AMERICAN UNIVERSITY OF BEIRUT

THE CHINESE SLOWDOWN'S IMPACT ON GLOBAL MARKETS: AN EMPIRICAL ANALYSIS

by
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AN ABSTRACT OF THE PROJECT OF

Christelle Ghazy Mouawad for Master of Arts in Financial Economics
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Reports of deteriorating Chinese economic activity have been affecting the performance of stock markets worldwide, from the Dow Jones Industrial Average to France's CAC40 and Japan's Nikkei. In fact, China has been experiencing a slowdown in the past few years, which resulted in a stock market bubble burst on August 24th, 2015 which lead to what analysts called "Black Monday": The Shanghai stock markets dropped by a sharp 8.49%, followed by more than a 1,080-point drop in the DJIA the same day and a 4.6% fall in Japan's Nikkei. Markets around the world suddenly redirected their attention towards Chinese markets and acknowledged the country as a new emerging superpower and a large economic influencer.

We cannot help but think of the possible financial market integration that exists between China's stock markets and markets around the world, which could help investors optimize their portfolios and increase their returns. In order to prove this theory, we build a VAR model consisting of time series representing the daily closing prices of the Chinese, NYSE, CAC40, DAX, Indonesian, Taiwanese, Japanese, GCC, and oil markets. We conduct basic tests on our time series including normality tests, unit root tests, etc. We then proceed to test for the cointegration existing between China and the groups of countries as well as for the Granger causality among them.

The Johansen Cointegration test concludes that there exists a semi-strong long-term relationship between the Chinese markets and the world markets but no long-term relationship with any of the remaining regions. As for the Granger Causality test, it shows the existence of a unilateral short-term relationship between China and Indonesia only. This means that investors can use the Chinese stocks along with Asian stocks for portfolio diversification, however, Chinese stocks and world stocks (from the US, France, or Germany) cannot be included in the same portfolio as they are financially integrated.

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CHAPTER I

INTRODUCTION

The People's Republic of China (or China) represents an exceptional economic model and not to mention political model that has been proven successful for decades now. China is one of the few remaining communist countries, governed by the Communist Party leader Xi Jinping and abiding by all the Communist Party rules. The country managed to transform itself politically, economically and socially throughout the decades, and moved from a communist, closed, centrally planned country, absolutely characterized by state intervention in all aspects of the economy (business, media, politics, etc.) to a socialist, open, market-based country, characterized by "opening-up" reforms ever since the early 1990s. As of today, the People's Republic of China is the second largest economy in terms of GDP, and first largest economy based on Purchasing Power Parity (PPP). With a highly competitive consumer goods market coupled with a controversially devalued currency, the People's Republic of China became the leading exporter of manufactured goods worldwide. It is also the world's second largest importer of goods. As a result, the country's new economic model has proven successful with two-digit GDP growth levels reaching a peak of 14% in 2007, making China the most important and successful model for an emerging economy in the 21st century.

Global institutions such as the IMF, the World Trade Organization and the World Bank have been recently redirecting their attention towards emerging markets, acknowledging their worldwide presence and their ability to drive global growth levels

forward. In details, ever since China's opening up to foreign investment and trade, Western economies have become increasingly dependent on and hence concerned with China's political and economic decisions and reforms. China's main trading partners include the United States, the European Union, Japan and South Korea. For the United States, China is its second largest trading partner, its third largest export market (accounting for 7.6% of US exports), and its largest importer (accounting for 19.9% of US imports).[1] [2] As for the Asian economies, China represents the main trading partner of numerous economies such as that of Japan (Chinese imports accounting for 22.3% of total imports), Taiwan (Chinese imports accounting for 17.6% of total imports), and South Korea (Chinese imports accounting for 17.1% of its total imports). The European Union would also be largely affected by China's economy knowing that China's demand for German imports accounts for 5.4% of the country's total import market whereas German and French demands for Chinese imports account for no less than 6.6% and 5% respectively. Finally, it is important to mention the relationship between the People's Republic of China and the Gulf countries, large producers and exporters of oil. In fact, China is the world's largest energy consumer, accounting for around 25% of the world's total oil consumption by the end of 2015. Although the country is the fourth largest oil producer in the world, its oil production is only consumed domestically and China requires incredibly large imports of energy to meet its increasingly growing industrial sector as well as population. Its importers of oil are mainly from the Gulf region such as Saudi Arabia (largest importer of oil to China

[1] U.S. Central Intelligence Agency, 2015

[2] Morrison, 2015

accounting for 16% of the country's total crude oil imports in 2014), Oman (10%), the United Arab Emirates (4%), and Kuwait (3%).[3] Consequently, not only do most countries around the world export manufactured goods and merchandise from China, but they also depend on Chinese demand for their own goods and services, which has been growing alongside the growth in the country's economy.

The interdependence between China and world markets is therefore clear. In fact, a recently observed Chinese slowdown, highlighted by the loss of over $3 trillion worth of market value on its stock market, has indeed affected not only equity markets worldwide, but also commodity prices, during the early second half of 2015.

In this project, we seek to empirically examine the short-term and long-term effects of the most recent Chinese slowdown on global markets (US, Asian, European, Middle-Eastern, and oil markets) using daily stock market data to construct VAR models to test for the existence of cointegration and causality. The results will allow us to predict whether or not the Chinese stocks can be used by investors worldwide for portfolio diversification.

Following this general introduction in Chapter I, Chapter II reviews the related literature. Chapter III presents an overview of the Chinese political and economic settings while Chapter IV presents an econometric analysis to examine the short-term and long-term relationships between the Chinese and the global markets. Finally, Chapter V concludes the project along with some policy implications.

