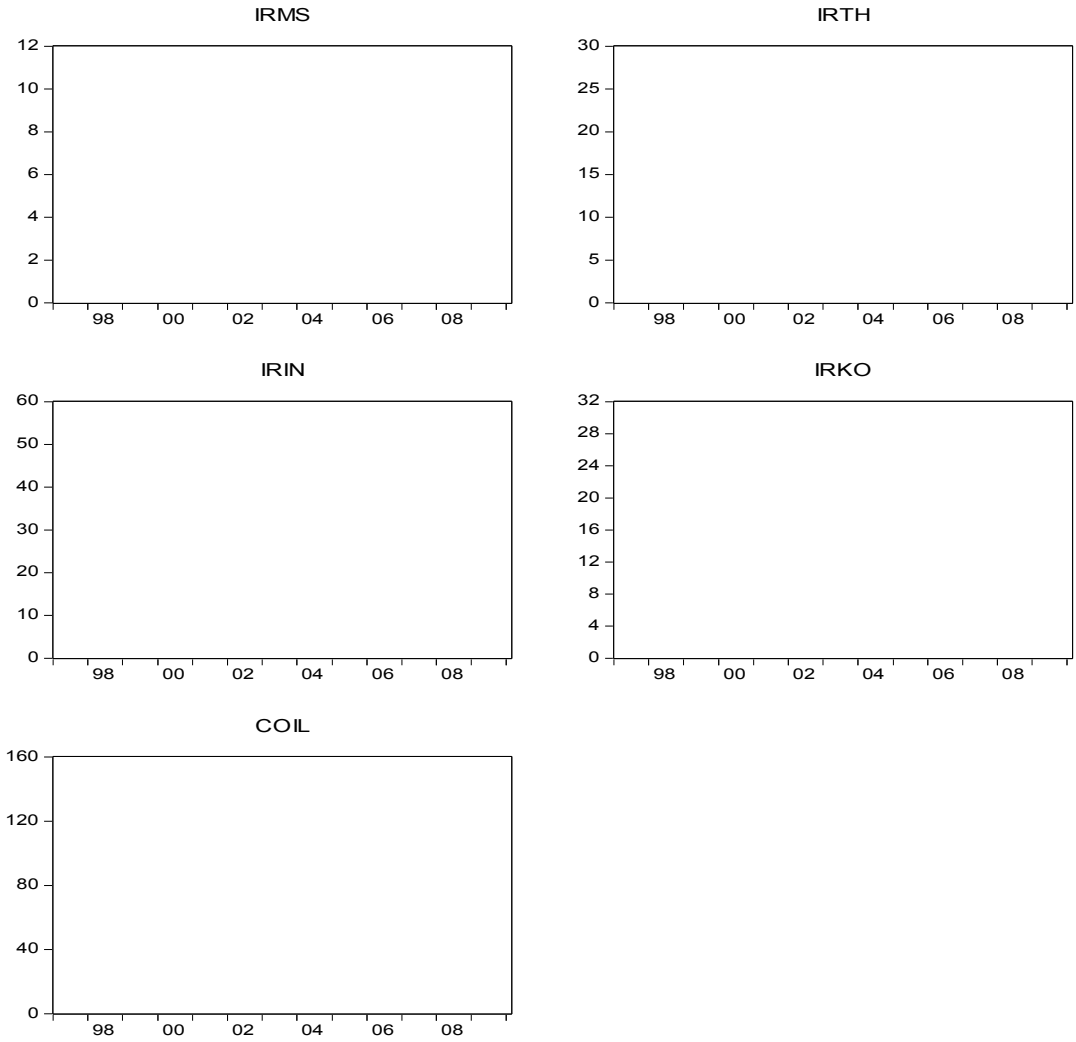

Note: VTMS: volatility in Malaysia, VTTH: volatility in Thailand, VTIN: volatility in Indonesia, and VTKO: volatility in South Korea

Appendix 4- 11: Countries' Exchange Rates (Jan 1997 - Dec 2009)




Note: ERIN: Indonesia's exchange rate, ERKO: South Korea's exchange rate, ERMS: Malaysia's exchange rate, ERTH: Thailand's exchange rate

Appendix 4- 12: Countries' Interest Rates and Oil Price (Jan 1997 – Dec 2009)




Note: IRMS: Malaysia's interest rate, IRTH: Thailand's interest rate, IRIN: Indonesia's interest rate, IRKO: South Korea's interest rate, COIL: crude oil price

Appendix 4- 13: Descriptive Statistics & Normality Test of Stock Market Size

| | Indo 97 | Thai 97 | Kor 97 | Msia 98 | Indo 99 | Kor 99 | Msia 03 | Msia 05 |
|---|---|---|---|---|---|---|---|---|
| Mean | 19.017 | 14.055 | 18.270 | 12.331 | 19.264 | 19.256 | 12.622 | 12.941 |
| Median | 19.003 | 14.089 | 18.300 | 12.347 | 18.986 | 19.329 | 12.634 | 12.941 |
| Maximum | 19.380 | 14.492 | 18.586 | 12.551 | 19.958 | 19.450 | 12.726 | 13.003 |
| Minimum | 18.743 | 13.683 | 17.919 | 12.027 | 18.872 | 18.939 | 12.536 | 12.903 |
| Std. Dev. | 0.178 | 0.233 | 0.178 | 0.159 | 0.392 | 0.171 | 0.071 | 0.026 |
| Skewness | 0.497 | -0.063 | -0.317 | -0.294 | 0.556 | -0.369 | 0.050 | 0.656 |
| Kurtosis | 2.450 | 1.920 | 2.253 | 1.879 | 1.596 | 1.627 | 1.367 | 3.032 |
| Jarque-Bera | 1.345 | 1.231 | 1.001 | 1.667 | 3.341 | 2.532 | 2.790 | 1.795 |
| Probability | 0.510 | 0.540 | 0.606 | 0.434 | 0.188 | 0.282 | 0.248 | 0.408 |

Appendix 4- 14: Descriptive Statistics & Normality Test of Stock Market Liquidity

| | Indo 97 | Thai 97 | Kor 97 | Msia 98 | Indo 99 | Kor 99 | Msia 03 | Msia 05 |
|---|---|---|---|---|---|---|---|---|
| Mean | 20.884 | 19.223 | 19.616 | 21.190 | 21.060 | 19.667 | 19.400 | 19.566 |
| Median | 20.837 | 19.232 | 19.804 | 20.772 | 21.060 | 19.513 | 19.464 | 19.559 |
| Maximum | 21.376 | 19.771 | 20.461 | 22.946 | 21.406 | 20.845 | 20.333 | 19.792 |
| Minimum | 20.189 | 18.683 | 18.121 | 19.858 | 20.551 | 18.675 | 18.469 | 19.227 |
| Std. Dev. | 0.266 | 0.315 | 0.555 | 0.986 | 0.244 | 0.512 | 0.490 | 0.153 |
| Skewness | -0.204 | 0.040 | -0.898 | 0.276 | -0.464 | 0.457 | -0.155 | -0.574 |
| Kurtosis | 3.400 | 2.033 | 3.385 | 1.727 | 2.371 | 2.823 | 2.389 | 2.756 |
| Jarque-Bera | 0.340 | 0.980 | 3.518 | 2.006 | 1.308 | 0.903 | 0.489 | 1.436 |
| Probability | 0.844 | 0.613 | 0.172 | 0.367 | 0.520 | 0.637 | 0.783 | 0.488 |

Appendix 5-1: Stock Market Liberalization and Stock Market Returns, Controlling for the Effects of Stock Market Characteristics and Macroeconomic Fundamentals in OLS Regression Model 1 (T±26 Week Event Window)

| | Indo 9/97 | Thai 10/97 | Korea 12/97 | Msia 4/98 | Indo 3/99 | Korea 7/99 | Msia 6/03 | Msia 4/05 |
|---|---|---|---|---|---|---|---|---|
| C | 0.027 | -0.446 | -0.368 | **0.982 | 1.070 | ***-0.500 | *-0.092 | -0.012 |
| | *0.970* | *0.193* | *0.523* | *0.046* | *0.157* | *0.001* | *0.085* | *0.842* |
| Lib | 0.298 | 0.341 | 0.279 | -0.810 | -0.224 | -0.031 | 0.073 | -0.123 |
| | *0.893* | *0.445* | *0.697* | *0.133* | *0.802* | *0.884* | *0.334* | *0.325* |
| Size | **-19.740 | ***72.650 | *** 87.000 | *** 106.000 | *** 54.000 | *** 98.300 | *** 99.900 | *** 83.500 |
| | *0.038* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| Liq | -0.583 | 0.140 | 0.370 | ***2.160 | 1.748 | -0.410 | 0.161 | 0.190 |
| | *0.823* | *0.797* | *0.619* | *0.003* | *0.103* | *0.112* | *0.132* | *0.120* |
| Vol | -0.064 | **12.7280 | -2.897 | 0.251 | 5.772 | *-5.251 | 1.985 | 0.011 |
| | *0.998* | *0.046* | *0.799* | *0.939* | *0.586* | *0.088* | *0.161* | *0.995* |
| ER | -5.523 | -5.438 | 6.287 | 2.670 | -9.309 | 0.505 | -183.939 | -16.553 |
| | *0.737* | *0.219* | *0.483* | *0.748* | *0.529* | *0.967* | *0.803* | *0.605* |
| IR | -14.336 | 0.332 | 2.281 | -1.234 | 14.363 | 2.734 | -1.568 | 14.615 |
| | *0.144* | *0.483* | *0.157* | *0.857* | *0.461* | *0.443* | *0.321* | *0.142* |
| Oil | 8.236 | 5.887 | -3.891 | 0.627 | **-23.04 | 3.858 | ***-2.470 | -0.232 |
| | *0.778* | *0.284* | *0.598* | *0.835* | *0.047* | *0.330* | *0.007* | *0.807* |
| Rs | 0.135 | 0.962 | 0.834 | 0.958 | 0.727 | 0.987 | 0.982 | 0.809 |
| Adj Rs | -0.003 | 0.956 | 0.807 | 0.951 | 0.684 | 0.985 | 0.979 | 0.779 |

Note: Regression model 1 as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it}$ where $R_{it}$ is the market returns of main index of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Event window is T-26 to T+26 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+26 week of stock market liberalization and ends; $\mu_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated.

Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.

Probabilities of t-statistics are in italic.

*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

Appendix 5- 2: Stock Market Liberalization and Stock Market Returns, Controlling for the Effects of Stock Market Characteristics and Macroeconomic Fundamentals in OLS Regression Model 1 (Dummy 1: T-4 to T+26)

| | Indo 9/97 | Thai 10/97 | Korea 12/97 | Msia 4/98 | Indo 3/99 | Korea 7/99 | Msia 6/03 | Msia 4/05 |
|---|---|---|---|---|---|---|---|---|
| C | 0.304 | -0.493 | -0.423 | *0.943 | 0.961 | ***-0.499 | -0.061 | -0.002 |
| | *0.654* | *0.127* | *0.449* | *0.099* | *0.240* | *0.001* | *0.185* | *0.983* |
| Lib | -0.293 | 0.366 | 0.351 | -0.669 | 0.079 | -0.036 | 0.014 | -0.125 |
| | *0.899* | *0.378* | *0.638* | *0.280* | *0.937* | *0.863* | *0.821* | *0.443* |
| Size | **-19.720 | ***72.407 | ***87.110 | ***105.800 | ***53.790 | ***98.362 | ***100.140 | ***82.878 |
| | *0.039* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| Liq | -0.625 | 0.143 | 0.376 | 2.131 | 1.753 | -0.412 | 0.147 | 0.191 |
| | *0.817* | *0.861* | *0.612* | *0.004* | *0.104* | *0.115* | *0.133* | *0.123* |
| Vol | 1.255 | **13.347 | -2.889 | 0.322 | 5.986 | *-5.226 | 2.134 | 0.037 |
| | *0.965* | *0.042* | *0.798* | *0.925* | *0.577* | *0.082* | *0.162* | *0.983* |
| ER | -4.991 | -5.475 | 6.164 | 2.637 | -9.396 | 0.398 | -175.553 | -16.92 |
| | *0.760* | *0.338* | *0.489* | *0.751* | *0.524* | *0.974* | *0.813* | *0.610* |
| IR | *-14.650 | **0.351 | 2.258 | -0.642 | 15.970 | 2.770 | -1.689 | 14.768 |
| | *0.097* | *0.036* | *0.157* | *0.929* | *0.412* | *0.441* | *0.257* | *0.145* |
| Oil | 6.881 | 5.335 | -3.705 | -0.310 | *-24.085 | 3.860 | ***-2.474 | -0.229 |
| | *0.815* | *0.362* | *0.631* | *0.923* | *0.054* | *0.330* | *0.008* | *0.813* |
| Rs | 0.135 | 0.493 | 0.834 | 0.957 | 0.727 | 0.987 | 0.981 | 0.809 |
| Adj Rs | -0.003 | 0.413 | 0.808 | 0.951 | 0.683 | 0.985 | 0.978 | 0.779 |

Note: Regression model 1 as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it}$ where $R_{it}$ is the market returns of main index of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Event window is T-26 to T+26 weeks. T is the implementation week. It takes a value of 1 from T-4 to T+26 week of stock market liberalization and ends; $\mu_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated.

Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.

Probabilities of t-statistics are in italic.

*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

Appendix 6- 1: Stock Market Liberalization and Sectoral Market Returns, Controlling for the Effects of Stock Market Characteristics and Macroeconomic Fundamentals in OLS Regression Model 1 (T±26 Week Event Window)

| | Indo 9/97 | Thai 10/97 | Korea 12/97 | Msia 4/98 | Indo 3/99 | Korea 7/99 | Msia 6/03 | Msia 4/05 |
|---|---|---|---|---|---|---|---|---|
| C | 0.340 | -0.890 | -0.368 | 1.149 | 0.924 | -0.379 | -0.039 | -0.116 |
| | *0.666* | *0.680* | *0.523* | *0.470* | *0.442* | *0.784* | *0.760* | *0.238* |
| Lib | 0.568 | 1.398 | 0.279 | **-3.877 | 1.104 | 0.954 | -0.069 | -0.008 |
| | *0.793* | *0.646* | *0.697* | *0.048* | *0.397* | *0.632* | *0.711* | *0.959* |
| Size | nil | nil | *** 87.031 *0.000* | nil | nil | nil | *** 108.539 *0.000* | *** 94.161 *0.000* |
| Liq | -0.846 | 2.544 | 0.370 | ***3.634 | 2.158 | 0.766 | 0.046 | -0.066 |
| | *0.658* | *0.369* | *0.619* | *0.006* | *0.112* | *0.574* | *0.870* | *0.583* |
| Vol | -0.220 | 3.331 | -2.897 | *-4.865 | **4.559 | -0.299 | -0.220 | *0.333 |
| | *0.938* | *0.400* | *0.799* | *0.067* | *0.015* | *0.909* | *0.292* | *0.072* |
| ER | -3.542 | -32.377 | 6.287 | *** -102.796 | *-47.980 | -141.922 | -1956.631 | -48.416 |
| | *0.843* | *0.457* | *0.483* | *0.000* | *0.055* | *0.133* | *0.185* | *0.341* |
| IR | -14.348 | 0.972 | 2.281 | -38.351 | 10.450 | *-54.701 | 2.822 | -7.663 |
| | *0.137* | *0.881* | *0.157* | *0.200* | *0.653* | *0.089* | *0.606* | *0.777* |
| Oil | 21.935 | 24.388 | -3.891 | -2.693 | *-25.202 | **55.018 | -1.471 | -1.646 |
| | *0.495* | *0.434* | *0.598* | *0.860* | *0.093* | *0.012* | *0.465* | *0.186* |
| Rs | 0.078 | 0.088 | 0.834 | 0.544 | 0.376 | 0.238 | 0.789 | 0.920 |
| Adj Rs | -0.045 | -0.034 | 0.807 | 0.483 | 0.293 | 0.137 | 0.755 | 0.907 |
| Prob(F-stat) | 0.702 | 0.634 | *0.000* | 0.000 | 0.001 | 0.047 | *0.000* | *0.000* |

Note: Regression model 1 as $R_{it} = \alpha_4 + \beta_1 Lib_{it} + \beta_2 Size_i + \beta_3 Liq_i + \beta_4 Vol_i + \beta_5 ER_i + \beta_6 IR_i + \beta_7 Oil_i + \mu_{it}$ where $R_{it}$ is the sectoral market returns of country *i* at time *t*; $Lib_{it}$ is a dummy variable for stock market liberalization. Event window is T-26 to T+26 weeks. T is the implementation week. It takes a value of 1 from T-1 to T+26 week of stock market liberalization and ends; $\mu_{it}$ is independently distributed random error term with zero mean and constant variance*;* $\alpha_4$ and $\beta_1 \ldots \beta_7$ are the parameters to be estimated. Data is stationary with adjusted standard errors: HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000) for regression estimation with serial correlation and heteroskedasticity problems; Newey-West HAC standard errors & covariance (lag truncation=2) for regression estimation with serial problem only; and White Heteroskedasticity-consistent standard errors & covariance for regression estimation with heteroskedasticity problem only.

nil = data not available

Probabilities of t-statistics are in italic.

*, **, and *** indicate significant difference at 10, 5 and 1 percent levels, respectively.

Appendix 7- 1:Johansen Cointegration Tests of the World, South Korea, Malaysia, Thailand and Indonesia in Three-Year Periods

Johansen Cointegration (1998-2000)

| Hypothesized No. of CE(s) | Trace Statistic | Prob.** | Max-Eigen Statistic | Prob.** |
|---|---|---|---|---|
| None | 34.4453 | 0.4776 | 25.8958 | 0.0809 |
| At most 1 | 16.1112 | 0.7044 | 14.8185 | 0.3018 |
| At most 2 | 6.88714 | 0.5908 | 7.35882 | 0.4476 |
| At most 3 | 2.5039 | 0.1136 | 2.81509 | 0.0934 |

Trace test indicates no cointegration at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level

Johansen Cointegration (2001-2003)

| Hypothesized No. of CE(s) | Trace Statistic | Prob.** | Max-Eigen Statistic | Prob.** |
|---|---|---|---|---|
| None | 34.4453 | 0.4776 | 18.3342 | 0.4675 |
| At most 1 | 16.1112 | 0.7044 | 9.22406 | 0.8139 |
| At most 2 | 6.88714 | 0.5908 | 4.38323 | 0.8168 |
| At most 3 | 2.5039 | 0.1136 | 2.5039 | 0.1136 |

Trace test indicates no cointegration at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level

Johansen Cointegration (2004-2006)

| Hypothesized No. of CE(s) | Trace Statistic | Prob.** | Max-Eigen Statistic | Prob.** |
|---|---|---|---|---|
| None | 31.3708 | 0.6465 | 15.668 | 0.6938 |
| At most 1 | 15.7029 | 0.733 | 7.76419 | 0.9176 |
| At most 2 | 7.93866 | 0.472 | 7.09685 | 0.4778 |
| At most 3 | 0.84182 | 0.3589 | 0.84182 | 0.3589 |

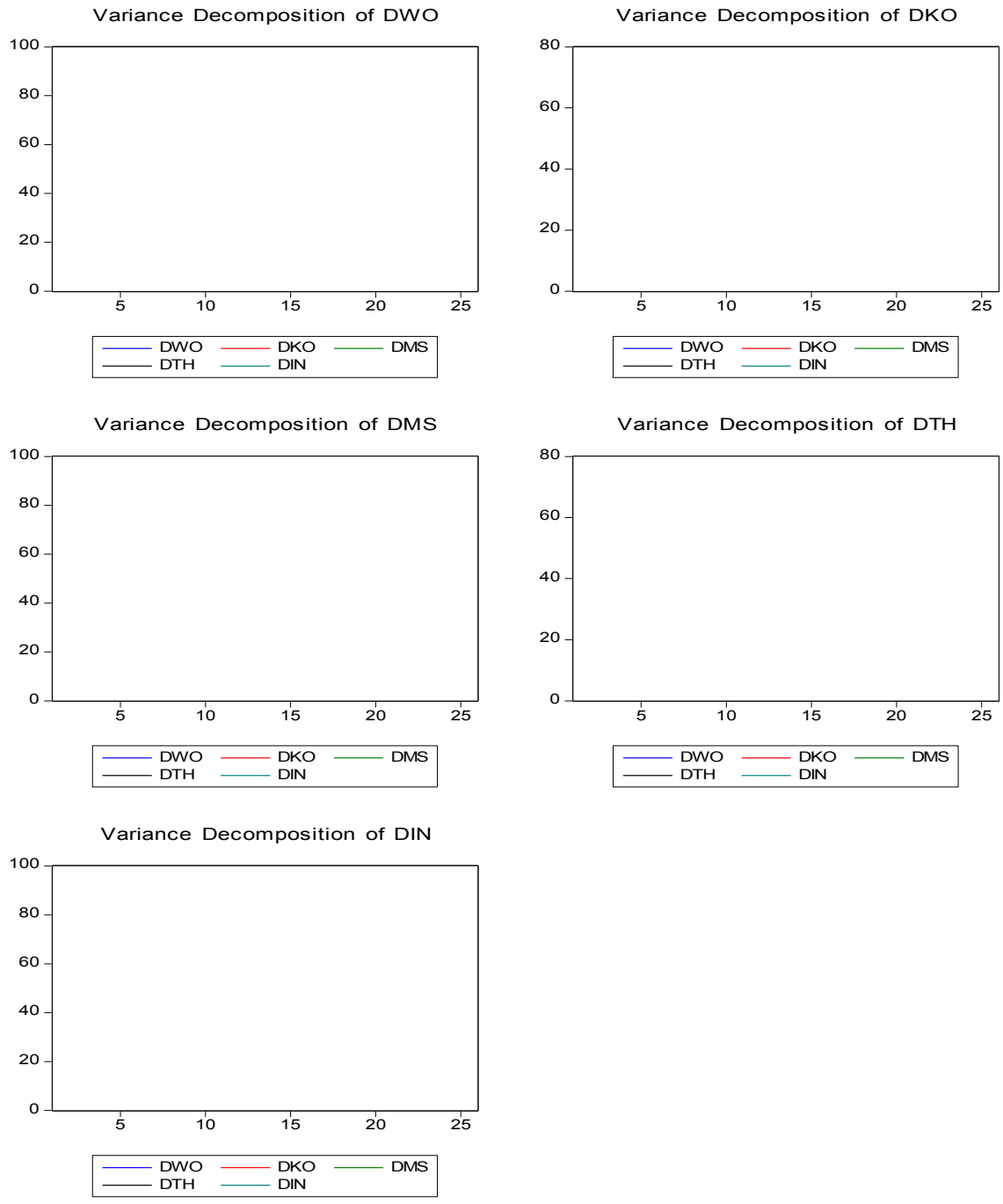
Trace test indicates no cointegration at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level

Johansen Cointegration (2007-2009)

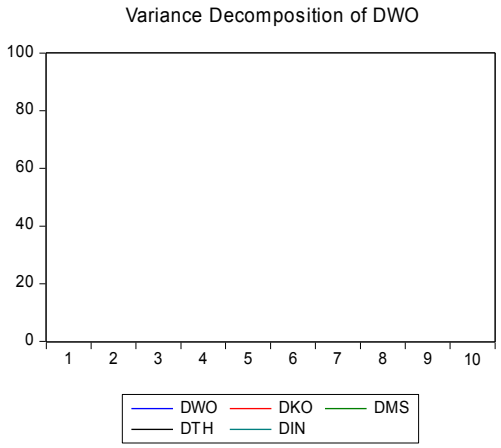
| Hypothesized No. of CE(s) | Trace Statistic | Prob.** | Max-Eigen Statistic | Prob.** |
|---|---|---|---|---|
| None | 38.6931 | 0.2727 | 16.3509 | 0.6358 |
| At most 1 | 22.3422 | 0.2799 | 15.1316 | 0.2798 |
| At most 2 | 7.2106 | 0.5533 | 5.51023 | 0.6765 |
| At most 3 | 1.70036 | 0.1922 | 1.70036 | 0.1922 |

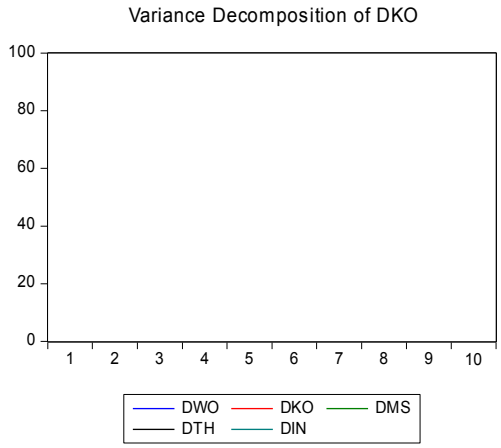
Trace test indicates no cointegration at the 0.05 level
Max-eigenvalue test indicates no cointegration at the 0.05 level

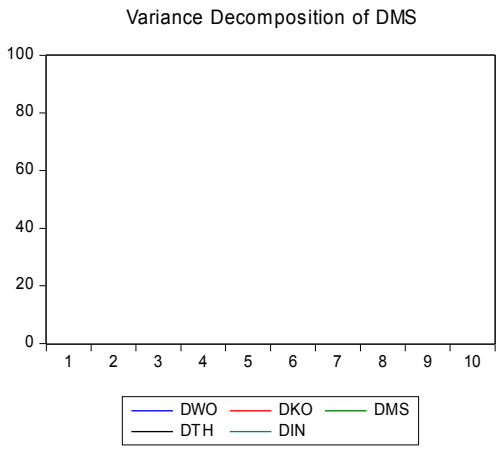
Appendix 7- 2: Variance Decomposition of the MSCI World and the four Asian countries Stock Markets at 25 week horizon (Jan 1997 – Dec 2009)

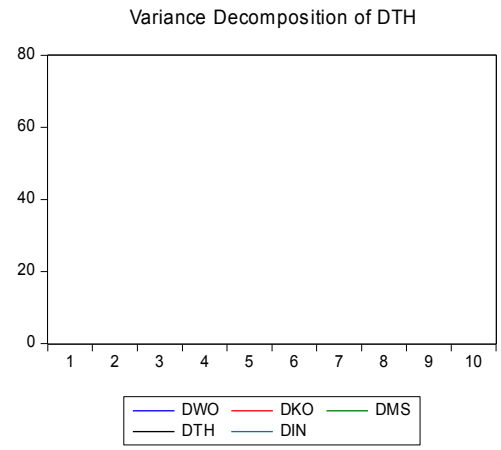


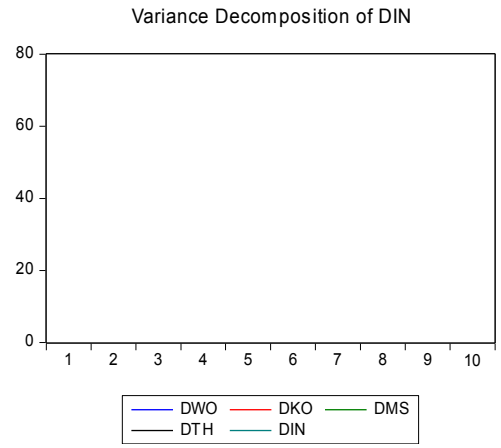
Appendix 7- 3: Variance Decomposition of the MSCI World and the four Asian Countries Stock Markets at 25 week horizon – During Liberalization Period



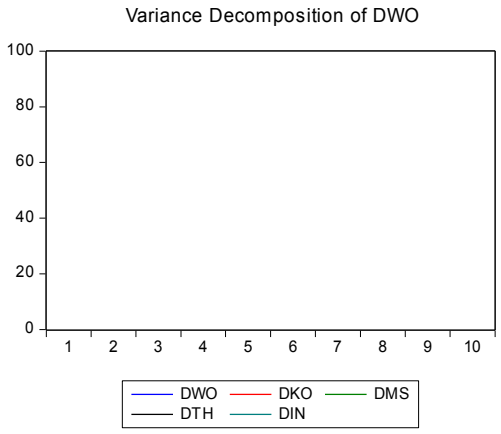



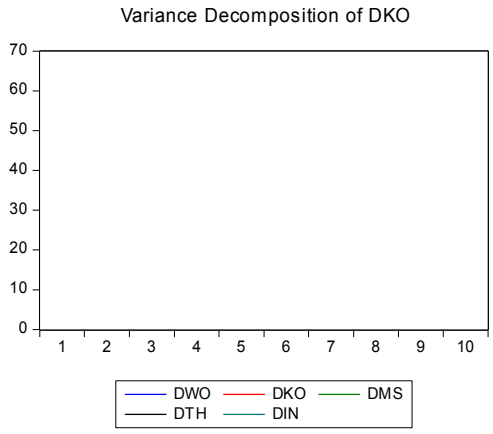



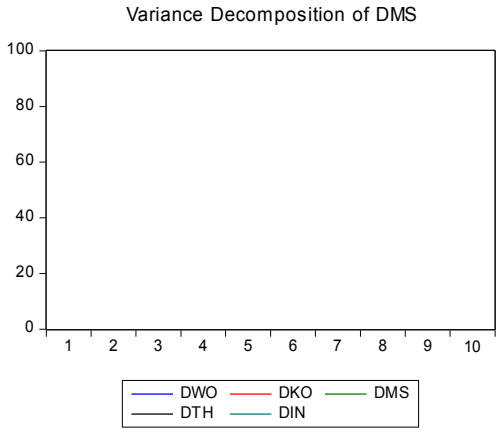



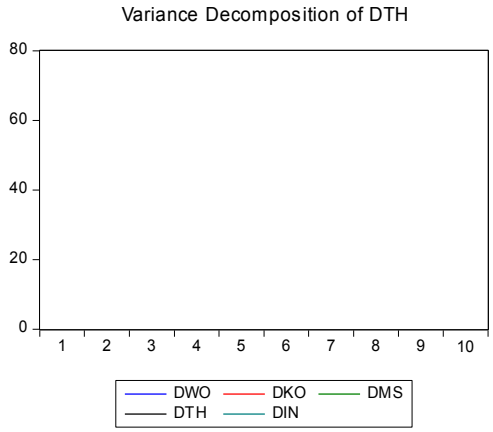



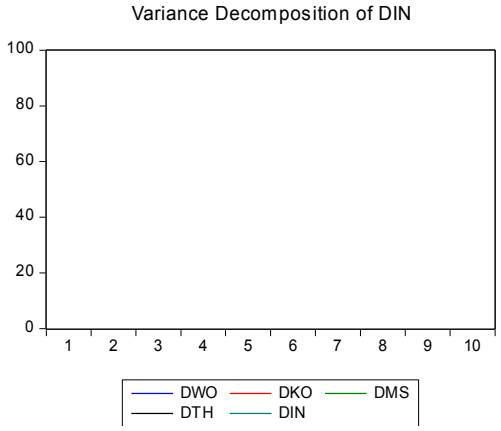
Appendix 7- 4: Variance Decomposition of the MSCI World and the four Asian Countries Stock Markets at 25 week horizon – Post Liberalization Period



