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The South East Asia Capital Markets: 1995-2015

Gerardo Alfonso Pérez

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UNIVERSITY OF BARCELONA

DOCTORAL THESIS

**The South East Asia Capital Markets:
1990-2015**

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*A thesis submitted in fulfillment of the requirements
for the degree of PhD ECONOMIC HISTORY*

in the

Departamento de Historia Económica, Instituciones, Política y Economía
Mundial

November 30, 2021

"History does not repeat itself, but it rhymes."

Mark Twain

UNIVERSITY OF BARCELONA

Abstract

Departamento de Historia Económica, Instituciones, Política y Economía Mundial

PhD ECONOMIC HISTORY

The South East Asia Capital Markets: 1990-2015

by G. ALFONSO

The South-East Asia region is an increasingly economically important region due to its large population and development potential. The region has however experienced phases of substantial economic turmoil such as for instance the South-East Asia financial crisis of the 90's. This dissertation analyses the short-term and long-term impacts of the financial crisis from a stock market point of view. This dissertation adds to the existing literature by focusing on the equity market rather than on the foreign exchange market which is the area covered in most of the existing literature. The results shows that the South-East Asia crisis was a rather complex event with quantitatively distinct phases. Granger causality and adjusted volatility analysis were also carried out. In both cases controlling for preexisting relations. The analysis shows that the South-East Asia financial crisis was a rather complex event, perhaps more complex than it is normally assumed, with dynamic interactions among the equity markets of the countries/jurisdictions analyzed. It will be shown that there was no country/jurisdiction that consistently drove the performance of the other countries/jurisdictions in the region. It will be also shown that the importance of some equity markets in the region shifted with for instance the equity market of Thailand becoming less regionally important and other countries, such as South Korea, becoming more important compared to the pre-crisis period.

It was also analyzed the impact of the legal system in the performance of the equity markets in the region. Most of the analyzed countries/jurisdictions analyzed, with the noticeable exception of Thailand, were colonized and the colonizing country tended to impose their own legal system. Three groups of major legal systems were analyzed including the English, French and German legal systems. Typically in the existing literature there is a four group usually called the Scandinavian system. However, this group was not included because Scandinavian countries did not colonize South-East Asia. The results suggest that the type of legal system has a statistically significant impact on equity performance. The results also suggest, but with less statistical robustness, that the English system appears to have an advantage, from an equity market performance point of view, compared to the French and German. The analysis was carried out using classical econometric models, controlling for several drivers of the stock market performance, as well as using a more systematic approach for model factor selection, using a Lasso algorithm. The Lasso regression automatically chooses which drivers to use (from a pool of drivers) for a model. In this way the driver selection is more objective.

Finally, it was proposed an approach to try to detect Black Swan events such as financial crisis. The algorithm automatically selects the parameters of the forecasting algorithm used. For example, the length of the training data and the number of neurons in a neural network but can be extended to other forecasting techniques. This automated approach presents two advantages. First, it avoids the risk of biased model selection. After a financial crisis has happened it is tempting to find a quantitative model that (a posteriori) is able to detect the crisis, such as for instance changing the length of the training dataset until the model fits the data. Second, it is also allows for comparison among techniques that might require different parameter selections, such as the above mentioned length of the training data.

Acknowledgements

I would like to thank my family and my thesis supervisors Prof. M.A. Pons for their encouragement and patient throughout the doctoral journey.

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List of Abbreviations

BBC	B angkok B ank of C ommerce
BHT	T hai B aht (Currency of Thailand)
BRL	B Razilian R eal
BIBFs	B angkok of I nternational L ending F acilities
BOT	B ank of T hailand
GBP	G reat B ritain P ound
IDR	I n D onesian R upiah
IMF	I nternational M onetary F und
QFII	Q ualified F oreign I nstitutional I nvestor
TMOF	T hailand M inistry of F inance
MYR	M ala Y sian R ingit
RMB	R en M in B i (currency of the People's Republic of China)
RQFII	R MB Q ualified F oreign I nstitutional I nvestor
UST	U.S. T reasury D epartment

In loving memory of Manuel Linares

Chapter 1

Brief introduction to emerging markets

1.1 Introduction and motivation

This dissertation focuses on the performance of emerging South East Asian markets during the 1990-2015 period that encompasses the Southeast Financial Crisis years. The dissertation has three main parts. In the first part, I characterize the capital markets in a selected sample of emerging countries (Thailand, Indonesia, Malaysia, the Philippines and South Korea) and I analyze some of the major events during the South East Financial Crisis from a capital markets point of view. In some cases, other countries such as Brazil, China and Japan are also included for comparison purposes. The first part of the dissertation includes chapter 1 and 2.

After characterizing the capital markets of the selected countries, this first part of the dissertation analyses whether the capital markets in emerging markets have been integrated into the global financial markets in order to consider the possible influence of an international financial crisis on them (and viceversa, the international influence of financial crises with roots in these emerging countries). The two main questions I try to resolve are:

1. Can the reactions of the stock markets of South East Asian countries to the South East Asian Financial Crisis be quantitatively measured adjusting for base line effects?
2. Can the contagion effect between countries during the South East Asia Financial Crisis be quantitatively measured (accounting for pre-existing relations between markets)?

One of the assumptions of this dissertation is that certain events can abruptly impact the performance of the stock market. An example of such an event is Thailand letting its currency to free float during the South East Asia financial crisis on July 2, 1997. This is considered by some scholars as the start of the crisis period. Until that moment most South East Asian countries have defended their currencies, many of them pegged to the USD. This is clearly an event of importance during the South East Asia Financial Crisis. The main hypothesis is that some events can have a significant impact on the capital market and these effects can be more complex than the usual assumption that the contagion effect is relatively homogenous and immediate among related countries. In this dissertation, to test the influence of some selected events, we carry out a short-term event driven Granger causality analysis using some of the most important events identified and cited in the existing literature as well as an adjusted volatility analysis.

It was also analyzed the long term impact of the crisis in the equity markets. It will be shown that correlations among equity markets increased after the crisis. However, it should be noted that the correlations were relatively low for the periods both before and after the crisis. There was also a shift on the regional importance of some of the market with some markets, such as Thailand stock market, becoming less regionally important and some other markets, such as the South Korean, becoming more important regionally compared to their pre-crisis levels.

Another factor that it is analyzed in this dissertation is how the characteristics of the capital markets in South East Asian countries during the period analyzed, such as for instance its legal system, can impact the performance of such market. For this reason, in the second part of the dissertation, I analyzed the impact of the legal system in the performance of the capital markets for South East Asian countries, comparing them with some emerging and non-emerging markets. The evolution of the financial markets in emerging markets in South East Asia is influenced, in many cases, by the colonizing western powers that conquered some of those countries, imposing in many cases their legal and administrative systems. The main hypothesis I want to test is that the legal system, which is characterized according to the countries that colonized the different emerging countries of my sample, has an influence on stock market performance. In this dissertation, after characterizing the main feature

of the capital markets for a selected sample of countries, their legal systems will be grouped using (La-Porta et al. 1997) classification into four major groups:

1. English legal system
2. French legal system
3. German legal system
4. Scandinavian legal system

It should be noted that only the first three legal systems were quantitatively used in this dissertation as Scandinavian countries did not have colonies in Asia and therefore did not impose their legal system on any country in Asia. It should be mentioned that not all Asian countries were colonized. For example, Thailand was not formally colonized but it did receive significant influence from the United Kingdom and to much less degree by France. It will be shown that the legal system of these countries had a statistically significant impact on the performance of their equity markets.

In the third and final part of this dissertation an algorithm to try to forecast Black Swan events, such as financial crisis, is presented. Black Swan events are unexpected event (such as the 1997 financial crisis) and consequently, difficult to predict. The algorithm we present can automatically select for some of the parameter of the forecasting technique used, such as for instance neural networks. One of the benefits of this approach is that the analysis is carried out in an objective way. After an event such as a financial crisis occurs it is possible to find a model that in principle could have been able to forecast it through data mining. However, it is clearly more difficult to have models that can predict it before it actually happens. The approached presented here is a relatively objective technique that automatically sets the parameters of the model, such as for instance the length of the training dataset. Another advantage of this approach is that it enables for a comparison among different types of forecasting techniques (it is not restricted to neural networks) which can potentially best perform with different parameters. For instance, different lengths of the training dataset.

This dissertation is based on several hypotheses:

1. Some events can trigger significant movements in the local stock market.
2. The impact on those events can also spread to other markets, particularly regional markets, also impacting the performance of those capital markets.
3. These fluctuations can be short lived, averaged out over long periods of time, but having substantial impact in the short term.
4. Statistical tests such as the Granger Causality test can detect some causality relationships.
5. The capital markets of emerging countries have some characteristics that are intrinsically different from those of developed markets.
6. The legal system of a given emerging country is a factor to take into account when analyzing financial crisis (La-Porta et al., 1997).

There is an extensive literature covering the South East Asia Financial Crisis but it tends to cover it from a foreign exchange point of view while this dissertation focuses more on the impact on the equity market that was also very substantial but has received much less attention. It will be shown later in this dissertation that we have used some innovative approaches, such as neural networks, to analyze carry out the analysis.

1.2 Problem statement

This dissertation attempts to answer the following research questions for South East Asia countries for the period from 1990 to 2015 that included the South East Asia Financial Crisis:

1. What, if any, are the main differences in the evolution of capital markets in emerging and developed economies? Do they follow the same pattern?
2. Can the reactions of the stock markets of South East Asian countries to the South East Asian Financial Crisis be quantitatively measured adjusting for base line effects? Trying to determine the peaks of the financial crisis from a capital markets point of view– Event driven approach

3. Can the contagion effect between countries during the South East Asia Financial Crisis be quantitatively measured (accounting for pre-existing relations between markets)? Achieve a granular understanding of the spread of the contagion among multiple countries – Event driven approach
4. What were the main measures introduced by countries to deal with the South East Asia Financial Crisis? Can we qualitatively assess their impact?
5. Was the type of legal system, which can be divided into four broad categories (English, French, German and Scandinavian), a significant factor in the evolution of the stock market in South East Asian countries?
6. Can the 1997 financial crisis be predicted (treated as a Black Swan Event and analyzed with neural networks)

1.3 Structure of the thesis

This dissertation focuses on the analysis of the capital markets of South East Asia countries in the 1990-2015 period and is divided into several chapters. The first two chapters are mostly descriptive. In Chapter 1 there is an overview of emerging markets with focus on the developments of their capital markets. As previously mentioned the focus is on South East Asian countries but some non-Asian emerging countries were also included for comparative purposes. For many of these countries the development of their capital markets was influenced by the colonizing powers (if any). It will be shown in later chapters that the colonizing power tended to implant their legal system and that the type legal system has a measurable impact on the performance of the stock market for the period analyzed.

Chapter 2 concentrates into the South East Asian Financial crisis, one of the major events during the 1990-2015 period, and identifies and goes in detail into the major events that took place in those years. There are significant differences in the way that South East Asian countries were impacted during the crisis and the type of responses. For instance, while several of the countries involved accepted bailouts from the IMF, such as Thailand and Indonesia, this was not the approach followed by Malaysia that decided to reject the bailout package as the authorities of Malaysia

considered that the conditions attached to this bailout will focus too much on austerity and too little on economic growth. The main focus of Chapter 2 is identifying some of the major developments during the South East Asia Financial Crisis, such as the acceptance of bailout packages by Thailand or the replacement of the finance minister in Malaysia. This list of major events will be used in Chapter 3 for a short-term event analysis of the stock markets of the involved countries.

In Chapter 3 the list of seven major developments identified in Chapter 2 was used to perform short-term event driven analysis of the stock market including Granger causality analysis and volatility analysis. The Granger causality test analysis that is carried out measures the number of stock markets influencing the performance of other stock markets (this was done in a directional and bidirectional way) and adjusting for base line effects, i.e., preexisting causality relationships before the crisis period. A volatility analysis for all of these seven events was also carried out. The first step consisted in calculating the daily standard deviations for all the seven periods analyzed. This volatility by itself is difficult to interpret so it was scaled by dividing it by the average volatility of a reference period before the financial crisis (1996). The resulting number is dimensionless as it represents the ratio between two standard deviations. The larger the number is the more volatile the market was, compared to the base line level, during the event analyzed. The results from both the Granger tests and the adjusted volatility analysis support the hypothesis that there were three distinct phases, from a stock market performance point of view, during the South East Asia Financial Crisis. Initially the crisis was mostly regional in nature mostly impacting emerging markets in South East Asia. Volatility then started to spread to other countries, such as for instance Japan, gradually the stock markets of even developed economies largely unrelated to the crisis such as Australia and Belgium started to experience increases in volatility, albeit clearly of moderate magnitude. This process reached its peak approximately at event 4 that was the announcement by Thailand of the restructuring package. After that initial phase of increasing volatility (from events 1 to 4) volatility started to gradually return more normal historical levels. Volatility then experienced another spike during event 7 that was the replacement of the finance minister in Malaysia. Volatility then after that gradually return to historical levels.

Chapter 4 focuses in the long term impact of the South-East Asian financial crisis on the stock markets. It will be shown, that there was a shift on the importance of the equity markets of some of those countries/jurisdictions in the region. For instance, the stock market of Thailand became less regionally important after the crisis compared to its situation before the crisis. The opposite was true for the equity market of South Korea that became more regionally important. Another conclusion of this chapter was that interdependencies among equity markets did increase in the post crisis period.

The aim of Chapter 5 is to classify countries (La-Porta et al., 1997) according to their legal origin (English, French and German) in order to determine whether the type of legal system is a significant factor in the explanation of stock market performance by controlling for other variables. Although we are primarily interested in the analysis of South East Asian countries, we have tried to test the robustness of our results by starting with the analysis of a broad sample of 24 countries that include a mix of developed and developing countries for the period 1997-2018, and then, by replicating the analysis for 12 emerging countries and finally, for only South East Asian countries (emerging). As there are many models describing the stock market performance and it is very difficult to select the "right model", we first have estimated eight different models of stock market performances. Secondly, given that there is no model that fully capture the dynamics of all the markets analyzed we, we have used Lasso regression that take all the independent variables collected and select a subset of those.

The results seem to indicate that there is a statistically significant advantage, regarding stock market performance, for countries following a legal system based on the English legal system compared to the French or German systems, which is consistent with the analysis obtained by (La-Porta et al., 1997). The Scandinavian system that is the fourth type of major legal system according to (La-Porta et al., 1997) was not included in the analysis as there are no emerging markets or Asian countries following such type of system.

In Chapter 6 an algorithm for the detection of Black Swan events, such as financial crisis, is presented. This algorithm automatically selects the parameter of forecasting models such as for instance the length of the training data in a neural

network. The proposed approach have some advantages. For instance, it is an objective approach that it is calibrated with the parameters decided a priori (without using the testing dataset that corresponds to the actually downturn in the stock market). It also allows for fair comparison between different forecasting techniques that require different parameters to work efficiently, such as different training dataset length.

Finally, in chapter 7 the main conclusions of this dissertation are presented.

1.4 Choice of countries

The countries analyzed in this dissertation include some of the countries more significantly affected by the South East Asia financial crisis such as Thailand, Indonesia, Malaysia the Philippines and South Korea. South Korea is not a South East Asia country but was significantly involved and affected by the South East financial crisis. Brazil is also included for comparison purposes as one of frequently used emerging market examples that was however relatively unaffected by the South East Asia crisis likely because of its geographical distance and relatively small trade with South East Asian countries. The two largest economies in Asia, China and Japan, had to be included for completeness purposes. China was relatively unaffected by the South East Financial crisis. Some authors believe that the rapid economic expansion experienced by the Chinese economy after the South East financial crisis slowed the economy recovery in South East Asia as foreign capital flooded into China. Japan was a significant participant in the events leading to the financial crisis with Japanese capital inflows and outflows into South East Asia playing a significant role in the crisis.

1.5 Origins of major emerging market stock exchanges

The first stock exchanges were created by developed European economies several centuries ago. The oldest stock exchange is the Amsterdam Stock Exchange, created in 1602 by the Dutch Republic. In contrast, Asia had to wait almost three centuries until the Bombay Stock Exchange was created in India under British colonial rule

TABLE 1.1: Legal systems (source: (La-Porta et al., 1997), World Bank)

Country	Legal system
United States	English
Malaysia	English
Singapore	English
Thailand	English
Brazil	French
Indonesia	French
Philippines	French
South Korea	German

(Raj and Hariom, 2009). The emerging market classification accounts for several very distinct countries with very different economies and legal systems. Several emerging market were under colonial rule and after independence adopted, in many cases, a legal system similar to the ones used by the colonial powers. For example, the legal system used in Brazil (Common Law) has many similarities with the legal system in Portugal and the legal system in Malaysia is based on the legal system of the United Kingdom with strong influences from religious law and Hindu law (Raisch and Johnson, 2006). Some authors have mentioned that the strong influence of the UK legal system continues until today with “Malaysian law schools and the professional training of lawyers are modeled on the English system” (Mohamed and Keng, 2012). While both Malaysia and Brazil are considered emerging markets their legal systems and economies are rather different.

(La-Porta et al., 1997) did a systematic analysis of legal system and their influence in the capital market (table 1.1). La-Porta et al. (1997) divided legal system into four major groups, the English, German, French and Scandinavian with many other countries following into one of these four categories. Many emerging countries were colonized and adopted the legal system of the colonizing power. Thailand is a special case as it was never formally colonized but it was however influenced by France and the United Kingdom. According to (La-Porta et al., 1997) Thailand falls in the English group from a legal system point of view. Furthermore, (La-Porta et al., 1997) argued that the legal system of a country has a significant impact in the development of its capital market with the English legal system giving more protection to shareholders and being one of the reasons why the equity markets in the United States

and the United Kingdom are so large. Then other three legal systems were less suitable for the development of large capital markets with the French system, always according to (La-Porta et al., 1997) being the worst on this regard. Each country was analyzed independently to ensure a reasonable legal system classification as well as to confirm consistency with the classification introduced by La-Porta et al., 1997. This analysis is shown in the following sections of this chapter.

The history of emerging market stock exchanges is much shorter than the history of stock exchanges in developed economies such as the UK or the US. For instance, during the 1930s Great Depression in the US very few emerging markets had a stock exchange operating in the modern sense. For example the Shanghai Stock Exchange only opened in the 90s. It is hence not feasible to use the Great Depression for a comparison between stock crashes in developed and developing economies. It is important to understand the origin of the stock markets in the analyzed countries as their background is very different from developed markets. In the next paragraph a brief introduction of the history of the Shanghai, Indonesia, Sao Paulo and Thailand stock exchanges is shown.

In order to better understand the legal origin in the Asian emerging countries in the next pages we briefly summarize the history of the stock markets and its legal influences to better justify their legal classification. For example, Thailand is a special case as it was never formally colonized but it was however influenced by France and the United Kingdom. According to La-Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) Thailand falls in the English group from a legal system point of view but in this section we will better explain why this country has been included as English influenced.

1.5.1 Thailand Stock Exchange

Thailand was never colonized by western powers as it were most of its neighbor countries such as Indonesia or Malaysia. Hence the development of its capital market was different from those neighboring countries that were heavily influenced by their colonizing powers. In fact, it is considered that Thailand laws are based on civil law but with common law influences that characterize the uniqueness of the Thai legal system, with characteristics from numerous Western countries including

France, Germany, Switzerland, England, Italy, Japan and India (Jayaphorn, 2006). Darling (1970) consider that the trade treaties during the 1850s with the US affected the Thai law and paradoxically, when the Thai tried to free themselves from treaty restrictions imposed by the West, they had to adopt Western legal concepts and institutions. In fact, they employed many British advisors to assist in the modernization of the government and the Thai legal system. For this reason, as Table 1 indicates, empirical works include the Thai legal system in the category of English.

The first attempt to create a stock exchange happened in 1962. This was interestingly a private enterprise created by a group of business without apparent support from the state (SET, 2018) and was in the form of a limited liability company that was renamed as The Bangkok Stock Exchange Co. in 1963. This initial stock exchange was not a successful story (SET, 2018) with low and declining trading volumes. Trading turnover declined in 1969 approximately 28.7 percent compared to the 160 million Thai Baht volume in the previous year (SET, 2018) with the exchange closing finally in 1973. According to (SET, 2018) this poor performance was mostly due to the lack of awareness regarding the stock market in the Thai population during that period as well as not being backed by the government, which might have caused some distrust among the general public for the newly created exchange.

The Thai authorities, as part of their second national development plan (NESDC, 2018), decided to create the Stock Exchange of Thailand which was made a reality in 1974. Similarly to many other Asian countries the Thailand Stock Exchange was badly affected by the South East Asia crisis in the 90s. Similarly to other South East Asia countries the Thailand Stock Exchanges had to cope with substantial level of political instability (Khositkulporn, 2013). As Nimkhunthod (2007) remarks, since 1975 there were 7 coup d'états, 11 dissolutions, 12 elections and 2 riots and he empirically shows that these political events reduced the investor's confidence over the market and had an impact on the Thai stock market. Political unrest continues to have an effect on the Thai economy and stock market today. Some authors, such as (Radelet, 2013), have indicated that the decline in the performance of the Thailand stock exchange in the month previous to the South East Asia crisis was one of the very few indicators of the impending crisis.

1.5.2 Indonesian Stock Exchange

Indonesia, from 1800 to the end of World War II was a colony of the Netherlands (with a French legal system) but the Dutch presence in the region started roughly two centuries before. Indonesia unilaterally proclaimed independence in 1945, and it was then recognized by the Netherlands in 1949. During the colonial times Indonesia had a functioning stock exchange in Batavia (ISE, 2018) however it focused mainly on trading shares of the Dutch East India Company. The Jakarta stock exchange was opened in 1912. Two other stock exchanges were also created in Semarang and Surabaya but they were short lived with both being closed in 1939 (ISE 2018). Indonesia unilaterally proclaimed independence in 1945. Indonesia's independence was then recognized by the Netherlands four years later in 1949. During the colonial times Indonesia had a functioning stock exchange in Batavia (ISE, 2018) however it focus mainly on trading shares of the Dutch East India Company (VOC) and it did not operate for long as it opened in 1912 and then was closed two years later in 1914 as a consequence of World War I. Trading resumed several years later, in 1925, but was once again interrupted, in this case by the onset of World War II. Two other stock exchanges were created during this period but they were short lived with both being closed in 1939 (ISE, 2018). The Jakarta Stock Exchange reopened in 1952, after the independence from the Netherlands with in reality only Indonesian government bonds trading (ISE, 2018). There was substantial turmoil during this period in the country, with even a coup in 1965 against president Sukarno, making difficult having an operating stock exchange. This instability, including a period of hyperinflation (McLeod, 2018) was used by general Suharto to seize power in 1966.

This environment caused a period of inactivity in the stock market from 1956 to 1977. The Jakarta Stock Exchange reopened in 1977 in its modern form. The Jakarta Stock Exchange merged in 2007 with a minor another minor stock exchanges, the Subaraya Stock Exchange to form the current Indonesian Stock Exchange. The Subaraya Stock Exchange was created in 1989 (ISE, 2018).

It has been noted by some authors that the US credit crunch had a bigger proportionate impact on the Indonesian stock exchange than in the US stock market (Adi, 2010). The reduction in regulation, in an attempt to have a less red tape, over the last

two decades in the Indonesian market was highlighted in (Erik and Ragnar, 2015).

1.5.3 Malaysia Stock Exchange (Bursa)

A formal stock market in what it is modern Malaysia can be tracked back to the British colonial era (1930) in the form of the Singapore Stockbrokers Association (KLSS, 2001). At this point in time Malaysia did not just yet exist as an independent country and was actually formed by three different areas the Affiliated Malay States, the Unaffiliated Malay States and the Strait Settlements. The Straits Settlements were created by the United Kingdom in 1826 the United Kingdom by grouping together of Malacca, Penang and Dindings (Matheson, 2003) and were under direct British control. In 1937 the Singapore Stock Brokers Association is renamed the Malayan Stockbrokers Association. Following World War II the United Kingdom decided to group all the Malay areas under the short lived Malayan Union (1946), excluding Singapore. Instead Singapore was officially renamed as the Colony of Singapore that lasted from 1945 to 1963. It was during this period (1960) that the Malayan Stock Exchange was formed.

The Malayan Union formally ended in 1948 and was followed by the Federation of Malaya. The Federation of Malaya gained formal independence from the United Kingdom in 1957 (National-Archive, 1957). In the same year a central bank was created (Bank Negara Malaya). In 1963 the Federation of Malay reunited with Singapore as well as with North Borneo and Sarawak to create Malaysia. In 1964 the Malayan Stock Exchange was renamed as the Stock Exchange of Malaysia. Singapore did however opted to become an independent country, unassociated with Malaysia, and did so in 1965. The reasons for the end of the Federation of Malay and the secession of Singapore continued to be disputed. According to (Schenk, 1957) Singapore wanted to ensure its future economic prosperity while Malaysia was concerned about too many resources being allocated to Singapore, and taken away from other parts of the Federation of Malay, given the economic preponderance of Singapore. Another possible reason, mentioned by (Schenk, 1957) were ethnic divisions as the population of Singapore as predominantly of Chinese background while the predominant ethnic group in Malaysia was the Malay. Nevertheless the two countries

continued sharing the same stock exchanges for several years. To reflect the political changes the Stock Exchange of Malaysia was renamed as the Stock Exchange of Malaysia and Singapore. This agreement ended with the dissolution of the monetary interchangeability in 1973. The Stock Exchange of Malaysia and Singapore split this year into the Kuala Lumpur Stock Exchange and the Stock Exchange of Singapore.

The currency was a long standing issue between Malaysia and Singapore. Since 1899 they had shared the same currency (Schenk, 1957) with the currency managed by a currency board. The central bank (Bank Negara Malaya) after the independence had relatively little control of the currency (Schenk, 1957). This lasted until 1966 when the currency board was dissolved and currency oversight came under the central bank. Political tensions and trade considerations lead to Malaysia in 1973 to unilaterally declare an end to the currency interchangeability between the two states.

After the end of the interchangeability of the currency and the creation of two separates stock exchanges their stock market started evolving independently with each stock exchange catering for the needs of the companies that operated in their country. In 2004 the Kuala Lumpur Stock Exchange was renamed as Bursa Malaysia.

The Malaysia stock exchange is one of the most accommodating for foreign investors compared to the other South East Asia nations as it tried to replicate, at least to certain degree, the London model of an international financial center opened to foreigners. Some authors such as (Ong and Yichen, 2010) have pointed out the different dynamics of the Malaysian stock market noticing for instance that periods of high PE multiples have not translated into lower stock growth appreciation (as traditional value investing would have assume).

1.5.4 The Philippines Stock Exchange

The Philippines was colonized by Spain, the United States and briefly by Japan during World War II, with these countries leaving a mark in its culture, economy and institutions. The Philippines was part of Spain until Treaty of Paris in 1898, which concluded the American-Spanish War, and in which Spain reluctantly cedes the Philippines to the United States (Cullinane, 2012). The Spanish roots of Philippines law explain its French origin. According to Kern (2012), the American presence in the

Philippines was supposed to be brief with the return of the Philippines resistance leader, Mr. Emilio Aguinaldo, from exile in Hong Kong in 1898 and the creation of the short-lived Philippines Republic on June 1898. However, the location of the Philippines was perceived as strategic as a trade outpost for Asia, particularly with China. These lead to the McKinley US administration deciding to install long term American control over the Philippines. In 1902, the US appointed General Luke Wright as the first governor of the Philippines (Bingham, Conroy, and Iklé, 1974) who, after some fighting, was replaced by a civilian in 1906, Mr. Henry Clay and six month later by Mr. James Smith. This started a period of relatively calm with only two changes of governor in the following 15 years. As a consequence, despite its French origin, the legal system of the Philippine is a mixture of French (civil law) and Anglo-American (common law). The first stock exchange was created in 1927 (the Manila Stock Exchange). The stock exchange was a private initiative created by American and British businessman. The Manila Stock Exchange operated, albeit with only a few listed stocks, basically uninterrupted until the Japanese invasion of the Philippines in 1942. The Japanese invasion of the Philippines brought substantial economic turbulence with the Manila Stock Exchange closing and some areas dominated by the resistance issuing unofficial currency (Shafer, 1974). October 1944 is typically regarded as the date of the end of the Japanese invasion of the Philippines (Satoshi, 2008) and in 1946 the Manila Stock Exchange resumed operations with only 14 companies listed reflecting only five sectors: banks, insurance, sugar, commercial and mining (Crisostomo, 2013). In 1963, another stock exchange was created in the Philippines: the Makati Stock Exchange. The overlap between these two stock exchanges was rather substantial since 16 out of the 18 companies listed on the Makati Stock Exchange in 1963 were also listed in the Manila Stock Exchange. This redundant system continued for several years until 1992 when both exchanges were merged into one called The Philippine Stock Exchange.

1.5.5 Korea Exchange

The Korea Stock exchange was established in 1953, after the Korean War. Although its legal system dates from the introduction of the original Constitution of the Republic of Korea and the organization of South Korea as an independent state, the

legal system is based on civil law and has Germanic origins as a consequence of the Japanese domination between 1910 and 1945 (Beck and Levine, 2005). Japan imposed their own legal order, built after the Meiji reforms in accord with the German model. Until 1987 Korea had two stock markets: one regulated stock market (the Korea Stock Exchange) and one unregulated (the Over-the-Counter market) (Shin, 2005). However, while the Korea Stock market grew significantly since the 1970s economic take-off, the unregulated market remained negligible. It was from 1987 when the government tried to stimulate the unregulated market creating and “organized” unregulated market that re-launched again in 1997, after its severe currency crisis (when the won depreciated over 100 per cent against the US dollar). From this moment the stock market grew rapidly and, for example, in 2020 was one of the world’s best performing (Financial Times December 1, 2020).

Similarly to the trend of other Asian countries, there was a wave of consolidation of the exchanges in Korea. In 2005 the Korean Stock Exchange merged with the Korean Futures Exchange. This type of merger between the stock exchange and the futures exchange was very become as a large part of the infrastructure to run those platforms is similar and there are clear synergies. Other stock related platforms such as the electronic market platform were also consolidated under a unique exchange creating the modern Korea Exchange. Some authors such as (Thompson, 1987) has highlighted the importance of the stock exchange as a driver of the internationalization of the Korean economy.

1.5.6 Singapore Exchange

As previously mentioned, the case of Singapore and Malaysia are closely related with the Singapore Stock Broker Association dating back to 1930. At that time the association covered both modern Malaysia and Singapore as Singapore had not achieved independence yet. The Malayan Stock exchange was only formed 30 years later in 1960. As discussed in the Malaysian section in the twenty century Malaysia and Singapore experienced several changes to their political organization. First, there were several reorganizations while they were part of the United Kingdom and then they achieved independence, then reunited as a single country to finally in 1965 (Turnbull, 2009) split once more becoming modern day Singapore and Malaysia.

(Schenk, 1957) mentioned that there were many reasons behind the final secession of Singapore from Malaysia with concerns about economic prosperity from the Singaporean side as well as concerns about resource allocation from the Malaysian side been among the major reasons for the split.

The close economic and capital market interactions between the two countries continued in the following years with the currency interchangeability only ending in 1973 which lead to the countries having to separate stock exchanges. In this way the modern form of a stock exchange started operations in Singapore 1973 (Sim and Maysami, 2000). The Stock Exchange of Malaysia and Singapore split this year into the Kuala Lumpur Stock Exchange and the Stock Exchange of Singapore. The exchange has continued to evolve over the years with one of the biggest changes happening in 1999 when the Singapore Exchange (SGX) was created as a merger (Akhtar et al., 2002) of the Stock Exchange of Singapore (SES) and the International Monetary Exchange Limited (SIMEX). The SIMEX scope was mostly limited to futures trading with the merger representing a consolidation of the trading avenues of different financial instruments.

1.5.7 Shanghai Stock Exchange

The Shanghai Stock exchange is the oldest stock exchange in China. There were forms of stock trading in Shanghai since 1866 (Fan, 2010), Qing dynasty period, with according to (Thomas, 2001) 13 companies listed at that point. The Shanghai Share-brokers Association was formed in 1891 (Thomas, 2001). This could be considered the first modern stock exchange in Shanghai and was composed mostly of foreign investors based in Shanghai (Lenon, 2015). During that period there was a significant foreign presence in Shanghai due to the concession obtained in the Treaty of Nanking in 1842 by the United Kingdom, which enable the presence of British subjects in Shanghai. This was the result of the end of the First Opium War (1840-1842) and a debilitated Qing dynasty. The First Opium War has been heavily criticized by some scholars such as J.K. Fairbank that called it “the most long-continued and systematic international crime of modern times” (Cassan, 1998; Fairbank, 1992; Newsinger, 1997). The motivation behind the First Opium War continued to be disputed in the academic literature with three frequently mentioned reasons (Cassan, 1998). The fist

one, and perhaps the most common is that this war was necessary from the British point of view as a way of ensuring British Merchants farther access to trade in Asia and in China in particular. A second reason frequently mentioned (Cassan, 1998) is that the war was the United Kingdom perceived the seizure of large amounts of opium by the Qing dynasty as an offence to Britain and reacted by declaring War. These seizures of large amount of opium were an attempt by the Qing dynasty to stop, or at least reduce, the clearly negative effects that opium was having in the country. The third reason (Cassan, 1998) was the influence that some opium merchants had in the British government at that time. Regardless of the reason for the war it clearly had significant repercussions in many different areas.

During the following decades the country experienced the decline of the Qing dynasty which finally collapsed in 1912 with the abdication of the last Chinese emperor Aisin Gioro Puyi (Puyi). This was followed by a temporary government headed by Mr. Sun Wen creating the Republic of China. In October 1913 an election appointed as president Mr. Yuan Shi Kai. During this period there still trading activity in Shanghai. Mr. Yuan Shi Kai decision to proclaim himself as a new emperor made his position more difficult (Khan, 2015) at it was not widespread accepted. Mr. Yuan Shi Kai died in 1916

After the end of World War II the Shanghai Stock Exchange reopened briefly for a few years until 1949. Military confrontations between the Kuomintang and Communist parties resumed by the end of World War II. Both parties have agreed to cease hostilities, albeit there were occasional altercations, as a response to the Japanese invasion of China. With the defeat of Japan that was the common enemy of both parties the ceasefire between both sides ended. The communist side was victorious and the People's Republic of China was formed in 1949. It was not until the opening up reform of Mr. Deng Xiao Ping that the Shanghai Stock Exchange resumed operations.

1.5.8 Hong Kong Stock Exchange

The Stockbrokers' Association of Hong Kong dates back to 1891 when Hong Kong was a British colony as a result of the outcome of the First opium War and the subsequent Nanking treaty in 1842. Subsequently Britain lost control of Hong Kong to

the Empire of Japan until its defeat in World War II in 1945. In the decades following World War II some new stock exchanges appeared in Hong Kong such as the Far East Exchange and later the Kowloon Stock Exchange (HEKX, 2021). Hong Kong returned to Chinese control in 1997 and its capital market, including its stock exchange has gradually started integrating in the Chinese capital market. To date the listing (IPO) system in the Hong Kong Stock Exchange as well as the access of international investors to the market remains rather different compared to its mainland China counterparts. The stock of listed companies in Hong Kong are usually called H-shares Meng, 2011. International investors face very few restrictions. Stocks listed on the mainland China stock markets are typically called A-shares. Foreign investors were not allowed to invest in these stocks until the introduction in 2003 of a special program called Qualified International Institutional Investors (QFII) program that allowed international institutional investors access to the market. The program has expanded over the years and new follow up programs have appeared such as the RMB Qualified International Institutional Investors (RQFII).

The integration of the Hong Kong Stock Exchange with the capital markets of mainland China has increased in recent years with the introduction of programs such as the Shanghai-Hong Kong Connect program and the Shenzhen-Hong Kong Connect program that enables some degree of mutual access i.e., Hong Kong investors can invest in A-shares listed in the mainland and mainland investors can invest in H-shares listed in Hong Kong. It should be noted that not all stocks listed on the exchanges are accessible through this programs.

Similarly to the case of Singapore, Hong Kong has consolidated its financial market infrastructure with a merger in 1999 of the Stock Exchange of Hong Kong Limited (SEHK) and the Hong Kong Futures Exchange Limited (HKFE), which was the platform for futures trading (HEKX, 2021). The clearing house was also incorporated in the new legal entity. The merger resulted in the modern Hong Kong Exchanges and Clearing Limited (HKEX).

1.5.9 Pakistan Stock Exchange

Pakistan has a relatively modern stock exchange since the creation of the Karachi Stock exchange in 1947 Clark, Masood, and Tunaru, 2008. There are other two,

but smaller exchanges in Pakistan the Lahore Stock Exchange, created in 1969 and the much more recent Islamabad Stock Exchange, created in 1989. The Karachi Stock Exchange was later renamed Pakistan Stock Exchange Limited (PSX). Pakistan achieved independence from Britain in 1947 so for its entire modern history has had a functioning stock market. For almost one decade after independence the country was a kingdom rather than a republic and had elections for the first time in 1970. The country has also experienced some military coups, such as for instance in 1977. This political instability has affected the performance of the Pakistani stock market Clark, Masood, and Tunaru, 2008.

The three stock exchanges in Pakistan operate basically in an independent manner without major shared operations. The evolution of the stock exchanges in Pakistan is different from other Asian countries such as Singapore or Hong Kong in which there has been a tendency to consolidate different exchanges over the years. This has not been the case in Pakistan with the Stock exchanges continue to operate in a very fragmented way.

1.5.10 Brasil Bolsa Balcão (Brazil)

Among emerging market countries Brazil has had a large stock market (figure ??) being for periods larger than many of its peers (Clemente, 2012; Smith, 2003). This was in part due to the financial reforms done in the 60th (Wagner, 1999) However, a prolonged period of high inflation followed by hyperinflation had a substantial negative impact on the market (Lameira, 2004; Wagner, 1999).

The hyperinflation period (Garcia, 2014) lasted in Brazil roughly from January 1983 to June 1994 with an average monthly inflation of approximately 20 percent and was preceded by a period of high inflation roughly starting in 1980. This was a much longer hyperinflation period that experienced by other countries than tend to last for about a year (Garcia, 2014). For instance, (Garcia, 2014) compared it to the hyperinflation periods in Germany, from August 1922 to November 1923, and also with the case of Hungary, from August 1945 to July 1946. This long period of hyperinflation was according to the author largely related to indexation that made living with high inflation rates more tolerable for the population. During the crisis period of 1998 and 1999 trading volumes did decline, down 28 percent and 40

percent respectively.

An interesting peculiarity of the Brazilian case is that (Garcia, 2014) since the early twenty century Brazilian banks are forbidden from providing foreign currency account services to clients. There are only very few exception related to infrastructure projects (Wagner, 1999). Because of this restriction the derivatives market in Brazil is the largest in Latin America as all the transaction that would have been done otherwise in the spot market need to be done in the derivatives market. Spot market, sometimes called cash market, is the traditional market for trading stocks, bond and foreign exchanges in the sense that the transaction is done immediately, without needing to use more complex financial instruments. An example of this could be buying a stock or exchanging money into a foreign currency. Derivatives in this context are financial instruments, such as for instance futures, which value is derived, hence the name, from traditional investment instruments such as stocks, bonds as well as foreign exchange. For instance, a futures contract on a stock is a contract to buy such stock at a future, predetermined, date at a set price. This can be done not only with stocks but also with currencies. Futures trading happen is a formal trading venue (exchange) that in Brazilian case was the Brazilian Mercantile and Futures Exchange (BMF). In 2008 the BMF merged with the Sao Paulo Stock Exchange creating the Brasil Bolsa Balcão (B3).

1.6 Characteristics of emerging markets

After describing the origin of the stock exchanges in the previous section, which is also useful in order to understand their legal origins, in this section we cover some of the characteristics of these markets. These characteristics do not pretend to be an all inclusive list but just a starting point that will be expanded at later stages. These characteristics include: economic size, economic growth, currency regime and credit ratings. Given that the South East Asia Financial Crisis occurred in countries with very different economies and financial markets it seemed reasonable to choose a broad range of variables in order to facilitate comparisons among those markets.

It is important to understand that there are very substantial differences between the economies and the stock market of the analyzed countries.

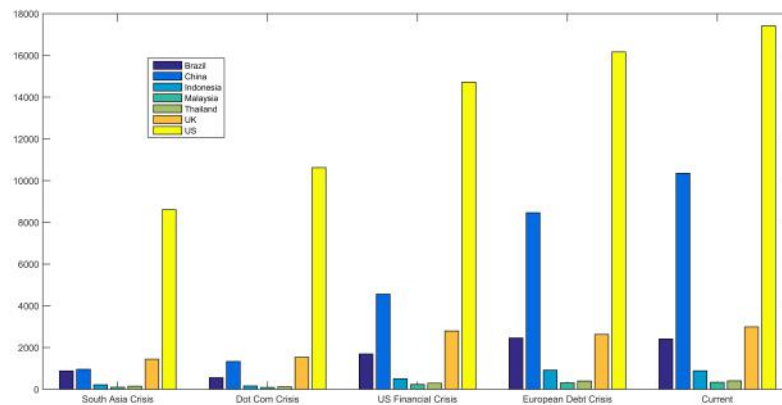


FIGURE 1.1: GDP in USD billions

1.6.1 Size and economic growth

For instance, the economy of China (GDP) during the European credit crisis was roughly 27 times the size of the Malaysian economy. The size of the analyzed economies during the period of the four crisis analyzed can be found in the figure 1.1. From figure 1.1 it is evident that there are very substantial different in size.

One of commonly assumed features of emerging markets is that they have high economic growth rate however the GDP growth rates of those economies as well as their overall business models are also very different (see figure 1.2). For instance, The Chinese economy has managed to sustain a growth rate for a prolonged period of time much higher than the one achieved by another emerging market such as Brazil.

The largest economy of the countries analyzed in this dissertation is, by far, that of China with a nominal GDP in 2018 according to the International monetary fund of 13.5 Trillion USD (1.2). This is more than double the size of Japan that was 5.1 Trillion USD. All the other countries analyzed in this dissertation have much smaller economies with Brazil and South Korea coming in third and fourth with a GDP in 2018 of approximately 1.9 and 1.7 Trillion USD respectively. Indonesia is in fourth place with approximately 1 Trillion USD. The other three countries analyzed have comparable economies and are in order of larger to smaller as follows: Thailand (390 billion), Malaysia (347 billion) and the Philippines (332 billion). In other words, the economies of all these seven countries together (including Japan), account for

TABLE 1.2: GDP ranking in 2018. Source: IMF

Country	GDP (USD Trillions) 2018
China	13.5
Japan	5.1
Brazil	1.9
Indonesia	1.7
Thailand	0.4
Malaysia	0.3
Philippines	0.3

approximately 79.8 percent of the Chinese economy. The emerging Asian countries analyzed (South Korea, Indonesia, Thailand, Malaysia and the Philippines) have an overall economy equivalent, in GDP terms, for approximately 27.9 percent of the Chinese economy.

In figure 1.2 it can be seen that China since the late 80th has maintained higher economic growth rates than the other countries analyzed. Indonesia had the most severe contraction during the South East Asia Financial crisis while Thailand and Malaysia experienced comparable corrections. However, during the period of the US debt crisis, Indonesia managed to keep higher GDP growth rates than its emerging markets peers. During the US debt crisis China did a massive fiscal stimulus plan (Burdekin, Barth, and Song, 2012; Lardy, 2010; Fardoust, Li, and Luo, 2012) that allowed its economy to maintain high growth rates.

1.6.2 Currency and exchange rate regime

Another important aspect are currencies. Currencies have played a substantial role in the financial crisis in emerging markets. There are significant differences, from a currency angle, between emerging market economies and the developed economies. Some of the main characteristics of those currencies can be seen in table 1.3. Most western developed economies have adopted a free float currency policy. In developing countries, that is not necessarily the case with some of those countries using pegs to the US dollar, which has been blamed as one of the factors in the South East Asia crisis or have interventionist central banks. Some of the interventions of these central banks do seem to have occasionally helped decreasing currency swings

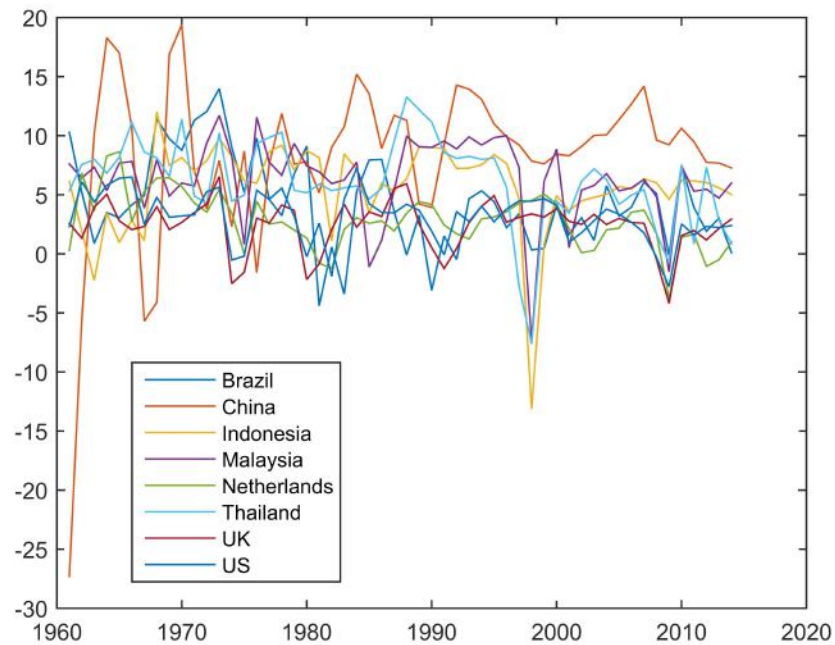


FIGURE 1.2: GDP Growth

TABLE 1.3: Currency details (Source: HSBC, PBOC, SAFE, Central Bank of Malaysia, financial freedom index)

Country	Currency	Freely convertible	Exchange rate regime
China	RMB	Partially convertible	Trading band
Thailand	THB	No	Managed float
Indonesia	IDR	No	Free float
Malaysia	MYR	No	Managed float
UK	GBP	Yes	Free float
Brazil	BRL	Inflation target	Interventionist

1.6.3 Credit rating

Credit rating is one of the most frequently used indicators of the financial condition of companies as well as countries and it seemed reasonable to include it in this analysis. There are three major international credit rating agencies: Standard and Poors, Moody's and Fitch. They rate many different types of debt instruments including sovereign debt. Credit ratings use is wide spread and they are frequently included in contracts. For instance, many asset managers are forbidden to hold securities that are rated below investment grade. The rating is typically composed of two parts, the actual rating and, sometimes, an outlook. The outlook is intended to give investors some guidance about possible future changes in ratings. The outlook is typically either: positive, negative or stable. The rating range, in the case of Standard and Poors is from AAA, which is the safest, to D, which implies that a security is on default. From AAA to BBB is the investment grade range. In the case of Moody's the rating goes from Aaa to C. The investment grade range is from Aaa to Baa. C ratings according to Moody's classification typically implies a default "with little with little prospect for recovery of principal or interest" (Moody's, 2018). Fitch ratings goes from AAA, highest, to D, which is the lowest and implies default. The investment grade according to Fitch's classification goes from AAA to BBB. A comparison of the different ratings of the three major rating agencies can be seen in 1.4.

It is also common for sovereign debt to have two different ratings, one for debt issued in the domestic currency, and another one for debt issued in foreign currency. This is because the risk of a country defaulting in its own currency should be lower than in a foreign currency as it could, in case of a distressed economic situation, print more money (domestic currency) that is an option not available if the debt is denominated in foreign currency. It should be noted that there are clear exceptions of this rule such as for instance countries belonging to a monetary union i.e., The European Union, in which the individual countries cannot issue more currency. The credit rating of a country is related to the financial strength of such country and is calculated by regressing some economic factors (Cantor and Packer, 1996), (Altenkirch, 2005) that are representative of the overall economic situation of the country. These same

TABLE 1.4: Credit ratings from Moody's, Standard and Poors, Fitch.
Source: Moody's, Standard and Poors and Fitch

Moody's	SP	Fitch
Aaa	AAA	AAA
Aa1	AA+	AA+
Aa2	AA	AA
Aa3	AA-	AA-
A1	A+	A+
A2	AL	A
A3	A-	A-
Baa	BBB+	BBB+
Baa	BBB	BBB
Baa	BBB-	BBB-
Ba1	BB+	BB+
Ba2	BB	BB
Ba3	BB-	BB-
B1	B+	B+
B2	B	B
B3	B-	B-
Caa1	CCC+	CCC+
Caa2	CCC	CCC
Caa3	CCC	CCC
Ca	CC	CC
C	C	C
C	D	D

TABLE 1.5: France sovereign credit rating (Moody's). Source: Moody's

Date	Rating
2018 December	Aa2
2015 September	Aa2
2014 September	Aa1
1979 January	Aaa

TABLE 1.6: United Kingdom sovereign credit rating (Moody's). Source: Moody's

Date	Rating
2018 December	Aa2
2013 February	Aa1
1978 March	Aaa

authors suggest that those factors are similar among the different credit rating agencies. They specifically mentioned the similarities between Standard and Poors and Moody's.

According to research from the IMF (Jaramillo and Tejada, 2011), in emerging markets, having an sovereign investment grade rating significantly impact the cost of debt with spreads decreasing by 36 percent. An improvement in rating within the investment grade classification has a much smaller impact while improvements in subinvestment grade classification have no significant impact.

Developed economies tend to have higher credit ratings than emerging markets. For instance, the United States has never (since the time series starts in 1949) had a rating below Aaa according to Moody's classification which is the highest and only one downgrade by Standard and Poors in August 2011, down from AAA (highest rating) to AA+ (second highest rating). Other economically developed countries, such as for instance France (table 1.5), while having downgrades has always remained with very high ratings and always within the investment grade status. The case of the United Kingdom (table 1.6) is similar always remaining well within the investment grade band. An emerging market like Thailand has had multiple downgrades (table 1.7), particularly around the period of the South East Financial Crisis. It should be noted that the credit rating only was changed after the crisis had

TABLE 1.7: Thailand sovereign credit rating (Moody's). Source: Moody's

Date	Rating
2018 December	Baa1
2003 November	Baa1
2000 June	Baa3
1997 December	Ba1
1997 November	Baa3
1997 October	Baa1
1997 April	A3
1989 August	A2

TABLE 1.8: Indonesia sovereign credit rating (Moody's). Source: Moody's

Date	Rating
2018 December	Baa2
2012 January	Baa3
2011 January	Ba1
2009 September	Ba2
2007 October	Ba3
2006 May	B1
2003 September	B2
1998 March	B3
1998 January	B2
1997 December	Ba1
1994 March	Baa3

already started as can be seen in table 1.7 . Thailand lost its investment grade status in December 1997, at the peak of the financial crisis, and did not recovered it until June 2000. The case of Indonesia (table 1.8) is similar with the country losing its investment grade status in December 1997, same as Thailand, but not recovering such status until much later, in January 2012, 12 years after Thailand.

The sovereign credit rating of a country because it affects not only the price at which that country can finance its debt but also because domestic companies, regardless of the strength of the financial position, cannot typically get ratings better than the sovereign debt. This is sometimes called the debt rating ceiling. The idea behind this ceiling is rather clear. A company that operates in a country will be affected by the economic performance of that country. Hence, they are not two independent concepts. Furthermore, in the case of domestic companies with a strong

international performance (making them less dependent on the domestic market) and with a very strong financial position could be the target of a nationalization by the government of that country. This is of particular importance in jurisdictions in which asset ownership laws and/or enforcement are not particularly strong, which could be argued that tends to happen more in developing economies than in developed ones.