[3] U.S. Energy Information Administration, 2015

CHAPTER II

LITERATURE REVIEW

Previous literature has long been concerned with international financial market integration among developed economies, as it provides global investors with opportunities to reduce risk while increasing their returns through portfolio diversification. More recently, however, scholars have redirected their attention towards emerging countries and their relationship to their peers as well as to the developed economies. Countless articles have been published to test for the short and long-run relationships between equity markets worldwide using different methods in econometric analysis. For example, Wang and Wang (2010) examine both price and volatility spillovers between China and each of the United States (representing the world market) and Japan (representing the regional Asian market) from 1992 to 2004. When it comes to price spillovers, there is almost no evidence of interdependence between the three studied markets. Furthermore, the Chinese markets' interdependence with the world and regional markets depends on the capital account openness and location of the market. The higher the openness, the larger the influence by the world market; similarly, the closer the country is, the larger the influence of it is. Wang and Wang also conclude that there exists a bi-directional relationship between the US and Japan on one side, and the Chinese equity markets on another. Japan represents the largest influencer of the Chinese market activity while the US represents the smallest.[4]

[4] Wang & Wang, 2010

Yang et al. (2014) examine the cointegrating relationship among 26 stock market indices from around the world, including the US, Japan, and China, focusing on the periods of the global financial crisis and the European debt crisis. The authors in this paper adopt the methods of directed and weighted cointegration networks and find that the cointegrating relationship among major global stock market returns changes after each of the two crises. The Chinese stock market movements became more integrated with global players during the 2008 global financial crisis as well as during the European debt crisis. During all other periods, Yang et al. found that the Chinese stock market movements would not significantly affect market movements worldwide; in fact, it was the United States that was the most integrated with other global players.[5] Another empirical study was conducted in 2009 by Fan, Lu & Wang to examine the short and long-term dynamic linkages between the Chinese stock markets and those of the US, the UK, Japan, and Hong Kong, taking data ranging from the year 1992 till 2008. Fan et al. use a Markov-Switching VECM (Vector Error Correction Model) to conclude that the Chinese and international stock markets are indeed cointegrated, i.e. there exists a significant long-term relationship between them, ever since the year 1999. In the short-term, the relationship varies in terms of significance under different regimes (depression, boom, speculation), but mainly indicates the existence of an impact of international stock markets on the Chinese equity market.[6] In addition, Wang and Firth (2004) examine both return and volatility transmission mechanisms, also known as spillover or contagion effects for four emerging markets and three developed equity

[5] Yang, Chen, Niu, & Li, 2014

[6] Fan, Lu, & Wang, 2009

markets (Hong Kong, Taiwan, Shanghai and Shenzhen, New York, London, and Tokyo). Wang and Firth find that the bi-directional relationship is heightened after the Asian financial crisis. In details, using a two-stage GARCH model, the study suggests that the Chinese equity market returns are affected by at least one of the three studied developed market. The cointegrating relationship is unidirectional pre-crisis while it is bi-directional after the 1997 Asian financial crisis. Overall, the paper indicated that the Shanghai and Shenzhen equity markets are only partially integrated with international stock markets.[7]

Furthermore, Mohammadi and Tan (2015) use a Vector Auto-Regressive (VAR) model and a multivariate GARCH model to examine the short-run relationships between the US, Hong Kong, and mainland China (Shanghai and Shenzhen). The results show that China's mainland stock markets are highly correlated and that there exists a strong unidirectional causal relationship from the US to Hong Kong and China and a non-existent relationship between the two latter equity markets. The analysis also suggests a small correlation between the US and the Shanghai and Shenzhen stock markets, which allows investors to diversify their portfolios, knowing that China is not very financially integrated with the United States.[8] Finally, Hua and Sanhaji (2015) adopt an extended constant or dynamic conditional correlation GARCH model to test for both the daytime and overnight information volatility spillovers between the Chinese and world equity markets. The results show that the Chinese stock market has a closer cointegration relationship with Asian markets than with non-Asian equity markets. Hua and Sanhaji also separated the

[7] Wang & Firth, 2004

[8] Mohammadi & Tan, 2015

relationships between China and the rest of the world equity markets over three periods: before, during, and after the global financial crisis. The authors found that throughout all three periods, the volatility spillovers are mainly from China to the United States and the United Kingdom. As for the players affecting the Chinese equity markets' volatility, it seems like Japan plays an important role in China's volatility during the crisis while Taiwan affects the Chinese equity market volatility after the global financial crisis.[9]

Other papers focus on the relationship among the East Asian countries representing the emerging markets, such as China, Japan, Hong Kong, Taiwan, and Singapore, as well as their relationship with the United States. This is clearly illustrated in McAleer et al.'s 2009 paper, which focuses on the period ranging between 1991 and 2010 using univariate GARCH and multivariate GARCH and AGARCH models to test for conditional correlation as well as volatility spillover effects among these emerging markets. Here, results indicate the existence of volatility spillovers between China's Shanghai and Shenzhen equity markets and the East Asian markets before the global financial crisis. As for the relationship between the United States and China, it seems to be negative in the peak of the global financial crisis.[10] A similar study was conducted in 2012 by Burdekin and Siklos, which studies the contagion or spillover effects in the Asia-Pacific region and the US over a fifteen-year period from 1995 to 2010. Similar to the results of Wang and Firth (2004), the empirical study using both short-run and long-run time series analysis

[9] Hua & Sanhaji, 2015

[10] McAleer, Allen, & Amram, 2011

suggests that the Chinese equity market has become increasingly financially integrated with the rest of the world, especially after the Asian financial crisis.[11]

Some scholars only focus on the Asian financial market integration, such as Joshi (2011) concentrating on India, Hong Kong, Japan, Jakarta, Korea, and China using a GARCH-BEKK model on data ranging from 2007 to 2010. Weak evidence of correlation between the Asian equity markets suggests a weak financial integration among the Asian financial markets. In fact, Joshi finds that volatility caused by movements in its own market is stronger than cross-market volatility, i.e. volatility caused by other markets, which presents investors with an opportunity to diversify their portfolios and therefore risks.[12]

Finally, some papers looked for ways to test for the effect of the Chinese stock market activity on the oil markets, knowing that China's demand for oil is ever-increasing. One example is Refalo (2009), who tests for the cointegration between the Chinese stock market activity and the world oil markets using the directed acyclic graphs (DAG) and a VECM for variance decomposition. Data ranging from 1997 to 2007 show that the Chinese market activity is affected by its own movements in the short run, but largely moved by external market activity in the long run. Refalo finds that the Chinese market has negligible impact on world oil prices, in contrast with the activity on the US and OPEC countries' markets, which represent the main drivers of activity on the world oil markets.[13]

[11] Wang & Firth, 2004

[12] Joshi, 2011

[13] Refalo, 2009

It is therefore evident how most if not all scholars acknowledge the importance of the rise of China as an economic and financial power. However, empirically, scholars have disagreed when it comes to the relevance of China's equity markets and significance of the short-term and long-term relationship between China and major regional and global economic players.