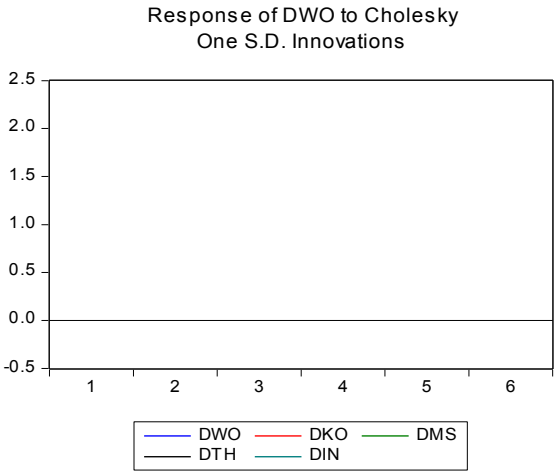



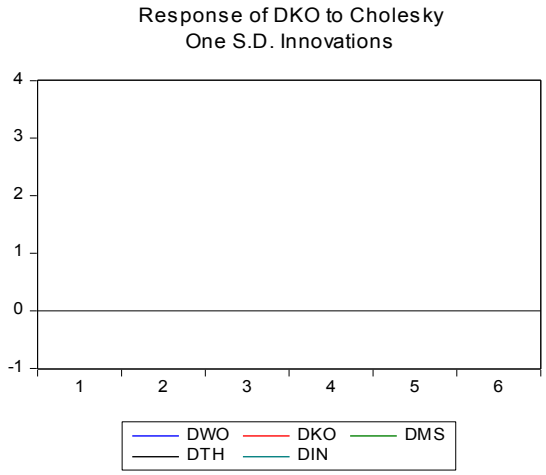



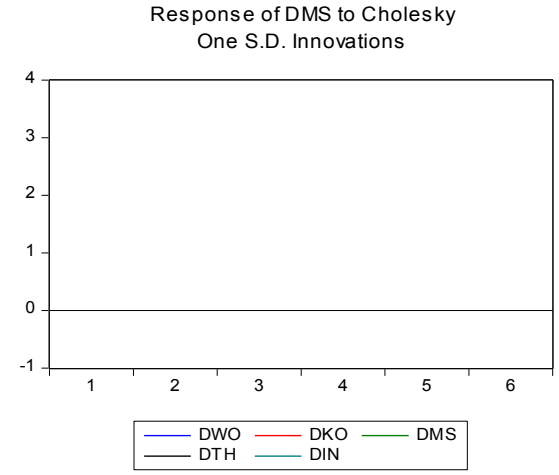



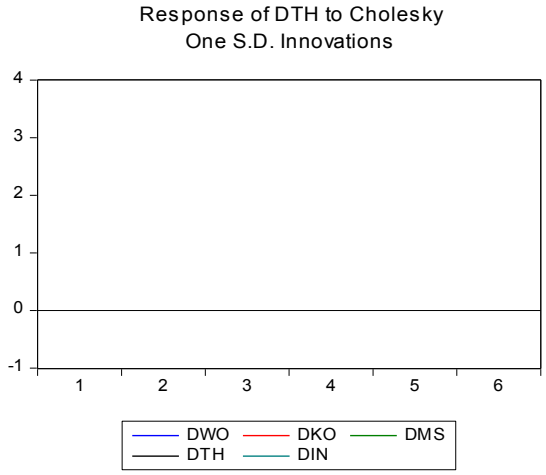



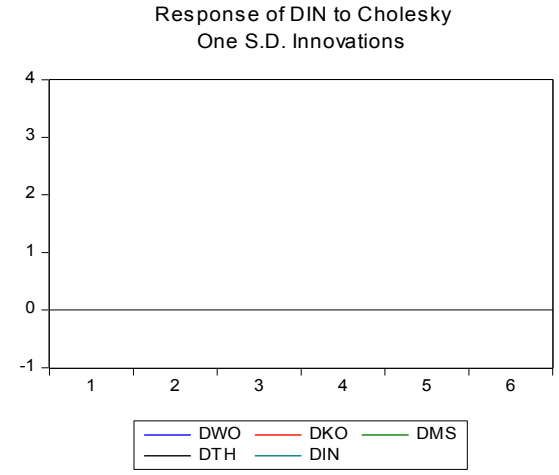
Appendix 7- 5: Impulse Response Functions of the MSCI World and the four Asian Countries Stock Markets at 6 week horizon (Jan 1997 to Dec 2009)



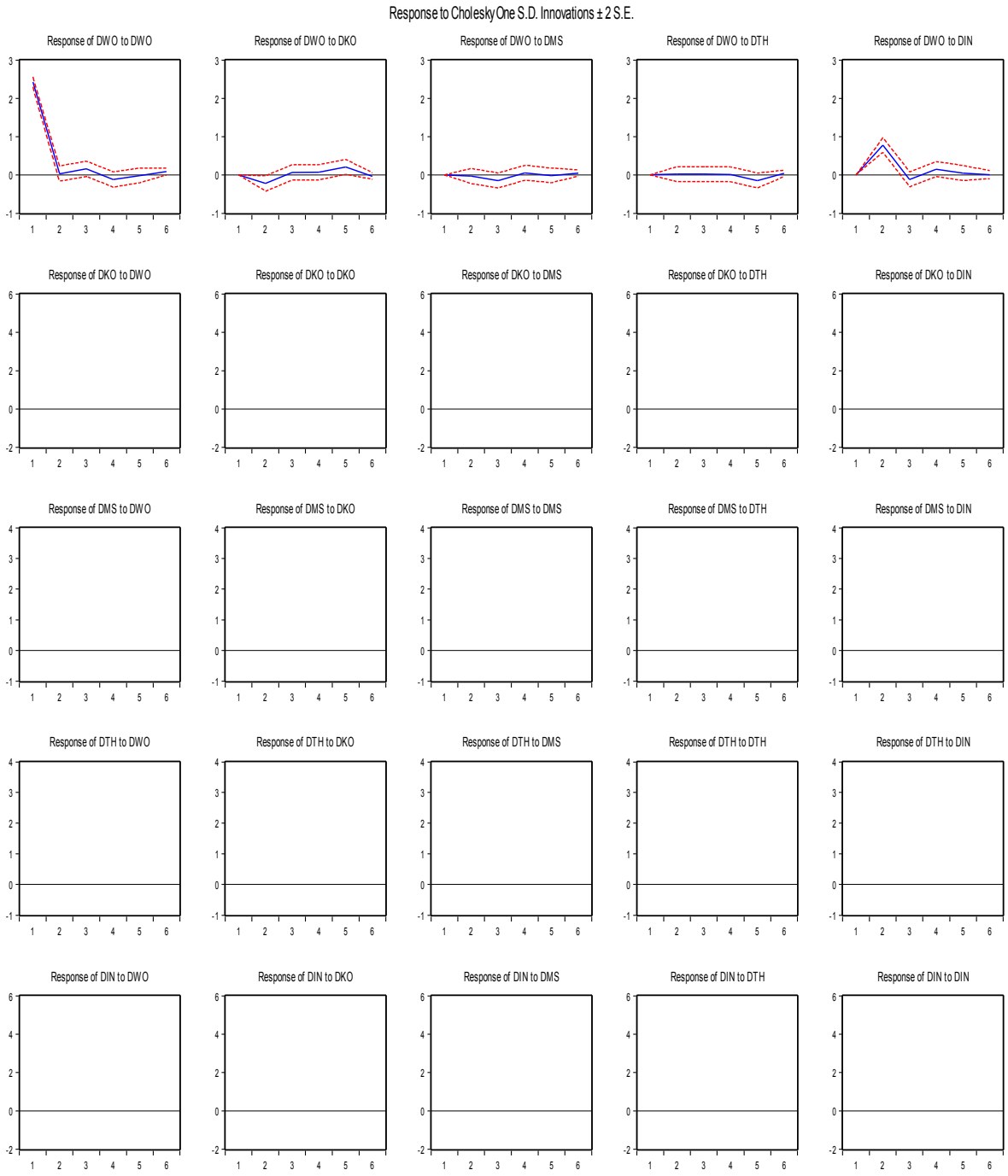



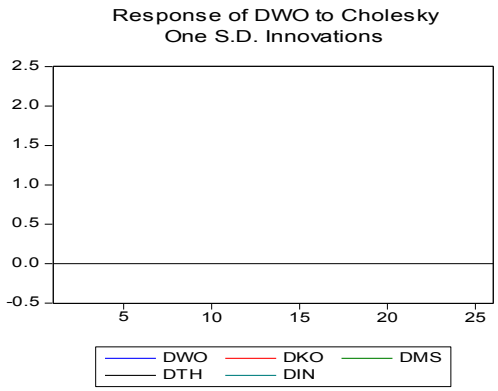



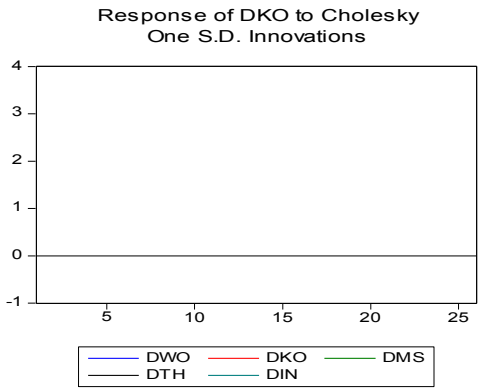



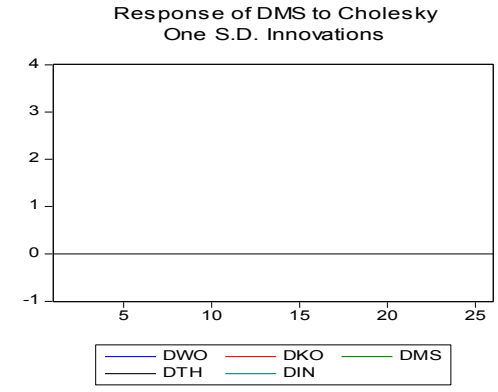
Appendix 7- 6: Impulse Response Functions of the Individual MSCI World and the four Asian Countries Stock Markets at 6 week horizon (Jan 1997 to Dec 2009)

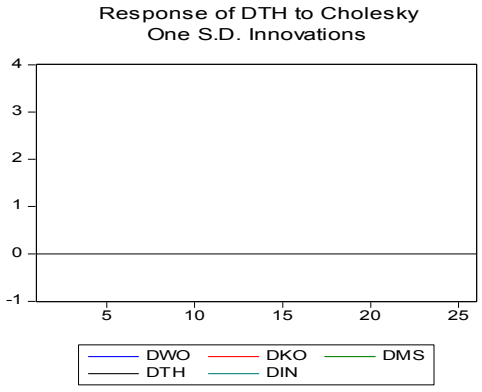


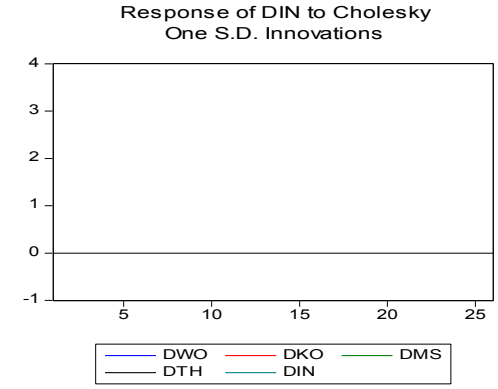
Appendix 7- 7: Impulse Response Functions of the MSCI World and the four Asian Countries Stock Markets at 25 week horizon (Jan 1997 to Dec 2009)



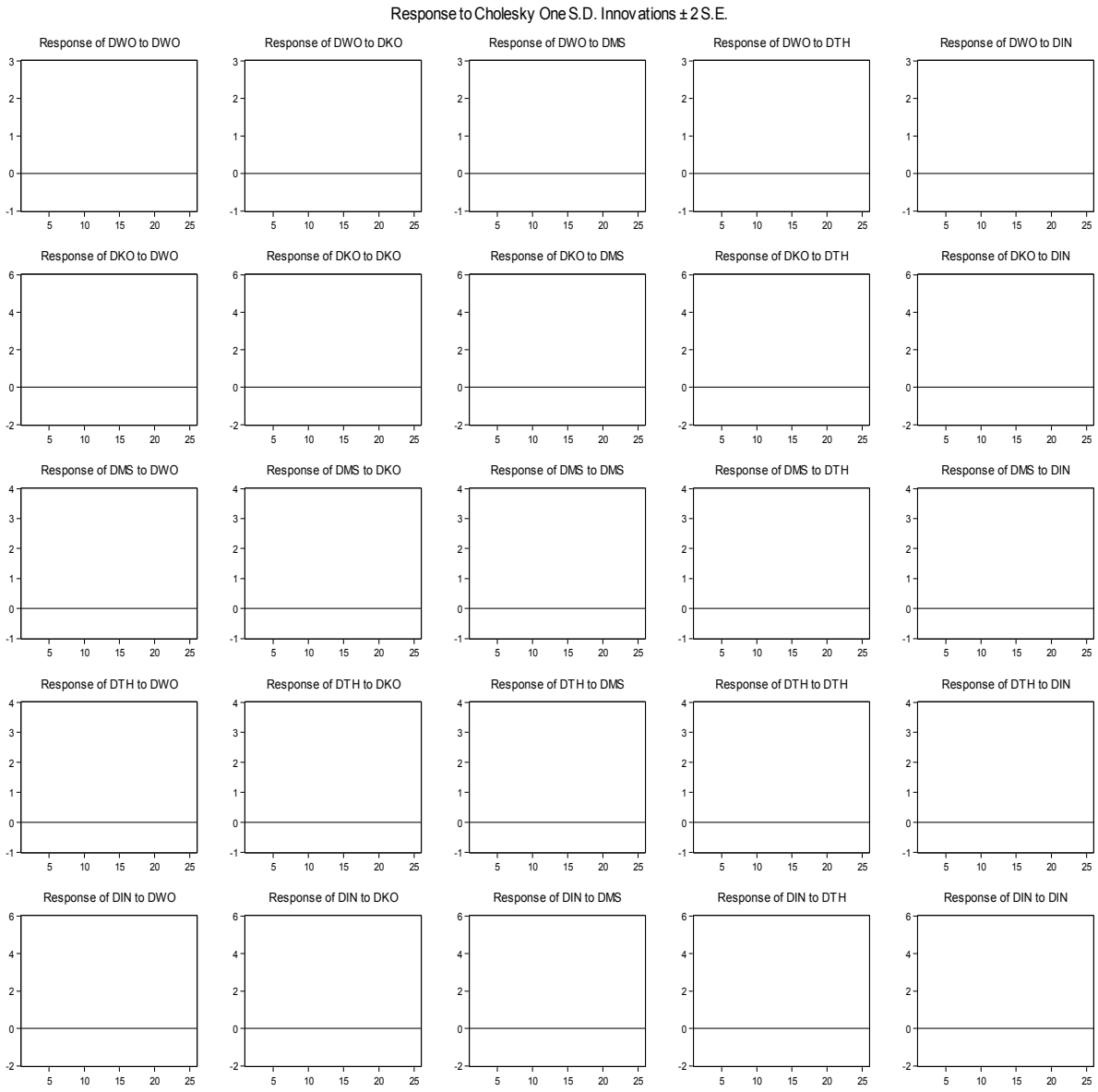



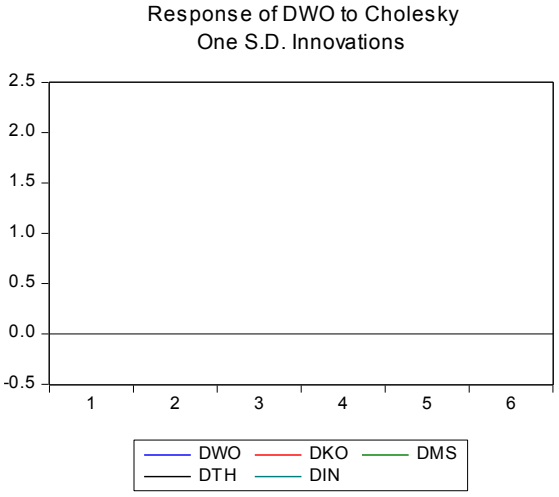



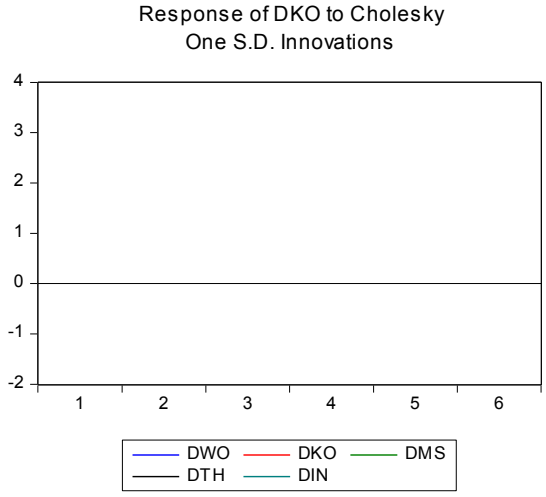



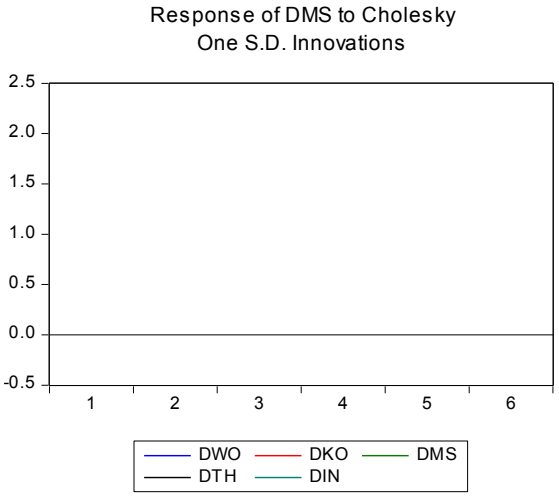
Appendix 7- 8: Impulse Response Functions of the Individual MSCI World and the four Asian Countries Stock Markets at 25 week horizon (Jan 1997 to Dec 2009)

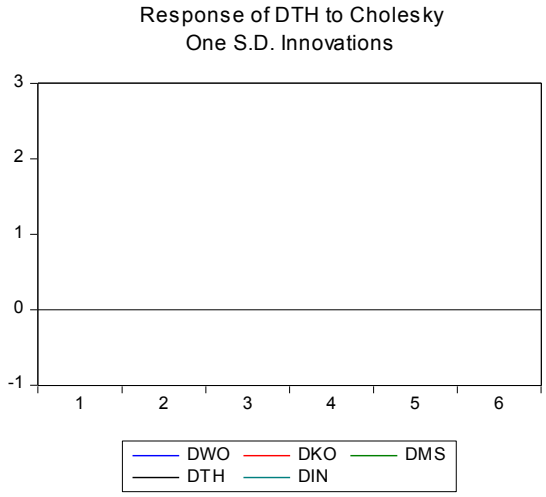


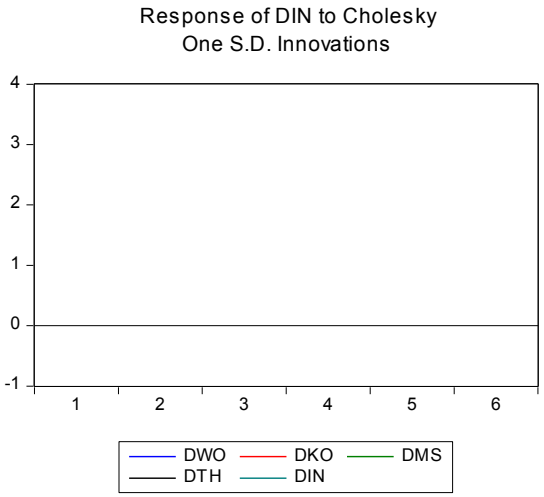
Appendix 7- 9: Impulse Response Functions of the MSCI World and the four Asian Countries Stock Markets at 6 week horizon – During Liberalization Period



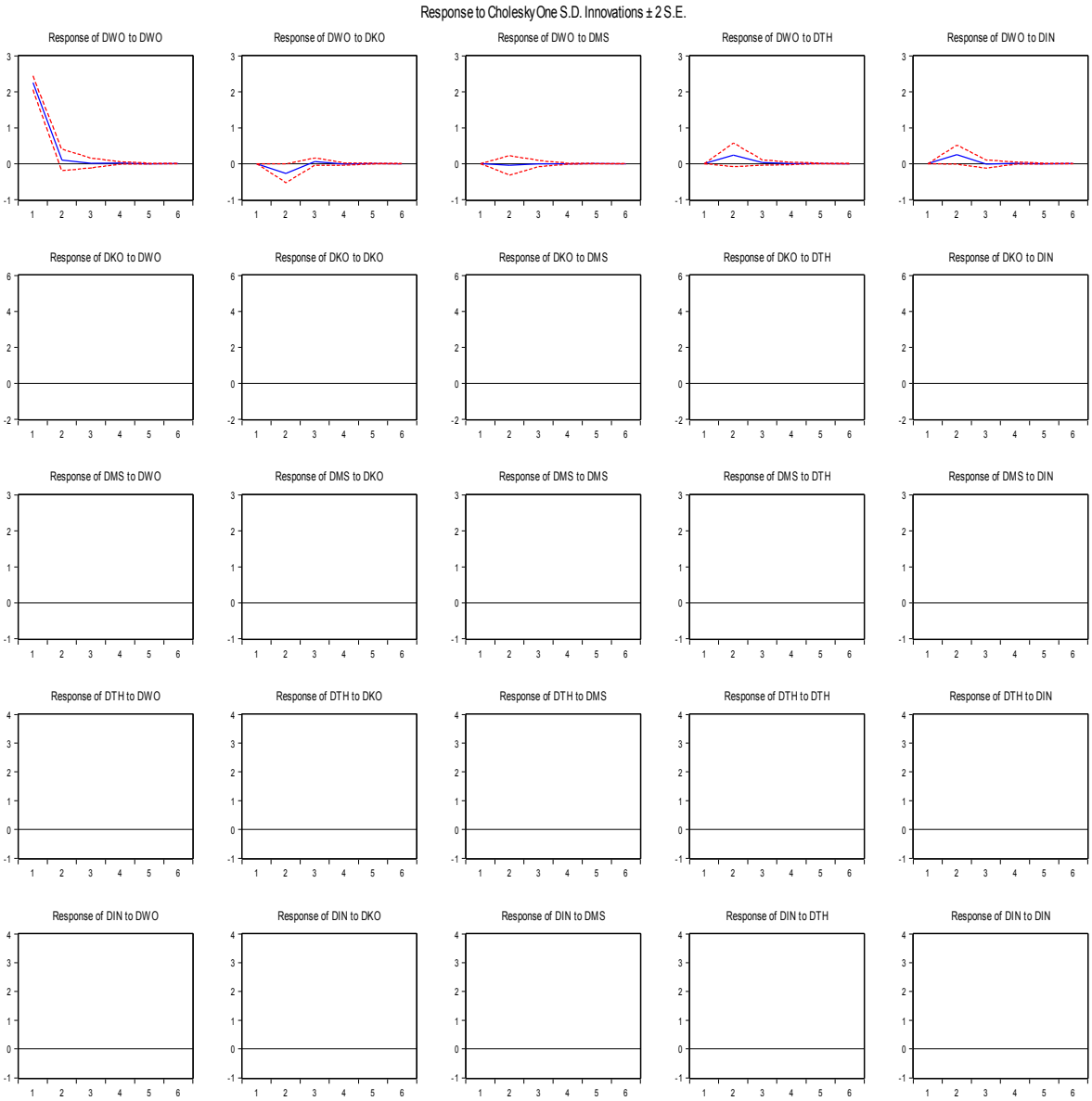



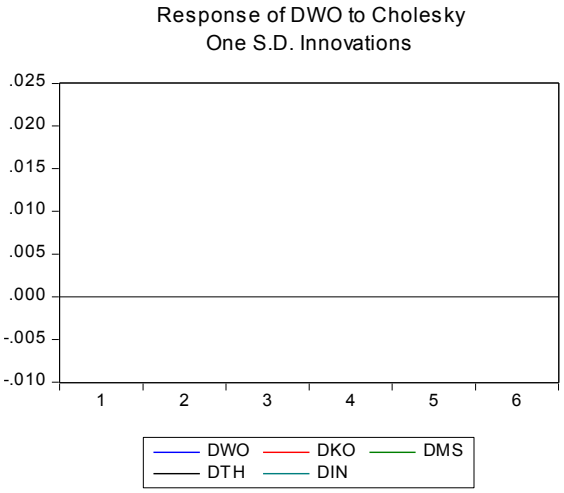



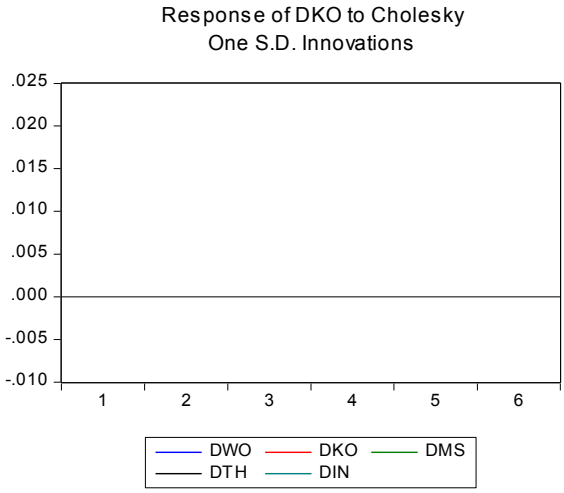



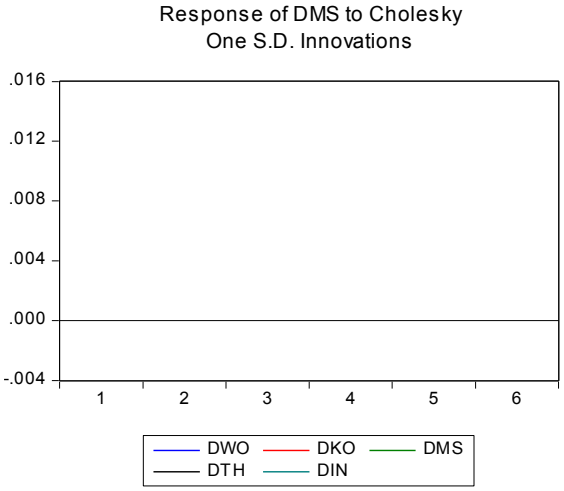
Appendix 7- 10: Impulse Response Functions of the Individual MSCI World and the four Asian Countries Stock Markets at 6 week horizon – During Liberalization Period

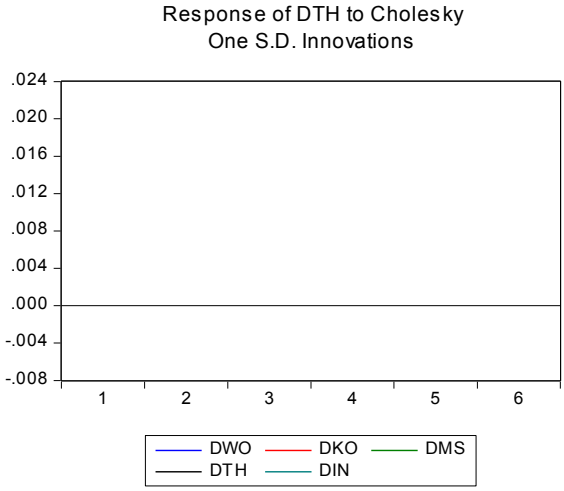


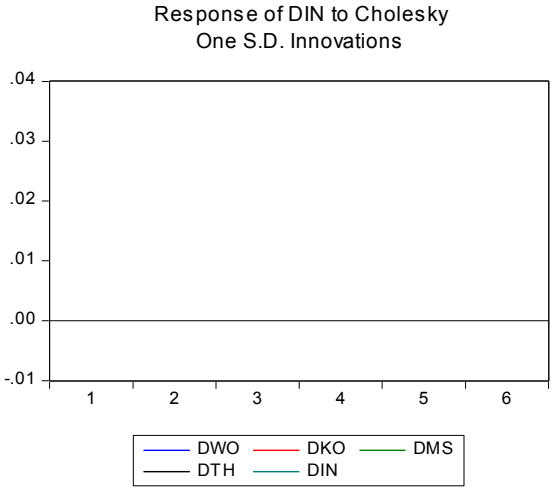
Appendix 7- 11: Impulse Response Functions of the MSCI World and the four Asian Countries Stock Markets at 6 week horizon – Post Liberalization Period



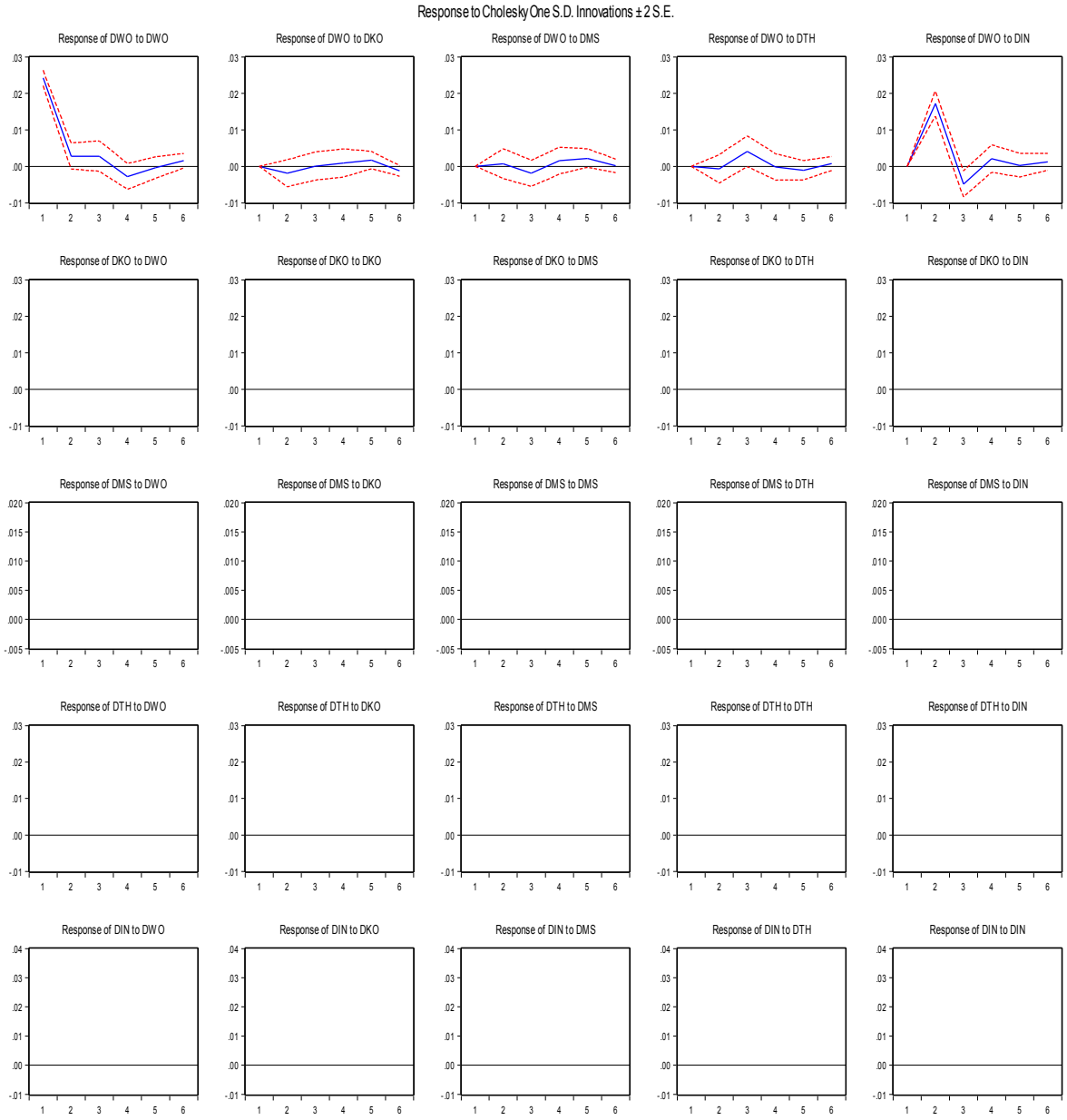



Appendix 7- 12: Impulse Response Functions of the Individual MSCI World and the four Asian Countries Stock Markets at 6 week horizon – Post Liberalization Period