The credit rating of a company has a direct impact on the price of its debt, or in other words in its cost of debt, with companies with better credit rating, everything else equal, paying less for its debt than companies with lower ratings. A full list of the historical credit ratings of all the countries covered in this dissertation can be found in the Appendix A .

1.6.4 Comparative size and liquidity

The sizes of the stock markets included in the research project are rather different with the market capitalization of the Chinese stock market being considerably larger than the other emerging countries stock markets (table 1.9). There are also clear differences in liquidity. For instance, if daily trading volume is used as a proxy for liquidity, then the Chinese market is also considerably more liquid than the other markets with the Malaysian market being the less liquid for 2015. The Chinese market appears to be bigger by more than one order of magnitude in both size as well as liquidity. Even the Brazilian case, which is frequently compared to China, the differences in size as well as liquidity are rather large. As it can be appreciated in figure 1.3 Brazil had a relatively large stock market compared to other emerging markets (measured by the number of company listed) during the sixties and early seventies but that strong position started to decline with both Malaysia and Thailand overtaking Brazil in the eighties.

The spike in activity (figure 1.3) for countries with strong exposure to commodities, such as Brazil and Russia, is related to the commodity supercycle (Nissanke and Huellen, 2013; MS, 2013; Eyraus, 2015) experienced by the sector over the last two decades, roughly starting in 2000. This commodity supercycle has been associated with the rapid growth experienced in emerging markets (MS, 2013) that has

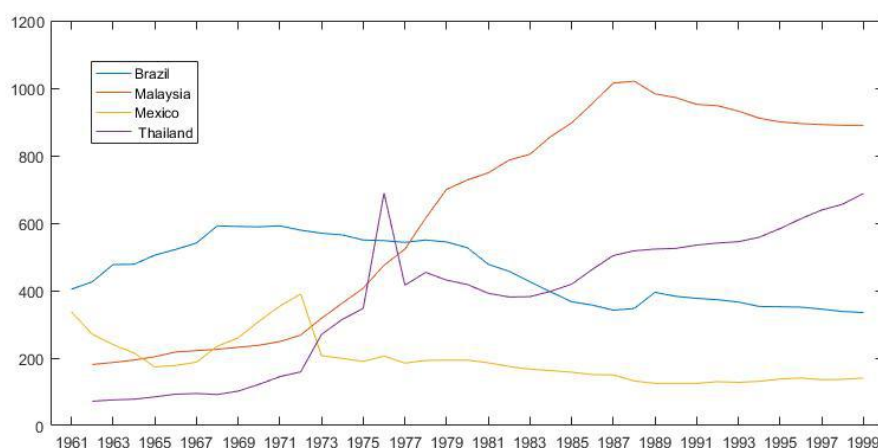


FIGURE 1.3: Number of listed companies. Source: World Bank

TABLE 1.9: Market capitalization and daily volumes (Source: Reuters)

Countries:	China	Brazil	Malaysia	Indonesia	Thailand
Market capitalization (as percent of world - 2015)	9.45	0.92	0.61	0.61	0.60
Daily trading volume (USD billions -2015)	37.62	1.52	0.12	0.43	0.71

increased the demand for raw materials, such as iron ore and coal. More specifically, China (MS, 2013; Derewell, 2016) has been one of the key drivers of this cycle as its economy grew rather quickly and it underwent a process of industrialization. According to (Buyuksahin and Kun Mo, 2016) for the period from 2002 to 2014 the global increase in metal consumption was roughly of the same size as the increase in metal consumption by China alone. (Buyuksahin and Kun Mo, 2016) also mentioned that in the case of oil, for the same period, China accounted for half of the increase in global demand. The following decline in the Russian case is likely due to the impact of the economic sanctions imposed on Russia by the United States as well as the European Union (Havko and Mitsova, 2015).

1.7 Conclusions

In this first chapter we have presented a brief introduction to emerging market focusing on some of the most impacted countries by the South East Asia Financial

Crisis, such as Thailand, Indonesia, Malaysia, The Philippines, as well as other regional jurisdictions such as China, Hong Kong (returned to Chinese control in 1997) and Singapore as well as some emerging countries introduced for comparison purposes such as Pakistan and Brazil. In later chapter the impact of the legal system in the equity market will be analyzed and in order to accomplish this it is important to first analyze the development of their stock exchanges. As illustrated in this chapter the developments of the stock exchanges of these jurisdictions are very different. For instance, during the period analyzed Hong Kong had a stock market completely opened to foreign investors while the stock market of mainland China was basically completely closed to foreign investors.

Chapter 2

The 1997 South East Asia Financial Crisis

In this chapter we carry out a country level analysis of the South East Financial crisis. It will be shown that there are very significant differences on the economies of the South East Asian affected by the financial crisis and that they also followed different approaches to handle the situation, such as for instance decision regarding accepting the bailout of the IMF. One of the objectives of this chapter is to identify significant events that will be used in a later chapter when we carry out an event driven analysis. It is necessary to do an extensive descriptive analysis of the events during the financial crisis in order to have a solid foundation to do an event driven analysis. It is also important when analyzing the South East Asia Financial Crisis to carry out a systematic analysis (per country) of the macroeconomic situation before, during and after the crisis. As an overview, a table (Source: Laeven and Valencia, 2008) showing some of the severity indicators some of the countries more directly involved is shown below (table 2.1).

As it can be seen in the table Thailand was one of the most impacted markets with an output loss as percentage of GDP reaching 97.7% followed by Indonesia with a 67.9%. The output loss, as in (Laeven and Valencia, 2008), is estimated using the trend in real GDP (previous years) and then subtracting the actual real GDP from the trend real GDP. Three years of previous data is considered the minimum for the calculation. Indonesia had also one of the largest gross fiscal cost at 56.8%, compared for instance with Malaysia with only a 16.4%. The gross fiscal cost is calculated by adding the recoveries to the net fiscal cost. While the net fiscal cost is calculated

TABLE 2.1: Crisis severity indicators. Source: Laeven and Valencia, 2008.

Country	Share of NPL at peak (%)	Gross fiscal cost (% of GDP)	Output loss (% of GDP)	Minimum real GDP growth rate (%)
Thailand	33.0	43.8	97.7	-10.5
Indonesia	32.5	56.8	67.9	-13.1
Malaysia	30.0	16.4	50.0	-7.4
Philippines	20.0	13.2	0.0	-0.6
South Korea	35.0	31.2	50.1	-6.9

using the five previous year trend values. The source of all the values in table 2.1 is (Laeven and Valencia, 2008).

In the following section it is presented a macroeconomic analysis of each country in the pre-crisis, crisis and post-crisis periods including the description of some major events that will be used in following chapters. The countries are presented in order of the severity of the impact on the crisis i.e., Thailand first followed by Indonesia and so on. A systematic approach was followed but focusing on the most relevant factors for each country. Some of the factors analyzed included GDP, length of the recovery period, unemployment, good prices and exports.

2.1 Thailand

2.1.1 Pre-crisis

During the years before the South East Asian crisis Thailand had experienced remarkable growth with real GDP above 5 percent since the 80s. The only exception was 1980 when the real GDP growth rate was just under that level coming at 4.6 percent (figure 2.1). Inflation had come down from the very significant 19.7 percent in 1980 to an average of 4.8 percent during the five years before the start of the crisis (1992-96). The unemployment rate in the five year period before the crisis remained relatively constant with an average of 7.2 percent (figure 2.2), slightly above the long run average of 6.9 percent (1980-97). Average current account balance as percentage of GDP for the 1992-96 period was -6.4 percent (figure 2.3). According to figures from the IMF the government debt as percentage of GDP was just before the crisis

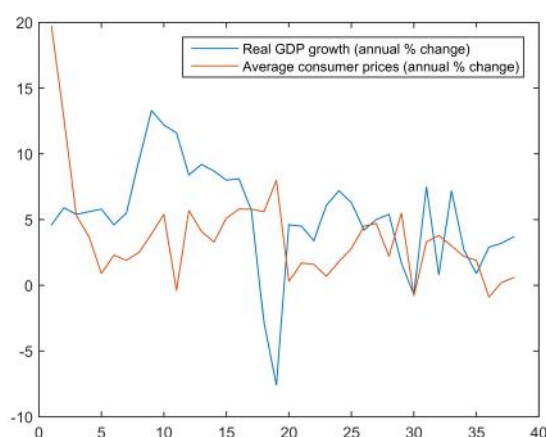


FIGURE 2.1: Thai Real GDP and inflation rate. (Source: IMF)

(1996) only 15.2 percent, jumping to 40.5 percent in the following year.

Thailand since the 70s had introduced financial reforms but accordingly to some scholars such reforms slowed down in the early 80s due to the impact on oil price hikes (Medhi, 1999). (Medhi, 1999) suggests considering three periods of financial plans in the period around the financial crisis. According to this author those three periods are from 1990 to 1992, from 1992 to 1995 and from 1995 to 2000 with only the firsts two plans being successful while the third plan was materially impacted the crisis. During the first two plans several targets were accomplished such as the liberalization of interest rates. This process actually started a few year before the first plan in 1989 (Karel, 2010) culminating in 1992. Before this period Thailand had typically maintained interest rates ceilings (Chanley Christophe, 1998). Interest rate liberalization was a step in the direction of making Bangkok a regional financial center (Karel, 2010) but had unintended consequences due the large differential in interest rates existing between Thailand and other countries.

Large inflows of foreign credit and BIBFs

As part of the drive to make Bangkok a regional financial center Bangkok International Banking Facilities (BIBFs) were introduced in 1993. Through this mechanism financial institutions were allowed to operate offshore (Tarisa, 2000). Domestic Thai banks with a presence overseas as well as foreign banks could both apply for BIBFs

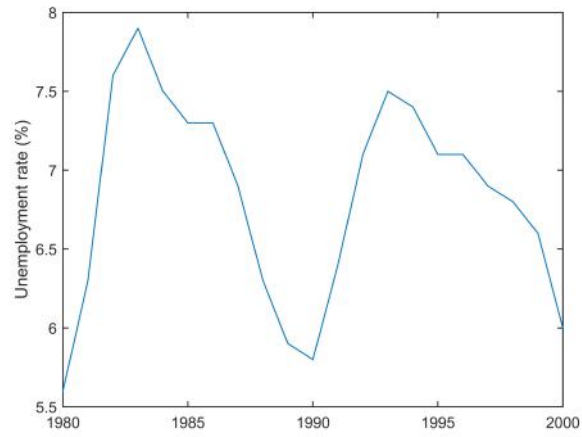


FIGURE 2.2: Unemployment rate. (Source: IMF)

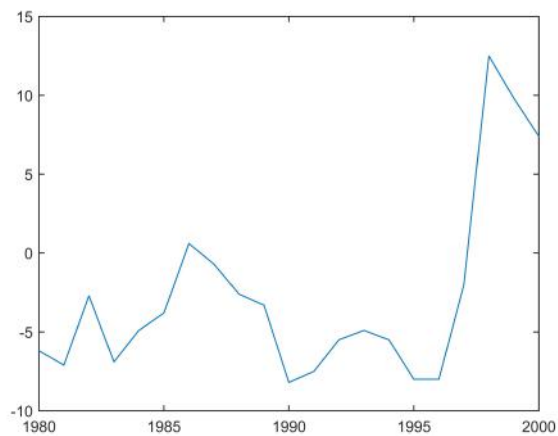


FIGURE 2.3: Current account balance as percent of GDP. (Source: IMF)

license. The major restriction of BIBFs is that they are not allowed to take domestic deposits. BIBFs have two major businesses: 1) lending to foreign entities, in what's commonly called out-out business (BOT, 2001) and 2) lending to domestic institutions (out-in) which was done in foreign currency. BIBFs are subject to a less regulation than onshore banks and have also some financial advantages particularly in the tax front. As previously mentioned the original idea was to make Bangkok as a regional financial center (Tarisa, 2000) so there were high expectations for the out-out side of the business. By the end of 1997 there were 52 BIBFs (UST, 2001). Domestic companies in Thailand at this stage were able to obtain financing through BIBFs as well as through the emission of bonds overseas at lower rates than they could obtain in Thailand (Kenichi, 1998) and as the currency was pegged to the USD there was no great perception of risk (Kenichi, 1998). This sudden inflow of foreign funds in the form of short term credit is mentioned by many scholars (Kenichi, 1998; Tarisa, 2000; Paul, 1998) as one of the reasons behind the financial issues that followed. According to figures from the Bank of Thailand (figure 2.4) BIBFs lending in 1996 accounted for approximately 19.7 percent of the total from an initial value of just 8 percent in 1993. Japanese and Thai institutions were among the biggest BIBFs creditors (see figures 2.4 and 2.5) accounting in 1996 by 39.7 percent and 40.9 percent of the total respectively. It is mentioned in an annual report from the Bank of Thailand (BOT, 1999) that foreign owned BBFs were initially less impacted by the financial crisis as they have borrowed their funds from their parents companies overseas while Thai BIBFs have borrowed from the Thai headquarters or directly from the overseas market with the urgency of repayments when conditions deteriorated increasing. The increase in borrowing coincide with a decline in exports and lower return on investment that are discussed in the next section.

Carry trade

The carry trade is the common term used to describe a financial strategy very popular in the years before the South East financial crisis. Conceptually it is rather easy. Interest rates were relatively high in Thailand. This was a consequence of some of some structural idiosyncratic issues in Thailand as well as the previously mentioned rapid liberalization on interest rates. Rates in other international countries were

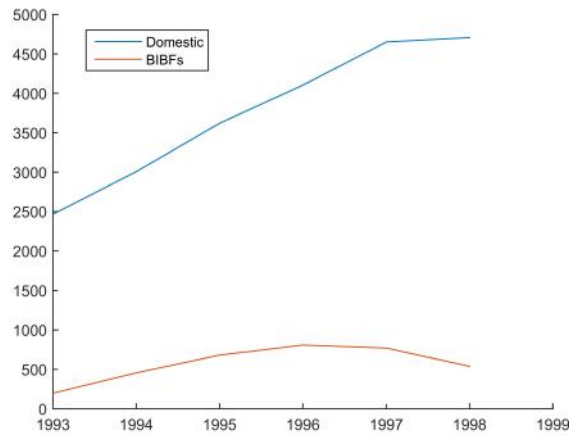


FIGURE 2.4: Lending in Thailand - BIBFs vs. Domestic (Source: Bank of Thailand).

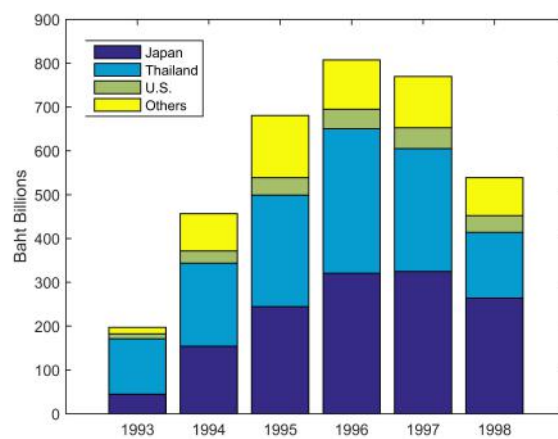


FIGURE 2.5: BIBF lending country (Source: Bank of Thailand).

lower and there was the possibility for domestic companies to access those funds, particularly after the creation of BIBs. It should be mentioned that BIBFs were not the only mechanism to access those funds but it was one that grew very rapidly. The Thai economy, despite some indications of fatigue, had experienced a very long period of growth generating a substantial demand for capital. The peg to the USD, as previously mentioned decreased the foreign exchange risk perception. These conditions were very favorable for the expansion of carry trades that it just basically borrowing overseas on a foreign currency with relative inexpensive interest rates and invest it domestically in an economy with higher rates that in the Thai case was expected by many to continue growing at an elevated rate reducing the default risk. Short term borrowing is typically considered to reduce risk on this type of trades as the tie horizon over which the lender is exposed to foreign exchange risk is smaller than in long term borrowing. Carry trade in this sense should not be interpreted as the usual fixed income meaning for the term i.e., investing in fixed income maturities that are long dated to then selling them after time has passed capturing potential capital gain appreciation in a positive sloped yield curve. The carry trade in this context has no relation with maturities across the yield curve.

Decline in exports and low return on investments

Some authors, such as (Medhi, 1999), have mentioned the decline in exports as an indications of the worsening macro environment in Thailand (figure 2.5) even before the financial crisis. In 1996 exports (measured in USD billions) declined by 1.9 percent after 10 year of double digit growth. This is particularly relevant in the case of Thailand as it has an export driven economy. The decline in exports has been related to multiple factors such as the slowdown in the Japanese economy that experienced a substantial growth in previous decades and that imported large amounts from Thailand (Ippei, 1998) or Thai products becoming less competitive against competitors, principally China (Kuejai, 2008). Some of these explanations, in hindsight, are perhaps not entirely satisfactory when considering the quick rebound in exports experienced in Thailand after the crisis. Despite this, short lived decline in exports, Thailand was attracting substantial inflows of capital.

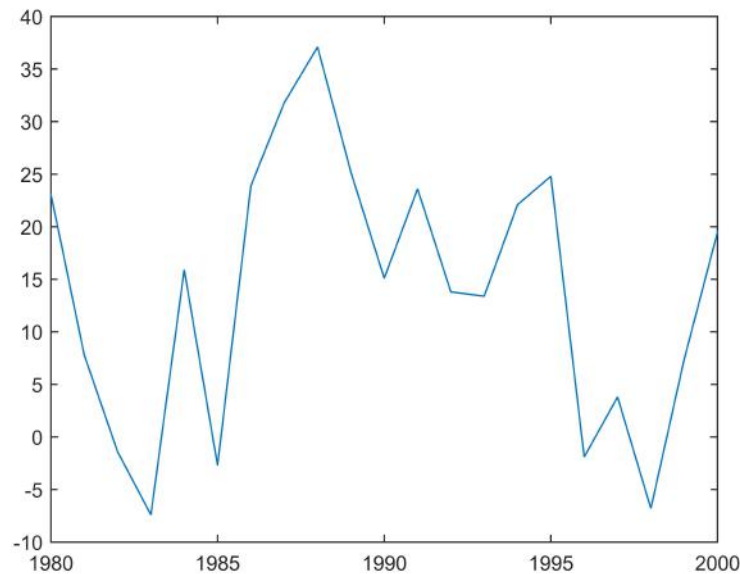


FIGURE 2.6: Exports change in USD billions percentage

Bangkok Bank of Commerce

Several authors, such as (Teena, 1996), have mentioned that the collapse of the Bangkok Bank of Commerce (BBC) in 1996 was a prelude of the financial crisis making investors focusing on the situation of the financial system in Thailand. The BBC was a privately own bank that went bankrupt due to questionable loans and accusations of embezzlement that concluded in convictions more than decade later (Amy, 2012). According to comments in the Thai parliament, quoted in the local media, the bank had approximately 3.2 billion on bad quality loans (Rupert, 2016). According to data from the 2015 annual report the company had total assets of 183,874 million Baht (a yearly increase of approximately 27percent) and 5,216 employees with 167 branches (42 in Bangkok). Net profit for 2015 was 335 million Baht. Interestingly the auditors mentioned in the report that in their opinion the allowance for possible loans of 3,243 million Baht made by the company were not enough to cover uncollectible loans. Concerns about the financial positions of the bank spread causing a run on the bank as depositors rushed to take their savings out of the bank becoming the first scare before the actual crisis. The bank was unable to survive the withdrawals from clients and was subsequently intervened by the central bank of Thailand. All “good” assets were transferred to the Bank of Thailand in October, 1998 (Bank of

Thailand Supervision Report, 2000). The bad assets were left at the BBC than was subsequently converted into an asset management company in an attempt to recover part of the losses. This is a frequent solution when dealing with failed financial institutions as the recovery rates are likely to be better than in a fire sale. The Thai government issued a decree in 1998 granting some tax and financial advantages for the acquisition of assets owned by the asset management companies created to manage failed financial institutions. The Nukul Commission, which is a review order by the Thai authorities of the reasons behind the financial crisis, mentioned that the "BBC problem was evident after a bank examination on April 30, 1991, discovered non-performing loans of 18.2 billion Baht, which represented 26.73 percent of the total assets". The report was rather critical on the management of the BBC situation. An English translation of the original Nukul report can be found in (Commission, 1998). According to the report by 1994 substandard loans reached approximately 20 billion Baht. At this stage, and always according to the Nugul report, it was decided that the best course of action was not to write off the bad loans but to issue shares on the company in an attempt to recapitalize BBC.

Somprasong Land

Paul (1998) pointed out the fact that a large amount of the capital borrowed overseas was directed towards investment in real estates. In many occasions foreign capital was cheaper than domestic one and companies borrowed in foreign currency. One of these companies was Somprasong Land, a property developer. Somprasong issued Eurobonds (see table 2.2) in foreign currency that was unable to repay going into default in February 1997. Several authors, such as (Charles and Abdelhak, 2002), have pointed to the existence of a property bubble in Thailand and other Asian countries in that period and the impact of the subsequent property price correction in the economy. From the start of the crisis in 1997 to the end of 1998 property prices declined in Thailand more than 70 percent (Charles and Abdelhak, 2002). To put this into context. From the peak of the property bubble in the U.S. in 2006 to the bottom of the market in 2011 the U.S. property market dropped 44 percent. This estimate was obtained using the U.S. Residential Property Prices Existing All Type of Dwellings index compiled by the Bank of International Settlement (figure 2.7). Concerns about

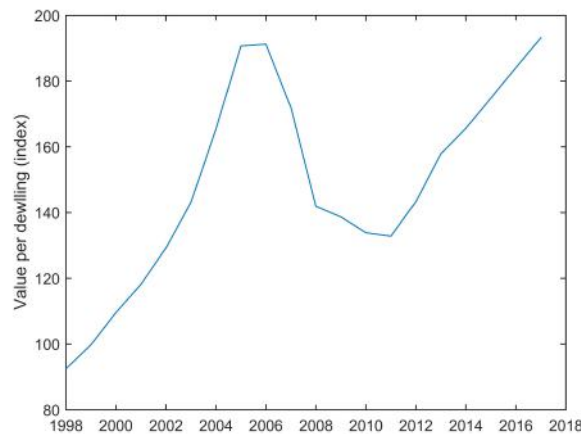


FIGURE 2.7: US residential property values per dwelling (Source: Bloomberg)

Currency	USD	Credit rating	Not rated
Amount	80,000,000	ISIN	XS0047640130
Features	Convertible	Conversion ratio	12.1469
Convertible until	21 of January 2004	Conversion price	Negative
Maturity	21 of January 2004	Missed payment date	21 of January 1997
Coupon	3.875	Default date	2 of February 1997

TABLE 2.2: United States Residential Property Prices Existing All Types of Dwellings SA

the financial soundness of other property developers rapidly spread with developers trying to deleverage their balance sheet by selling assets (Kuejai, 2008) while not really finding investors with appetite for such assets.

2.1.2 Crisis

Pressure on the Thai economy in early 1997 are becoming evident with the default of Somprasong Land adding concerns about the health of the property developers. Hedge funds increase their pressure on the Baht. Perhaps some of the best know hedge funds to bet against the Baht during this period are the Quantum Fund (George Soros) and Tiger Fund (Julian Robertson) with a reportedly 1 and 3 USD billion short positions on the currency (Jonathan, 2007). The Baht until that moment had been pegged to the U.S. Dollar and the Thai central bank tried to defend that pegged by increasing rates and using the foreign exchange reserves of the country. While the exact amount of foreign reserves used by the central bank to defend the pegged are not know some estimates from the media put it at around USD 37 billion,

from a total of 40 USD billion of total reserves (IMF, 2007). In March 1997 the Bank of Thailand identifies 10 financial companies experiencing financial issues (Kenichi, 1998) and request that these companies take steps to solve such issues. Nevertheless the Bank of Thailand at this stage considered that there was no need for a devaluation and that the overall financial system was safe. There has been substantial speculation regarding this announcement. A few months after that, in June 27, the Bank of Thailand suspended 16 companies (Haggard Stephan, 1999; Bong-Chan Kho, 2000; Sakulrat and Rajan, 2003). The fact that all the 10 initial companies were included in this list of 16 names has been a fact reflected in a large amount of articles such as for instance (Haggard Stephan, 1999). This was shortly preceded by the resignation of the then minister of finance Dr. Amnuay Viravan on the 21 of June 1997 (TMOF, 1997) his replacement was Mr. Thanong. There were several articles in the international media highlighting the fact that it was the fifth finance minister in two years (WSJ, 1997). Pressure on the currency continue to increase forcing the prime minister on June 30 to make a public statement (Bong-Chan Kho, 2000) affirming that there will not be a depreciation of the currency. A few days after that Thailand officially ends the peg letting the Baht to free float. This is received with positive comments from the hedge fund community and other investors with comments such as the one from Stanley Drunckenmiller, which was at the time the CIO of the Quantum Fund, published in the Chicago Tribune stating "We think this is a great first step" (WSJ, 1997). There were several similar comments in the media from the hedge fund community regarding the decision of letting the Baht float. After the Bank of Thailand stopped trying to defend the Baht the volatility in the currency increased substantially.

End of peg with USD

Since at least 1996 the Bank of Thailand has been having meeting with the International Monetary (IMF) Fund regarding the economic situation. In a contact mentioned in (Commision, 1998) the IMF encouraged Thailand in December 1996 to keep up the reform and manage the situation carefully but did not see necessary to change the exchange rate. The situation however deteriorated rather rapidly with, always according to (Commision, 1998), the IMF recommending only a few months later

(February 1997) to devalue the currency. At this stage the IMF considered that the Bank of Thailand did not have the necessary tools to defend the Baht. Nevertheless the Bank of Thailand tried to defend the currency. It should be noted that there are some discrepancies with this time line as scholar such as (Teena, 1996) mentioned that the IMF has requested some degree of depreciation in the Baht since December 1996,

On July 2nd 1997 the peg of the Thai Baht with the U.S. dollar ends with the dollar appreciating 15 percent overnight putting substantial pressure on Thai companies that have borrowed in U.S. dollars. The deterioration in returns combined with large amounts of borrowings in foreign currency plus a significant devaluation of the Baht proved to be a combination that hurt a large amount of Thai companies that were unable to repay their borrowings. (Karel, 2010) and several other scholars have mentioned that financial institutions as well as companies got used to have a stable currency pegged to the USD creating a false sense of security and causing poor risk management. According to these authors the possibility of a sudden change in the exchange rate of the Baht was regarded as a rather remote possibility and this perception was based on many years of stable foreign exchange values and growing economy. While there were financial tools for hedging currency exposure the borrowing from Thai domestic companies were, at least in their majority, not hedged (Kenichi, 1998) so companies had to absorb the full repayment on a currency that is rapidly depreciated. What started as a national issue rapidly started to spread to other countries with similar foreign characteristics such as open foreign exchange markets. This concerns affected very quickly other Asian countries such as Indonesia, Malaysia and South Korea.

IMF intervention

As the situation deteriorated in Thailand the perceived necessity of an intervention by the IMF and other international bodies increased. In August 11 a group of IMF members agreed in a meeting (IMF, 1997) to commit to approximately USD 9 billion of financial support for Thailand (details can be seen on table 2.3). China PRC and other international bodies subsequently committed to provide some funding as well. These commitment were followed by a standing credit facility issued by the

TABLE 2.3: IMF commitments (11 of August 1997).

IMF member	USD billion
Japan	4
Australia	1
Hong Kong	1
Malaysia	1
Singapore	1
Indonesia	0.5
South Korea	0.5
Total	9

IMF of approximately USD 3.9 billion approved on the 20th of August 1997. That financing came with conditions that have been subject of debate through the years. Not all the financing came immediately with the funding coming at regular steps and conditional to achieve some goals. For instance, of the USD 3.9 billion of credit facility only USD 1.6 billion was made available immediately with USD 0.8 billion available two months later and the rest coming every quarter.

The main conditions imposed by the IMF were: 1) to increase interest rates in an attempt to stabilize the currency, 2) to continue the reforms. This included closing financial institutions that were deemed as non-viable (Stanley, 1998), 3) a “fiscal adjustment of 3 percent of GDP” (Stanley, 1998) that basically translated into less investment by the government. 4) acceleration of the privatizations, 5) improvement in regulatory oversight and 6) improvement in education. This austerity measures received a considerable amount of backlash from the local population (Gerald, 1999; David, 1998). Thailand during this period, even before the requests from the IMF, tried to stabilize its financial sector by using a combination of measures such as suspensions on financial institutions, followed in some cases by nationalizations or by selling some of the troubled financial institutions and assets to foreign investors. As previously mentioned by early July there were 16 companies suspended. The newly appointed finance minister had to announce a few weeks later (5th of August) that another additional 42 financial companies were suspended. This was despite previous mentions of no further company suspensions.

Financial Sector Restructuring Agency

As a response to the ongoing crisis several institutions were created. One of these institutions is the Financial Sector Restructuring Authority commonly known as FRA. This institution was created in October 1997 (John, 1999). FRA was one of the main agencies in charge of assessing the economic situation and handling troubled financial assets and had a wide range of powers including the ability to request troubled financial companies to recapitalize or to arrange acquisitions by third parties. It has been noted by some scholars that despite some early success FRA had a challenging time selling off some of the troubled loans with repeated auctions not achieving the desired prices (Kenichi, 1998). Of the 58 financial companies under supervision from FRA the vast majority (56) did not survive.

Disposal and nationalizations of troubled banks

The Bank of Thailand speed up the interventions in the banking sector by the end of 1997 and beginning of 1998. The most frequently used strategies to deal with troubled banks were to nationalize them, typically done through some type of national bank such as Krung Tai bank or selling it to foreign financial institutions. Radanasin Bank was created with the scope of acquiring some of assets that appeared of value. Laemthong Bank was initially acquired by Radanasin Bank but shortly after that a majority stake of 75 percent was bought by Union Overseas Bank. Bank Thai was a few decades later (2008) acquired by CIMB, a financial institution from Malaysia. Another channel used was to capitalize the banks through stakes from the bank of Thailand. This was done by using the Financial Institutions development Fund (FIDF), which was set up in 1985 and was under the direct control of the bank of Thailand.

In other words, the Bank of Thailand tried to control the situation by helping banks directly or by arranging acquisitions. As previously mentioned those acquisitions were done both by local and foreign banks but as the table 2.4 shows at an initial stage, probably due to some risk aversion by foreign banks it was done banks owned by the estate. Several articles in the media did mention that there were negotiations with several other foreign banks such as HSBC or Bank of Nova Scotia

TABLE 2.4: Some major mergers in the banking sector

Bank	Nationalized	Foreign acquisition
Bangkok Bank of Commerce	Krung Thai Bank	
First Bangkok City Bank	Krung Thai Bank	
Laemthong Bank	Radanasin Bank	United Overseas Bank
Nakornthon Bank		Standard Chartered
Union Bank of Bangkok	Krung Thai Bank	

in Canada regarding possible acquisitions but at that stage those negotiations did not finalize in an acquisition agreement.

Role of hedge funds

There has been intense discussion regarding the role that hedge funds played in the South East Asia financial crisis. Perhaps one of the best known opinions on this regard was the one from Mr. Barry Eichengreen from the IMF. His alleged quote that “hedged funds triggered Thailand’s financial crisis” has been mentioned in a myriad of scholar and media articles (Duncan, 1998; Fred, 2000) or the one from (Mitidiero Daniel, 2012) describing as predatory the behavior of some hedge funds. Other authors, such as (William and James, 1998) founded no empirical evidence that hedge funds caused the financial crisis in Thailand. This remains a topic with deeply divided opinions from both scholars as well as market participants. Some of the facts that are undisputed is that some hedge funds had short positions in the Baht and some other South East Asian currencies (Fung William, 1999; Gregory and Mason, 2003) and that some of the managers at those funds were rather vocal with their opinions on the situation appearing frequently in the media. While there is certainly no strong consensus in this regard it seems that the idea that while hedged funds did not create the underlying problems in the affected South East Asian countries they were a “last straw” component with large bets against their currencies that might have precipitated the events is a theory shares by several scholars such as (Fung William, 1999).

The actual mechanism of the Soro’s trade, according to for example (Connor Gregory, 2003), are well understood. In mid 1997 Mr. Soros entered into a forward contract that allowed them to exchange 26 Baht per 1 USD at a future date. Reportedly

his fund had approximately 1 billion USD (there is no hard evidence regarding the total amount of the position). By entering into that forward he would benefit from a depreciation of the Baht. As long as the Baht decline to more than 26 Baht per USD then there would be a profit on this trade. This is a simplification because there will be some costs, albeit small, in entering that trade. The decline of the Baht over the following few months was significant. For instance, in January 1998 the spot rate was at some point at roughly 54 Baht per USD. At that point the trade would have been very profitable i.e., Buying Baht at the low rate of 54 Baht per 1 USD and the using the forward converting those Baht into USD at the high rate of 1 USD per Baht. These are the figures used (Connor Gregory, 2003) and while it is impossible to know the exact amount committed and exact dates it likely reflects accurately the basic concept of the trade. From a technical point of view this is not a particularly difficult trade assuming that the investor has the insight of knowing which currency is going to depreciate.

2.1.3 After crisis

Unemployment and social issues

The 1997 financial crisis in Thailand created caused significant protests (TNS, 1997; CNN, 1997) increasing in turn the pressure on the prime minister. The pressure continued to increase on the prime minister that was forces to resign on November 1997. At this stage the crisis had already spread to other countries such as Malaysia and Indonesia making it a regional rather than national issue. As mentioned in previous sections there was a significant part of the population that resented the conditions requested by the IMF in order to provide financial assistance with for instance the increase in interest rates putting pressure on businesses or the restructuring in the financial sector putting well paid jobs at risk. Despite a large amount of failed financial institutions and the hike in interest rates the Thai economy recovered relatively rapidly with for instance GDP growth rebounding rather quickly. Thailand experienced a rapid increase in unemployment adding pressure on the economy. However, partially due to the low starting point, unemployment remained solidly in the low to mid-single figures. This clearly contrasts with the impact of unemployment in other

financial crisis such as the European credit crunch. The increase in unemployment in Thailand during the crisis was significant but lasted only for a year (1999) with unemployment rates coming, albeit slowly, gradually down in the years after. It has been reported by some international organizations, such as the United Nations (UN, 2007), that the absence of social safety net programs put additional pressure on the population, which in turn further impacted the economy. It was also reported in this and other articles, such as (Rizwanul, 2003), the underemployment issue. (UN, 2007) also mentioned the issue of the stability of the recovery in poverty reduction as some of the gains experienced during the recovery period from 1999 to 2000 were partially lost when the global slowdown in economic growth in 2001.

Exports

The financial crisis caused a significant depreciation on the Baht which in turn made Thai exports more competitive in the international market. Measured in the domestic currency (Baht) exports increased substantially. Some authors, such as (Julian, 2006) have mentioned this recovery in exports as a significant contributor to the recovery of the economy. The Thai economy is an export focus economy fuelled by a large amount of cheap labor, similar to other South East Asian countries, making a recovery in the exports sector even more important. According to figure from the Bank of Thailand total export (custom basis) increased in Baht term by 28 percent and 24 percent in 1997 and 1998 respectively and only have a small correction of approximately 1 percent in 1999 (figure 2.8). After that exports in Baht terms increased every year until 2011. Approximately 82 percent of the Thai exports (Baht terms) were related to the manufacturing sector in 1997 while 10 percent to the agricultural sector. These two industries remained the driver of exports in Thailand until the present day with agricultural product losing some ground over manufacturing over time. In 2016 then contribution of the manufacturing sector to total exports was 87 percent while agriculture was 7 percent.

Electronics were one of the large sectors experiencing a higher rate of exports growth during the financial crisis and immediately after that (exports up 34.2 percent in 1998). More specifically computer parts and printed circuits had particularly

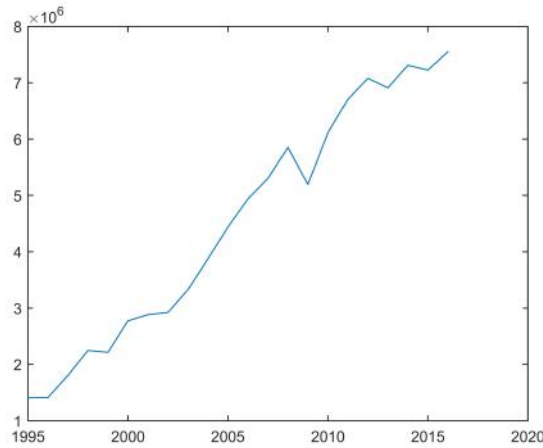


FIGURE 2.8: Thai exports in Baht millions (Source: Bank of Thailand)

strong growth in 1998 gaining 70.3 percent and 59.9 percent respectively. Rice exports (metric tons) increased by 17.5 percent and 4.6 percent in 1998 and 1999 respectively to then decrease by 15 percent in 1999. However it should be note that revenue in Baht from rice exports decrease in 1999 and 2000 which are typically considered the years of the economic rebound. Rubber, which is another significant Thai export had a more stable performance with exports basically remaining stable in 1997 in metric tons term (-0.1 percent) to then increase moderately in the following two years by 4.1 percent and 1.7 percent respectively. Revenue from rubber exports declined from 1997 to 1999 with the first year of recovery after the crisis being 2000.

2.2 Indonesia

2.2.1 Pre-crisis

Overall, the pre-crisis situation could be described as of high economic growth, albeit lower than peers, high inflation rates with the average consumer price index growth roughly in line with GDP growth and substantial foreign inflows. The Indonesian economy before the South East financial crisis (1981-1998) was growing, according to figure from the World Bank at an average growth rate of approximately 6.9 percent which is a high rate but lower than its peers during the same period. For instance, Thailand and Malaysia grew at average rates of 11.4 percent and 9.6 percent respectively during the same period. The Indonesian growth rate during this

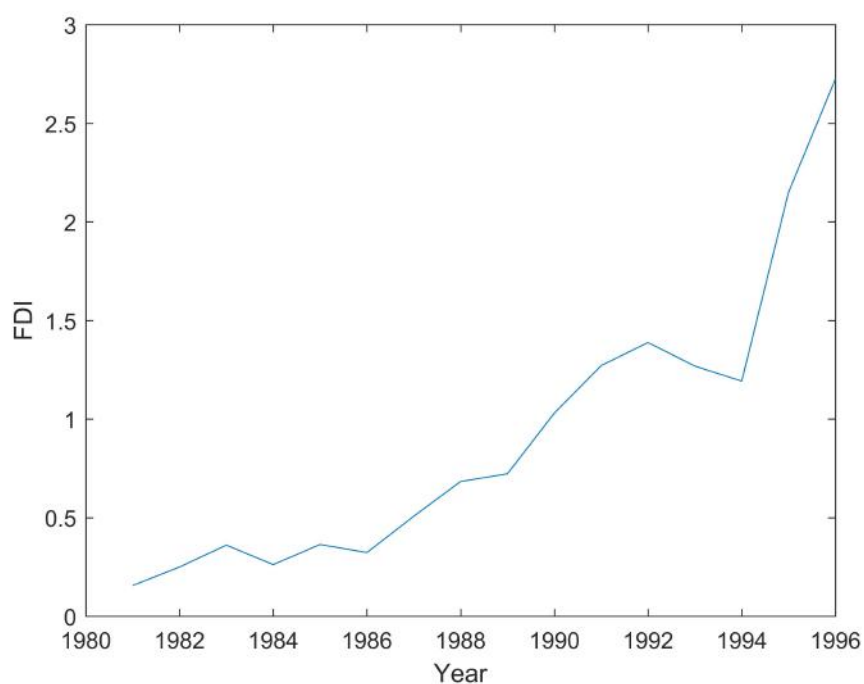


FIGURE 2.9: Foreign direct investment as percentage of total GDP for Indonesia. Source: World Bank

period was comparable to the case of the Philippines that grew during this period at an average 6.4 percent. GDP had negative growth in four of those years (1993 and 1985-87). Consumer price inflation remained high during the same period with an average value from 1981 to 1996 of 6.9 percent but it did however moderate in the years just before the crisis. Consumer price index in 1995 and 1996 was 3.5 percent and 3.8 percent respectively (figure 2.11). During the precrisis period there were substantial inflows of foreign capital into Indonesia. Foreign direct investment, as a percentage of total GDP, increase from 0.15 percent in 1981 to 2.7 percent by 1996 (figure 2.9). Net foreign assets increased from 6.8 T (local currency) in 1981 to 51.6 T (local currency) in 1996 (figure 2.10). Despite rapid urbanization rate Indonesia was in the pre-crisis period a mostly rural country with only 37 percent of the total population being urban by 1996. This however represented a rapid increase from the 22 percent of urban population in 1980. GDP per capita increased 91 percent (constant local currency) in the period from 1980 to 1996 (figure 2.12).

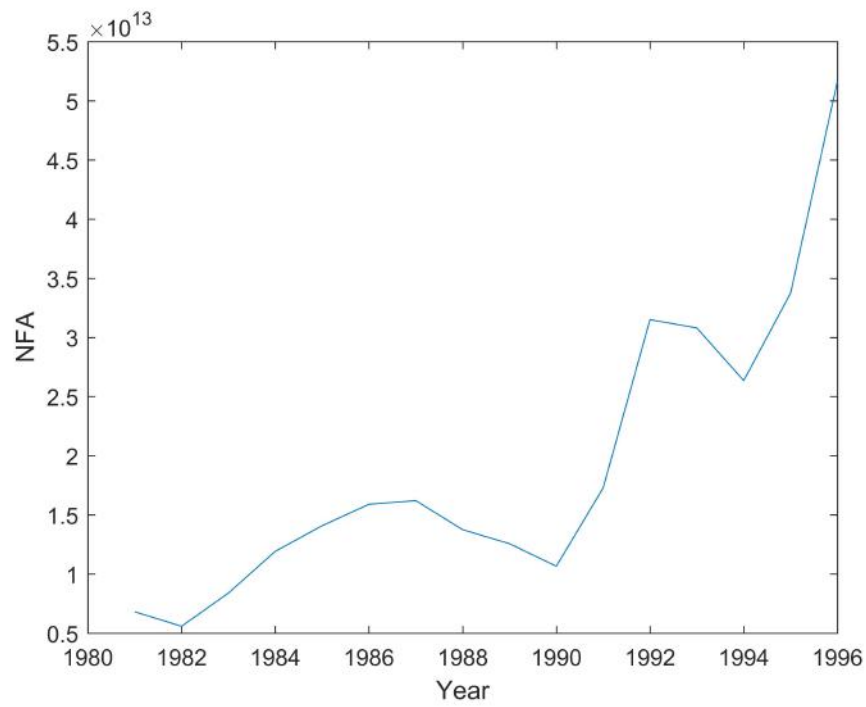


FIGURE 2.10: Net foreign assets (local currency billions). Source: World Bank

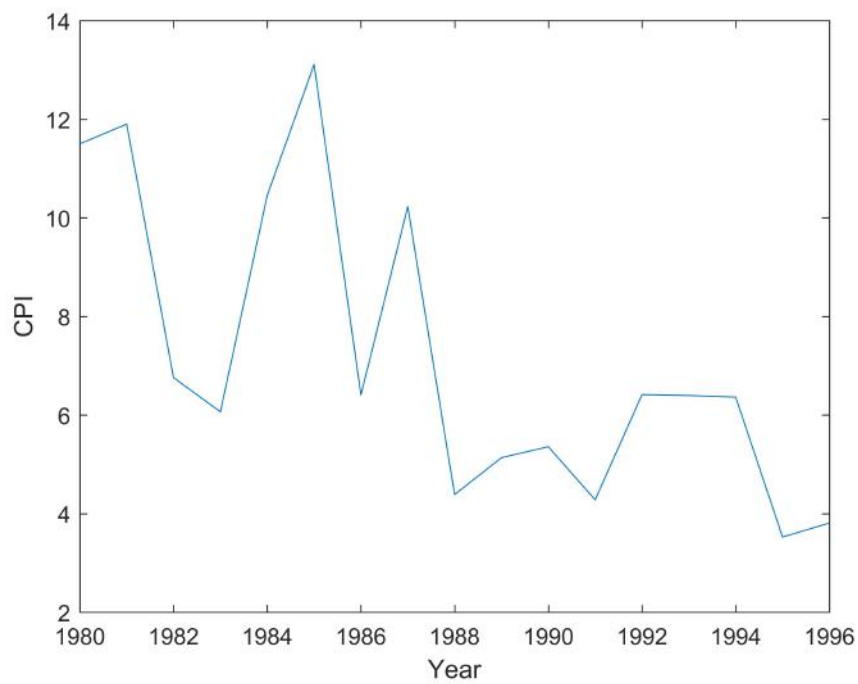


FIGURE 2.11: Consumer price index (percent) – Indonesia. Source: World Bank

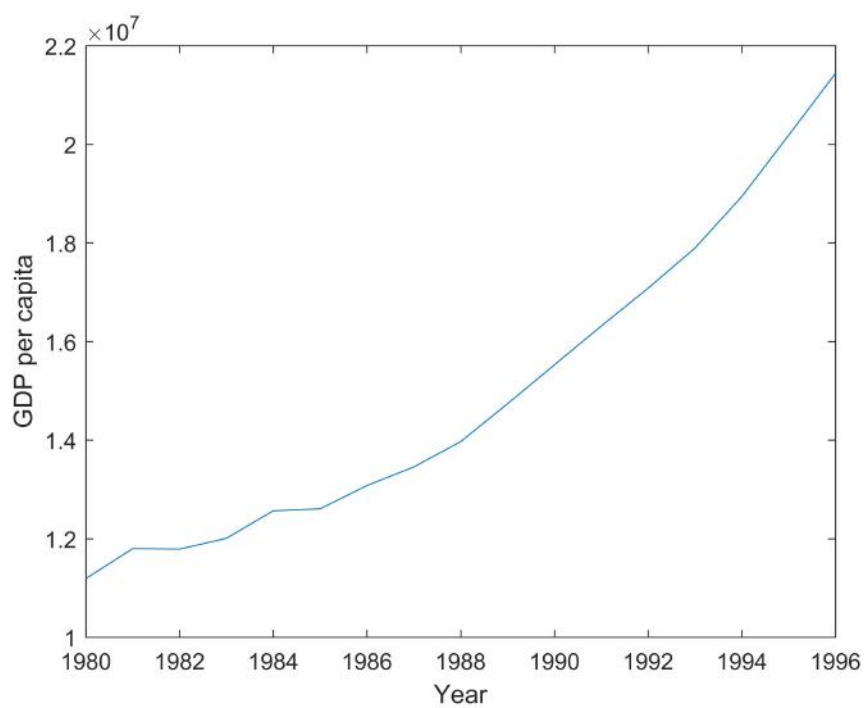


FIGURE 2.12: GDP per capita Indonesia (constant local currency).
Source: World Bank

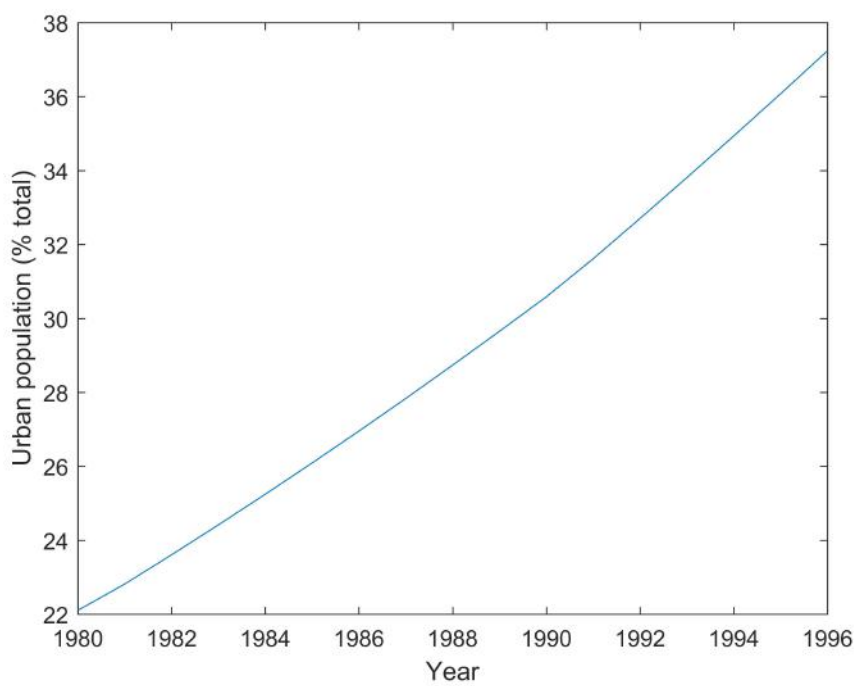


FIGURE 2.13: Urban population as percentage of total. Source: World Bank

Oil and gas

The country since the 80s underwent a process aimed to reduce its dependency of oil export with the percentage contribution of oil rents to total GDP declining, according to figures from the World Bank, from 21.3 percent in 1980 to 2.8 percent in 1997 (World Bank, 2014). Indonesia joined OPEC in 1962 (OPEC, 2009). The efforts of Indonesia diversifying away its economy from oil into a manufacturing export-oriented industry were mentioned by Indonesia to the IMF in its "Letter of Intent of the Government of Indonesia" of October 1997 to the IMF supporting its request for economic support (Ind, 1997). Interestingly this ore-crisis diversification away from oil was done by developing the manufacturing sector while the oil sector remained roughly constant measured in number of produced barrel per days (figure 2.15). Production of oil did decline significantly after the crisis partially due to the depletion of reserves and the relatively low success finding new deposits (PWC, 2018). This is an issue that continues nowadays impacting the development of the oil industry in Indonesia (PWC, 2018). So it is unclear if the decision to expand the economy into other sectors was based purely on a prudent policy to diversify the economy or was mostly driven by the challenges of keeping production in the mid term at the same levels as they had been before the crisis. It should be noted that Indonesia is a vast country with oil reserves heavily concentrated in the Western part of the country. According to (PWC, 2018) more than 75 percent of the total production of oil is centered in the Western part of the country. Another issue that has caused production to decline is, according to the US Energy Information Administration its chronic issues attracting investment for exploration and development (EIA, 2015). This is considered by the EIA has a persistent issue impacting the oil sector over the last several decades. It should also be noted that while production has declined consumption has steadily increased with the country shifting from a net exporter to a net importer in 2003. In fact this was one of the reasons behind the temporary exclusion of Indonesia from OPEC in January 2009. The country did rejoin OPEC in 2016 but remaining as a net importer. Indonesia has also a sizeable natural gas industry that grew robustly in the pre-crisis period and has since then had a better growth rate (figure 2.16). Natural gas production has however declined in recent years (figure 2.16).

Situation in the banking sector before the crisis

The fragility of the Indonesian banking system preceding the actual South East Asian Crisis is frequently mentioned in the literature. According to (Enoch, Frecatit, and Kovanen, 2003) Indonesia experienced from 1988 to mid-1997 a period of unbalanced liberalization in the banking sector with a large amount of new banks created. (Enoch, Frecatit, and Kovanen, 2003) pointed remarked that many industrial conglomerates created their own banks during this period. The number of banks more than double during this period reaching a maximum of 240 in 1996. The same authors mentioned that while the banking system was growing very rapidly the regulatory oversight was not evolving accordingly with no clear or efficient process to deal with banks insolvencies.