CHAPTER III

CHINESE & WORLD ECONOMY

A. Chinese Political Overview

The People's Republic of China (PRC), established on October 1st, 1949 by then Chinese Communist Party leader Mao Zedong, is one of the few remaining communist[14] countries known for being the most populated country worldwide. Mao Zedong is considered to be the founding father of the Communist Party of China, the single party running the PRC till today. Consequently, the Chinese population should above all respect and abide by the Party's constitution stating that communism is the "highest ideal and ultimate goal."[15] Public ownership, control of information, and communist propaganda therefore play a prominent role in China's economic system. It is then clear how understanding China's basic political system and its main actors is crucial to understanding China's economic and business growth trends and drivers.

1. Chinese Leading Political Institutions

There exist four main players in the People's Republic of China's political system. The first and foremost institution would be the Communist Party of China (CPC) whose General Secretary holds the most powerful position in China. The Party has been the only

[14] Although it is considered socialist nowadays

[15] Congressional Research Service, 2013

political party in power since 1949, and is the largest political party in the world, with 82.6 million members in China. The current Party leader is the PRC's Chairman, i.e. President of China, Xi Jinping (since March 2013). In fact, since the early 1990s, the General Secretary of the CPC position and the Chinese Presidency have been occupied by the same person. Therefore, in practice, the Communist Party holds ultimate power and authority over all governmental institutions, and is largely able to control all publicly owned enterprises and the media. In detail, the Party controls China's official army, the People's Liberation Army (PLA), China's paramilitary force, the people's armed police as well as other internal security forces responsible for controlling any type of dissidence and protests against the Party.[16] The party is also responsible for appointing and selecting personnel in governmental institutions, state-owned enterprises and the media.

The second political institution is the above mentioned People's Liberation Army, which is China's official army and armed wing of the Communist Party. It is headed by the president of China, Xi Jinping and abides by the Party's command.

The State Council, responsible for all daily administrative tasks, is headed by the premier, i.e. the Chinese prime minister, Li Keqiang (since March 2013). He is responsible for overseeing all ministerial work and implementing economic and social developments. The premier is appointed by the Chinese president and approved by the National People's Congress (NPC), the fourth major political institution. The NPC, on paper, is the most powerful institution in the PRC; it approves of all the actions taken by the Chinese president, including the promulgation of laws, the appointment of high-level political

[16] Congressional Research Service, 2013

personnel, and the declaration of a state of emergency. However, the Congress' actions are controlled by the Communist Party, and therefore require the unofficial approval of the latter.

Finally, in order to control dissidence and gain public consent, China wishes to classify itself as a "multi-party cooperation and political consultation led by the Communist Party of China."[17] Consequently, there exist eight other minor "democratic" parties in China, whose combined number of members actually only reaches 1 million, versus 82.6 million members in the CPC, and whose main activities are in accordance with the Party's demands.

It is clear then, that even though China has been trying to implement some political reforms to open up its economy, classify itself as a democratic state led by a single communist party, and control, as much as it can, public disagreement, it remains a highly nepotistic institution, based on favoritism, bribery, corruption and working to serve the interests of the officials affiliated with the Party. In fact, China ranked 100th out of 175 countries in Transparency International's Corruption Perceptions Index of 2014, which ranks countries based on how corrupt their public sector is perceived to be. China scored 36/100, on a scale of 0 (representing a highly corrupt country) to 100 (representing a very clean country). This indicates that corruption is widespread in the governmental institutions, which do not respond to the people's needs, but rather to the Party's interests and demands. The predominance of corruption in China hinders economic efficiency and destabilizes the business environment, especially for foreign investors. Lack of consistency

[17] Congressional Research Service, 2013

and transparency in Chinese rules and regulations, as well as lack of intellectual property rights' protection makes foreign firms reluctant to enter the Chinese market and operate in it. Business decisions would then be based on the wrong criteria related to political connections and corruption, rather than on competition, economic efficiency and growth.[18]

2. China and its Role in International Organizations

Even though China is a single-party socialist country, focused on public ownership, state intervention and basically the abolition of all Western values, it managed to become the world's second largest economy and first in terms of Purchasing Power Parity, the world's largest manufacturer, according to the IMF, the soon-to-be third largest voter in the International Monetary Fund, one of the five permanent members of the United Nations Security Council and the only "communist" country in the G20, forming along with the United States what is now called the "G2". China's role in the Bretton-Woods Institutions (BWIs)[19] has become prominent and world leaders have become aware of Chinese demands and are keen on satisfying most of them, for the well-being of their own economy.

First of all, since China's economy is heavily reliant on trade of manufactured goods and merchandise, its admission to the World Trade Organization (WTO) in 2001 has played a significant role in enhancing the country's trade relations and helped Chinese

[18] Transparency International, 2015

[19] The World Bank, the International Monetary Fund & the World Trade Organization

businesses conduct their operations more easily and efficiently. As a result, China's share of global merchandise exports soared from a mere 2.9% in 1995 to 12.1% in 2013. [20]

Second of all, China's participation in the G20 provides it with the power to push its agenda globally, negotiate with major global economic players and allows it to set its own conditions and rules, if managed carefully, as the new rising economic superpower. In fact, the G20 awarded the presidency of its 2016 G20 summit to the People's Republic of China, making the country a "global rule-maker."[21] It is obvious that if China manages to control international concern regarding its economic rise, it will be able to shift attention away from Western economies and towards new emerging countries, hence shifting the traditional global economic governance model, led by the Bretton-Woods countries, towards a new modern model reflecting the 21st-century economic reality, led by emerging countries and the "G2". China's presidency of the 2016 G20 summit would give it the opportunity to enhance its global reputation among world leaders and push for its key policy issues on the global agenda to enhance its own political and economic environment.