# Appendix 8- 1: Weekly Data on Stock Market Characteristics

Sources: Stock Exchange Websites of individual countries; Bloomberg & Datastream

| | Stock Market Size (Local, mil) | | | | Stock Market Liquidity | | | | Stock Market Volatility | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Msia | Thai | Indo | Kor | Msia | Thai | Indo | Kor | Msia | Thai | Indo | Kor |
| 1/3/1997 | 477558 | 1931183 | 2.2E+08 | 1.1E+08 | 8E+07 | 1E+08 | 1E+08 | 2.9E+07 | 10.05 | 28.29 | 13.22 | 20.76 |
| 1/10/1997 | 483596 | 2113410 | 2.2E+08 | 1.1E+08 | 2E+08 | 2.3E+08 | 2.3E+08 | 1.7E+08 | 9.68 | 29.28 | 13.26 | 22.71 |
| 1/17/1997 | 486145 | 2082584 | 2.2E+08 | 1.2E+08 | 3E+08 | 1.8E+08 | 1.8E+08 | 2.3E+08 | 9.82 | 29.42 | 13.18 | 24 |
| 1/24/1997 | 492491 | 2138035 | 2.3E+08 | 1.1E+08 | 3E+08 | 2.1E+08 | 2.1E+08 | 2.1E+08 | 10.25 | 28.75 | 13.33 | 25.3 |
| 1/31/1997 | 488475 | 1952016 | 2.3E+08 | 1.1E+08 | 3E+08 | 1.9E+08 | 1.9E+08 | 1.7E+08 | 10.66 | 29.86 | 13.35 | 25.13 |
| 2/7/1997 | 496980 | 1829056 | 2.3E+08 | 1.2E+08 | 2E+08 | 1.7E+08 | 1.7E+08 | 1.3E+08 | 10.9 | 29.22 | 13.7 | 25.11 |
| 2/14/1997 | 506857 | 1739318 | 2.4E+08 | 1.2E+08 | 2E+08 | 2.5E+08 | 2.5E+08 | 2.2E+08 | 11.2 | 27.61 | 13.57 | 25.09 |
| 2/21/1997 | 519702 | 1853022 | 2.4E+08 | 1.1E+08 | 4E+08 | 2.2E+08 | 2.2E+08 | 1.8E+08 | 11.04 | 28.87 | 12.89 | 25.53 |
| 2/28/1997 | 525575 | 1789507 | 2.4E+08 | 1.1E+08 | 5E+08 | 2.7E+08 | 2.7E+08 | 1.5E+08 | 11.06 | 28.36 | 13.1 | 24.98 |
| 3/7/1997 | 516964 | 1694380 | 2.3E+08 | 1.1E+08 | 3E+08 | 2.7E+08 | 2.7E+08 | 2E+08 | 11.32 | 29.14 | 13.58 | 24.37 |
| 3/14/1997 | 515172 | 1707123 | 2.3E+08 | 1.1E+08 | 3E+08 | 2.8E+08 | 2.8E+08 | 1.7E+08 | 11.62 | 29.88 | 13.99 | 24.87 |
| 3/21/1997 | 504148 | 1735311 | 2.2E+08 | 1E+08 | 3E+08 | 1.6E+08 | 1.6E+08 | 1.9E+08 | 11.89 | 29.21 | 14.19 | 25.08 |
| 3/28/1997 | 508418 | 1755688 | 2.3E+08 | 1.1E+08 | 3E+08 | 1.4E+08 | 1.4E+08 | 2.4E+08 | 11.75 | 27.03 | 14.23 | 26.43 |
| 4/4/1997 | 468491 | 1788074 | 2.2E+08 | 1.1E+08 | 4E+08 | 1.8E+08 | 1.8E+08 | 2E+08 | 12.99 | 27.32 | 13.92 | 26.51 |
| 4/11/1997 | 469904 | 1787262 | 2.2E+08 | 1.2E+08 | 3E+08 | 1.2E+08 | 1.2E+08 | 2.5E+08 | 12.97 | 27.08 | 12.75 | 26.12 |
| 4/18/1997 | 454285 | 1780504 | 2.2E+08 | 1.2E+08 | 3E+08 | 1.4E+08 | 1.4E+08 | 2.4E+08 | 14.41 | 27.18 | 12.49 | 24.37 |
| 4/25/1997 | 450642 | 1725814 | 2.2E+08 | 1.2E+08 | 2E+08 | 1.6E+08 | 1.6E+08 | 2.2E+08 | 15.07 | 26.97 | 12.19 | 23.28 |
| 5/2/1997 | 452339 | 1636672 | 2.2E+08 | 1.2E+08 | 2E+08 | 1.6E+08 | 1.6E+08 | 2.2E+08 | 16.01 | 26.64 | 12.22 | 21.49 |
| 5/9/1997 | 455864 | 1485017 | 2.3E+08 | 1.1E+08 | 1E+08 | 2E+08 | 2E+08 | 2E+08 | 15.81 | 26.97 | 12.53 | 20.34 |
| 5/16/1997 | 427127 | 1361372 | 2.3E+08 | 1.2E+08 | 2E+08 | 3.1E+08 | 3.1E+08 | 2E+08 | 16.86 | 27.82 | 12.99 | 19.68 |
| 5/23/1997 | 450932 | 1422833 | 2.3E+08 | 1.2E+08 | 2E+08 | 2.5E+08 | 2.5E+08 | 3.4E+08 | 17.24 | 28.04 | 12.66 | 19.48 |
| 5/30/1997 | 447726 | 1374090 | 2.4E+08 | 1.2E+08 | 1E+08 | 1.6E+08 | 1.6E+08 | 2.9E+08 | 17.24 | 27.47 | 13.51 | 19.74 |
| 6/6/1997 | 447726 | 1262416 | 2.4E+08 | 1.3E+08 | 2E+08 | 1.6E+08 | 1.6E+08 | 3.2E+08 | 17.44 | 27.52 | 13.21 | 19.65 |
| 6/13/1997 | 440599 | 1225707 | 2.4E+08 | 1.3E+08 | 2E+08 | 2.7E+08 | 2.7E+08 | 3.7E+08 | 17.27 | 27.08 | 13 | 18.95 |
| 6/20/1997 | 442947 | 1117532 | 2.5E+08 | 1.3E+08 | 2E+08 | 3.1E+08 | 3.1E+08 | 2.9E+08 | 17.18 | 27.56 | 12.97 | 19.31 |
| 6/27/1997 | 438890 | 1282628 | 2.5E+08 | 1.2E+08 | 2E+08 | 4.3E+08 | 4.3E+08 | 2.2E+08 | 17.17 | 30.19 | 12.89 | 19.13 |
| 7/4/1997 | 443166 | 1735020 | 2.6E+08 | 1.3E+08 | 2E+08 | 3.9E+08 | 3.9E+08 | 2.5E+08 | 17.13 | 36.61 | 13 | 18.63 |
| 7/11/1997 | 429729 | 1663478 | 2.6E+08 | 1.3E+08 | 3E+08 | 4.1E+08 | 4.1E+08 | 2.2E+08 | 17.98 | 38.2 | 12.91 | 16.85 |
| 7/18/1997 | 423371 | 1745253 | 2.6E+08 | 1.3E+08 | 2E+08 | 3.1E+08 | 3.1E+08 | 1.9E+08 | 17.94 | 39.48 | 12.53 | 16.42 |
| 7/25/1997 | 442717 | 1724483 | 2.6E+08 | 1.2E+08 | 2E+08 | 2.5E+08 | 2.5E+08 | 2E+08 | 18.66 | 39.87 | 12.52 | 16.72 |
| 8/1/1997 | 432390 | 1738976 | 2.6E+08 | 1.2E+08 | 2E+08 | 3.9E+08 | 3.9E+08 | 1.6E+08 | 18.73 | 40.7 | 12.15 | 16.45 |
| 8/8/1997 | 406498 | 1719499 | 2.4E+08 | 1.3E+08 | 3E+08 | 3.1E+08 | 3.1E+08 | 1.9E+08 | 19.92 | 41.02 | 13.51 | 16.32 |
| 8/15/1997 | 393605 | 1.8E+08 | 2.2E+08 | 1.3E+08 | 3E+08 | 1.3E+08 | 1.3E+08 | 1.6E+08 | 19.53 | 40.98 | 15.96 | 16.37 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1.3E+0 | 3E+0 | 1.8E+ | 1.8E+ | 1.9E+ | 21.7 | 41. | | 16.2 |
| 8/22/1997 | 390731 | 1474302 | 2.1E+08 | 8 | 8 | 08 | 08 | 08 | 1 | 48 | 19.02 | 6 |
| | | | | 1.2E+0 | 4E+0 | 1.8E+ | 1.8E+ | | 23.5 | 42. | | 16.1 |
| 8/29/1997 | 328146 | 1283947 | 1.8E+08 | 8 | 8 | 08 | 08 | 2E+08 | 6 | 51 | 25.58 | 3 |
| | | | | 1.2E+0 | 8E+0 | 1.9E+ | 1.9E+ | 1.8E+ | 32.8 | 43. | | 15.7 |
| 9/5/1997 | 346616 | 1431912 | 2.2E+08 | 8 | 8 | 08 | 08 | 08 | 7 | 88 | 34.7 | 4 |
| | | | | 1.2E+0 | 7E+0 | 2.4E+ | 2.4E+ | 1.7E+ | 35.7 | 45. | | 15.3 |
| 9/12/1997 | 365228 | 1416962 | 1.7E+08 | 8 | 8 | 08 | 08 | 08 | 9 | 7 | 35.71 | 5 |
| | | | | 1.2E+0 | 4E+0 | 1.4E+ | 1.4E+ | 7.4E+ | 36.0 | 45. | | 15.5 |
| 9/19/1997 | 340128 | 1387734 | 1.8E+08 | 8 | 8 | 08 | 08 | 07 | 5 | 36 | 36 | 2 |
| | | | | 1.1E+0 | 4E+0 | 1.9E+ | 1.9E+ | 1.7E+ | 36.5 | 44. | | 16.0 |
| 9/26/1997 | 340412 | 1516020 | 1.8E+08 | 8 | 8 | 08 | 08 | 08 | 5 | 65 | 36.5 | 4 |
| | | | | 1.1E+0 | 3E+0 | 1.5E+ | 1.5E+ | 1.4E+ | 36.6 | 44. | | 17.0 |
| 10/3/1997 | 338082 | 1487172 | 1.9E+08 | 8 | 8 | 08 | 08 | 08 | 1 | 37 | 36.71 | 4 |
| 10/10/199 | | | | | 4E+0 | 1.9E+ | 1.9E+ | 1.5E+ | | 44. | | 17.8 |
| 7 | 353690 | 1444466 | 2E+08 | 1E+08 | 8 | 08 | 08 | 08 | 37.5 | 5 | 37.09 | 3 |
| 10/17/199 | | | | | 3E+0 | 2.4E+ | 2.4E+ | 1.7E+ | 37.6 | 44. | | |
| 7 | 342370 | 1408327 | 1.9E+08 | 1E+08 | 8 | 08 | 08 | 08 | 2 | 27 | 37.2 | 19.7 |
| 10/24/199 | | | | 9.8E+0 | 4E+0 | 1.6E+ | 1.6E+ | 2.7E+ | 38.7 | 44. | | |
| 7 | 303495 | 1307164 | 1.8E+08 | 7 | 8 | 08 | 08 | 08 | 5 | 72 | 37.31 | 24.8 |
| 10/31/199 | | | | 8.1E+0 | 3E+0 | 2.7E+ | 2.7E+ | | 40.7 | 44. | | 30.7 |
| 7 | 285640 | 1152212 | 1.9E+08 | 7 | 8 | 08 | 08 | 3E+08 | 8 | 18 | 42.71 | 7 |
| | | | | 8.9E+0 | 3E+0 | 3.9E+ | 3.9E+ | | 43.5 | 43. | | 35.5 |
| 11/7/1997 | 302182 | 1314646 | 1.7E+08 | 7 | 8 | 08 | 08 | 4E+08 | 4 | 39 | 42.87 | 6 |
| 11/14/199 | | | | 8.9E+0 | 2E+0 | 2.2E+ | 2.2E+ | | 43.4 | 39. | | 37.0 |
| 7 | 285865 | 1174491 | 1.6E+08 | 7 | 8 | 08 | 08 | 3E+08 | 3 | 06 | 43.22 | 1 |
| 11/21/199 | | | | 8.7E+0 | 7E+0 | 1.8E+ | 1.8E+ | 3.1E+ | 49.3 | 37. | | 39.0 |
| 7 | 232785 | 1067749 | 1.5E+08 | 7 | 8 | 08 | 08 | 08 | 6 | 05 | 44.27 | 1 |
| 11/28/199 | | | | 7.1E+0 | 4E+0 | 2.2E+ | 2.2E+ | 2.9E+ | 50.8 | 37. | | |
| 7 | 222512 | 994268 | 1.5E+08 | 7 | 8 | 08 | 08 | 08 | 6 | 02 | 45.55 | 41.3 |
| | | | | 7.5E+0 | 4E+0 | 2.5E+ | 2.5E+ | 4.9E+ | 53.2 | 36. | | 45.7 |
| 12/5/1997 | 238232 | 976794 | 1.6E+08 | 7 | 8 | 08 | 08 | 08 | 1 | 15 | 46.3 | 7 |
| 12/12/199 | | | | 6.1E+0 | 6E+0 | 2.9E+ | 2.9E+ | 4.6E+ | 58.8 | 37. | | 50.2 |
| 7 | 228450 | 918643 | 1.4E+08 | 7 | 8 | 08 | 08 | 08 | 3 | 22 | 48.61 | 3 |
| 12/19/199 | | | | 6.9E+0 | 4E+0 | 3.3E+ | 3.3E+ | 4.7E+ | 59.3 | 37. | | 53.6 |
| 7 | 223724 | 975957 | 1.5E+08 | 7 | 8 | 08 | 08 | 08 | 9 | 82 | 51.08 | 8 |
| 12/26/199 | | | | 6.5E+0 | 2E+0 | 2.9E+ | 2.9E+ | | 59.0 | 37. | | 56.5 |
| 7 | 211872 | 876164 | 1.6E+08 | 7 | 8 | 08 | 08 | 4E+08 | 8 | 75 | 51.33 | 7 |
| | | | | 6.5E+0 | 3E+0 | 1.5E+ | 1.5E+ | 3.6E+ | 59.6 | 36. | | 56.8 |
| 1/2/1998 | 214799 | 922599 | 1.6E+08 | 7 | 8 | 08 | 08 | 07 | 8 | 71 | 50.05 | 1 |
| | | | | 7.1E+0 | 4E+0 | 3.2E+ | 3.2E+ | 5.2E+ | 54.0 | 37. | | 58.9 |
| 1/9/1998 | 187600 | 928077 | 1.4E+08 | 7 | 8 | 08 | 08 | 08 | 2 | 06 | 52.58 | 3 |
| | | | | 8.4E+0 | 5E+0 | 4.4E+ | 4.4E+ | 7.7E+ | 56.1 | 37. | | 60.8 |
| 1/16/1998 | 202752 | 1057618 | 1.7E+08 | 7 | 8 | 08 | 08 | 08 | 9 | 1 | 52.35 | 5 |
| | | | | 8.4E+0 | 5E+0 | 9.5E+ | 9.5E+ | 6.7E+ | 58.1 | 40. | | 63.0 |
| 1/23/1998 | 207407 | 1194501 | 1.8E+08 | 7 | 8 | 08 | 08 | 08 | 9 | 78 | 54.08 | 7 |
| | | | | 9.6E+0 | 6E+0 | 6.6E+ | 6.6E+ | 2.3E+ | 59.2 | 44. | | 64.2 |
| 1/30/1998 | 229372 | 1448434 | 2E+08 | 7 | 7 | 08 | 08 | 08 | 8 | 86 | 54.66 | 5 |
| | | | | 9.3E+0 | 1E+0 | 1.3E+ | 1.3E+ | 5.6E+ | 71.0 | 51. | | 64.8 |
| 2/6/1998 | 274557 | 1545983 | 2.2E+08 | 7 | 9 | 09 | 09 | 08 | 3 | 81 | 59.85 | 2 |
| | | | | 8.7E+0 | 9E+0 | | | 4.8E+ | 71.4 | 52. | | 64.3 |
| 2/13/1998 | 262421 | 1443793 | 1.8E+08 | 7 | 8 | 5E+08 | 5E+08 | 08 | 3 | 15 | 62.96 | 7 |
| | | | | | 6E+0 | | | 4.1E+ | 72.0 | 52. | | 62.9 |
| 2/20/1998 | 273297 | 1547961 | 2E+08 | 9E+07 | 8 | 7E+08 | 7E+08 | 08 | 1 | 89 | 63.5 | 5 |
| | | | | 9.8E+0 | 6E+0 | 8.7E+ | 8.7E+ | 4.6E+ | 71.6 | 52. | | 61.7 |
| 2/27/1998 | 282447 | 1547226 | 2E+08 | 7 | 8 | 08 | 08 | 08 | 9 | 85 | 63.54 | 4 |
| | | | | 9.3E+0 | 5E+0 | 6.4E+ | 6.4E+ | 5.1E+ | | 52. | | 60.7 |
| 3/6/1998 | 260333 | 1480896 | 2.1E+08 | 7 | 8 | 08 | 08 | 08 | 69.2 | 81 | 64.33 | 2 |
| | | | | 9.6E+0 | 3E+0 | 4.8E+ | 4.8E+ | | 69.1 | 51. | | 60.8 |
| 3/13/1998 | 263923 | 1504925 | 2.1E+08 | 7 | 8 | 08 | 08 | 4E+08 | 3 | 72 | 61.22 | 1 |
| | | | | 9.4E+0 | 4E+0 | 7.5E+ | 7.5E+ | | | 50. | | |
| 3/20/1998 | 272907 | 1441765 | 2.1E+08 | 7 | 8 | 08 | 08 | 4E+08 | 69.3 | 14 | 61.22 | 58.5 |
| | | | | | 3E+0 | 6.7E+ | 6.7E+ | 4.1E+ | 63.9 | 49. | | 57.0 |
| 3/27/1998 | 270807 | 1338877 | 2.2E+08 | 9E+07 | 8 | 08 | 08 | 08 | 5 | 41 | 61.52 | 9 |
| | | | | 7.8E+0 | 3E+0 | 3.8E+ | 3.8E+ | 3.4E+ | | 49. | | 54.0 |
| 4/3/1998 | 249611 | 1254301 | 2.2E+08 | 7 | 8 | 08 | 08 | 08 | 62.8 | 23 | 61.53 | 5 |
| | | | | 8.4E+0 | 2E+0 | 3.1E+ | 3.1E+ | 3.3E+ | 58.7 | 49. | | 50.7 |
| 4/10/1998 | 251154 | 1297958 | 2.2E+08 | 7 | 8 | 08 | 08 | 08 | 7 | 25 | 60.45 | 2 |
| | | | | 8.1E+0 | 3E+0 | 1.4E+ | 1.4E+ | 2.8E+ | 55.5 | 49. | | 47.5 |
| 4/17/1998 | 235038 | 1272129 | 2.1E+08 | 7 | 8 | 08 | 08 | 08 | 5 | 34 | 60.15 | 9 |
| | | | | 7.5E+0 | 2E+0 | 3.9E+ | 3.9E+ | 2.5E+ | 54.9 | 47. | | 47.2 |
| 4/24/1998 | 233406 | 1231248 | 2E+08 | 7 | 8 | 08 | 08 | 08 | 6 | 93 | 59.83 | 6 |
| 5/1/1998 | 230366 | 1195769 | 1.8E+08 | 7.6E+0 | 1E+0 | 2.9E+ | 2.9E+ | 2.1E+ | 55.1 | 48. | 56.61 | 46.0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 7 | 8 | 08 | 08 | 08 | 1 | 01 | | 3 |
| | | | | 6.7E+0 | 3E+0 | 2.4E+ | 2.4E+ | 2.1E+ | 54.1 | 47. | | 43.5 |
| 5/8/1998 | 214326 | 1170548 | 1.8E+08 | 7 | 8 | 08 | 08 | 08 | 3 | 85 | 57.1 | 7 |
| | | | | 6.4E+0 | 2E+0 | 3.1E+ | 3.1E+ | 3.3E+ | 53.8 | 48. | | 39.9 |
| 5/15/1998 | 209329 | 1124011 | 1.7E+08 | 7 | 8 | 08 | 08 | 08 | 3 | 08 | 58.14 | 3 |
| | | | | 6.4E+0 | 3E+0 | 5.3E+ | 5.3E+ | 3.9E+ | 50.3 | 48. | | 39.2 |
| 5/22/1998 | 210861 | 1090853 | 1.8E+08 | 7 | 8 | 08 | 08 | 08 | 4 | 56 | 59.95 | 3 |
| | | | | 6.1E+0 | 2E+0 | 5.1E+ | 5.1E+ | 3.5E+ | 49.9 | 47. | | 42.3 |
| 5/29/1998 | 199056 | 969769 | 1.7E+08 | 7 | 8 | 08 | 08 | 08 | 9 | 53 | 53.39 | 2 |
| | | | | 6.3E+0 | 2E+0 | 5.2E+ | 5.2E+ | 3.2E+ | 32.5 | 43. | | 42.3 |
| 6/5/1998 | 190746 | 956785 | 1.7E+08 | 7 | 8 | 08 | 08 | 08 | 8 | 37 | 50.91 | 7 |
| | | | | 5.6E+0 | 3E+0 | 3.7E+ | 3.7E+ | 4.2E+ | 32.1 | 43. | | 43.0 |
| 6/12/1998 | 178817 | 818266 | 1.7E+08 | 7 | 8 | 08 | 08 | 08 | 8 | 99 | 49.28 | 8 |
| | | | | 5.8E+0 | 4E+0 | | | 4.4E+ | 33.0 | 36. | | 47.0 |
| 6/19/1998 | 175434 | 844045 | 1.8E+08 | 7 | 8 | 1E+09 | 1E+09 | 08 | 7 | 31 | 44.47 | 5 |
| | | | | 5.6E+0 | 2E+0 | 5.2E+ | 5.2E+ | 3.5E+ | 31.3 | 35. | | 45.0 |
| 6/26/1998 | 167137 | 770094 | 1.8E+08 | 7 | 8 | 08 | 08 | 08 | 4 | 07 | 40 | 6 |
| | | | | 5.8E+0 | 3E+0 | 3.3E+ | 3.3E+ | 4.2E+ | 31.4 | 34. | | 46.1 |
| 7/3/1998 | 173246 | 865766 | 2E+08 | 7 | 8 | 08 | 08 | 08 | 7 | 92 | 39.41 | 6 |
| | | | | 5.9E+0 | 2E+0 | 2.4E+ | 2.4E+ | 4.3E+ | 32.0 | 34. | | 46.5 |
| 7/10/1998 | 159596 | 875112 | 1.9E+08 | 7 | 8 | 08 | 08 | 08 | 9 | 69 | 39.49 | 8 |
| | | | | 6.3E+0 | 4E+0 | 7.2E+ | 7.2E+ | 3.6E+ | 32.5 | 36. | | 48.3 |
| 7/17/1998 | 163351 | 966168 | 2E+08 | 7 | 8 | 08 | 08 | 08 | 4 | 42 | 38.22 | 7 |
| | | | | 6.5E+0 | 4E+0 | 1.1E+ | 1.1E+ | 7.2E+ | 32.2 | 36. | | 49.0 |
| 7/24/1998 | 155444 | 881376 | 2E+08 | 7 | 8 | 09 | 09 | 08 | 2 | 72 | 37.93 | 3 |
| | | | | 6.5E+0 | 3E+0 | 5.9E+ | 5.9E+ | 5.5E+ | 33.8 | 36. | | 47.5 |
| 7/31/1998 | 151618 | 847393 | 2E+08 | 7 | 8 | 08 | 08 | 08 | 9 | 38 | 37.72 | 3 |
| | | | | 6.1E+0 | 2E+0 | 4.6E+ | 4.6E+ | 4.6E+ | 34.2 | 36. | | 47.7 |
| 8/7/1998 | 136974 | 792893 | 1.8E+08 | 7 | 8 | 08 | 08 | 08 | 6 | 16 | 37.23 | 4 |
| | | | | 5.8E+0 | 3E+0 | | | 3.6E+ | 36.0 | 37. | | 47.4 |
| 8/14/1998 | 125151 | 783878 | 1.7E+08 | 7 | 8 | 7E+08 | 7E+08 | 08 | 1 | 93 | 37.02 | 3 |
| | | | | | 5E+0 | 1.1E+ | 1.1E+ | 4.5E+ | 41.7 | 38. | | 47.7 |
| 8/21/1998 | 125015 | 766823 | 1.6E+08 | 6E+07 | 8 | 09 | 09 | 08 | 2 | 58 | 37.48 | 3 |
| | | | | 5.9E+0 | 3E+0 | 4.1E+ | 4.1E+ | 4.4E+ | 42.2 | 37. | | 47.4 |
| 8/28/1998 | 118338 | 687026 | 1.4E+08 | 7 | 8 | 08 | 08 | 08 | 4 | 87 | 38.95 | 2 |
| | | | | | 7E+0 | 5.5E+ | 5.5E+ | 4.4E+ | 60.4 | 37. | | |
| 9/4/1998 | 142113 | 644662 | 1.4E+08 | 6E+07 | 8 | 08 | 08 | 08 | 7 | 86 | 40.03 | 47 |
| | | | | 6.1E+0 | 1E+0 | 8.3E+ | 8.3E+ | | 83.9 | 40. | | 45.7 |
| 9/11/1998 | 143338 | 668855 | 1.3E+08 | 7 | 9 | 08 | 08 | 5E+08 | 7 | 3 | 39.7 | 4 |
| | | | | 5.8E+0 | 4E+0 | 7.5E+ | 7.5E+ | | 84.0 | 40. | | 44.5 |
| 9/18/1998 | 153812 | 708811 | 1.1E+08 | 7 | 8 | 08 | 08 | 4E+08 | 5 | 75 | 40.07 | 3 |
| | | | | 5.8E+0 | 3E+0 | 1.4E+ | 1.4E+ | 3.5E+ | 83.9 | 42. | | 42.6 |
| 9/25/1998 | 151612 | 820206 | 1.1E+08 | 7 | 8 | 09 | 09 | 08 | 5 | 97 | 41.05 | 7 |
| | | | | 5.9E+0 | 2E+0 | 1.6E+ | 1.6E+ | 3.2E+ | 84.2 | 42. | | 37.5 |
| 10/2/1998 | 143367 | 825748 | 1.1E+08 | 7 | 8 | 09 | 09 | 08 | 8 | 74 | 39.99 | 4 |
| | | | | 6.3E+0 | 2E+0 | | | 3.6E+ | 84.4 | 45. | | 39.3 |
| 10/9/1998 | 146590 | 1002015 | 1.3E+08 | 7 | 8 | 2E+09 | 2E+09 | 08 | 4 | 91 | 43.14 | 3 |
| 10/16/199 | | | | 7.2E+0 | 3E+0 | 2.6E+ | 2.6E+ | 7.2E+ | | 47. | | 41.4 |
| 8 | 156248 | 1102962 | 1.4E+08 | 7 | 8 | 09 | 09 | 08 | 84.4 | 15 | 47.21 | 5 |
| 10/23/199 | | | | 7.3E+0 | 4E+0 | 2.3E+ | 2.3E+ | 7.6E+ | 84.7 | 46. | | 40.9 |
| 8 | 162920 | 1097751 | 1.3E+08 | 7 | 8 | 09 | 09 | 08 | 7 | 59 | 46.07 | 7 |
| 10/30/199 | | | | 7.8E+0 | 2E+0 | 3.2E+ | 3.2E+ | | 84.7 | 44. | | 42.2 |
| 8 | 157390 | 1129667 | 1.3E+08 | 7 | 8 | 09 | 09 | 6E+08 | 5 | 34 | 45.92 | 6 |
| | | | | 8.6E+0 | 3E+0 | 2.7E+ | 2.7E+ | | 85.0 | 44. | | 39.5 |
| 11/6/1998 | 177895 | 1317385 | 1.5E+08 | 7 | 8 | 09 | 09 | 1E+09 | 3 | 78 | 48.1 | 8 |
| 11/13/199 | | | | 8.3E+0 | 5E+0 | 2.2E+ | 2.2E+ | 9.2E+ | 84.3 | 49. | | |
| 8 | 183620 | 1144997 | 1.5E+08 | 7 | 8 | 09 | 09 | 08 | 3 | 17 | 48.15 | 38.4 |
| 11/20/199 | | | | 9.2E+0 | 2E+0 | 1.8E+ | 1.8E+ | | 83.9 | 49. | | 38.3 |
| 8 | 184862 | 1299797 | 1.7E+08 | 7 | 8 | 09 | 09 | 1E+09 | 9 | 47 | 49.97 | 2 |
| 11/27/199 | | | | 9.1E+0 | 6E+0 | 2.6E+ | 2.6E+ | 1.1E+ | 83.8 | 49. | | 38.5 |
| 8 | 201587 | 1286572 | 1.6E+08 | 7 | 8 | 09 | 09 | 09 | 8 | 22 | 52.41 | 9 |
| | | | | 9.5E+0 | 7E+0 | 1.2E+ | 1.2E+ | 1.3E+ | 83.1 | 49. | | 38.2 |
| 12/4/1998 | 220927 | 1142829 | 1.6E+08 | 7 | 8 | 09 | 09 | 09 | 3 | 9 | 52.58 | 3 |
| 12/11/199 | | | | 1.1E+0 | 5E+0 | 7.8E+ | 7.8E+ | 1.7E+ | 82.8 | 50. | | 40.4 |
| 8 | 217591 | 1243066 | 1.7E+08 | 8 | 8 | 08 | 08 | 09 | 2 | 14 | 51.98 | 9 |
| 12/18/199 | | | | 1.1E+0 | 4E+0 | 7.6E+ | 7.6E+ | 1.5E+ | 81.3 | 50. | | 42.4 |
| 8 | 218354 | 1179005 | 1.7E+08 | 8 | 8 | 08 | 08 | 09 | 1 | 11 | 51.8 | 7 |
| 12/25/199 | | | | 1.2E+0 | 3E+0 | 5.7E+ | 5.7E+ | | 79.2 | 48. | | 44.4 |
| 8 | 215438 | 1235242 | 1.8E+08 | 8 | 8 | 08 | 08 | 1E+09 | 5 | 89 | 51.35 | 8 |
| | | | | 1.3E+0 | 3E+0 | 5.7E+ | 5.7E+ | 2.5E+ | 74.4 | 48. | | 44.1 |
| 1/1/1999 | 221500 | 1223652 | 1.7E+08 | 8 | 8 | 08 | 08 | 08 | 1 | 75 | 50.47 | 4 |
| | | | | 1.4E+0 | 4E+0 | 1.8E+ | 1.8E+ | 1.3E+ | 57.3 | 49. | | 43.7 |
| 1/8/1999 | 275698 | 1411839 | 1.9E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 7 | 51.56 | 7 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1.4E+0 | 3E+0 | 1.1E+ | 1.1E+ | 1.6E+ | | 49. | | 44.1 |
| 1/15/1999 | 229236 | 1342301 | 1.7E+08 | 8 | 8 | 09 | 09 | 09 | 30.3 | 13 | 51.76 | 4 |
| | | | | 1.3E+0 | 2E+0 | 8.7E+ | 8.7E+ | 1.2E+ | 29.4 | 48. | | 45.3 |
| 1/22/1999 | 237776 | 1319832 | 1.7E+08 | 8 | 8 | 08 | 08 | 09 | 6 | 77 | | 8 |
| | | | | 1.3E+0 | 3E+0 | 6.9E+ | 6.9E+ | 9.1E+ | | 49. | | 46.3 |
| 1/29/1999 | 228154 | 1260958 | 1.7E+08 | 8 | 8 | 08 | 08 | 08 | 28.7 | 29 | 50.41 | 5 |
| | | | | 1.3E+0 | 3E+0 | 6.8E+ | 6.8E+ | 8.4E+ | 29.5 | 47. | | 45.1 |
| 2/5/1999 | 214273 | 1307545 | 1.7E+08 | 8 | 8 | 08 | 08 | 08 | 6 | 94 | 48.41 | 6 |
| | | | | 1.3E+0 | 3E+0 | | | 6.9E+ | | 51. | | 44.7 |
| 2/12/1999 | 218715 | 1355311 | 1.7E+08 | 8 | 8 | 8E+08 | 8E+08 | 08 | 31.3 | 28 | 46.9 | 7 |
| | | | | 1.2E+0 | 7E+0 | 7.8E+ | 7.8E+ | 2.6E+ | 29.6 | 48. | | 45.2 |
| 2/19/1999 | 215894 | 1290236 | 1.7E+08 | 8 | 7 | 08 | 08 | 08 | 2 | 93 | 46.18 | 4 |
| | | | | 1.2E+0 | 2E+0 | 4.2E+ | 4.2E+ | | 29.8 | 46. | | 45.2 |
| 2/26/1999 | 206661 | 1310436 | 1.7E+08 | 8 | 8 | 08 | 08 | 6E+08 | 2 | 79 | 43.23 | 4 |
| | | | | 1.3E+0 | 2E+0 | 4.2E+ | 4.2E+ | 5.5E+ | 29.7 | 45. | | 44.7 |
| 3/5/1999 | 196536 | 1308344 | 1.6E+08 | 8 | 8 | 08 | 08 | 08 | 5 | 76 | 39.27 | 4 |
| | | | | 1.4E+0 | 2E+0 | 9.6E+ | 9.6E+ | 1.1E+ | 28.8 | 44. | | 44.9 |
| 3/12/1999 | 199369 | 1367028 | 1.6E+08 | 8 | 8 | 08 | 08 | 09 | 5 | 77 | 38.6 | 2 |
| | | | | 1.5E+0 | 2E+0 | 1.3E+ | 1.3E+ | 1.1E+ | 28.3 | 44. | | 45.8 |
| 3/19/1999 | 192674 | 1466415 | 1.7E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 04 | 38.27 | 7 |
| | | | | 1.5E+0 | 2E+0 | 6.9E+ | 6.9E+ | 9.1E+ | 27.9 | 38. | | 44.7 |