Several years before the South East Financial Crisis erupted there were indications of fragility in the banking sector. One of the frequently cited issues (Enoch, Frecatit, and Kovanen, 2003) was the collapse of Bank Summa in 1992. Bank Summa was regarded at its peak as one of the success stories in Indonesia (Arnold, 2000). According to (Arnold, 2000) the banks started to have significant issues in 1991 after a reversal in the property market lead to significant loan impairment with the bank facing by 1992 liabilities close to 700 million USD that lead to the collapse of the bank.

The collapse of Bank Summa was considered as an isolated event with to contagion on the overall banking sector. In fact and as previously mentioned the banking sector continued during the following years to expand very rapidly. The large expansion of the banking system that coincided with a period of large economic growth and robust property market created a climate of easy access to capital and imprudent lending (Aaron, 2000) that resulted in a very severe banking crisis starting in 1997.

2.2.2 Crisis

In the initial stages of the financial crisis Indonesia showed some signs of resilience with no immediate contagion from the situation in Thailand (Sherlock, 1998). This

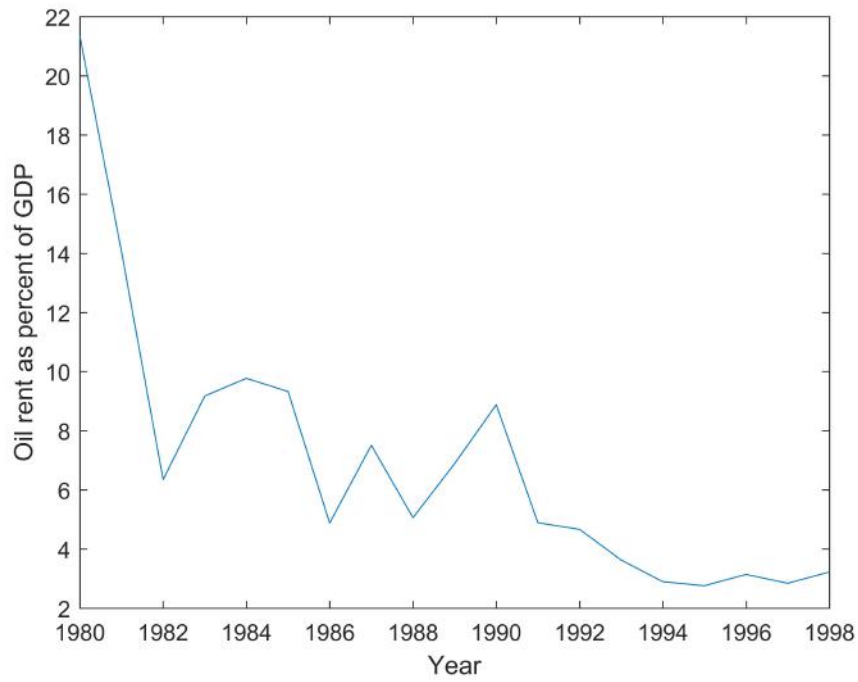


FIGURE 2.14: Oil rents as percentage of total GDP. Source: World Bank

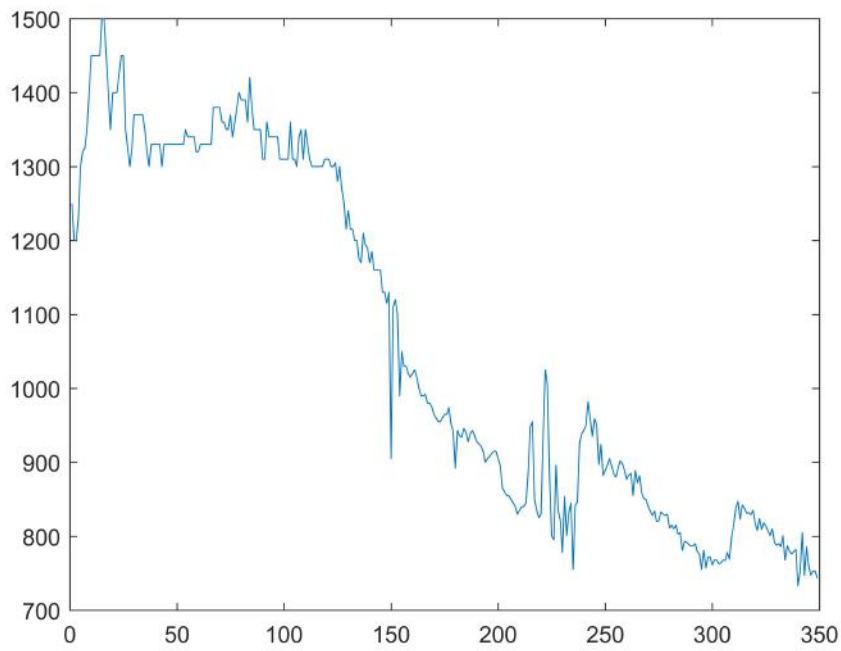


FIGURE 2.15: Indonesia oil production 1000 barrels per day. Source: World Bank

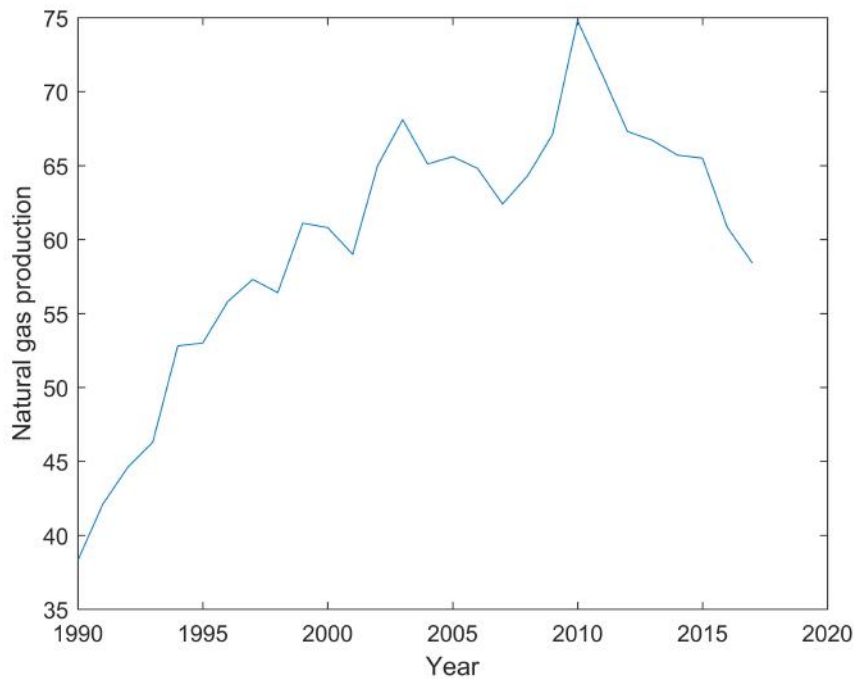


FIGURE 2.16: Natural gas production (million tons of oil equivalent).
Source: Bloomberg

situation quickly changed with the local currency slumping and a run on the banking sector outing the national finances under considerable stress. The crisis period in Indonesia started with a 5.1 percent drop in GDP in 1997, which is a very substantial economic contraction but smaller than for instance the 17.9 percent contraction experienced in the same year by Thailand. This 1997 contraction was however substantially larger than the one experienced by its peers, such as Malaysia or The Philippines that experienced GDP contractions of 0.6 percent and 0.7 percent respectively.

The first clear sign of stress in Indonesian economy appeared in the currency market with the Indonesian Rupiah slumping 84 percent against the U.S. dollar (Ryu, 2008) from July 1997 to January 1998. Indonesia had started a process of liberalizing the exchange rate system (Gregory, 2005), (Pill, 1997) in previous decades and by 1997 the Indonesia Rupiah traded within a relatively narrow band relatively to the U.S. dollar. Given the increasing pressure on the currency and the cost of defending it Indonesia decided on August 14th, 1997 (BIS, 2004) to let the currency free float. The shift from a managed float regime to free float added significant amount of volatility to the exchange rate and increased economic pressure. Some authors,

such as for instance (Siregar and Pontines, 2005) and (Pratomo, 2013), have argued that the Indonesian Rupiah was not a stable currency even before the South East Financial crisis and that if more efforts were have done to stabilize it in the years before the crisis the Rupiah should have hold better substantially better during the crisis period.

IMF intervention and banking crisis

The mounting financial pressure, reflected by a sharp devaluation of the Rupiah forced the government of President Suharto in late 1997 to ask for financial support to the International Monetary Fund with an initial agreement for a bailout of approximately 40 billion U.S. dollars being relatively quickly reached but with significant conditions. The intervention of the IMF in several Asian crisis during the crisis has been criticized by many academics (ODriscoll, 1999), (Chang et al., 2001). In the case of Indonesia the level of criticism is particularly high due to a series of factor frequently cited in the literature such as the IMF sending a team to help restructure the local economy with little knowledge of the country and particularly by the initial approach followed for the restructuring of the banking sector. As previously mentioned there were some indications of fragility, and even corruption, in the banking sector before the crisis and it was unsurprising that the IMF requested significant changes in the industry. The main requests made by the IMF could be summarized as follows:

1. Reforms in the banking sector
2. Reduction of national expenditures
3. End of monopolies in several sectors and less restrictions on foreign investment

One of those request by the IMF was the closure of banks that were considered insolvent. Indonesia complied quickly with this request closing overnight 16 banks in November 1997. Several academic articles have stated that the selection of banks to be closed was done arbitrarily without really looking in depth to the fundamentals of the bank but with other factors such as for instance who were the owners of

those banks being a more important factor for their closures. Given the absence of a formal deposit insurance scheme the rapid closure of banks caused a run on the banking system that significantly exacerbated the economic decline. The 16 banks that were suddenly closed (Apriadi and Santosa, 2017) are:

1. Bank Andromeda
2. Bank Pacific
3. Bank Harapan Santosa
4. Bank Guna International
5. Bank industri
6. Sejahtera Bank Umum
7. Bank Jakarta
8. Southeast Asia Bank
9. Bank Umum Majapahit
10. Bank Pinaesaan
11. Bank Kosagraha Sejahtera
12. Bank Dwipa Semesta
13. Bank Astria Raya
14. Bank Kosagraha Sejahtera
15. Bank Mataram Dhanarta
16. Bank Citrahasta Dhanamanunggal

An environment of a rapidly depreciating currency in an economy that focuses on manufacturing exports coupled with banks failures put enormous pressure on the local economy with even profitable local companies struggling to get financing to export as banks stopped accepting letters of credit from other banks and similar

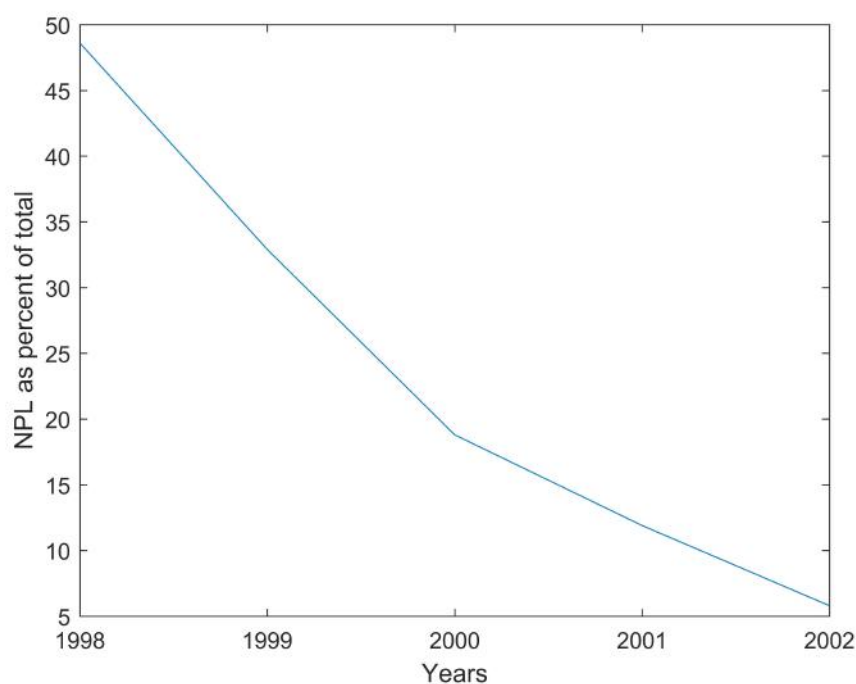


FIGURE 2.17: Non performing loans as percentage of total. Source: IMF

standard financial contracts. This caused the economy to deteriorate with a substantial increase in loan defaults. The IMF did not report non-performing loans (NPL) for Indonesia before 1998 but in that year NPLs in Indonesia, always according to IMFs figures it reached 48.6 percent (as percentage of total loans) only returning to single digits in 2002, see figure 2.17.

The banking crisis in Indonesia during the South East Financial Crisis expanded rapidly with multiple runs on the banks. Banks stopped accepting letters of credit from other banks and depositors, concerned by the safety of their saving, started withdrawing their capital from banks. (Enoch, Frecatit, and Kovanen, 2003) described this banking crisis as “one of the most serious [banking crisis] affecting any country in the twenties century”. As previously mentioned, the absence, despite some assurances by the government, of a formal deposit insurance guarantee created a climate on anxiety compounding the pressure on the banking system.

The Indonesia government, as requested by the IMF also announced the reduction on national expenditures. In September 1997 the governor of the Bank of Indonesia announced the cancellation of previously announced projects amounting to approximately 62 billion USD (Chang et al., 2001) adding additional pressure on the

economy. An attempt by the Indonesian government to renegotiate the terms of the IMF bailout program caused additional anxiety in the financial markets. Finally in early 1998 a bailout package of 43 U.S. billion was finally agreed between the IMF and Indonesia. Some reforms were introduced making easier for foreign investors to invest in several sectors in Indonesia but this was unlikely to have a significant short term impact. (Sherlock, 1998) identified the request of the partial dismantle of monopolies as one of the most difficult request as (Sherlock, 1998) several of these monopolies had significant powers with their dismantling proving rather challenging.

Peregrine investments

The crisis of confidence in the Indonesian banking system affected not only to a domestic banks but also to financial institutions with operations in Indonesia. One of this financial institutions was Peregrine Investments, which was headquarter in Hong Kong. Peregrine Investments went into liquidation in January 1998 in Hong Kong. At the core of the collapse of Peregrine Investments was a 269 million USD loan to a taxi company in Indonesia called PT Steady Safe (Ismail, 2018). Several attempts to restructure the loan were unsuccessful with the company going into liquidation relatively quickly after the start of the South East Asia Financial crisis. In the liquidation proceedings the French bank BNP Paribas bought and renamed Peregrine Investments. It should be noted that Peregrine Investments was a well-regarded institution with diversified operations across Asia and to a lesser degree in Europe and the US and at the time of its collapse was the largest independent investment bank in Asia (Rob, 1998).

The liquidation proceedings lasted for many years with the liquidator (Price Water House Coopers) reaching an agreement with PT Steady Safe in 2001 by which the shareholders of PT Steady Safe give up their ownership rights to compensate Peregrine Investments for its loss (Delaney, 2001). A formal investigation in Hong Kong about the collapse of Peregrine Investments concluded that the company could not have reasonably forecasted the Financial Crisis and its ramifications but highlighted the issues of poor corporate governance and risk management (Kenedy, 2001). The investigation did not find any indications of fraud or embezzlement by the company.

Nevertheless directors of the company received a temporary ban from becoming a director of another company due to poor oversight.

2.2.3 Post-crisis

Indonesia had a time line during the South East Asia slightly different to its peers. The country initially had relatively good performance, supported by a relatively balanced balance of payments, in the early stages of the financial crisis was followed by a rapid and large decline in the value of the Rupiah, followed by a banking crisis that spread into the real economy with high food inflation. The period after the crisis was also different to most of its peers with a slower recovery. Inflation remained high for several years after the crisis in Indonesia with an average CPI growth rate from 1999 to 2009 of approximately 9.5 percent. The peak inflation during this period was in 1999 with a CPI growth of roughly 20.5 percent. During this period there was only one year in which CPI growth was below four percent, this was in 2000 with a CPI growth of approximately 3.7 percent. After the end of the Suharto ruling in 1998 the country experienced several internal conflicts derived from ethnic and socio-economic differences that in several occasions turned violent (Malley, 2001) slowing in the process of economic recovery. As previously mentioned the Indonesian middle class was among the most impacted groups. This fast decline of the economic gains earned by the middle class during the previous three decades caused a decline in social stability (Malley, 2001). Indonesia had in the immediate after crisis period 4 presidents in 6 years with all those presidents struggling to keep territorial integrity with violence recurring. This is perhaps one of the main differences between Indonesia and its neighbors such as Thailand or Malaysia during the after-crisis period with more episodes of violence in Indonesia.

(Ramesh, 2009) mentioned that one of the unexpected effects of the crisis during the recovery years was the decrease in enrolment in education, likely as a necessity to find work at an earlier age to support the family during periods of slower economic growth. (Ramesh, 2009) acknowledge that finding reliable data on this topic is challenging but according to the calculations on that paper the enrollment in secondary education in Indonesia declined in the post-crisis period by 11 percent,

which is higher than for instance the 8 percent decline experienced in the Philippines.

GDP growth, according to figures from the World Bank, decline more than 13 percent in 1998 and only increased by 0.8 percent in 1999. After that Indonesia managed to have GDP growth rates more in line with its neighbors with GDP growth averaging 5.2 percent from 2000 to 2010. One of the main conclusions is that Indonesia was one of the most impacted countries during the South East Financial Crisis, experiencing a steep decline in the local currency, a banking crisis and a slower recovery than its peers. This slower economic recovery might be related to the social issues and episodes of violence experienced in the country during these years.

Unemployment

Historical unemployment data Indonesia is not complete with figures from the World Bank missing several years. Nevertheless, an always according to World Bank figure the unemployment did not dramatically increase during or after the crisis. The earliest data point for unemployment according to the World Bank time series for Indonesia was for 1997 with a 1.92 percent unemployment rate that would suggest that the country was close to full employment. The figure for 1998 was actually lower with unemployment rate going down to 1.29 percent to finally moderately pick up in 1999 reaching 2.48 percent. In 2001 the unemployment rate went down to 1.66 percent (there is no official data for 2000 or 2002). Indonesia had less of an issue with unemployment during the financial crisis than Thailand or Malaysia (Ramesh, 2009) but similar to the case of Thailand has a substantial issue with underemployment with an estimated 18.4 million underemployed in the country in 1998 (Sherlock, 1998).

Inflation in food prices

One of the most severe issues during the South East Asian financial Crisis in Indonesia was high inflation, more specifically high inflation in food prices (Ramesh, 2009). According to figures from the World Bank overall inflation growth (CPI) reached in 1998 58.2 percent, compared to a 6.2 percent in the previous year (figure 2.19). While unemployment did not appear to drastically increase during the financial crisis in



FIGURE 2.18: Map of Indonesia. Source: Free maps

Indonesia the cost of basic food staples increases 88 percent in 1998 (Ramesh, 2009), (Sherlock, 1998). Food inflation was exacerbated by a severe drought (Chang et al., 2001) impacting some of the main food producing areas of the country forcing and increase in food imports while the currency was rapidly depreciating. Import of rice in Indonesia was run by a monopoly that while experienced in dealing with issues such as the very complicated logistic of delivering food that the country has due to its topology, was run in a relatively inefficient way (Ramesh, 2009). The logistic of food distribution in a country like Indonesia should not be underestimated with the country being formed with and excess of 17,000 islands and a population in 1997, according to figure from the World Bank, of in excess of 202 million (figure 2.18) .

While the crisis affected virtually all parts of society it had a particularly strong impact on the middle class (Gragnotati, 2001). While overall unemployment did not drastically increased there were significant differences among different sectors. For instance, many bank employees became unemployed as a consequence of bank closures. These jobs were on average mid to moderately high paying jobs impacting directly the Indonesia middle class that has risen over the previous 30 years of ruling of President Suharto. The deteriorating situation of the middle class that has had traditionally supported President Suharto and benefited from decades of high economic growth put substantial pressure on the president (Gragnotati, 2001). As

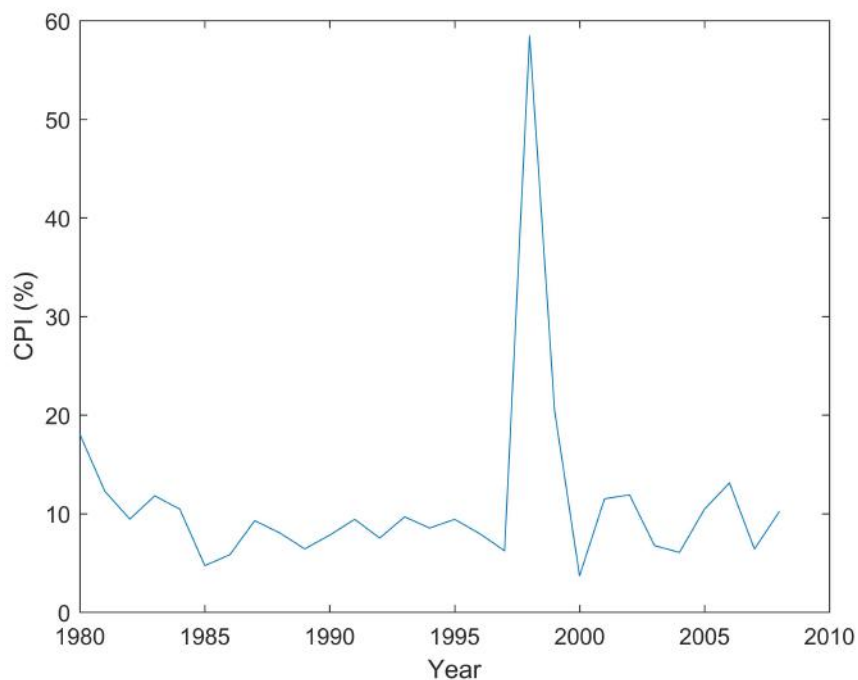


FIGURE 2.19: Spike in inflation (CPI) - Indonesia . Source: Bloomberg

the economic situation deteriorated President Suharto was forced to resign in May 1998.

Exports

Similarly to the case of Thailand the depreciation of the currency in Indonesia made the products from that country cheaper on a USD basis facilitating a recovery in exports. Another factor maintaining Thai exports cheaper (in a USD basis) was the high unemployment rate, adding pressure on salaries as competition for jobs increased. This was however a much less important factor in the case of Indonesia as unemployment rates remained relatively stable. It should be however mentioned that the quality of the data of unemployment data in the case of Indonesia is relatively low. The main export from the country is palm oil but also has sizeable coal and petroleum exports that other countries in the region lack.

2.3 Malaysia

Malaysia has a relatively low population compared to some of its regional neighbors with the 2000 census estimating that there are approximately 23 million MDS,

2001, up from 19 million in 1991. Estimates for the population are in the range of 30 million. The population has a mixed ethnic diversity and is concentrated in the Malaysian peninsula. The country is a federal constitutional monarchy. The figure of the king, partially modeled in that of the United Kingdom is mostly ceremonial with the actual power concentrated in the figure of the Prime Minister. The Malayan Federation obtained independence from the United Kingdom in 1946. The country went through various changes with Malaysia, in its modern form, being officially created in 1963. Two years later Singapore was expelled. Malaysia has large natural resources and it is a significant producer of oil and natural gas. The national oil and gas company (Petronas) was created in 1974 and it is a defacto monopoly of the country oil and gas resources. Revenues from these natural oil and gas reserves are the main source of funding for the Malay sovereign wealth fund (1MBD).

2.3.1 Pre-crisis

Malaysia, similarly to the other Southeast Asian Countries directly involved in the Southeast Asia Financial Crisis experienced a period of robust economic growth before the crisis. GDP growth from 1988 to 1996 was in excess of 8% Ariff and Abubakar, 1999a and inflation remained below 4% for this entire period. The economic growth was so robust that the Malay government set the target of becoming a developed economy by 2020 (Ariff and Abubakar, 1999a). Malaysia, as previously mentioned, is an ethnically diverse country with large Malay, Indian (7%) and Chinese (26%) communities. Malaysia has had policies in place for several decades aiming to bring more socio-economic equality for these diverse groups. According to (Rajah Rasiah, 2001), these policies have helped improving the political stability of the country but have come at a cost as and have hindered technological development.

(Mohamed, 2004) identified an excessive dependence in short term capital in the pre-crisis period as an issue affecting the Malay economy. (Mohamed, 2004) explicitly made the difference between Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) with the first one typically being long term investments into companies, in many cases unlisted, while the second one being purchases of

equities or bonds in the secondary market, which tend to be short lived. The author highlighted the dependency of the Malay economy for the 1993 to 1997 period of foreign capital in the form of FPI. Furthermore, (Mohamed, 2004) described the mechanism through which excessive dependency on short term capital, particularly of foreign origin (FPI), can potentially cause a significant impact on the value of the Malaysian ringgit. According to the author, if growth expectation slowdown then FPI will quickly reduced their exposure to the equity market and exchange their local currency cash holdings (Malay ringgit) into foreign currency (typically USD). The imbalance between large amount of ringgit sellers and a local investor base not large enough to absorb this outflow creates a rapid depreciation of the currency.

Authors, such as (Komo, 1998) have mentioned that the financial situation of Malaysia before the financial crisis was relatively healthy, besides a large current-account deficit. (Komo, 1998), similarly to (Mohamed, 2004) highlighted that this deficit was covered with short term inflow of foreign capital. According to (Corsetti Giancarlo, 1999) the Malaysian Current Account deficit reached 8.8% GDP in 1995. In the years preceding the Southeast Asia Financial Crisis there was an increase in infrastructure

It should be noted that the situation of Malaysia before the Southeast Financial Crisis was rather different from some of its regional neighbors as it experienced a financial crisis in the mid eighties followed by a banking crisis in the late eighties that translated into much stricter financial regulation. This tightening in regulation in the late eighties was followed by a proactive campaign from the Kuala Lumpur Stock Exchange to attract foreign capital into Malaysia that was actually rather successful. However, it attracted speculative inflows that quickly left the country in 1993 triggering a financial crisis. The Malaysia response to this financial crisis was to further tightening financial regulation. This tight financial regulation was only slightly lifted in the years preceding the Southeast Asia Financial Crisis. This is in direct contrast with other countries, such as Thailand, that had experienced a period of significant financial liberalization in the decades preceding the financial crisis.

2.3.2 Crisis

Malaysia faced significant internal political turmoil during this period with public disagreement between the members of the Malaysian government in how to react to the crisis with on one hand the Prime Minister Mahatir Mohamad, against accepting the bailout offer from the IMF, and on the other hand the finance minister that supported this idea and was an advocate of free markets. The finance minister was replaced by September 1998 and Malaysia continued its strategy of not requesting a bailout from the IMF. Prime Minister Mahatir mentioned that the IMF would have requested too stringent economic reforms and that they will focus only on repaying the loans rather than on economic growth which was according to Prime Minister Mahatir not an acceptable approach as the country was embarking on an 'affirmative action program to level the economic situation of the different communities than form Malaysia' [CAN interview, 2017]. Malaysia, opposite to the cases of Thailand, Indonesia and South Korea did not finally request a bailout from the IMF.

The initial response to the crisis has been described by some scholars as a "state of denial" (Ariff and Abubakar, 1999a) with the government downplaying the seriousness of the situation. One of the first clear indications of the severity of the financial crisis was the depreciation of the Malay ringgit. The central bank of Malaysia (Bank Negara Malaysia) tried to support the currency purchasing at the beginning of July 1997 in excess of 1 US\$ billion. The efforts from the central bank were not successful and by July 1997 Malaysia had to allow its currency to free float. It has been highlighted by some scholars that despite refusing the intervention by the IMF the Malay government immediate response was roughly in line with the IMF suggestions, by substantially decreasing government spending and delaying major projects such as railways and the emblematic Bakun dam (Ariff and Abubakar, 1999a) and banning some term repatriation of capital (less than 12 months). The severity of the economic situation became self evident rather quickly and the Malay government reacted by establishing, in the beginning on 1998, the National Economic Action Council, which could be described as a think-tank helping the government drafting policies to overcome the financial crisis. Eventually the government took two major decisions: 1) strict capital control, 2) peg of the currency to the USD at a 3.8 rate. This meant that

the offshore ringgit was no longer convertible, basically closing the offshore FX market and forcing some repatriations of ringgit into Malaysia. Furthermore, Malaysia went a step further by declaring the Malay ringgit “illegal tender outside Malaysia” and by freezing non-resident bank accounts holding deposits denominated in Malay ringgit (Mohamed, 2004). The capital controls were rather strict and targeted primarily short term capital trying to leave the country. While repatriation of short term capital (less than 12 months in the country) was technically possible under the new rules it strongly discouraged it (Mohamed, 2004). For instance, foreign capital that had entered the country before mid February 1999 will experience no tax levy after a 12 months period. However, the applicable tax rate introduced were 10%, 20% and 30% for 9-12 months periods, 7 to 9 months periods and less than 7% month periods respectively. Despite all these measures the depreciation of the Malaysian ringgit during the South East Financial Crisis was in line with most of its Asian neighbors, such as Thailand, Philippines and South Korea, with depreciation against the USD of roughly 34% for the period from June 1997 to September 1998. The Indonesian rupiah was the most severely impacted currency with depreciation against the USD in excess of 83% for the above mentioned period.

There was an intense focus by the Malaysian government on providing liquidity (Rajah Rasiah, 2014) and the management of bad assets. Three new institutions were created to handle these issues (Mohamed, 2004):

1. Danamodal
2. Danaharta
3. Corporate and Debt Restructuring Agency (CDRC)

Danamodal main task was liquidity management, specifically ensuring that banks had enough capital to operate. Danaharta handed mostly trouble assets, both in the corporate and the banking sectors while CDRC focused mostly in restructuring activities. (Mohamed, 2004) mentioned that one of the main overall objectives was to avoid mass bankruptcies that could cripple the economy and sharply increase unemployment.

Bank Bumiputra Malaysia Berhard

The Malay banking system came under pressure during the Southeast Asia Financial Crisis with the central bank (Bank Negara Malaysia) urging some of the main Malay banks, such as Bank Bumiputra Malaysia Berhard, to recapitalize. One of the sectors most severely impacted by the financial crisis in Malaysia was the property sector (Mohamed, 2004). Malaysia had a property boom during the pre-crisis period with banks having significant exposures to the sector. In late 1998 it was reported (Shansuddin, 1998) the merger between Bank Bumiputra Malaysia Berhard and Commerce Asset Holding, creating in the process the second largest financial conglomerate in Malaysia at the time. The reported due diligence process of 12 weeks (Shansuddin, 1998) was remarkably short for a deal this size and there was no actual cash payment with the deal taking the form of a share swap between the two institutions. In other words, there was no new inflow of capital for neither of the two institutions. The financial situation of Bank Bumiputra Malaysia Berhard at that moment was weaker than that of Commerce Asset Holding (Shansuddin, 1998) and the deal was perceived as an attempt to consolidate the Malay banking sectors, which was a policy decision by Danamodal.

Sime Bank

Sime Bank faced a similar situation that Bank Bumiputra Malaysia Berhard with rapidly increasing non-performing loans (NPL) and calls from the central bank to rapidly recapitalize. The situation of Sime Bank deteriorated rapidly with an official investigation into the bank ordered by the Ministry of Finance (Lopez, 1998). According to an announcement from the central bank, as of early March 1998 Sime Bank has incurred losses in excess of 1.5 bn ringgit. This created concern among financial analysts at the time of other banks having undeclared losses (Lopez, 1998). Sime Bank merged in 1999 with RHB bank.

Impact on the equity market

The impact on the local equity market was very substantial with a (-45%) drop in the Kuala Lumpur Stock Exchange Composite Index (KLCI). Some authors have

highlighted that international investors at that time were becoming concerned about their investment in emerging markets with the collapse of the Russian Ruble and the Brazilian Real in 1998 (Mohamed, 2004) adding pressure on other, arguably mostly unrelated, emerging markets such as Malaysia. It should be noted that the KLSE did managed to rebound by the end of 1998 in perhaps an example of equity markets being forward looking and the expectation that the worst of the crisis was already passed.

2.3.3 Post-crisis

The government of Malaysia, opposite to those in Thailand and Indonesia, survived the South East Final Crisis but with political cost, such as intense tensions within the governing party that lead to the dismissal and eventual incarceration of the ministry of finance. These tensions remain to the present day with the recent issues involving the investigations on 1MBD the sovereign wealth fund of Malaysia chartered to invest the revenue from the oil industry. The drop in GNP in Malaysia, from June 1997 to September 1998, was approximately 39%, which is roughly in line with the GNP drop in Thailand, Philippines and South Korea. The drop in GBP in Indonesia for the same period was significantly larger coming at approximately 83%.

The impact of the financial crisis in Malaysia, which did not accept the bailout offer from the IMF, was comparable by those experienced in Thailand and South Korea with both of these two countries accepting the bailout offer from the IMF and being subject therefore by the rather stringent rules imposed by the IMF. The impact on the currency, stock market and overall economic growth was comparable among these three countries (Malaysia, Thailand and South Korea) with Indonesia having worse results.

Unemployment

Unemployment had been decreasing in Malaysia steadily in the years before the crisis with the unemployment rate peaking in 1993 at 4.11% to then gradually drop to 2.52% in 1996. At the beginning of the crisis unemployment actually slightly decrease (2.45% in 1997) but the situation quickly deteriorated with unemployment reaching 3.2% in 1998 and remaining above 3% until 2014. However, this was a much more stable unemployment situation that most of the other countries in the region (with the exception of the Philippines).

Inflation

Similar to the case of Thailand, Malaysia had experienced relatively stable inflation in the years before the crisis (3.49% in 1996) with the inflation rate declining to 2.66% in 1997. Inflation did significantly increase in 1998, reaching 5.27%, followed by a

sharp decline in 1999 and 2000 reaching 2.74% and 1.5%. Inflation remained below 2% until 2005.

Exports

Malaysian exports of goods and services increased slightly in 1997, reaching 95.75 USD bn (current) to then dropped 11.3% in 1998. After that dropped exports recovered quickly growing at a 15.3% and 16.6% rates in the following two years. Malaysian exports recovered relatively quickly, perhaps facilitating in the process the economic recovery.

2.4 Philippines

2.4.1 Pre-crisis

The Philippines is a populous country with approximately 77 million citizens at the time of the Southeast Financial crisis. Currently the population of the Philippines is approximately 109 million. The Philippines had trailed its regional neighbors in economic developments in the decades preceding the financial crisis but interestingly it is argued by authors such as (Gong-meng, 1998) that it arrived to the crisis in better economic shape than its neighbors with a banking system that was more selective when allocating credit (Gong-meng, 1998) with less exposure to the real estate sector than other countries such as Malaysia and Thailand. (Nolan, 2000) seems to support the idea that this was more by luck than by design with property developers in the Philippines more reluctant to ask banks for loans due to the very high prevailing interest rates. The Philippines, before the Southeast Asia Financial Crisis had experienced a few smaller financial crises that have resulted in high interest rates. The most relevant crisis in the Philippines in the years before the South East Asia Financial Crisis was the credit crisis in the 80s. Some authors, such as (Pennay, 2014) have mentioned the fragility of the governmental institutions in the Philippines as a potential cause of the multiple crises that the country has experienced. Furthermore, (Pennay, 2014) states that it is unclear which one is the cause and which one is the effect, with financial crisis weakening governmental institutions and weak governmental institutions generating (mis)managing financial crises.

Philippines, like most other Southeast Asia countries did experience inflows of foreign capital during the years before the financial crisis but due to the above mentioned peculiarities this capital was mostly channeled to the manufacturing (export oriented) sector rather than to the real estate sector that proved a significant advantage during the actual crisis.

This is not to say that the banking system of the Philippines had no significant exposure to the real estate sector. According to (Bello, 2009), the commercial bank loan exposure of the Philippines to the real estate sector was approximately 20% in the period just before the financial crisis, while the real estate exposure in Indonesia during the same period was approximately 25% (Bello, 2009). (Nolan, 2000) also mentioned

Country	GDP 1998 (%)
Indonesia	-13.1 (%)
Malaysia	-7.4 (%)
Philippines	-0.6 (%)
Singapore	-2.2 (%)
South Korea	-5.5 (%)
Thailand	-7.6 (%)

TABLE 2.5: GDP (1998);Source: World Bank

that the Philippines, while attracting large foreign capital, did it to a much less degree to its regional peers with global assets allocators such as Morgan Stanley Asset Management having an underweight position on the country, meaning that less hot money was likely entering the Philippines during the pre-crisis period and hence there were smaller outflows during the crisis period.

Therefore, the situation of the Philippines in the pre-crisis period was rather different than other countries in the region with a banking sector less exposed to the real estate sector and less exposure to contagion as it has received less inflows of hot money due to its lackluster performance in the previous decades.

2.4.2 Crisis

The Philippine peso experienced depreciation against the USD of approximately 37% from June 1997 to September 1998, which is in line with most of the Asian neighbors such as Thailand, Malaysia and South Korea. Indonesia had a larger FX depreciation in excess of 83%. The Philippines, opposite to the cases of Thailand and Malaysia did not strongly support its currency. The Philippine peso was allowed to free float in July 1997. Nevertheless, the impact on the GDP growth for the Philippines in 1998 came at only -0.6%, which is considerable better than the one experienced by for instance Indonesia (-13.1%).

The Philippines was one of the very few Asian countries, at the time of the Southeast Financial Crisis to have a fund deposit insurance (Kalpana Kolchar, 1998), likely helping alleviating runs in the Philippines banks. As previously mentioned the banking sector in the Philippines was less exposed to the real estate sector than most of its regional peers and this likely helped maintaining the ratio of non-performing loans relatively low. There continues to be significant uncertainty about the actual

Country	Exposure (%)
Indonesia	30 (%)
Malaysia	40 (%)
Philippines	20 (%)
Singapore	40 (%)
South Korea	25 (%)
Thailand	40 (%)

TABLE 2.6: Banking system exposure to the real estate sector. Source: Bank of International Settlements, Goldman.

Country	Exposure (%)
Indonesia	9 (%)
Malaysia	6 (%)
Philippines	3 (%)
Singapore	2 (%)
South Korea	14 (%)
Thailand	18 (%)

TABLE 2.7: Banking sector non-performing loans (1998). Source: Goldman

level of NPLs for the banking system of Asian countries during the Southeast Asia Financial Crisis. One of the most frequently quoted figures are the estimations from Goldman Sachs in 1998 (IIE, 1999).

2.4.3 Post-Crisis

The final impact of the Southeast Asia Financial crisis on the Philippines was slightly more moderate but comparable to those of its regional neighbors, Thailand and Malaysia, and better than the one experienced by Indonesia. The economic recovery of the Southeast Asia financial crisis was relatively quick from most Asian countries, including the Philippines, income per capita recovered quickly and by 1999 it had bounced back to pre-crisis levels (Sutiphand, 2007). However, the GDP growth rate of the Philippines, according to figures from the World Bank was in the pre-crisis period 5.8% (1996). In the following ten years the GDP growth rate only exceeded the 1996 rate once, in 2004 coming at 6.7%.

Some authors have highlighted that Asian women experienced a disproportionate impact from the financial crisis as they are more exposed to poverty and substandard working conditions (Pennay, 2014). (Pennay, 2014) mentioned that Filipinas had a rather challenging time recovering from the Southeast Asia Financial Crisis due to inadequate policies from the government. The author did also mentioned that this is likely the reality faced by women across all other Southeast Asian countries and not specific to the Philippines only.

In 1998 Joseph Ejecito Estrada, representing the political party PMP, won the general election succeeding Fidel V. Ramos as president of the Philippines. Estrada won the election with a populist message, promising alleviating poverty. (Thompson, 2016) mentioned that president Estrada did not have the support of the elites in the Philippines, causing instability that lead in 2001 to his impeachment, through a military coup. President Estrada was replaced in 2001 by President Gloria Macapagal-Arroyo, who was Estrada's Vice President.

A significant consequence of the Southeast Asia Financial Crisis was the perception by the countries involved on the need to "self-insure" (Muchhala, 2007) or in other words he need to have large cash reserves to protect from external financial shocks. It was estimated by (Muchhala, 2007) that as of 2007 Indonesia, Malaysia, South Korea and the Philippines had more than 461 bn USD in reserves. Some critics, such as (Muchhala, 2007), have mentioned that those reserves were not efficiently managed as they were mostly held in low yielding assets, such as US treasuries,

rather than invested in profitable development projects.

Unemployment

The unemployment situation in the Philippines was one of the most stable during and after the crisis. The rate remained roughly unchanged around 3.7% from 1993 to 2001. This is a rather different unemployment dynamics than the one experienced by for instance Malaysia with a steady decline on unemployment in the pre-crisis followed by a clear rebound after the crisis. In fact, while the Philippines economy was clearly impacted by the crisis there is no evidence that it had any significant impact on the unemployment rate.

Inflation

The Philippines before the South East Asia Crisis was experiencing relatively high inflation rates. For instance, inflation reached 4.48% in 1996. The country experienced hyperinflation in the previous decade with an inflation rate as high as 50% in 1984. As in the case of many other countries in the region the inflation rate actually decreased in 1997, reaching 5.59% spiking back 9.23% in 1998. Inflation during the years following the crisis did never went below 2% as it occurred in many other of its regional peers.

Exports

The Philippines had a very strong increase in exports in 1997, up 21.5%. This contrast for instance with only a 1% increase in the case of Malaysia. However exports did not only decline in 1998 (-9.7%) but also, and very significantly, in 1999 (-39.4%). Exports of goods and services finally rebounded in 2000, up 17.1%.

2.5 South Korea

2.5.1 Pre-crisis

South Korea joined the OECS in 1993 embarking in a process of financial liberalization that has been criticized by some scholars (Sundaram, 2013). For instance, (Sundaram, 2013) criticized the decision of opening the Korean capital account to early in the process of liberalization of its economies, which in (Sundaram, 2013) opinion favored large conglomerates that were able to benefit from the mobility of capital internationally while in the process losing their focus on industrializing the country. South Korea experienced a recession in 1980 and experienced after that several years of strong economic growth before the financial crisis.

South Korea embarked in a process of financial liberalization in the pre-crisis period. This phase can be divided into three main periods (Balino, 1999):

1. 1993. Interest rate deregulation, applicable to most financial products such as deposits.
2. 1994-1995. Continuation of interest rate deregulation. Removal of most restrictions on CDS.
3. 1996-1997. Further liberalization of interest rates.

Several other reforms were introduced by the South Korea during these years such as for instance partial liberalization of the capital account as well as a significant expansion of the number of industries in which foreigners were allowed to invest. As a result of all these measures, by the start of the Southeast Asian Financial Crisis, South Korea had one of the most opened economies among its regional peers. During the pre-crisis period South Korea had a booming economy with unemployment rate consistently below 3% and real GDP growth of 8.6% and 8.9% in 1994 and 1995 respectively. By 1996 there were however some indications of a mild slowdown in the economy by a deceleration of GDP growth (7.1%). Nevertheless, economic growth remained at robust levels. The stock market also gave some indications of the possibility of troubles ahead with a 26% correction in 1996.

(Balino, 1999) considers that the South Korean financial institutions were not robust enough to handle the rapid liberalization that the Korean economy experienced

during the pre-crisis period, causing implementation mistakes. One of the regulatory issues mentioned by (Balino, 1999) is that there was a fragmented regulatory environment with multiple regulatory bodies but without an ultimate institution providing a centralized overall regulation to the financial sector. The overlapping, and sometime competition, between institutions such as the Ministry of Finance, the Office of the Banking Supervision and the Monetary Board created what (Balino, 1999) described as “regulatory arbitrage” with financial institutions able in some instances to pick what regulator to ask for approval for new business.

Chaebols

Chaebols are family controlled conglomerates that have had a very profound role in the Korean economy for many decades. Perhaps, one of the most well-known Chaebols is Samsung. Samsung is a very large conglomerate with business in multiple sectors such as semiconductors, home appliances, defense and financial services. Other well-known chaebols include Hyundai, Lotte and Hanjin. These family run conglomerates are not exclusive from South Korea, with many other countries having similar companies, but South Korea is perhaps an extreme case with chaebols accounting according to some estimates (C, 2017) for 80% of the South Korean overall economy. Other authors, such as (Premack, 2017) lower that figure to 68% but mentioning that assets held by Chaebols are approximately equal to 110% of the Korean GDP. Despite some uncertainty regarding their overall size it is clear that chaebols represent a very important part of the Korean economy. Another peculiarity of chaebols is that it is frequent that they have cross holdings with other chaebols. It is also not uncommon that chaebols enter into agreements guaranteeing each other debts.

(Kinwam, 2006) mentioned that in the pre-crisis period there was a significant expansion of the number of commercial banks with many of those banks owned or controlled by chaebols. Borrowing in foreign currency, particularly US dollar and Japanese Yen, was one of the main activities of those banks with the funds invested in the industrial activities of chaebols. This was a very common trade with the low interest rate in foreign currencies (particularly the Yen) translating into cheap credit for large corporations that were under guidelines from the South Korean government to expand their industrial capabilities (Kinwam, 2006). This process will come

to a sharp end. First, with Japanese financial institutions becoming less willing to lend, followed during the crisis by the reduction on lending and investment by the large American banks during the crisis period.

2.5.2 Crisis

The depreciation of the Korean Won from January 1997 to September 1998 was 34%, slightly smaller number than the one experienced by the currencies of Thailand, Malaysia and the Philippines and substantially better than the 83% depreciation experienced by Indonesian rupiah. Non-performing loans, according to estimations by Goldman Sachs, reached in 1998 14%, second only to the NPL rate in Thailand at 18%. This was probably related to the close relationship between the banking system and chaebols (Kinwam, 2006) which likely translated in weak lending standards. Interestingly, compared to its regional neighbors the exposure of the Korean banking system to the real estate sector was relatively low coming at 25% (see table 2.6). Only the Philippines had less exposure to the sector.

The rapid slowdown in Japanese Yen denominated credit, coupled with the rapid devaluation of the Won and the collapse in the stock market put substantial pressure on the Korean economy that was exacerbated by US dollar funding drying up as well. This led to a liquidity mismatch between the required servicing of foreign debt, which had increased steadily over the last decade, and a weakening currency and economy. South Korea entered negotiations for a bailout with the IMF and an agreement was reached by the end of 1997. The rescue plan from the IMF has been heavily criticized (Kinwam, 2006). The bailout plan introduced by the IMF did not manage to calm foreign financial institutions with foreign currency credit remaining scarce and capital outflows continued. A full sovereign default was averted only by the final direct intervention of the US (Kinwam, 2006).

KAMCO

The Korean Asset Management Corporation (KAMCO) was created in 1967 few decades before the Southeast Asia Financial Crisis, and restructured in 1997 to deal with the increase in non-performing loans and bad assets experienced by South Korea, which as mentioned before were among the largest among regional peers. One of the main functions of KAMCO is to work as a bad banks in which troubled assets are kept until proper disposal can be carried out. Troubled assets were purchased by KAMCO from commercial banks, allowing them to operate with less balance sheet

Channel	Recovery rate (%)
International bidding	26.4
ABS	52.0
Public auction	38.9
Collection	46.9
Individual loan sale	35.0
Sale to AMC	35.6
Sale to CRC	36.5
Daewoo	81.3
Total	46.8

TABLE 2.8: KAMCO recovery rates according to the channel utilized.

Source: Extracted from (He, 2004)

pressure. (He, 2004) mentioned that KAMCO benefited from the development of the distressed markets, i.e., investment in asset and/or securities of companies that are undergoing financial distressed typically at step discount. KAMCO was able to recover some of the capital utilized to purchase these troubled assets from banks by issuing asset backed securities. Asset backed securities were uncommon in Asia at that time and their issuance was considered as a significant success for KAMCO (He, 2004).

KAMCO used several avenues to try to recover the funds used to purchase these assets. The recovery rates vary depending the type of channel used but on average it achieved a remarkable 46% recovery rate (He, 2004). Table 2.8, extracted from (He, 2004) show the different recovery rates for the different channels utilized.

Bankruptcies

The bankruptcy legal process in South Korea before the crisis was not particularly efficient (Lim, 2002) with most assets liquidated in a “non-judicial” manner (Lim, 2002). To make things more complicated there were two main ways in which companies can handle bankruptcies: 1) file for composition and 2) file for reorganization. One of the major differences between these two approaches is the in the first option (composition) the controlling shareholder can does not lose all its equity in the company while in the second case controlling shareholders have no real claims as they are considered, at least partially, responsible for the bankruptcy (Lim, 2002). (Lim, 2002) highlighted the case of Kia motors that file for composition in 1997 while at

Country	Debt to equity ratio (%)
South Korea	396
United States	154
Japan	193

TABLE 2.9: Debt to equity ratios during the Southeast Asia Financial crisis. Source: (Joh, 2004)

the same time the shareholder file a petition for reorganization. According to Korean law a petition for reorganization has priority over a petition for composition and finally this was the avenue followed for KIA's bankruptcy. However, (Lim, 2002) mentioned that these conflicting petitions unnecessary delayed the legal process and added financial pressure on the company.

1997 was a challenging year for the chaebol system with multiple bankruptcies. The first major bankruptcy of a Chaebol in 1997 was Hanbo Steel. This occurred before Thailand let the baht free float with the problems of Hanbo preceding the Southeast Asia Financial crisis. (Joh, 2004) mentioned that the fragility of the chaebol system during that period was related to the high amount of leverage that some of these corporations had. According to (Joh, 2004) Korean companies had at that time a debt to equity ratio of 396%, considerable larger than those in other countries at the time (see table 2.9).

This would suggest that after several years of strong economic growth some Korean companies were overleveraged and that the banking system, which was as previously mentioned closely intertwined with the chaebol system, was also exposed in the event of economic recession.

2.5.3 Post-Crisis

South Korea recovered relatively quickly from the crisis with negative GDP growth only in 1998 (-5.5%) and a strong rebound, albeit from a low base, in the following year 11.3%. The GSP growth for the five year period before the crisis (1992-1996) was 7.9% while the average GDP growth after the crisis (1999-2003) was slightly lower coming at 7.0%.

One of the frequently positive mentioned consequences of the Southeast Asia Financial Crisis in South Korea was a push to reform corporate governance in the country providing more transparency as better protection for investors (Sundaram, 2013) as well as the reform of the bankruptcy procedures. The bankruptcy law was amended in 1998 establishing clear rules separating judicial and non-judicial bankruptcy procedures based on the financial situation rather than in the most subjective social benefit of the company, which was the prevailing consideration until the financial crisis.

Another frequently mentioned result from the financial crisis were several round of privatization of state controlled assets as there was social pressure to quickly recover the investments done by KAMCO to bailout firms (He, 2004) with the trend of privatization expanding to assets not directly related to the bailouts.

Unemployment

Korea experienced one of the most extreme increases in unemployment as a consequence of the crisis but it was relatively short lived. The unemployment rate in the country on the pre-crisis period was low (2.05% in 1996), increasing to 2.61% in 1997 but the biggest increase in unemployment occurred in the following year with the rate reaching 6.96% (1998). After that the rate started to also sharply decrease reaching 4.4% in the year 2000. This is a very different unemployment behavior that the one experienced by for instance the Philippines (remaining roughly flat at 3.7% during this entire period).