As for China's role in the International Monetary Fund (IMF), it has been pushing for increased voting rights for emerging countries, especially the BRICS[22], through the recent implementation of the 2008 reform package, aimed at increasing the quotas of 54 member countries and redirecting attention towards emerging markets. In detail, a country's quota, denominated in Special Drawings Rights (SDRs), reflects its financial and

[20] Jorgensen & Strube, 2014

[21] Jorgensen & Strube, 2014

[22] Brazil, Russia, India, China and South Africa

organizational relationship with the IMF, depending on the country's Gross Domestic Product (GDP), openness, economic variability and international reserves. The larger a country's quota, the bigger its "subscriptions", i.e. the maximum amount of financial resources provision to the IMF, its "access to power", i.e. the maximum amount of financing obtained from the IMF, and, most importantly, its voting power. With the implementation of the 2008 reform package, China became the third largest member country in the IMF, and the BRIC among the ten largest shareholders of the IMF.[23]

China has not only been relying on the assistance of the BWIs to push their plans up the world agenda, but has also been establishing and leading new international financial institutions committed to support development projects in developing countries and emerging markets. One example would be the New Development Bank (NDB), headquartered in Shanghai, China and operated by the BRICS countries on an equal-equity stake basis, to contrast the BWIs structure which is proportional to a country's size and power. Another example would be the Chinese proposed financial institution, the Asian Infrastructure Investment Bank (AIIB), aimed at financially supporting infrastructure projects in the Asia Pacific region, with a $54 billion initial capital base and 21 members from Asia. However, South Korea and Australia have been reluctant to join the AIIB due to their questioning over the institution's proper governance and transparency, and whether or not it will be able to live up to the BWIs standards.[24]

[23] International Monetary Fund, 2015

[24] Jorgensen & Strube, 2014

Caught between achieving the ultimate goal of the Communist Party in China - which is the realization of communism and the dominance of public ownership – and pushing key policy issues on global agendas through participating in international organizations such as the IMF, the G20 and the WTO; China must build consensus among prominent political figures and Party members as well as the people of China. It is now in transition from a planned economy - in which all businesses are state-owned and are required to have a Party representative committee – to a market economy – in which the Party has limited or no say at all in the businesses' operations and decision-making process. In addition, media, and consequently, public opinion, are now harder to control. Most observers believe that China must introduce reforms to its political system in order to fundamentally change and improve its economy and pull it from the recent recession it has been suffering from.[25] Finally, there has been disagreement regarding the call for reforms. Some politicians, such as China's former prime minister Wen Jiabao, call for a political structural reform in order to maintain the gains from previous economic development efforts and avoid a people's revolution.[26] Other politicians, however, especially the ones deeply connected to the Party, believe that the westernization of China's political system, in other words, shifting it to a multi-party political system, will lead to the deepening of social divisions, the destabilization of the political situation, and the ultimate failure of China's economic model; and will not be able to deliver a fast-paced economic growth such as the one experienced by China over the past decades.

[25] Lombardi & Wang, 2015

[26] Congressional Research Service, 2013

B. Chinese Economic Overview

1. China's Economic History

China's economic history can be divided into two main periods that have been absolutely contrasting: the pre-reform era (1949-1978) - characterized by a centrally planned economy - and the post-reform era (1979-today) – characterized by the efforts of the Chinese government to implement a market-oriented approach towards the economy.

a. Pre-reform Era (1949-1978)

Before the late 1970s, China was considered to have failed economically, due to its imperial system that mainly protected elite groups of politically involved individuals and families. Since their interests were highly taken into consideration and therefore benefited largely from this elitist and corrupt system, the political and economic leaders were resistant to reforms and change and worked hard on maintaining the country's status quo. Competition among firms and businesses as well as labor productivity were therefore hindered since production and output goals and resource allocation were mainly set by the government, and most firms were state-owned enterprises (SOEs).[27] During that time, China was not able to compete globally with the Western countries and instead, its economy fell behind due to its isolated, centrally-controlled, inefficient and politically unstable environment, as well as natural or man-made disasters. Despite the clear signs of a failed state, Chinese officials were keen on following a "Soviet model", where rapid industrialization through government resource reallocation and control was the main goal

[27] Zhu, 2012

of the country. The years from 1952 to 1960 were called the "Great Leap Forward" years, and were characterized by the Party's efforts to transform China into a self-sufficient, heavily industrialized economy driving growth and innovation, as opposed to the agrarian economy it once was. As a result, the Chinese government reduced consumption and reallocated resources from the agricultural sector to the heavy industries to raise its investments in industries such as steel, concrete, and heavy machinery. However, the lack of resources in the agricultural sector coupled with adverse weather conditions ended the "Great Leap Forward" years (1952-1960) with a famine that hit the country and lowered its living standards in 1961, resulting in millions of deaths across the country and an inability to raise GDP growth. In fact, during the "Great Leap Forward", the levels of growth were mainly due to the large levels of government investments, as opposed to consumption-driven growth. The misallocation of resources reduced labor incentives and productivity and had an adverse effect on the country's economy.

Added to the economic downturns were the political instabilities that have surfaced in 1966 due to the ten-year "Cultural Revolution" led by then-Communist Party leader Mao Zedong, in efforts to gain political power. This set the economy back even further, leading to the repetitive halt of production as well as education. By the year 1978, China was considered to be one of the poorest countries worldwide.

b. Post-reform Era (1979-Present)

Following the death of Mao Zedong in 1976, Deng Xiaoping took over in 1978 and decided to take on many economic reforms to pull China out of its despair and end its history of centrally-planned, government-controlled and self-sufficient economy.

Xiaoping's goal was to reform the communist (or Soviet) style economy and build a socialist economy, with Chinese characteristics. The most important reform involved opening up the Chinese markets, allowing private and foreign ownership in Chinese enterprises, setting prices according to the free market dynamics, and foreign trade and investment. One relevant example of an important economic reform would be the introduction of the "Law on Chinese Foreign Equity Joint Ventures" which specifically allowed the entry of foreign capital into the Chinese markets. These simple economic reforms have helped China reach outstanding levels of growth over the past few decades, with an average real GDP growth rate of around 10% up until the year 2014.[28] China emerged as a major global exporter which led to its accession to the World Trade Organization in November 2001, thus ending a fifteen-year debate over China's trading rights as a communist country with other Western or capitalist countries.[29] Of course, many analysts argue that China still has plenty of room to grow, not only through even more developed economic reforms aimed at opening up the country, but also, and most importantly, through political reforms aimed at reforming the public institutions and improving the level of governance, transparency and credibility in China's political system.

2. China's Recent Economic Downturn

Following a three-decade streak of economic prosperity and success, China has recently witnessed a slowdown in its economic activity, not only reflected by its declining

[28] Morrison, 2015

[29] Hirst, 2015

levels of real GDP growth rates, from a 10.4% in 2010 to 7.3% in 2014 and an expected 6.8% by the end of the year 2015,[30] but also by its stock market activity on both the Shanghai and Shenzhen stock exchanges.

China's recent recession has been feared by many analysts around the world, especially due to China's current status in the world economy as an economic superpower and a leading trading partner to most major countries worldwide. However, other analysts believe that following China's remarkable rise and sustained economic growth for over three decades, this situation is to be expected, as it becomes harder and harder for the country to deliver the same rate of growth, when it has reached such a high level of GDP. In addition, the Chinese economy recently witnessed bubbles in the real estate and stock markets, which leads us to conclude that a bubble burst was most likely to happen, and it did.