| 3/26/1999 | 186240 | 1456740 | 1.6E+08 | 8 | 8 | 08 | 08 | 08 | 9 | 86 | 35.07 | 5 |
| | | | | 1.6E+0 | 2E+0 | 4.5E+ | 4.5E+ | 9.5E+ | 29.0 | 37. | | 44.6 |
| 4/2/1999 | 204006 | 1423974 | 1.7E+08 | 8 | 8 | 08 | 08 | 08 | 5 | 16 | 34.7 | 2 |
| | | | | 1.7E+0 | 3E+0 | 6.1E+ | 6.1E+ | 1.2E+ | 28.9 | 37. | | 44.7 |
| 4/9/1999 | 210228 | 1497164 | 1.8E+08 | 8 | 8 | 08 | 08 | 09 | 1 | 1 | 33.34 | 8 |
| | | | | 1.8E+0 | 4E+0 | | | 1.7E+ | 29.2 | 39. | | |
| 4/16/1999 | 224268 | 1637217 | 2.4E+08 | 8 | 8 | 5E+08 | 5E+08 | 09 | 5 | 23 | 31.56 | 44.6 |
| | | | | 1.9E+0 | 6E+0 | 1.7E+ | 1.7E+ | 1.6E+ | | 38. | | 44.3 |
| 4/23/1999 | 239024 | 1638181 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 30.2 | 36 | 33.69 | 5 |
| | | | | 1.9E+0 | 7E+0 | 2.9E+ | 2.9E+ | 1.8E+ | 30.3 | 39. | | 43.4 |
| 4/30/1999 | 251497 | 1889122 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 3 | 33.89 | 3 |
| | | | | 2.1E+0 | 7E+0 | 2.2E+ | 2.2E+ | 1.4E+ | 30.0 | 43. | | 41.9 |
| 5/7/1999 | 257163 | 2004043 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 18 | 35.9 | 6 |
| | | | | 1.9E+0 | 7E+0 | 1.8E+ | 1.8E+ | 1.6E+ | 30.8 | 43. | | 41.2 |
| 5/14/1999 | 280146 | 1944230 | 3.6E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 1 | 35.97 | 6 |
| | | | | 1.8E+0 | 1E+0 | 2.1E+ | 2.1E+ | 9.4E+ | | 41. | | 40.6 |
| 5/21/1999 | 289745 | 1961767 | 3.8E+08 | 8 | 9 | 09 | 09 | 08 | 30.9 | 07 | 35.9 | 6 |
| | | | | 1.9E+0 | 5E+0 | 1.6E+ | 1.6E+ | 9.3E+ | 31.2 | 41. | | 39.9 |
| 5/28/1999 | 277626 | 1858918 | 3.7E+08 | 8 | 8 | 09 | 09 | 08 | 7 | 71 | 33.83 | 9 |
| | | | | 2.1E+0 | 3E+0 | 1.6E+ | 1.6E+ | | 31.1 | 41. | | 37.9 |
| 6/4/1999 | 273640 | 1947071 | 3.8E+08 | 8 | 8 | 09 | 09 | 1E+09 | 6 | 75 | 31.43 | 7 |
| | | | | 2.2E+0 | 5E+0 | 3.1E+ | 3.1E+ | 1.3E+ | 28.4 | 41. | | 40.2 |
| 6/11/1999 | 290141 | 2070348 | 4.6E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 19 | 36.67 | 7 |
| | | | | 2.2E+0 | 8E+0 | 2.3E+ | 2.3E+ | | 27.3 | 40. | | 40.5 |
| 6/18/1999 | 297883 | 2113004 | 4.3E+08 | 8 | 8 | 09 | 09 | 1E+09 | 6 | 26 | 37.23 | 5 |
| | | | | 2.3E+0 | 7E+0 | 2.9E+ | 2.9E+ | 1.4E+ | 26.8 | 39. | | 39.3 |
| 6/25/1999 | 307990 | 2211174 | 4.2E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 74 | 37.81 | 7 |
| | | | | 2.5E+0 | 1E+0 | | | 1.3E+ | 26.9 | 36. | | 38.7 |
| 7/2/1999 | 329565 | 2155495 | 4E+08 | 8 | 9 | 2E+09 | 2E+09 | 09 | 1 | 8 | 38.16 | 6 |
| | | | | 2.8E+0 | 1E+0 | 1.8E+ | 1.8E+ | | 26.3 | 37. | | 38.7 |
| 7/9/1999 | 336686 | 2047891 | 4.6E+08 | 8 | 9 | 09 | 09 | 2E+09 | 9 | 32 | 38.64 | 5 |
| | | | | 2.8E+0 | 1E+0 | | | 1.9E+ | 26.0 | 37. | | 39.2 |
| 7/16/1999 | 339478 | 1961437 | 4.5E+08 | 8 | 9 | 1E+09 | 1E+09 | 09 | 2 | 61 | 38.5 | 8 |
| | | | | 2.5E+0 | 7E+0 | 1.1E+ | 1.1E+ | | | 37. | | 41.9 |
| 7/23/1999 | 323959 | 1905328 | 4.2E+08 | 8 | 8 | 09 | 09 | 2E+09 | 26.5 | 96 | 38.76 | 2 |
| | | | | 2.7E+0 | 6E+0 | 5.4E+ | 5.4E+ | 1.9E+ | 27.9 | 37. | | |
| 7/30/1999 | 305015 | 1815691 | 4.2E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 58 | 41.59 | 44.4 |
| | | | | 2.6E+0 | 6E+0 | 6.4E+ | 6.4E+ | 1.6E+ | 29.1 | 37. | | 44.6 |
| 8/6/1999 | 275148 | 1754306 | 4.1E+08 | 8 | 8 | 08 | 08 | 09 | 1 | 85 | 42 | 2 |
| | | | | 2.6E+0 | 7E+0 | 5.3E+ | 5.3E+ | 1.4E+ | 32.7 | 37. | | 45.1 |
| 8/13/1999 | 302307 | 1695977 | 3.6E+08 | 8 | 8 | 08 | 08 | 09 | 9 | 92 | 43.49 | 8 |
| | | | | 2.5E+0 | 4E+0 | | | 1.4E+ | 32.2 | 38. | | 45.0 |
| 8/20/1999 | 298173 | 1729872 | 3.8E+08 | 8 | 8 | 1E+09 | 1E+09 | 09 | 9 | 77 | 42.91 | 9 |
| | | | | 2.8E+0 | 4E+0 | 1.6E+ | 1.6E+ | 1.7E+ | 31.1 | 37. | | 44.5 |
| 8/27/1999 | 302792 | 1814157 | 3.7E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 14 | 39.34 | 4 |
| | | | | 2.7E+0 | 2E+0 | | | 1.5E+ | 31.6 | 37. | | |
| 9/3/1999 | 296209 | 1708670 | 3.6E+08 | 8 | 8 | 8E+08 | 8E+08 | 09 | 9 | 22 | 39.15 | 43.9 |
| | | | | 2.8E+0 | 2E+0 | 6.4E+ | 6.4E+ | 1.4E+ | 30.4 | 35. | | 43.5 |
| 9/10/1999 | 293790 | 1699363 | 3.5E+08 | 8 | 8 | 08 | 08 | 09 | 6 | 19 | 39.59 | 1 |
| | | | | 2.7E+0 | 3E+0 | 1.1E+ | 1.1E+ | 1.3E+ | | 30. | | 42.7 |
| 9/17/1999 | 286533 | 1733346 | 3.5E+08 | 8 | 8 | 09 | 09 | 09 | 29.3 | 66 | 39.54 | 5 |
| 9/24/1999 | 278815 | 1493018 | 3.3E+08 | 2.7E+0 | 3E+0 | 8.3E+ | 8.3E+ | 8.4E+ | 29.8 | 31. | 39.35 | 42.4 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8 | 8 | 08 | 08 | 08 | 2 | 78 | | 6 |
| | | | | 2.5E+0 | 2E+0 | 8.4E+ | 8.4E+ | 1.2E+ | 29.7 | 32. | | 43.7 |
| 10/1/1999 | 272156 | 1606265 | 3.7E+08 | 8 | 8 | 08 | 08 | 09 | 6 | 07 | 39.95 | 2 |
| | | | | 2.5E+0 | 4E+0 | 8.2E+ | 8.2E+ | 1.5E+ | 30.6 | 31. | | 45.0 |
| 10/8/1999 | 297244 | 1539098 | 3.9E+08 | 8 | 8 | 08 | 08 | 09 | 3 | 48 | 40.14 | 3 |
| 10/15/199 | | | | 2.6E+0 | 3E+0 | 6.4E+ | 6.4E+ | 1.5E+ | 30.2 | 31. | | 41.4 |
| 9 | 288148 | 1509325 | 3.8E+08 | 8 | 8 | 08 | 08 | 09 | 2 | 4 | 34.07 | 3 |
| 10/22/199 | | | | 2.5E+0 | 2E+0 | 4.7E+ | 4.7E+ | 1.4E+ | 30.6 | 32. | | 41.5 |
| 9 | 293483 | 1473110 | 4.1E+08 | 8 | 8 | 08 | 08 | 09 | 3 | 05 | 35.72 | 5 |
| 10/29/199 | | | | 2.5E+0 | 3E+0 | 8.6E+ | 8.6E+ | 1.3E+ | 30.5 | 31. | | 41.6 |
| 9 | 295978 | 1549724 | 4E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 49 | 35.98 | 3 |
| | | | | 2.7E+0 | 2E+0 | 1.4E+ | 1.4E+ | | 29.8 | 32. | | 41.9 |
| 11/5/1999 | 286557 | 1710458 | 4.3E+08 | 8 | 8 | 09 | 09 | 2E+09 | 3 | 32 | 35.94 | 9 |
| 11/12/199 | | | | 2.9E+0 | 2E+0 | 1.1E+ | 1.1E+ | 2.2E+ | 30.1 | 32. | | 41.9 |
| 9 | 286817 | 1775926 | 4.2E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 37 | 35.54 | 6 |
| 11/19/199 | | | | | 2E+0 | | | 2.2E+ | 30.1 | 31. | | 41.8 |
| 9 | 291803 | 1681104 | 4.2E+08 | 3E+08 | 8 | 8E+08 | 8E+08 | 09 | 9 | 62 | 35.43 | 3 |
| 11/26/199 | | | | 2.9E+0 | 3E+0 | 4.7E+ | 4.7E+ | 1.6E+ | 29.1 | 31. | | 40.9 |
| 9 | 297487 | 1692947 | 3.9E+08 | 8 | 8 | 08 | 08 | 09 | 3 | 58 | 35.73 | 1 |
| | | | | 2.9E+0 | 2E+0 | 6.7E+ | 6.7E+ | 1.5E+ | 27.8 | 30. | | 36.3 |
| 12/3/1999 | 290165 | 1707364 | 4E+08 | 8 | 8 | 08 | 08 | 09 | 3 | 82 | 33.13 | 1 |
| 12/10/199 | | | | 3.1E+0 | 3E+0 | 2.3E+ | 2.3E+ | 1.5E+ | 25.0 | 30. | | |
| 9 | 297593 | 1739851 | 4E+08 | 8 | 8 | 08 | 08 | 09 | 9 | 88 | 32.68 | 36.3 |
| 12/17/199 | | | | 2.9E+0 | 4E+0 | 8.6E+ | 8.6E+ | 1.7E+ | 21.1 | 31. | | 36.6 |
| 9 | 312940 | 1865892 | 4.2E+08 | 8 | 8 | 08 | 08 | 09 | 8 | 18 | 31.46 | 2 |
| 12/24/199 | | | | 3.1E+0 | 2E+0 | 1.3E+ | 1.3E+ | 1.4E+ | 20.8 | 31. | | 35.7 |
| 9 | 315702 | 1961932 | 4.4E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 47 | 31.03 | 8 |
| 12/31/199 | | | | 3.2E+0 | 2E+0 | 6.9E+ | 6.9E+ | 4.9E+ | 21.0 | 30. | | 35.2 |
| 9 | 326874 | 2067127 | 4.5E+08 | 8 | 8 | 08 | 08 | 08 | 8 | 27 | 31.16 | 6 |
| | | | | | 4E+0 | 1.1E+ | 1.1E+ | 8.7E+ | 21.0 | 32. | | 37.5 |
| 1/7/2000 | 333362 | 1944991 | 4.3E+08 | 3E+08 | 8 | 09 | 09 | 08 | 2 | 61 | 32.05 | 4 |
| | | | | | 7E+0 | | | 1.2E+ | 23.4 | 32. | | 37.7 |
| 1/14/2000 | 369924 | 2051492 | 4.4E+08 | 3E+08 | 8 | 1E+09 | 1E+09 | 09 | 6 | 89 | 30.99 | 6 |
| | | | | 2.9E+0 | 1E+0 | 1.6E+ | 1.6E+ | 1.1E+ | 23.7 | 32. | | 38.6 |
| 1/21/2000 | 386679 | 2060013 | 4.2E+08 | 8 | 9 | 09 | 09 | 09 | 8 | 39 | 30.22 | 2 |
| | | | | | 6E+0 | 8.7E+ | 8.7E+ | 1.3E+ | 21.3 | 32. | | 39.0 |
| 1/28/2000 | 379381 | 2051340 | 4E+08 | 3E+08 | 8 | 08 | 08 | 09 | 9 | 07 | 30.11 | 3 |
| | | | | | 4E+0 | | | 1.2E+ | 22.0 | 29. | | 38.2 |
| 2/4/2000 | 392765 | 2022734 | 4.1E+08 | 3E+08 | 8 | 7E+08 | 7E+08 | 09 | 4 | 86 | 30.64 | 1 |
| | | | | | 8E+0 | 8.6E+ | 8.6E+ | 1.3E+ | 21.0 | 28. | | 37.2 |
| 2/11/2000 | 418947 | 1953233 | 4.1E+08 | 3E+08 | 8 | 08 | 08 | 09 | 4 | 82 | 29.06 | 6 |
| | | | | 2.8E+0 | 8E+0 | 7.5E+ | 7.5E+ | 1.1E+ | 20.2 | 30. | | 37.1 |
| 2/18/2000 | 426015 | 1718561 | 3.9E+08 | 8 | 8 | 08 | 08 | 09 | 1 | 63 | 29.08 | 7 |
| | | | | 2.8E+0 | 9E+0 | | | 1.3E+ | 19.8 | 32. | | 37.3 |
| 2/25/2000 | 427085 | 1711587 | 3.7E+08 | 8 | 8 | 6E+08 | 6E+08 | 09 | 3 | 99 | 28.87 | 2 |
| | | | | 2.9E+0 | 6E+0 | 8.1E+ | 8.1E+ | 1.2E+ | 20.7 | 35. | | 40.3 |
| 3/3/2000 | 400743 | 1599265 | 3.4E+08 | 8 | 8 | 08 | 08 | 09 | 2 | 06 | 26.48 | 1 |
| | | | | 2.7E+0 | 4E+0 | 8.1E+ | 8.1E+ | 1.7E+ | 21.2 | 35. | | 40.1 |
| 3/10/2000 | 403091 | 1686404 | 3.7E+08 | 8 | 8 | 08 | 08 | 09 | 3 | 12 | 26.81 | 6 |
| | | | | 2.7E+0 | 2E+0 | 8.1E+ | 8.1E+ | 1.6E+ | 21.4 | 35. | | 39.6 |
| 3/17/2000 | 396112 | 1673838 | 3.7E+08 | 8 | 8 | 08 | 08 | 09 | 6 | 59 | 26.48 | 9 |
| | | | | 2.9E+0 | 4E+0 | 9.4E+ | 9.4E+ | 1.3E+ | | 35. | | 39.4 |
| 3/24/2000 | 412051 | 1691387 | 3.6E+08 | 8 | 8 | 08 | 08 | 09 | 21.6 | 28 | 26.45 | 8 |
| | | | | 2.8E+0 | 5E+0 | 8.9E+ | 8.9E+ | 1.3E+ | 21.7 | 35. | | 38.8 |
| 3/31/2000 | 418344 | 1673546 | 3.6E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 19 | 26.55 | 9 |
| | | | | 2.7E+0 | 4E+0 | 4.3E+ | 4.3E+ | 7.9E+ | 21.8 | 35. | | |
| 4/7/2000 | 406403 | 1697106 | 3.6E+08 | 8 | 8 | 08 | 08 | 08 | 4 | 19 | 26.9 | 40 |
| | | | | 2.6E+0 | 3E+0 | 5.6E+ | 5.6E+ | | 21.3 | 35. | | 40.7 |
| 4/14/2000 | 398070 | 1735514 | 3.6E+08 | 8 | 8 | 08 | 08 | 1E+09 | 9 | 48 | 25.8 | 1 |
| | | | | 2.5E+0 | 4E+0 | 1.1E+ | 1.1E+ | 1.3E+ | 24.3 | 36. | | |
| 4/21/2000 | 377098 | 1637357 | 3.3E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 79 | 26.47 | 46.2 |
| | | | | 2.3E+0 | 3E+0 | 5.1E+ | 5.1E+ | | 24.4 | 36. | | 46.7 |
| 4/28/2000 | 379144 | 1610500 | 3.3E+08 | 8 | 8 | 08 | 08 | 1E+09 | 7 | 22 | 26.49 | 3 |
| | | | | 2.4E+0 | 2E+0 | 2.5E+ | 2.5E+ | 5.7E+ | 24.1 | 35. | | 47.0 |
| 5/5/2000 | 392463 | 1574095 | 3.4E+08 | 8 | 8 | 08 | 08 | 08 | 1 | 57 | 26.19 | 4 |
| | | | | 2.4E+0 | 3E+0 | 5.7E+ | 5.7E+ | 7.6E+ | 23.1 | 36. | | 47.2 |
| 5/12/2000 | 384343 | 1417406 | 3.3E+08 | 8 | 8 | 08 | 08 | 08 | 1 | 81 | 26.13 | 4 |
| | | | | 2.4E+0 | 2E+0 | 3.6E+ | 3.6E+ | 9.8E+ | | 34. | | 45.7 |
| 5/19/2000 | 397414 | 1408682 | 3.1E+08 | 8 | 8 | 08 | 08 | 08 | 21.2 | 32 | 26.91 | 7 |
| | | | | 2.2E+0 | 3E+0 | 5.8E+ | 5.8E+ | 1.4E+ | | 35. | | 47.4 |
| 5/26/2000 | 368380 | 1289719 | 3E+08 | 8 | 8 | 08 | 08 | 09 | 21.5 | 03 | 26.36 | 8 |
| | | | | 2.5E+0 | 3E+0 | 7.9E+ | 7.9E+ | 1.9E+ | 22.0 | 36. | | 48.8 |
| 6/2/2000 | 371429 | 1400371 | 2.8E+08 | 8 | 8 | 08 | 08 | 09 | 2 | 17 | 26.61 | 9 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2.7E+0 | 3E+0 | 7.7E+ | 7.7E+ | 2.1E+ | 21.7 | 36. | | 50.1 |
| 6/9/2000 | 359423 | 1418964 | 3.1E+08 | 8 | 8 | 08 | 08 | 09 | 1 | 97 | 27.75 | 6 |
| | | | | 2.5E+0 | 1E+0 | 5.2E+ | 5.2E+ | 2.1E+ | 22.1 | 37. | | 51.3 |
| 6/16/2000 | 348860 | 1443572 | 3E+08 | 8 | 8 | 08 | 08 | 09 | 6 | 44 | 27.71 | 2 |
| | | | | 2.5E+0 | 3E+0 | 4.6E+ | 4.6E+ | 1.8E+ | 23.2 | 37. | | 51.4 |
| 6/23/2000 | 338249 | 1400180 | 3.1E+08 | 8 | 8 | 08 | 08 | 09 | 5 | 24 | 26.95 | 5 |
| | | | | 2.7E+0 | 3E+0 | 3.6E+ | 3.6E+ | 2.1E+ | | 36. | | 50.7 |
| 6/30/2000 | 347072 | 1367985 | 3.3E+08 | 8 | 8 | 08 | 08 | 09 | 24 | 44 | 27.14 | 2 |
| | | | | 2.7E+0 | 2E+0 | 4.1E+ | 4.1E+ | 2.7E+ | 25.1 | 33. | | 50.0 |
| 7/7/2000 | 340947 | 1357639 | 3.2E+08 | 8 | 8 | 08 | 08 | 09 | 7 | 94 | 26.49 | 2 |
| | | | | 2.7E+0 | 2E+0 | 3.7E+ | 3.7E+ | 2.7E+ | 25.0 | 31. | | 47.5 |
| 7/14/2000 | 356869 | 1326115 | 3.4E+08 | 8 | 8 | 08 | 08 | 09 | 5 | 22 | 26.07 | 5 |
| | | | | 2.6E+0 | 2E+0 | 2.4E+ | 2.4E+ | 1.6E+ | 24.7 | 31. | | 47.4 |
| 7/21/2000 | 346119 | 1284363 | 3.4E+08 | 8 | 8 | 08 | 08 | 09 | 8 | 03 | 24.82 | 4 |
| | | | | 2.3E+0 | 1E+0 | 3.9E+ | 3.9E+ | 1.6E+ | 24.0 | 29. | | 48.7 |
| 7/28/2000 | 331967 | 1225247 | 3.4E+08 | 8 | 8 | 08 | 08 | 09 | 5 | 97 | 24.14 | 3 |
| | | | | 2.3E+0 | 2E+0 | 1.1E+ | 1.1E+ | 1.3E+ | 24.0 | 31. | | 48.8 |
| 8/4/2000 | 338802 | 1311441 | 3.3E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 41 | 24 | 1 |
| | | | | 2.4E+0 | 1E+0 | 1.2E+ | 1.2E+ | 1.3E+ | 24.1 | 32. | | 50.6 |
| 8/11/2000 | 334107 | 1333262 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 09 | 24.74 | 2 |
| | | | | 2.4E+0 | 2E+0 | 6.7E+ | 6.7E+ | 1.2E+ | 21.7 | 32. | | 50.3 |
| 8/18/2000 | 341011 | 1346151 | 3.4E+08 | 8 | 8 | 08 | 08 | 09 | 9 | 39 | 24.4 | 2 |
| | | | | 2.4E+0 | 1E+0 | 4.1E+ | 4.1E+ | 1.4E+ | 21.5 | 30. | | 49.0 |
| 8/25/2000 | 332342 | 1294230 | 3.3E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 82 | 23.93 | 2 |
| | | | | 2.3E+0 | 1E+0 | | | 1.2E+ | 22.4 | 30. | | 43.8 |
| 9/1/2000 | 319080 | 1312262 | 3.3E+08 | 8 | 8 | 6E+08 | 6E+08 | 09 | 1 | 56 | 24.01 | 3 |
| | | | | 2.1E+0 | 2E+0 | 4.7E+ | 4.7E+ | 1.2E+ | 22.5 | 30. | | 42.5 |
| 9/8/2000 | 308174 | 1256656 | 3.4E+08 | 8 | 8 | 08 | 08 | 09 | 5 | 67 | 23.89 | 1 |
| | | | | 2.1E+0 | 2E+0 | 4.7E+ | 4.7E+ | 6.6E+ | 23.0 | 29. | | 42.3 |
| 9/15/2000 | 313574 | 1242682 | 3.1E+08 | 8 | 8 | 08 | 08 | 08 | 3 | 66 | 24.36 | 8 |
| | | | | 1.8E+0 | 2E+0 | 4.2E+ | 4.2E+ | 1.6E+ | 22.1 | 29. | | 47.1 |
| 9/22/2000 | 308588 | 1160759 | 2.8E+08 | 8 | 8 | 08 | 08 | 09 | 9 | 01 | 27.61 | 6 |
| | | | | | 2E+0 | 6.3E+ | 6.3E+ | 1.8E+ | 21.3 | 28. | | 47.7 |
| 9/29/2000 | 298581 | 1177242 | 2.9E+08 | 2E+08 | 8 | 08 | 08 | 09 | 9 | 11 | 26.26 | 2 |
| | | | | | 2E+0 | 4.9E+ | 4.9E+ | 1.4E+ | 21.3 | 26. | | 46.9 |
| 10/6/2000 | 296887 | 1135928 | 2.9E+08 | 2E+08 | 8 | 08 | 08 | 09 | 4 | 49 | 25.83 | 4 |
| 10/13/200 | | | | 1.7E+0 | 3E+0 | 6.7E+ | 6.7E+ | 1.5E+ | 21.7 | 25. | | 45.3 |
| 0 | 313580 | 1077526 | 2.7E+08 | 8 | 8 | 08 | 08 | 09 | 3 | 61 | 24.78 | 1 |
| 10/20/200 | | | | 1.8E+0 | 4E+0 | 1.1E+ | 1.1E+ | 1.7E+ | | 26. | | 46.3 |
| 0 | 326150 | 1176197 | 2.8E+08 | 8 | 8 | 09 | 09 | 09 | 20.9 | 34 | 23.79 | 3 |
| 10/27/200 | | | | 1.7E+0 | 2E+0 | 6.3E+ | 6.3E+ | 1.4E+ | | 26. | | 45.3 |
| 0 | 330600 | 1166546 | 2.8E+08 | 8 | 8 | 08 | 08 | 09 | 20.3 | 58 | 23.33 | 6 |
| | | | | 1.8E+0 | 2E+0 | 9.3E+ | 9.3E+ | 1.9E+ | 18.7 | 27. | | 46.6 |
| 11/3/2000 | 319819 | 1246010 | 2.7E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 51 | 23.26 | 9 |
| 11/10/200 | | | | 1.9E+0 | 1E+0 | 1.6E+ | 1.6E+ | 1.8E+ | 17.9 | 27. | | 46.3 |
| 0 | 316526 | 1275214 | 2.8E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 11 | 23.26 | 7 |
| 11/17/200 | | | | 1.8E+0 | 1E+0 | 8.9E+ | 8.9E+ | 1.5E+ | 18.1 | 27. | | 46.8 |
| 0 | 307212 | 1281085 | 2.7E+08 | 8 | 8 | 08 | 08 | 09 | 2 | 2 | 23.36 | 8 |
| 11/24/200 | | | | 1.7E+0 | 1E+0 | 6.5E+ | 6.5E+ | 1.5E+ | 18.4 | 27. | | 47.2 |
| 0 | 298078 | 1239942 | 2.8E+08 | 8 | 8 | 08 | 08 | 09 | 6 | 11 | 23.61 | 4 |
| | | | | 1.7E+0 | 2E+0 | 4.3E+ | 4.3E+ | 1.7E+ | 19.0 | 26. | | 47.4 |
| 12/1/2000 | 303306 | 1189940 | 2.8E+08 | 8 | 8 | 08 | 08 | 09 | 1 | 22 | 23.47 | 2 |
| | | | | 1.8E+0 | 2E+0 | 3.5E+ | 3.5E+ | 1.5E+ | 19.1 | 24. | | 47.2 |
| 12/8/2000 | 306666 | 1190153 | 2.9E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 85 | 23.47 | 1 |
| 12/15/200 | | | | 1.8E+0 | 2E+0 | 3.7E+ | 3.7E+ | 1.6E+ | 19.2 | 23. | | 47.2 |
| 0 | 292834 | 1188202 | 2.8E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 64 | 24 | 3 |
| 12/22/200 | | | | 1.6E+0 | 2E+0 | 3.3E+ | 3.3E+ | 1.5E+ | 19.1 | 22. | | |
| 0 | 291418 | 1163065 | 2.7E+08 | 8 | 8 | 08 | 08 | 09 | 5 | 65 | 23.19 | 45.8 |
| 12/29/200 | | | | 1.7E+0 | 5E+0 | 2.2E+ | 2.2E+ | 2.5E+ | 19.9 | 21. | | 45.5 |
| 0 | 284290 | 1172992 | 2.7E+08 | 8 | 7 | 08 | 08 | 08 | 7 | 85 | 23.65 | 9 |
| | | | | 1.9E+0 | 2E+0 | 4.4E+ | 4.4E+ | 1.6E+ | 18.8 | 22. | | 47.8 |
| 1/5/2001 | 273660 | 1257155 | 2.7E+08 | 8 | 8 | 08 | 08 | 09 | 1 | 94 | 22.39 | 9 |
| | | | | 1.9E+0 | 2E+0 | 2.9E+ | 2.9E+ | | 18.5 | 25. | | |
| 1/12/2001 | 277459 | 1366854 | 2.6E+08 | 8 | 8 | 09 | 09 | 3E+09 | 8 | 34 | 22.42 | 49.1 |
| | | | | | 2E+0 | 3.2E+ | 3.2E+ | 2.6E+ | 18.2 | 25. | | 48.9 |
| 1/19/2001 | 283743 | 1393144 | 2.5E+08 | 2E+08 | 8 | 09 | 09 | 09 | 4 | 68 | 22.03 | 2 |
| | | | | 1.9E+0 | 1E+0 | 4.5E+ | 4.5E+ | 9.3E+ | 18.8 | 26. | | |
| 1/26/2001 | 291619 | 1459786 | 2.6E+08 | 8 | 8 | 09 | 09 | 08 | 9 | 46 | 19.21 | 49.7 |
| | | | | | 2E+0 | | | 2.1E+ | 18.7 | 26. | | 47.8 |
| 2/2/2001 | 300476 | 1468480 | 2.8E+08 | 2E+08 | 8 | 3E+09 | 3E+09 | 09 | 8 | 04 | 19.83 | 4 |
| | | | | | 2E+0 | 1.3E+ | 1.3E+ | 1.7E+ | 18.8 | 26. | | 45.0 |
| 2/9/2001 | 296534 | 1427903 | 2.6E+08 | 2E+08 | 8 | 09 | 09 | 09 | 8 | 17 | 20.19 | 7 |
| 2/16/2001 | 292240 | 1389297 | 2.6E+08 | 2E+08 | 2E+0 | 1.1E+ | 1.1E+ | 1.7E+ | 17.2 | 26. | 20.1 | 44.2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 8 | 09 | 09 | 09 | 6 | 44 | | 9 |
| | | | | 1.9E+0 | 1E+0 | 1.2E+ | 1.2E+ | 2.1E+ | 17.0 | 26. | | 43.3 |
| 2/23/2001 | 291259 | 1441603 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 46 | 20.16 | 6 |
| | | | | 1.9E+0 | 1E+0 | 2.7E+ | 2.7E+ | 1.6E+ | 16.4 | 26. | | 40.5 |
| 3/2/2001 | 287648 | 1359880 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 85 | 20.95 | 3 |
| | | | | 1.9E+0 | 1E+0 | 1.3E+ | 1.3E+ | 1.8E+ | 15.3 | 27. | | 38.9 |
| 3/9/2001 | 284749 | 1363883 | 2.5E+08 | 8 | 8 | 09 | 09 | 09 | 8 | 14 | 22.59 | 2 |
| | | | | 1.8E+0 | 1E+0 | 1.1E+ | 1.1E+ | 1.9E+ | 15.1 | 26. | | 39.2 |
| 3/16/2001 | 275796 | 1315065 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 53 | 23.98 | 7 |
| | | | | 1.8E+0 | 2E+0 | 6.4E+ | 6.4E+ | 1.7E+ | | 25. | | 37.7 |
| 3/23/2001 | 274528 | 1302210 | 2.3E+08 | 8 | 8 | 08 | 08 | 09 | 15.7 | 84 | 24.07 | 8 |
| | | | | 1.8E+0 | 1E+0 | 6.3E+ | 6.3E+ | 2.2E+ | | 25. | | 36.9 |
| 3/30/2001 | 265396 | 1311261 | 2.3E+08 | 8 | 8 | 08 | 08 | 09 | 14.7 | 76 | 24.07 | 3 |
| | | | | 1.7E+0 | 3E+0 | 5.7E+ | 5.7E+ | 1.2E+ | 19.3 | 26. | | 37.3 |
| 4/6/2001 | 236363 | 1256383 | 2.2E+08 | 8 | 8 | 08 | 08 | 09 | 8 | 17 | 24.27 | 3 |
| | | | | 1.7E+0 | 2E+0 | 6.5E+ | 6.5E+ | 1.7E+ | | 26. | | 36.6 |
| 4/13/2001 | 238299 | 1290644 | 2.2E+08 | 8 | 8 | 08 | 08 | 09 | 21.5 | 67 | 24.57 | 1 |
| | | | | 1.9E+0 | 2E+0 | 1.6E+ | 1.6E+ | 2.2E+ | 21.1 | 27. | | 37.1 |
| 4/20/2001 | 235117 | 1298586 | 2.1E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 56 | 24.4 | 1 |