Inflation

From an inflation point of view South Korea experienced similar trends than in the other Asian countries involved in the crisis but with overall higher rates (with the clear exception of the Philippines). Inflation in the pre-crisis period was 4.92% (1996), moderately declining in 1997 to 4.44% to then spike to 7.51% in 1998. This trend of an inflation decline in 1997 followed by a large spike in 1998 was very common among the countries involved in the crisis. This trend of an inflation decline in 1997 followed by a large spike in 1998 was very common among the countries involved in the crisis. In the following year inflation decline sharply reaching 0.81% but differently to most of its peers in the following years it rebounded above 2%.

Exports

Korean exports of goods and services had a relatively large increase in 1997, up 7.3% in USD current terms. Followed by only a modest 3.4% correction in the following year. Korean exports steadily increased after the small 1998 correction, increasing by 6.2% and 24.0% respectively. Compared to other peers, Korean exports experienced one of the smallest corrections in 1997 followed by one of the strongest growth periods in the following years.

2.6 Singapore

2.6.1 Pre-crisis

Singapore was, and remains, an important financial hub in Asia. However, in the period before the Southeast Financial Crisis Singapore had, opposite to its regional neighbors, significant restrictions on capital inflows and robust financial regulation. The Monetary Authority of Singapore had a longstanding policy, before the crisis, of non-internationalization of their local currency (the Singaporean Dollar) as this could expose a relatively small and otherwise open economy like Singapore to significant capital flows volatility (Tee, 2003). In other words it was not possible for corporations to borrow in Singaporean Dollars outside Singapore. Additionally, the Monetary Authority of Singapore required, before the crisis, that financial institutions seek their approval before extending credit, in local currency, to non-residents. Also, there was strict regulation preventing financial instruments to be used as speculative tools against the local currency. Therefore, Singapore before the Southeast Asia Financial crisis had a largely open economy but with an array of regulations in place, protecting the local currency from speculation

(Jin, 2001) mentioned that Singapore had a healthy banking industry with strong oversight. Weak regulatory bodies in other countries, such as for instance Indonesia, have been mentioned in the existing literature as a source of financial weakness. According to (Jin, 2001), Singapore had a robust banking regulatory framework before the crisis

Monetary Authority of Singapore

(Tee, 2003) gave credit to the Monetary Authority of Singapore (MAS) for having countercyclical measures in place before the start of the crisis, such as the previously mentioned long standing policy of non-internationalization of the Singaporean Dollar. The MAS is the central bank of Singapore and it is modeled on the Federal Reserve Bank of the United States. The mandate of MAS is “to promote sustained non-inflationary economic growth, and a sound and progressive financial centre” (MAS, 2020). Therefore it has a dual mandate, on one hand to maintain economic

growth while controlling inflation, similar to the mandate from the US Federal Reserve, and on the other hand to develop a stable financial centre.

Country	ST Debt/FX Reserves
Indonesia	1.89
Malaysia	0.71
Philippines	0.26
Singapore	0.04
Thailand	1.30

TABLE 2.10: Ratio of short-term debt to FX reserves (1997). Source: (Garrido, 2005)

2.6.2 Crisis

The resilience of the Singaporean banking system during the crisis was remarkable. Among the Southeast Asian countries Singapore had one the lowest NPLs rate in 1998 at only 2%, which is substantially lower than the 18% for instance experienced by Thailand. This is even more remarkable when taking into account that the Singaporean banking sector had a large exposure to the property sector, approximately 40% (see table 2.6), which has been identified as a risk factor in other countries. At the time of the crisis the Singaporean international reserve were larger than those of its regional neighbours, providing an extra buffer for the economy (Garrido, 2005), see table 2.10.

The Singaporean economy contracted in 1998 only 2.2%. Of the countries directly involved in the Southeast Asia Financial crisis only the Philippines experienced a smaller contraction in 1998. Indonesia for instance had a GDP contraction in 1998 of 13.1%. Authors such as (Tee, 2003) mentioned that the credibility of the Singaporean dollar exchange rate and the sound economic situation of Singapore before the Southeast Asia Crisis were among the major factors protecting the currency during this period. Nevertheless, Singapore felt the effects of the Southeast Asia Financial crisis with for instance the Singaporean dollar dropping close to 19% from July 1997 (when Thailand allowed its currency to free float) to the beginning of 1998.

2.6.3 Post-crisis

Malaysia in 1998 introduced regulation requiring Malaysian companies to trade only in the Kuala Lumpur Stock Exchange. Until that year several Malay companies traded in the Singapore Stock exchange that was considered more advanced and with more international projection. In this way the Singapore Stock Exchange lost access to Malay companies.

A combination of existing capital controls (pre-crisis) coupled with a string regulatory environment are likely to be some of the main factors giving the Singaporean economy some degree of protection during the Southeast Asia Financial crisis (Jin, 2001). This is not to say that Singapore was unaffected as the contraction in the economies of its regional neighbors impacted trade. There were other negative effects such as the previously mentioned lost of access for Malaysian companies to the Singapore Stock Exchange.

Interesting, after the crisis, there were some relaxations of the policies protecting the Singaporean dollar such as for instance allowing non-resident to freely transact local currency interest rate derivatives (Tee, 2003). This would seem a bit surprising considering the long standing direction of its financial policies but it is likely an important step in order to continue being an important international financial hub.

Unemployment

Singapore experienced a rather different unemployment situation compared to their regional peers. The unemployment rate dropped from 3.57% in 1996 to 2.5% in 1997, perhaps reflecting a more resilient and less impacted by the crisis economy (compared to other countries in the region). However, this initial improved in unemployment was short lived with the rate reaching 3.41% and 4.85% in 1998 and 1999 respectively.

Inflation

Singapore in the two years before the crisis was experiencing inflation rates below 2% and inflation rates in the roughly 2% to 3% range for many years. Just before

the crisis, in 1996 the inflation rate was 1.38%. The inflation dynamics in the Singaporean case was rather different with most of its peers with the inflation rate actually increasing in Singapore 1997 reaching 2% followed by a negative inflation in 1998 (-0.27%). Inflation remained below two percent until 2007 with another negative inflation (-0.39%) in 2002.

Exports

Singaporean exports of goods and services grew steadily in the pre-crisis period with almost no change in 1997 (0.2%). However, in the following years exports fluctuated significantly with a 10% correction in 1998, followed by a 18.7% in 1999 and another correction in the following year 9.2%. Singapore had one of the most volatile export growth rates among Asian peers during this period, second only to the one in the Philippines.

2.7 Other Asian countries/jurisdictions

The following countries and jurisdictions were added for comparison purposes in the analysis and are regional neighbors hence it seemed important to give a brief overview of their situation in the crisis for completeness purposes.

2.7.1 Mainland China

Mainland China was not directly affected by the Southeast Asia Financial Crisis. The Chinese economy in 1997 remained largely closed. (Mohamed, 2004) mentioned that one of the main reasons shielding China from this crisis was the strict capital controls in place in the pre-crisis period. Most of the existing literature seems to support this analysis with for instance (Wang, 1999) mentioning that the two main reasons behind China not experiencing the economic problems experienced by its neighbors during this period are:

1. Non-convertibility of the RMB. (Wang, 1999) “non convertibility of RMB through capital account transactions and only partial convertibility through current account transactions”.
2. Most of the foreign investment in form of long term FDI rather than short term FPI.

China started allowing foreign investors into their main equity market (A-share) in 2003, several years after the Southeast Asia Financial crisis and only through a pilot program called Qualified Foreign Institutional Investors “QFII”. This program allowed large international financial institutions access to the A-share market through a tightly managed system which includes maximum quota allocations for each individual investor as well as overall maximum ownership limits in any given stock by all international investors (cumulative foreign ownership).

The currency (RMB) was also largely shielded with the RMB pegged to the USD and not convertible (capital account). There is a distinction between the onshore RMB market and the offshore RMB market. The onshore RMB market, usually called CNY, is the RMB in Mainland China, which account for the vast majority of the RMB transactions and holding. As previously mentioned the CNY was (and remains)

largely insulated as there is no capital account convertibility. There is also a much smaller offshore RMB, typically called CNH, mostly based in Hong Kong. CNH is not as shielded as the CNY but its size minimal compared to the onshore market.

Therefore, a combination of long term investment from foreign investors (FDI) rather than short term speculative portfolio investments in the secondary market, coupled with no, or at least very limited, transmission channels (due to very strict financial regulations) were likely the main reasons shielding China from the South-east Financial Crisis that affected a large amount of its regional neighbors.

Country/jurisdiction	Foreign Reserves (USD Billion)
Hong Kong (SAR)	92.8
Indonesia	17.4
Mainland China	142.8
Malaysia	20.8
Philippines	7.2
Singapore	71.2
South Korea	20.4
Thailand	26.3

TABLE 2.11: Foreign exchange reserves (1997). Source: (Chirathivat, 2007), IMF

2.7.2 Hong Kong (SAR)

In 1997 Hong Kong was reunited with Mainland China after a prolonged period of British control. The financial institutions and the overall financial system in Hong Kong at the time of the Southeast Financial Crisis were modeled according to the British system and was considered an efficient one. The legal tender of Hong Kong is the Hong Kong dollar that was pegged to the USD since 1983 at a rate of 7.8 HKD/USD. A few years after the financial crisis, in 2005, the strict pegged was replaced by a relatively narrow trading band. Hong Kong successfully defended the peg against speculative attacks during the Southeast Financial Crisis period. One factor facilitating the defense of the peg was the large reserves of foreign capital held by Hong Kong, second only among neighboring Asian countries/jurisdictions to that of Mainland China (Chirathivat, 2007). Hong Kong strongly defended the currency peg with the Monetary Authority of Hong Kong, the defacto central bank of Hong Kong, using its reserves to support the HKD. For instance, it was reported that the HKMA spent in two hours on July 24, 1997 1 USD billion supporting the HKD (Kearney, 2014).

While Hong Kong overcame the Southeast Financial Crisis better than most of its regional neighbors and was able to maintain the HKD/USD peg it was clearly affected by it. According to data from the IMF the Hong Kong economy managed to grow in 1997, with a GDP of +5.1%, but contracted in 1998, GDP -5.5%. To then remain positive in the following years. The performance of the Hong Kong economy during this period considerably lagged that of Mainland China. Mainland China did

not have, during this period, a single year of negative growth with GDP increasing 9.3% and 7.8% in 1997 and 1998 respectively. GDP growth in the post-crisis period in Hong Kong remained positive but volatile with oscillations such as a GDP increase of 10.0% in 2000 followed by a GSP increase of only 0.6% in 2001. The stock market in Hong Kong was also impacted with the Hang Seng Index down approximately 46% from the peak in August 7, 1997 of 16,673 to the bottom of October 28, 1997 of 9,059.

Country/jurisdiction	1996	1997	1998
Hong Kong (SAR)	87.5	76.3	38.7
Indonesia	22.0	22.0	16.4
Mainland China	17.8	19.6	15.1
Malaysia	8.2	8.6	6.6
Philippines	1.6	2.6	2.3
Singapore	58.8	58.6	29.5
South Korea	24.3	20.3	16.9
Thailand	37.5	33.2	22.4

TABLE 2.12: Japanese bank assets in Asia (USD billions). Source: (Katada, 2001)

2.7.3 Japan

Japan, after a period of remarkable expansion in the 80s experienced a challenging 90s in what has been described as the Japanese “lost decade” (Gary Saxonhouse, 2002). During the 80s Japan experienced an asset price bubble, both in equities as well as in real estate prices. The collapse of that bubble led to a decade of economic troubles for Japan. (Fumio Hayashi, 2014) mentioned that a period of overinvestment in the 80s was followed by a period of underinvestment by Japanese institutions in the 90s with even the banking system more reluctant to lend capital to foreign companies and/or projects. Japan in 1997 was experienced substantial economic pressure at home with the bankruptcies of two major financial institutions Hokkaido bank and Yamaichi Securities (1997). Japanese banking institutions faced with deteriorating credit conditions, both domestically and internationally, started to reduce exposures to other Asian countries (Katada, 2001). The retrenchment of the Japanese banks overseas was not homogeneous across all Asian countries with geopolitical considerations affecting those decisions and varying from country to country.

(Katada, 2001) described three phases of the Japanese reaction during the crisis and highlighted that they were not consistent. These significant policy changes might have been related to the varying perceptions of the situation in the Japanese domestic audience.

1. Phase 1: Active leadership (early to mid 1997)
2. Phase 2: Passive (late 1997)

3. Phase 3: Moderately active (1998)

In Phase 1 there was an unsuccessful initiative by Japan, sponsored by its financial vice minister, to form an Asian Monetary Facility (AMF) targeting a size of approximately 100 bn. This initiative never really gained traction and was quickly abandoned (Sundaram, 2013; Fumio Hayashi, 2014) with opposition from the other major economic blocks, namely the US, China and Europe. This would have been an institution designed to largely replace the role of the International Monetary Fund (IMF) in Asia and was suggested during a period of intense criticism of the IMF policies in several Asian countries. In Phase 2 Japan took a secondary role, with no major initiative proposal. In Phase 3 Japan proposed what is usually called the New Miyazawa Initiative. The New Miyazawa Initiative was, according to (Katada, 2001), partially forced by the request of the US to Japan to do more for its regional neighbors as the US attention shifted to new financial crises developing in Russia and Brazil. Most of the help under this new Japanese initiative came in the form of a 30 USD billion aid package for the Asian countries impacted by the financial crisis.

2.8 Conclusions

It was shown in this chapter that the impact of the economic crisis as well as the actions taken the countries involved in the countries to try to overcome this crisis were rather different. For instance, the majority of countries that received a bailout offered by the IMF accepted it. The exception of this trend was Malaysia that rejected the bailout mentioning that the IMF conditions will dampen economic growth in the following years. Interestingly the severity and duration of the crisis in Malaysia was comparable to that of Thailand or Indonesia that accepted the bailout program from the IMF.

It was also shown that Thailand was one of the most impacted countries by the crisis with for instance a 97.7% of output loss (as percentage of GDP) compared to 50.0% in Malaysia and 50.1% in South Korea. Another interesting observation is that the increase in unemployment was relatively short lived. Interestingly, South Korea that is one of the countries that experienced the fastest recovery had one of the largest increases in unemployment. In this regard the case of the Philippines is rather remarkable with an unemployment rate remaining basically unchanged during the pre-crisis, crisis and post-crisis periods.

In this chapter some major event were also highlighted such as the end of the currency peg for the Thai Baht or the collapse of Peregrine Investments. These events will be used in a late chapter to develop an event driven analysis of the crisis from a stock market point of view. In this chapter it was also highlighted the banking crisis in Indonesia, which was one of the most severe, likely caused not only for the complicated economic situation generated by the crisis but also for the mismanagement of the process as well for weak or inappropriate regulatory institutions. Indonesia has arguably one of the healthies economies before the crisis, at least compared to its peers, but it experienced, together with Thailand, one of the most severe crisis.

Chapter 3

Short-term event driven impact on stock market

3.1 Introduction

The South-East Asia financial crisis of the late twenty century was an unexpected (Krugman, 1999) development that saw a rapid deterioration of the economies (Suryahadi, Hadiwidjaja, and Sumarto, 2012) and financial markets (Choudhry, Lu, and Peng, 2007; Khan and Park, 2009; Click and Plummer, 2005) of several South-East Asian countries. Several of the countries directly impacted by the crisis had experienced significant economic growth in the years previous to the crisis (Huang and Xu, 1999). There were several major events during the crisis, such as Thailand floating the currency as well as political changes such as the high profile replacement in Malaysia of the finance minister, creating a very complex economic and financial situation. External factors, such as the IMF intervention, have been also frequently cited as detrimental (Bello, 1999) further adding complexity to the crisis with some authors, such as (Pilbeam, 2001), suggesting that some of the programs introduced by the IMF were too harsh. In fact some authors, such as Miller, 1998, consider that it is more precise describing the situation as multiple crisis occurring simultaneously rather than a single crisis with papers such as (Akyüz, 1998) mentioning the substantial differences in the economies of the countries involved in the crisis. Some of the countries/regions more heavily impacted by this crisis were Thailand, where the crisis arguably started, Malaysia, Indonesia, South Korea and the Philippines. Some

authors, such as Dickinson and Mullineux, 2001, have mentioned that one major factor behind the crisis was the ineffective financial regulation in some of the countries impacted.

Most of the existing literature in the South-East Asia financial crisis focuses on the impact on the real economy as well as in the fluctuations in the foreign exchange market (Woo, Carleton, and Rosario, 2000). This is perhaps due to some very high profile developments in the foreign exchange market such as the well-known bet of George Soros against the baht. There are also some interesting research, such as Beaverstock and Doel, 2001, mentioning the role played by the banking sector, of both domestic institutions as well as of the international investment banks.

There is however relatively less literature covering the impact on the stock market, particularly from a short-term event driven angle. There is ample literature suggesting that there are volatility clusters in several equity markets (Lux and Marchesi, 2000; Cont, 2007) and such clusters might potentially be related to a major event. An example of such an event could be Thailand letting its currency to free float during the South-East Asia financial crisis on July 2, 1997. Until that moment most South-East Asian countries have defended their currencies, many of them pegged to the U.S. dollar. A related factor frequently mentioned in the existing literature Radelet and Sachs, 2007 is the spread of financial panic. In this paper we carry out a short-term event driven Granger causality analysis using some important events cited in the existing literature. Granger causality tests are a frequently used technique to analyze dependencies between financial variables (Ibrahim, 2000). The analysis focuses on the impact on the equity markets rather than the impact on the foreign exchange market.

One of the assumptions underlying this chapter is that some events, such as for instance the end of a currency peg, can trigger significant movements in the local equity market. Furthermore, the impact on those events can also spread to other markets, particularly regional, also impacting their performance. It seems also reasonable to assume that in principle this market fluctuations can be short lived, averaging out over long periods of time, but having substantial impact in the short term. In order to analyse these events it is necessary to have the appropriate mathematical and statistical tools. It should be noted that the focus on this paper is on trying to

determine the changes in interdependencies of stock markets rather than on trying to forecast the stock prices themselves. In recent years there has been a focus on using machine learning techniques generating interesting results, such as for instance neural networks (García et al., 2018; Cervelló-Royo and Guijarro, 2020).

However, the analysis in this chapter focuses on changes in the dynamics of the market with actual forecasting outside of the scope. An underlying assumption in this analysis is that the Granger causality test can detect some causality relationships. This is a common assumption in multiple articles such as Hoffmann et al., 2005 and Lopez and Weber, 2017. It is not assumed that the Granger causality test fully accurately reflects underlying causality relationships but it is rather used as a quantitative indication of their existence. In other words, the Granger causality test reflects Granger causality rather than true underlying causality. Nevertheless, it is important to have a quantitative test that can be applied objectively to the data to try to minimize as much as possible the potential for biases in the analysis.

The following are some of the assumptions on this chapter:

Hypothesis 1 *Some events can trigger significant movements in the local stock market.*

Hypothesis 2 *The impact on those events can also spread to other markets, particularly regional markets, also impacting the performance of those capital markets.*

Hypothesis 3 *This fluctuations can be short lived, averaged out over long periods of time, but having substantial impact in the short term.*

Hypothesis 4 *Statistical tests such as the Granger Causality test can detect this type of causality relations.*

3.2 Some major events during the South-East Asia financial crisis

It is a challenging task to identify the major events during any financial crisis and the South-East Asia financial crisis is no exception and even more complex to determine the factors that might impact the equity market. For instance, besides objective

TABLE 3.1: List of some major events during the South-East Asia financial crisis.

Event	Date	Description
1	July 2, 1997	End of the Thai baht peg
2	August 14, 1997	Indonesia let the currency to free float
3	October 14, 1997	Restructuring package announced by Thailand
4	January 12, 1998	Collapse of Peregrine investment
5	March 31, 1998	Thai guideline of definition of non-performing loans
6	May 11, 1998	Joseph Estrada wins general elections in the Philippines
7	September 3, 1998	Finance minister of Malaysia replaced

financial conditions there is some existing research on the impact of investors sentiment (Guijarro, Moya-Clemente, and Saleemi, 2019) on the equity market. This could be a particularly important factor to be taken into consideration during financial crisis. It is also acknowledged that there is some degree of subjectivity and that there are some other events that could potentially be considered. Nevertheless, it is necessary when attempting to carry out an event driven analysis, to identify a list of such events that are significant enough to have had a large impact on the stock market. In this case of the South-East Asia financial crisis seven events (table 3.1) were identified as substantial enough to potentially having the capacity to impact the stock market. These events range from July 2, 1997 (Jansen, 2001) that saw the end of the Thai baht peg (event 1), to September 3, 1998 with the replacement of the finance minister in Malaysia (event 7). Some authors, such as Jansen, 2001, consider that the start of the South-East Asia financial crisis was July 1997, coinciding with the end of the Thai baht peg. Krongkaew, 1999, more explicitly, mentions that the start of the economic crisis occurs in Thailand with the flotation of its currency. Hence this event should be one of those analysed.

Pressure had been building on the Thai economy since early 1997 and were becoming evident with the default of Somprasong Land (Wong, 2001), a property developer, adding concerns about the health of property developers. However, this event by itself did not appear to have caused an impact on the broad financial market or economy. Another factor to take into account was the increasing pressure from hedge funds Robins, 2000 on the baht. Perhaps some of the best known hedge funds to bet against the baht during this period are the Quantum Fund and Tiger

Fund with a reportedly one and three billion U.S. dollars short positions on the currency respectively. It should be mentioned that the actual impact that the hedge funds had on the South-East Asia financial crisis remains a disputed topic with authors, such as Brown, Goetzmann, and Park, 2000, not founding empirical evidence that hedge funds caused the financial crisis in Thailand. Regardless of the actual impact of hedge funds the situation in the currency front eventually became unsustainable and Thailand had to float its currency. After the flotation of the Thai baht there was an almost immediate overnight depreciation compared to the U.S. dollar (Punyaratabandhu, 1998) putting substantial pressure on Thai companies that had borrowed in U.S. dollar terms. The deterioration in returns combined with large amounts of borrowings in foreign currency plus a significant devaluation of the baht proved to be a combination that hurt a large amount of Thai companies that were unable to repay their borrowings. Jansen Jansen, 2001 and several other scholars have mentioned that financial institutions as well as companies got used to have a stable currency pegged to the U.S. dollar creating a false sense of security and causing poor risk management. According to these authors the possibility of a sudden change in the exchange rate of the baht was regarded as a rather remote possibility and this perception was based on many years of stable foreign exchange values and growing economy. While there were financial tools for hedging currency exposure the borrowing from Thai domestic companies was predominantly not hedged Kawai and Takayasu, 1999 and hence companies had to absorb loan repayments denominated in U.S. dollar while the local currency was rapidly depreciating.

Another event considered (event 2) was Indonesia letting its currency to free float in August 14, 1997 (Pratomo, Warokka, et al., 2013). This was arguably unavoidable after Thailand ending its peg a few weeks earlier and the Indonesian currency reserves coming under increasing pressure during those weeks. In the initial stages of the financial crisis Indonesia showed some signs of resilience. This situation quickly changed with the local currency slumping and a run on the banking sector putting the national finances under considerable stress. One of the first clear signs of stress in Indonesian economy appeared in the currency market with the Indonesian rupiah slumping against the U.S. dollar from July 1997 to January 1998. Indonesia had started a process of liberalizing the exchange rate system in the previous decades

and by 1997 the Indonesia rupiah traded within a relatively narrow band relatively to the U.S. dollar. Given the increasing pressure on the currency and the cost of defending it, Indonesia decided on August 14, 1997 to float the currency. The regime shift added significant amount of volatility to the exchange rate and increased economic pressure. Some authors, such as for instance Pratomo, Warokka, et al., 2013, have argued that the Indonesian rupiah was not a stable currency even before the South-East Asia financial crisis and that if more efforts were have done to stabilize it in the years before the crisis the rupiah should have hold substantially better during the crisis period.

After a turbulent summer of 1997 several of the countries engulfed in the crisis developed economic plans to tackle the crisis, such as for instance the restructuring package introduced by the Thai government in October 14, 1997 (event 3). This restructuring initiative received the praise by the IMF with IMF managing director, Mr. Michel Camdemssus, stating “The Thai government has made a significant announcement today about its detailed strategy to restructure Thailand’s troubled financial sector”. An important development of this initiative was the creation in Thailand of the Financial Sector Restructuring Authority commonly known as FRA (Hawkins, 1997). FRA was one of the main agencies in charge of assessing the economic situation and handling troubled financial assets and had a wide range of powers including the ability to request troubled financial companies to recapitalize or to arrange acquisitions by third parties. An event that attracted substantial attention during the South-East Asia financial crisis was the collapse or Peregrine Investments in early 1998 (event 4). Peregrine Investments went into liquidation in January 1998 in Hong Kong. At the core of the collapse of Peregrine Investments was a 269 million U.S. dollar loan to a taxi company in Indonesia called PT Steady Safe. Several attempts to restructure the loan were unsuccessful with the company going into liquidation relatively quickly after the start of the South-East Asia financial crisis. It should be noted that Peregrine Investments was a well-regarded institution with diversified operations across Asia and to a lesser degree in Europe and the US. At the time of its collapse it was one of the largest independent investment bank in Asia. A few months later, in 1998, there was a subtle but important development with Thailand modifying the definition of non-performing bank loans (event 5). The

TABLE 3.2: Banking system exposure to the real estate sector. Source: Bank of International Settlements.

Country	Country Exposure (%)
Indonesia	30
Malaysia	40
Philippines	20
Singapore	40
South Korea	25
Thailand	40

objective of this measure was to make the definition of non-performing bank loans in Thailand in line with the international accepted guidelines Kawai and Takayasu, 1999. While a positive development, this reclassification arguably added in the short term more pressure on the market as international standards at the time were more stringent.

Another event considered was the successful presidential campaign of Mr. Joseph Estrada in the Philippines (Claudio, 2014; Ringuet and Estrada, 2003), representing the political party PMP, becoming president after winning the elections in May 11, 1998 (event 6). Estrada won the election with a populist message (Hedman, 2001), promising alleviating poverty. The Philippines was one of the very few Asian countries, at the time of the South-East Asia financial crisis to have a fund deposit insurance scheme (Kochhar, Loungani, and Stone, 1998), likely helping alleviating runs in the Philippines banks. Additionally the banking sector in the Philippines was less exposed to the real estate sector (table 3.2) than most of its regional peers. This is not to say that the banking system of the Philippines had no significant exposure to the real estate sector. According to Bello, 1999, the commercial bank loan exposure of the Philippines to the real estate sector was approximately 20% in the period just before the financial crisis, while the real estate exposure in Indonesia during the same period was approximately 25% (Bello, 1999). Several authors, such as Krugman, 1999, have mentioned that a major issue was that a large amount of the capital borrowed overseas was directed towards investment in real estates. In many occasions foreign capital was cheaper than domestic one and companies borrowed in foreign currency increasing their foreign exchange risk.

A lesser exposure of the banking sector to property developers was one of the

TABLE 3.3: GDP (1998). Source: World Bank.

Country	Country Exposure (%)
Indonesia	-13.1
Malaysia	-7.4
Philippines	-0.6
Singapore	-2.2
South Korea	-5.5
Thailand	-7.6

factors allowing the Philippines to be relatively less impacted than its peers by the crisis with for instance, according to figures from the World Bank, having the smaller GDP correction in 1998 (table 3.3).

This is not to say that the Philippines were untouched by the financial crisis. For instance, the Philippine peso experiencing a depreciation against the U.S. dollar of approximately 37% from June 1997 to September 1998, which is in line with most of the Asian neighbours such as Thailand, Malaysia and South Korea. The last event considered was the abrupt replacement of the finance minister in Malaysia in September 3, 1998. Malaysia faced significant internal political turmoil during this period with public disagreement between the members of the Malaysian government regarding how to react to the crisis with on one hand the Prime Minister Mahathir Mohamad (Kelly, 2001), against accepting the bailout offer from the IMF, and on the other hand the finance minister that supported this idea and was an advocate of free markets. The finance minister was replaced (Sundaram, 2006) and Malaysia continued its strategy of not requesting a bailout from the IMF (De Saumarez, 2004). Prime Minister Mahathir mentioned that the IMF would have requested too stringent economic reforms and that IMF will focus only on loan repayments rather than on economic growth which was according to Prime Minister Mahathir not an acceptable approach for the country. Malaysia initial response to the crisis has been described by some scholars as a “state of denial” (Ariff and Abubakar, 1999b) with the government downplaying the seriousness of the situation. One of the first clear indications of the severity of the financial crisis was the depreciation of the Malay ringgit. The central bank of Malaysia (Bank Negara Malaysia) tried to support the currency purchasing at the beginning of July 1997 in excess of one billion U.S. dollar. It has been highlighted by some scholars that despite refusing the

intervention by the IMF the Malay government immediate response was roughly in line with the IMF suggestions, by substantially decreasing government spending and delaying major projects such as railways and the emblematic Bakun dam (Ariff and Abubakar, 1999b) and banning short term repatriation of capital (less than 12 months). The severity of the economic situation became self-evident rather quickly and the Malay government reacted by establishing, in the beginning on 1998, the National Economic Action Council, which could be described as a think-tank helping the government drafting policies to overcome the financial crisis. Eventually the government took two major decisions: 1) strict capital control, 2) peg of the currency to the U.S. dollar at a 3.8 rate. This meant that the offshore ringgit was no longer convertible, basically closing the offshore foreign exchange market and forcing some repatriations of ringgit into Malaysia. Furthermore, Malaysia went a step further by declaring the Malay ringgit “illegal tender outside Malaysia” and by freezing non-resident bank accounts holding deposits denominated in Malay ringgit. Despite all these measures the depreciation of the Malaysian ringgit compared to the U.S. dollar during the South-East Asia financial crisis was in line with most of its Asian neighbours, such as Thailand, Philippines and South Korea.

3.3 Methodology

A broad approach was followed in this chapter including in the analysis not only South-East Asian countries but also emerging and non-emerging countries in order to make the comparison easier as well as in order to determine base line pre-existing relationships. An underlying assumption is that financial crisis can cause contagion among the equity markets of different countries Kenourgios, Samitas, and Paltalidis, 2011. A short-term event driven Granger causality test was performed among all the 23 countries/regions analysed (table 3.4). Granger causality tests have been applied to the stock market in several paper such as Hiemstra and Jones, 1994. A set of events, previously identified in table 1, were used as critical dates representing significant developments such as for instance Thailand floating the baht. This differs from most of the analysis in the existing literature that tend to segment the analysis into the pre, post and crisis periods (Jang and Sul, 2002) rather than going to

TABLE 3.4: GDP (1998). Indexes included in the Granger causality test.

Country/region	Stock index	Country/region	Stock index
Argentina	Argentine Merval	Netherlands	Netherlands AEX
Australia	S&P ASX 200 Australia	New Zealand	NSZE
Austria	ATX Austria	Pakistan	Pakistan KSE
Belgium	Belgium BEL 20	Peru	S&P BVL Peru
Canada	S&P TSX 60 Canada	Philippines	Philippine PCOMP
France	France CAC 40	Portugal	Portugal PSI 20
Germany	Germany DAX	South Africa	FTSE JSE
Hong Kong	Hang Seng Index	South Korea	Kospi
Indonesia	Indonesia Jakarta Composite	Spain	IBEX 35
Japan	Nikkei 225	Thailand	Thai SET
Malaysia	FTSE Malay KLCI	United States	Dow Jones Industrial
Mexico	S&P BMC Mexico		

a more granular level during the actual financial crisis. For each event a time period, including ten days before and ten days after the events, was analysed. This period of time was chosen to avoid overlap between the different events which can make the interpretation of the results more difficult. Following the standard notation the variables can be described as (equation 3.1):

$$y_{i,t} = \alpha_{0,i} + \alpha_{1,i}y_{i,t-1} + \alpha_{2,i}y_{i,t-2} + \dots + \alpha_{j,i}y_{i,t-j} + \beta_{1,i}x_{i,t-1} + \beta_{2,i}x_{i,t-2} + \dots + \beta_{j,i}x_{i,t-j} \quad (3.1)$$

The inputs for the Granger causality test were the daily returns on the indexes of all countries/regions analysed for the previously mentioned periods (equation 2).

$$R_{t+1} = \frac{P_{t+1}}{P_t} - 1 \quad (3.2)$$

The Granger causality test was carried out using 2, 3 and 4 days lag. The data for all the stock equity indexes was obtained from Bloomberg.

This type of analysis intends to analyse events in isolation. It is acknowledged that events do not occur in isolation and that there are other moving parts. Nevertheless, the events described in table 3.1 are likely significant enough to have, by themselves, an impact on the stock market. A total of 23 countries/jurisdictions were included in the analysis. The Granger causality tests were carried out including all the pairs of stock indexes analysed. The Singaporean stock market was not included

in the analysis. This is due to data availability during the time period analysed. Given the number of data points, using more than a four day lag does not appear to be advisable. It is also acknowledged that a Granger causality tests does not necessarily infer real causality relationships between to events, but it is nevertheless an empirically objective test that can add some support to the existence of real underlying causality relationships between the variables analysed. Given that the Granger causality test of 23 countries are analysed in pairs, for seven different major events an including three different lag terms the number of tests is clearly rather large.

Another important factor that needs to be taken into account is that there could be structural, pre-existing, relationships between the countries/regions analysed. For instance, it would be likely that the stock market of a country would have an impact on the performance of the stock market in its region. In order to account for those relationships a base line Granger causality relationships was established using the index returns before the crisis. More specifically, the returns of the indexes were calculated for the 1996 calendar year and the related Granger causality tests calculated. Existing causality relationship before the crisis period were excluded from the list of Granger causalities relationships for each of the seven events analysed. In this way it was obtained a list of filtered Granger causality results.

The adjusted volatility for each of the seven periods analysed was also estimated. The first step consisted in calculating the daily standard deviations Schwert, 1990 for all the seven periods analysed (σ_p). This volatility by itself is difficult to interpret so it was scaled by dividing it by the average volatility of a reference period (σ_{Ref}) before the financial crisis (1996). The resulting number ($\sigma_{Adjusted}$) is dimensionless as it represents the ratio between two standard deviations (equation 3).

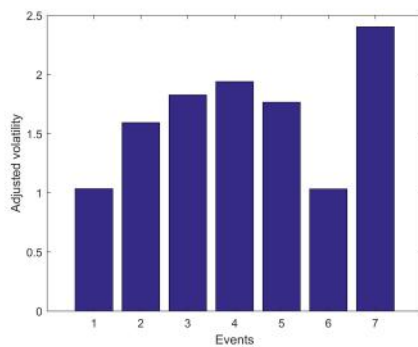
$$\sigma_{Adjusted} = \frac{\sigma_p}{\sigma_{Ref}} \quad (3.3)$$

The larger the number is the more volatile the market was, compared to the base line level, during the event analysed. A formal F-test comparing the volatility for each indexes in each event with the base line volatility was also carried out. The null hypothesis is that the volatility of the two distributions (base line and during the event) are the same.

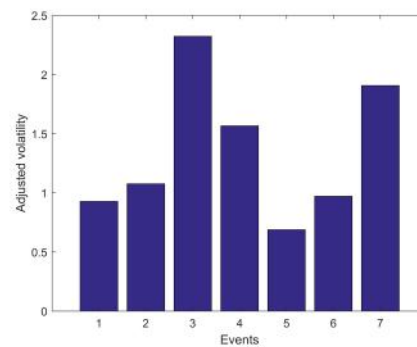
Results

The results seem to support the idea that there are three distinct phases, from a stock market volatility point of view. Initially the crisis was mostly regional in nature (event 1) mostly impacting emerging markets in South-East Asia. Volatility started to spread to other markets, such as for instance Japan (figure 3.1a) and even developed markets as different as Australia (figure 3.1b). This process reached its peak approximately at event 4. After that initial phase of increasing volatility (from event 1 to 4) volatility started to gradually return more normal historical levels. Volatility then experienced another spike during event 7. The results illustrated graphically with the adjusted volatility values were formally tested using F-tests. As previously mentioned the volatility for each event and each index was compared to the volatility during the base line period (1996). The result of the graphical approach and the formal statistical test are consistent with all the markets analysed having statistically higher volatility during events 3, 4 and 7 compared to their base line levels.

In order to estimate a base line the pre-existing (1996) Granger relationships were analyzed. During this period, the stock market of the countries in the region did not appear, according to the Granger analysis, to be a major driver of other markets. For example, Indonesia was only driver (Granger causality) of the Hong Kong and Portugal markets (using 2 day lag) and the Philippines was only a driver of the Thai market. Hong Kong was a driver of Argentina, Indonesia and the Netherlands and Japan of Austria, Indonesia and the Netherlands. Some of these Granger relationships might be the result of spurious data relationships not based on strong underlying economic reasons however some of those relationships seem consistent with expectations, such as for instance, Philippines and Thailand. Similar results were obtained when the analysis was carried out with 2 and 3 days lag. Overall, there were less than expected pre-existing relationship (Granger causality) among countries in the South-East Asia region. In the following sections the results for each event are presented.



(A) Adjusted volatility for Japan during all the considered events



(B) Adjusted volatility for Australia during all the considered events

FIGURE 3.1: Examples of adjusted volatility

3.3.1 Event 1 - July 2, 1997

Thailand letting the Thai baht to freely float is arguably one of the most important event during the South-East Asia financial crisis. The results from the F-tests (table 3.21) comparing the volatility of the stock markets suggest that at this stage the South-East Asia financial crisis was mostly a regional event. The volatility during this event was statistically higher than in the base line period (1996) only in 6 out of the 24 countries analysed, most of these countries where the volatility was significantly higher were countries directly related to the crisis such as Thailand and the Philippines. As illustrated in figure 3.2a, Thailand since event 1 started having high adjusted volatility levels of almost twice its base line levels. This is a reasonable result considering that letting the Thai baht to float, after a long period of stable exchange rates, likely substantially impacted the performance of the Thai stock exchange. In figure 3.2b it is shown the results from the Granger causality tests (adjusted for baseline effects) using three different time lags (1, 2 and 3 days). The number of statistically significant Granger causality relationships was relatively low. Using 1 and 2 days lag there were only 14 statistically significant Granger causality relationships while 15 relationships were found when using 3 days lag. Interestingly during this first event, the Thai stock market, according to the Granger causality test, did not substantially impact other markets after adjusting for base line relationships. Perhaps this is related to investors, at that initial stage, considering that it was mostly a local issue. The stock market of Malaysia seems to have impacted, during this period, the stock market of Thailand (1 day lag) and Japan (2 and 3 days lag).

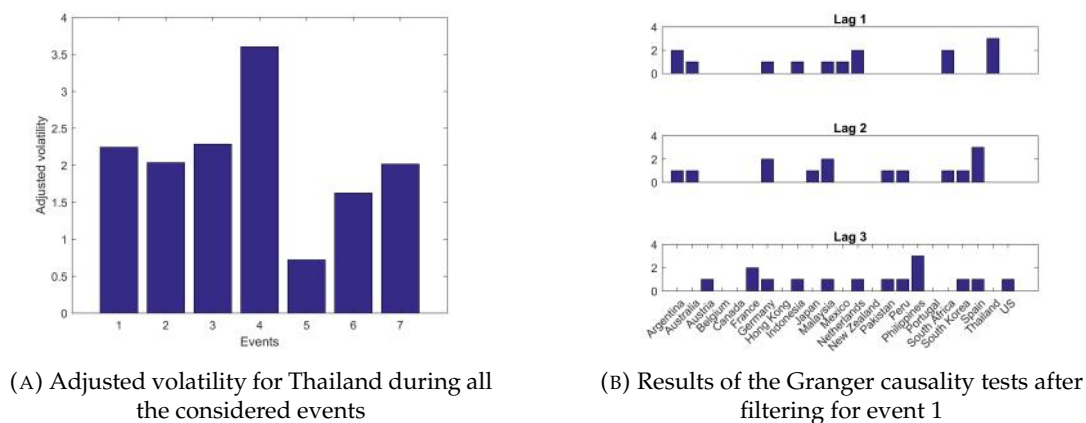


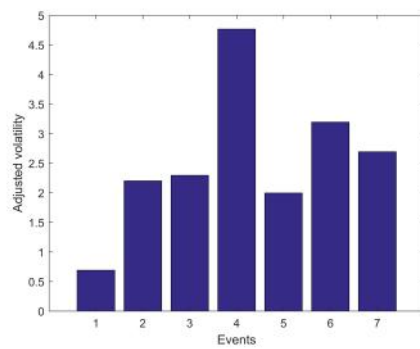
FIGURE 3.2: Adjusted volatility for Thailand and Granger analysis of event 1

3.3.2 Event 2 - August 14, 1997

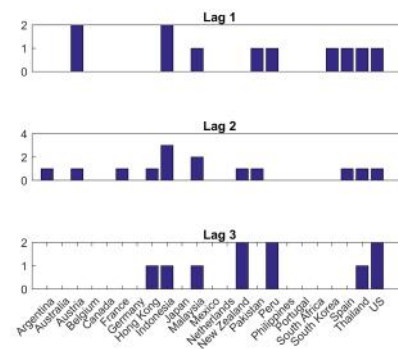
After several attempts to defend its currency on August 14, 1997 Indonesia decided to float its currency. The Indonesian central bank tried robustly to defend its currency but pressure was gradually increasing and foreign reserves were not large enough. Indonesia was initially not too severely affected. In fact, at the beginning of the financial crisis it was considered a success story. However that rapidly changed with volatility doubling compared to its baseline level during the event 2 period. In the Indonesian case volatility remained elevated for prolonged periods of time. The stock market experienced the same phases as previously mentioned with an initial phase of sustained volatility increases, peaking in event 4, followed by a phase of lower volatility, around event 6. The main difference in the Indonesian case compared to some other markets is that this phase of lower volatility was shorter with a volatility spike during event 6. Volatility remained high during event 7. The number of Granger causality relationships remained low during this period at 11, 14 and 10 for lags of 1, 2 and 3 days respectively.

3.3.3 Event 3 - October 14, 1997

In October 14, 1997 Thailand announced a restructuring package in another of the major events during the South-East Asia financial crisis. In this event volatility remained high compared to historical levels. In fact, from event 1 to 3 volatility was



(A) Adjusted volatility for Indonesia during all the considered events



(B) Results of the Granger causality tests after filtering for event 2

FIGURE 3.3: Adjusted volatility for Indonesia and Granger analysis of event 2

roughly twice the base line levels volatility of 1996. The number of statistically significant Granger causality relationships was one of the lowest during this period with only 10, 10 and 17 relationships identified when using 1, 2 and 3 days lag respectively. A bidirectional relationship between the stock markets of South Korea and Indonesia was identified when using the Granger test (3 day lag).

3.3.4 Event 4 - January 12, 1998

Another important event during the financial crisis was the collapse of Peregrine investment on January 12, 1998. The investment company was based in Hong Kong but it failed due to losses for a transaction in Indonesia. As it can be seen in figure 3.4a volatility in the Hong Kong stock market was significantly higher than the base line levels during events 3 and 4. It should be noted that Hong Kong did manage to successfully defend its peg to the U.S. dollar but clearly its stock market was substantially impacted by the crisis. The same phases as in other markets can be identified in Hong Kong with a primary spike in volatility around event 3 and 4 and a secondary spike around event 7. As shown in figure 3.4b the Indonesian market experienced a drastic increase in volatility in event 4 passing from approximately twice its baseline level in event three to more than four times during event 4. The number of Granger causality relationships identified as statistically significant (adjusted for base line level) remained relatively moderate during the event 4 period with 19, 14 and 18 relationships using 1, 2 and 3 days lags.

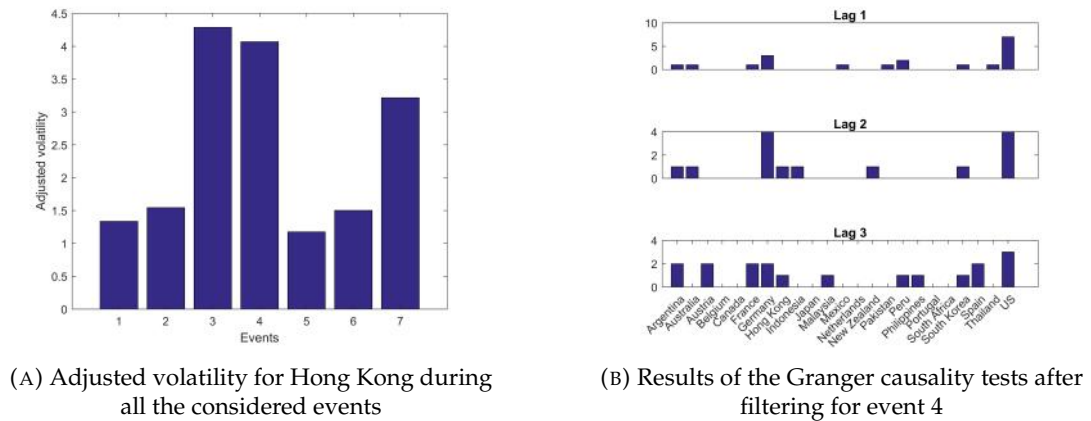


FIGURE 3.4: Adjusted volatility for Hong Kong and Granger analysis of event 4

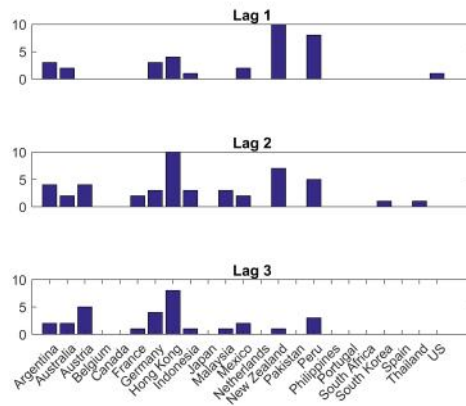


FIGURE 3.5: Results of the Granger causality tests after filtering for event 5

3.3.5 Event 5 – March 31, 1998

On March 31, 1998 another major development in the South-East Asia financial crisis happened with Thailand releasing new guidelines for the definition of nonperforming loans. Event 5 coincides with one of the lowest adjusted volatility periods for the markets analysed. By event 5 there started to be clear, statistically significant signs of contagion among different stock markets with Granger causality relationships, adjusted by base line effects, increasing regardless of the lag used. The Granger causality relationship found using 1, 2 and 3 days lag were 34, 47 and 30 respectively (figure 3.5).

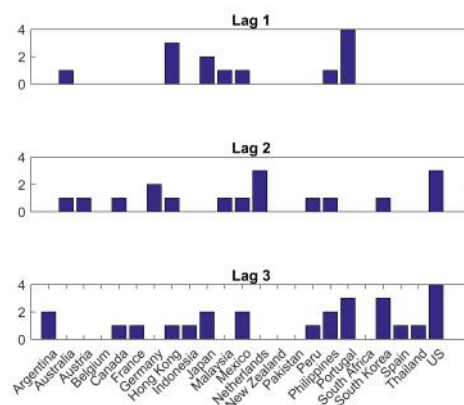


FIGURE 3.6: Results of the Granger causality tests after filtering for event 6

3.3.6 Event 6 - May 11, 1998

On May 11, 1998 Joseph Estrada won the general elections in the Philippines in another major development during the South-East Asia financial crisis. During this event volatility started to increase again compared to the previous events for most of the markets analysed. The Granger causality tests identified 13 causality relationships among the countries, using a one day lag period. When using 2 and 3 days lag there were 17 and 25 Granger causality relationships respectively (figure 3.6). A bidirectional relationships was found between the US and Canadian markets (3 days lag).

3.3.7 Event 7 - September 3, 1998

Event 7 was a rather important event with the replacement of the Malaysian finance minister. This event lead to a decades long feud among the Malaysian elites. As previously mentioned Malaysia followed a rather unique direction during the crisis compared to its regional neighbours by refusing the bailout offered by the IMF. During event 7 most of the markets analysed experienced a significant increase in volatility (figure 3.7a). The case of Malaysia is particularly remarkable with volatility increasing to 12 times the base line levels. This increase in adjusted volatility was much large in the case of Malaysia than in the case of its regional neighbours. Using one and two days lag there were 21 statistically significant Granger causality relationships while 25 relationships were found when using 3 days lag (figure 3.7b). The

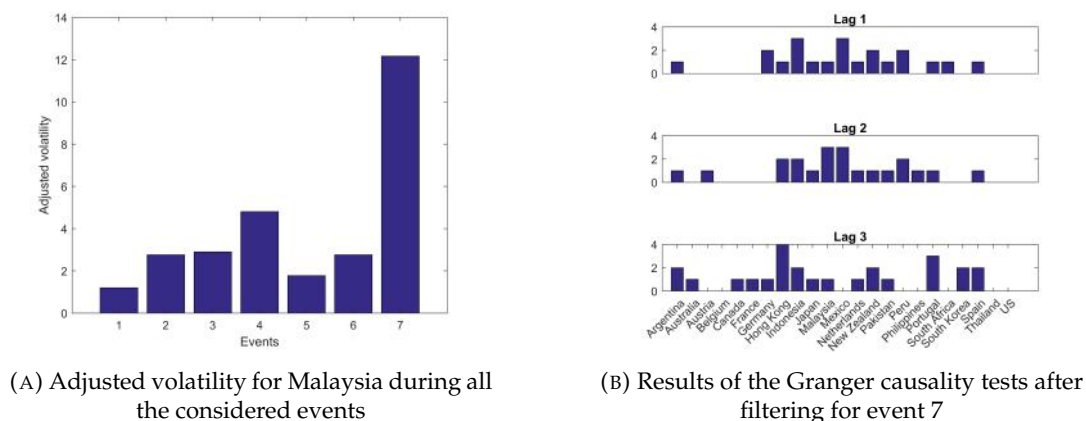


FIGURE 3.7: Adjusted volatility for Malaysia and Granger analysis of event 7

Indonesian stock market during this period seemed to impact several other markets such as for instance Japan and the Philippines (using a lag of 1 day).

The adjusted volatility for all the countries/jurisdictions and for all the seven events considered can be seen in table 3.5. The main statistics for the indexes in 1996, which was used as a reference period to estimate the pre-existing (base) volatility of the indexes can be seen in table 3.6. The main statistics for the indexes for all the events can be seen in tables 3.7 to 3.13 and the results from the Granger tests can be seen in tables 3.14 to 3.20. The null hypothesis in the Granger tests is that $Index_A$ does not Granger cause $Index_B$.

TABLE 3.16: Granger test results - Event 3. Only combinations with p-value less than than 5% shown.

$Index_A$	$Index_B$	Lag-1 P-val.	Lag-2 P-val.	Lag-3 P-val.
X_2	X_7	0.0151		
X_8	X_{12}	0.0206		
X_9	X_{12}	0.0191		
X_9	X_{14}	0.0309		
X_9	X_{15}	0.0257		
X_{11}	X_1	0.0064		
X_{11}	X_{12}	0.0011		
X_{12}	X_6	0.0434		

Continued on next page

Table 3.16 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₁₈	X ₅	0.0443		
X ₁₉	X ₁₅	0.0107		
X ₂	X ₈		0.0478	
X ₃	X ₁₅		0.0035	
X ₈	X ₁		0.0264	
X ₈	X ₂₃		0.0391	
X ₉	X ₁₅		0.0201	
X ₁₀	X ₁₄		0.0054	
X ₁₁	X ₁		0.0005	
X ₁₁	X ₁₂		0.0040	
X ₁₃	X ₁₅		0.0178	
X ₁₉	X ₁₅		0.0012	
X ₁	X ₁₆			0.0325
X ₂	X ₇			0.0377
X ₃	X ₁₄			0.0292
X ₃	X ₁₅			0.0249
X ₃	X ₂₃			0.0189
X ₇	X ₂₁			0.0226
X ₈	X ₂₃			0.0360
X ₉	X ₂₀			0.0362
X ₁₁	X ₁			0.0029
X ₁₁	X ₆			0.0334
X ₁₁	X ₁₂			0.0160
X ₁₂	X ₂₀			0.0378
X ₁₄	X ₂₂			0.0161
X ₁₉	X ₁₅			0.0145
X ₂₀	X ₂			0.0296

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Table 3.16 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₂₀	X ₉			0.0129
X ₂₁	X ₈			0.0151

TABLE 3.17: Granger test results - Event 4. Only combinations with p-value less than than 5% shown.