[30] International Monetary Fund, 2015

Source: Yahoo Finance

Figure 1 Shanghai Composite Index

In fact, a 141% and 132% year-on-year surge in the respective values of the Shanghai and Shenzhen Stock Exchange Composite Indexes in June 2015 lead the International Monetary Fund to conclude that China was indeed witnessing a stock market bubble. By June 2015, the Shanghai Composite Index would have reached more than 5,178 points, "a level not merited by China's economic fundamentals."[31] In fact, investors were borrowing money to pump into the stock market while the macroeconomic situation of China had been degrading. In details, the Chinese economy being heavily reliant on exports of manufactured goods, had been seeing its currency, the Chinese Yuan or Renminbi

[31] Morrison, 2015

(RMB) appreciating against other currencies, which would pull back its exporting activity and deprive China from its economically competitive advantage. As a result, China decided, on August 11, 2015, to change the way it set its initial price for the RMB each morning, to move towards a more market-oriented approach to evaluate the currency. However, this is thought to represent a simple alibi for China to devaluate its currency and make its exports cheaper and boost its trading activity. However, disappointing data about China's slowing industrial activity and the Chinese government's inability to pull up falling equity prices triggered a chain reaction which reflected the deterioration of the Chinese economy through the stock market crash.[32]

As expected, the stock market bubble burst early July 2015, reflected in the fall of the Shanghai and Shenzhen Composite Indexes by 32% and 40% respectively from the peak of the bubble on June 12, 2015 to July 7, 2015, and a combined market capitalization loss of almost $4 trillion.[33] The Chinese government immediately intervened to stimulate its economy and alleviate worries regarding the Chinese stock markets. China cut both its interest rates and reserve requirements simultaneously to stimulate investment and increase liquidity in the banking sector. However, the Chinese lived in a deflationary environment and were not willing to invest or consume, and so the excess liquidity pumped in the markets would either encourage the formation of asset bubbles, or entice capital outflows. As a result, stock market activity would continue to decline and the investment climate in China to worsen. The government intervened even further and prohibited any initial public

[32] The Economist, 2015

[33] Morrison, 2015

offerings from happening, any individual owning more than 5% of a company's stock from short-selling its stocks, and any state-owned enterprise from selling its shares. It also provided brokers with money backed by the Central Bank in order for them to buy shares and lift stock prices.

On August 24, 2015, the Chinese stock market crashed, with the Shanghai Composite Index dropping by a sharp 8.49%, from 3,507.74 to 3,209.91 points, marking the largest fall since 2007. This so-called "Black Monday"[34] crash spilled-over to markets worldwide, with the Dow Jones Industrial Average (DJIA) dropping by 1,089 points the same day, the largest drop ever. Japan's Nikkei dropped by 4.6% the same day while European stock markets lost around 4.5%.[35]

It is very interesting to see the relationship between all important international stock exchanges from around the world by plotting them on the same chart and seeing how they move together: in fact, by comparing the Shanghai Stock Exchange Composite Index to each of the Dow Jones Industrial Average, New York Stock Exchange Composite Index, CAC40 index, FTSE100 index, Germany's DAX, and Japan's Nikkei over the year 2015, two remarkable trends are noticeable: the first is the increase in stock prices on the SSE in May 2015, which reached a peak, as described previously, in early June 2015, and the second, and most important one, is the new lows reached by each of the plotted indices on August 25th, 2015. We cannot but think of the obvious market integration of the Chinese

[34] The People's Daily, the Communist Party's mouthpiece, declared the day Black Monday (The Economist, 2015)

[35] The Economist, 2015

stock markets with the rest of the world markets, and how the recently observed Chinese stock market crash has affected investors around the world and has redirected attention towards China, the new global business and financial hub.