| | | | | 1.9E+0 | 2E+0 | 1.1E+ | 1.1E+ | 1.7E+ | 20.9 | 27. | | |
| 4/27/2001 | 238969 | 1322937 | 2.1E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 63 | 24.96 | 36.3 |
| | | | | | 3E+0 | 6.4E+ | 6.4E+ | 1.7E+ | 23.7 | 27. | | 35.9 |
| 5/4/2001 | 235376 | 1365245 | 2.3E+08 | 2E+08 | 8 | 08 | 08 | 09 | 2 | 8 | 24.87 | 8 |
| | | | | | 2E+0 | | | 2.6E+ | 23.4 | 28. | | |
| 5/11/2001 | 233752 | 1385403 | 2.3E+08 | 2E+08 | 8 | 1E+09 | 1E+09 | 09 | 7 | 06 | 24.61 | 35.5 |
| | | | | | 2E+0 | 1.5E+ | 1.5E+ | 2.8E+ | 23.5 | 28. | | 33.3 |
| 5/18/2001 | 228513 | 1353489 | 2.3E+08 | 2E+08 | 8 | 09 | 09 | 09 | 3 | 13 | 24.76 | 4 |
| | | | | 2.1E+0 | 2E+0 | 1.8E+ | 1.8E+ | 3.3E+ | 23.0 | 27. | | 31.6 |
| 5/25/2001 | 230957 | 1400703 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 55 | 25.59 | 1 |
| | | | | | 1E+0 | | | 2.2E+ | 22.6 | 25. | | 31.5 |
| 6/1/2001 | 233785 | 1404910 | 2.4E+08 | 2E+08 | 8 | 2E+09 | 2E+09 | 09 | 3 | 56 | 25.58 | 9 |
| | | | | 2.1E+0 | 1E+0 | 1.6E+ | 1.6E+ | 1.5E+ | 22.6 | 24. | | 30.6 |
| 6/8/2001 | 235735 | 1405311 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 4 | 24.38 | 1 |
| | | | | 2.1E+0 | 3E+0 | 2.7E+ | 2.7E+ | 1.8E+ | 23.2 | 24. | | 28.6 |
| 6/15/2001 | 241432 | 1458757 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 26 | 23.72 | 3 |
| | | | | | 1E+0 | 1.5E+ | 1.5E+ | 2.2E+ | | 23. | | 28.4 |
| 6/22/2001 | 240715 | 1434122 | 2.7E+08 | 2E+08 | 8 | 09 | 09 | 09 | 23.4 | 92 | 22.97 | 9 |
| | | | | | 2E+0 | 2.1E+ | 2.1E+ | 1.4E+ | | 23. | | 28.5 |
| 6/29/2001 | 242505 | 1452193 | 2.7E+08 | 2E+08 | 8 | 09 | 09 | 09 | 23.6 | 33 | 22.94 | 1 |
| | | | | 1.9E+0 | 3E+0 | | | | 24.6 | 23. | | 28.3 |
| 7/6/2001 | 261503 | 1462491 | 2.6E+08 | 8 | 8 | 2E+09 | 2E+09 | 1E+09 | 6 | 1 | 22.76 | 3 |
| | | | | 1.8E+0 | 2E+0 | 1.7E+ | 1.7E+ | 1.2E+ | 24.8 | 21. | | 28.5 |
| 7/13/2001 | 259367 | 1415161 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 65 | 21.03 | 7 |
| | | | | 1.8E+0 | 5E+0 | 2.4E+ | 2.4E+ | | 25.1 | 20. | | 27.1 |
| 7/20/2001 | 270589 | 1407626 | 2.8E+08 | 8 | 8 | 09 | 09 | 1E+09 | 2 | 67 | 20.44 | 2 |
| | | | | 1.8E+0 | 5E+0 | | | 1.8E+ | 24.8 | 20. | | 27.2 |
| 7/27/2001 | 269199 | 1358637 | 2.9E+08 | 8 | 8 | 2E+09 | 2E+09 | 09 | 5 | 47 | 19.57 | 5 |
| | | | | 1.9E+0 | 5E+0 | 1.5E+ | 1.5E+ | 1.6E+ | 24.7 | 21. | | 27.5 |
| 8/3/2001 | 274311 | 1426079 | 2.8E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 6 | 20.06 | 7 |
| | | | | 1.9E+0 | 3E+0 | 2.6E+ | 2.6E+ | 1.7E+ | 19.7 | 21. | | 27.5 |
| 8/10/2001 | 269729 | 1426193 | 2.8E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 91 | 19.89 | 6 |
| | | | | | 3E+0 | 1.8E+ | 1.8E+ | 1.8E+ | 19.0 | 21. | | 27.1 |
| 8/17/2001 | 272931 | 1460395 | 2.8E+08 | 2E+08 | 8 | 09 | 09 | 09 | 6 | 43 | 19.57 | 4 |
| | | | | 1.9E+0 | 3E+0 | 2.9E+ | 2.9E+ | 2.2E+ | 19.2 | 21. | | |
| 8/24/2001 | 284029 | 1500086 | 2.8E+08 | 8 | 8 | 09 | 09 | 09 | 8 | 06 | 18.84 | 26.8 |
| | | | | 1.8E+0 | 3E+0 | 3.6E+ | 3.6E+ | 2.8E+ | 19.4 | 20. | | 25.3 |
| 8/31/2001 | 286111 | 1515862 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 32 | 18.95 | 4 |
| | | | | 1.9E+0 | 3E+0 | 1.8E+ | 1.8E+ | 2.8E+ | 15.2 | 20. | | 24.8 |
| 9/7/2001 | 289759 | 1554136 | 2.8E+08 | 8 | 8 | 09 | 09 | 09 | 2 | 3 | 19.77 | 5 |
| | | | | 1.6E+0 | 4E+0 | 2.1E+ | 2.1E+ | 3.5E+ | 17.6 | 26. | | |
| 9/14/2001 | 268500 | 1307581 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 52 | 21.71 | 34.4 |
| | | | | 1.6E+0 | 4E+0 | 2.1E+ | 2.1E+ | 3.4E+ | 22.2 | 29. | | 35.2 |
| 9/21/2001 | 253166 | 1246272 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 71 | 22.22 | 9 |
| | | | | 1.6E+0 | 2E+0 | | | 2.5E+ | | 29. | | 34.4 |
| 9/28/2001 | 256307 | 1257578 | 2.4E+08 | 8 | 8 | 1E+09 | 1E+09 | 09 | 22.3 | 44 | 22.2 | 7 |
| | | | | 1.7E+0 | 2E+0 | 1.5E+ | 1.5E+ | 1.3E+ | 22.3 | 29. | | 35.3 |
| 10/5/2001 | 253420 | 1286041 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 51 | 23.19 | 4 |
| 10/12/200 | | | | 1.8E+0 | 2E+0 | 2.1E+ | 2.1E+ | | | 30. | | 35.4 |
| 1 | 254221 | 1305106 | 2.3E+08 | 8 | 8 | 09 | 09 | 3E+09 | 22.3 | 05 | 22.56 | 8 |
| 10/19/200 | | | | 1.8E+0 | 2E+0 | 1.4E+ | 1.4E+ | 2.3E+ | 22.0 | 29. | | 34.8 |
| 1 | 253174 | 1304430 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 5 | 22.47 | 1 |
| 10/26/200 | | | | 1.9E+0 | 1E+0 | 6.5E+ | 6.5E+ | 2.3E+ | 21.9 | 29. | | 34.8 |
| 1 | 252242 | 1285509 | 2.4E+08 | 8 | 8 | 08 | 08 | 09 | 7 | 39 | 22.55 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1.9E+0 | 1E+0 | 7.5E+ | 7.5E+ | 2.7E+ | 21.8 | 29. | | 35.0 |
| 11/2/2001 | 245642 | 1257940 | 2.3E+08 | 8 | 8 | 08 | 08 | 09 | 5 | 51 | 22.39 | 9 |
| | | | | 2.1E+0 | 1E+0 | 7.9E+ | 7.9E+ | 2.7E+ | 20.9 | 29. | | 35.1 |
| 11/9/2001 | 246861 | 1230283 | 2.3E+08 | 8 | 8 | 08 | 08 | 09 | 4 | 67 | 22.65 | 9 |
| 11/16/200 | | | | 2.2E+0 | 3E+0 | 1.6E+ | 1.6E+ | 4.1E+ | 21.3 | 29. | | |
| 1 | 261528 | 1265645 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 74 | 22.06 | 34.9 |
| 11/23/200 | | | | 2.4E+0 | 3E+0 | 3.8E+ | 3.8E+ | 4.2E+ | 21.2 | 30. | | 35.4 |
| 1 | 263193 | 1364577 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 21 | 21.04 | 5 |
| 11/30/200 | | | | 2.3E+0 | 3E+0 | 3.1E+ | 3.1E+ | 3.8E+ | 20.9 | 30. | | 37.3 |
| 1 | 262821 | 1394920 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 62 | 20.83 | 4 |
| | | | | 2.6E+0 | 3E+0 | | | 4.1E+ | 21.0 | 30. | | 38.4 |
| 12/7/2001 | 272707 | 1501188 | 2.3E+08 | 8 | 8 | 3E+09 | 3E+09 | 09 | 9 | 47 | 20.46 | 3 |
| 12/14/200 | | | | 2.4E+0 | 3E+0 | 2.1E+ | 2.1E+ | 2.8E+ | 21.1 | 30. | | 39.2 |
| 1 | 274179 | 1454950 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 09 | 19.78 | 9 |
| 12/21/200 | | | | 2.4E+0 | 8E+0 | 3.5E+ | 3.5E+ | 2.6E+ | 21.3 | 29. | | 39.5 |
| 1 | 274432 | 1468314 | 2.3E+08 | 8 | 7 | 09 | 09 | 09 | 9 | 73 | 20.5 | 5 |
| 12/28/200 | | | | 2.5E+0 | 2E+0 | 4.4E+ | 4.4E+ | | 21.0 | 29. | | 39.9 |
| 1 | 285816 | 1504379 | 2.4E+08 | 8 | 8 | 09 | 09 | 2E+09 | 7 | 76 | 20.76 | 4 |
| | | | | 2.7E+0 | 2E+0 | 2.5E+ | 2.5E+ | | | 29. | | 40.7 |
| 1/4/2002 | 286312 | 1506754 | 2.2E+08 | 8 | 8 | 09 | 09 | 2E+09 | 21.5 | 76 | 21.83 | 2 |
| | | | | 2.6E+0 | 4E+0 | 3.8E+ | 3.8E+ | 4.4E+ | 21.5 | 29. | | 40.7 |
| 1/11/2002 | 290307 | 1539351 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 33 | 21.74 | 5 |
| | | | | 2.5E+0 | 2E+0 | 2.7E+ | 2.7E+ | 3.3E+ | 16.4 | 29. | | 41.1 |
| 1/18/2002 | 288345 | 1516192 | 2.5E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 2 | 21.39 | 1 |
| | | | | 2.8E+0 | 2E+0 | | | 3.3E+ | 13.4 | 21. | | 32.9 |
| 1/25/2002 | 286287 | 1617575 | 2.6E+08 | 8 | 8 | 3E+09 | 3E+09 | 09 | 8 | 6 | 20.03 | 6 |
| | | | | 2.7E+0 | 3E+0 | 3.7E+ | 3.7E+ | 3.6E+ | 13.6 | 19. | | 32.5 |
| 2/1/2002 | 296528 | 1606145 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 26 | 20.19 | 1 |
| | | | | 2.6E+0 | 4E+0 | 3.4E+ | 3.4E+ | 2.7E+ | 13.4 | 19. | | 32.5 |
| 2/8/2002 | 293159 | 1686875 | 2.5E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 48 | 19.49 | 8 |
| | | | | 2.8E+0 | 1E+0 | 4.3E+ | 4.3E+ | 1.5E+ | 13.1 | 19. | | 34.2 |
| 2/15/2002 | 297679 | 1785238 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 48 | 18.09 | 2 |
| | | | | 2.8E+0 | 3E+0 | 4.8E+ | 4.8E+ | 3.5E+ | 13.3 | 21. | | 33.8 |
| 2/22/2002 | 293650 | 1682030 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 07 | 18.35 | 7 |
| | | | | 2.9E+0 | 2E+0 | 2.9E+ | 2.9E+ | 2.4E+ | 13.4 | 22. | | 33.9 |
| 3/1/2002 | 296722 | 1824513 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 8 | 35 | 19.38 | 4 |
| | | | | | 4E+0 | 4.8E+ | 4.8E+ | 3.7E+ | | 22. | | 34.1 |
| 3/8/2002 | 308896 | 1874529 | 2.8E+08 | 3E+08 | 8 | 09 | 09 | 09 | 13.5 | 83 | 19.28 | 4 |
| | | | | 3.1E+0 | 3E+0 | 2.4E+ | 2.4E+ | 3.2E+ | 13.9 | 23. | | 33.8 |
| 3/15/2002 | 310661 | 1825967 | 2.9E+08 | 8 | 8 | 09 | 09 | 09 | 2 | 08 | 18.74 | 4 |
| | | | | 3.2E+0 | 3E+0 | 2.6E+ | 2.6E+ | 3.5E+ | 12.5 | 22. | | 33.8 |
| 3/22/2002 | 311195 | 1878840 | 3.1E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 69 | 18.67 | 1 |
| | | | | 3.5E+0 | 3E+0 | 2.6E+ | 2.6E+ | 2.2E+ | 12.4 | 22. | | 33.9 |
| 3/29/2002 | 312478 | 1800929 | 3.1E+08 | 8 | 8 | 09 | 09 | 09 | 1 | 84 | 18.84 | 9 |
| | | | | 3.6E+0 | 3E+0 | 1.9E+ | 1.9E+ | | 12.4 | 22. | | 34.3 |
| 4/5/2002 | 315114 | 1787196 | 3.2E+08 | 8 | 8 | 09 | 09 | 2E+09 | 3 | 68 | 19.35 | 3 |
| | | | | 3.4E+0 | 6E+0 | 2.6E+ | 2.6E+ | 3.3E+ | 12.4 | 22. | | 32.6 |
| 4/12/2002 | 321140 | 1837889 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 32 | 19.98 | 1 |
| | | | | 3.6E+0 | 6E+0 | 2.4E+ | 2.4E+ | 4.2E+ | 12.7 | 22. | | |
| 4/19/2002 | 330823 | 1867297 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 85 | 19.98 | 31.7 |
| | | | | 3.2E+0 | 4E+0 | 2.7E+ | 2.7E+ | 3.6E+ | | 22. | | 31.2 |
| 4/26/2002 | 335043 | 1824412 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 12.9 | 52 | 20.57 | 9 |
| | | | | 3.2E+0 | 3E+0 | 1.4E+ | 1.4E+ | 2.9E+ | 12.8 | 22. | | 31.5 |
| 5/3/2002 | 332113 | 1820198 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 72 | 20.75 | 2 |
| | | | | | 3E+0 | 1.7E+ | 1.7E+ | 3.1E+ | 12.1 | 22. | | 31.9 |
| 5/10/2002 | 329724 | 1861758 | 3.4E+08 | 3E+08 | 8 | 09 | 09 | 09 | 9 | 75 | 20.14 | 8 |
| | | | | 3.3E+0 | 2E+0 | | | 3.5E+ | 11.8 | 22. | | 30.7 |
| 5/17/2002 | 329729 | 1842634 | 3.3E+08 | 8 | 8 | 2E+09 | 2E+09 | 09 | 4 | 56 | 20.32 | 6 |
| | | | | 3.2E+0 | 2E+0 | 2.7E+ | 2.7E+ | 3.8E+ | 12.1 | 22. | | 31.0 |
| 5/24/2002 | 321040 | 1919241 | 3.1E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 71 | 20.51 | 4 |
| | | | | | 2E+0 | 3.3E+ | 3.3E+ | 3.5E+ | 12.4 | 23. | | 31.0 |
| 5/31/2002 | 311033 | 1997458 | 3.2E+08 | 3E+08 | 8 | 09 | 09 | 09 | 9 | 01 | 19.77 | 4 |
| | | | | | 2E+0 | | | 2.7E+ | 12.3 | 22. | | 30.7 |
| 6/7/2002 | 316489 | 2043379 | 3.1E+08 | 3E+08 | 8 | 4E+09 | 4E+09 | 09 | 8 | 61 | 20.27 | 1 |
| | | | | | 2E+0 | | | 3.3E+ | | 22. | | 30.1 |
| 6/14/2002 | 313091 | 2070234 | 3.3E+08 | 3E+08 | 8 | 5E+09 | 5E+09 | 09 | 12.2 | 84 | 19.73 | 4 |
| | | | | 2.9E+0 | 2E+0 | 2.6E+ | 2.6E+ | 3.6E+ | 11.9 | 23. | | 30.8 |
| 6/21/2002 | 311381 | 1935103 | 3.2E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 46 | 19.61 | 8 |
| | | | | 2.8E+0 | 4E+0 | 2.1E+ | 2.1E+ | 3.4E+ | 13.0 | 24. | | 31.6 |
| 6/28/2002 | 303942 | 1907703 | 3E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 31 | 20.29 | 8 |
| | | | | | 2E+0 | 2.2E+ | 2.2E+ | 3.3E+ | | 23. | | 32.0 |
| 7/5/2002 | 311913 | 1968815 | 2.9E+08 | 3E+08 | 8 | 09 | 09 | 09 | 13.5 | 87 | 19.88 | 4 |
| 7/12/2002 | 309573 | 1966937 | 2.9E+08 | 3E+08 | 2E+0 | 2.8E+ | 2.8E+ | 6.1E+ | 13.0 | 21. | 19.94 | 33.0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 8 | 09 | 09 | 09 | 4 | 15 | | 8 |
| | | | | 2.8E+0 | 2E+0 | 2.5E+ | 2.5E+ | 7.7E+ | 12.9 | 20. | | 33.3 |
| 7/19/2002 | 304229 | 1943504 | 2.9E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 2 | 21.47 | 4 |
| | | | | 2.6E+0 | 2E+0 | 1.7E+ | 1.7E+ | 8.1E+ | 13.4 | 21. | | 35.1 |
| 7/26/2002 | 300638 | 1805183 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 1 | 83 | 22.23 | 7 |
| | | | | 2.6E+0 | 2E+0 | 1.9E+ | 1.9E+ | 8.4E+ | 13.3 | 21. | | 35.3 |
| 8/2/2002 | 301705 | 1827447 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 86 | 21.96 | 8 |
| | | | | 2.6E+0 | 1E+0 | 2.1E+ | 2.1E+ | 6.5E+ | 12.9 | 22. | | 35.5 |
| 8/9/2002 | 302922 | 1812716 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 4 | 21.13 | 7 |
| | | | | 2.7E+0 | 2E+0 | 1.9E+ | 1.9E+ | 3.3E+ | 12.8 | 22. | | 35.0 |
| 8/16/2002 | 308369 | 1843878 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 8 | 24 | 20.76 | 5 |
| | | | | 2.8E+0 | 1E+0 | 1.6E+ | 1.6E+ | 6.5E+ | 12.1 | 21. | | 34.6 |
| 8/23/2002 | 305557 | 1821402 | 2.7E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 82 | 20.94 | 3 |
| | | | | 2.8E+0 | 2E+0 | | | 3.9E+ | 12.0 | 21. | | 33.9 |
| 8/30/2002 | 297689 | 1793226 | 2.6E+08 | 8 | 8 | 9E+08 | 9E+08 | 09 | 3 | 22 | 20.97 | 7 |
| | | | | 2.7E+0 | 2E+0 | 7.8E+ | 7.8E+ | 3.3E+ | 12.2 | 20. | | |
| 9/6/2002 | 290236 | 1755267 | 2.5E+08 | 8 | 8 | 08 | 08 | 09 | 7 | 99 | 20.93 | 33.6 |
| | | | | 2.7E+0 | 2E+0 | 1.2E+ | 1.2E+ | 4.1E+ | 12.6 | 21. | | 33.3 |
| 9/13/2002 | 288886 | 1774192 | 2.5E+08 | 8 | 8 | 09 | 09 | 09 | 1 | 15 | 21.5 | 3 |
| | | | | 2.7E+0 | 2E+0 | 1.3E+ | 1.3E+ | 2.5E+ | | 21. | | 33.8 |
| 9/20/2002 | 282742 | 1749076 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 13.1 | 4 | 20.95 | 6 |
| | | | | 2.5E+0 | 2E+0 | 1.1E+ | 1.1E+ | 3.3E+ | 14.1 | 21. | | |
| 9/27/2002 | 272163 | 1688418 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 56 | 21.22 | 33.7 |
| | | | | 2.5E+0 | 2E+0 | 9.5E+ | 9.5E+ | 2.5E+ | 13.7 | 21. | | 32.9 |
| 10/4/2002 | 270969 | 1699725 | 2.5E+08 | 8 | 8 | 08 | 08 | 09 | 7 | 04 | 21.88 | 8 |
| 10/11/200 | | | | 2.2E+0 | 1E+0 | 1.1E+ | 1.1E+ | 3.1E+ | 13.7 | 20. | | 34.6 |
| 2 | 268614 | 1648227 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 91 | 28.96 | 9 |
| 10/18/200 | | | | 2.6E+0 | 2E+0 | 2.2E+ | 2.2E+ | | 14.7 | 21. | | 36.4 |
| 2 | 274427 | 1711780 | 2.2E+08 | 8 | 8 | 09 | 09 | 5E+09 | 8 | 47 | 29.16 | 8 |
| 10/25/200 | | | | 2.5E+0 | 2E+0 | 2.4E+ | 2.4E+ | 7.1E+ | 14.3 | 21. | | 36.8 |
| 2 | 274302 | 1742881 | 2.1E+08 | 8 | 8 | 09 | 09 | 09 | 2 | 43 | 29.54 | 9 |
| | | | | 2.5E+0 | 1E+0 | 2.9E+ | 2.9E+ | 6.1E+ | 13.5 | 21. | | 36.9 |
| 11/1/2002 | 275369 | 1792338 | 2.2E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 13 | 29.79 | 8 |
| | | | | 2.6E+0 | 1E+0 | 2.2E+ | 2.2E+ | 5.8E+ | 12.7 | 19. | | 34.7 |
| 11/8/2002 | 274983 | 1781574 | 2.2E+08 | 8 | 8 | 09 | 09 | 09 | 2 | 6 | 29.93 | 8 |
| 11/15/200 | | | | 2.6E+0 | 2E+0 | 2.3E+ | 2.3E+ | | | 20. | | 34.6 |
| 2 | 271318 | 1789487 | 2.3E+08 | 8 | 8 | 09 | 09 | 4E+09 | 12.6 | 17 | 30.16 | 8 |
| 11/22/200 | | | | 2.6E+0 | 2E+0 | 3.3E+ | 3.3E+ | 4.9E+ | 12.3 | 20. | | |
| 2 | 278619 | 1827613 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 26 | 29.27 | 33.6 |
| 11/29/200 | | | | 2.8E+0 | 2E+0 | 2.7E+ | 2.7E+ | 5.1E+ | 12.2 | 18. | | 31.9 |
| 2 | 275698 | 1839717 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 1 | 61 | 28.87 | 1 |
| | | | | 2.8E+0 | 1E+0 | | | 3.6E+ | | 17. | | 31.3 |
| 12/6/2002 | 270619 | 1846017 | 2.4E+08 | 8 | 8 | 2E+09 | 2E+09 | 09 | 12.5 | 94 | 28.86 | 2 |
| 12/13/200 | | | | 2.7E+0 | 2E+0 | 1.3E+ | 1.3E+ | 4.3E+ | 13.7 | 17. | | 30.9 |
| 2 | 276506 | 1802296 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 55 | 29.51 | 5 |
| 12/20/200 | | | | 2.7E+0 | 2E+0 | 1.3E+ | 1.3E+ | 4.1E+ | 13.7 | 16. | | |
| 2 | 279597 | 1770301 | 2.5E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 69 | 29.47 | 31.1 |
| 12/27/200 | | | | 2.5E+0 | 9E+0 | 9.4E+ | 9.4E+ | | 14.0 | 16. | | 31.4 |
| 2 | 285740 | 1804718 | 2.6E+08 | 8 | 7 | 08 | 08 | 3E+09 | 3 | 65 | 30.14 | 2 |
| | | | | 2.6E+0 | 1E+0 | 3.8E+ | 3.8E+ | 2.4E+ | 14.3 | 16. | | |
| 1/3/2003 | 278403 | 1809693 | 2.5E+08 | 8 | 8 | 08 | 08 | 09 | 7 | 96 | 30.53 | 33.1 |
| | | | | 2.4E+0 | 1E+0 | 2.6E+ | 2.6E+ | 3.3E+ | 14.1 | 17. | | 33.5 |
| 1/10/2003 | 279089 | 1823752 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 24 | 30.91 | 5 |
| | | | | 2.4E+0 | 5E+0 | 2.5E+ | 2.5E+ | 3.3E+ | 15.0 | 17. | | 33.5 |
| 1/17/2003 | 294162 | 1870126 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 2 | 63 | 30.33 | 2 |
| | | | | 2.3E+0 | 3E+0 | 2.4E+ | 2.4E+ | 2.4E+ | 14.5 | 17. | | |
| 1/24/2003 | 293714 | 1924294 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 48 | 30.66 | 32.9 |
| | | | | 2.3E+0 | 2E+0 | 1.4E+ | 1.4E+ | 1.8E+ | 13.5 | 17. | | 32.6 |
| 1/31/2003 | 292197 | 1892974 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 15 | 30.16 | 8 |
| | | | | 2.2E+0 | 1E+0 | 2.7E+ | 2.7E+ | 2.9E+ | 13.6 | 16. | | 32.3 |
| 2/7/2003 | 291192 | 1939888 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 58 | 30.18 | 5 |
| | | | | 2.2E+0 | 2E+0 | 3.5E+ | 3.5E+ | 2.3E+ | 13.4 | 16. | | 31.5 |
| 2/14/2003 | 291145 | 1886949 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 86 | 29.76 | 6 |
| | | | | 2.3E+0 | 2E+0 | 3.3E+ | 3.3E+ | 3.6E+ | 12.5 | 16. | | |
| 2/21/2003 | 290274 | 1840131 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 8 | 96 | 28.93 | 29.6 |
| | | | | 2.2E+0 | 2E+0 | 2.7E+ | 2.7E+ | 2.9E+ | 12.5 | 16. | | 29.0 |
| 2/28/2003 | 286332 | 1849615 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 51 | 20.75 | 7 |
| | | | | 2.1E+0 | 1E+0 | | | 3.3E+ | 12.7 | 16. | | |
| 3/7/2003 | 282539 | 1835327 | 2.4E+08 | 8 | 8 | 2E+09 | 2E+09 | 09 | 9 | 31 | 20.91 | 28.9 |
| | | | | 2.1E+0 | 2E+0 | 1.7E+ | 1.7E+ | 3.5E+ | 13.3 | 16. | | 27.9 |
| 3/14/2003 | 279411 | 1833922 | 2.3E+08 | 8 | 8 | 09 | 09 | 09 | 8 | 01 | 20.83 | 9 |
| | | | | 2.2E+0 | 3E+0 | 3.1E+ | 3.1E+ | 3.8E+ | 13.4 | 16. | | 30.4 |
| 3/21/2003 | 280418 | 1862413 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 43 | 19.59 | 7 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2.1E+0 | 2E+0 | 2.2E+ | 2.2E+ | 3.7E+ | | 15. | | 30.3 |
| 3/28/2003 | 281617 | 1891167 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 13.4 | 65 | 19.29 | 8 |
| | | | | 2.2E+0 | 2E+0 | 2.5E+ | 2.5E+ | 2.9E+ | 13.3 | 15. | | 30.8 |
| 4/4/2003 | 280378 | 1904324 | 2.4E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 7 | 20.71 | 8 |
| | | | | 2.2E+0 | 2E+0 | 3.3E+ | 3.3E+ | 4.1E+ | 12.1 | 16. | | 32.3 |
| 4/11/2003 | 279294 | 1963392 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 07 | 20.62 | 9 |
| | | | | 2.4E+0 | 1E+0 | 2.8E+ | 2.8E+ | | 12.4 | 16. | | 32.8 |
| 4/18/2003 | 282609 | 1970439 | 2.7E+08 | 8 | 8 | 09 | 09 | 4E+09 | 4 | 09 | 20.81 | 6 |
| | | | | 2.2E+0 | 1E+0 | 3.7E+ | 3.7E+ | 3.6E+ | 12.4 | 16. | | 33.3 |
| 4/25/2003 | 278974 | 1892072 | 2.6E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 54 | 21.43 | 3 |