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₁	X ₁₄	0.0067		
X ₂	X ₁₉	0.0331		
X ₆	X ₃	0.0139		
X ₇	X ₁	0.0233		
X ₇	X ₃	0.0377		
X ₇	X ₁₁	0.0488		
X ₁₂	X ₆	0.0152		
X ₁₅	X ₂₀	0.0377		
X ₁₆	X ₃	0.0397		
X ₁₆	X ₁₄	0.0141		
X ₂₀	X ₂₁	0.0410		
X ₂₂	X ₂₀	0.0157		
X ₂₃	X ₂	0.0387		
X ₂₃	X ₆	0.0414		
X ₂₃	X ₈	0.0022		
X ₂₃	X ₉	0.0337		
X ₂₃	X ₁₁	0.0122		
X ₂₃	X ₁₄	0.0007		
X ₂₃	X ₁₆	0.0069		
X ₁	X ₁₄		0.0054	
X ₂	X ₁₉		0.0196	

Continued on next page

Table 3.17 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₇	X ₁		0.0134	
X ₇	X ₃		0.0376	
X ₇	X ₈		0.0019	
X ₇	X ₁₂		0.0210	
X ₈	X ₁₉		0.0418	
X ₉	X ₁₄		0.0244	
X ₁₄	X ₁		0.0216	
X ₂₀	X ₁₅		0.0243	
X ₂₃	X ₈		0.0039	
X ₂₃	X ₉		0.0046	
X ₂₃	X ₁₄		0.0034	
X ₂₃	X ₁₆		0.0199	
X ₁	X ₁₂			0.0006
X ₁	X ₁₄			0.0070
X ₃	X ₂			0.0371
X ₃	X ₁₆			0.0168
X ₆	X ₁			0.0350
X ₆	X ₃			0.0267
X ₇	X ₈			0.0088
X ₇	X ₁₇			0.0393
X ₈	X ₁₁			0.0483
X ₁₁	X ₈			0.0473
X ₁₆	X ₃			0.0286
X ₁₇	X ₃			0.0426
X ₂₀	X ₂			0.0216
X ₂₁	X ₁₂			0.0214
X ₂₁	X ₁₈			0.0059

Continued on next page

Table 3.17 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₂₃	X ₈			0.0216
X ₂₃	X ₉			0.0065
X ₂₃	X ₁₄			0.0406

TABLE 3.18: Granger test results - Event 5. Only combinations with p-value less than than 5% shown.

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₁	X ₁₀	0.0094		
X ₁	X ₁₄	0.0045		
X ₁	X ₁₆	0.0253		
X ₂	X ₃	0.0029		
X ₂	X ₇	0.0437		
X ₃	X ₂	0.0272		
X ₃	X ₅	0.0236		
X ₇	X ₁₄	0.0114		
X ₈	X ₅	0.0001		
X ₈	X ₁₂	<0.0001		
X ₈	X ₁₄	0.0234		
X ₈	X ₁₆	0.0069		
X ₉	X ₁₅	0.0039		
X ₁₂	X ₁₀	0.0131		
X ₁₂	X ₁₆	0.0010		
X ₁₄	X ₂	0.0489		
X ₁₄	X ₃	0.0007		
X ₁₄	X ₄	0.0022		
X ₁₄	X ₅	0.0113		
X ₁₄	X ₇	0.0038		

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Table 3.18 – continued from previous page

$Index_A$	$Index_B$	Lag-1 P-val.	Lag-2 P-val.	Lag-3 P-val.
X_{14}	X_8	0.0056		
X_{14}	X_{10}	0.0195		
X_{14}	X_{11}	0.0103		
X_{14}	X_{12}	0.0108		
X_{14}	X_{16}	0.0063		
X_{16}	X_1	0.0106		
X_{16}	X_3	0.0044		
X_{16}	X_5	0.0085		
X_{16}	X_7	0.0407		
X_{16}	X_9	0.0436		
X_{16}	X_{10}	0.0451		
X_{16}	X_{12}	0.0175		
X_{16}	X_{20}	0.0020		
X_{23}	X_{15}	0.0471		
X_1	X_{10}		0.0258	
X_1	X_{12}		0.0360	
X_1	X_{14}		0.0141	
X_1	X_{16}		0.0055	
X_2	X_3		0.0145	
X_2	X_{16}		0.0490	
X_3	X_2		0.0361	
X_3	X_5		0.0213	
X_3	X_9		0.0119	
X_3	X_{10}		0.0403	
X_6	X_{10}		0.0006	
X_6	X_{11}		0.0279	
X_7	X_8		0.0248	

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Table 3.18 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1 P-val.	Lag-2 P-val.	Lag-3 P-val.
X ₇	X ₉		0.0483	
X ₇	X ₁₂		0.0328	
X ₈	X ₇		0.0023	
X ₈	X ₆		0.0406	
X ₈	X ₅		0.0011	
X ₈	X ₃		0.0405	
X ₈	X ₂		0.0041	
X ₈	X ₁		0.0001	
X ₈	X ₁₆		0.0075	
X ₈	X ₁₄		0.0017	
X ₈	X ₁₂		0.0001	
X ₈	X ₁₀		0.0187	
X ₉	X ₃		0.0154	
X ₉	X ₆		0.0320	
X ₉	X ₁₅		0.0252	
X ₁₁	X ₁		0.0316	
X ₁₁	X ₆		0.0149	
X ₁₁	X ₁₃		0.0278	
X ₁₂	X ₁₀		0.0159	
X ₁₂	X ₁₆		0.0071	
X ₁₄	X ₃		0.0208	
X ₁₄	X ₅		0.0335	
X ₁₄	X ₇		0.0253	
X ₁₄	X ₈		0.0069	
X ₁₄	X ₁₀		0.0392	
X ₁₄	X ₁₁		0.0225	
X ₁₄	X ₁₆		0.0130	

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Table 3.18 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X_{16}	X_1		0.0319	
X_{16}	X_5		0.0466	
X_{16}	X_9		0.0364	
X_{16}	X_{17}		0.0347	
X_{16}	X_{20}		0.0107	
X_{20}	X_8		0.0483	
X_{22}	X_8		0.0209	
X_1	X_{14}			0.0114
X_1	X_{16}			0.0208
X_2	X_3			0.0299
X_2	X_{18}			0.0282
X_3	X_2			0.0366
X_3	X_9			0.0305
X_3	X_{10}			0.0085
X_3	X_{11}			0.0443
X_3	X_{14}			0.0342
X_6	X_9			0.0062
X_7	X_9			0.0435
X_7	X_{11}			0.0030
X_7	X_{12}			0.0005
X_7	X_{14}			0.0085
X_8	X_1			0.0004
X_8	X_2			0.0138
X_8	X_5			0.0008
X_8	X_7			0.0271
X_8	X_9			0.0167
X_8	X_{12}			0.0011

Continued on next page

Table 3.18 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₈	X ₁₄			0.0304
X ₈	X ₁₆			0.0242
X ₉	X ₃			0.0164
X ₁₁	X ₉			0.0147
X ₁₂	X ₁₆			0.0011
X ₁₂	X ₂₀			0.0038
X ₁₆	X ₉			0.0172
X ₁₄	X ₁₆			0.0166
X ₁₆	X ₁₇			0.0481
X ₁₆	X ₂₀			0.0127

TABLE 3.19: Granger test results - Event 6. Only combinations with p-value less than than 5% shown.

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₂	X ₁₈	0.0372		
X ₈	X ₇	0.0114		
X ₈	X ₁₀	0.0440		
X ₈	X ₁₂	0.0254		
X ₁₀	X ₁₈	0.0342		
X ₁₀	X ₂₃	0.0339		
X ₁₁	X ₃	0.0117		
X ₁₂	X ₂	0.0167		
X ₁₇	X ₂₀	0.0475		
X ₁₈	X ₅	0.0422		
X ₁₈	X ₆	0.0414		
X ₁₈	X ₈	0.0288		
X ₁₈	X ₁₃	0.0312		

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Table 3.19 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₂	X ₁₈		0.0417	
X ₃	X ₂₀		0.0125	
X ₅	X ₂₃		0.0363	
X ₇	X ₁		0.0482	
X ₇	X ₂₀		0.0212	
X ₈	X ₅		0.0250	
X ₁₁	X ₅		0.0455	
X ₁₂	X ₁₀		0.0168	
X ₁₃	X ₁		0.0381	
X ₁₃	X ₁₈		0.0303	
X ₁₃	X ₂₀		0.0080	
X ₁₆	X ₁₇		0.0335	
X ₁₇	X ₂₀		0.0004	
X ₂₀	X ₂₃		0.0408	
X ₂₃	X ₆		0.0155	
X ₂₃	X ₁₂		0.0290	
X ₂₃	X ₁₃		0.0084	
X ₁	X ₁₇			0.0366
X ₁	X ₁₉			0.0364
X ₅	X ₂₃			0.0231
X ₆	X ₂₀			0.0463
X ₈	X ₅			0.0315
X ₉	X ₁₅			0.0116
X ₁₀	X ₂₂			0.0389
X ₁₀	X ₂₃			0.0003
X ₁₂	X ₁₈			0.0235
X ₁₂	X ₂₃			0.0354

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Table 3.19 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₁₆	X ₂₁			0.0167
X ₁₇	X ₂₀			0.0035
X ₁₇	X ₂₁			0.0407
X ₁₈	X ₃			0.0122
X ₁₈	X ₆			0.0131
X ₁₈	X ₇			0.0351
X ₂₀	X ₃			0.0386
X ₂₀	X ₁₉			0.0431
X ₂₀	X ₂₁			0.0353
X ₂₁	X ₅			0.0121
X ₂₂	X ₉			0.0153
X ₂₃	X ₅			0.0459
X ₂₃	X ₆			0.0097
X ₂₃	X ₉			0.0267
X ₂₃	X ₁₃			0.0033

TABLE 3.20: Granger test results - Event 7. Only combinations with p-value less than than 5% shown.

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-2
		P-val.	P-val.	P-val.
X ₁	X ₁₅	0.0441		
X ₇	X ₁	0.0198		
X ₇	X ₃	0.0205		
X ₈	X ₁₅	0.0394		
X ₉	X ₁	0.0402		
X ₉	X ₁₀	0.0068		
X ₉	X ₁₇	0.0212		
X ₁₀	X ₁	0.0045		

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Table 3.20 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1	Lag-2	Lag-3
		P-val.	P-val.	P-val.
X ₁₁	X ₉	0.0272		
X ₁₂	X ₁₅	0.0020		
X ₁₂	X ₁₇	0.0149		
X ₁₂	X ₂₂	0.0329		
X ₁₃	X ₃	0.0048		
X ₁₄	X ₁₀	0.0074		
X ₁₄	X ₂₀	0.0139		
X ₁₅	X ₁₇	0.0430		
X ₁₆	X ₈	0.0030		
X ₁₆	X ₁₅	0.0075		
X ₁₈	X ₁₇	0.0499		
X ₁₉	X ₁₈	0.0482		
X ₂₁	X ₁₃	0.0043		
X ₁	X ₃		0.0026	
X ₃	X ₂₃		0.0292	
X ₈	X ₁₀		0.0352	
X ₈	X ₁₅		0.0447	
X ₉	X ₁		0.0309	
X ₉	X ₁₀		0.0330	
X ₁₀	X ₁		0.0037	
X ₁₁	X ₁		0.0161	
X ₁₁	X ₈		0.0247	
X ₁₁	X ₁₆		0.0211	
X ₁₂	X ₁₅		0.0047	
X ₁₂	X ₁₇		0.0414	
X ₁₂	X ₂₂		0.0273	
X ₁₃	X ₃		0.0033	

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Table 3.20 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1 P-val.	Lag-2 P-val.	Lag-3 P-val.
X ₁₄	X ₁₀		0.0264	
X ₁₅	X ₁₇		0.0303	
X ₁₆	X ₉		0.0267	
X ₁₆	X ₁₅		0.0402	
X ₁₇	X ₂₀		0.0377	
X ₁₈	X ₁₇		0.0327	
X ₂₁	X ₁₃		0.0105	
X ₁	X ₃			0.0094
X ₁	X ₁₅			0.0456
X ₂	X ₂₃			0.0018
X ₅	X ₂₃			0.0173
X ₆	X ₂₀			0.0188
X ₇	X ₁			0.0480
X ₈	X ₆			0.0104
X ₈	X ₁₀			0.0050
X ₈	X ₁₅			0.0176
X ₈	X ₁₆			0.0334
X ₉	X ₁			0.0418
X ₉	X ₁₀			0.0292
X ₁₀	X ₁			0.0131
X ₁₁	X ₁			0.0121
X ₁₃	X ₃			0.0085
X ₁₄	X ₂₀			0.0449
X ₁₄	X ₂₁			0.0331
X ₁₅	X ₁₇			0.0043
X ₁₈	X ₉			0.0440
X ₁₈	X ₁₅			0.0111

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Table 3.20 – continued from previous page

<i>Index_A</i>	<i>Index_B</i>	Lag-1 P-val.	Lag-2 P-val.	Lag-3 P-val.
X_{18}	X_{17}			0.0486
X_{20}	X_{21}			0.0380
X_{20}	X_{23}			0.0272
X_{21}	X_3			0.0477
X_{21}	X_{11}			0.0076

3.4 Discussion

While there is clearly some level of subjectivity, from a stock market point of view the South-East Asia financial market can be divided, according to the short-term event driven carried out, into three main phases. A first phase in which the crisis initially appears to be a local issue to then rapidly spread to other stock markets even outside Asia. This phase goes approximately from the decision of Thailand to float the baht on July 2, 1997 (event 1) to the collapse of Peregrine investments on January 12, 1998 (event 4). During this phase there is an increasing level of volatility, adjusted for base line effects, across stock markets. The number of statistically significant Granger causality relationships, adjusted for base line effects, also gradually increases. A second phase, of lower volatility across multiple stock markets happened during event 5 which was the release by Thailand of the new guidelines for non-performing bank loans on March 31, 1998. While volatility decreased during this period there are indications of contagion with the number of statistically significant Granger relationships increasing. This was a period of lower volatility that for some markets expanded to event 6. Event 6 was the victory of Joseph Estrada in the general elections of the Philippines on May 11, 1998. The final phase was another spike in volatility on September 3, 1998 when the Malaysian finance ministered was replaced triggering a spike in volatility across markets.

The results from F-test comparing the volatilities for each market during each event with its baseline levels of 1996 are consistent with above mentioned results.

TABLE 3.5: Adjusted volatility per jurisdiction in each event.

Event/Jurisdiction	Symbol	1	2	3	4	5	6	7
Argentina	X_1	0.853	0.728	2.485	1.700	0.960	1.114	4.063
Australia	X_2	0.928	1.076	2.322	1.566	0.689	0.972	1.908
Austria	X_3	1.120	2.120	2.849	1.802	1.240	1.043	3.653
Belgium	X_4	1.106	1.674	1.767	1.486	0.984	1.721	2.641
Canada	X_5	1.310	1.147	2.685	2.201	1.134	1.088	3.747
France	X_6	1.424	1.628	2.053	1.533	1.404	1.908	3.257
Germany	X_7	1.145	2.037	3.202	1.811	1.091	1.535	3.694
Hong Kong	X_8	1.337	1.543	4.288	4.069	1.176	1.502	3.217
Indonesia	X_9	0.691	2.202	2.295	4.769	1.997	3.195	2.692
Japan	X_{10}	1.036	1.594	1.827	1.940	1.766	1.033	2.403
Malaysia	X_{11}	1.207	2.759	2.899	4.803	1.771	2.761	12.159
Mexico	X_{12}	0.920	1.062	3.500	1.709	0.777	1.133	3.926
Netherlands	X_{13}	1.211	2.959	2.690	1.578	1.321	2.597	2.930
New Zealand	X_{14}	1.321	1.220	3.663	1.546	1.253	1.154	3.013
Pakistan	X_{15}	1.274	1.184	1.393	0.873	0.675	3.880	1.353
Peru	X_{16}	1.577	0.972	1.637	0.852	0.920	1.089	2.619
Philippines	X_{17}	2.814	3.162	1.984	4.135	0.901	1.708	3.860
Portugal	X_{18}	2.115	4.035	2.127	2.693	4.475	3.824	6.560
South Africa	X_{19}	0.496	1.158	3.591	2.531	1.015	2.573	4.145
South Korea	X_{20}	0.735	0.794	3.457	3.089	2.162	2.233	1.973
Spain	X_{21}	1.593	1.392	1.836	1.164	2.011	1.909	4.930
Thailand	X_{22}	2.244	2.037	2.286	3.601	0.722	1.625	2.016
United States	X_{23}	1.198	1.601	2.902	1.382	1.245	1.456	2.669

TABLE 3.6: Main descriptive statistics of the indexes in 1996 (used to calculate per-existing base volatility). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	Daily σ	Avg. Daily Ret.
Argentina	0.2250	0.0150	0.0009
Australia	0.1015	0.0075	0.0004
Austria	0.1693	0.0076	0.0006
Belgium	0.1949	0.0069	0.0007
Canada	0.2547	0.0061	0.0010
France	0.2205	0.0077	0.0008
Germany	0.2464	0.0079	0.0009
Hong Kong	0.3032	0.0103	0.0012
Indonesia	0.2300	0.0097	0.0009
Japan	-0.0125	0.0092	-0.0000
Malaysia	0.2262	0.0078	0.0009
Mexico	0.2089	0.0120	0.0008
Netherlands	0.2756	0.0073	0.0011
New Zealand	0.1092	0.0061	0.0004
Pakistan	-0.0118	0.0127	-0.0000
Peru	0.1525	0.0100	0.0006
Philippines	0.1809	0.0093	0.0007
Portugal	0.3100	0.0043	0.0012
South Africa	0.0060	0.0068	0.0000
South Korea	-0.1780	0.0126	-0.0007
Spain	0.3823	0.0077	0.0015
Thailand	-0.4924	0.0129	-0.0019
United States	-0.2910	0.0068	-0.0011

TABLE 3.7: Main descriptive statistics of the index (event 1). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	Daily σ	Avg. Daily Ret.
Argentina	0.0128	0.0329	0.0016
Australia	0.0069	-0.0116	-0.0006
Austria	0.0085	0.0769	0.0037
Belgium	0.0077	0.0707	0.0034
Canada	0.0080	0.0391	0.0019
France	0.0110	0.0798	0.008
Germany	0.0090	0.1170	0.0056
Hong Kong	0.0138	0.0786	0.0037
Indonesia	0.0067	0.0263	0.0013
Japan	0.0096	-0.0106	-0.0005
Malaysia	0.0094	-0.0690	-0.0033
Mexico	0.0110	0.1143	0.0054
Netherlands	0.0089	0.1317	0.0063
New Zealand	0.0081	0.0446	0.0021
Pakistan	0.0162	0.1624	0.0077
Peru	0.0158	-0.0143	-0.0007
Philippines	0.0261	-0.0329	-0.0016
Portugal	0.0091	0.0454	0.0022
South Africa	0.0034	0.0063	0.0003
South Korea	0.0093	-0.0572	-0.0027
Spain	0.0123	-0.0623	-0.0030
Thailand	0.0289	0.0618	0.0029
United States	0.0081	0.0378	0.0018

TABLE 3.8: Main descriptive statistics of the index (event 2). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	Daily σ	Avg. Daily Ret.
Argentina	0.0109	0.0223	0.0011
Australia	0.0080	-0.0411	-0.0020
Austria	0.0160	-0.0823	-0.0039
Belgium	0.0116	-0.1129	-0.0054
Canada	0.0070	-0.0418	-0.0020
France	0.0125	-0.0800	-0.0038
Germany	0.0161	-0.1040	-0.0050
Hong Kong	0.0159	-0.0691	-0.0033
Indonesia	0.0214	-0.3015	-0.0144
Japan	0.0147	-0.0888	-0.0042
Malaysia	0.0214	-0.2266	-0.0108
Mexico	0.0127	-0.0362	-0.0017
Netherlands	0.0217	-0.1009	-0.0048
New Zealand	0.0075	-0.0310	-0.0015
Pakistan	0.0151	-0.0219	-0.0010
Peru	0.0097	-0.0576	-0.0027
Philippines	0.0293	-0.1292	-0.0062
Portugal	0.0174	0.0342	0.0016
South Africa	0.0079	-0.0400	-0.0019
South Korea	0.0100	-0.0710	-0.0034
Spain	0.0107	0.0153	0.0007
Thailand	0.0262	-0.1447	-0.0069
United States	0.0109	0.0060	0.0003

TABLE 3.9: Main descriptive statistics of the index (event 3). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	Daily σ	Avg. Daily Ret.
Argentina	0.0373	-0.1225	-0.0058
Australia	0.0173	-0.1784	-0.0085
Austria	0.0215	-0.1280	-0.0061
Belgium	0.0122	-0.0861	-0.0041
Canada	0.0163	-0.0406	-0.0019
France	0.0158	-0.1170	-0.0056
Germany	0.0253	-0.1332	-0.0063
Hong Kong	0.0441	-0.4689	-0.0223
Indonesia	0.0223	-0.1922	-0.0092
Japan	0.0169	-0.0946	-0.0045
Malaysia	0.0225	-0.2167	-0.0103
Mexico	0.0419	-0.0831	-0.0040
Netherlands	0.0197	-0.0755	-0.0036
New Zealand	0.0224	-0.1586	-0.0076
Pakistan	0.0178	-0.0896	-0.0043
Peru	0.0164	-0.0733	-0.0035
Philippines	0.0184	-0.1195	-0.0057
Portugal	0.0092	-0.0711	-0.0034
South Africa	0.0245	-0.1210	-0.0058
South Korea	0.0436	-0.1327	-0.0063
Spain	0.0142	-0.0772	-0.0037
Thailand	0.0294	-0.1565	-0.0075
United States	0.0197	-0.0694	-0.0033

TABLE 3.10: Main descriptive statistics of the index (event 4). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	DDaily σ	Avg. Daily Ret.
Argentina	0.0255	-0.0430	-0.0020
Australia	0.0117	0.0187	0.0009
Austria	0.0136	0.0241	0.0011
Belgium	0.0103	0.0601	0.0029
Canada	0.0134	0.0107	0.0005
France	0.0118	0.0450	0.0021
Germany	0.0143	0.0131	0.0006
Hong Kong	0.0419	-0.1315	-0.0063
Indonesia	0.0464	0.1985	0.0095
Japan	0.0179	0.1132	0.0054
Malaysia	0.0373	0.0382	0.0018
Mexico	0.0205	-0.0937	-0.0045
Netherlands	0.0116	0.0485	0.0023
New Zealand	0.0094	-0.0016	-0.0001
Pakistan	0.0111	0.1198	0.0057
Peru	0.0085	-0.0751	-0.0036
Philippines	0.0383	0.3920	0.0187
Portugal	0.0116	0.1235	0.0059
South Africa	0.0172	0.1566	0.0075
South Korea	0.0389	0.1813	0.0086
Spain	0.0090	0.0952	0.0045
Thailand	0.0464	0.4370	0.0208
United States	0.0094	0.0891	0.0042

TABLE 3.11: Main descriptive statistics of the index (event 5). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	Daily σ	Avg. Daily Ret.
Argentina	0.0144	0.0023	0.0001
Australia	0.0051	0.0428	0.0020
Austria	0.0094	0.0708	0.0034
Belgium	0.0068	0.0654	0.0031
Canada	0.0069	0.0492	0.0023
France	0.0108	0.0735	0.0035
Germany	0.0086	0.0967	0.0046
Hong Kong	0.0121	0.0226	0.0011
Indonesia	0.0194	0.0141	0.0007
Japan	0.0163	-0.0325	-0.0015
Malaysia	0.0137	-0.0547	-0.0026
Mexico	0.0093	0.0500	0.0024
Netherlands	0.0097	0.0516	0.0025
New Zealand	0.0077	0.0025	0.0001
Pakistan	0.0086	0.0244	0.0012
Peru	0.0092	0.0905	0.0043
Philippines	0.0083	-0.0121	-0.0006
Portugal	0.0193	0.0385	0.0018
South Africa	0.0069	0.0693	0.0033
South Korea	0.0272	-0.0981	-0.0047
Spain	0.0155	-0.0296	-0.0014
Thailand	0.0093	-0.1013	-0.0048
United States	0.0084	0.0225	0.0011

TABLE 3.12: Main descriptive statistics of the index (event 6). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	Daily σ	Avg. Daily Ret.
Argentina	0.0167	-0.1341	-0.0064
Australia	0.0073	-0.0488	-0.0023
Austria	0.0079	0.0310	0.0015
Belgium	0.0119	0.0438	0.0021
Canada	0.0066	0.0219	0.0010
France	0.0147	0.0848	0.0040
Germany	0.0121	0.0821	0.0039
Hong Kong	0.0155	-0.1281	-0.0061
Indonesia	0.0311	-0.0997	-0.0047
Japan	0.0095	-0.0134	-0.0006
Malaysia	0.0214	-0.1023	-0.0049
Mexico	0.0136	-0.0957	-0.0046
Netherlands	0.0190	0.0482	0.0023
New Zealand	0.0070	-0.0439	-0.0021
Pakistan	0.0495	-0.3572	0.0170
Peru	0.0109	-0.0330	-0.0016
Philippines	0.0158	-0.1701	-0.0081
Portugal	0.0165	-0.0105	-0.0005
South Africa	0.0175	0.1465	-0.0070
South Korea	0.0281	-0.0871	-0.0041
Spain	0.0147	-0.0018	-0.0001
Thailand	0.0209	-0.2713	-0.0129
United States	0.0099	-0.0303	-0.0014

TABLE 3.13: Main descriptive statistics of the index (event 7). Including the standard deviation daily σ , return and average daily return.

Jurisdiction	Return	Daily σ	Avg. Daily Ret.
Argentina	0.0609	-0.2590	-0.0123
Australia	0.0142	-0.0441	-0.0021
Austria	0.0276	-0.2257	-0.0107
Belgium	0.0183	-0.1001	-0.0048
Canada	0.0228	-0.1235	-0.0059
France	0.0251	-0.1503	-0.0072
Germany	0.0291	-0.1717	-0.0082
Hong Kong	0.0331	0.0049	0.0002
Indonesia	0.0262	-0.3419	-0.0163
Japan	0.0222	-0.1006	-0.0048
Malaysia	0.0943	0.2068	0.0098
Mexico	0.0470	-0.0378	-0.0018
Netherlands	0.0215	-0.1893	-0.0090
New Zealand	0.0184	-0.1063	-0.0051
Pakistan	0.0173	0.1179	0.0056
Peru	0.0262	-0.2354	-0.0112
Philippines	0.0358	0.0189	0.0009
Portugal	0.0283	-0.2537	-0.0121
South Africa	0.0282	0.0518	0.0025
South Korea	0.0249	-0.0180	-0.0009
Spain	0.0381	-0.1394	-0.0066
Thailand	0.0260	0.1795	0.0085
United States	0.0181	0.0145	0.0007

TABLE 3.14: Granger test results - Event 1. Only combinations with p-value less than than 5% shown.

<i>Index_A</i>	<i>Index_B</i>	Lag-1 P-val.	Lag-2 P-val.	Lag-3 P-val.
X ₁	X ₁₀	0.0306		
X ₁	X ₁₄	0.0078		
X ₂	X ₁₄	0.0055		
X ₇	X ₁₄	0.0050		
X ₉	X ₃	0.0386		
X ₁₁	X ₂₂	0.0296		
X ₁₂	X ₆	0.0445		
X ₁₃	X ₁	0.0392		
X ₁₃	X ₁₄	0.0442		
X ₁₉	X ₁₁	0.0343		
X ₁₉	X ₁₇	0.0133		
X ₂₁	X ₁₁	0.0191		
X ₂₁	X ₂₀	0.0241		
X ₂₁	X ₂₂	0.0206		
X ₁	X ₁₄		0.0332	
X ₂	X ₁₄		0.0142	
X ₇	X ₁₄		0.0349	
X ₇	X ₁₆		0.0426	
X ₁₀	X ₁₅		0.0377	
X ₁₁	X ₃		0.0234	
X ₁₁	X ₁₀		0.0180	
X ₁₅	X ₅		0.0110	
X ₁₆	X ₉		0.0157	
X ₁₉	X ₁₇		0.0386	
X ₂₀	X ₁₀		0.0129	
X ₂₁	X ₁₁		0.0422	
X ₂₁	X ₂₀		0.0162	
X ₂₁	X ₂₂		0.0443	
X ₃	X ₂₀			0.0338
X ₆	X ₁₄			0.0457
X ₆	X ₁₆			0.0466
X ₇	X ₁₆			0.0347
X ₉	X ₂₀			0.0069
X ₁₁	X ₁₀			0.0295
X ₁₃	X ₁			0.0429
X ₁₅	X ₆			0.0409
X ₁₆	X ₉			0.0296
X ₁₇	X ₂			0.0244
X ₁₇	X ₁₁			0.0059
X ₁₇	X ₁₅			0.0373
X ₂₀	X ₁₀			0.0448
X ₂₁	X ₂₀			0.0119
X ₂₃	X ₁₇			0.0372

TABLE 3.15: Granger test results - Event 2. Only combinations with p-value less than than 5% shown.

<i>Index_A</i>	<i>Index_B</i>	Lag-1 P-val.	Lag-2 P-val.	Lag-3 P-val.
X ₃	X ₂	0.0373		
X ₃	X ₁₀	0.0232		
X ₉	X ₅	0.0101		
X ₉	X ₁₀	0.0240		
X ₁₁	X ₁₂	0.0371		
X ₁₅	X ₁₉	0.0091		
X ₁₆	X ₈	0.0434		
X ₂₀	X ₁₉	0.0144		
X ₂₁	X ₁₇	0.0454		
X ₂₂	X ₈	0.0262		
X ₂₃	X ₁₆	0.0007		
X ₁	X ₁₀		0.0334	
X ₆	X ₅		0.0155	
X ₆	X ₁₁		0.0207	
X ₈	X ₂		0.0352	
X ₉	X ₃		0.0375	
X ₉	X ₅		0.0460	
X ₉	X ₁₀		0.0089	
X ₁₁	X ₁		0.0268	
X ₁₁	X ₁₂		0.0168	
X ₁₄	X ₂₂		0.0377	
X ₁₅	X ₈		0.0244	
X ₂₁	X ₁₆		0.0368	
X ₂₂	X ₈		0.0408	
X ₂₃	X ₁₆		0.0070	
X ₈	X ₂			0.0259
X ₉	X ₁₀			0.0280
X ₁₁	X ₁₂			0.0153
X ₁₄	X ₈			0.0313
X ₁₄	X ₂₂			0.0289
X ₁₆	X ₂₁			0.0272
X ₁₆	X ₂₂			0.0203
X ₂₂	X ₆			0.0139
X ₂₃	X ₁₅			0.0281
X ₂₃	X ₁₆			0.0299

This analysis suggests that there were two differentiated peaks in stock market volatility one centred around the collapse of Peregrine investments (event 4) and another centred around the period when the finance minister in Malaysia was replaced (event 7). This second peak in volatility was, at least for some countries, even more intense than during the first phase of the crisis. During the period in which that Thai government released the new guidelines for non-performing loans classification (event 5) there were indications of contagion effects even outside Asia. There are however no statistically significant indications of a single country in South-East Asia having consistently driven (tested using Granger causality) the stock market of several other countries consistently during the entire crisis period.

TABLE 3.21: Volatility F- test.

Index	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7
Argentina	0.40600	0.09510	0.00000	0.00012	0.88230	0.43960	0.00000
Australia	0.72540	0.58220	0.00000	0.00140	0.05150	0.93640	0.00000
Austria	0.42180	0.00000	0.00000	0.00001	0.13740	0.72650	0.00000
Belgium	0.46860	0.00019	0.00003	0.00520	0.99900	0.00008	0.00000
Canada	0.06200	0.33640	0.00000	0.00000	0.37470	0.53580	0.00000
France	0.13500	0.00046	0.00000	0.00250	0.01790	0.00000	0.00000
Germany	0.34240	0.00000	0.00000	0.00001	0.52620	0.00240	0.00000
H.K.	0.04450	0.00210	0.00000	0.00000	0.26050	0.00400	0.00000
Indonesia	0.05330	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Japan	0.75770	0.00085	0.00001	0.00000	0.00003	0.76890	0.00000
Malaysia	0.19300	0.00001	0.00001	0.00000	0.00003	0.00000	0.00000
Mexico	0.68820	0.00000	0.00000	0.00010	0.18160	0.37870	0.00000
Netherlands	0.18670	0.00000	0.00000	0.00110	0.05420	0.00000	0.00000
N.Z.	0.05430	0.16910	0.00000	0.00200	0.11970	0.31600	0.00000
Pakistan	0.09480	0.24230	0.02090	0.48380	0.04040	0.00000	0.03590
Peru	0.00120	0.94010	0.00039	0.40540	0.68790	0.53390	0.00000
Philippines	0.00000	0.00000	0.00000	0.00000	0.60080	0.00010	0.00000
Portugal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00000
S. Africa	0.00060	0.30700	0.00000	0.00000	0.85210	0.00010	0.00000
S. Korea	0.10500	0.22290	0.00000	0.00000	0.00000	0.00000	0.00000
Spain	0.00087	0.02110	0.00001	0.28990	0.00000	0.00000	0.00000
Thailand	0.00000	0.00000	0.00000	0.00000	0.08650	0.00048	0.00000
U.S.	0.21180	0.00075	0.00000	0.02440	0.13140	0.00830	0.00000

Chapter 4

Long-term impact on the equity market

In this chapter the long-term impact on the equity markets are analyzed. It will be shown that the correlations among the equity markets increased for the majority of the countries analyzed. However it should be noted that the interdependencies both before and after the crisis appeared to be relatively small. It will also be shown that the regional relative importance of some of those equity markets changed after the crisis. A principal components analysis (PCA) is also carried out in this chapter. The idea behind this approach is trying to find the largest drivers to give some intuition regarding the dynamic of the market.

4.1 Introduction

Financial crisis have attracted a sizeable body of academic research. However, the majority of the published work regarding stock crashes revolves around mature markets, particularly the U.S. and European markets. Nevertheless, there are some articles covering the impact on emerging market such as for instance (Su and Yip, 2014). Su and Yip analyzed a 13 years period covering the 2007 financial crisis and its impact on emerging markets mentioning that the level of co-integration increased during the 2007 crisis. Cointegration is a statistical measure that can be used to measure linkages between stock markets. The result of higher integration was also found by some other researcher such as Mandigma and Ben-David (Ben-David, Franzoni, and Moussawi, 2012; Mandigma, 2014).

The level of cointegration seems also to vary drastically from country to country. For instance, Jeong found that the Chinese market, was more impacted by local regional market i.e. North Asia, than by the international market (Jeong, 2012). That was not the case for Japan, which is already a mature market. Wuthisatian found that there was a weak relationship between the stock market of Thailand and the stock markets of another 11 jurisdictions (Wuthisatian, 2014). In the case of Japan, Jeong mentioned that the stock market is more influenced by international markets than its regional market (Jeong, 2012). Jeong similarly to Su and Yip concluded that the financial crisis did increase the level of integrations between the markets in Northern Asia (Jeong, 2012; Su and Yip, 2014). In an article analyzing a total of 64 countries Calomiris concluded that “relative to developed economies, emerging markets are more responsive to global trade conditions, but less responsive to selling pressures” (Calomiris, Love, and Pería, 2012). Golab concluded that there is a great level of mutual impact between the stock markets in the US and the Asia Pacific area (Golab et al., 2018). Similar results were obtained by (Caporale, Gil-Alaña, and You, 2019). In this article the authors focused on ASEAN countries and found interdependencies among those countries and the US.

The results were less conclusive when analyzing the interdependencies between the Chinese stock market and ASEAN countries. It should be noted that some authors have found different relationships but that such differences can in most cases be explained by the differences in countries analyzed. For instance, De Paula supports the idea that movements in mature stock markets highly impact emerging markets, which apparently is not consistent with the results of other authors, but the list of countries analyzed by De Paula only include European countries with Slovakia, Poland, Hungary and Romania representing emerging markets (Paula, Hotta, and Zevallos, 2008). All those countries are European and have relatively open stock markets while emerging markets tend to have a much more strict restriction on foreign investors and hence the results from De Paula cannot easily be extrapolated to emerging countries (Paula, Hotta, and Zevallos, 2008).

One commonality found by Radelet and Sachs refers to the term “crisis of success” (Radelet and Sachs, 2000). The authors use this term to describe the Mexican, Korean and South-East Asia financial crisis in the 90’s. They mentioned that those

crises came not after a period of progressively poor financial conditions but quite the opposite. The authors mentioned that the stock market crash on those markets happened after relatively long periods of strong growth. In the case of the South-East Asia financial crisis the market correction happened after those countries recorded some of the highest economic growth rate in the world during the previous years. One result that seems to be consistent across the literature, mentioned for instance by (Bae and Zhang, 2015), is that the more an emerging market is integrated to the global financial markets the more that such country is influenced by international financial crisis (Bae and Zhang, 2015). According to Bae and Zhang this pattern was followed not only during the 2007 financial crisis but also during the South-East Asia financial crisis in the nineties (Bae and Zhang, 2015).

Another result often found in the literature, such as by Eichengreen, is that emerging markets tend to depend less on foreign capital after financial crisis (Eichengreen, 2010). An interesting result was obtained by Engkuchik and Kaya in the Malaysian stock market (Engkuchik and Kaya, 2012). In this article the authors suggest that liquidity of stocks in Malaysia during the South-East Asia financial crisis increased during the financial crisis. The author mentions that this increase in liquidity was probably due to force selling by investors. Another result that seems consistent across the literature is that the stocks crises in emerging markets seem to have different characteristics than in developed markets. Given this existing literature it seems interesting analyzing the long term impacts of the South-East Asia financial crisis on the regional equity markets and trying to detect changes in the interdependencies of these markets. This chapter also tries to analyze how the interdependencies with mature markets, namely the U.S. equity market, changed from the pre to the post-crisis period.

In this chapter the long-term effects that the South-East Asia financial crisis had on the stock markets of the main countries involved in the crisis are analyzed, particularly the changes in correlation after the financial crisis. As it will be explained in the methodology section, different post-crisis periods were analyzed to try to control the impact that other major events, such as the U.S. financial crisis, might have had on the interdependencies among other stock markets. Authors such as Caporale have mentioned that there is relatively little available existing literature covering the

impact of the 2008 US financial crisis on the interdependencies among stocks markets in different jurisdictions (Caporale, Gil-Alaña, and You, 2019). Only a few articles such as Glick and Hutchinson (mentioned by Caporale) cover this issue (Glick and Hutchinson, 2013). (Gulzar et al., 2019) analyzed several Asian stock markets during a period of time including the 2008 US financial crisis and concluded that there only were spillovers on a couple of those markets.

Liow and Song found a small but significant level of interdependency between ASEAN and G5 stocks (Liow and Song, 2020). The impact of the 2008 US financial crisis seems to be rather complex with for instance Das concluding that it only had a limited impact on emerging markets in Latin America (Das et al., 2018). Morales and Andreosso-O'Callaghan found no evidence of spillover in the Asian stock market due to the 2008 US financial crisis (Morales and Andreosso-O'Callaghan, 2012). While the results are rather mixed, some authors such as Dhanaraj, still finding a strong influence of the US market in the Asian markets (Dhanaraj, Gopaldaswamy, et al., 2013). Given the mixed existing literature it seems reasonable to do an analysis using multiple, post crisis period to try to account for the effect of the 2008 US financial crisis. It will be shown that there were changes in the correlation in the pre and post South-East Asia crisis periods.

4.2 Methodology

As a preliminary step the relationship between the different indexes was modeled using linear correlation. In order to do this the returns of equity indexes, representing several jurisdictions, were estimated as shown in equation 4.1.

$$R_t^i = \frac{P_t}{P_{t-1}} - 1 \quad (4.1)$$

P_t is the closing price of the index in day t and R_t^i is the return on index i . It is advisable working with returns rather than with index prices to avoid biases in the analysis. Then the 20-day rolling linear correlation was estimated for each day (see equation 4.2), the subindex t in the term R_t^i is omitted for simplicity purposes.

TABLE 4.1: Periods considered.

Period	Date
1	July 1987 - June 1997
2	January 1999 - January 2018
2*	January 1999 - December 2007

TABLE 4.2: Indexes analyzed.

Index	Name	Country/Region
1	S&P 500 Index	U.S.
2	Dow Jones Industrial Index	U.S.
3	Nasdaq Composite Index	U.S.
4	Nikkei 225 Index	Japan
5	Kospi Index	South Korea
6	FTSE Bursa Malaysia KLCI Index	Malaysia
7	SET Index	Thailand
8	Jakarta Stock Exchange Composite Index	Indonesia
9	Hang Seng Index	Hong Kong

$$C_t^{ij} = \frac{n(\sum R^i R^j) - (\sum R^i)(\sum R^j)}{\sqrt{[n\sum (R^i)^2 - (\sum R^i)^2][n\sum (R^j)^2 - (\sum R^j)^2]}} \quad (4.2)$$

R^i and R^j are the returns of the indexes as described in equation 4.1. The average value for the linear correlation C_t^{ij} between the pairs of indexes were obtained for the pre-crisis and post-crisis periods. The periods analyzed can be seen in table 4.1. The indexes analyzed are shown in table 4.2 and are composed by three U.S. stock indexes as well as several Asian stock indexes from areas involved in the South-East Asia financial crisis. The pre and post-crisis periods were analyzed. The start of the financial crisis was considered to occur in July 1997 when Thailand floated their currency the Baht (see table 4.1). A period of approximately 10 years, accommodating for data availability, was used for the pre-crisis period. The post-crisis period was considered to start at the beginning of 1999. The post-crisis time was carried out for two different time periods. One ranging from January 1999 to December 2018 and another period starting in the same date (January 1999) but ending in 2007 to avoid the impact on the analysis of the U.S. financial crisis. It would appear reasonable to assume that the U.S. financial crisis of 2008 could have arguably had an impact on the interdependencies of equity markets worldwide. In order to account for this potential impact this second period, ending in 2017, was also analyzed.

Another approach followed to analyze the interdependencies among equity markets before and after the South-East Asia financial crisis was to use principal components analysis (PCA). As in the previous case, the pre and post-crisis periods were analyzed according to table 4.1. The PCA approach can be interpreted as a change of basis of the data space which might be more useful for the interpretation of the presented data without losing a large amount of information. PCA is a frequently used technique when analyzing stock market data (Chang and Wu, 2015; Yu, Chen, and Zhang, 2014). To avoid multicollinearity issues only one index per country was used. In the case of the U.S. the indexes chosen was the S&P 500 index. The reason behind this choice is that it is a broader index than the Dow Jones index, which is skewed towards large capitalization stocks, as well as the NASDAQ index, which is skewed towards technology related names. An Engle-Granger test was also carried out for the stock returns for the same the periods of time as before (pre-crisis (1), post-crisis (2) and post-crisis (2*)). The results of the test can be seen in table 4.3.

4.3 Results

For a majority of the indexes their pairwise linear correlation increased for the period after the South-East Asia financial crisis (July 1997 to 2018). The only exceptions of this trend were the correlations between the US indexes and the Malaysian index. In all these cases the relationships were small before and after the crisis. When using the post-crisis period from January 1999 to December 2007 the results obtained were similar to those obtained in the previous case (January 1999 to July 2018) plus two additional cases. These two cases were the correlations between the Hang Seng Index in Hong Kong and the KOSPI and FBMKLCI in South Korea and Malaysia respectively. The PCA analysis generates consistent results (tables 4.4, 4.5 and 4.6). Interestingly, for the period before the crisis, the S&P 500 index does not appear in the components one, two and four, which cumulatively account for more than 66% of the variance and it only has a small load in component 3. In the post-crisis period (January 1999 to December 2018) the S&P 500 appears in the main four components. When the alternative post-crisis period (January 1999 to December 2007) is analyzed the S&P 500 index appears in all the components suggesting a larger impact of the U.S. equity market on the regional Asian markets analyzed. Arguably this might be related to Asian countries being relatively less impacted by the 2008 U.S. financial crisis. The picture for the regional stock markets is also rather complex with equity markets such as the one in Hong Kong remaining to have large loads but gradually smaller. There appears to be some changes such as for instance the Korean and Indonesian markets gaining in importance after the crisis while the opposite has been true for the cases of Malaysia and Thailand (when focusing on the loads in the first components). Malaysia and Thailand were among the countries most impacted by the crisis hence it is not intuitively surprising to see a decline in the importance of their stock market in the region. The case of Indonesia is more surprising given that the country was also severely impacted by the crisis, arguably even more than Thailand and Malaysia. A graphical interpretation of the PCA analysis results can be seen in figures 4.1 to 4.4. The results from the Engle-Granger analysis suggest that there was cointegration between the returns of all the stock markets analyzed for the pre and post-crisis periods.

TABLE 4.3: Correlation among major stock indexes.

Index	Pre-Crisis (1)	Pre-Crisis (2)	Pre-Crisis (2*)
S&P 500 - Dow Jones	0.936	0.947	0.937
S&P 500 - Nasdaq	0.764	0.913	0.887
S&P 500 - Nikkei	0.171	0.214	0.184
S&P 500 - KOSPI	0.035	0.209	0.192
S&P 500 - KLCI	0.120	0.116	0.060
S&P 500 - SET	0.039	0.197	0.142
S&P 500 - JCI	0.009	0.120	0.070
S&P 500 - HSI	0.111	0.230	0.202
Dow Jones - Nasdaq	0.698	0.810	0.766
Dow Jones - Nikkei	0.160	0.210	0.179
Dow Jones - KOSPI	0.028	0.198	0.174
Dow Jones - KLCI	0.132	0.113	0.057
Dow Jones - SET	0.048	0.190	0.145
Dow Jones - JCI	0.011	0.123	0.081
Dow Jones - HSI	0.111	0.219	0.201
Nasdaq - Nikkei	0.186	0.225	0.218
Nasdaq - KOSPI	0.044	0.225	0.220
Nasdaq - KLCI	0.171	0.133	0.089
Nasdaq - SET	0.089	0.199	0.151
Nasdaq - JCI	0.033	0.128	0.080
Nasdaq - HSI	0.164	0.252	0.240
Nikkei - KOSPI	0.056	0.575	0.527
Nikkei - KLCI	0.270	0.376	0.324
Nikkei - SET	0.155	0.348	0.317
Nikkei - JCI	0.072	0.334	0.280
Nikkei - HSI	0.310	0.545	0.518
KOSPI - KLCI	0.077	0.387	0.313
KOSPI - SET	0.109	0.393	0.383
KOSPI - JCI	0.035	0.400	0.312
KOSPI - HSI	0.384	0.401	0.322
KLCI - SET	0.317	0.355	0.328
KLCI - JCI	0.186	0.398	0.319
KLCI - HSI	0.384	0.414	0.346
SET - JCI	0.149	0.385	0.333
SET - HSI	0.303	0.444	0.413
JCI - HSI	0.137	0.432	0.358

TABLE 4.4: PCA for the Pre-Crisis Period (1).

Index	Comp. 1	Comp. 2	Comp. 3	Comp. 4	Comp. 5	Comp. 6	Comp. 7
S&P 500			0.101		0.103	0.238	0.952
Nikkei	0.288		0.372	0.307	0.788	-0.199	-0.131
KOSPI	0.129		-0.351	0.894	-0.244		
KLCI	0.466		0.114			0.837	-0.256
SET	0.589	0.137	-0.676	-0.312	0.172	-0.209	
JCI	0.182	-0.981					
HSI	0.544	0.104	0.508		-0.525	-0.393	
σ	0.027	0.021	0.016	0.015	0.014	0.012	0.010
Prop. σ^2	0.343	0.208	0.129	0.113	0.090	0.067	0.049
Cum. Prop	0.343	0.551	0.681	0.794	0.884	0.951	1.000

TABLE 4.5: PCA for the Pre-Crisis Period (2).

Index	Comp. 1	Comp. 2	Comp. 3	Comp. 4	Comp. 5	Comp. 6	Comp. 7
S&P 500	0.175		0.201	0.917	0.270		
Nikkei	0.422	0.441	-0.197	0.220	-0.612	0.393	-0.103
KOSPI	0.498	0.360	-0.182	-0.260	0.691	0.204	
KLCI	0.203	-0.139			-0.134		0.957
SET	0.365	-0.436	0.259	-0.699	-0.269	0.160	-0.154
JCI	0.388	-0.648	-0.120	0.565	0.191	0.192	-0.148
HSI	0.466				-0.109	-0.858	-0.150
σ	0.029	0.014	0.013	0.011	0.011	0.010	0.009
Prop. σ^2	0.524	0.117	0.102	0.079	0.075	0.059	0.044
Cum. Prop	0.524	0.641	0.743	0.823	0.897	0.956	1.000

TABLE 4.6: PCA for the Pre-Crisis Period (2*).

Index	Comp. 1	Comp. 2	Comp. 3	Comp. 4	Comp. 5	Comp. 6	Comp. 7
S&P 500	0.113	0.171	0.125	0.456	0.790	0.262	0.204
Nikkei	0.341	0.220		0.532	-0.339	-0.506	0.424
KOSPI	0.613	0.516	-0.190	-0.536		0.133	0.107
KLCI	0.205	-0.190		0.213	-0.446	0.781	0.249
SET	0.400	-0.391	0.771	-0.217		-0.189	
JCI	0.362	-0.679	-0.859		0.213	-0.102	
HSI	0.402			0.359			-0.834
σ	0.027	0.021	0.016	0.015	0.014	0.012	0.010
Prop. σ^2	0.343	0.208	0.129	0.113	0.090	0.067	0.049
Cum. Prop	0.343	0.551	0.681	0.794	0.884	0.951	1.000

4.4 Discussion

The South-East Asian financial crisis disturbed the economies and capital markets of several countries. The capital markets data supports the assumption that there were significant, long lasting changes, in the market such as some equity markets (South Korea) becoming more regional important while other (Thailand) becoming less so. The analysis was carried out for two different post South-East Asia financial crisis, one including the 2008 U.S. financial crisis and one excluding it. The results appear consistent in both cases. While not the focus of this dissertation, the results are consistent with the conclusions of Morales and Andreosso-O'Callaghan suggesting no obvious systemic spillover in Asian markets as a consequence of the 2008 US financial crisis (Morales and Andreosso-O'Callaghan, 2012). Interdependencies among the various stock markets did appear to increase in the post-crisis period. This finding is consistent with the results obtained by Su and Yip (Su and Yip, 2014). Interestingly the U.S. equity market did not appear to be a major driver of those in the regions, particularly in the pre-crisis period. This is in contrast with some existing literature, such as (Dhanaraj, Gopalaswamy, et al., 2013), which postulates a relatively strong impact of the US market on emerging market. Nevertheless, cointegration among markets was found for both the pre and post-crisis periods. The analysis suggest that the interdependencies on the stock markets are rather complex and evolving dynamically over time with the South-East Asia financial crisis having a sizeable impact on those interdependencies.