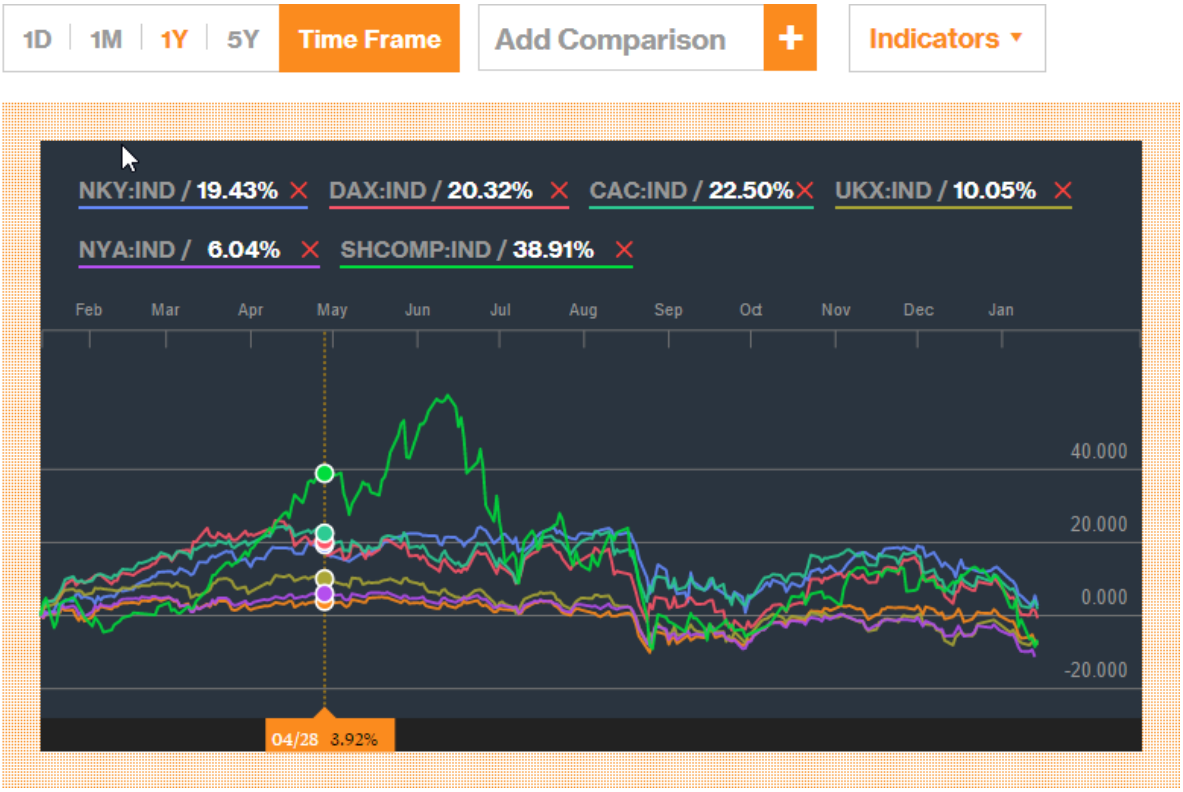


Figure 2 Comparison of Stock Exchange Indices Worldwide

Another shocking worldwide market crash occurred during the first week of the year 2016, and it's all blamed on China. In fact, new disappointing reports of China's declining industrial activity triggered fears about China's overall economic activity, which spilled over to markets worldwide. This prompted a large sell-off on the Shanghai stock markets, resulting in a 7% fall in SSE's CSI 300 index, an index of China's biggest stocks, on the first Chinese trading day of 2016. As a result, Chinese officials implemented, after

the first 27 minutes of trading on January 4th, the "trading curb" or "circuit breaker" rule, a mechanism intended to help markets cool off and decrease the stock market volatility by halting trades after losses reach a certain threshold. In addition, on January 7, 2016, the People's Bank of China set the midpoint rate on the Renminbi to a new nearly five-year low (since March 2011). Since the Chinese stock markets are dominated by speculation made by individual fast-trading investors, the circuit-breaker mechanism, coupled by a weaker Chinese currency, increased investors' fears of "getting stuck" and caused a large capital outflow from the Chinese markets. The circuit breaker mechanism did not serve its purpose, but instead created a downward spiral which resulted in a large drop in stock markets worldwide: the Dow Jones Industrial Average fell by more than 2% the same day (January 4), while Germany's DAX fell below the psychologically relevant 10,000 point threshold, resulting in a 2.29% drop on January 7.

As a result, China's head of the Securities Regulatory Commission made an announcement on January 16th, 2016, to tackle the deep-rooted problems facing the Chinese stock market trading activity, including lack of transparency, dominance of illegal activities and weak education and knowledge of Chinese investors.[36]

3. China's Financial Market Developments

Following the Cultural Revolution events and the People's Republic of China's establishment in 1949, the Chinese stock market activity was considered dead. The official stock exchanges on which investors could buy or sell shares were closed and China was

[36] Deng, Trivedi, & Magnier, 2016

ruled by the Communist Party led by Mao Zedong, focused on transforming China into a self-sufficient economy. As a result, China was not open to foreign capital and investment was limited to the government and state-owned enterprises. However, as soon as Deng Xiaoping came to power in 1978 and took on his "opening-up" and reformist campaigns, both the Shanghai and Shenzhen stock exchanges reopened and began operating in December of the year 1990. Since then, these two Chinese stock exchanges[37] grew exponentially and are now part of the top 10 largest stock exchanges in the world in terms of market capitalization, reflecting thus the glorious rise of China's economy and its emergence as one of the top players in the world.

The following table ranks the global stock exchanges by market capitalization, as at end of October 2015:

Rank	Stock Exchange	Market Capitalization as at October 2015 ($ trillion)
1	New York Stock Exchange (NYSE)	18.654
2	NASDAQ OMX	7.413
3	Japan Exchange Group - Tokyo	4.805
4	**Shanghai Stock Exchange**	**4.388**
5	Euronext	3.394
6	Hong Kong Exchanges & Clearings	2.236
7	**Shenzhen Stock Exchange**	**3.122**
8	Deutsche Boerse	1.719
9	TMX Group	1.713
10	SIX Swiss Exchange	1.515

Source: World Federation of Exchanges

Table 1 Top Stock Exchanges Worldwide by Market Capitalization

[37] along with the Hong Kong Stock Exchange, which we will not be studying in this paper

Both the Shanghai and Shenzhen stock exchanges figure among the top 10 major stock exchanges worldwide in terms of market capitalization, with the Shanghai Stock Exchange (SSE) coming in 4th, with a market cap of $4.388 trillion as at end of October 2015, lagging behind the New York Stock Exchange (NYSE) ($18.654 trillion), NASDAQ ($7.413 trillion), and Tokyo Stock Exchange ($4.805 trillion) only. The Shenzhen Stock Exchange came in 7th with a total market cap of $3.122 trillion, leading in front of the German, Canadian, and Swiss stock exchanges. It is therefore clear how the world economy has shifted and market players have changed, with the main focus being on the United States and China.[38]

Since the Shanghai Stock Exchange is largest in terms of market capitalization, and hence, more reflective of the Chinese and world economic activity in general, it would be more relevant for this study to focus on the Shanghai Stock Exchange rather than on the Shenzhen Stock Exchange.

a. Shanghai Stock Exchange (SSE) Historical Overview

In his efforts to reform the Chinese economy, Xiaoping reopened the Shanghai Stock Exchange[39] on December 19th, 1990 to provide Chinese businesses from key industries and sectors with the opportunity to publicly list and trade their shares on a well-organized, regulated and monitored platform. The SSE undertook many development projects over the past decades to continuously improve the operations conducted on its

[38] World Federation of Exchanges, 2015

[39] along with the Shenzhen Stock Exchange

platform through enhanced technologies and regulation. In detail, the Shanghai Stock Exchange has built the world's largest stock exchange database using its New Generation Trading System (NGTS) and built a nation-wide satellite specialized for securities' trading and communication among the Chinese users. In addition, the SSE signed multiple memorandums of understanding (MOUs) with prominent stock exchanges overseas such as the London Stock Exchange, the New York Stock Exchange, the Abu Dhabi Securities Exchange, Deutsche Boersa, only to name a few. As a result of its continuous efforts, the SSE became a member of international organizations for securities trading such as the International Organization of Securities Commission (1996), the Asian and Oceanian Stock Exchanges Federation (2000) and the World Federation of Exchanges (2002).[40]

As for the exchange's operating hours, brokers are allowed to trade on a continuous, market-driven and free auction basis from Monday to Friday, except for public holidays, from 9:30 to 11:30 AM, then from 1:00 to 3:00 PM.

b. Financial Instruments Traded

Stocks, bonds and funds (Exchange-Traded Funds and Warrants) are all traded on the SSE. Stocks can fall in either of the following two categories: A shares, traded only by domestic investors and Qualified Financial Institutional Investors (QFFIs)[41], and B shares, traded by both domestic and foreign investors. Bonds, on the other hand, include treasury