| | | | | 2.3E+0 | 1E+0 | 1.6E+ | 1.6E+ | 1.9E+ | | 16. | | 34.0 |
| 5/2/2003 | 278271 | 1927081 | 2.8E+08 | 8 | 8 | 09 | 09 | 09 | 12.4 | 39 | 21.1 | 3 |
| | | | | 2.4E+0 | 1E+0 | 2.6E+ | 2.6E+ | 1.7E+ | 11.6 | 16. | | 33.9 |
| 5/9/2003 | 279606 | 1973616 | 2.9E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 73 | 20.15 | 7 |
| | | | | 2.4E+0 | 1E+0 | | | 2.9E+ | 10.6 | 16. | | 32.7 |
| 5/16/2003 | 286656 | 1968784 | 2.9E+08 | 8 | 8 | 3E+09 | 3E+09 | 09 | 7 | 6 | 19.82 | 2 |
| | | | | 2.4E+0 | 3E+0 | 4.1E+ | 4.1E+ | 2.1E+ | 10.4 | 16. | | 32.4 |
| 5/23/2003 | 293126 | 2043458 | 2.9E+08 | 8 | 8 | 09 | 09 | 09 | 2 | 41 | 19.33 | 4 |
| | | | | 2.5E+0 | 4E+0 | 4.8E+ | 4.8E+ | 2.5E+ | 10.8 | 15. | | |
| 5/30/2003 | 302236 | 2086892 | 3.1E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 83 | 19.7 | 32.6 |
| | | | | 2.5E+0 | 3E+0 | | | | 10.7 | 15. | | 32.2 |
| 6/6/2003 | 306856 | 2162691 | 3.3E+08 | 8 | 8 | 4E+09 | 4E+09 | 2E+09 | 8 | 88 | 19.84 | 3 |
| | | | | 2.6E+0 | 5E+0 | 5.1E+ | 5.1E+ | 2.3E+ | | 15. | | 31.7 |
| 6/13/2003 | 311179 | 2214906 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 10.7 | 93 | 19.94 | 2 |
| | | | | 2.7E+0 | 3E+0 | 7.6E+ | 7.6E+ | 2.8E+ | 10.7 | 16. | | 31.8 |
| 6/20/2003 | 307468 | 2341060 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 69 | 20.34 | 3 |
| | | | | 2.7E+0 | 3E+0 | 8.4E+ | 8.4E+ | 2.4E+ | 10.9 | 16. | | 31.1 |
| 6/27/2003 | 312473 | 2369890 | 3.3E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 46 | 20.28 | 6 |
| | | | | 2.7E+0 | 7E+0 | 8.1E+ | 8.1E+ | 2.1E+ | 11.8 | 17. | | 30.3 |
| 7/4/2003 | 327781 | 2568621 | 3.3E+08 | 8 | 8 | 09 | 09 | 09 | 6 | 38 | 20.4 | 4 |
| | | | | 2.8E+0 | 6E+0 | 1.1E+ | 1.1E+ | 2.7E+ | 11.0 | 18. | | |
| 7/11/2003 | 327559 | 2510137 | 3.4E+08 | 8 | 8 | 10 | 10 | 09 | 9 | 61 | 20.2 | 29.7 |
| | | | | 2.8E+0 | 5E+0 | 6.5E+ | 6.5E+ | 2.4E+ | 10.8 | 18. | | 29.5 |
| 7/18/2003 | 324052 | 2556294 | 3.5E+08 | 8 | 8 | 09 | 09 | 09 | 3 | 86 | 20.06 | 7 |
| | | | | 2.8E+0 | 3E+0 | 5.2E+ | 5.2E+ | 3.2E+ | 10.9 | 19. | | 28.2 |
| 7/25/2003 | 321149 | 2501786 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 07 | 19.83 | 9 |
| | | | | 2.9E+0 | 3E+0 | 6.3E+ | 6.3E+ | 2.4E+ | | 19. | | 26.6 |
| 8/1/2003 | 327017 | 2536087 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 11.11 | 06 | 20.93 | 1 |
| | | | | 2.8E+0 | 3E+0 | 6.9E+ | 6.9E+ | 2.2E+ | 10.5 | 19. | | 25.5 |
| 8/8/2003 | 327035 | 2590394 | 3.3E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 22 | 19.71 | 1 |
| | | | | 2.9E+0 | 3E+0 | 6.3E+ | 6.3E+ | 1.7E+ | 10.2 | 19. | | 25.5 |
| 8/15/2003 | 329349 | 2675390 | 3.4E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 58 | 19.27 | 6 |
| | | | | | 4E+0 | 1.1E+ | 1.1E+ | 2.7E+ | 10.1 | 19. | | 23.8 |
| 8/22/2003 | 336347 | 2753582 | 3.5E+08 | 3E+08 | 8 | 10 | 10 | 09 | 4 | 69 | 19.01 | 6 |
| | | | | | 4E+0 | 1.2E+ | 1.2E+ | 2.2E+ | | 19. | | 22.9 |
| 8/29/2003 | 336106 | 2762109 | 3.5E+08 | 3E+08 | 8 | 10 | 10 | 09 | 9.89 | 78 | 19.23 | 7 |
| | | | | | 3E+0 | 1.3E+ | 1.3E+ | 2.1E+ | | 19. | | 20.8 |
| 9/5/2003 | 342611 | 2877015 | 3.8E+08 | 3E+08 | 8 | 10 | 10 | 09 | 9.89 | 44 | 19.56 | 7 |
| | | | | 3.1E+0 | 3E+0 | 1.6E+ | 1.6E+ | 7.5E+ | 10.4 | 19. | | |
| 9/12/2003 | 335667 | 2933049 | 3.8E+08 | 8 | 8 | 10 | 10 | 08 | 8 | 65 | 19.41 | 19.4 |
| | | | | | 3E+0 | 1.4E+ | 1.4E+ | 2.2E+ | 10.4 | 20. | | 19.7 |
| 9/19/2003 | 336651 | 2926975 | 3.8E+08 | 3E+08 | 8 | 10 | 10 | 09 | 7 | 3 | 19.39 | 4 |
| | | | | 2.8E+0 | 4E+0 | | | 2.2E+ | 10.4 | 20. | | 20.8 |
| 9/26/2003 | 336273 | 3001818 | 3.9E+08 | 8 | 8 | 1E+10 | 1E+10 | 09 | 9 | 2 | 19.19 | 8 |
| | | | | 2.9E+0 | 4E+0 | 7.9E+ | 7.9E+ | 1.7E+ | 10.0 | 20. | | 20.4 |
| 10/3/2003 | 335258 | 2911914 | 4E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 72 | 19.28 | 6 |
| 10/10/200 | | | | | 8E+0 | 6.2E+ | 6.2E+ | 2.2E+ | 11.1 | 21. | | 20.4 |
| 3 | 356113 | 3031521 | 4.2E+08 | 3E+08 | 8 | 09 | 09 | 09 | 5 | 84 | 18.36 | 5 |
| 10/17/200 | | | | 3.1E+0 | 6E+0 | 7.8E+ | 7.8E+ | 2.5E+ | 11.1 | 22. | | 20.1 |
| 3 | 353385 | 3064930 | 4.2E+08 | 8 | 8 | 09 | 09 | 09 | 2 | 26 | 18.55 | 9 |
| 10/24/200 | | | | | 4E+0 | | | 2.2E+ | 11.6 | 21. | | 20.9 |
| 3 | 362624 | 3178744 | 4.1E+08 | 3E+08 | 8 | 7E+09 | 7E+09 | 09 | 4 | 72 | 18.4 | 9 |
| 10/31/200 | | | | 3.1E+0 | 5E+0 | 1.5E+ | 1.5E+ | 2.4E+ | 11.3 | 21. | | 20.5 |
| 3 | 369523 | 3327573 | 4E+08 | 8 | 8 | 10 | 10 | 09 | 7 | 51 | 18.79 | 9 |
| | | | | 3.2E+0 | 4E+0 | 1.6E+ | 1.6E+ | 2.7E+ | 10.4 | 21. | | 20.6 |
| 11/7/2003 | 365291 | 3505356 | 4E+08 | 8 | 8 | 10 | 10 | 09 | 4 | 48 | 18.78 | 5 |
| 11/14/200 | | | | 3.3E+0 | 4E+0 | | | 2.7E+ | 10.6 | 20. | | 20.8 |
| 3 | 360010 | 3539023 | 4E+08 | 8 | 8 | 1E+10 | 1E+10 | 09 | 2 | 87 | 18.45 | 7 |
| 11/21/200 | | | | 3.2E+0 | 4E+0 | 9.4E+ | 9.4E+ | 3.1E+ | 11.5 | 21. | #N/A | |
| 3 | 357178 | 3314748 | 4E+08 | 8 | 8 | 09 | 09 | 09 | 5 | 13 | N/A | 22 |
| 11/28/200 | | | #N/A | 3.3E+0 | 1E+0 | 7.3E+ | 7.3E+ | 2.7E+ | 11.6 | 22. | | 22.1 |
| 3 | 354432 | 3520250 | N/A | 8 | 8 | 09 | 09 | 09 | 6 | 03 | 18.45 | 2 |
| 12/5/2003 | 358128 | 3594665 | 4.1E+08 | 3.2E+0 | 3E+0 | 8E+09 | 8E+09 | 2.5E+ | 11.9 | 22. | 18.54 | 22.2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8 | 8 | | | 09 | 1 | 03 | | 3 |
| 12/12/2003 | 359959 | 3691089 | 4.3E+08 | 3.3E+08 | 3E+08 | 6.9E+09 | 6.9E+09 | 2E+09 | 11.95 | 21.7 | 17.08 | 22.08 |
| 12/19/2003 | 349998 | 4068971 | 4.4E+08 | 3.3E+08 | 3E+08 | 1.2E+10 | 1.2E+10 | 2.3E+09 | 12.36 | 21.57 | 17.01 | 22.29 |
| 12/26/2003 | 354667 | 4257634 | 4.4E+08 | 3.3E+08 | 1E+08 | 1.5E+10 | 1.5E+10 | 1.7E+09 | 12.34 | 21.5 | 17.39 | 22.09 |
| 1/2/2004 | 359368 | 4494058 | 4.6E+08 | 3.4E+08 | 2E+08 | 6.4E+09 | 6.4E+09 | 9.8E+08 | 12.57 | 21.71 | 19.4 | 22.07 |
| 1/9/2004 | 375122 | 4596828 | 4.9E+08 | 3.5E+08 | 5E+08 | 1.8E+10 | 1.8E+10 | 2.3E+09 | 13.24 | 23.4 | 19.79 | 22.37 |
| 1/16/2004 | 372512 | 4577759 | 5E+08 | 3.5E+08 | 4E+08 | 1.9E+10 | 1.9E+10 | 2.1E+09 | 13.03 | 23.68 | 18.61 | 22.36 |
| 1/23/2004 | 375014 | 4451191 | 5.1E+08 | 3.6E+08 | 2E+08 | 8.2E+09 | 8.2E+09 | 7.7E+08 | 13.12 | 23.92 | 18.52 | 22.44 |
| 1/30/2004 | 372521 | 4131339 | 4.9E+08 | 3.5E+08 | 4E+08 | 7.2E+09 | 7.2E+09 | 2.2E+09 | 12.99 | 25.3 | 19.57 | 22.09 |
| 2/6/2004 | 371262 | 4209812 | 5E+08 | 3.5E+08 | 3E+08 | 1.2E+10 | 1.2E+10 | 2.4E+09 | 13.62 | 28.2 | 19.11 | 20.54 |
| 2/13/2004 | 376528 | 4479187 | 5.1E+08 | 3.7E+08 | 4E+08 | 1E+10 | 1E+10 | 2.2E+09 | 12.51 | 28.1 | 18.68 | 20.12 |
| 2/20/2004 | 392632 | 4325783 | 5.2E+08 | 3.6E+08 | 9E+08 | 7E+09 | 7E+09 | 2.5E+09 | 13.03 | 28.3 | 19.17 | 19.42 |
| 2/27/2004 | 400581 | 4251170 | 5E+08 | 3.7E+08 | 7E+08 | 5.7E+09 | 5.7E+09 | 2.5E+09 | 13.11 | 28.1 | 19.38 | 19.49 |
| 3/5/2004 | 403205 | 4131800 | 5.1E+08 | 3.8E+08 | 7E+08 | 4.5E+09 | 4.5E+09 | 2.1E+09 | 13.79 | 28.9 | 20.1 | 18.81 |
| 3/12/2004 | 403099 | 4190148 | 4.8E+08 | 3.5E+08 | 5E+08 | 7.5E+09 | 7.5E+09 | 2.6E+09 | 13.81 | 28.1 | 20.27 | 19.28 |
| 3/19/2004 | 411961 | 4109309 | 4.9E+08 | 3.7E+08 | 6E+08 | 5.7E+09 | 5.7E+09 | 2.3E+09 | 13.63 | 28.3 | 20.54 | 19.32 |
| 3/26/2004 | 408419 | 4013107 | 4.7E+08 | 3.6E+08 | 6E+08 | 3.6E+09 | 3.6E+09 | 1.7E+09 | 12.95 | 28.5 | 20.55 | 19.17 |
| 4/2/2004 | 405254 | 4195855 | 4.9E+08 | 3.7E+08 | 4E+08 | 6E+09 | 6E+09 | 1.8E+09 | 12.94 | 29.4 | 20.86 | 17.74 |
| 4/9/2004 | 402886 | 4196511 | 5.2E+08 | 3.8E+08 | 3E+08 | 7.3E+09 | 7.3E+09 | 1.8E+09 | 12.78 | 28.8 | 20.87 | 17.42 |
| 4/16/2004 | 392681 | 4323930 | 5.1E+08 | 3.7E+08 | 4E+08 | 2.1E+09 | 2.1E+09 | 1.6E+09 | 13.12 | 28.2 | 21.35 | 17.56 |
| 4/23/2004 | 399468 | 4157658 | 5.4E+08 | 3.9E+08 | 3E+08 | 6.4E+09 | 6.4E+09 | 2.5E+09 | 12.85 | 29.5 | 21.98 | 17.59 |
| 4/30/2004 | 382623 | 3954013 | 5.2E+08 | 3.6E+08 | 3E+08 | 5.1E+09 | 5.1E+09 | 2E+09 | 13.38 | 29.8 | 22.69 | 18.34 |
| 5/7/2004 | 380377 | 3884984 | 4.9E+08 | 3.5E+08 | 2E+08 | 2.4E+09 | 2.4E+09 | 1.4E+09 | 13.58 | 29.8 | 25.23 | 19.06 |
| 5/14/2004 | 361144 | 3722446 | 4.8E+08 | 3.2E+08 | 5E+08 | 5.6E+09 | 5.6E+09 | 1.9E+09 | 14.12 | 30.2 | 29.16 | 23.06 |
| 5/21/2004 | 360008 | 3756513 | 4.8E+08 | 3.3E+08 | 5E+08 | 9.3E+09 | 9.3E+09 | 1.8E+09 | 14.62 | 31.2 | 28.36 | 26.56 |
| 5/28/2004 | 369419 | 3896379 | 4.8E+08 | 3.4E+08 | 4E+08 | 1.1E+10 | 1.1E+10 | 1.3E+09 | 14.61 | 32.1 | 28.77 | 27.01 |
| 6/4/2004 | 366177 | 3821299 | 4.6E+08 | 3.3E+08 | 2E+08 | 7.8E+09 | 7.8E+09 | 1.8E+09 | 14.42 | 32.2 | 28.58 | 28.29 |
| 6/11/2004 | 375568 | 3739413 | 4.6E+08 | 3.2E+08 | 2E+08 | 6.9E+09 | 6.9E+09 | 2.3E+09 | 14.45 | 31.2 | 28.3 | 29.93 |
| 6/18/2004 | 374713 | 3798452 | 4.5E+08 | 3.1E+08 | 2E+08 | 9E+09 | 9E+09 | 2E+09 | 14.53 | 28.3 | 28.06 | 30.15 |
| 6/25/2004 | 376233 | 3933488 | 4.7E+08 | 3.3E+08 | 3E+08 | 8.7E+09 | 8.7E+09 | 1.8E+09 | 13.72 | 27.4 | 28.27 | 30.94 |
| 7/2/2004 | 379345 | 3953256 | 4.9E+08 | 3.2E+08 | 2E+08 | 6.7E+09 | 6.7E+09 | 1.7E+09 | 13.45 | 27.1 | 28.72 | 31.43 |
| 7/9/2004 | 390636 | 4087182 | 5.1E+08 | 3.1E+08 | 4E+08 | 8.7E+09 | 8.7E+09 | 1.9E+09 | 13.15 | 27.5 | 28.39 | 31.22 |
| 7/16/2004 | 385481 | 3964131 | 5E+08 | 3.1E+08 | 2E+08 | 8.5E+09 | 8.5E+09 | 1.8E+09 | 13.12 | 26.2 | 27.96 | 31.38 |
| 7/23/2004 | 383017 | 3979406 | 5.1E+08 | 3.1E+08 | 2E+08 | 6.7E+09 | 6.7E+09 | 1.8E+09 | 12.83 | 26.3 | 27.51 | 31.51 |
| 7/30/2004 | 381888 | 3907918 | 5E+08 | 3.2E+08 | 3E+08 | 5.1E+09 | 5.1E+09 | 1.7E+09 | 12.63 | 26.2 | 27.24 | 31.07 |
| 8/6/2004 | 375913 | 3750973 | 5E+08 | 3.2E+08 | 2E+08 | 3.5E+09 | 3.5E+09 | 1.6E+09 | 12.37 | 26.7 | 27.05 | 31.37 |
| 8/13/2004 | 373833 | 3617587 | 5.1E+08 | 3.4E+08 | 2E+08 | 3.8E+09 | 3.8E+09 | 1.7E+09 | 12.39 | 26.18 | 26.5 | 31.39 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 3.5E+0 | 2E+0 | 8.7E+ | 8.7E+ | 1.6E+ | 12.0 | 24. | | 31.3 |
| 8/20/2004 | 370551 | 3678057 | 5E+08 | 8 | 8 | 09 | 09 | 09 | 9 | 53 | 26.65 | 9 |
| | | | | 3.6E+0 | 3E+0 | 8.2E+ | 8.2E+ | 1.4E+ | 12.1 | 24. | | 31.1 |
| 8/27/2004 | 377932 | 3816763 | 5E+08 | 8 | 8 | 09 | 09 | 09 | 4 | 37 | 26.36 | 4 |
| | | | | 3.6E+0 | 3E+0 | 1.1E+ | 1.1E+ | 1.8E+ | 11.9 | 24. | | 30.6 |
| 9/3/2004 | 386775 | 3872492 | 5.3E+08 | 8 | 8 | 10 | 10 | 09 | 9 | 16 | 26.04 | 4 |
| | | | | 3.7E+0 | 3E+0 | 7.8E+ | 7.8E+ | | 10.9 | 23. | | 30.1 |
| 9/10/2004 | 390861 | 3942672 | 5.3E+08 | 8 | 8 | 09 | 09 | 2E+09 | 6 | 32 | 23.96 | 6 |
| | | | | 3.7E+0 | 3E+0 | 1.3E+ | 1.3E+ | | | 21. | | 27.0 |
| 9/17/2004 | 395345 | 4130033 | 5.5E+08 | 8 | 8 | 10 | 10 | 2E+09 | 9.71 | 5 | 22.81 | 1 |
| | | | | 3.7E+0 | 3E+0 | | | 1.8E+ | | 20. | | 24.0 |
| 9/24/2004 | 393654 | 4048446 | 5.5E+08 | 8 | 8 | 1E+10 | 1E+10 | 09 | 9.65 | 12 | 16.44 | 2 |
| | | | | 3.7E+0 | 3E+0 | 6.9E+ | 6.9E+ | 5.9E+ | | 17. | | |
| 10/1/2004 | 393691 | 4094286 | 5.6E+08 | 8 | 8 | 09 | 09 | 08 | 9.44 | 55 | 16.41 | 23.7 |
| | | | | 3.9E+0 | 4E+0 | 9.9E+ | 9.9E+ | 1.9E+ | | 17. | | |
| 10/8/2004 | 396854 | 4186378 | 5.7E+08 | 8 | 8 | 09 | 09 | 09 | 9.07 | 02 | 15.58 | 23.8 |
| 10/15/200 | | | | 3.7E+0 | 2E+0 | | | 1.6E+ | | 18. | | 21.9 |
| 4 | 392254 | 4025024 | 5.8E+08 | 8 | 8 | 7E+09 | 7E+09 | 09 | 9 | 1 | 15.83 | 8 |
| 10/22/200 | | | | 3.7E+0 | 2E+0 | 4.7E+ | 4.7E+ | 1.6E+ | | 18. | | 21.1 |
| 4 | 393724 | 4095219 | 5.7E+08 | 8 | 8 | 09 | 09 | 09 | 8.71 | 61 | 15.8 | 8 |
| 10/29/200 | | | | 3.7E+0 | 2E+0 | 4.9E+ | 4.9E+ | 1.4E+ | | 19. | | 21.5 |
| 4 | 397576 | 3993740 | 5.8E+08 | 8 | 8 | 09 | 09 | 09 | 8.63 | 75 | 15.82 | 3 |
| | | | | 3.8E+0 | 3E+0 | | | 1.3E+ | | 19. | | 20.8 |
| 11/5/2004 | 402224 | 4041674 | 6E+08 | 8 | 8 | 6E+09 | 6E+09 | 09 | 8.4 | 59 | 15.09 | 5 |
| 11/12/200 | | | | 3.9E+0 | 2E+0 | 5.4E+ | 5.4E+ | 1.5E+ | | 19. | #N/A | 20.7 |
| 4 | 407569 | 4079420 | 6.3E+08 | 8 | 8 | 09 | 09 | 09 | 8.35 | 79 | N/A | 5 |
| 11/19/200 | | | #N/A | 3.8E+0 | 5E+0 | 8.8E+ | 8.8E+ | 1.6E+ | | 19. | | 20.2 |
| 4 | 414282 | 4167800 | N/A | 8 | 8 | 09 | 09 | 09 | 9.12 | 6 | 14.79 | 4 |
| 11/26/200 | | | | 3.8E+0 | 5E+0 | | | 1.4E+ | | 19. | | 20.2 |
| 4 | 419138 | 4151885 | 6.5E+08 | 8 | 8 | 8E+09 | 8E+09 | 09 | 9.46 | 58 | 15.24 | 4 |
| | | | | 3.9E+0 | 5E+0 | 1.3E+ | 1.3E+ | 1.6E+ | | 19. | | 20.1 |
| 12/3/2004 | 424604 | 4250116 | 6.6E+08 | 8 | 8 | 10 | 10 | 09 | 9.38 | 28 | 16 | 6 |
| 12/10/200 | | | | 3.7E+0 | 4E+0 | 5.5E+ | 5.5E+ | 1.5E+ | | 19. | | 20.2 |
| 4 | 414598 | 4154202 | 6.4E+08 | 8 | 8 | 09 | 09 | 09 | 9.69 | 48 | 16.8 | 3 |
| 12/17/200 | | | | 3.9E+0 | 3E+0 | 1.1E+ | 1.1E+ | 1.6E+ | | 19. | | 20.0 |
| 4 | 418729 | 4313698 | 6.6E+08 | 8 | 8 | 10 | 10 | 09 | 9.57 | 36 | 16.74 | 9 |
| 12/24/200 | | | | 3.9E+0 | 2E+0 | 8.9E+ | 8.9E+ | 1.6E+ | | 18. | | 19.9 |
| 4 | 421357 | 4320598 | 6.7E+08 | 8 | 8 | 09 | 09 | 09 | 9.74 | 9 | 16.53 | 1 |
| 12/31/200 | | | | | 2E+0 | 4.4E+ | 4.4E+ | | | 18. | | 19.7 |
| 4 | 421572 | 4306136 | 6.8E+08 | 4E+08 | 8 | 09 | 09 | 1E+09 | 9.39 | 95 | 16.48 | 8 |
| | | | | 3.9E+0 | 3E+0 | 1.3E+ | 1.3E+ | 1.6E+ | | 19. | | 19.8 |
| 1/7/2005 | 425921 | 4491898 | 7E+08 | 8 | 8 | 10 | 10 | 09 | 9.05 | 11 | 16.72 | 5 |
| | | | | | 5E+0 | 1.4E+ | 1.4E+ | 1.6E+ | | 18. | | 20.0 |
| 1/14/2005 | 431430 | 4520605 | 6.9E+08 | 4E+08 | 8 | 10 | 10 | 09 | 9.07 | 97 | 16.32 | 1 |
| | | | | 4.1E+0 | 4E+0 | 1.7E+ | 1.7E+ | 2.2E+ | | 18. | | 19.9 |
| 1/21/2005 | 431273 | 4494993 | 7E+08 | 8 | 8 | 10 | 10 | 09 | 9.13 | 87 | 16.02 | 6 |
| | | | | 4.1E+0 | 4E+0 | 1.5E+ | 1.5E+ | 2.4E+ | | 18. | | 20.0 |
| 1/28/2005 | 427290 | 4532770 | 7.1E+08 | 8 | 8 | 10 | 10 | 09 | 8.95 | 69 | 15.88 | 2 |
| | | | | 4.2E+0 | 3E+0 | 1.2E+ | 1.2E+ | 2.1E+ | | 18. | | 19.5 |
| 2/4/2005 | 422388 | 4654868 | 7.1E+08 | 8 | 8 | 10 | 10 | 09 | 8.93 | 07 | 15.97 | 5 |
| | | | | 4.2E+0 | 1E+0 | 1.4E+ | 1.4E+ | | | | | 18.5 |
| 2/11/2005 | 426374 | 4701888 | 7.1E+08 | 8 | 8 | 10 | 10 | 8E+08 | 8.96 | 17 | 15.43 | 3 |
| | | | | 4.4E+0 | 4E+0 | 1.9E+ | 1.9E+ | 2.7E+ | | 16. | | 18.2 |
| 2/18/2005 | 421779 | 4778688 | 7.4E+08 | 8 | 8 | 10 | 10 | 09 | 9.18 | 96 | 15.63 | 2 |
| | | | | 4.5E+0 | 4E+0 | 1.1E+ | 1.1E+ | 2.9E+ | | 15. | | |
| 2/25/2005 | 420469 | 4794362 | 7.3E+08 | 8 | 8 | 10 | 10 | 09 | 9.2 | 42 | 15.69 | 18.5 |
| | | | | 4.5E+0 | 4E+0 | 1.1E+ | 1.1E+ | 2.5E+ | | 15. | | 16.9 |
| 3/4/2005 | 412590 | 4723238 | 7.5E+08 | 8 | 8 | 10 | 10 | 09 | 9.43 | 33 | 15.13 | 2 |
| | | | | 4.6E+0 | 3E+0 | 8.9E+ | 8.9E+ | | | 14. | | 16.9 |
| 3/11/2005 | 420346 | 4622064 | 7.5E+08 | 8 | 8 | 09 | 09 | 3E+09 | 9.34 | 4 | 15.24 | 6 |
| | | | | 4.4E+0 | 3E+0 | | | 3.4E+ | | 14. | | 17.0 |
| 3/18/2005 | 417656 | 4625655 | 7.8E+08 | 8 | 8 | 8E+09 | 8E+09 | 09 | 8.37 | 5 | 15.73 | 4 |
| | | | | 4.3E+0 | 3E+0 | 7.7E+ | 7.7E+ | 2.7E+ | | 14. | | 16.8 |
| 3/25/2005 | 412836 | 4468606 | 7.6E+08 | 8 | 8 | 09 | 09 | 09 | 8.42 | 29 | 16.57 | 9 |
| | | | | 4.4E+0 | 3E+0 | 6.9E+ | 6.9E+ | 2.5E+ | | 14. | | 16.9 |
| 4/1/2005 | 407301 | 4530134 | 7.4E+08 | 8 | 8 | 09 | 09 | 09 | 7.97 | 8 | 16.22 | 2 |
| | | | | 4.5E+0 | 4E+0 | | | | | 15. | | 16.4 |
| 4/8/2005 | 401721 | 4458875 | 7.5E+08 | 8 | 8 | 5E+09 | 5E+09 | 2E+09 | 8.22 | 03 | 16.12 | 1 |
| | | | | 4.3E+0 | 2E+0 | 2.8E+ | 2.8E+ | 2.1E+ | | 15. | | 17.0 |
| 4/15/2005 | 406416 | 4554277 | 7.4E+08 | 8 | 8 | 09 | 09 | 09 | 8.19 | 11 | 17.35 | 6 |
| | | | | 4.2E+0 | 2E+0 | 7.7E+ | 7.7E+ | | | 15. | | 16.7 |
| 4/22/2005 | 408575 | 4453752 | 7.1E+08 | 8 | 8 | 09 | 09 | 2E+09 | 8.26 | 7 | 17.04 | 2 |
| 4/29/2005 | 408850 | 4328633 | 7E+08 | 4.1E+0 | 3E+0 | 7.5E+ | 7.5E+ | 1.9E+ | 8.28 | 15. | 16.89 | 16.7 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8 | 8 | 09 | 09 | 09 | | 8 | | 4 |
| | | | | 4.2E+0 | 3E+0 | 4.6E+ | 4.6E+ | 1.3E+ | | 16. | | 17.0 |
| 5/6/2005 | 418654 | 4528159 | 7.2E+08 | 8 | 8 | 09 | 09 | 09 | 8.99 | 25 | 17.09 | 2 |
| | | | | 4.1E+0 | 3E+0 | 1.2E+ | 1.2E+ | 1.6E+ | | 16. | | 17.0 |
| 5/13/2005 | 414063 | 4460428 | 7.2E+08 | 8 | 8 | 10 | 10 | 09 | 8.92 | 22 | 16.8 | 1 |
| | | | | 4.3E+0 | 2E+0 | | | 1.7E+ | | 15. | | 17.1 |
| 5/20/2005 | 410279 | 4409973 | 6.7E+08 | 8 | 8 | 1E+10 | 1E+10 | 09 | 8.64 | 89 | 16.59 | 7 |
| | | | | 4.3E+0 | 3E+0 | 6.1E+ | 6.1E+ | 1.5E+ | | 15. | | 17.0 |
| 5/27/2005 | 403388 | 4365053 | 6.8E+08 | 8 | 8 | 09 | 09 | 09 | 8.91 | 93 | 16.85 | 1 |
| | | | | 4.4E+0 | 4E+0 | 5.7E+ | 5.7E+ | 1.4E+ | | 15. | | 16.5 |
| 6/3/2005 | 401553 | 4454033 | 7E+08 | 8 | 8 | 09 | 09 | 09 | 9.06 | 85 | 16.68 | 7 |
| | | | | 4.5E+0 | 3E+0 | 7.3E+ | 7.3E+ | 1.6E+ | | 15. | | 16.5 |
| 6/10/2005 | 413268 | 4475531 | 7.1E+08 | 8 | 8 | 09 | 09 | 09 | 9.18 | 77 | 16.96 | 1 |
| | | | | 4.5E+0 | 4E+0 | 8.3E+ | 8.3E+ | 2.1E+ | | 15. | | 16.5 |
| 6/17/2005 | 416879 | 4520354 | 7.3E+08 | 8 | 8 | 09 | 09 | 09 | 9.14 | 9 | 16.99 | 5 |
| | | | | 4.5E+0 | 3E+0 | | | 2.2E+ | | 16. | | 16.3 |
| 6/24/2005 | 417687 | 4552851 | 7.3E+08 | 8 | 8 | 8E+09 | 8E+09 | 09 | 9.12 | 02 | 17.08 | 6 |
| | | | | 4.6E+0 | 3E+0 | 5.5E+ | 5.5E+ | 2.2E+ | | 15. | | |
| 7/1/2005 | 432989 | 4454280 | 7.4E+08 | 8 | 8 | 09 | 09 | 09 | 9.24 | 96 | 16.95 | 16.4 |
| | | | | 4.6E+0 | 3E+0 | 9.2E+ | 9.2E+ | 3.1E+ | | 16. | | |
| 7/8/2005 | 437533 | 4241731 | 7.2E+08 | 8 | 8 | 09 | 09 | 09 | 9.01 | 78 | 16.61 | 15.8 |
| | | | | 4.8E+0 | 4E+0 | 1.1E+ | 1.1E+ | 3.5E+ | | 16. | | 16.0 |
| 7/15/2005 | 443899 | 4327109 | 7.3E+08 | 8 | 8 | 10 | 10 | 09 | 9.12 | 65 | 16.69 | 8 |
| | | | | 4.8E+0 | 6E+0 | 5.8E+ | 5.8E+ | 3.4E+ | | 16. | | 14.8 |
| 7/22/2005 | 455616 | 4285835 | 7.6E+08 | 8 | 8 | 09 | 09 | 09 | 9.54 | 06 | 16.42 | 7 |
| | | | | | 5E+0 | 7.6E+ | 7.6E+ | 3.2E+ | | 16. | | 14.7 |
| 7/29/2005 | 454513 | 4465104 | 7.7E+08 | 5E+08 | 8 | 09 | 09 | 09 | 9.5 | 32 | 15 | 1 |
| | | | | 4.9E+0 | 5E+0 | | | | | 16. | | 14.4 |
| 8/5/2005 | 458598 | 4540485 | 7.6E+08 | 8 | 8 | 1E+10 | 1E+10 | 3E+09 | 9.43 | 18 | 15.16 | 3 |
| | | | | 5.1E+0 | 3E+0 | 5.7E+ | 5.7E+ | 2.1E+ | | 16. | | 14.4 |