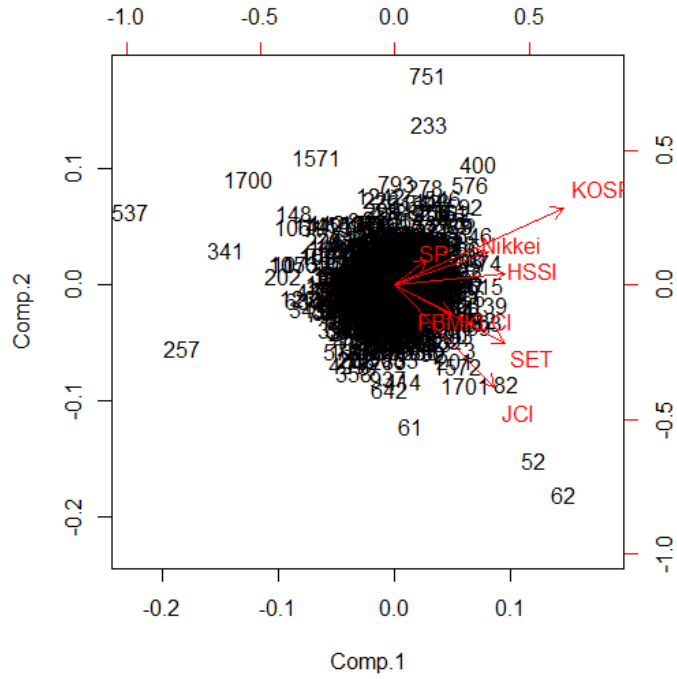


FIGURE 4.3: PCA – Pre-Crisis (2*).

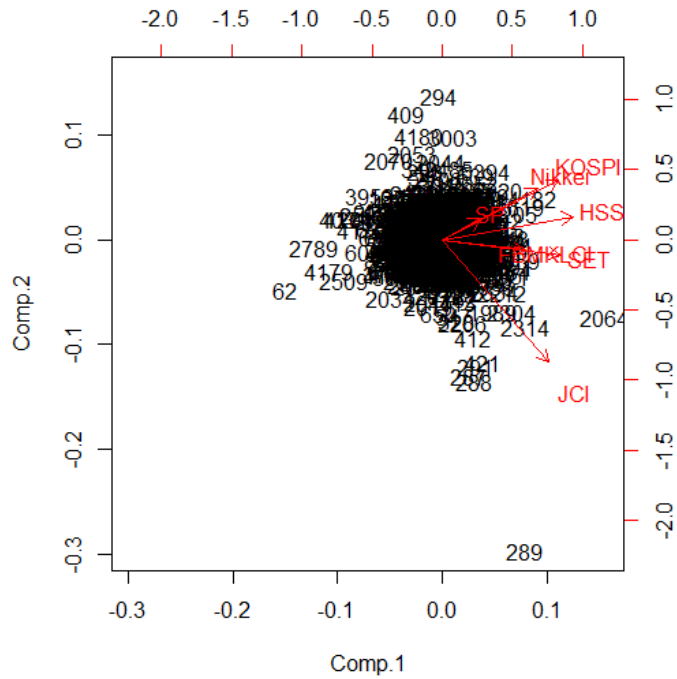


FIGURE 4.4: PCA – Entire period.

Chapter 5

Impact of different legal systems

5.1 Introduction: Legal origin and stock market developments

There is a broad literature on the links between legal origin and cross-country differences in financial development. According to the legal origins theory, the influence of legal origins on finance development is due to the contrasts between civil and common law systems (Beck and Levine, 2005). These two systems induce differences in financial law, which lead to disparities in financial outcomes. Some papers argue that common law systems better protect minority stockholders via judge-made fiduciary duties than civil law systems. The second major explanation for financial differences between civil and common law economies is that civil law systems overregulate, killing securities markets before they can develop. By contrast, common law systems are more decentralized and less regulatory and they facilitate the private, marketplace transactions that allow securities markets to thrive. The paper of La-Porta et al., 1997, assumes that legal origins are important in determining creditor rights and that the effectiveness of legal institutions has a strong impact on equity and credit market development. They classified the legal origin in four: English, French, German and Scandinavian. According to La-Porta et al., 1997, the English legal system gives more protection to shareholders, being this one of the reasons why the equity markets in the United States and the United Kingdom are so large. However, they maintain that other three legal systems were less suitable for the development of large capital markets with the French system being the worst on this regard.

Beck, Demirgüç-Kunt, and Levine, 2007, analyzed the particular channels through

which the legal origin influences finance by concentrating in the “political” channel (that is, the priority of the rights of the individual investors vis-à-vis the state and the repercussions of property rights on financial developments) and the “adaptability” channel (that is, how legal traditions differ in the ability to adjust to changes in commercial circumstances and to adapt to the needs of the economy fostering financial development) and they obtained that legal origins matter for financial development. Andrianova, Demetriades, and Xu, 2011, postulated in another important paper the importance of the intervention of the government in the development of the financial sector. The authors focused on the cases of London, Amsterdam and Hong Kong.

This analysis attempts to deepen the debate by analyzing whether the legal origins affected stock market development in Asian emerging countries from 1997 to 2018. Our purpose is to use the case study of Asian countries that were affected by the 1997 crises to assess the influence of legal origins on stock market developments. Our intention is not to obtain a model that accurately forecasts the performance of stock markets but only to determine if the legal system has had an effect on the stock performance for our sample of countries from 1997 onwards. Data availability for the considered variables does not allow to consider a longer period.

The following strategy was used. First, we estimate whether the legal system of a country/jurisdiction has an impact of the stock performance, by controlling for a set of variables. For completeness purposes, we use two different dependent variables that can be used to describe stock market performance: 1) market capitalization of domestic companies and 2) the return of the country/jurisdiction stock index. The control variables, including the legal system, are based on the literature about the main variables impacting stock performance. Second, a different and novelty approach is presented. Instead of trying to identify a specific model, a Lasso regression was used for variable selection. The Lasso regression sets the coefficient of some of the variables equals to zero, eliminating those variables from the actual regression. This is a frequently used approach for variable selection when a relatively large number of initial variables is considered. In order to check the robustness of the results, in addition to analyze the significance of the legal system for Asian merging countries, we replicate the exercise for Asian countries, for a sample of 12 emerging countries

and for a broad sample of 24 countries that include a mix of developed and developing countries. Finally, we have used the Sharpe ratio to gauge the performance of the stock market assets in our sample of Asian emerging markets. Although we have not obtained statistically conclusive results, the data suggest that those countries with an English legal based system does have an advantage, from a stock market performance point of view, compared to those countries based on a French or a German legal system. The main contributions of this chapter are two. Firstly, to study the influence between the origin of the legal system and stock market performance for a sample of Asian emerging countries. These countries were (formally or informally) under colonial rule and their legal systems were influenced by the colonial powers; consequently, it is very relevant to study whether the legal origin of the rules and regulations matters for stock market performance for this sample of countries. Secondly, in addition to estimate a traditional lineal regression model, we use a novel approach named Lasso regression that automates the model selection and helps in finding the models in which the variable we are interested (in this case, the legal origin) is significant.

5.2 The legal origin of Asian stock markets

As mentioned, the influence of legal origins on finance development is due to the contrasts between civil and common law systems. The literature classifies four major legal systems: English, French, German and Scandinavian (La-Porta et al., 1997). English law is common law, made by judges and subsequently incorporated into legislation. By contrast, French, German, and Scandinavian laws are part of the scholar and legislator-made civil law tradition, which dates back to Roman law. Most countries have adopted their legal systems through occupation or colonization of the European powers that imposed their original legal systems. Some other countries, such as those in Latin America, have adopted their legal systems after attaining independence, but have still typically chosen the laws of their former colonizers. Then, the evolution of the financial markets in Asian and other emerging markets has been influenced by the colonizing western powers that conquered some of those countries, imposing in many cases their legal and administrative systems.

TABLE 5.1: Legal systems in Asian and some other emerging countries. Source: La-Porta et al., 1997, World Bank.

Country/Jurisdiction	Legal system
Thailand	English
Indonesia	French
Malaysia	English
Philippines	French
South Korea	German
Singapore	English
Hong Kong	English
Japan	German
Pakistan	English
Argentina	French
Mexico	French
South Africa	English

The focus of this dissertation is on emerging Asian countries (Thailand, Indonesia, Malaysia, Philippines, South Korea, Singapore and Pakistan), although in order to assess the influence of legal origins on stock market performance and to check the robustness of our result we also considered: a) our sample of Asian emerging countries plus Hong Kong and Japan, b) a sample of 12 emerging countries that includes the Asian countries plus Argentina, Mexico, Peru and South Africa and c) a broad sample of 24 countries that include a mix of developed and developing countries.

Table 5.1 classifies our sample of Asian and emerging countries according to the origin of their legal systems. The most important legal influence in Asia is English, although in the sample there are also countries with French and German legal influences. The Scandinavian system was not included as there are no countries in our sample markets with this type of legal system.

5.3 An empirical analysis of the influence of the legal system on stock market performance

In this section the influence of the legal system on stock market performance for Asian emerging countries from 1997 to 2018 is examined. In order to assess if the legal system of a country/jurisdiction has an impact on the performance of its equity market it is necessary to control for other variables. The approach followed is to use the legal system as a dummy variable while controlling for other variables

that can impact stock performance. Many variables have been identified in the existing literature as having an impact on the performance of the stock market. In the absence of a comprehensive theory or model about the main determinants of stock market performance, we revise the main explanations suggested by the literature and the empirical results obtained to identify the key factors in theory that could affect the stock market evolution. Some of the variables that are more frequently cited in the literature are inflation (Bodie, 1976; Campbell, Pflueger, and Viceira, 2020; Flannery and Protopapadakis, 2002), interest rates (Campbell, Pflueger, and Viceira, 2020; Bjornland, 2009) and economic growth (Campbell, Pflueger, and Viceira, 2020; Baele, Bekaert, and Inghelbrecht, 2010) but there are many other variables that can potentially impact stock prices. Some of these variables are related to the internal evolution of the country, such as the gross capital formation, while other variables have a clear relation with international factors such as the foreign exchange rate. Then, in this chapter we consider the theory and existing empirical work in order to select a number of variables that could be correlated to the stock market performance. The main considered variables are: inflation, interest rates, gross fixed capital formation, economic growth, personal remittances, agriculture production and prices, crude oil prices, labor force participation/unemployment, Foreign exchange rate, exports, FDI, interdependencies of equities markets and trading volumes. We have also included autoregressive terms. Lag terms are frequently used when forecasting stock market returns. For instance, the return of the market in a given day it is likely that impacts the performance of the stock market in the following day. This approach is supported by a large amount of papers such as (Engle and Gonzalez-Rivera, 1991) or (Harvey and Siddique, 1999) although how many of those lag terms to be included in the analysis vary widely among the literature. As mentioned, the considered period is 1997-2018 because there are some data availability issues not enabling analysis for longer periods. The following variables are included in the empirical works on stock market performance:

1. Inflation

As previously mentioned inflation is one of the most frequently mentioned macroeconomics factors impacting stock prices. There are many articles in the

literature analyzing the relationship between inflation and asset prices. Several empirical analysis have found a short-term negative relationship between inflation and stock prices (Anari, 2014). However, there are also articles such as (Engsted, 2002) which find a positive relationship. In another interesting article, (Boudouk, 1994) found that the type of relationship between inflation and stock prices depends on the type of company analyzed with companies in non-cyclical sectors having a positive relationship between inflation and stock prices while the opposite being true for companies operating in cyclical sectors. The conclusions about the long term impact on stock prices of inflation is less clear with the majority of the literature, such as the previously mentioned finding a positive Fisher effect for stock in the long run (Anari, 2014).

2. Interest rates

Interest rates is another of the most frequently factors impacting stock returns (Campbell, Pflueger, and Viceira, 2020; Lettau, 2007; Hardouvelis, 1987). There is a large literature devoted to the impact of interest rates on the stock market with for instance, (Bjornland, 2009) empirically finding that for the US case there is a 7% to 9% correction in the stock market as a response to an increase of 4 bps in the interest rate. The prevailing observation in the literature is that there is an inverse relationship between interest rates and stock prices. While a significant fraction of the existing literature focuses in the US case there is also a large body of articles finding similar results in other countries (Alam, 2017). (Alam, 2017) founds that for a sample of 15 countries (Australia, Bangladesh, Canada, Chile Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippines, South Africa, Spain and Venezuela) all of them had exhibit a negative relationship between interest rates and stock performance.

3. Gross fixed capital formation

The impact of gross fixed capital formation on the stock market has attracted much less attention among researchers than inflation or interest rate. There are however some articles, particularly in the case of emerging countries, such as (Okwuchukwu, 2017; Ibadin, 2014). In fact, it might be the case that gross fixed

capital formation might have a large impact on the stock markets of developing countries than on those of developed economies. Some authors, such as (Boamah, 2018) have found that gross fixed capital formation is an important factor driving economic growth in 18 Asian countries.

4. Economic growth

Economic growth, typically measured as GDP growth, is another of the most frequently cited macroeconomic factors in the existing academic literature regarding its impact on stock prices. The relationship between economic growth and stock performance is perhaps one of the most intuitive as it would seem like a reasonable assumption that economic growth should, at least to some degree, translate into positive stock market performance. There are numerous papers analyzing this relationship between economic growth and stock returns in many different countries such as the US (Bodie, 1976; Campbell, Pflueger, and Viceira, 2020; Bradford, 2010) European countries (Sukruoglu, 2014), Latina America (Garcia, 1999), Asian countries (Garcia, 1999). Nevertheless, there are also some very well-known articles such as (Ritter, 2005) mentioning that the impact of economic growth on stock returns is not as large as institution would indicate.

5. Personal remittances

Personal remittances are an important contributor to the economy of many developing countries such as the Philippines. According to figures from the World Bank, personal remittances accounted in 2018 for approximately 10.2% of the total GDP of the Philippines. Given that personal remittances are such a large part of some economies it seemed reasonable to consider them in the analysis. Some papers, such as (Haruna, 2019) have linked remittances with stock market performance. Interestingly, (Tsaurai, 2019) found a negative, but rather small, relationship between personal remittances and stock performance in the case of South Africa.

It should be noted that while the majority of the existing literature supports the idea that personal remittances have a positive impact on economic development (Amponsah, 2019; Karikari, 2016; Nyamongo, 2012; Mwangi, 2015;

Yismaw, 2019; Fayissa, 2010) some authors, such as (Incaltarau, 2011), argued that there is a moral hazard problem as the local economies become too dependent of remittances and therefore have less incentive to promote local economic growth.

6. Agricultural production/prices

The majority of the existing literature covering the issue of agricultural prices/production impacting stock prices tend to focus on developed economies, particularly the US (Ma, 2019; Chevalier, 2013), with less focus on developing countries. This is likely due to better data availability. Nevertheless, developing countries are likely to have very different economies with several of those countries, particularly in Latin America and South East Asia, having large agricultural sectors. The importance of the agricultural sector, and its impact in the stock market, will clearly depend on the specific country analyzed but it is an important industry for many developing countries (Candila, 2018).

7. Crude oil prices

A financial variable frequently mentioned is the price of crude oil (Gomes, 2014) with a very large literature covering the impact of oil prices on the economy. For instance (Hamilton, 2000) found that increases in the price of oil had a larger impact on the economy than a decrease in price. Spillovers from crude price into the stock market is a well document event identified in multiple countries. For example, (Agren, 2018) identified these spillovers in the stock markets of countries such as Japan and the US. This event has also been identified in emerging markets (Gomes, 2014) as Argentina and Pakistan. (Nzalioglu, 2015) analyzed the impact of oil prices on the stock market during periods of financial stress such as the 2008 US debt crisis. (Trujillo-Barrera, 2012) concluded that there are volatility spillovers between the agricultural prices and crude oil prices in the futures market.

8. Labor force participation/unemployment

Unemployment is another factor that clearly can have an impact on the performance of the stock market. There many papers concluding that unemployment has an impact on the stock performance for many different countries, such as

for instance the US (Chen, 2009; Jareno, 2016; Boyd, 2005), Europe Pilinkus, 2010 and Pakistan Haider, 2018. Some authors, such as Loungani, 1990 have mentioned that this is likely a bidirectional relationship with stock prices also affecting unemployment.

9. Foreign exchange rate

Another factor that has attracted a lot of research is the impact of foreign exchange changes on the stock market. The foreign exchange market and the stock market are not perfectly correlated but however many papers have shown that during times of financial distress that correlation increases. The impact of foreign exchange changes in the stock market has been documented in many markets, such as US (Morales-zumaquero, 2018; Reboredo, 2016; Xuejin, 2017), Korea (Taly, 2015), China (Fengming, 2018; Khalil, 2018), Japan (Fengming, 2018), Pakistan (Suriani, 2015; Qayyum, 2018), Canada (Morales-zumaquero, 2018) and South Africa (Niyitegeka, 2020). Given the importance of foreign exchange fluctuations during the South East Asian financial crisis it seemed reasonable to include them in the analysis.

10. Exports

Exports is another frequently mentioned determinant of stock market performance in many counties such as South Africa (Tsaurai, 2018), Germany (Celebi, 2019; Lin, 2012), China, Bangladesh (Hasanujzaman, 2016) and India (Hasanujzaman, 2016). As previously mentioned some emerging markets have a large agricultural sector so it seemed reasonable to separate agricultural production from non-agricultural merchandise exports. Exports have been a very important part of rapid economic development of some Asian countries in what is referred in the literature as the “Asian miracle” (Ang, 2015). In this dissertation we consider merchandise exports (agricultural production is considered separately).

11. Foreign Direct Investment (FDI)

Foreign direct investment can potentially have a significant impact on the stock performance of many emerging markets. It has been identified in several countries, including Nigeria (Abubakar, 2018), Croatia (Arcabic, 2013) and Ghana

(Kwaku, 2013). FDI in some emerging markets account for a significant part of its economy. As discussed in Chapter 1 and 2 several South East Asian countries attracted considerable inflows of foreign capital in the years before the start of the South East financial crisis.

12. Interdependencies of equities markets

The performance of the equity market in one country or region is affected by the performance of the equity markets in other countries and regions. There is ample literature mentioning this point with for instance, (Theodossiou, 1993) finding empirical evidence of interdependences among the stock markets of several countries including US, Japan, Canada and Germany. Similar results have been found by many authors such as (Hui-chu, 2018) that found interdependencies between the stock market in the US, Europe and Asia. Weiping (2020) also found interdependencies among the stock markets of the G20 countries and by (Gamba-Santamaria, 2017) that found interdependencies among several countries including Australia, Canada, China, Germany, Japan and the US.

13. Trading volume

The traded volume of a stock might impact the performance of such stock. This is well-documented in several markets including the US (Campbell, 1993; Easton, 1999; Gong-meng, 1998; Gong-meng, 2001), China (Gong-meng, 2001), Sri Lanka (Pathirawasam, 2011) and Japan (Lee, 2011). Gervais (2011) argued that stocks that experienced unusually high trading volumes tend to appreciate following that increase in volume. Gong-meng (2001) mentioned that there is an interconnection within these two variables as volumes produce returns and returns produce volume.

14. Autoregressive terms

Lag terms are frequently used when forecasting stock market returns. For instance, the return of the market in a given day it is likely that impacts the performance of the stock market in the following day. This approach is supported by a large amount of papers such as (Engle, 1991; Campbell, 1999), which lag terms and how many of those lag terms to be included in the analysis vary

widely among the literature. Given how frequently these lag terms are in the literature it seemed reasonable to include them in the modelling.

After identifying the most important variables for stock market performance according to theory and the empirical literature, we will use them as control variables. A dummy variable, representing the type of legal system was included and it is the main focus of this analysis. There are many models describing the performance of specific emerging markets and moreover, it is very complex to find models that work well for developed and emerging markets as they are likely to exhibit very different characteristics. Although our central interest are Asian emerging countries, we have also estimated the same model for a sample of 24 countries and for a sample of emerging and Asian countries (see Appendix). Two different dependent variables, representing the stock market, were used: 1) Market capitalization of domestic companies (YoY change) and 2) Return of country/jurisdiction stock indexes. The market capitalization of domestic company's data was obtained from the World Bank, IMF and Bloomberg while the country/jurisdiction stock index data was obtained from Bloomberg. Both of these numerical values were converted into yearly returns, which were the variables finally used in the calculations. As a consequence, there are two versions: version A (with market capitalization as a dependent variable) and version B (with return of country/jurisdiction stock index as dependent variable).

The relationship between the stock market performance and the legal system was analyzed by controlling by a set of 12 variables:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12} + \epsilon \quad (5.1)$$

where:

X_1 = Change in GDP (%)

X_2 = *World MSCI*_(t)

X_3 = *World MSCI*_(t-1)

X_4 = Dummy variable reflecting the different types of legal systems (see table 5.8)

X_5 = Labor force participation rate, total

Description	Source
GDP(t)	World Bank, IMF and Bloomberg
MSCI(t)	Bloomberg
MSCI(t-1)	Bloomberg
Dummy	Legal systems
Labor force participation	World Bank, IMF and Bloomberg
Merchandise exports	World Bank, IMF and Bloomberg
Personal remittances received	World Bank, IMF and Bloomberg
Fuel imports (%)	World Bank, IMF and Bloomberg
Agriculture (local currency)	World Bank, IMF and Bloomberg
Gross fixed capital formation (local currency)	World Bank, IMF and Bloomberg
R(t-1); index return in the previous day	Bloomberg
Foreign direct investments (% of GDP)	World Bank, IMF and Bloomberg
Inflation, consumer prices (%)	World Bank, IMF and Bloomberg
Foreign exchange rate	Bloomberg
Stocks traded (total value)	World Bank, IMF and Bloomberg
Real interest rates	World Bank, IMF and Bloomberg

TABLE 5.2: Independent variables considered

X_6 = Change (%) merchandise exports (USD)

X_7 = Change (%) personal remittances, received (USD)

X_8 = Fuel imports (% of merchandise imports)

X_9 = Change (%) agriculture, forestry, and fishing, value added (local currency)

X_{10} = Change(%) gross fixed capital formation (local currency)

X_{11} = $r_{(t-1)}$

X_{12} = Real interest rate (%)

And the dependent variable, as previously mentioned, is either:

Y = Market capitalization of domestic companies (YoY change)

or

Y = Return of country stock indexes (see table 5.7)

We start by analyzing the influence of the legal system in the stock market performance for eight emerging Asian countries. The list of countries included is in Table 5.3 and the main results of our regressions are in Table 5.4. Our estimates show that the coefficient of the dummy variable representing the legal system is statistically significant at a 5% significance level. We have replicated our estimates for a sample of emerging countries that in addition to Asian countries includes Argentina, Mexico, Peru and South Africa (see Table 5.9 in the Appendix) and, finally for a sample of 24 developed and developing countries (see Table 5.10 in the Appendix). In all

cases our result maintains and the legal system is statistically significant at 5 per cent level in all the regressions.

Country/jurisdiction
Thailand
Indonesia
Malaysia
Philippines
South Korea
Singapore
Hong Kong
Pakistan

TABLE 5.3: List of considered Asian emerging countries/jurisdictions

5.4 Lasso regression

Rather than defining the model, another approach is to use an algorithm to select from all the variables available those that are most appropriate. One robust way of doing these variable selection is called a Lasso regression (Fu, 1998; Osborne, 2000). In a Lasso regression some of the coefficients of the regression are actually set to zero, reducing the number of variables. The algorithm starts with all the variables (none excluded) and creates models gradually with less variables until the coefficients for all the variables are zero. Therefore, the Lasso regression generates multiple models for the data set analyzed. This approach was followed including initially all the 16 variables that we have analyzed in the previous section. The Lasso regression generates 100 models ranging from an initial model, containing all the 16 available variables, to the final model in which all the coefficients of the variables are set to zero. The vast majority of the models obtained included the dummy variable attributed to the type of legal system.

Lasso regressions, like other similar automated model for variable selection, has the drawback that it might be difficult to understand why certain variables were chosen and certain other variables excluded from the model. The Lasso approach is rather sophisticated and might be detecting relationships subtle relationship between variables that are difficult to identify with more traditional approaches. In the

context of this dissertation the focus is not on providing complete and easily understandable stock forecasting models but on establishing if the legal system of a certain country/jurisdiction has an impact on the stock performance while controlling for other variables. In this regard, an automated system like a Lasso regression that generates several output model seems like an ideal, objective, data based approach.

Our results show that in the case of the regression using as the dependent variable the change in market capitalization, 81 out of 100 models generated by the Lasso regression included the dummy variable related to the type of legal system (X4). Similar results were obtained when using as dependent variable the return of the indexes. In this case 73 out of 100 models generated by the Lasso regression included the dummy variable (X4) related to the type of legal system (table 5.5). The forecasting accuracy of the Lasso regression can be seen in figures 5.1, 5.2, 5.3 and 5.4 (market capitalization) and figures 5.5, 5.6, 5.7 and 5.8 (equity index returns). The forecasting accuracy is measured using the R-Squared and the Adjusted R-squared of the output generated using the Lasso regressions and the actual values (change in market capitalization or return on the index). The accuracy of the model changes as the number of variables used is gradually reduced by the Lasso regression. The dynamics of the forecasting accuracy is similar in both cases with an initial phase in which there is no large change in the accuracy of the models followed by a smooth decline until another equilibrium is reached.

Y= Market capitalization of domestic companies (YoY change)				
Term	Estimate	SE	t-stat	p-value
b_0	0.00150	0.19669	0.00766	0.99390
b_1	0.08794	0.04691	1.87460	0.06264
b_2	0.09019	0.47581	0.18954	0.84991
b_3	1.62940	0.39822	4.09180	6.7166e-5
b_4	0.21439	0.09083	2.36030	0.01944
b_5	3.0792e-11	5.4696e-11	0.56297	0.57423
b_6	-0.41244	0.69053	-0.59728	0.55115
b_7	0.40206	0.32099	1.2526	0.22216
b_8	-0.01704	0.01067	-1.59670	0.11227
b_9	0.28503	1.41970	0.20076	0.84114
b_{10}	-1.69910	1.42400	-1.19320	0.23452
b_{11}	-0.11254	0.07967	-1.41260	0.15969
b_{12}	-0.00022	0.01041	-0.020967	0.98330
R-squared	0.16			
Adjusted R-squared	0.10			
Y= Return of country stock indexes				
Term	Estimate	SE	t-stat	p-value
b_0	0.09817	0.061076	1.60740	0.10991
b_1	-0.00504	0.01457	-0.34595	0.72982
b_2	-0.65597	0.14775	-4.43970	1.6546e-05
b_3	1.19060	0.12366	9.62850	1.1833e-17
b_4	-0.06218	0.02821	-2.20460	0.02889
b_5	-3.6968e-11	1.6985e-11	-2.1766	0.03095
b_6	0.36917	0.21443	1.7217	0.08706
b_7	-0.09410	0.09968	-0.94401	0.34656
b_8	0.00416	0.00331	1.23560	0.21178
b_9	0.18266	0.44087	0.41431	0.67919
b_{10}	0.18012	0.44218	0.40734	0.68428
b_{11}	0.02203	0.02474	0.89031	0.37461
b_{12}	-0.00170	0.00323	-0.52407	0.60009
R-squared	0.44			
Adjusted R-squared	0.40			

TABLE 5.4: Stock market estimation for emerging Asian countries, 1997-2018. Note: In the upper section it is shown the results of the regressions using the market capitalization of domestic companies (YoY change) as the dependent variable. In the lower section it is shown the results of the regressions using the return of country/jurisdiction stock indexes.

Description	Source
X1	GDP(t)
X2	MSCI(t)
X3	MSCI(t-1)
X4	Dummy (legal systems)
X5	Labor force participation
X6	Merchandise exports
X7	Personal remittances received
X8	Fuel imports (%)
X9	Agriculture (local currency)
X10	Gross fixed capital formation (local currency)
X11	R(t-1); index return in the previous day
X12	Foreign direct investments (% of GDP)
X13	Inflation, consumer prices (%)
X14	Foreign exchange rate
X15	Stocks traded (total value)
X16	Real interest rates

TABLE 5.5: Lasso variables

We consider the sample of countries included in Table 5.3. The Lasso regression, as previously mentioned, were done twice, one for the change in market capitalization as dependent variable and another one using the return on stock indexes as the dependent variable. It will be shown that the analysis consistent regardless of which one of these two dependent variables are used. The dummy variable representing the legal system (X_4), which is the focus of this analysis, is once more present in the majority of the models generated by the Lasso regression. The forecasting accuracy of the Lasso regression can be seen in figure 5.4 (dependent variable is the change in market capitalization) and figure 5.8 (dependent variable is the return on the stock index). This forecasting accuracy is measured using the R-Squared and the Adjusted R-squared of the output generated using the Lasso regressions and the actual values (change in market capitalization or return on the index). The accuracy of the model changes as the number of variables used is gradually reduced by the Lasso regression. The dynamics of the forecasting accuracy is similar in both cases with an initial phase in which there is no large change in the accuracy of the models followed by a smooth decline until another equilibrium is reached. When we only consider emerging Asian countries/jurisdictions the results show that 90 out of 100 models (using the change in market capitalization as the dependent variable) had a non-zero coefficient for the variable related to the type of legal system. When the return on the equity market is used as dependent variable then 79 out of 100 models included a non-zero coefficient for the type of legal system.

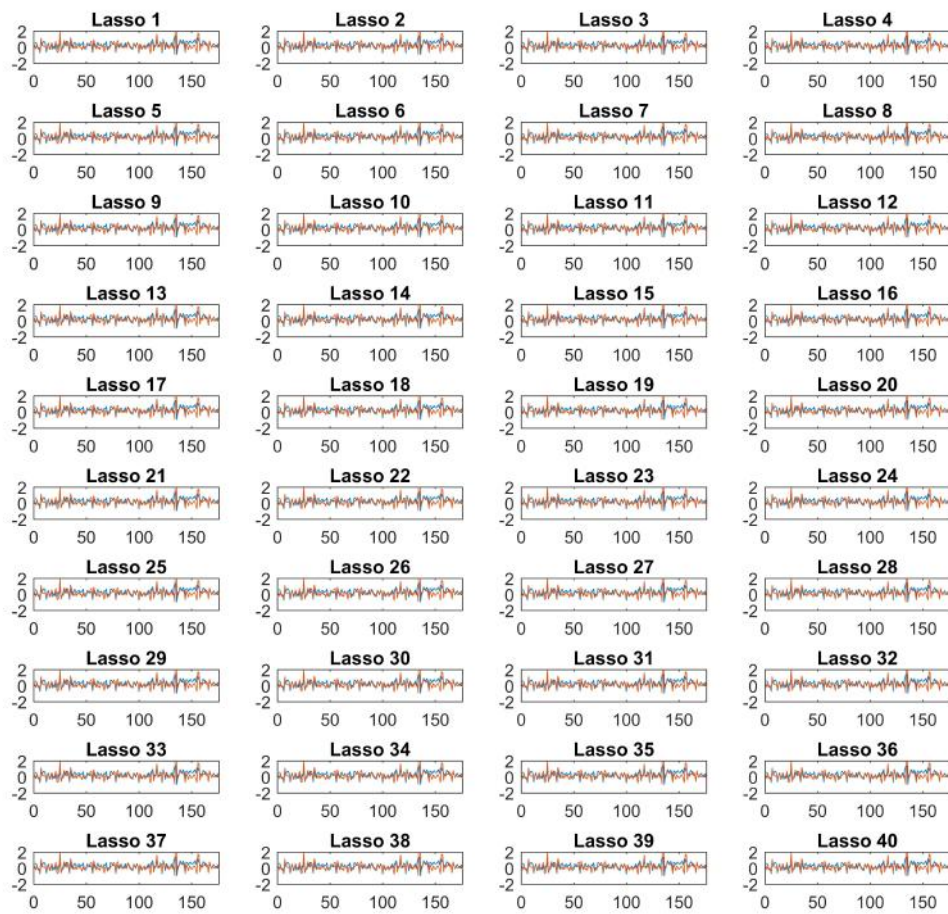


FIGURE 5.1: Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks (orange) - emerging Asian markets only.



FIGURE 5.2: Continuation - Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks (orange) - emerging Asian markets only.

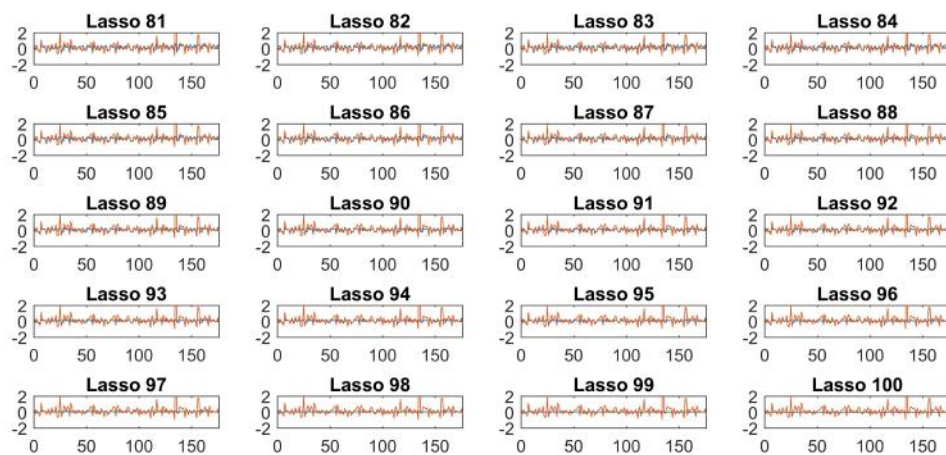


FIGURE 5.3: Continuation - Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks (orange) - emerging Asian markets only.

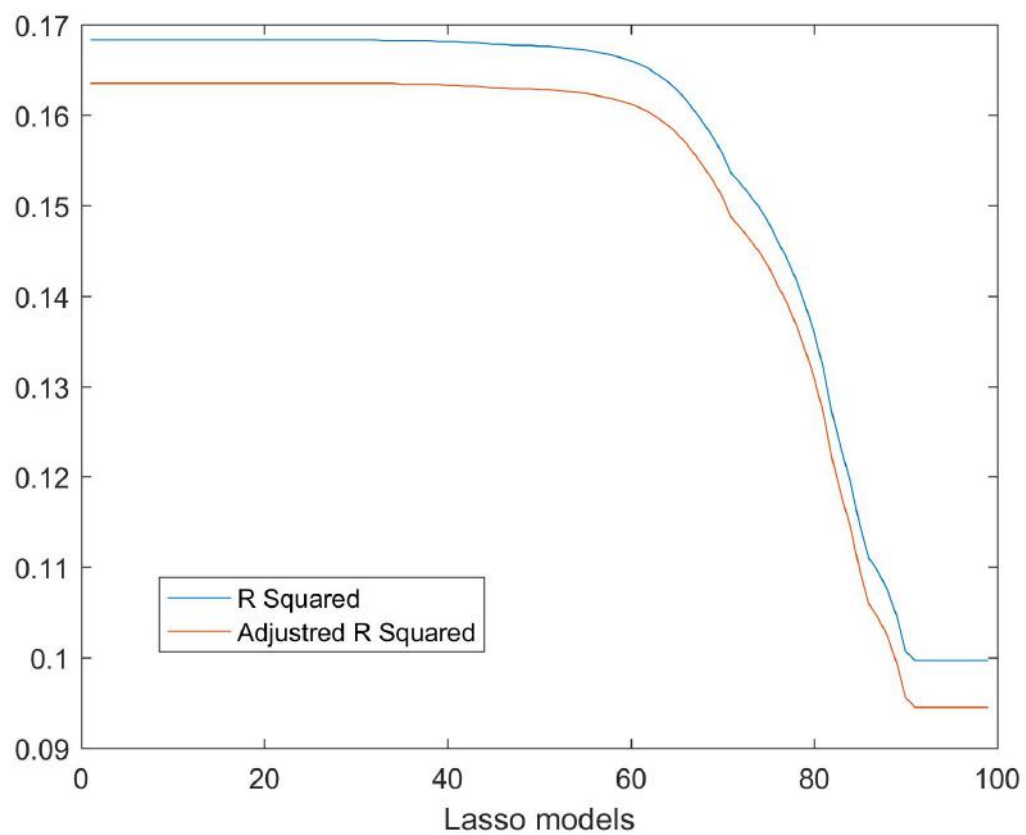


FIGURE 5.4: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable in the regressions is the change of the total market capitalization of domestic stocks - Emerging Asia only.

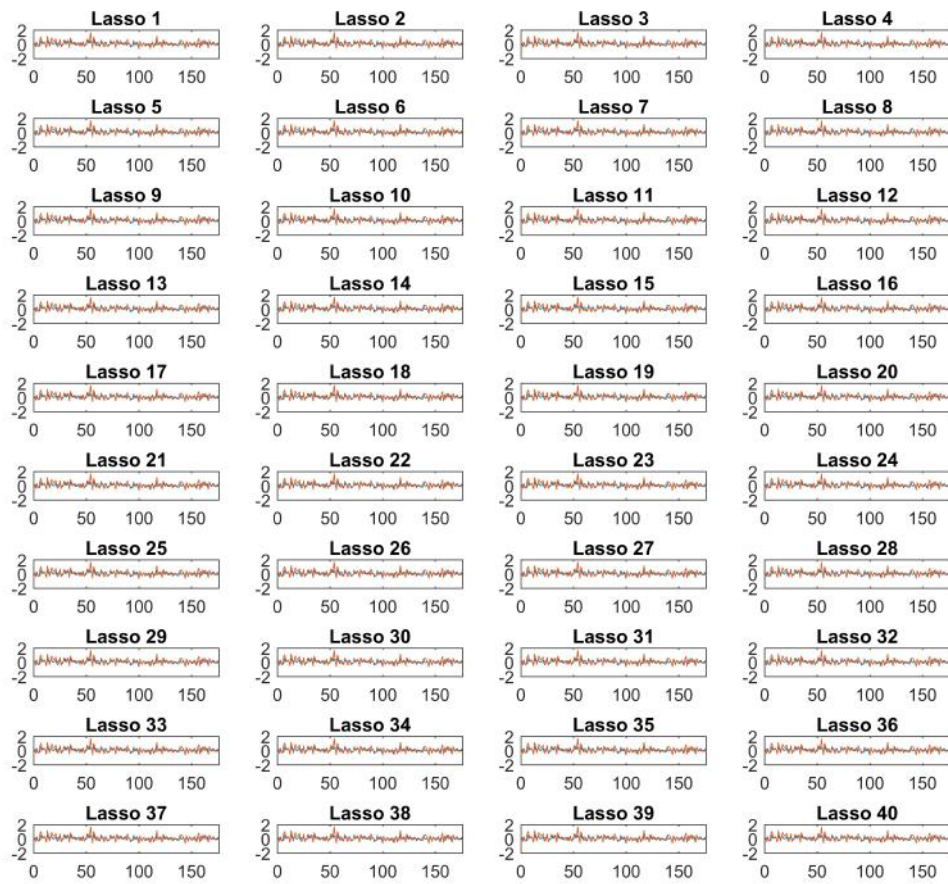


FIGURE 5.5: Output of Lasso regressions (blue) compared to actual equity index returns (orange) - emerging Asian markets only.

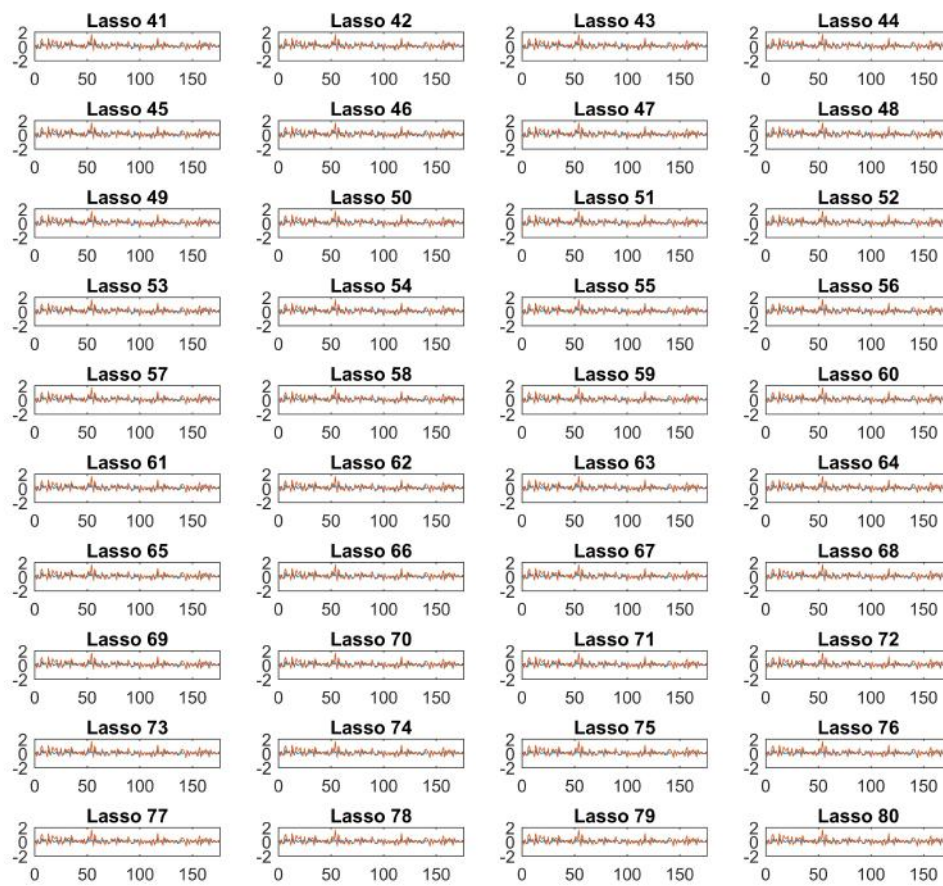


FIGURE 5.6: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - emerging Asian markets only.

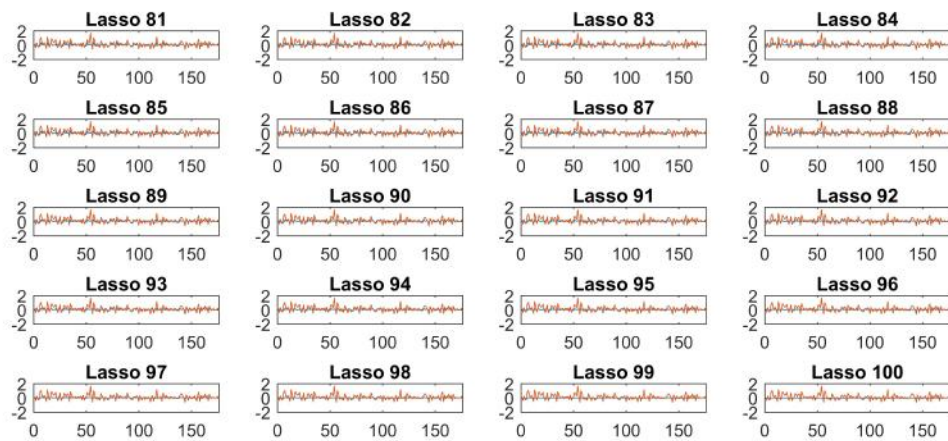


FIGURE 5.7: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - emerging Asian markets only.

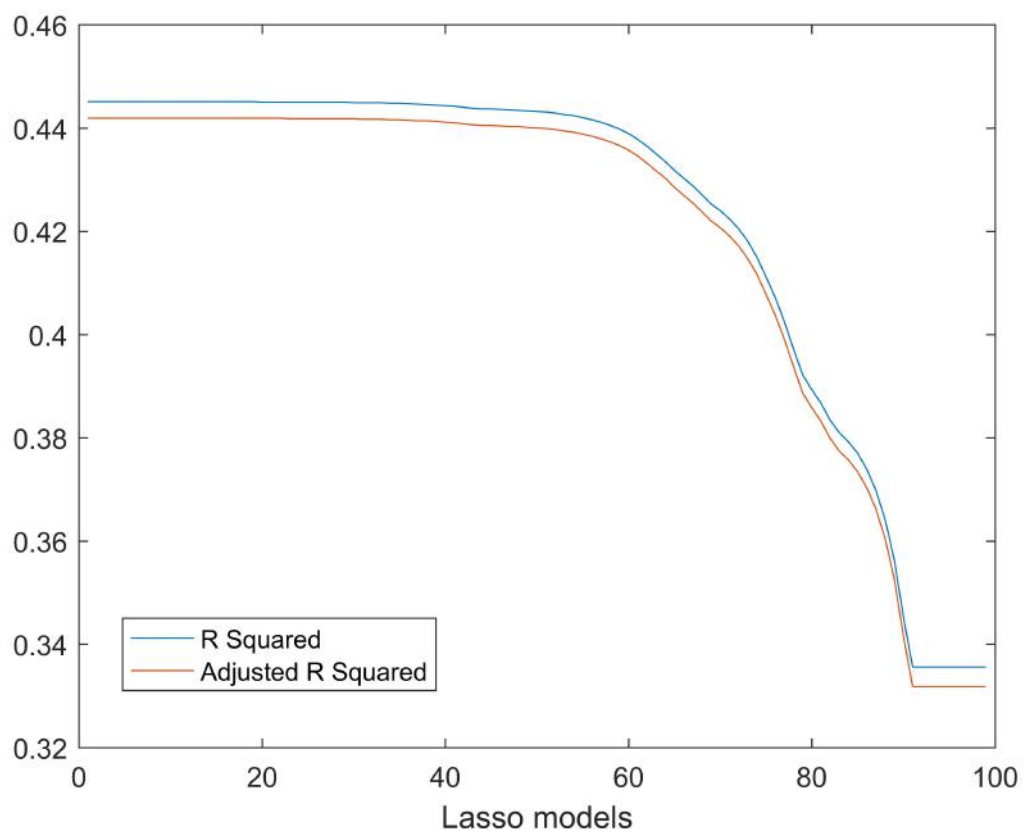


FIGURE 5.8: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable in the regressions is the returns of the equity indexes - Emerging Asia only.

We have also replicated the Lasso regressions including other Asian countries (Hong Kong and Japan), for a sample of emerging countries (that includes in addition to the Asian countries, Argentina Mexico and South Africa) and for a sample of 24 developed and developing countries. Results of the regressions are in the Appendix. When incorporating Japan and Hong Kong, the results show that 86 out of the 100 models generated by the Lasso regression, when using the change in market capitalization as dependent variable, included a non-zero coefficient for the dummy variable representing the type of legal system (see figures 5.12, 5.13 and 5.14 in the Appendix). When the dependent variable used is the return on the stock index the results are similar with 81 out of 100 models including the coefficient for the type of legal system (see figures 5.16, 5.17 and 5.18 in the Appendix). Our regression incorporating emerging countries, when using the change in market capitalization as the dependent variable, 79 out of 100 models included the dummy variable related to the type of legal system (see figures 5.20, 5.21 and 5.22 in the appendix). In the case of the regressions using the return of the stock index as dependent variable 82 out of 100 models included the before mentioned variable (see figures 5.24, 5.25 and 5.26 in the Appendix). Finally, for the sample of 24 countries, in the case of the regression using as the dependent variable the change in market capitalization, 81 out of 100 models generated by the Lasso regression included the dummy variable related to the type of legal system (X4) (see figures A.9a, A9b and A.9c in the Appendix). Similar results were obtained when using as dependent variable the return of the indexes. In this case 73 out of 100 models generated by the Lasso regression included the dummy variable (X4) related to the type of legal system (see figures 5.28, 5.29 and 5.30 in the Appendix). The Lasso regression, for the majority of the models generated and in all the samples considered, incorporates the dummy variable relate to the type of legal system. In any case, the number of models that consider the proxy of the legal system is even higher in the emerging Asian countries when we use as dependent variable the market capitalization.

Additionally, a risk adjusted return on the Asian emerging markets stock indexes was carried out. The Sharpe ratios were calculated using the standard formula (equation 5.2).

Dependent Var.	Emerging Asian	Asian	Emerging	Developed and developing
A	90%	86%	79%	81%
B	79%	81%	82%	73%

TABLE 5.6: Lasso results: number of models generated that included the dummy variable related to the type of legal system for different samples. Note: A= Market capitalization of domestic companies, B: Return of country/jurisdiction stock indexes

$$SR = \frac{R_I - R_f}{\sigma} \quad (5.2)$$

Where SR stands for Sharpe ratio, R_I is the return of the index, R_f is the risk free return and σ is the volatility of the excess return. Pakistan and Singapore were excluded from the analysis due to data availability. The risk free rates for each country/jurisdiction were obtained from multiple sources such as Bloomberg, World Bank and IMF. When available the 10-year sovereign bond was used as reference but this was not available for all the years analyzed. For some countries, particularly in the 1997 to 1998 period, the deposit rate was used as a proxy for the risk free rate as there were no bond data available. After the Sharpe ratio was calculated for each jurisdiction for each an average amount for each legal system (English, French and German) was obtained. In 10 of the 22 years analyzed (1997-2018) the Sharpe ratio of the English legal system was the highest among the three analyzed. The French system had the highest level in 7 years and the German system in only 5. It is acknowledged that the German legal system only has one representative in emerging Asia (South Korea) but that's a limitation unavoidable in this type of analysis. Overall, while no statistically conclusive the data suggest that the English legal system does have an advantage, from a stock market performance point of view, compared to the French and German legal systems. The average Sharpe ratios can be seen in figure 5.9.