[40] Shanghai Stock Exchange, 2015

[41] To be discussed later in this section

bonds, local government bonds, enterprise bonds, corporate bonds, and SME (small & medium enterprises) bonds.

c. Market Capitalization

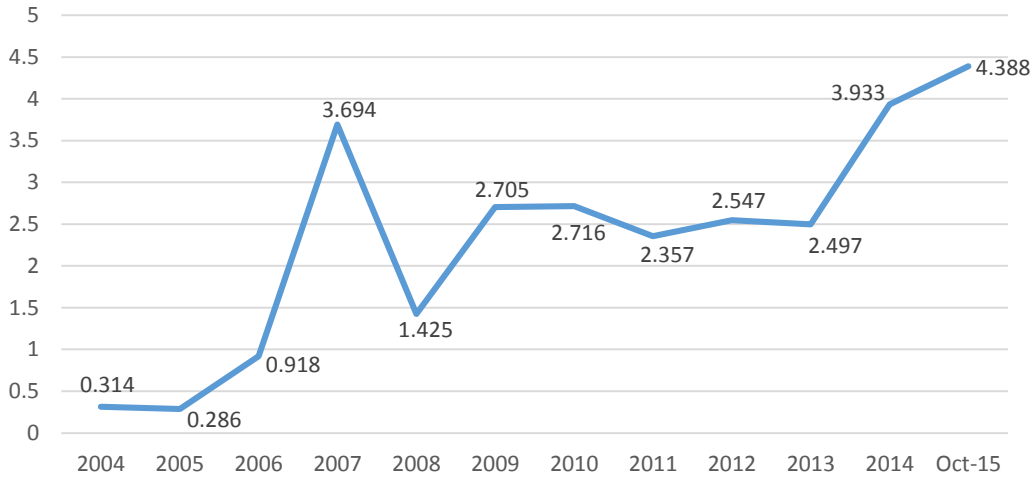
The Chinese stock market has been on an upward trend ever since its inception, thanks to its continuous reforms and efforts to open up to foreign investors. In fact, SSE's market capitalization, which represents total value of stocks traded on the exchange multiplied by the total number of shares outstanding, has soared from a low of around $314 billion in 2004, representing only 16.2% of that year's GDP, to an astounding $3.933 trillion as at end-of-year 2014, and $4.388 trillion as at end of October 2015, representing around 38.5% of expected GDP for the year 2015. Market capitalization is expected to continue its upward move, especially with the continuous opening of the stock market to foreign investors, and the increasing role of China as an emerging economic superpower and a new Asian business hub.

Year	Market Capitalization of Listed Companies ($ trillion)	Market Capitalization as a % of GDP
2004	0.314	16.2%
2005	0.286	12.6%
2006	0.918	33.6%
2007	3.694	104.9%
2008	1.425	31.3%
2009	2.705	53.5%
2010	2.716	45.0%
2011	2.357	31.5%
2012	2.547	30.1%

2013	2.497	26.3%
2014	3.933	38.0%
Oct-15	4.388	38.5%

Source: World Federation of Exchanges, IMF World Economic Outlook Database

Table 2 Market Capitalization of Listed Companies on the SSE



Source: World Federation of Exchanges

Figure 3 Market Capitalization of Listed Companies on the SSE ($ trillion)

d. Number of Listed Companies

In order for a company to be listed on the SSE, it must have a minimum total capital stock of RMB 50 million ($7.826 million), with a minimum of 25% of its total shares publicly issued on the exchange.

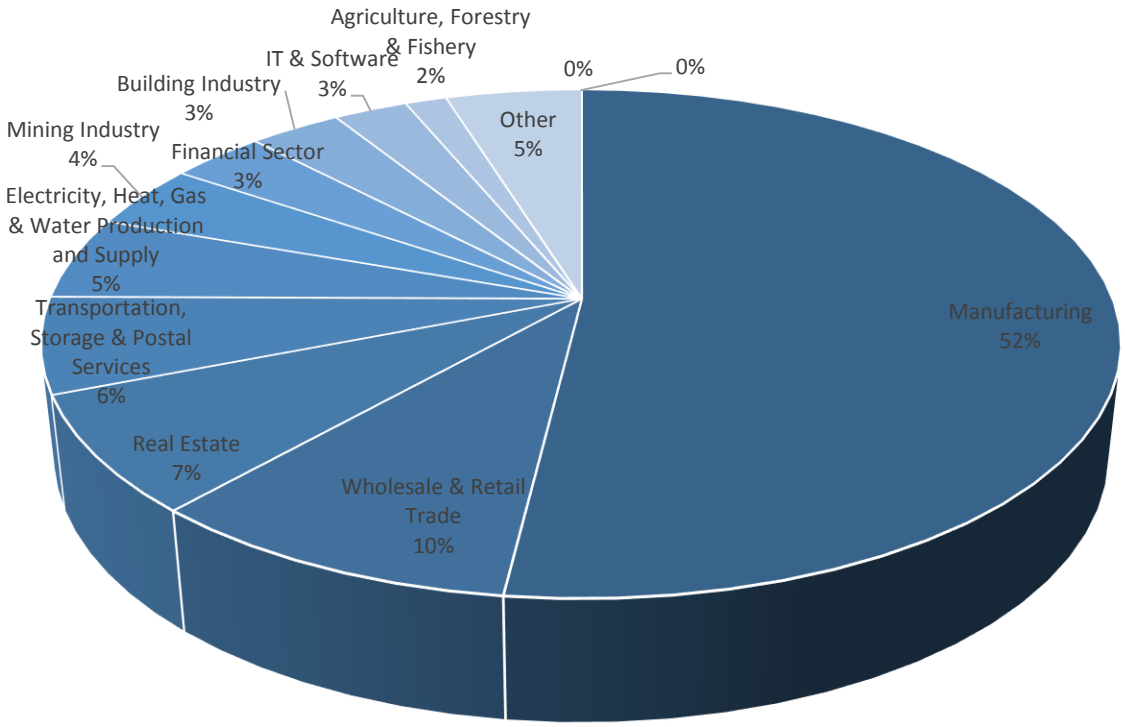
As at the end of October 2015, the Shanghai Stock Exchange listed 1,071 publicly traded companies and comprised more than 18 individual market sectors including

manufacturing real estate, transportation services, wholesale, retail & trade, energy & utilities, mining industries and the financial sector, only to name a few.