| 8/12/2005 | 455269 | 4519939 | 7.5E+08 | 8 | 8 | 09 | 09 | 09 | 9.35 | 01 | 16.29 | 9 |
| | | | | 4.9E+0 | 3E+0 | 7.5E+ | 7.5E+ | 1.7E+ | | 15. | | 15.0 |
| 8/19/2005 | 448449 | 4514098 | 7E+08 | 8 | 8 | 09 | 09 | 09 | 9.22 | 42 | 16.74 | 1 |
| | | | | 4.9E+0 | 3E+0 | 9.8E+ | 9.8E+ | 1.8E+ | | 15. | | 14.4 |
| 8/26/2005 | 446942 | 4616242 | 6.8E+08 | 8 | 8 | 09 | 09 | 09 | 9.11 | 37 | 19.64 | 5 |
| | | | | | 3E+0 | | | 1.8E+ | | 14. | | 15.2 |
| 9/2/2005 | 442019 | 4709342 | 6.7E+08 | 5E+08 | 8 | 1E+10 | 1E+10 | 09 | 8.9 | 67 | 20.2 | 2 |
| | | | | 5.2E+0 | 3E+0 | 1.4E+ | 1.4E+ | 2.1E+ | | 14. | | 14.8 |
| 9/9/2005 | 446419 | 4731443 | 7.1E+08 | 8 | 8 | 10 | 10 | 09 | 8.7 | 3 | 20.36 | 9 |
| | | | | 5.3E+0 | 3E+0 | 1.4E+ | 1.4E+ | 2.3E+ | | 13. | | 14.5 |
| 9/16/2005 | 449228 | 4723129 | 6.9E+08 | 8 | 8 | 10 | 10 | 09 | 8.65 | 68 | 20.95 | 8 |
| | | | | 5.3E+0 | 4E+0 | | | 1.9E+ | | 13. | | |
| 9/23/2005 | 449050 | 4837319 | 6.6E+08 | 8 | 8 | 1E+10 | 1E+10 | 09 | 8.54 | 77 | 22.12 | 15.2 |
| | | | | 5.5E+0 | 4E+0 | 9.9E+ | 9.9E+ | 2.2E+ | | 13. | | 15.3 |
| 9/30/2005 | 451721 | 4822847 | 7.2E+08 | 8 | 8 | 09 | 09 | 09 | 8.01 | 4 | 21.89 | 8 |
| | | | | 5.4E+0 | 4E+0 | 7.6E+ | 7.6E+ | | | 13. | | 16.0 |
| 10/7/2005 | 450139 | 4723016 | 7.3E+08 | 8 | 8 | 09 | 09 | 2E+09 | 7.72 | 58 | 22.02 | 7 |
| 10/14/200 | | | | 5.4E+0 | 3E+0 | 6.1E+ | 6.1E+ | 2.7E+ | | 13. | | 17.4 |
| 5 | 451543 | 4672965 | 7E+08 | 8 | 8 | 09 | 09 | 09 | 7.39 | 54 | 22.13 | 1 |
| 10/21/200 | | | | 5.4E+0 | 4E+0 | 6.7E+ | 6.7E+ | 2.6E+ | | 13. | | 18.2 |
| 5 | 444260 | 4581451 | 6.8E+08 | 8 | 8 | 09 | 09 | 09 | 7.45 | 52 | 21.93 | 4 |
| 10/28/200 | | | | 5.2E+0 | 4E+0 | 4.6E+ | 4.6E+ | 2.1E+ | | 13. | | 18.6 |
| 5 | 443319 | 4557491 | 6.7E+08 | 8 | 8 | 09 | 09 | 09 | 7.22 | 56 | 21.86 | 3 |
| | | | | 5.5E+0 | 1E+0 | 7.3E+ | 7.3E+ | 1.9E+ | | 13. | | 19.1 |
| 11/4/2005 | 447077 | 4719453 | 6.8E+08 | 8 | 8 | 09 | 09 | 09 | 7.19 | 74 | 22.05 | 7 |
| 11/11/200 | | | | 5.7E+0 | 4E+0 | 7.1E+ | 7.1E+ | 2.2E+ | | 13. | | 19.2 |
| 5 | 439076 | 4619042 | 6.5E+08 | 8 | 8 | 09 | 09 | 09 | 7.14 | 46 | 22.2 | 9 |
| 11/18/200 | | | | 5.8E+0 | 4E+0 | 8.7E+ | 8.7E+ | 2.5E+ | | 11. | | |
| 5 | 440829 | 4621796 | 6.7E+08 | 8 | 8 | 09 | 09 | 09 | 7 | 96 | 22.31 | 19.1 |
| 11/25/200 | | | | 5.9E+0 | 3E+0 | 6.5E+ | 6.5E+ | 2.6E+ | | 11. | | 19.9 |
| 5 | 442561 | 4569262 | 6.8E+08 | 8 | 8 | 09 | 09 | 09 | 6.03 | 89 | 22.54 | 1 |
| | | | | 5.9E+0 | 4E+0 | 7.4E+ | 7.4E+ | 2.5E+ | | 11. | | 20.0 |
| 12/2/2005 | 438667 | 4512788 | 7.1E+08 | 8 | 8 | 09 | 09 | 09 | 6.17 | 47 | 22.8 | 4 |
| | | | | | 4E+0 | | | 2.5E+ | | 12. | | 20.0 |
| 12/9/2005 | 445144 | 4739940 | 7.4E+08 | 6E+08 | 8 | 1E+10 | 1E+10 | 09 | 5.73 | 87 | 23.08 | 1 |
| 12/16/200 | | | | | 3E+0 | 1.3E+ | 1.3E+ | 2.7E+ | | 12. | | 19.7 |
| 5 | 442990 | 4619713 | 7.3E+08 | 6E+08 | 8 | 10 | 10 | 09 | 5.42 | 87 | 22.98 | 6 |
| 12/23/200 | | | | 6.2E+0 | 3E+0 | 1.3E+ | 1.3E+ | 2.5E+ | | 12. | | 19.2 |
| 5 | 443366 | 4676623 | 7.4E+08 | 8 | 8 | 10 | 10 | 09 | 5.46 | 68 | 22.22 | 6 |
| 12/30/200 | | | | 6.3E+0 | 2E+0 | 9.6E+ | 9.6E+ | 1.6E+ | | 12. | | 18.5 |
| 5 | 449924 | 4762054 | 7.4E+08 | 8 | 8 | 09 | 09 | 09 | 5.34 | 29 | 21.65 | 4 |
| | | | | 6.5E+0 | 2E+0 | 1.6E+ | 1.6E+ | 2.6E+ | | 13. | | |
| 1/6/2006 | 455561 | 4983143 | 7.8E+08 | 8 | 8 | 10 | 10 | 09 | 5.87 | 17 | 17.86 | 18 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 6.5E+0 | 4E+0 | 2.7E+ | 2.7E+ | 2.4E+ | | 13. | | 17.6 |
| 1/13/2006 | 455306 | 5043378 | 8E+08 | 8 | 8 | 10 | 10 | 09 | 5.75 | 49 | 18.95 | 7 |
| | | | | 6.1E+0 | 4E+0 | 2.2E+ | 2.2E+ | 2.4E+ | | 13. | | 19.3 |
| 1/20/2006 | 452367 | 5005109 | 7.8E+08 | 8 | 8 | 10 | 10 | 09 | 5.87 | 97 | 18.2 | 9 |
| | | | | 6.4E+0 | 4E+0 | 1.9E+ | 1.9E+ | 2.4E+ | | 13. | | |
| 1/27/2006 | 456861 | 5109154 | 7.9E+08 | 8 | 8 | 10 | 10 | 09 | 6 | 9 | 17.98 | 20.4 |
| | | | | 6.1E+0 | 2E+0 | 1.6E+ | 1.6E+ | 1.8E+ | | 14. | | 20.5 |
| 2/3/2006 | 463843 | 5022224 | 8E+08 | 8 | 8 | 10 | 10 | 09 | 6.55 | 43 | 17.22 | 2 |
| | | | | 6.3E+0 | 6E+0 | 1.7E+ | 1.7E+ | 1.8E+ | | 14. | | 20.1 |
| 2/10/2006 | 460756 | 4965111 | 8.1E+08 | 8 | 8 | 10 | 10 | 09 | 6.61 | 56 | 16.33 | 7 |
| | | | | 6.3E+0 | 5E+0 | 1.1E+ | 1.1E+ | 1.7E+ | | 14. | | 19.5 |
| 2/17/2006 | 464185 | 4979147 | 8E+08 | 8 | 8 | 10 | 10 | 09 | 6.63 | 85 | 16.45 | 8 |
| | | | | 6.4E+0 | 4E+0 | 1.1E+ | 1.1E+ | 1.8E+ | | 15. | | 18.9 |
| 2/24/2006 | 463177 | 4996292 | 7.9E+08 | 8 | 8 | 10 | 10 | 09 | 6.63 | 01 | 16.55 | 4 |
| | | | | 6.2E+0 | 5E+0 | 1.1E+ | 1.1E+ | 1.3E+ | | 14. | | 19.4 |
| 3/3/2006 | 459469 | 5080477 | 8.2E+08 | 8 | 8 | 10 | 10 | 09 | 6.61 | 87 | 16.39 | 6 |
| | | | | 6.2E+0 | 5E+0 | 6.9E+ | 6.9E+ | 1.5E+ | | 15. | | 18.6 |
| 3/10/2006 | 461316 | 4916100 | 8.1E+08 | 8 | 8 | 09 | 09 | 09 | 6.7 | 3 | 17.17 | 2 |
| | | | | 6.3E+0 | 4E+0 | 1.1E+ | 1.1E+ | 1.6E+ | | 15. | | 18.7 |
| 3/17/2006 | 462572 | 5005431 | 8.4E+08 | 8 | 8 | 10 | 10 | 09 | 6.53 | 14 | 17.14 | 7 |
| | | | | 6.2E+0 | 5E+0 | 1.1E+ | 1.1E+ | 1.6E+ | | 15. | | 18.8 |
| 3/24/2006 | 475486 | 4936985 | 8.5E+08 | 8 | 8 | 10 | 10 | 09 | 6.37 | 25 | 16.91 | 9 |
| | | | | 6.4E+0 | 6E+0 | | | 1.7E+ | | 15. | | 18.1 |
| 3/31/2006 | 475447 | 4946019 | 8.6E+08 | 8 | 8 | 1E+10 | 1E+10 | 09 | 6.32 | 2 | 16.81 | 1 |
| | | | | 6.6E+0 | 6E+0 | 1.3E+ | 1.3E+ | 1.9E+ | | 15. | | 18.0 |
| 4/7/2006 | 484443 | 5199442 | 8.8E+08 | 8 | 8 | 10 | 10 | 09 | 6.53 | 97 | 16.78 | 1 |
| | | | | 6.7E+0 | 4E+0 | 5.4E+ | 5.4E+ | 1.6E+ | | 16. | | |
| 4/14/2006 | 481269 | 5083075 | 9E+08 | 8 | 8 | 09 | 09 | 09 | 6.32 | 14 | 16.87 | 18.5 |
| | | | | 6.8E+0 | 5E+0 | | | 1.8E+ | | 15. | | 18.5 |
| 4/21/2006 | 486573 | 5202367 | 9.5E+08 | 8 | 8 | 1E+10 | 1E+10 | 09 | 6.25 | 15 | 17.18 | 6 |
| | | | | 6.7E+0 | 8E+0 | 1.1E+ | 1.1E+ | 1.6E+ | | 15. | | 18.9 |
| 4/28/2006 | 487636 | 5165463 | 9.5E+08 | 8 | 8 | 10 | 10 | 09 | 6.32 | 2 | 16.89 | 7 |
| | | | | 6.8E+0 | 7E+0 | 6.4E+ | 6.4E+ | 8.7E+ | | 15. | | |
| 5/5/2006 | 493841 | 5168833 | 9.6E+08 | 8 | 8 | 09 | 09 | 08 | 6.43 | 24 | 17.53 | 19 |
| | | | | 6.8E+0 | 9E+0 | 1.1E+ | 1.1E+ | 1.3E+ | | 15. | | 19.1 |
| 5/12/2006 | 495897 | 5267477 | 9.9E+08 | 8 | 8 | 10 | 10 | 09 | 6.37 | 51 | 22.37 | 4 |
| | | | | 6.5E+0 | 9E+0 | 9.3E+ | 9.3E+ | 1.5E+ | | 15. | | 20.3 |
| 5/19/2006 | 484834 | 5028893 | 9E+08 | 8 | 8 | 09 | 09 | 09 | 6.57 | 54 | 24.68 | 6 |
| | | | | 6.2E+0 | 9E+0 | 8.3E+ | 8.3E+ | 1.2E+ | | 16. | | 21.2 |
| 5/26/2006 | 477039 | 4832959 | 8.6E+08 | 8 | 8 | 09 | 09 | 09 | 7.28 | 95 | 24.69 | 2 |
| | | | | 6.2E+0 | 6E+0 | 6.6E+ | 6.6E+ | 9.3E+ | | 16. | | 20.2 |
| 6/2/2006 | 479124 | 4870493 | 8.8E+08 | 8 | 8 | 09 | 09 | 08 | 7.14 | 86 | 26.1 | 5 |
| | | | | 5.8E+0 | 5E+0 | 5.8E+ | 5.8E+ | 9.5E+ | | 17. | | 20.7 |
| 6/9/2006 | 471066 | 4574937 | 8.3E+08 | 8 | 8 | 09 | 09 | 08 | 7.24 | 17 | 28.09 | 7 |
| | | | | | 5E+0 | | | | | 18. | | 21.4 |
| 6/16/2006 | 460240 | 4543206 | 8.5E+08 | 6E+08 | 8 | 4E+09 | 4E+09 | 1E+09 | 7.56 | 89 | 28 | 9 |
| | | | | 5.8E+0 | 4E+0 | 3.8E+ | 3.8E+ | 9.7E+ | | 19. | | 21.5 |
| 6/23/2006 | 466973 | 4507567 | 8.4E+08 | 8 | 8 | 09 | 09 | 08 | 7.77 | 02 | 28.27 | 2 |
| | | | | 6.1E+0 | 4E+0 | 5.8E+ | 5.8E+ | | | 18. | | 21.8 |
| 6/30/2006 | 472697 | 4635428 | 8.5E+08 | 8 | 8 | 09 | 09 | 1E+09 | 7.87 | 95 | 28.27 | 3 |
| | | | | | 4E+0 | 6.9E+ | 6.9E+ | 9.4E+ | | 19. | | 21.7 |
| 7/7/2006 | 477694 | 4827850 | 8.8E+08 | 6E+08 | 8 | 09 | 09 | 08 | 7.91 | 5 | 28.42 | 8 |
| | | | | | 5E+0 | | | 9.9E+ | | 19. | | 21.5 |
| 7/14/2006 | 471556 | 4667470 | 8.5E+08 | 6E+08 | 8 | 5E+09 | 5E+09 | 08 | 8.26 | 49 | 28.74 | 4 |
| | | | | | 4E+0 | 9.9E+ | 9.9E+ | 7.6E+ | | 19. | | 22.2 |
| 7/21/2006 | 477632 | 4839326 | 8.6E+08 | 6E+08 | 8 | 09 | 09 | 08 | 8.67 | 87 | 28.32 | 6 |
| | | | | 6.2E+0 | 4E+0 | 1.5E+ | 1.5E+ | 9.1E+ | | 19. | | 22.4 |
| 7/28/2006 | 483369 | 4881757 | 8.8E+08 | 8 | 8 | 10 | 10 | 08 | 8.83 | 84 | 28.31 | 2 |
| | | | | 6.2E+0 | 4E+0 | 1.1E+ | 1.1E+ | 8.9E+ | | 19. | | 22.1 |
| 8/4/2006 | 485362 | 4967646 | 9.1E+08 | 8 | 8 | 10 | 10 | 08 | 8.79 | 95 | 28.68 | 9 |
| | | | | 6.2E+0 | 3E+0 | 1.2E+ | 1.2E+ | | | 20. | | 22.2 |
| 8/11/2006 | 487644 | 5009646 | 9.2E+08 | 8 | 8 | 10 | 10 | 1E+09 | 8.5 | 27 | 28.65 | 2 |
| | | | | 6.3E+0 | 3E+0 | | | 8.3E+ | | 20. | | 22.4 |
| 8/18/2006 | 487238 | 5010099 | 9.4E+08 | 8 | 8 | 8E+09 | 8E+09 | 08 | 8.55 | 13 | 28.65 | 1 |
| | | | | 6.3E+0 | 4E+0 | 8.8E+ | 8.8E+ | 9.8E+ | | 19. | | 22.1 |
| 8/25/2006 | 491594 | 4872573 | 9.3E+08 | 8 | 8 | 09 | 09 | 08 | 8.53 | 35 | 28.11 | 6 |
| | | | | 6.5E+0 | 4E+0 | 8.1E+ | 8.1E+ | 1.2E+ | | 19. | | 22.1 |
| 9/1/2006 | 496726 | 4929785 | 9.5E+08 | 8 | 8 | 09 | 09 | 09 | 8.49 | 36 | 28.01 | 5 |
| | | | | 6.5E+0 | 4E+0 | 8.7E+ | 8.7E+ | 1.2E+ | | 19. | | 21.5 |
| 9/8/2006 | 495083 | 4916459 | 9.6E+08 | 8 | 8 | 09 | 09 | 09 | 8.69 | 45 | 27.9 | 8 |
| | | | | 6.5E+0 | 5E+0 | 1.8E+ | 1.8E+ | 1.4E+ | | 19. | | 21.8 |
| 9/15/2006 | 496683 | 4974501 | 9.6E+08 | 8 | 8 | 10 | 10 | 09 | 8.58 | 32 | 25.42 | 7 |
| 9/22/2006 | 500494 | 4847790 | 9.9E+08 | 6.4E+0 | 6E+0 | 1.6E+ | 1.6E+ | 1.3E+ | 8.48 | 19. | 21.49 | 21.2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8 | 8 | 10 | 10 | 09 | | 36 | | 4 |
| | | | | 6.5E+0 | 5E+0 | 1.1E+ | 1.1E+ | 1.2E+ | | 18. | | 20.3 |
| 9/29/2006 | 501648 | 4878357 | 1E+09 | 8 | 8 | 10 | 10 | 09 | 7.59 | 32 | 20.48 | 4 |
| | | | | 6.4E+0 | 5E+0 | 9.2E+ | 9.2E+ | 4.5E+ | | 17. | | 19.9 |
| 10/6/2006 | 503982 | 4942552 | 9.9E+08 | 8 | 8 | 09 | 09 | 08 | 7.64 | 62 | 19.43 | 3 |
| 10/13/200 | | | | 6.4E+0 | 5E+0 | 8.4E+ | 8.4E+ | 1.4E+ | | | | 19.8 |
| 6 | 510835 | 5069340 | 1E+09 | 8 | 8 | 09 | 09 | 09 | 7.56 | 17 | 16.98 | 6 |
| 10/20/200 | | | | 6.5E+0 | 4E+0 | 1.1E+ | 1.1E+ | 1.4E+ | | 15. | #N/A | 18.2 |
| 6 | 508718 | 5133271 | 1E+09 | 8 | 8 | 10 | 10 | 09 | 6.63 | 4 | N/A | 3 |
| 10/27/200 | | | #N/A | 6.5E+0 | 2E+0 | 9.5E+ | 9.5E+ | 1.2E+ | | 14. | | 16.2 |
| 6 | 514584 | 5139272 | N/A | 8 | 8 | 09 | 09 | 09 | 6.66 | 36 | 14.44 | 5 |
| | | | | 6.6E+0 | 6E+0 | | | 1.1E+ | | 14. | | 15.8 |
| 11/3/2006 | 518973 | 5187199 | 1E+09 | 8 | 8 | 1E+10 | 1E+10 | 09 | 6.61 | 44 | 14.33 | 2 |
| 11/10/200 | | | | 6.7E+0 | 8E+0 | 1.7E+ | 1.7E+ | 9.9E+ | | 14. | | 15.0 |
| 6 | 532284 | 5272635 | 1.1E+09 | 8 | 8 | 10 | 10 | 08 | 7.05 | 03 | 14.23 | 9 |
| 11/17/200 | | | | 6.7E+0 | 1E+0 | 1.5E+ | 1.5E+ | 1.1E+ | | 13. | | 14.4 |
| 6 | 540960 | 5227223 | 1.1E+09 | 8 | 9 | 10 | 10 | 09 | 7.22 | 45 | 14.35 | 7 |
| 11/24/200 | | | | 6.8E+0 | 9E+0 | 1.4E+ | 1.4E+ | 1.3E+ | | 12. | | 13.5 |
| 6 | 550937 | 5159164 | 1.1E+09 | 8 | 8 | 10 | 10 | 09 | 6.75 | 57 | 13.9 | 3 |
| | | | | 6.8E+0 | 1E+0 | 1.1E+ | 1.1E+ | 1.3E+ | | 12. | | 12.4 |
| 12/1/2006 | 556429 | 5286190 | 1.1E+09 | 8 | 9 | 10 | 10 | 09 | 7.3 | 17 | 13.79 | 8 |
| | | | | 6.6E+0 | 1E+0 | | | 1.2E+ | | 12. | | 12.6 |
| 12/8/2006 | 565746 | 5286808 | 1.1E+09 | 8 | 9 | 8E+09 | 8E+09 | 09 | 7.54 | 08 | 13.62 | 2 |
| 12/15/200 | | | | 6.8E+0 | 1E+0 | | | 1.2E+ | | 11. | | 12.8 |
| 6 | 560841 | 5253691 | 1.2E+09 | 8 | 9 | 7E+09 | 7E+09 | 09 | 8.36 | 88 | 14.62 | 5 |
| 12/22/200 | | | | 6.9E+0 | 8E+0 | 1.9E+ | 1.9E+ | 1.1E+ | | 35. | | 12.5 |
| 6 | 558479 | 4851768 | 1.2E+09 | 8 | 8 | 10 | 10 | 09 | 9.42 | 15 | 14.02 | 8 |
| 12/29/200 | | | | 6.9E+0 | 4E+0 | 4.9E+ | 4.9E+ | 5.6E+ | | 35. | | 12.5 |
| 6 | 567079 | 4847908 | 1.2E+09 | 8 | 8 | 09 | 09 | 08 | 9.49 | 21 | 14.25 | 3 |
| | | | | 6.6E+0 | 6E+0 | 4.8E+ | 4.8E+ | 8.7E+ | | | | 12.7 |
| 1/5/2007 | 579894 | 4509767 | 1.2E+09 | 8 | 8 | 09 | 09 | 08 | 9.98 | 36 | 16.56 | 9 |
| | | | | 6.6E+0 | 1E+0 | 9.1E+ | 9.1E+ | | | 36. | | 13.2 |
| 1/12/2007 | 580368 | 4639809 | 1.1E+09 | 8 | 9 | 09 | 09 | 1E+09 | 10.3 | 57 | 17.27 | 5 |
| | | | | 6.5E+0 | 1E+0 | 8.4E+ | 8.4E+ | 9.4E+ | 10.2 | 36. | | 13.5 |
| 1/19/2007 | 594086 | 4730865 | 1.2E+09 | 8 | 9 | 09 | 09 | 08 | 4 | 61 | 17.44 | 9 |
| | | | | 6.6E+0 | 2E+0 | 6.9E+ | 6.9E+ | 8.9E+ | 10.6 | 36. | | 13.1 |
| 1/26/2007 | 605793 | 4728395 | 1.1E+09 | 8 | 9 | 09 | 09 | 08 | 4 | 54 | 17.43 | 9 |
| | | | | 6.8E+0 | 1E+0 | 8.6E+ | 8.6E+ | 8.8E+ | 10.8 | 36. | | 13.7 |
| 2/2/2007 | 625616 | 4824897 | 1.2E+09 | 8 | 9 | 09 | 09 | 08 | 9 | 51 | 17.21 | 8 |
| | | | | 6.8E+0 | 2E+0 | 9.6E+ | 9.6E+ | 9.8E+ | 11.1 | 36. | | 13.5 |
| 2/9/2007 | 643462 | 5003619 | 1.1E+09 | 8 | 9 | 09 | 09 | 08 | 8 | 71 | 17.67 | 4 |
| | | | | 6.9E+0 | 2E+0 | 9.1E+ | 9.1E+ | 1.1E+ | 11.3 | 36. | | 12.7 |
| 2/16/2007 | 653700 | 4951319 | 1.2E+09 | 8 | 9 | 09 | 09 | 09 | 2 | 71 | 17.75 | 6 |
| | | | | | 1E+0 | 6.1E+ | 6.1E+ | 1.1E+ | 11.5 | 36. | | 12.6 |
| 2/23/2007 | 664885 | 4969700 | 1.2E+09 | 7E+08 | 9 | 09 | 09 | 09 | 5 | 57 | 17.94 | 3 |
| | | | | 6.8E+0 | 2E+0 | 7.5E+ | 7.5E+ | 1.1E+ | 14.8 | 36. | | 13.5 |
| 3/2/2007 | 609049 | 4885016 | 1.1E+09 | 8 | 9 | 09 | 09 | 09 | 2 | 52 | 19.46 | 3 |
| | | | | 6.8E+0 | 2E+0 | 3.7E+ | 3.7E+ | 1.2E+ | 18.1 | 36. | | 14.6 |
| 3/9/2007 | 621178 | 4828016 | 1.1E+09 | 8 | 9 | 09 | 09 | 09 | 1 | 49 | 19.67 | 9 |
| | | | | 6.8E+0 | 1E+0 | 6.1E+ | 6.1E+ | 1.3E+ | 18.9 | 36. | | 15.3 |
| 3/16/2007 | 618203 | 4827674 | 1.1E+09 | 8 | 9 | 09 | 09 | 09 | 5 | 44 | 19.35 | 1 |
| | | | | 6.9E+0 | 1E+0 | 7.2E+ | 7.2E+ | 1.6E+ | 19.0 | 36. | | 15.1 |
| 3/23/2007 | 645931 | 4876019 | 1.2E+09 | 8 | 9 | 09 | 09 | 09 | 1 | 44 | 19.51 | 8 |
| | | | | | 1E+0 | | | 1.4E+ | 19.0 | 36. | | 15.2 |
| 3/30/2007 | 652753 | 4843262 | 1.2E+09 | 7E+08 | 9 | 5E+09 | 5E+09 | 09 | 5 | 49 | 20.08 | 1 |
| | | | | 7.1E+0 | 1E+0 | 7.9E+ | 7.9E+ | 1.6E+ | | 36. | | 15.2 |
| 4/6/2007 | 672043 | 4976078 | 1.2E+09 | 8 | 9 | 09 | 09 | 09 | 18.9 | 58 | 19.6 | 6 |
| | | | | 7.3E+0 | 1E+0 | 3.2E+ | 3.2E+ | 1.9E+ | | 36. | | 15.2 |
| 4/13/2007 | 688446 | 4977713 | 1.3E+09 | 8 | 9 | 09 | 09 | 09 | 18.8 | 43 | 19.96 | 9 |
| | | | | 7.3E+0 | 1E+0 | 3.4E+ | 3.4E+ | | 18.9 | 36. | | |
| 4/20/2007 | 691393 | 4946912 | 1.3E+09 | 8 | 9 | 09 | 09 | 2E+09 | 4 | 43 | 19.98 | 15.4 |
| | | | | 7.4E+0 | 9E+0 | 6.8E+ | 6.8E+ | | 18.3 | 36. | | 14.8 |
| 4/27/2007 | 697920 | 5004093 | 1.3E+09 | 8 | 8 | 09 | 09 | 2E+09 | 7 | 44 | 19.14 | 9 |
| | | | | 7.5E+0 | 8E+0 | 6.3E+ | 6.3E+ | 1.1E+ | 18.7 | 15. | | 14.8 |
| 5/4/2007 | 713339 | 5163605 | 1.3E+09 | 8 | 8 | 09 | 09 | 09 | 5 | 01 | 19.07 | 2 |
| | | | | 7.7E+0 | 1E+0 | 6.1E+ | 6.1E+ | | 18.5 | 15. | | 14.4 |
| 5/11/2007 | 707413 | 5095907 | 1.3E+09 | 8 | 9 | 09 | 09 | 2E+09 | 3 | 03 | 18.83 | 8 |
| | | | | 7.7E+0 | 1E+0 | 9.1E+ | 9.1E+ | 2.3E+ | 18.5 | 12. | | 14.1 |
| 5/18/2007 | 796188 | 5257500 | 1.3E+09 | 8 | 9 | 09 | 09 | 09 | 1 | 53 | 16.62 | 1 |
| | | | | 7.9E+0 | 1E+0 | 7.6E+ | 7.6E+ | 1.9E+ | 18.8 | 10. | | 13.9 |
| 5/25/2007 | 693820 | 5188931 | 1.3E+09 | 8 | 9 | 09 | 09 | 09 | 2 | 92 | 16.66 | 8 |
| | | | | 8.2E+0 | 1E+0 | 7.5E+ | 7.5E+ | 2.5E+ | 18.7 | 11. | | 14.0 |
| 6/1/2007 | 706661 | 5443220 | 1.3E+09 | 8 | 9 | 09 | 09 | 09 | 3 | 42 | 16.82 | 3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8.3E+0 | 1E+0 | 1.4E+ | 1.4E+ | | 18.5 | 12. | | 14.1 |
| 6/8/2007 | 702944 | 5429798 | 1.3E+09 | 8 | 9 | 10 | 10 | 2E+09 | 7 | 12 | 17.07 | 1 |
| | | | | 8.5E+0 | 1E+0 | 7.8E+ | 7.8E+ | 2.7E+ | 18.3 | 13. | | 14.1 |
| 6/15/2007 | 707805 | 5374183 | 1.4E+09 | 8 | 9 | 09 | 09 | 09 | 8 | 24 | 16.95 | 9 |
| | | | | 8.5E+0 | 1E+0 | 1.4E+ | 1.4E+ | 3.1E+ | 18.2 | 13. | | 14.7 |
| 6/22/2007 | 724656 | 5675160 | 1.4E+09 | 8 | 9 | 10 | 10 | 09 | 7 | 48 | 16.82 | 9 |
| | | | | 8.4E+0 | 1E+0 | 8.8E+ | 8.8E+ | 1.7E+ | 18.1 | 13. | | 15.0 |
| 6/29/2007 | 708181 | 5713009 | 1.4E+09 | 8 | 9 | 09 | 09 | 09 | 6 | 51 | 16.84 | 8 |
| | | | | | 1E+0 | | | 2.1E+ | 15.9 | 14. | | 15.5 |
| 7/6/2007 | 722073 | 6145816 | 1.5E+09 | 9E+08 | 9 | 2E+10 | 2E+10 | 09 | 5 | 58 | 15.33 | 5 |
| | | | | 9.5E+0 | 1E+0 | 2.6E+ | 2.6E+ | 2.3E+ | 12.3 | 15. | | 14.2 |
| 7/13/2007 | 729354 | 6346655 | 1.5E+09 | 8 | 9 | 10 | 10 | 09 | 4 | 15 | 15.11 | 3 |
| | | | | 9.6E+0 | 9E+0 | 1.6E+ | 1.6E+ | 2.4E+ | 11.0 | 15. | | 14.7 |
| 7/20/2007 | 728402 | 6283486 | 1.6E+09 | 8 | 8 | 10 | 10 | 09 | 1 | 14 | 15.82 | 4 |
| | | | | 9.1E+0 | 1E+0 | 1.7E+ | 1.7E+ | 2.9E+ | 11.3 | 16. | | 16.5 |
| 7/27/2007 | 715077 | 6412839 | 1.5E+09 | 8 | 9 | 10 | 10 | 09 | 6 | 09 | 17.55 | 3 |
| | | | | 9.1E+0 | 1E+0 | 7.8E+ | 7.8E+ | 1.9E+ | 12.2 | 17. | | 18.3 |
| 8/3/2007 | 705008 | 6220242 | 1.5E+09 | 8 | 9 | 09 | 09 | 09 | 9 | 13 | 19.63 | 8 |
| | | | | 8.9E+0 | 1E+0 | 8.5E+ | 8.5E+ | 1.8E+ | 14.0 | 18. | | 20.3 |
| 8/10/2007 | 690256 | 5972723 | 1.4E+09 | 8 | 9 | 09 | 09 | 09 | 8 | 55 | 25.1 | 1 |
| | | | | | 2E+0 | 6.1E+ | 6.1E+ | 1.7E+ | 16.0 | 19. | | 24.7 |
| 8/17/2007 | 638920 | 5626797 | 1.3E+09 | 8E+08 | 9 | 09 | 09 | 09 | 2 | 97 | 28.87 | 6 |
| | | | | 8.7E+0 | 1E+0 | 8.3E+ | 8.3E+ | | 18.1 | 22. | | 26.6 |
| 8/24/2007 | 681017 | 5869562 | 1.4E+09 | 8 | 9 | 09 | 09 | 2E+09 | 7 | 52 | 28.67 | 9 |
| | | | | 9.1E+0 | 7E+0 | 6.3E+ | 6.3E+ | 1.9E+ | 18.2 | 22. | | 26.7 |
| 8/31/2007 | 681408 | 6039087 | 1.5E+09 | 8 | 8 | 09 | 09 | 09 | 9 | 88 | 28.56 | 2 |
| | | | | 9.2E+0 | 9E+0 | 5.9E+ | 5.9E+ | | 17.8 | 23. | | 26.7 |
| 9/7/2007 | 710047 | 5956003 | 1.5E+09 | 8 | 8 | 09 | 09 | 2E+09 | 6 | 11 | 28.62 | 2 |
| | | | | 9.1E+0 | 6E+0 | 4.3E+ | 4.3E+ | 1.9E+ | | 22. | | 27.5 |
| 9/14/2007 | 701839 | 6013630 | 1.5E+09 | 8 | 8 | 09 | 09 | 09 | 17.9 | 99 | 29.05 | 3 |
| | | | | 9.4E+0 | 7E+0 | 5.2E+ | 5.2E+ | 2.1E+ | 18.0 | 23. | | 28.2 |
| 9/21/2007 | 697390 | 6166885 | 1.6E+09 | 8 | 8 | 09 | 09 | 09 | 8 | 29 | 29.05 | 1 |
| | | | | 9.5E+0 | 1E+0 | 7.6E+ | 7.6E+ | 9.4E+ | 17.8 | 23. | | 28.2 |
| 9/28/2007 | 715458 | 6271119 | 1.6E+09 | 8 | 9 | 09 | 09 | 08 | 8 | 33 | 29.37 | 3 |
| | | | | 9.8E+0 | 1E+0 | | | 1.8E+ | 18.0 | 23. | | 28.5 |