5.5 Robustness analysis

The robustness was tested using a machine learning approach. The importance of a robustness analysis in this context has been highlighted by several well-known

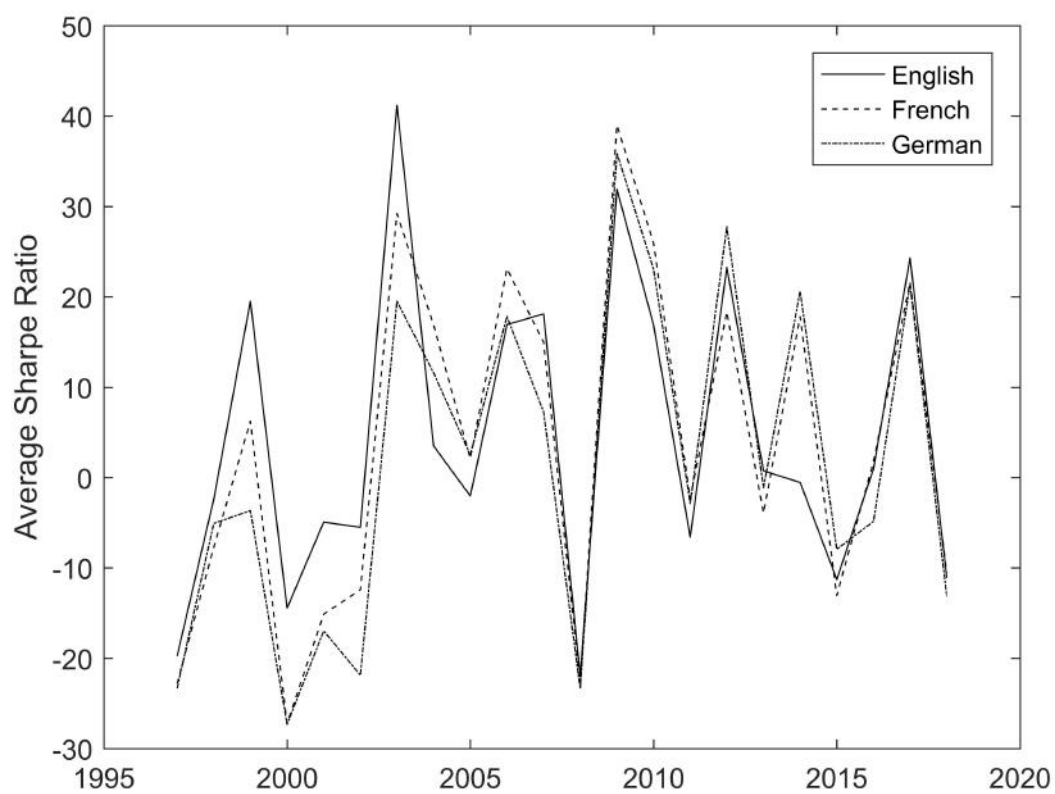


FIGURE 5.9: Average Sharpe ratios for the equity markets in emerging Asia (1997-2018)

articles such as Klerman and Mahoney, 2007, Klerman et al., 2011, Spamann, 2010, and Chang, Garoupa, and Wells, 2021. It should be noted that the economic differences resulting from having a common or civil law system is an area of active research with for instance (Spamann, 2010) concluding that contract enforceability is higher in common law countries than in French systems but lower than in German or Scandinavians. The author also highlights the potential economic relevance of these differences. Spamann, 2010, challenges the assumption that investor protection is higher in common law jurisdiction compared to civil law jurisdictions. Mentioning that some studies supporting this idea, such as La-Porta et al., 1997, are difficult to reproduce. Bradford et al., 2021 mentioned the discrepancies in the classification of jurisdictions according to the original legal system (English, French, German or Nordic) and the ongoing debate on how to classify jurisdictions accordingly. The specific tool used was neural networks for classification processes. There are several ways in which this analysis can be carried out, such as for instance sparse the novel application of linear discriminant analysis (LDA) in the context of this problem used in Chang, Garoupa, and Wells, 2021. As there is no empirical indication that the relationships are necessary linear it seemed reasonable to use a technique such as neural networks that can model, at least in principle, both linear and non-linear processes. As a preliminary step, the yearly values for the variables considered for each market were assigned a dummy variable representing the chosen type of legal system (the classification showed on table 1). 35% of the data was used for testing purposes while the rest for training purposes. The testing dataset was not used during the training phase. The error rate was then obtained for the misclassification of the three different legal systems (English, French and German). The network used has one hidden layer with 20 neurons. The classification error of the neural networks depends on the initial (random) values of the weights of the individual neurons in the network as well as the training dataset. In order to account for this 120,000 simulations were carried out. In each simulation the actual data that is allocated to the 35% testing dataset is selected randomly. The average misclassification errors for the French, English and German legal systems, following this approach were 11.2%, 9.84% and 22.49% respectively and the related standard deviations 3.27%, 4.14% and 10.14%. The confusion matrix for one iteration is shown in figure 5.10. A histogram

with the classification for the three different legal systems can be seen in figure 5.11. These are the results of 120,000 simulations.

5.6 Conclusions

The aim of this chapter is to determine whether the type of legal system is a significant factor in the explanation of stock market performance for the Asian emerging countries from 1997 to 2018. To capture the influence of the legal system we have used the classification of a sample of countries according to their legal origin (English, French and German) by La-Porta et al., 1997. To better justify this classification for our sample of Asian emerging countries, we have also historically examined the origin of the legal system and the emergence of the stock market system. We have tested the robustness of our results by replying the analysis for a sample of Asian countries (than includes Hong Kong and Japan), for a sample of 12 emerging countries and for a broad sample of 24 countries that include a mix of developed and developing countries. As there are many models describing the stock market performance and it is very difficult to select the “right” model”, we first have estimated a model of stock market performances that includes as control variables most of the variables that theory and empirical works have considered. Secondly, given that there is no model that fully capture the dynamics of all the markets analyzed we have used Lasso regression that take all the independent variables collected and select a subset of those. Our results for the emerging Asian countries by estimating a model that includes as controlling variables all those considered in theory and empirical analysis on stock market performance indicate that the dummy variable, representing the type of legal system, is statistically significant at a 95% confidence level. The analysis was carried out for two different dependent variables (the change in market capitalization of domestic companies and the return on the stock index). The results are consistent regardless of which one of the two independent variables is used. We have replicated the regressions for Asian countries, for 12 emerging countries and for a broad sample of 24 for countries and in all cases the coefficients for the dummy variable representing the type of legal system is statistically significant at a 5% significance. Finally, the results from the Lasso regressions also seem



FIGURE 5.10: Confusion matrices for a simulation (120,000 simulations were carried out). Class 1, 2 and 3 represent the French, English and German legal system respectively.

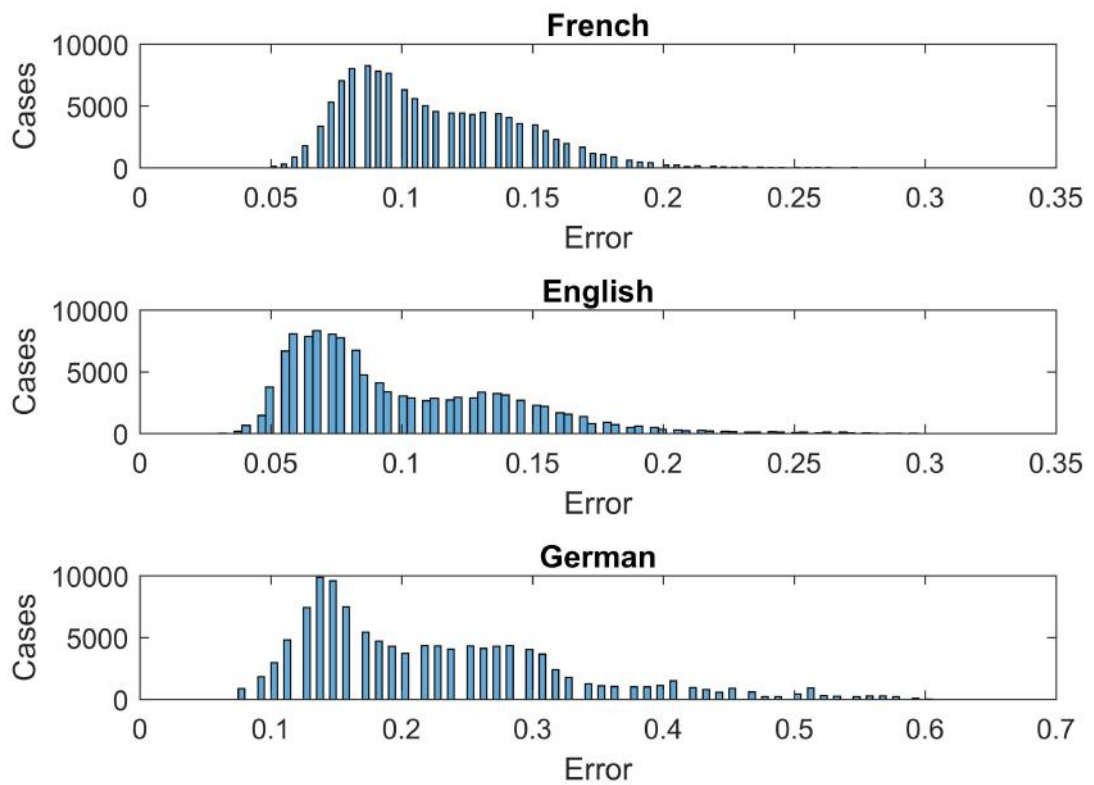


FIGURE 5.11: Histograms for the classification error rates for each of the legal systems (French, English and German)

to support the idea that the type of legal system has an impact on the performance of the market. We obtain that 90 per cent of the models automatically generated by the Lasso regression using the yearly change in market capitalization of domestic companies had a non-zero coefficient for the dummy variable representing the type of legal system. Similar results were obtained when using the return on the country/jurisdiction stock indexes. In this case 79 per cent of the models generated by the Lasso regression included a non-zero coefficient for dummy variable representing the type of legal system. When we replicate the regression for our different samples similarly, most of the models generated by the Lasso regression include this variable (with a non-zero coefficient). It is interesting to remark that when using the market capitalization, the highest percentage of models generated by Lasso that include a non-zero coefficient for dummy variable representing the legal origin is in the emerging Asian countries (90 per cent). This would seem to indicate that the legal system of the country/jurisdiction has statistically significant impact on the performance of the equity market, which is consistent with some of the results of (La-Porta et al., 1997). La-Porta et al., 1997, also concluded that the English legal system appears to have an advantage over the French and German, suggesting that the English system provides better investors protection. Our results, while not statistically conclusive, also suggest that the average risk adjusted performance, using the Sharpe ratio as an indicator, of emerging Asian market also favors countries with a legal based on the English one.

Appendix

Country/region	Stock index
Argentina	Argentine Merval
Australia	S&P ASX 200 Australia
Austria	ATX Austria
Belgium	Belgium BEL 20
Canada	S&P TSX 60 Canada
France	France CAC 40
Germany	German DAX
Hong Kong	Hang Seng Index
Indonesia	Indonesia Jakarta Composite
Japan	Nikkei 225
Malaysia	FTSE Malay KLCI
Mexico	S&P BMV Mexico
Netherlands	Netherlands AEX
New Zealand	NZSE New Zealand All
Pakistan	Pakistan KSE
Peru	S&P BVL Peru
Philippines	PSEi Index
Portugal	Portugal PSI 20
Singapore	Singapore Strait Times*
South Africa	FTSE JSE All
South Korea	Kospi
Spain	Spain IBEX 35
Thailand	SET Thai
United States	Dow Jones

TABLE 5.7: Country/jurisdiction stock indexes. Note: * indicates short time series

French legal system	
Country or region	Legal system dummy variable
Argentina	0
Belgium	0
Spain	0
France	0
Indonesia	0
Mexico	0
Netherlands	0
Peru	0
Philippines	0
Portugal	0
English legal system	
Country or region	Legal system dummy variable
Australia	1
Canada	1
Hong Kong	1
Malaysia	1
New Zealand	1
Pakistan	1
Singapore	1
Thailand	1
United States	1
South Africa	1
German legal system	
Country or region	Legal system dummy variable
Austria	2
Germany	2
Japan	2
South Korea	2

TABLE 5.8: Country/region classification according to legal system type (and related dummy variable)

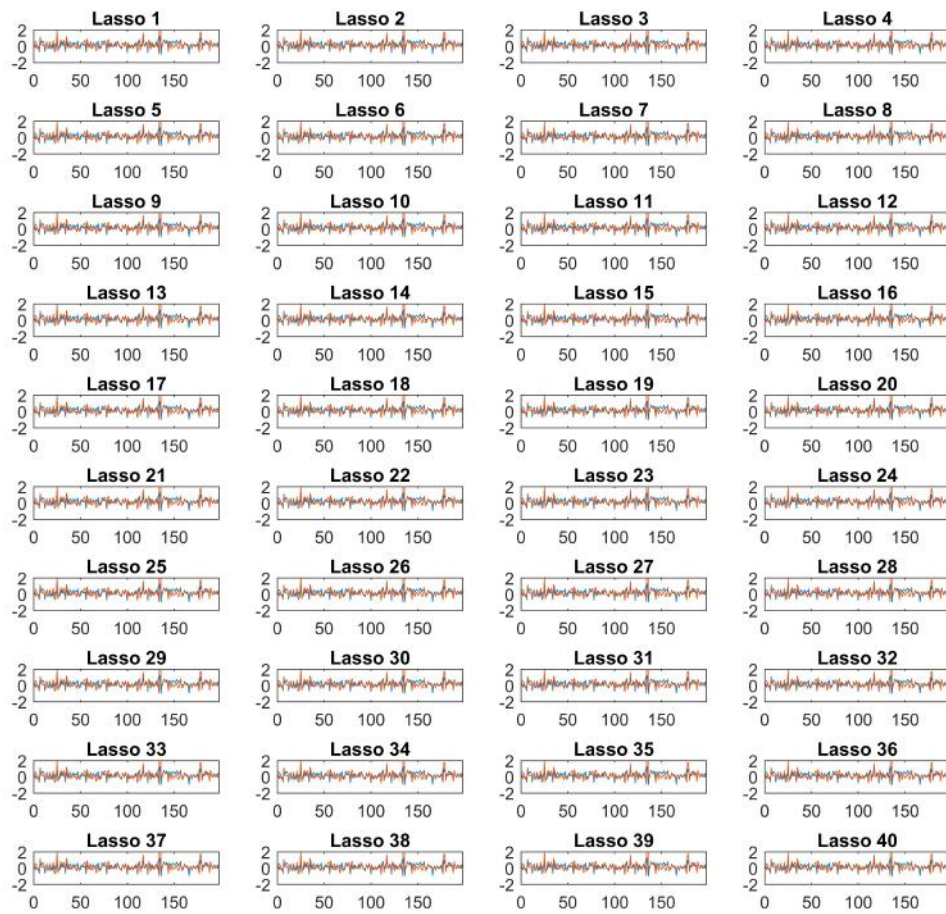


FIGURE 5.12: Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks (orange) - Asian markets only.

Y= Market capitalization of domestic companies (YoY change)				
Term	Estimate	SE	t-stat	p-value
b_0	-0.014144	0.12242	-0.11554	0.9081
b_1	0.039784	0.024982	1.5925	0.11243
b_2	-0.14889	0.30268	-0.4919	0.62318
b_3	1.3983	0.25108	5.569	6.1299e-8
b_4	0.14496	0.064439	2.2497	0.025267
b_5	1.8272e-11	4.1939e-11	0.43569	0.66341
b_6	0.07414	0.44439	0.16683	0.86762
b_7	0.074325	0.20638	0.36014	0.71902
b_8	-0.0088226	0.0062036	-1.422	0.15612
b_9	0.82964	0.84494	0.9819	0.32702
b_{10}	-0.66243	0.80755	-0.82029	0.41277
b_{11}	-0.09558	0.061909	-1.5439	0.12378
b_{12}	0.0024921	0.0076868	0.3242	0.74603
R-squared	0.15			
Adjusted R-squared	0.11			
Y= Return of country stock indexes				
Term	Estimate	SE	t-stat	p-value
b_0	0.097221	0.041596	2.3372	0.02015
b_1	-0.0052247	0.0084884	-0.61551	0.53873
b_2	-0.51678	0.10284	-5.0249	9.1201e-07
b_3	1.0869	0.085312	12.74	1.721e-29
b_4	-0.068719	0.021895	-3.1386	0.0018837
b_5	-3.4404e-11	1.425e-11	-2.4143	0.016243
b_6	0.34056	0.151	2.2555	0.024897
b_7	-0.085488	0.070124	-1.2191	0.22386
b_8	0.0031649	0.0021079	1.5015	0.13439
b_9	0.28344	0.28709	0.98727	0.32439
b_{10}	0.19195	0.27439	0.69955	0.4848
b_{11}	0.014818	0.021035	0.70443	0.48177
b_{12}	-0.001672	0.0026118	-0.64015	0.52261
R-squared	0.43			
Adjusted R-squared	0.40			

TABLE 5.9: Stock market estimation for emerging countries, 1997-2018. Note: In the upper section it is shown the results of the regressions using the market capitalization of domestic companies (YoY change) as the dependent variable. In the lower section it is shown the results of the regressions using the return of country/jurisdiction stock indexes

Y= Market capitalization of domestic companies (YoY change)				
Term	Estimate	SE	t-stat	p-value
b_0	-0.006092	0.068693	-0.88684	0.37558
b_1	0.045036	0.014516	3.1026	0.002024
b_2	-0.21995	0.16905	-1.3011	0.19382
b_3	1.2585	0.13937	9.0298	3.4578e-18
b_4	0.073759	0.036267	2.0338	0.042484
b_5	1.274e-11	2.9953e-11	0.42535	0.67076
b_6	0.14185	0.26121	0.54306	0.58733
b_7	0.13055	0.11649	1.1207	0.26294
b_8	-0.0027805	0.0034102	-0.81535	0.41525
b_9	0.33878	0.39534	0.85693	0.39188
b_{10}	-0.89449	0.4842	-1.8473	0.065272
b_{11}	-0.090725	0.044791	-2.0255	0.04333
b_{12}	0.0013974	0.0052463	0.26635	0.79007
R-squared	0.18			
Adjusted R-squared	0.16			
Y= Return of country stock indexes				
Term	Estimate	SE	t-stat	p-value
b_0	0.0038801	0.026887	0.14431	0.88531
b_1	0.013762	0.0056816	2.4222	0.01577
b_2	-0.34373	0.06617	-5.1946	2.9622e-07
b_3	0.99223	0.0545552	18.189	1.9379e-57
b_4	-0.03139	0.014195	-2.2113	0.027454
b_5	1.6865e-11	1.1724e-11	-1.4385	0.15089
b_6	0.10031	0.10224	0.98114	0.32699
b_7	0.023769	0.045596	0.52131	0.60238
b_8	0.0029307	0.0013348	2.1956	0.028565
b_9	0.11634	0.15474	0.75186	0.454248
b_{10}	-0.19734	0.18952	-1.0412	0.29825
b_{11}	0.0082099	0.017532	0.46829	0.63978
b_{12}	-0.00068964	0.0020535	-0.33584	0.73713
R-squared	0.43			
Adjusted R-squared	0.42			

TABLE 5.10: Stock market estimation for a sample of 24 countries, 1997-2018 (see table 5.7). Note: In the upper section it is shown the results of the regressions using the market capitalization of domestic companies YoY change) as the dependent variable. In the lower section it is shown the results of the regressions using the return of country/jurisdiction stock indexes.

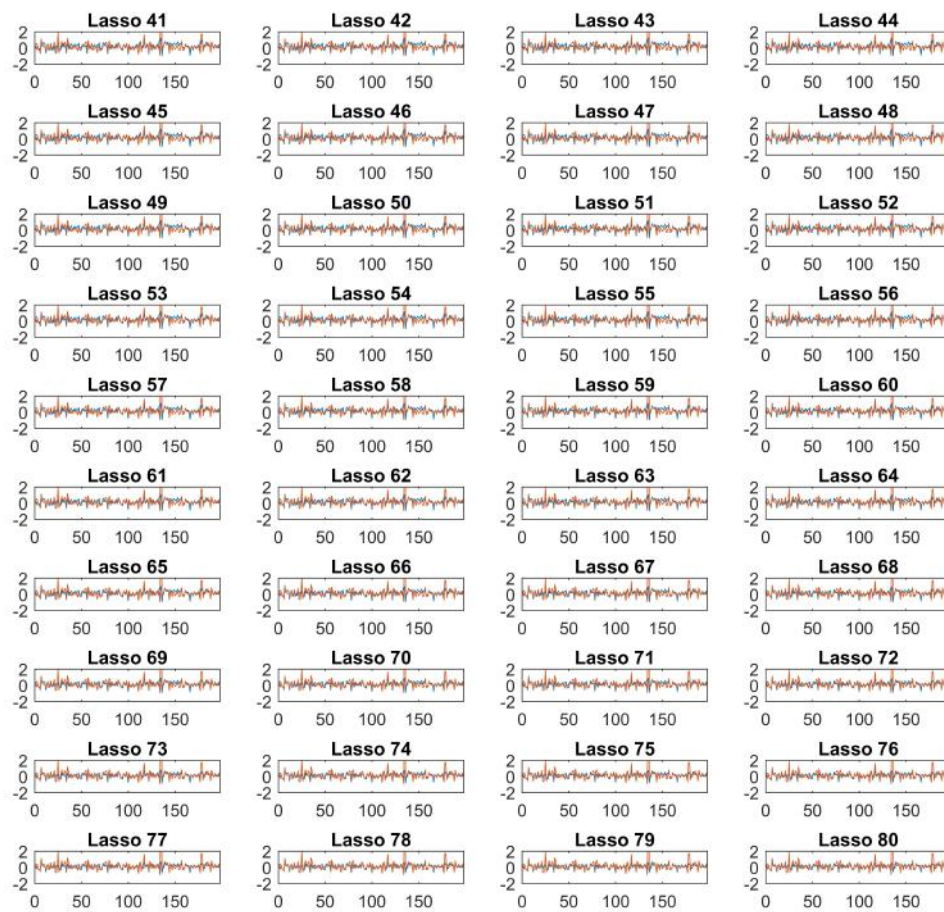


FIGURE 5.13: Continuation - Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks (orange) - Asian markets only.

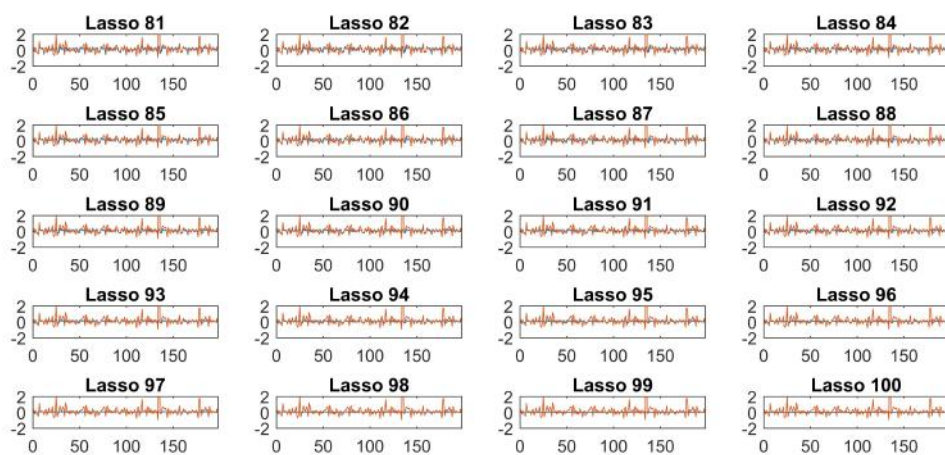


FIGURE 5.14: Continuation - Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks (orange) - Asian markets only.

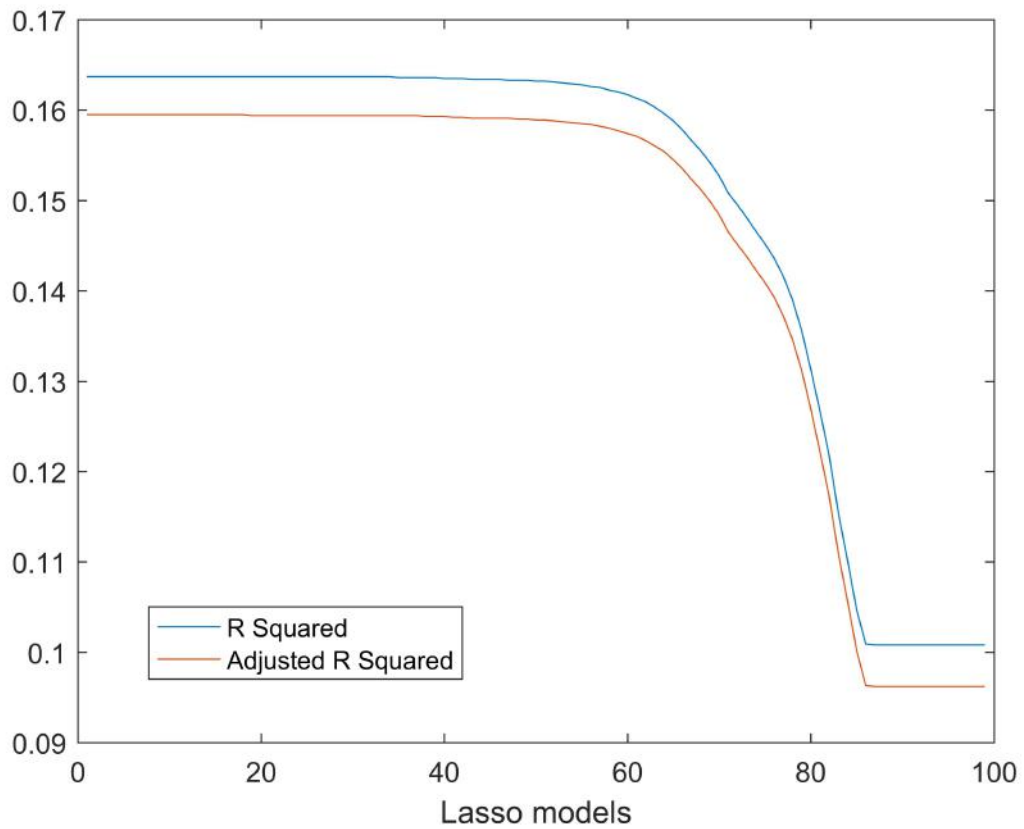


FIGURE 5.15: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable in the regressions is the change of the total market capitalization of domestic stocks - Asian markets only. Note: The dependent variable in the regressions is the change of the total market capitalization of domestic stocks

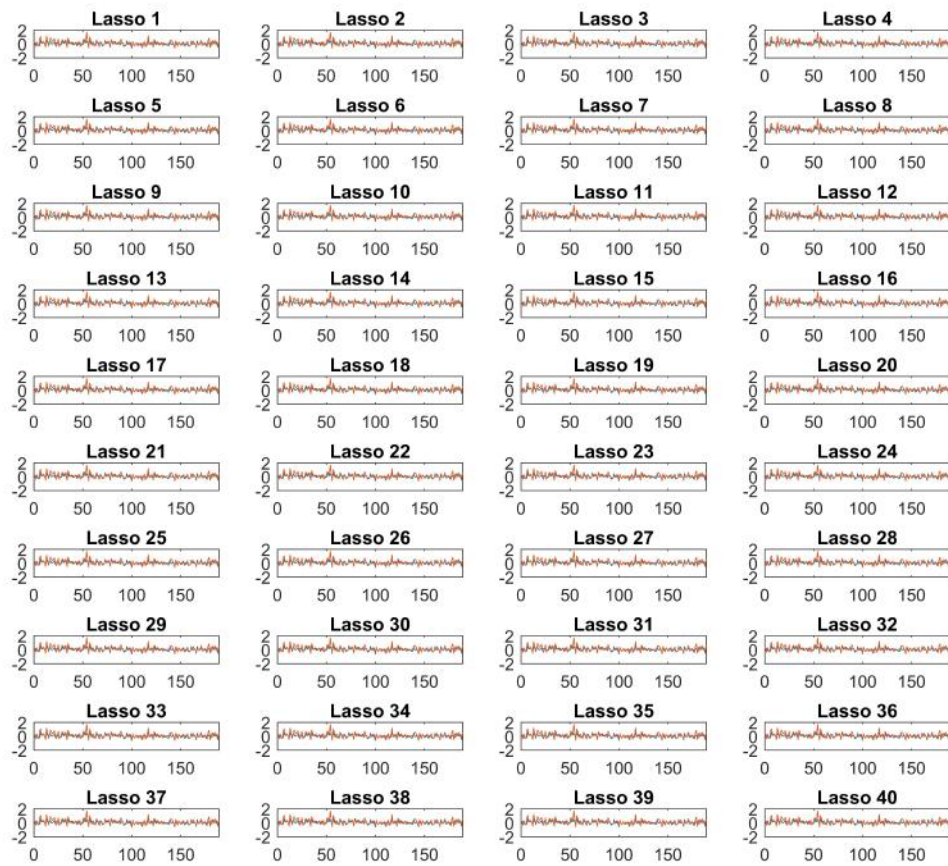


FIGURE 5.16: Output of Lasso regressions (blue) compared to actual equity index returns (orange) - Asian markets only.

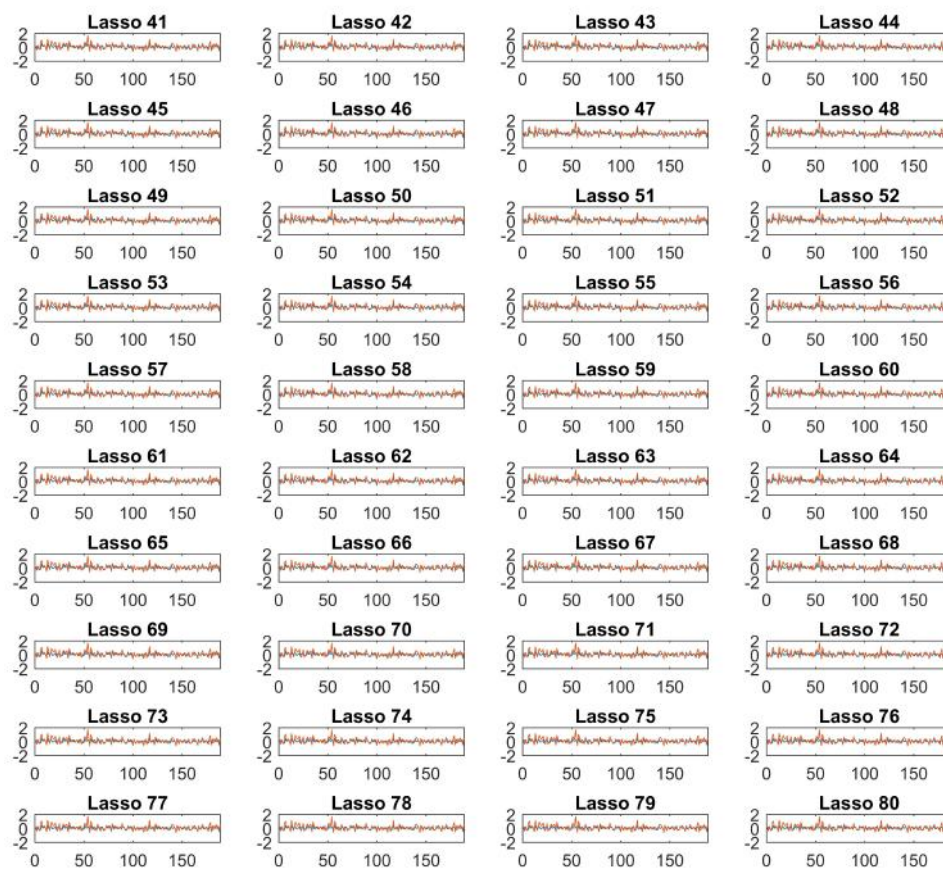


FIGURE 5.17: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - Asian markets only.

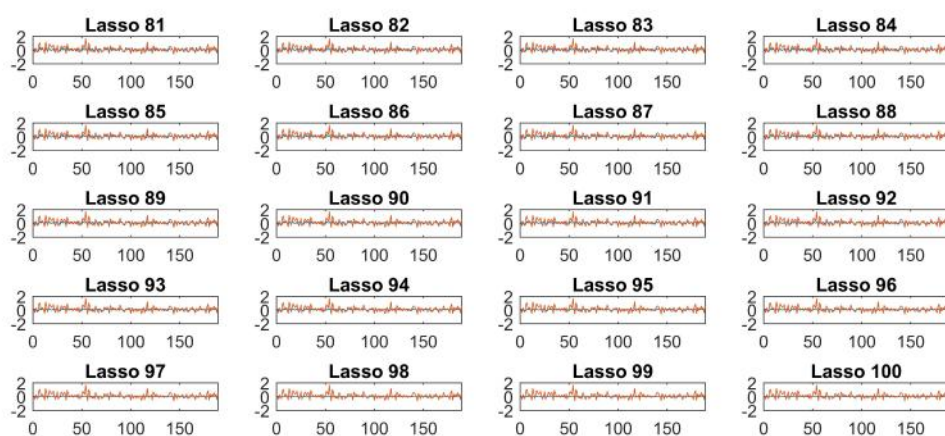


FIGURE 5.18: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - Asian markets only.

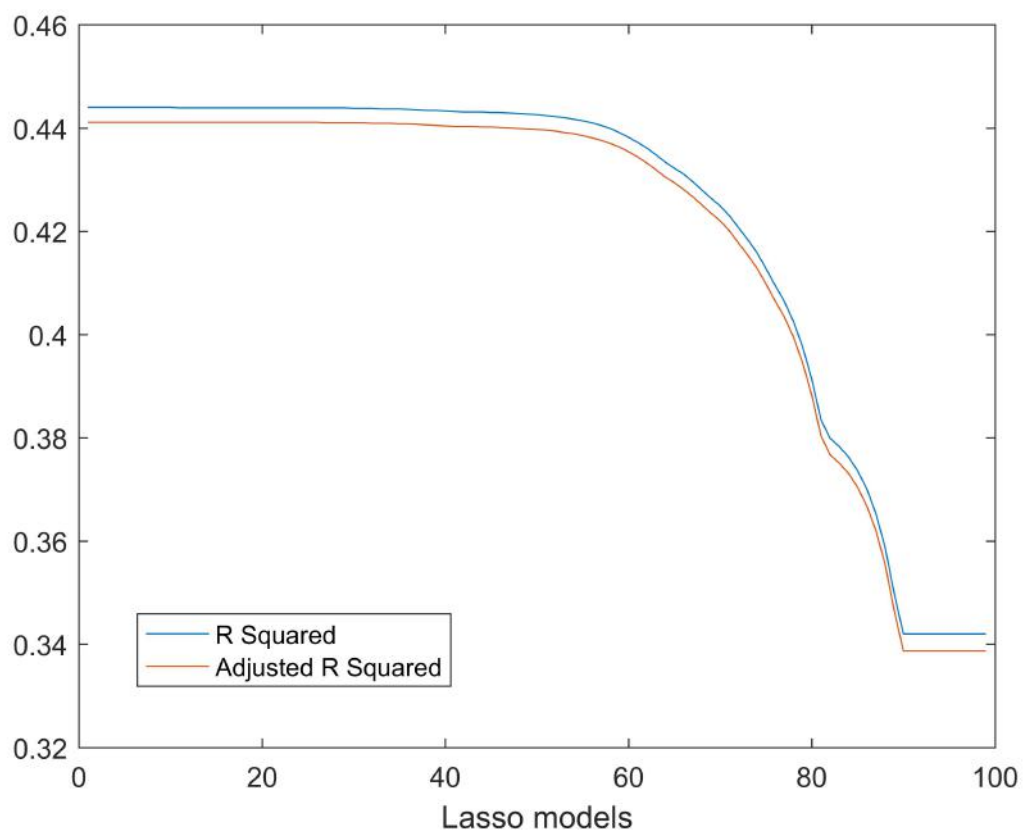


FIGURE 5.19: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable in the regressions is the returns of the equity indexes for each country - Asian markets only.

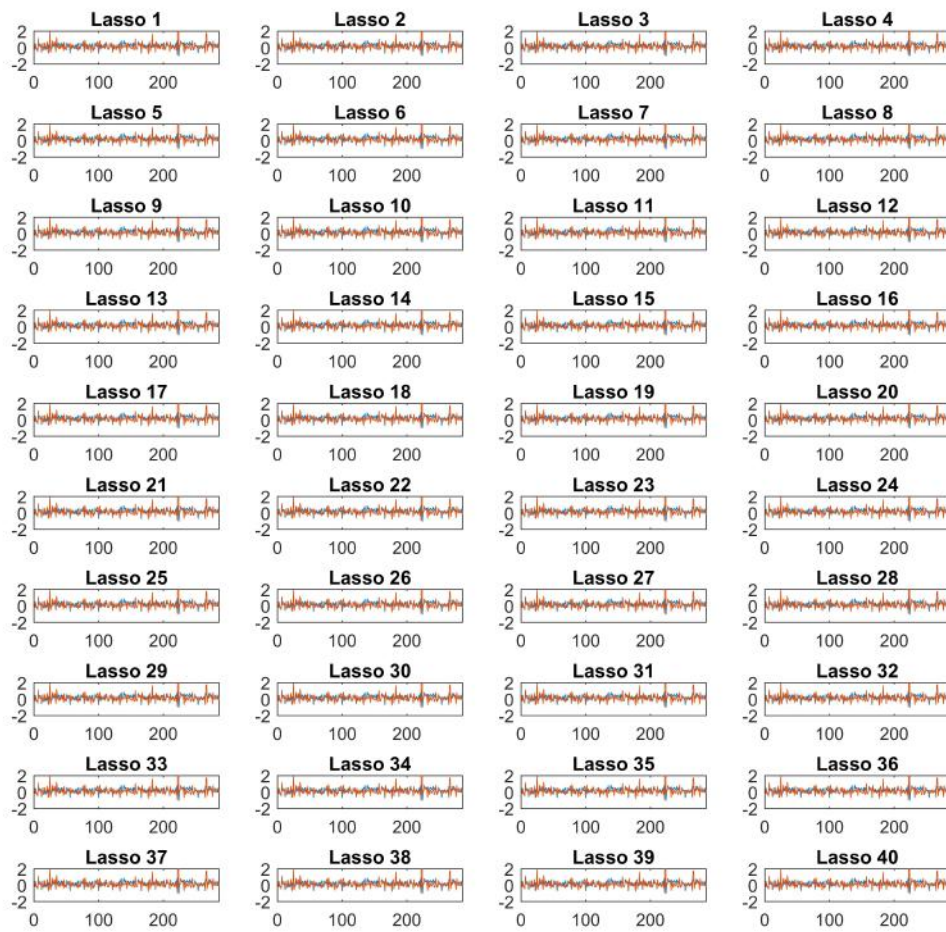


FIGURE 5.20: Output of Lasso regressions (blue) compared the change of the total market capitalization of domestic stocks (orange) - Emerging markets only.

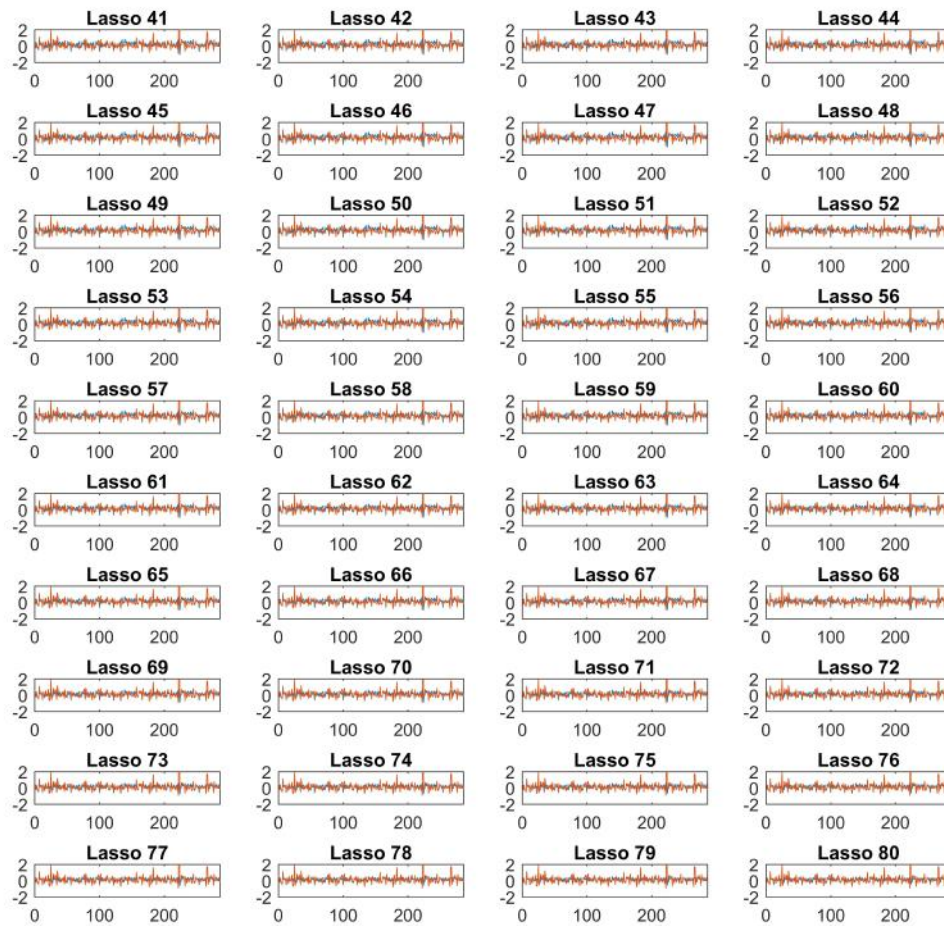


FIGURE 5.21: Continuation - Output of Lasso regressions (blue) compared the change of the total market capitalization of domestic stocks (orange) - Emerging markets only.

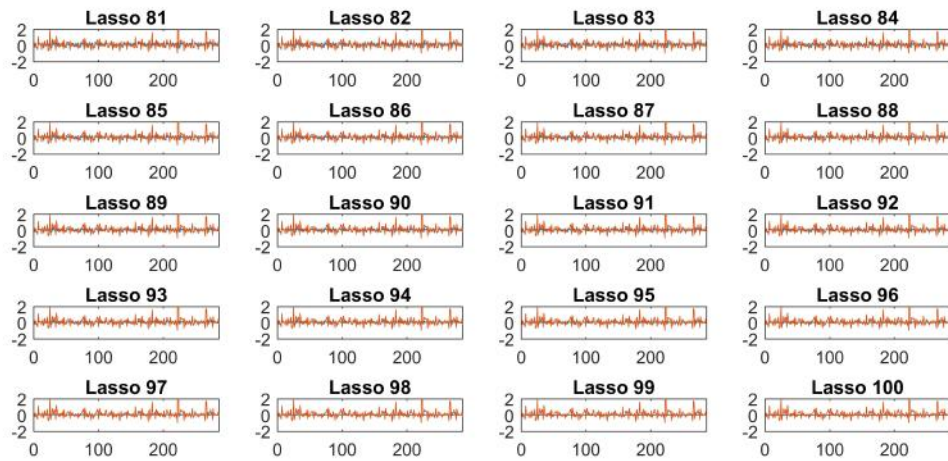


FIGURE 5.22: Continuation - Output of Lasso regressions (blue) compared the change of the total market capitalization of domestic stocks (orange) - Emerging markets only.

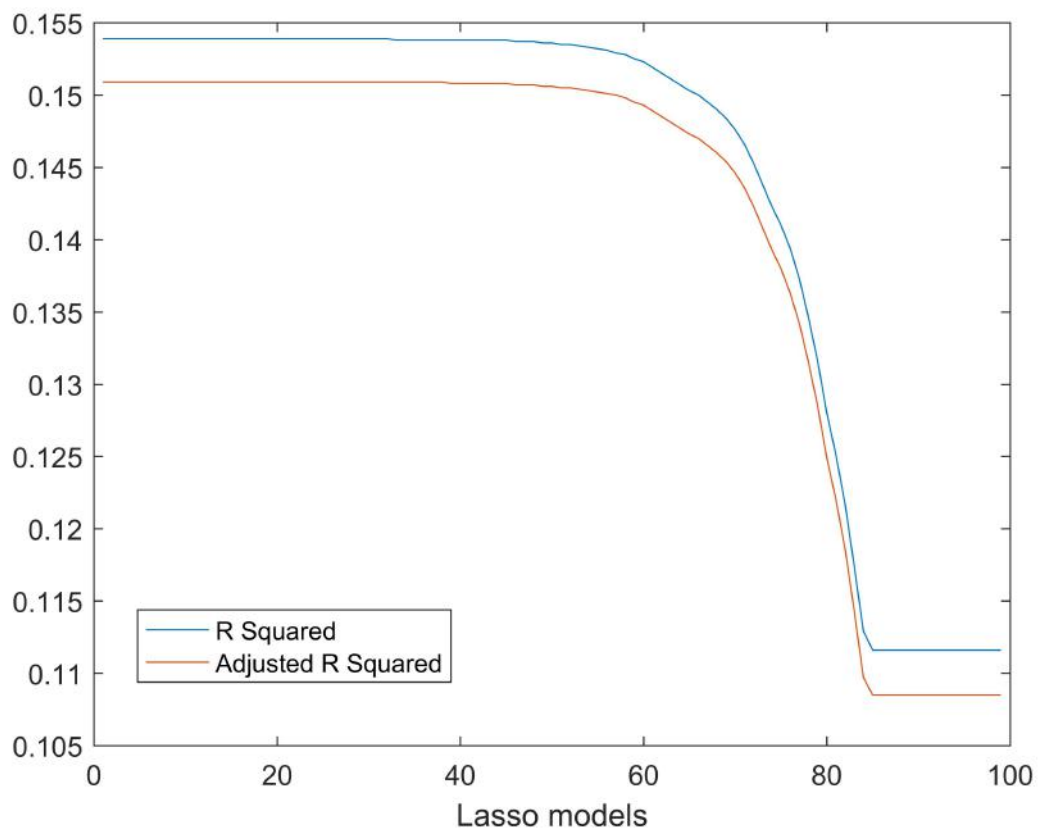


FIGURE 5.23: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable in the regressions is the change of the total market capitalization of domestic stocks - Emerging markets only.

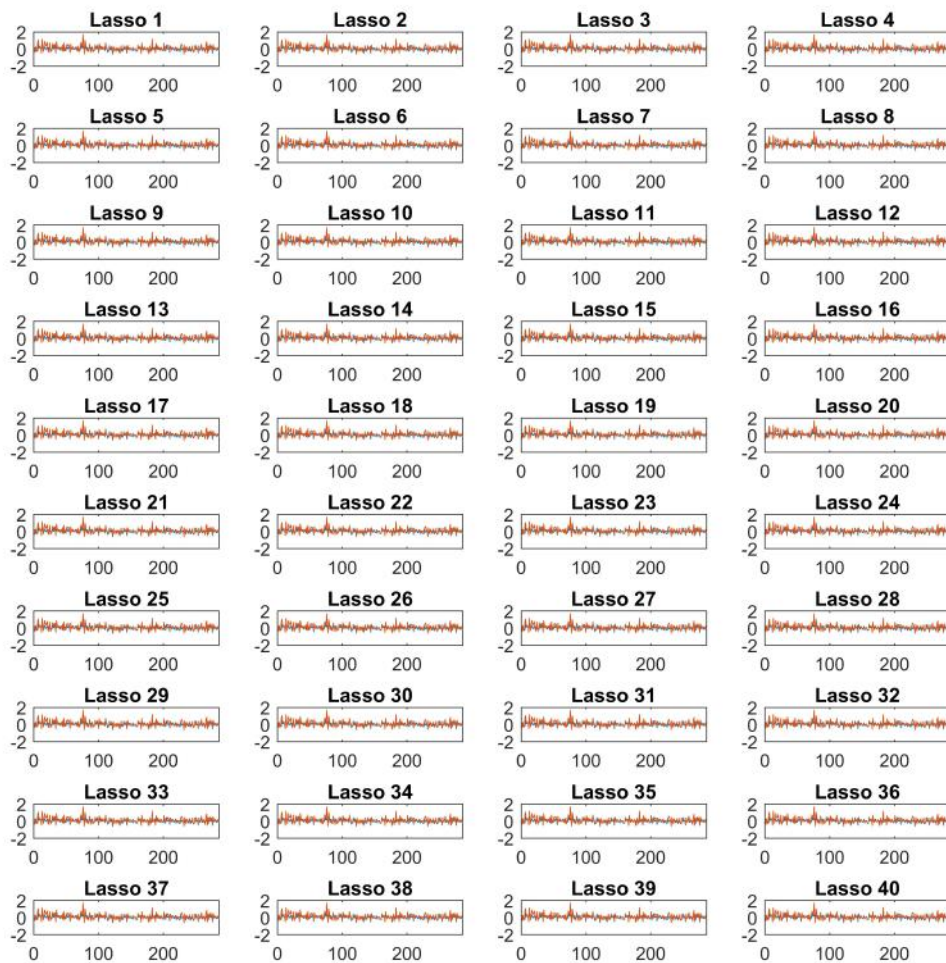


FIGURE 5.24: Output of Lasso regressions (blue) compared to actual equity index returns (orange) - Emerging markets only.

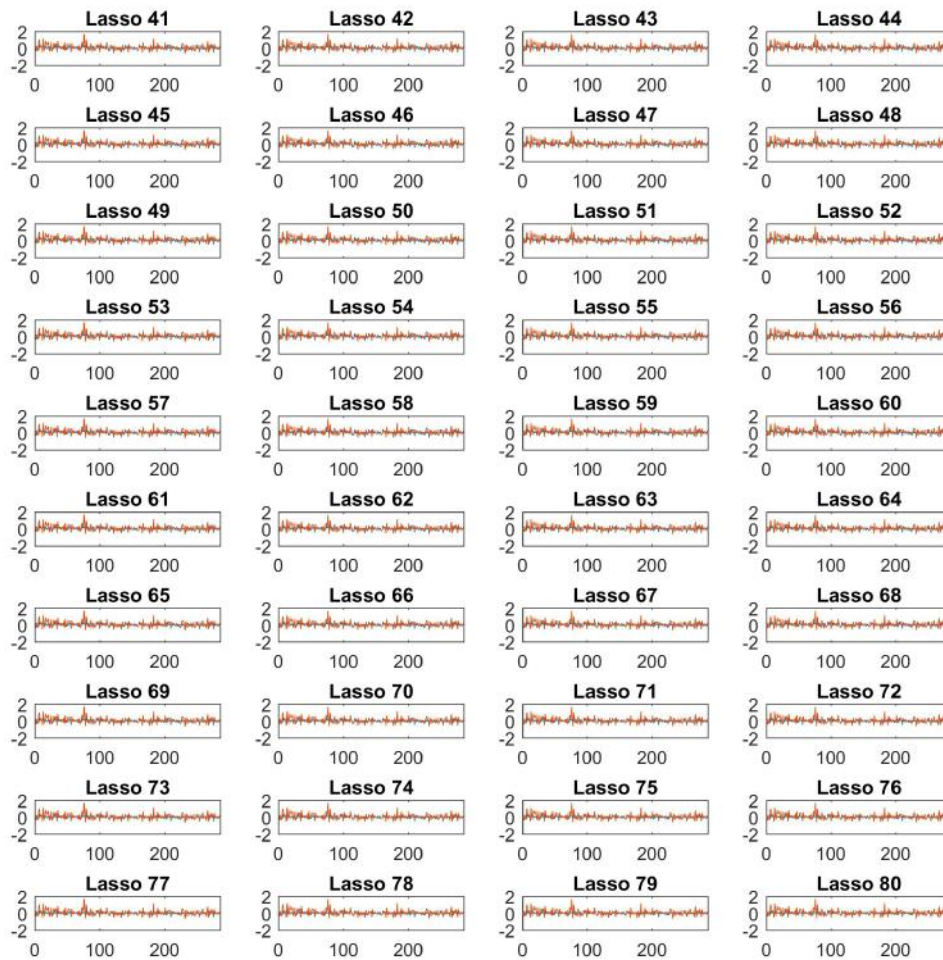


FIGURE 5.25: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - Emerging markets only.

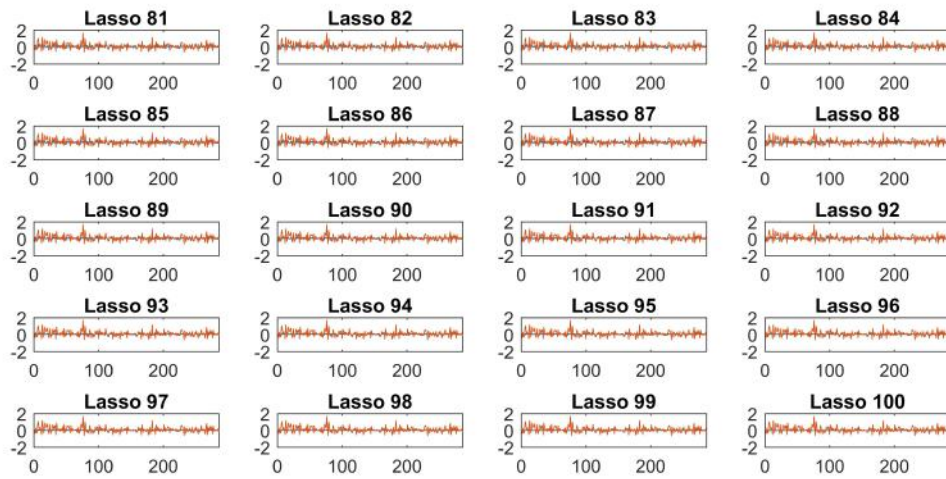


FIGURE 5.26: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - Emerging markets only.

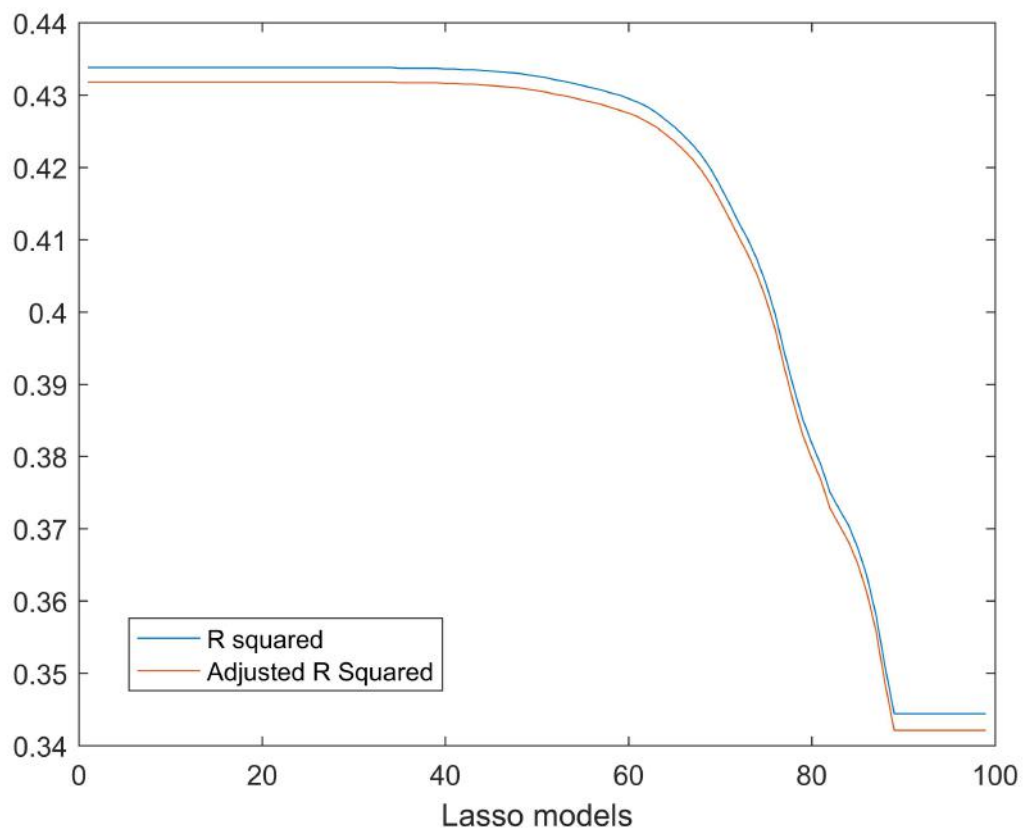


FIGURE 5.27: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable in the regressions is the returns of the equity indexes - Emerging markets only.



FIGURE 5.28: Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks (orange)
- All countries/jurisdictions.

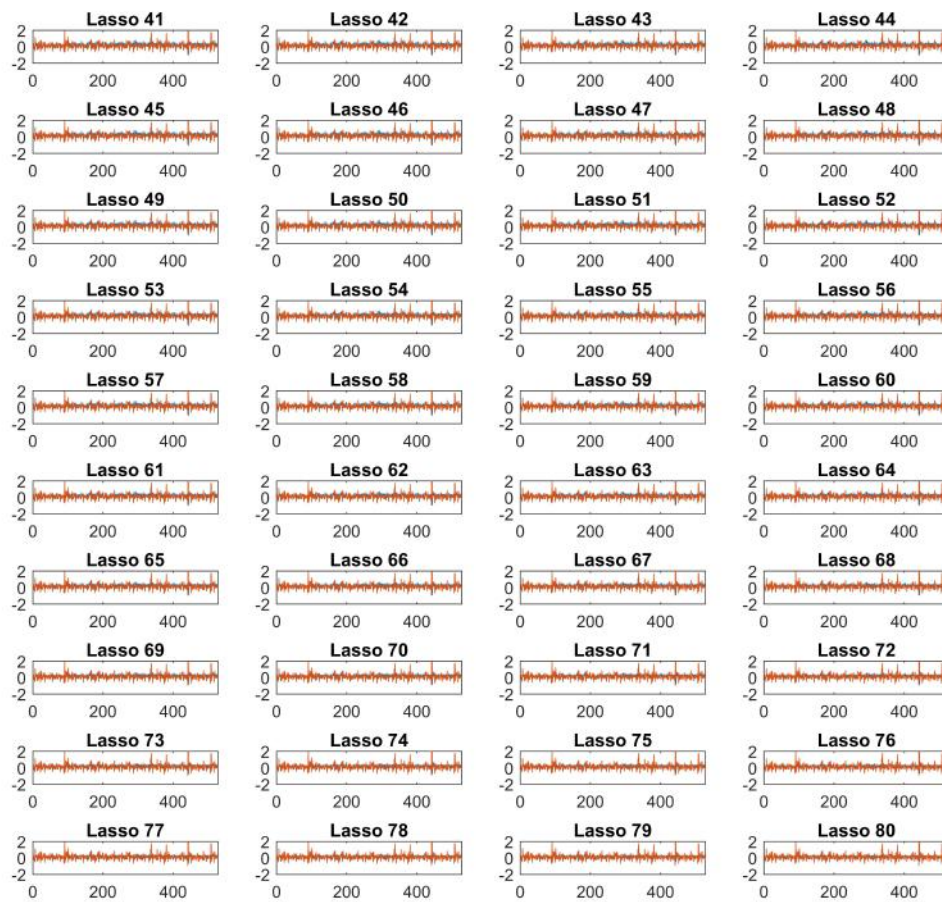


FIGURE 5.29: Continuation - Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks - All countries/jurisdictions.

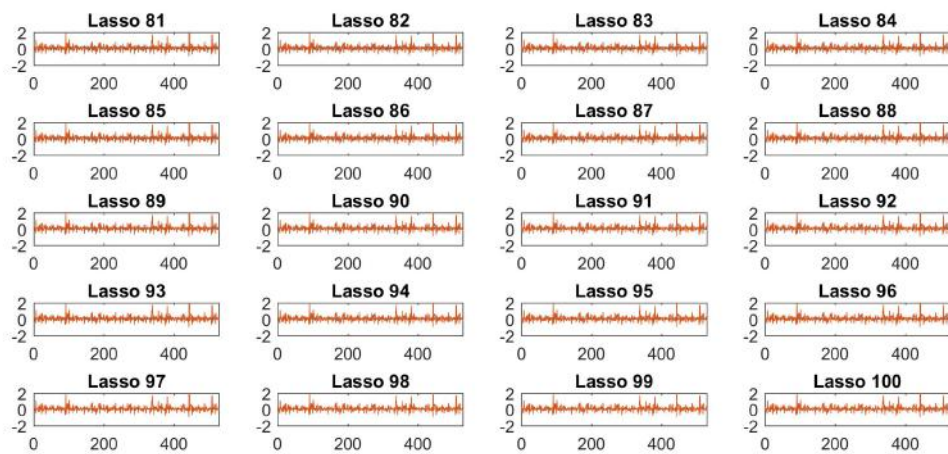


FIGURE 5.30: Continuation - Output of Lasso regressions (blue) compared to the change of the total market capitalization of domestic stocks - All countries/jurisdictions.

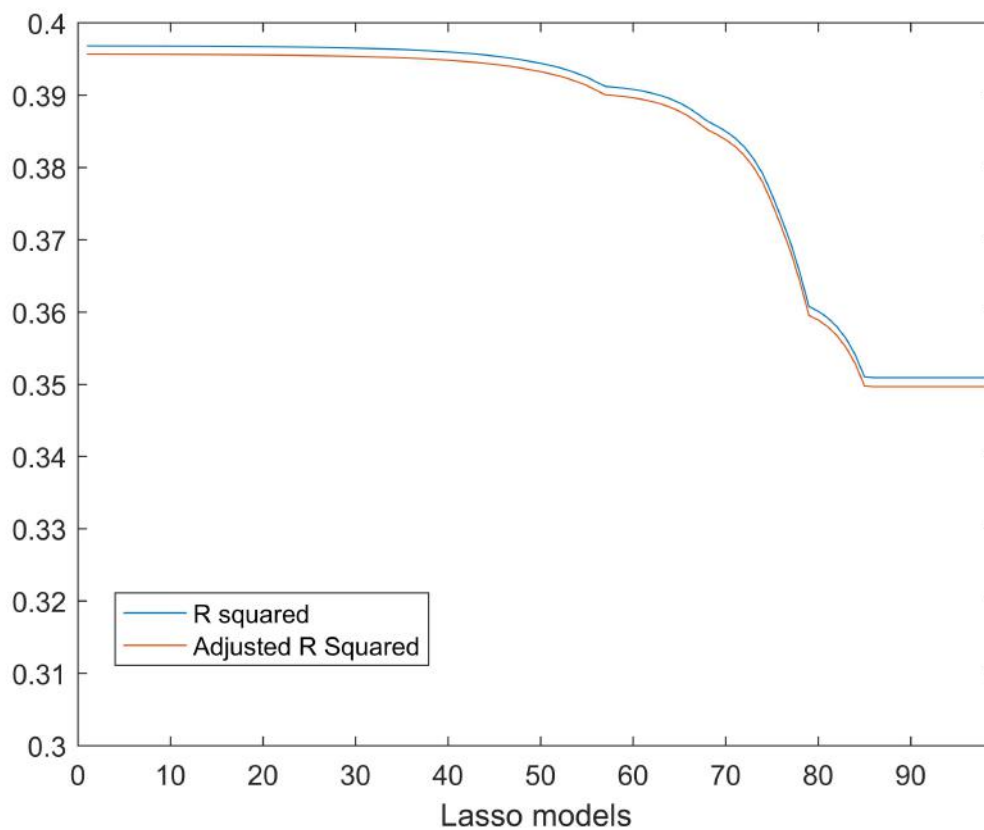


FIGURE 5.31: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable in the regressions is the change of the total market capitalization of domestic stocks - All countries/jurisdictions.



FIGURE 5.32: Output of Lasso regressions (blue) compared to actual equity index returns (orange) - All countries/jurisdictions.



FIGURE 5.33: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - All countries/jurisdictions.

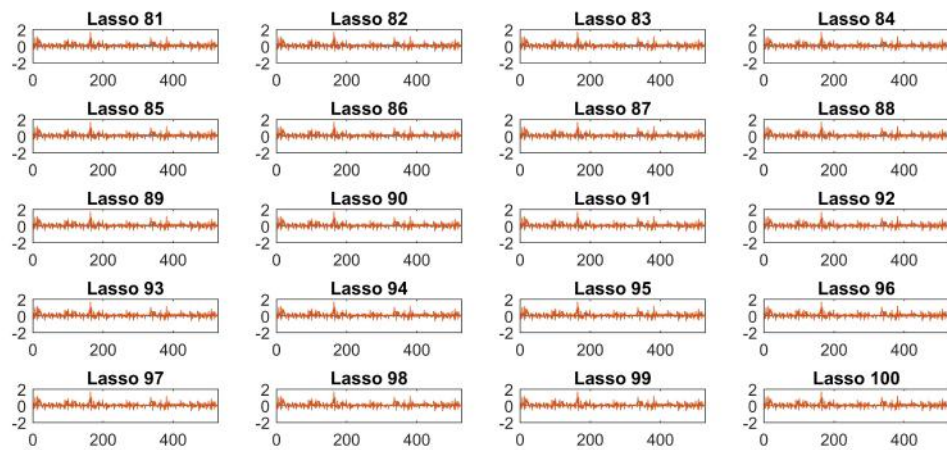


FIGURE 5.34: Continuation - Output of Lasso regressions (blue) compared to actual equity index returns (orange) - All countries/jurisdictions.

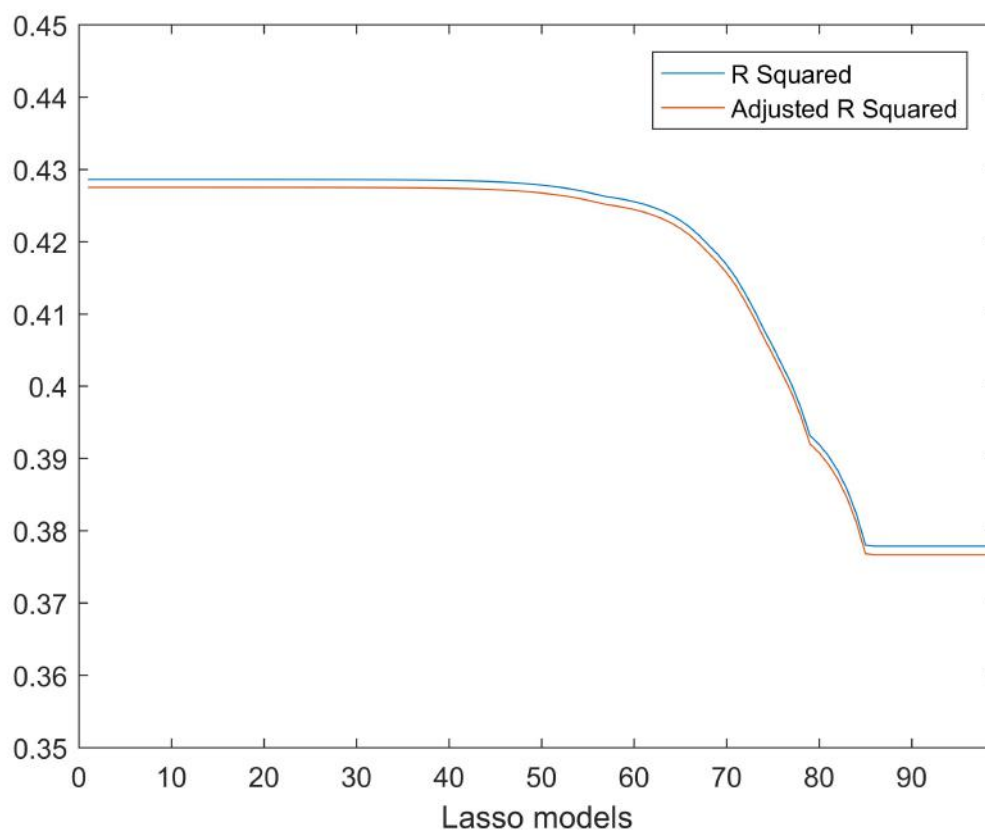


FIGURE 5.35: R Squared and Adjusted R Squared of the Lasso regressions. The dependent variable is the return on the stock index - All countries/jurisdictions.

Chapter 6

Identification of Black Swan Events

6.1 Introduction to Black Swan events

There is a large number of mathematical models used for stock forecasting purposes, such as (Cai et al., 2013; Liao and Wang, 2010; Kazem et al., 2013; Pettenuzzo, Timmermann, and Valkanov, 2014). Many of these models are successfully applied by investors. One frequent drawback common to most stock forecasting mathematical models is that they rely on historical data and hence their performance is uncertain when the market conditions change drastically and stock prices behave in previously unseen ways. This is particularly important when the change is sudden and unanticipated, in what it is frequently described as a black swan event (Taleb, 2007; Bogle, 2008; Aven, 2015). For instance, The South East Asia crisis (Chakrabarti and Roll, 2002; Akyüz, 1998; Huang and Xu, 1999) in the late twenty century could be categorized as one of this black swan events with market conditions deteriorating rapidly. These black swan events can have a very substantial impact on the long term performance of an investor (Estrada, 2009). Figure 6.1 shows the value for the Bangkok SET stock index which is frequently used index describing the performance of the Thai stock market (Forson and Janrattanagul, 2014). Thailand was one of the most impacted countries during the crisis (Radelet et al., 1998; Radelet and Sachs, 2007) with its stock market plummeting substantially. The collapse of the main stock index can be seen in red in figure 6.1 while the previous phase of stable growth is shown in blue.

Neural networks are a frequently used modelling tool for stock forecasting (Enke and Thawornwong, 2005; Chen, Leung, and Daouk, 2003; Shen et al., 2011; Ticknor,

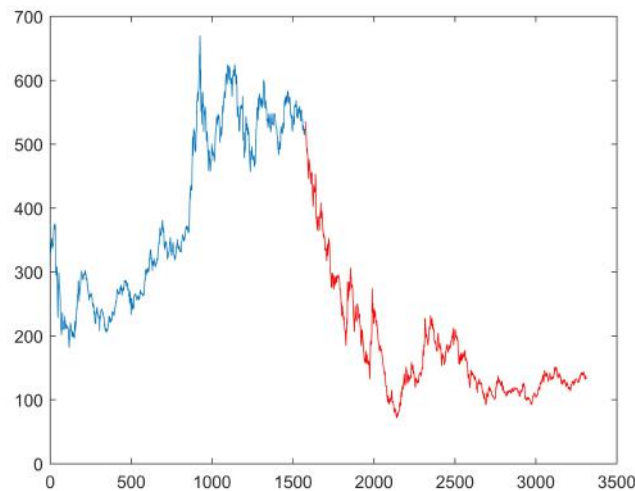


FIGURE 6.1: Thai SET index. Two different stock market regimes, the pre-crisis (blue) and the crisis (red) can be seen

2013; Olson and Mossman, 2003). As previously mentioned one of the drawbacks is that neural networks do rely on historical data. There are other factors affecting the accuracy of such forecasts such as for instance the number of neurons in the network. In practice, the determination of the number of neurons is done frequently by hand by the researcher (Shin-ike, 2010). Deciding the number of neurons to use is a delicate process. More neurons does not necessarily translate into better forecasts as it can lead to overfitting issues (Srivastava et al., 2014; Lawrence, Giles, and Tsoi, 1997; Tetko, Livingstone, and Luik, 1995).

The standard approach when training neural networks is to divided the data into a training and a testing dataset. The network is trained using the training dataset and then the accuracy of the model is tested using the testing dataset. The importance of the training data has been highlighted in many neural network applications Shalev-Shwartz and Srebro, 2008; Kavzoglu, 2009; Banko and Brill, 2001. In the context of stock forecasting during black swan events this might lead to some complacency (Hardy, 2001; Schaller and Norden, 1997; Balcilar, Gupta, and Miller, 2015) as the new stock regime (showed in red in figure 6.1) is by definition not know and the temptation might be to change the size of the training dataset of the parameters of the neural network, such as the number of neurons, to achieve an accurate forecast. This approach is not feasible in practice as the change in regime is unexpected so it would seem interesting finding an algorithm that systematically sets the parameters

of the neural network as well as the size of the training data without using the testing dataset.

The core idea in this chapter is trying to find an algorithm to construct a neural network that might be able to handle significant changes in the stock market rather than finding (a posteriori) the best model that describes the unexpected black swan event. There are some papers in the existing literature proposing approaches to set the number of neurons in a neural network. (Vujicic et al., 2016) did an interesting review of the main proposed techniques concluding that there is no single technique that it is clearly better than the others for all applications i.e., it is an application specific issue. (Vujicic et al., 2016) also mentioned that several of the proposed approaches are rules of thumb.

6.2 Methodology

The objective is to find suitable n^* and m^* which are some of the major factors that the researcher can modify in a neural network $\Gamma(n^*, m^*)$ where n^* and m^* are the size of the training dataset and the number of neurons respectively. This removes subjectivity in the choice of the structure of the neural network as well as on the choice of the size of the data set. It might not be desirable to use the entire dataset and there might be situations, with long time series, in which it might not be feasible to check all the possible lengths of the training dataset. Please note that the following is assumed:

$$\exists n^*, m^* \in \mathbb{Z}^+ \text{ such that } \phi(n_p, m_p) < \phi(n^*, m^*) < \phi(n_{max}, m_{max})$$

Where n_{max} and m_{max} are the maximum length of the training dataset and the maximum number of neurons. This maximum number of neurons should be understood as the reasonable largest number of neuron that the researcher is (in practice) likely to test. This is a task dependent number. n_p and m_p are the theoretical values that optimize the forecasts using the testing dataset (which are not known).

The objective of the proposed algorithm is to obtain suitable values for n^* and m^* while strictly not using the testing data which in the context of time series such

as stock prices it is assumed not to be available i.e., they are stock prices at a future time t . The main steps in the algorithm are as follows:

1. Divide the data into the testing

$$X^{Test} \equiv X^{Te} = \{X_{t+1}^{Te}, X_{t+2}^{Te}, \dots, X_{t+k}^{Te}\} \quad (6.1)$$

$$Y^{Test} \equiv Y^{Te} = \{Y_{t+1}^{Te}, Y_{t+2}^{Te}, \dots, Y_{t+k}^{Te}\} \quad (6.2)$$

and the training data.

$$X^{Training} \equiv X^{Tr} = \{X_t^{Tr}, X_{t-1}^{Tr}, \dots, X_{t-l}^{Tr}\} \quad (6.3)$$

$$Y^{Training} \equiv Y^{Tr} = \{Y_t^{Tr}, Y_{t-1}^{Tr}, \dots, Y_{t-l}^{Tr}\} \quad (6.4)$$

2. Initialize the neural network choosing the number of neurons (p).
3. Set the starting point for the length of the training data set. Three different starting points are chosen representing a low (n_{min}), mid (n_{mid}) and high (n_{max}) levels. The low, mid and high approaches can be run in parallel, helping speeding up the execution.
4. Mid (n_{mib}) loop.

(a) Set up the number max of iterations (i_{max}) and start iterative process.

(b) For $j = 1$ to i_{max} .

(c) Estimate price forecast $\phi_j(n_{mid})$

(d) Estimate the error between the forecast and the actual value

$$\epsilon_j = \frac{1}{n_j} \sum_t^{n_j} |\phi_j(X^{Tr}(n_j, t), m_j) - Y^{Tr}(n_j, t)| \quad (6.5)$$

(e) Set the basic random jump value (a).

$$a \in [-b, b] \text{ with } b \in \mathbb{Z}, a \in \mathbb{Z} \quad (6.6)$$

(f) Estimate the change in the forecasting values

$$\Delta S_j = \left| \frac{\phi_{j-1} - \phi_{j-2}}{\phi_{j-2} - \phi_{j-3}} \right| \quad (6.7)$$

Note 1: The first few iterations are carried out with a constant "a" until there are enough iterations to calculate the above ratio.

Note 2: Please notice that this is different from the common approach of using the error function.

(g) Update the value of the jump (a_{j+1}) for the next step ($j + 1$).

$$\Delta S_j \begin{cases} < 1 & \text{then } a_{j+1} = 0.5a_j \\ = 1 & \text{then } a_{j+1} = a_j \\ > 1 & \text{then } a_{j+1} = 2a_j \end{cases} \quad (6.8)$$

(h) Update the size of the training data set.

$$n_{j+1} = n_j + a_{j+1} \quad (6.9)$$

(i) Estimate the forecast ϕ_{j+1} and the error ϵ_{j+1}

(j) Repeat until:

$$\epsilon_{j'} < \epsilon_{inf} \quad (6.10)$$

or

$$j' = i_{max} \quad (6.11)$$

Where ϵ_{inf} and i_{max} are predetermined values and j' is the value of j at each iteration.

(k) Select the $\mathbf{n}_j^{*,mid}$ such that

$$\mathbf{n}^{*,mid} = \arg \min_{\mathbf{n}_j^{mid}} \phi_j^{mid}(\mathbf{n}_j^{mid}) \quad (6.12)$$

5. Low (n_{min}) loop

- (a) Starting from n_{min} follow the same process as in the Mid loop showed in step 4 but in the case use only positive (or zero) jumps.

$$a \in [0, b] \text{ with } b > 0 \in \mathbb{Z}^+, a \in \mathbb{Z}^{0+} \quad (6.13)$$

- (b) Select the $\mathbf{n}_j^{*,min}$ such that

$$\mathbf{n}^{*,min} = \arg \min_{\mathbf{n}_j^{min}} \phi_j^{min}(\mathbf{n}_j^{min}) \quad (6.14)$$

6. High (n_{max}) loop

- (a) Starting from n_{max} follow the same process as in the Mid loop showed in step 4 but in the case use negative (or zero) jumps.

$$a \in [-b, 0] \text{ with } b > 0 \in \mathbb{Z}^+, a \in \mathbb{Z}^{0-} \quad (6.15)$$

- (b) Select the $n_j^{*,max}$ such that

$$\mathbf{n}^{*,max} = \min_{\mathbf{n}_j^{max}} \phi_j^{max}(\mathbf{n}_j^{max}) \quad (6.16)$$

7. From the mapping

$$\{n^{*,min}, n^{*,mid}, n^{*,max}\} \rightarrow \{\phi^{min}, \phi^{mid}, \phi^{max}\} \quad (6.17)$$

choose the \underline{n}^* value that minimizes ϕ . In this way the training data set has \underline{n}^* elements.

$$X^{Tr} = \{X_t, X_{t-1}, \dots, X_{t-\underline{n}^*-1}\} \quad (6.18)$$

8. Similar process is followed to estimate an appropriate number of neural networks. The first step is to set some reasonable values for m^{min} , m^{mid} and m^{max} . Where m^{min} is the minimum number of neurons used, m^{max} is the maximum and m^{mid} a mid size level.

9. Repeat steps 4,5 and 6 but maintaining constant the size of the training data set and varying instead the number of neurons.
10. Obtain, following a procedure analogue to the one used in the previous sections, the mapping:

$$\{m^{*,min}, m^{*,mid}, m^{*,max}\} \rightarrow \{\phi_{neuron}^{min}, \phi_{neuron}^{mid}, \phi_{neuron}^{max}\} \quad (6.19)$$

11. Chose the \underline{m}^* value that minimizes ϕ_{neuron} among the three possible values.
12. Estimate the forecasting accuracy using the testing data set

$$X^{Te} = \{X_{t+1}^{Te}, X_{t+2}^{Te}, \dots, X_{t+k}^{Te}\} \quad (6.20)$$

$$Y^{Te} = \{Y_{t+1}^{Te}, Y_{t+2}^{Te}, \dots, Y_{t+k}^{Te}\} \quad (6.21)$$

Note 3: Please note that the testing data set does not change and it is not used in the algorithm. The testing data set is (by definition) not available data for the algorithm as it occurs at a future time $\{t + 1, t + 2, \dots, t + k\}$ and hence cannot be directly or indirectly used by the algorithm.

The algorithm is built in a general way and therefore the forecasting technique ϕ is not restricted to be a neural network accommodating for other forecasting techniques (Pai and Lin, 2005; Wang et al., 2012; Huang, Nakamori, and Wang, 2005).

6.2.1 Case study - Bangkok SET index (Thai stock market)

The algorithm was tested using data from the Bangkok SET stock index. A time series of the daily closing prices for the index starting in June 1990 was obtained from the Bloomberg database. In order to make the situation more realistic it is assumed that the entire training dataset (X^{Tr}, Y^{Tr}) is known (shown in blue in figure 3.1a) and available while the testing dataset (shown in red in figure 6.1) is not known. The basic idea is to avoid the temptation of generating multiple models and then selecting the one with the smaller error when applied to the testing data.

The objective of the algorithm is to generate a forecast for the first 25 days of the testing dataset as objectively as possible. This 25 days period was chosen because realistically an investor is likely to be concerned on the performance of a stock forecasting model during the initial phase of black swan event. 25 days of data roughly approximate to a month when the weekends are excluded. After a month of the occurrence of the black swan event the investor is likely to have already recalibrated the model or generated a new one. Therefore is clearly important to test the accuracy of the forecast, particularly during this first month.

The price level of the stock index was smoothed in an attempt to remove some of the stochastic component of the price movement, which arguably cannot be forecasted. This was done using a simple moving average as shown in equation 6.22. Moving averages are frequently used in stock forecasting Fong and Yong, 2005; Chitra, 2011; Gencay and Stengos, 1998.

$$P_t^s = \frac{1}{q} \sum_{k=1}^q P_{t-k+1} \quad (6.22)$$

Where P_t is the value of the stock index and P_t^s is the value after the smoothing process. In this case a value of q equal to ten was chosen. This equates to two week of trading data. Both the training and the testing dataset were constructed using these smoothed values. 25 consecutive smoothed prices were used as the input to the neural network to forecast the closing price in the next 25 days. For instance:

$$Y^{forecast} \{P_{26}^s, P_{27}^s, \dots, P_{50}^s\} = \phi \{X^{tr} (P_1^s, P_2^s, \dots, P_{25}^s)\} \quad (6.23)$$

Where $Y^{forecast} \{P_{26}^s, P_{27}^s, \dots, P_{50}^s\}$ is a vector containing the forecasts for the smoothed values of the index $\{P_{26}^s, P_{27}^s, \dots, P_{50}^s\}$. The algorithm selects the length of the training dataset i.e., how many blocks of 25 days are used during the training phase. After the algorithm has selected the length of the training dataset and the number of neurons of the network and the network has been trained the forecasting accuracy of the obtained model is then tested using the testing data set. More precisely, the smoothed prices of the index in the first 25 days of the testing dataset are forecasted using the trained network and the smoothed prices of the last 25 days on the training dataset. This division of the data is in an attempt to recreate an extreme situation as

realistically as possible. No data from the testing dataset was used as input.

6.3 Results

The South East Asia crisis caused a significant slump in the Thai equity market. This occurred, as shown in figure 6.1, after a prolonged period of a robust stock performance which make the subsequent correction rather difficult to anticipate. The results of the case study for the Bangkok SET index can be seen in figure 6.2. The blue line is the actual price level of the Bangkok SET index during the first 25 days of the correction. The orange line is a theoretical line (not obtainable in real applications) created by generating multiple models with the training dataset and then choosing the one that minimizes the error for the testing dataset (minimizing the error between the forecasts generated for the testing dataset and the actual values of the testing dataset). Please notice that this a theoretical unobtainable value as the testing dataset is assumed to be not known and hence selecting the model according to it would be, in practice, impossible. Finally, the blue line represents the actual obtained forecasts. These forecasts were obtained using only the training data. The values generated from the algorithm are relatively close to the actual values but the results are clearly worse than those that use, as a model selection criteria, the error in the testing dataset (the a priori unobtainable model).

The results can be shown in a numerical way in table 6.1. Some intermediate results are also shown as the forecasting accuracy (testing data) generated by low, mid and high intermediate loops, which tried to generate suitable values for the size of the training data. It can be seen that the Mid loop generated the best forecast among those three. The result was the further improved by the loop in charge of deciding the number of neurons to be used. The error (ϵ) improved from 5.410 (with no number of neuron optimization) to 3.373 when the loop was applied to try to optimize the number of neurons. The theoretical value using the testing dataset to choose among multiple models, was 1.366. In the table it is also shown two baseline results. These baselines were obtained using the entire training dataset and a relatively large number of neurons, 100 in the case of the baseline 1 (Base 1) and 1,000 in the case of baseline 2 (Base 2). In order to account for the random initialization of the weights of

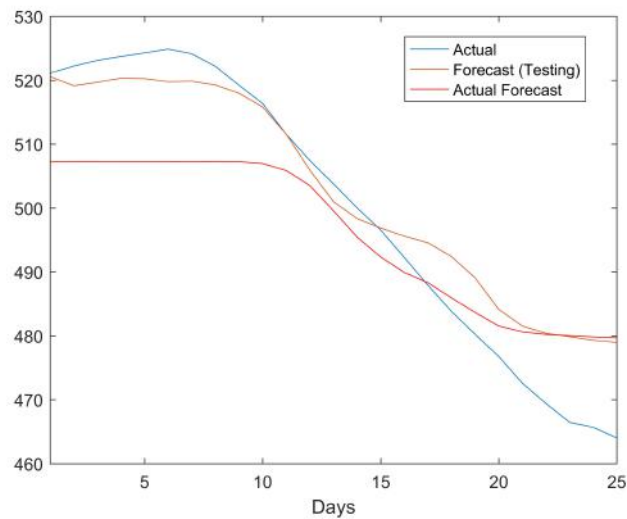


FIGURE 6.2: Results of the case study for the Thai stock market during the first 25 days of the market correction

TABLE 6.1: Accuracy of different approaches. The table shows the results using the three preliminary loops (low, mid and high) as well as the final results after the neuron optimization loop. The results obtained by using the training data set during the training process and then selecting the model that minimizes the error using the testing data is also shown (with the header For.(Testing)). Additionally, two baseline cases using the entire training dataset were estimated, one with 100 neurons (Base 1) and another one with 1,000 neurons (Base 2).

Field	For. (Testing)	Low	Mid	High	N. opt.	Base 1	Base 2
Error (ϵ)	1.366	5.528	5.410	6.264	3.373	16.547	17.302
Correlation (ρ)	0.993	0.825	0.862	0.817	0.868	0.381	0.324
Size Training	372	82	368	730	368	750	750
N. Neurons	64	50	50	50	57	100	1,000

the neurons 100 simulations were ran with the same configuration with the average values shown in the table 6.1. The results show that increasing the number of neurons does not necessarily translate to higher precision with the neuron optimization loop selecting 57 neurons as an appropriate number for the data analyzed.

6.4 Discussion

The results show that the algorithm presented generated relatively precise stock forecast even when faced with a black swan event such as the South East Asia financial crisis. This was tested using the Bangkok SET stock index. When analyzing this type of events it is tempting, with hindsight, to generate multiple models until

finding one that can actually accurately predict it, but this is a naïve approach. It would appear more interesting to create models in a more objective way and see how they perform during crisis periods. The forecast generated by the algorithm presented in this paper was accurate, particularly when taking into account the extreme movements of the market during that period and it was more precise than the baseline cases. However, when compared to naïve (a priori unobtainable) model, is less precise. Nevertheless, even if it is less accurate it might be a more useful approach as the market performance in the future is not known.

The algorithm presented in this paper can also be used to compare different forecasting techniques (this might require skipping the loop optimizing the number of neurons). The example was illustrated with neural networks but it is easy to incorporate other techniques. Using the algorithm could create more reasonable comparisons that using for instance the same length of the trading dataset for different forecasting techniques. The algorithm would allow to compare different techniques in an objective way while not requiring to use the same length for the training dataset. The algorithm can also easily be expanded to other parameters such as for instance deciding how many layers to include in a neural network.

Chapter 7

Discussion

This dissertation tries to analyze the Southeast Asia Financial Crisis as well as trying to understand if the type of legal system has an impact on stock market performance in emerging Asian countries. While at a first glance emerging Asian countries might look as a homogenous look they are far from it with deep socio-economic differences.

7.1 Southeast Asia Financial Crisis

The causes and factors contributing to a financial crisis are in almost all cases complex and the Southeast Asia Financial crisis is no exception with many country specific issues to take into account. The crisis, originated in Thailand, and was relatively well contained within the region with Indonesia, Malaysia and South Korea also significantly impacted. While there are very big differences between these countries, such as for instance the type of legal system and many other socio economic factors, there are also some commonalities. All these countries, to various degrees, experienced strong economic growth and significant inflows of foreign capital during the years before the Southeast Financial Crisis. Authors such as (Gong-meng, 1998) have mentioned the importance distinction between Foreign Direct Investment (FDI) in the form of long term investment, frequently invested in the Pre-IPO or growth phase of a company, and Foreign Portfolio Investment (FPI), which related to short term investment typically done in the secondary stock market. According to several scholars, such as the previously mentioned (Gong-meng, 1998), in the years before the crisis there were large inflows on FPI, which are easily reverted when the economic situation deteriorates. Another commonality between the above mentioned countries is that they have embarked in a process of financial liberalization

without is some cases having a robust enough financial institution and regulatory framework. This was for instance the case of Indonesia. Another further commonality is that these countries had stable foreign exchange levels (local currency versus the US dollar) for several years. The combination of rapidly growing economies, plus stable exchange rates and financial liberalization attracted large amount of foreign capital. This capital was both in the form of equity and debt investments.

When the economic situation started to deteriorate these countries rapidly experienced liquidity issues as they had low foreign exchange reserves, coupled with large due debt payments in foreign currencies. Japanese banks that have been a large source of funding were experiencing problems at home in the so called Japanese “lost decade” and becoming less active in Southeast Asia. After the situation started to deteriorate the large American investment banks followed the same trend as their Japanese counterparties becoming more reluctant to extend credit, exacerbating the liquidity issues of local companies with foreign debt obligations and triggering the financial crisis.

Other jurisdictions, such as Singapore, Hong Kong (SAR) and Mainland China, coped significantly better with the financial crisis than Thailand, Indonesia, Malaysia and South Korea. A commonality between the economies of Singapore, Hong Kong (SAR) and Mainland China at the time of the crisis was that they all had relatively large foreign reserves. Other factors also helped these jurisdictions. For instance, Mainland China had a mostly closed economy during this period and the Chinese RMB was, at remains, non-convertible, further insulating it from the ups and downs of global flows of capital. Hong Kong (SAR) returned to China in 1997 after a prolonged period of British control. It had a strong financial regulatory framework, modeled to the British one, and substantial foreign reserves. Hong Kong (SAR) was one of the few jurisdictions that managed to defend its peg to the dollar successfully. Singapore is another interesting case. Singapore had strong financial stability policies in place before the crisis, including a policy of non-internationalization of the Singaporean dollar. It also had relatively large foreign reserves that enabled the country to handle the financial crisis relatively well.

Thailand was the first country affected by the crisis with the free floating of the

Thai Baht in July 1997 considered by many as the start of the Southeast Asia Financial Crisis. Thailand nevertheless recovered relatively quickly with the crisis having an impact comparable with that experienced by Malaysia, the Philippines and South Korea. Indonesia on the other hand, while arguably starting for a relatively stronger economic position than peers such as Thailand, was much more severely impacted. This is likely related to the mismanagement of a large number of bankruptcies during the crisis.

Another important factor during the crisis was the role of the International Monetary Fund (IMF). Thailand, Indonesia and South Korea were bailed out by the IMF while Malaysia refused the aid package offer. The IMF was heavily criticized for its management of the financial crisis with some authors mentioning that the IMF transformed a liquidity crisis into a full blown financial crisis. Some of the most controversial actions by the IMF during this period were the very strict austerity clauses attached to the bailout offers as well as the overall management of the crisis. Malaysia decided to decline the offer mentioning that the IMF will focus excessively in loan prepayments and not enough in economic growth in a period in which Malaysia was undergoing a policy of “affirmative action” to level the economic situation of its diverse ethnic communities.

7.2 Short-term, event driven impact on the equity market

From a short term event-driven approach several major events were analyzed, describing a much more complex overall situation than just a broad homogenous market contagion. More precisely, two different phases of high volatility were identified. When using Granger causality tests, adjusted by base line relationships, there appears to be an initial phase that it is mostly regional but rapidly expanding to other countries, ranging from the floating of the Thai Baht (event 1) to the collapse of Peregrine investment (events 2) adjusted volatility and the number of Granger causality relationship found increase in this phase. This was followed by a phase of lower volatility. This phase coincides with Thailand releasing new rules for the classification of non-performing loans. Volatility then increased again following the victory in the Philippines elections of Joseph Estrada and particularly after the abrupt replacement of the Malaysian finance minister. One of the main take away was that there was no single country apparently driven the process i.e., a country consistently impacting other countries, which suggest a much more fluid and complex situation.

7.3 Long-term impact on the equity market

The South-East Asian Financial crisis had long lasting implications on the equity market with an interesting some interesting shifts. Some markets, such as for instance the one on South Korea, became more regional important while at the same time some other markets, such as for instance the Thai market, becoming less regionally important compared to their situation before the crisis. The analysis carried out using two post-crisis periods, one excluding the 2008 U.S. financial crisis and another one including it. The results suggest that there were no clear systemic spillover results for the 2008 U.S. into Asian markets. This is not to say that there was no impact just that it was not as significant as the one caused by the South East-Asian crisis. While out of the scope of this dissertation, a potential line of future research could be the impact of the very large Chinese economic stimulus released as a response to the 2008 U.S. financial crisis on other equity markets in the Asian region.

The results suggest that interdependencies between markets are rather complex and dynamic (evolving through time) with cointegration between markets found for the periods before and after the financial crisis and evolving. This suggests that oversimplifying such a complex situation as a financial crisis might lead to misleading conclusions. The results also suggest that the US market was a relatively small driver of emerging Asian markets in the period analyzed. Interdependencies among stock markets increased in the post crisis period.

7.4 Impact of legal systems in emerging Asian countries

The impact of the legal system in the performance of the equity market of emerging Asian countries and jurisdictions was also analyzed. The legal system of these countries and jurisdictions is heavily influenced by the countries, if any, that colonized them. In this dissertation the (La-Porta et al., 1997). According to this classification there are four major legal systems: 1) English, 2) German, 3) French and 4) Scandinavian. (La-Porta et al., 1997) argues that the English system offer better investor protection and therefore should help improving equity performance. The Scandinavian system was not analyzed in this dissertation as there are no Asian countries using their system as they Scandinavian countries did not colonize Asia. The results for the 24 countries analyzed were consistent supporting the idea that the type of legal system has an impact on the performance of the equity market while controlling for multiple other variables. In order to be as systematic as possible these two approaches were followed using two sets of countries/jurisdictions:

In order to test this hypothesis two quantitative approaches were followed. In the first approach several models using a dummy variable representing the type of legal system were constructed controlling for several variables. In the second approach, rather than specifying the model a Lasso approach was followed. The Lasso approach starts with a large set of variables with the Lasso regression reducing the number of variables used. In this case, multiple models are generated (100 in our case) with the number of variables used gradually being reduced. The Lasso regression stops when all the coefficients for the analyzed variables are zero. Most of the models generated using the Lasso approach included the dummy variable

related to the legal system in that jurisdiction. In order to be as systematic as possible these two approaches were followed using two four sets of countries/jurisdictions: 1) emerging markets 2) Asia 3) emerging Asia. The results remain consistent when these subsets were analyzed.

This would seem to indicate that there is a statistically significant advantage, regarding stock market performance, for countries following a legal system based on the English legal system compared to the French or German systems. As previously mentioned, the Scandinavian system that is the fourth type of major legal system according to (La-Porta et al., 1997) was not included in the analysis as there are no emerging markets or Asian countries following such type of system. A possible explanation, consistent with the existing literature, is that the English legal system tends to have better investors protection rights than those in countries with German or French systems. The French system puts a stronger emphasis on workers protections and the German case is a middle ground approach.

7.5 Identification of Black Swan events

It was also presented an algorithm that can be used to try to identify potential financial crisis. Furthermore, this approach can be used to compare among different forecasting techniques without requiring the time series to have the same length, as the appropriate length of the training data might be different when using different techniques. This algorithm is designed to avoid model selection bias i.e., data mining a model that works to describe a large stock correction but that was rather unlikely to be found before the actual correction happens. In this way is a relatively objective approach. It was shown using the data from the Thai stock market and neural networks that this approach was reasonably accurate when forecasting the market correction without having to resort to biased model selection.

Appendix A

Country credit rating (Standards and Poors)

What follows is a list of the historical credit ratings (Standard and Poor's) of the emerging market analyzed in this dissertation and of some developed economies for comparison purposes. All the data were obtained as reported by Bloomberg.

TABLE A.1: United States credit rating - Standards and Poor's

Date	Foreign currency long term debt	Date	Local currency long term debt
08/05/2011	AA+	08/05/2011	AA+
07/14/2011	AAA	07/14/2011	AAA
02/24/2011	AAA	02/24/2011	AAA
09/25/1991	AAA	07/27/1992	AAA

TABLE A.2: United Kingdom credit rating - Standards and Poor's

Date	Foreign currency long term debt	Date	Local currency long term debt
02/17/2011	AAA	02/17/2011	AAA
04/28/1978	AAA	10/06/1993	AAA

TABLE A.3: Netherlands credit rating - Standards and Poor's

Date	Foreign currency long term debt	Date	Local currency long term debt
11/20/2015	AAA	11/20/2015	AAA
11/29/2013	AA+	11/29/2013	AA+
01/13/2012	AAA	01/13/2012	AAA
12/05/2011	AAA	12/05/2011	AAA
02/17/2011	AAA	02/17/2011	AAA
12/07/1992	AAA	03/17/1995	AAA

TABLE A.4: China credit rating - Standards and Poor's

Date	Foreign currency long term debt	Date	Local currency long term debt
12/16/2010	AA+	12/16/2010	AA-
07/31/2008	A+	07/31/2008	A+
07/27/2006	A	07/27/2006	A
07/20/2005	A-	07/20/2005	A-
02/18/2004	BBB+	02/18/2004	BBB+
07/20/1999	BBB	07/20/1999	BBB
05/14/1997	BBB+	05/14/1997	BBB+
12/07/1992	BBB	12/07/1992	BBB

TABLE A.5: Malaysia credit rating - Standards and Poor's

Date	Foreign currency long term debt	Date	Local currency long term debt
10/08/2003	A-	07/27/2011	A
08/20/2002	BBB+	08/20/2002	A+
11/10/1999	BBB	11/10/1999	A
09/15/1998	BBB-	09/15/1998	A-
07/24/1998	BBB+	07/24/1998	A+
04/17/1998	A-	04/17/1998	AA-
12/23/1997	A	05/14/1997	AA
12/29/1994	A+	12/23/1997	AA+
09/13/1990	A-		

TABLE A.6: Indonesia credit rating - Standards and Poor's

Date	Foreign currency long term debt	Date	Local currency long term debt
04/08/2011	BB+	07/26/2006	BB+
03/12/2010	BB	12/22/2004	BB
07/26/2006	BB-	10/08/2003	B+
12/22/2004	B+	05/12/2003	B
10/08/2003	B	05/21/2001	B-
05/12/2003	B-	10/02/2000	B
09/05/2002	CCC+	04/17/2000	B-
04/23/2002	SD	09/12/1999	B-
11/02/2001	CCC	05/15/1998	B-
05/21/2001	CCC+	03/11/1998	B+
10/02/2000	B-	01/27/1998	BB-
04/17/2000	SD	01/09/1998	BBB
09/12/1999	CCC+	12/31/1997	BBB+
03/30/1999	CCC+	10/10/1997	A-
03/29/1999	SD	05/30/1996	A+
05/15/1998	CCC+		
03/11/1998	B-		
01/27/1998	B		
01/09/1998	BB		
12/31/1997	BB+		
10/10/1997	BBB-		
04/18/1995	BBB		
12/07/1992	BBB-		

TABLE A.7: Thailand credit rating - Standards and Poor's

Date	Foreign currency long term debt	Date	Local currency long term debt
10/31/2006	BBB+	04/14/2009	A-
09/19/2006	BBB+	10/31/2006	A
08/26/2004	BBB+	09/19/2006	A
10/08/2003	BBB	10/08/2003	A
01/08/1998	BBB-	01/08/1998	A-
10/24/1997	BBB	10/24/1997	A
09/03/1997	A-	09/03/1997	AA-
08/01/1997	A	08/01/1997	AA
12/29/1994	A	05/02/1996	AA
06/14/1989	A-		

Appendix B

Qualified foreign investors as of December 2009 (Source: SAFE)

The data was extracted from a public release in the website of SAFE, which is the department in charge of managing currency issues in China PRC.

TABLE B.1: Qualified foreign investors list

First column	Second column	Third column
UBS AG	May-03	790
Nomura Securities Co.,Ltd.	May-03	350
Morgan Stanley Co. International PLC.	Jun-03	600
Citigroup Global Markets Limited	Jun-03	550
Goldman, Sachs Co.	Jul-03	300
Deutsche Bank Aktiengesellschaft	Jul-03	600
HSBC	Aug-03	600
ING Bank N.V.	Sep-03	70
JPMorgan Chase Bank, National Association	Sep-03	600
Credit Suisse (Hong Kong) Limited	Oct-03	600
Standard Chartered Bank (Hong Kong)	Dec-03	175
Nikko Asset Management Co.,Ltd.	Dec-03	450
Merrill Lynch International	Apr-04	800
Hang Seng Bank Limited	May-04	150
Daiwa Securities Capital Markets Co	May-04	50
Continued on next page		

Table B.1 – continued from previous page

First column	Second column	Third column
Bill Melinda Gates Foundation Trust	Jul-04	400
INVESCO Asset Management Limited	Aug-04	125
Société Générale	Sep-04	1,000
Barclays Bank PLC	Sep-04	652
Commerzbank AG	Sep-04	320
BNP Paribas	Sep-04	350
Power Corporation of Canada	Oct-04	50
Goldman Sachs Asset Management Inter.	May-05	600
Martin Currie Investment Management Ltd	Oct-05	226
GIC Private Limited	Oct-05	1,500
PineBridge Investment LLC	Nov-05	292
Temasek Fullerton Alpha Pte Ltd	Nov-05	1,500
JF Asset Management Limited	Dec-05	525
The Dai-ichi Life Insurance Company	Dec-05	250
AMP Capital Investors Limited	Apr-06	500
KBC Financial Products UK Limited	Apr-06	20
Edmond de Rothschild Banque	Apr-06	200
Yale University	Apr-06	150
Morgan Stanley Investment Management	Jul-06	450
Eastspring Investment(Hong Kong)	Jul-06	350
Stanford University	Aug-06	80
GE Asset Management Incorporated	Aug-06	300
Stanford University	Aug-06	80
United Overseas Bank Limited	Aug-06	50
Schroder Investment Mangement	Aug-06	425
HSBC Global Asset Management	Aug-06	327
Mizuho Securities Co.,Ltd (shinko securities)	Sep-06	50
UBS Global Asset Management (Singapore)	Sep-06	750
Continued on next page		

Table B.1 – continued from previous page

First column	Second column	Third column
Sumitomo Mitsui Asset Management	Sep-06	583
Norges Bank	Oct-06	2,500
The Trustees of Columbia University	Mar-08	20
State Street Global Advisors Asia Limited	Mar-08	50
Platinum Investment Company Limited	Jun-08	300
KBC Asset Management N.V.	Jun-08	210
Mirae Asset Global Investments Co., Ltd.	Jul-08	350
ACE INA International Holdings, Ltd.	Aug-08	150
Caisse de dépôt et placement du Québec	Aug-08	500
President and Fellows of Harvard College	Aug-08	200
Samsung Investment Trust Management	Aug-08	650
Alliance Bernstein Limited	Aug-08	150
First State Investment Management (UK)	Sep-08	630
DAIWA Asset Management Co.	Sep-08	200
Credit Suisse AG	Oct-08	300
UOB Asset Management Ltd	Nov-08	50
ABU Dhabi Investment Authority	Dec-08	4,000
Allianz Global Investors GmbH	Dec-08	200
Capital International, Inc.	Dec-08	100
Mitsubishi UFJ Morgan Stanley Securities	Dec-08	100
Hanwha Investment Trust Management	Feb-09	238
Ashmore Equities Investment Management	Feb-09	25
DWS Investment S.A.	Feb-09	200
The Korea Development Bank	Apr-09	140
Woori Bank Co., Ltd	May-09	50
Bank Negara Malaysia	May-09	1,500
Lloyd George Management (Hong Kong)	May-09	50
Templeton Investment Counsel, LLC	Jun-09	300
Continued on next page		

Table B.1 – continued from previous page

First column	Second column	Third column
BEA Union Investment Management	Jun-09	100
The Sumitomo Trust Banking Co., Ltd.	Jun-09	50
Korea Investment Trust Management	Jul-09	300
		32,323

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