| 10/5/2007 | 734405 | 6323802 | 1.7E+09 | 8 | 9 | 7E+09 | 7E+09 | 09 | 1 | 05 | 29.51 | 3 |
| 10/12/200 | | | | 9.9E+0 | 9E+0 | 9.9E+ | 9.9E+ | 2.3E+ | 17.9 | 22. | | 28.5 |
| 7 | 728725 | 6586536 | 1.8E+09 | 8 | 8 | 09 | 09 | 09 | 9 | 62 | 29.5 | 6 |
| 10/19/200 | | | | 9.6E+0 | 7E+0 | 8.1E+ | 8.1E+ | 2.3E+ | 18.0 | 22. | | 28.7 |
| 7 | 725943 | 6502925 | 1.7E+09 | 8 | 8 | 09 | 09 | 09 | 7 | 17 | 31.56 | 8 |
| 10/26/200 | | | | 9.9E+0 | 9E+0 | 4.5E+ | 4.5E+ | 2.1E+ | 18.4 | 22. | | 29.8 |
| 7 | 741262 | 6649654 | 1.8E+09 | 8 | 8 | 09 | 09 | 09 | 6 | 28 | 31.85 | 1 |
| | | | | 9.9E+0 | 1E+0 | 7.5E+ | 7.5E+ | | 18.3 | 22. | | 29.8 |
| 11/2/2007 | 741600 | 6661256 | 1.8E+09 | 8 | 9 | 09 | 09 | 2E+09 | 9 | 61 | 32.08 | 4 |
| | | | | 9.8E+0 | 7E+0 | 5.5E+ | 5.5E+ | 1.6E+ | 18.6 | 22. | | 30.3 |
| 11/9/2007 | 743641 | 6513578 | 1.8E+09 | 8 | 8 | 09 | 09 | 09 | 7 | 46 | 32.22 | 9 |
| 11/16/200 | | | | 9.4E+0 | 8E+0 | 7.3E+ | 7.3E+ | 1.7E+ | 18.7 | 22. | | |
| 7 | 734837 | 6326583 | 1.8E+09 | 8 | 8 | 09 | 09 | 09 | 3 | 21 | 32.53 | 30.9 |
| 11/23/200 | | | | 8.7E+0 | 8E+0 | | | 1.6E+ | 18.7 | 22. | | 31.2 |
| 7 | 717601 | 6139977 | 1.8E+09 | 8 | 8 | 1E+10 | 1E+10 | 09 | 7 | 96 | 32.74 | 6 |
| 11/30/200 | | | | 9.3E+0 | 8E+0 | 7.5E+ | 7.5E+ | 1.6E+ | 18.9 | 23. | | 32.3 |
| 7 | 747608 | 6309007 | 1.8E+09 | 8 | 8 | 09 | 09 | 09 | 3 | 23 | 32.23 | 7 |
| | | | | 9.5E+0 | 1E+0 | 4.6E+ | 4.6E+ | 1.6E+ | 18.2 | 22. | | 31.4 |
| 12/7/2007 | 769413 | 6272331 | 1.9E+09 | 8 | 9 | 09 | 09 | 09 | 1 | 61 | 30.85 | 5 |
| 12/14/200 | | | | 9.3E+0 | 8E+0 | 4.4E+ | 4.4E+ | 1.5E+ | 17.2 | 22. | | 30.6 |
| 7 | 752638 | 6236479 | 1.9E+09 | 8 | 8 | 09 | 09 | 09 | 9 | 13 | 30.43 | 5 |
| 12/21/200 | | | | 9.2E+0 | 8E+0 | 5.7E+ | 5.7E+ | 1.3E+ | 16.3 | 21. | | 30.1 |
| 7 | 752857 | 6067059 | 1.8E+09 | 8 | 8 | 09 | 09 | 09 | 2 | 95 | 27.95 | 8 |
| 12/28/200 | | | | 9.3E+0 | 6E+0 | 7.4E+ | 7.4E+ | | 13.0 | 19. | | 26.9 |
| 7 | 776335 | 6400159 | 1.9E+09 | 8 | 8 | 09 | 09 | 1E+09 | 7 | 98 | 22.93 | 2 |
| | | | | 9.2E+0 | 6E+0 | 4.9E+ | 4.9E+ | | 12.6 | | | 25.5 |
| 1/4/2008 | 787117 | 6028918 | 1.9E+09 | 8 | 8 | 09 | 09 | 8E+08 | 6 | 20 | 22.01 | 3 |
| | | | | 8.8E+0 | 2E+0 | 7.4E+ | 7.4E+ | 1.4E+ | 12.7 | 20. | | 25.7 |
| 1/11/2008 | 813802 | 5976755 | 2E+09 | 8 | 9 | 09 | 09 | 09 | 4 | 22 | 24.5 | 2 |
| | | | | 8.5E+0 | 1E+0 | 6.9E+ | 6.9E+ | 1.4E+ | 14.3 | 20. | | |
| 1/18/2008 | 772601 | 5923897 | 1.8E+09 | 8 | 9 | 09 | 09 | 09 | 2 | 55 | 32.95 | 26 |
| | | | | 8.3E+0 | 1E+0 | 9.5E+ | 9.5E+ | 1.4E+ | 16.9 | 23. | | 27.4 |
| 1/25/2008 | 754308 | 5698170 | 1.8E+09 | 8 | 9 | 09 | 09 | 09 | 4 | 13 | 33.01 | 4 |
| | | | | | 7E+0 | 1.2E+ | 1.2E+ | 1.6E+ | 17.0 | 24. | | 27.8 |
| 2/1/2008 | 748084 | 6085579 | 1.9E+09 | 8E+08 | 8 | 10 | 10 | 09 | 6 | 35 | 33.04 | 9 |
| | | | | 8.3E+0 | 6E+0 | 1.3E+ | 1.3E+ | 5.9E+ | 17.4 | 24. | | 28.5 |
| 2/8/2008 | 760488 | 6052188 | 1.9E+09 | 8 | 8 | 10 | 10 | 08 | 7 | 58 | 33.27 | 1 |
| 2/15/2008 | 764864 | 6190736 | 1.9E+09 | 8.3E+0 | 1E+0 | 1.2E+ | 1.2E+ | 1.8E+ | 17.3 | 24. | 32.98 | 29.3 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8 | 9 | 10 | 10 | 09 | 1 | 85 | | 5 |
| | | | | 8.3E+0 | 1E+0 | 6.6E+ | 6.6E+ | 1.6E+ | 17.9 | 24. | | |
| 2/22/2008 | 734475 | 6192139 | 1.9E+09 | 8 | 9 | 09 | 09 | 09 | 2 | 68 | 32.83 | 29.5 |
| | | | | 8.4E+0 | 1E+0 | 1.2E+ | 1.2E+ | 1.5E+ | 17.8 | 24. | | 29.4 |
| 2/29/2008 | 727831 | 6335458 | 1.9E+09 | 8 | 9 | 10 | 10 | 09 | 5 | 74 | 32.81 | 8 |
| | | | | 8.2E+0 | 1E+0 | 1.5E+ | 1.5E+ | 1.4E+ | 18.8 | 24. | | 28.7 |
| 3/7/2008 | 695157 | 6152711 | 1.9E+09 | 8 | 9 | 10 | 10 | 09 | 2 | 08 | 33.1 | 2 |
| | | | | 7.9E+0 | 2E+0 | 1.3E+ | 1.3E+ | 1.5E+ | | 24. | | 28.7 |
| 3/14/2008 | 641347 | 6129506 | 1.7E+09 | 8 | 9 | 10 | 10 | 09 | 26.2 | 21 | 33.41 | 9 |
| | | | | 8.1E+0 | 9E+0 | 1.1E+ | 1.1E+ | 1.3E+ | 26.2 | 23. | | 28.5 |
| 3/21/2008 | 639003 | 6020326 | 1.6E+09 | 8 | 8 | 10 | 10 | 09 | 7 | 93 | 33.51 | 1 |
| | | | | 8.4E+0 | 1E+0 | 1.1E+ | 1.1E+ | 1.5E+ | 26.5 | 23. | | 27.8 |
| 3/28/2008 | 676116 | 6187676 | 1.8E+09 | 8 | 9 | 10 | 10 | 09 | 3 | 96 | 34.62 | 8 |
| | | | | 8.7E+0 | 9E+0 | 1.7E+ | 1.7E+ | 1.4E+ | | 23. | | 27.3 |
| 4/4/2008 | 656488 | 6184940 | 1.6E+09 | 8 | 8 | 10 | 10 | 09 | 26.6 | 09 | 35.5 | 8 |
| | | | | 8.8E+0 | 9E+0 | 1.5E+ | 1.5E+ | | 26.6 | 22. | | 26.1 |
| 4/11/2008 | 670381 | 6217356 | 1.7E+09 | 8 | 8 | 10 | 10 | 1E+09 | 4 | 43 | 35.34 | 5 |
| | | | | 8.8E+0 | 9E+0 | 1.1E+ | 1.1E+ | 1.3E+ | 26.4 | 22. | | 25.8 |
| 4/18/2008 | 681119 | 6332119 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 4 | 38 | 35.48 | 4 |
| | | | | | 1E+0 | 2.7E+ | 2.7E+ | 1.8E+ | 26.4 | 22. | | 25.9 |
| 4/25/2008 | 664718 | 6237560 | 1.6E+09 | 9E+08 | 9 | 10 | 10 | 09 | 3 | 42 | 35.78 | 3 |
| | | | | 9.2E+0 | 7E+0 | 1.4E+ | 1.4E+ | 1.2E+ | 26.4 | 22. | | 25.4 |
| 5/2/2008 | 656356 | 6320299 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 3 | 09 | 35.6 | 2 |
| | | | | | 1E+0 | 1.3E+ | 1.3E+ | 1.3E+ | 26.2 | 20. | | |
| 5/9/2008 | 662968 | 6390781 | 1.7E+09 | 9E+08 | 9 | 10 | 10 | 09 | 2 | 54 | 35.58 | 25 |
| | | | | 9.4E+0 | 9E+0 | 1.4E+ | 1.4E+ | 1.3E+ | 25.9 | 20. | | 25.0 |
| 5/16/2008 | 671724 | 6567782 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 6 | 27 | 35.63 | 3 |
| | | | | 9.1E+0 | 8E+0 | 1.8E+ | 1.8E+ | 1.7E+ | 25.6 | 19. | | 24.8 |
| 5/23/2008 | 658406 | 6620110 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 8 | 67 | 34.16 | 7 |
| | | | | 9.2E+0 | 1E+0 | 2.4E+ | 2.4E+ | 1.4E+ | 25.0 | | | 24.5 |
| 5/30/2008 | 659517 | 6309174 | 1.8E+09 | 8 | 9 | 10 | 10 | 09 | 4 | 20 | 27.23 | 2 |
| | | | | 9.1E+0 | 1E+0 | 1.5E+ | 1.5E+ | | 23.9 | 18. | | 22.6 |
| 6/6/2008 | 673553 | 6194583 | 1.7E+09 | 8 | 9 | 10 | 10 | 1E+09 | 5 | 9 | 26.35 | 9 |
| | | | | 8.7E+0 | 9E+0 | 1.7E+ | 1.7E+ | 1.6E+ | 23.5 | 16. | | 21.3 |
| 6/13/2008 | 663221 | 5929791 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 7 | 87 | 25.61 | 2 |
| | | | | 8.6E+0 | 9E+0 | 1.4E+ | 1.4E+ | 1.8E+ | 23.6 | 17. | | 19.8 |
| 6/20/2008 | 650730 | 5828351 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 6 | 88 | 25.25 | 4 |
| | | | | 8.4E+0 | 9E+0 | 1.7E+ | 1.7E+ | 1.6E+ | | 17. | | 19.0 |
| 6/27/2008 | 642182 | 5879645 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 23.6 | 57 | 26.02 | 1 |
| | | | | 7.8E+0 | 8E+0 | 1.2E+ | 1.2E+ | 1.5E+ | | 17. | | 19.1 |
| 7/4/2008 | 611732 | 5630435 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 23.8 | 89 | 25.65 | 3 |
| | | | | 7.8E+0 | 9E+0 | 1.4E+ | 1.4E+ | 1.6E+ | 23.4 | 17. | | |
| 7/11/2008 | 620675 | 5533713 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 7 | 95 | 24.8 | 19.6 |
| | | | | 7.5E+0 | 8E+0 | 9.3E+ | 9.3E+ | 1.5E+ | 14.9 | 19. | | 19.7 |
| 7/18/2008 | 596126 | 5032719 | 1.6E+09 | 8 | 8 | 09 | 09 | 09 | 7 | 62 | 23.13 | 5 |
| | | | | 7.9E+0 | 1E+0 | | | 1.5E+ | 14.8 | 20. | | 20.5 |
| 7/25/2008 | 616342 | 5193729 | 1.7E+09 | 8 | 9 | 1E+10 | 1E+10 | 09 | 9 | 34 | 22.84 | 7 |
| | | | | 7.8E+0 | 8E+0 | | | 1.2E+ | 14.1 | 20. | | 20.5 |
| 8/1/2008 | 625168 | 5140909 | 1.7E+09 | 8 | 8 | 7E+09 | 7E+09 | 09 | 5 | 27 | 22.36 | 4 |
| | | | | 7.8E+0 | 9E+0 | 1.1E+ | 1.1E+ | 1.2E+ | 14.3 | 21. | | 21.1 |
| 8/8/2008 | 603584 | 5244340 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 2 | 74 | 21.73 | 4 |
| | | | | 7.8E+0 | 7E+0 | 8.9E+ | 8.9E+ | 9.9E+ | 14.2 | 21. | | 20.7 |
| 8/15/2008 | 590654 | 5375058 | 1.6E+09 | 8 | 8 | 09 | 09 | 08 | 2 | 88 | 21.08 | 3 |
| | | | | 7.4E+0 | 7E+0 | 1.1E+ | 1.1E+ | 1.3E+ | | 22. | | 20.7 |
| 8/22/2008 | 585399 | 5179405 | 1.6E+09 | 8 | 8 | 10 | 10 | 09 | 14.4 | 26 | 20.78 | 6 |
| | | | | 7.3E+0 | 8E+0 | 8.8E+ | 8.8E+ | 1.1E+ | | 22. | | 20.5 |
| 8/29/2008 | 593339 | 5196901 | 1.7E+09 | 8 | 8 | 09 | 09 | 09 | 15 | 25 | 20.87 | 4 |
| | | | | | 6E+0 | 6.1E+ | 6.1E+ | 1.7E+ | 15.1 | 22. | | 21.6 |
| 9/5/2008 | 577444 | 4902541 | 1.5E+09 | 7E+08 | 8 | 09 | 09 | 09 | 3 | 67 | 22.95 | 3 |
| | | | | 7.4E+0 | 8E+0 | 7.5E+ | 7.5E+ | 1.9E+ | | 23. | | 23.8 |
| 9/12/2008 | 562571 | 4973815 | 1.4E+09 | 8 | 8 | 09 | 09 | 09 | 15.4 | 42 | 26.39 | 9 |
| | | | | 7.2E+0 | 1E+0 | | | 1.7E+ | 16.8 | 25. | | 27.8 |
| 9/19/2008 | 553233 | 4748951 | 1.4E+09 | 8 | 9 | 1E+10 | 1E+10 | 09 | 9 | 52 | 26.24 | 1 |
| | | | | 7.3E+0 | 8E+0 | 7.8E+ | 7.8E+ | 2.1E+ | 16.8 | 25. | | 27.7 |
| 9/26/2008 | 550232 | 4705831 | 1.4E+09 | 8 | 8 | 09 | 09 | 09 | 3 | 34 | 26.17 | 7 |
| | | | | 7.1E+0 | 5E+0 | 1.1E+ | 1.1E+ | 1.4E+ | 16.7 | 25. | | 27.6 |
| 10/3/2008 | 548354 | 4483838 | 1.4E+09 | 8 | 8 | 10 | 10 | 09 | 6 | 28 | 36.4 | 8 |
| 10/10/200 | | | | 6.2E+0 | 1E+0 | 1.7E+ | 1.7E+ | | 18.2 | 34. | | 30.5 |
| 8 | 504095 | 3460600 | 1.1E+09 | 8 | 9 | 10 | 10 | 2E+09 | 7 | 44 | 39.2 | 5 |
| 10/17/200 | | | | 5.9E+0 | 2E+0 | 2.5E+ | 2.5E+ | | 18.9 | 37. | | 37.1 |
| 8 | 488370 | 3611093 | 1.1E+09 | 8 | 9 | 10 | 10 | 2E+09 | 7 | 41 | 41.58 | 2 |
| 10/24/200 | | | | 4.7E+0 | 2E+0 | 1.3E+ | 1.3E+ | | 19.9 | 39. | | 43.8 |
| 8 | 463478 | 3315945 | 9.5E+08 | 8 | 9 | 10 | 10 | 2E+09 | 9 | 35 | 46.45 | 4 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/31/2008 | 465257 | 3187346 | 9.6E+08 | 5.5E+08 | 2E+09 | 2.3E+10 | 2.3E+10 | 3.4E+09 | 21.24 | 44.85 | 49.27 | 49.92 |
| 11/7/2008 | 482818 | 3553267 | 1E+09 | 5.6E+08 | 2E+09 | 2.7E+10 | 2.7E+10 | 3.5E+09 | 22.83 | 47.1 | 49.33 | 52.34 |
| 11/14/2008 | 475907 | 3290122 | 9.7E+08 | 5.4E+08 | 2E+09 | 1.5E+10 | 1.5E+10 | 2.9E+09 | 22.63 | 47.2 | 49.69 | 52.49 |
| 11/21/2008 | 468016 | 3040333 | 8.7E+08 | 5E+08 | 1E+09 | 1.1E+10 | 1.1E+10 | 2.2E+09 | 22.26 | 47.37 | 50.66 | 54.65 |
| 11/28/2008 | 467892 | 3069499 | 9.4E+08 | 5.4E+08 | 1E+09 | 9.6E+09 | 9.6E+09 | 2.6E+09 | 22.45 | 47.55 | 50.37 | 55.45 |
| 12/5/2008 | 452784 | 3000491 | 9.1E+08 | 5.2E+08 | 8E+08 | 8.6E+09 | 8.6E+09 | 2.3E+09 | 21.97 | 47.76 | 52.03 | 55.61 |
| 12/12/2008 | 460392 | 3247023 | 9.6E+08 | 5.6E+08 | 9E+08 | 1.4E+10 | 1.4E+10 | 2.8E+09 | 22.48 | 48.86 | 53.89 | 57.61 |
| 12/19/2008 | 473932 | 3418112 | 1E+09 | 5.9E+08 | 9E+08 | 1.9E+10 | 1.9E+10 | 3E+09 | 22.74 | 48.47 | 53.28 | 58.31 |
| 12/26/2008 | 468821 | 3414892 | 1E+09 | 5.6E+08 | 4E+08 | 1.1E+10 | 1.1E+10 | 1.6E+09 | 22.65 | 48.58 | 53.34 | 58.46 |
| 1/2/2009 | 483142 | 3440249 | 1E+09 | 5.8E+08 | 5E+08 | 2.9E+09 | 2.9E+09 | 1E+09 | 23.06 | 48.74 | 54.22 | 58.66 |
| 1/9/2009 | 496267 | 3511644 | 1.1E+09 | 6E+08 | 2E+09 | 1.6E+10 | 1.6E+10 | 2.3E+09 | 23.78 | 50.03 | 54.36 | 58.78 |
| 1/16/2009 | 484137 | 3327343 | 1E+09 | 5.7E+08 | 1E+09 | 1.3E+10 | 1.3E+10 | 1.8E+09 | 23.39 | 50.74 | 54.15 | 59.19 |
| 1/23/2009 | 471315 | 3313460 | 1E+09 | 5.5E+08 | 6E+08 | 9.8E+09 | 9.8E+09 | 1.6E+09 | 23.19 | 50.41 | 53.35 | 58.36 |
| 1/30/2009 | 477941 | 3345314 | 1E+09 | 5.9E+08 | 3E+08 | 8.9E+09 | 8.9E+09 | 1.1E+09 | 23.01 | 49.85 | 51.75 | 58.41 |
| 2/6/2009 | 484202 | 3396468 | 1E+09 | 6.1E+08 | 5E+08 | 9.5E+09 | 9.5E+09 | 2.2E+09 | 22.38 | 50.04 | 51.73 | 58.81 |
| 2/13/2009 | 491114 | 3407224 | 1E+09 | 6E+08 | 7E+08 | 6.9E+09 | 6.9E+09 | 2.5E+09 | 22.66 | 49.6 | 44.94 | 58.35 |
| 2/20/2009 | 480537 | 3325753 | 9.9E+08 | 5.4E+08 | 8E+08 | 1.1E+10 | 1.1E+10 | 2.9E+09 | 22.57 | 46.72 | 42.55 | 57.47 |
| 2/27/2009 | 480321 | 3304592 | 9.8E+08 | 5.4E+08 | 9E+08 | 8.3E+09 | 8.3E+09 | 2.8E+09 | 20.86 | 41.06 | 41.08 | 54.14 |
| 3/6/2009 | 463078 | 3210665 | 9.8E+08 | 5.3E+08 | 8E+08 | 7.6E+09 | 7.6E+09 | 2.4E+09 | 20.03 | 39.33 | 36.67 | 48.82 |
| 3/13/2009 | 510737 | 3252021 | 1E+09 | 5.7E+08 | 6E+08 | 9.7E+09 | 9.7E+09 | 2.7E+09 | 18.13 | 32.3 | 31.42 | 43.81 |
| 3/20/2009 | 518588 | 3291836 | 1E+09 | 5.9E+08 | 8E+08 | 7.6E+09 | 7.6E+09 | 2.6E+09 | 15.88 | 29.26 | 31.42 | 41.15 |
| 3/27/2009 | 535557 | 3379255 | 1.1E+09 | 6.3E+08 | 1E+09 | 8.7E+09 | 8.7E+09 | 2.8E+09 | 15.78 | 28.71 | 29.88 | 40.92 |
| 4/3/2009 | 554905 | 3416072 | 1.1E+09 | 6.5E+08 | 2E+09 | 1E+10 | 1E+10 | 3E+09 | 16.61 | 27.71 | 29.89 | 37.57 |
| 4/10/2009 | 580674 | 3477166 | 1.1E+09 | 6.8E+08 | 2E+09 | 7.3E+09 | 7.3E+09 | 4E+09 | 17.27 | 27.23 | 30.36 | 37.38 |
| 4/17/2009 | 594837 | 3506479 | 1.2E+09 | 6.7E+08 | 3E+09 | 5E+09 | 5E+09 | 4.1E+09 | 16.73 | 26.33 | 30.3 | 34.61 |
| 4/24/2009 | 610544 | 3640209 | 1.2E+09 | 6.9E+08 | 2E+09 | 1.9E+10 | 1.9E+10 | 3.4E+09 | 16.39 | 25.13 | 26.26 | 32.36 |
| 5/1/2009 | 609888 | 3777295 | 1.3E+09 | 7E+08 | 2E+09 | 1.4E+10 | 1.4E+10 | 2.7E+09 | 16.99 | 24.94 | 26.81 | 33.46 |
| 5/8/2009 | 629415 | 4056545 | 1.4E+09 | 7.2E+08 | 3E+09 | 1.9E+10 | 1.9E+10 | 3E+09 | 16.96 | 25.83 | 26.38 | 32.93 |
| 5/15/2009 | 621072 | 4104441 | 1.3E+09 | 7.1E+08 | 3E+09 | 3.3E+10 | 3.3E+10 | 3.6E+09 | 16.56 | 26.93 | 27.49 | 32.82 |
| 5/22/2009 | 639060 | 4259613 | 1.4E+09 | 7.1E+08 | 3E+09 | 2.2E+10 | 2.2E+10 | 3.6E+09 | 15.92 | 25.35 | 26.94 | 32.35 |
| 5/29/2009 | 634635 | 4303313 | 1.5E+09 | 7.1E+08 | 3E+09 | 2E+10 | 2E+10 | 3.4E+09 | 15.53 | 24.26 | 27.4 | 30.35 |
| 6/5/2009 | 653205 | 4644856 | 1.6E+09 | 7.3E+08 | 3E+09 | 2.7E+10 | 2.7E+10 | 3.1E+09 | 15.53 | 24.34 | 27.28 | 28.77 |
| 6/12/2009 | 661776 | 4830809 | 1.6E+09 | 7.3E+08 | 2E+09 | 2.4E+10 | 2.4E+10 | 2.5E+09 | 15.49 | 24.44 | 28.57 | 28.69 |
| 6/19/2009 | 645542 | 4525658 | 1.5E+09 | 7E+08 | 2E+09 | 1.4E+10 | 1.4E+10 | 2.3E+09 | 15.72 | 25.68 | 30.04 | 28.55 |
| 6/26/2009 | 654828 | 4578619 | 1.6E+09 | 7.1E+08 | 2E+09 | 1.3E+10 | 1.3E+10 | 2.2E+09 | 15.82 | 26.06 | 29.51 | 27.87 |
| 7/3/2009 | 653958 | 4483674 | 1.6E+09 | 7.2E+08 | 1E+09 | 1E+10 | 1E+10 | 2.3E+09 | 15.67 | 26.14 | 29.83 | 25.82 |
| 7/10/2009 | 507202 | 4404187 | 1.6E+09 | 7.2E+08 | 6E+09 | 5.9E+10 | 5.9E+10 | 2.2E+09 | 15.26 | 26.15 | 30.15 | 24.17 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 8 | 8 | 09 | 09 | 09 | 7 | 64 | | |
| | | | | 7.3E+0 | 8E+0 | 1.2E+ | 1.2E+ | 2.1E+ | 15.1 | 26. | | 24.5 |
| 7/17/2009 | 528510 | 4642410 | 1.6E+09 | 8 | 8 | 10 | 10 | 09 | 3 | 41 | 30.33 | 6 |
| | | | | 7.6E+0 | 8E+0 | 1.3E+ | 1.3E+ | 2.7E+ | 15.3 | 26. | | 24.2 |
| 7/24/2009 | 544398 | 4783928 | 1.7E+09 | 8 | 8 | 10 | 10 | 09 | 5 | 85 | 30.55 | 6 |
| | | | | 7.9E+0 | 8E+0 | 1.1E+ | 1.1E+ | 2.3E+ | 15.1 | 26. | | 23.9 |
| 7/31/2009 | 551816 | 4862325 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 9 | 68 | 29.44 | 4 |
| | | | | | 7E+0 | 1.4E+ | 1.4E+ | 2.5E+ | 14.2 | 26. | | 22.2 |
| 8/7/2009 | 558114 | 5018572 | 1.8E+09 | 8E+08 | 8 | 10 | 10 | 09 | 9 | 94 | 29.7 | 2 |
| | | | | 8.1E+0 | 7E+0 | 1.7E+ | 1.7E+ | 2.7E+ | 13.1 | 27. | | |
| 8/14/2009 | 559413 | 5097527 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 7 | 08 | 29.06 | 20.6 |
| | | | | 8.1E+0 | 5E+0 | 2.2E+ | 2.2E+ | 2.6E+ | 13.6 | 27. | | |
| 8/21/2009 | 548433 | 5022196 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 1 | 32 | 28.73 | 21.3 |
| | | | | 8.2E+0 | 5E+0 | 1.8E+ | 1.8E+ | 2.3E+ | 13.4 | 27. | | 21.4 |
| 8/28/2009 | 555033 | 5119481 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 6 | 19 | 28.9 | 9 |
| | | | | 8.2E+0 | 4E+0 | 1.9E+ | 1.9E+ | 2.5E+ | 12.4 | | | |
| 9/4/2009 | 556188 | 5209926 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 1 | 27 | 27.12 | 20.1 |
| | | | | 8.4E+0 | 6E+0 | | | 2.5E+ | 12.0 | 26. | | 20.1 |
| 9/11/2009 | 567964 | 5523746 | 1.9E+09 | 8 | 8 | 3E+10 | 3E+10 | 09 | 8 | 82 | 26.87 | 9 |
| | | | | 8.7E+0 | 5E+0 | 2.4E+ | 2.4E+ | 2.5E+ | 11.9 | 26. | | 19.9 |
| 9/18/2009 | 573667 | 5569239 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 1 | 17 | 26.95 | 2 |
| | | | | 8.6E+0 | 3E+0 | 3.5E+ | 3.5E+ | 2.2E+ | 11.4 | 24. | | 19.3 |
| 9/25/2009 | 572341 | 5631492 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 6 | 24 | 24.84 | 4 |
| | | | | 8.4E+0 | 4E+0 | 1.9E+ | 1.9E+ | 1.4E+ | 11.4 | 23. | | |
| 10/2/2009 | 566499 | 5655707 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 5 | 92 | 24.77 | 19.1 |
| | | | | 8.4E+0 | 5E+0 | 2.4E+ | 2.4E+ | 1.9E+ | 11.1 | 23. | | 19.1 |
| 10/9/2009 | 577365 | 5831316 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 3 | 22 | 23.96 | 1 |
| 10/16/200 | | | | 8.4E+0 | 4E+0 | 2.7E+ | 2.7E+ | 1.9E+ | 11.0 | 25. | | |
| 9 | 588374 | 5597140 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 1 | 66 | 23.84 | 18.5 |
| 10/23/200 | | | | 8.4E+0 | 5E+0 | 1.3E+ | 1.3E+ | 1.7E+ | 10.6 | 25. | | 18.3 |
| 9 | 591456 | 5531226 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 3 | 27 | 23.41 | 4 |
| 10/30/200 | | | | 8.1E+0 | 4E+0 | 1.2E+ | 1.2E+ | 1.6E+ | 10.0 | 23. | | 18.1 |
| 9 | 581264 | 5348701 | 1.8E+09 | 8 | 8 | 10 | 10 | 09 | 3 | 94 | 21.47 | 1 |
| | | | | 8.1E+0 | 4E+0 | 1.3E+ | 1.3E+ | 1.3E+ | | 24. | | 18.7 |
| 11/6/2009 | 588764 | 5454062 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 9.86 | 19 | 21.44 | 8 |
| 11/13/200 | | | | 8.1E+0 | 4E+0 | 1.5E+ | 1.5E+ | 1.3E+ | | 24. | | 18.9 |
| 9 | 593032 | 5451315 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 9.73 | 64 | 20.92 | 6 |
| 11/20/200 | | | | 8.3E+0 | 5E+0 | 1.1E+ | 1.1E+ | 1.4E+ | | 23. | | |
| 9 | 629525 | 5426583 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 9.18 | 68 | 20.39 | 17.6 |
| 11/27/200 | | | | 7.8E+0 | 4E+0 | 1.1E+ | 1.1E+ | 1.6E+ | | 23. | | 19.0 |
| 9 | 630490 | 5310363 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 8.53 | 35 | 20.09 | 7 |
| | | | | 8.4E+0 | 5E+0 | 1.4E+ | 1.4E+ | 1.5E+ | | 24. | | 19.4 |
| 12/4/2009 | 628960 | 5474854 | 1.9E+09 | 8 | 8 | 10 | 10 | 09 | 8.26 | 37 | 19.35 | 1 |
| 12/11/200 | | | | 8.5E+0 | 4E+0 | 5.7E+ | 5.7E+ | 1.9E+ | | 24. | | 19.4 |
| 9 | 625392 | 5496968 | 1.9E+09 | 8 | 8 | 09 | 09 | 09 | 7.92 | 07 | 18.9 | 6 |
| 12/18/200 | | | | 8.5E+0 | 3E+0 | 9.7E+ | 9.7E+ | 1.8E+ | | 23. | | 19.2 |
| 9 | 628144 | 5594286 | 1.9E+09 | 8 | 8 | 09 | 09 | 09 | 7.96 | 98 | 19.62 | 8 |
| 12/25/200 | | | | 8.7E+0 | 2E+0 | 7.6E+ | 7.6E+ | 1.5E+ | | 22. | | |
| 9 | 629493 | 5710353 | 1.9E+09 | 8 | 8 | 09 | 09 | 09 | 8.06 | 85 | 19.08 | 18.5 |