Year	Number of Listed Companies
2004	837
2005	834
2006	842
2007	860
2008	864
2009	870
2010	894
2011	931
2012	954
2013	953
2014	995
2015	1071

Source: World Federation of Exchanges, IMF World Economic Outlook Database

Table 3 Number of Listed Companies on the SSE



Source: Shanghai Stock Exchange Factbook 2014

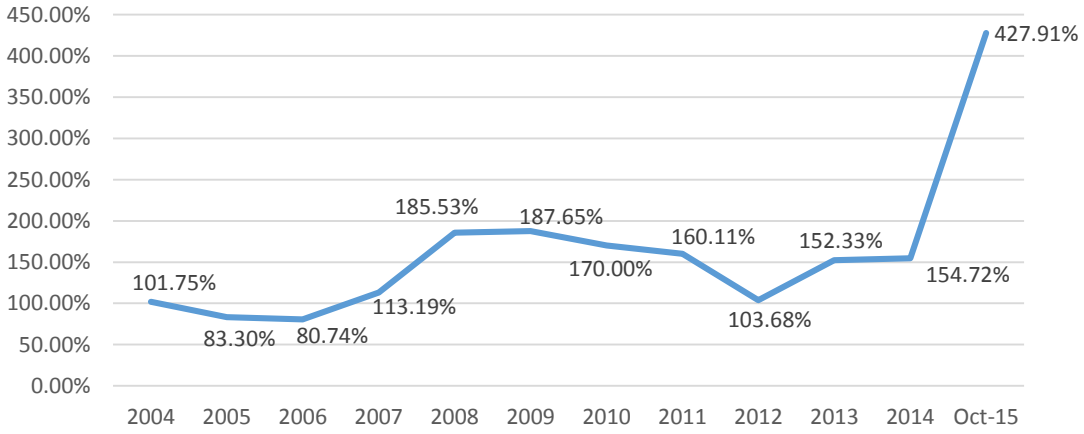
Figure 4 Decomposition of SSE by Market Capitalization in 2014

As depicted in the pie chart above, the manufacturing sector enjoys the lion's share in the number of listed companies on the Shanghai Stock Exchange, with a total of 495 companies and representing 52% of the total number of listed companies, followed by the wholesale & retail trade sector, represented by 92 listed companies and reaching around 10% of the total number of companies present on the stock exchange. These two sectors are trailed by the real estate sector (71 listed companies, 7% of total number of companies), the transportation, storage and postal services sector (58 listed companies, 6% of total number

of companies), and the energy sector (50 listed companies, 5% of total number of companies).[42]

e. Turnover Ratio

Turnover ratio, which is the total yearly value of stocks traded divided by the average market capitalization of the stock exchange during that year, represents the stock market liquidity. SSE's turnover ratio had been hovering around 100% for the time period ranging between 2004 and 2007, until it significantly rose to around 186% in 2008, due to the large flow of capital into the country, fleeing the deteriorating economic and financial situation in Western countries at the time of the global financial crisis of 2008. The annual turnover ratio managed to maintain its high levels, more or less, and reached 154.72% as at end of year 2014.



Source: World Federation of Exchanges, Shanghai Stock Exchange

Figure 5 Annual Turnover Ratio on the SSE (%)

[42] Shanghai Stock Exchange, 2015

f. Capital Account Openness

The Qualified Foreign Institutional Investor (QFFI) program, introduced in 2002, allows foreign financial institutions to trade Chinese A-shares on both the Shanghai and Shenzhen stock exchanges platforms, and hence access China's capital market. The quota for QFIIs was increased in 2012 to $80 billion, which is the maximum amount of investment allowed for foreign institutions, up from only $4 billion in 2002. This perfectly reflects China's efforts to internationalize its currency, the Renminbi, and strengthen its financial standing worldwide among major financial market leaders.

A foreign financial institution qualifies for the QFFI program if its country of origin has signed a memorandum of understanding with the Chinese stock exchange regulatory commission, it enjoys a good reputation stemming from a healthy financial and governing structure, etc.

In addition to the QFFI program, China launched the Shanghai-Hong Kong Stock Connect program in November 2014, allowing investors from the Hong Kong stock market to trade shares listed on the Shanghai stock market, and vice-versa. This mutual market access program provides an additional investment channel for investors looking to trade A-shares of certain companies listed on one of the two stock exchanges, and, most importantly, comes as part of the Chinese efforts to open up its capital market and economy.

g. Public vs. Private Ownership: Privatization

As a country ruled by a communist party, public ownership still plays an important role in China's economy. Most state-owned enterprises are spread out through various

sectors of the economy such as energy sectors, transportation, and telecommunications. In fact, the Congressional Research Service's report titled "China's Economic Rise: History, Trends, Challenges, and Implications for the United States" mentions that privatization in the top 500 manufacturing firms in China has only reached 50%, while it has fared slightly worse in the services sector with 39% of the 500 companies. However, as part of its reformist plans, the People's Republic of China is constantly trying to privatize its economy, with the congress' recent announcement, in September 2015, to partially privatize the Chinese SOEs and encourage their investments and growth. The success of this "master plan" merely depends on the insistence of the political figures and Communist Party to keep controlling SOEs in such important industries. The congress calls for the establishment of a sovereign wealth fund aimed at preserving the government's control over the SOEs while simultaneously allowing the businesses to make decisions regardless of the political opinion.[43]

h. Corporate Governance

The SSE has been working hard over its lifetime to improve corporate governance and build a safe, trusted, stable and regulated stock market environment. In summary, the stock exchange aims at enhancing the listed companies' transparency through full disclosure of information and an optimized legal system to ensure that the shareholders' and investors' rights are fully protected and taken into consideration. Finally, the SSE aims at matching the right investments with the right quality of investors. The stock exchange is

[43] Morrison, 2015

working on improving the businesses' quality and provide the qualified investors with long-term valuable investments, as opposed to newly-listed, short-term, and speculation-based investments, in order for the investors to effectively participate in the businesses' corporate governance structure.

i. The Shanghai Stock Exchange Composite Index

The Shanghai Stock Exchange Composite Index is the most comprehensive and widely-used official index for the SSE, comprising all listed A-shares and B-shares on a market capitalization basis, with December 19th, 1990 as the base date and 100 points as the base value. As at November 1st, 2015, the SSE Composite Index would have reached 3,325.08 points.

Source: Yahoo Finance

Figure 6 The SSE Composite Index's Historical Performance

Activity on the SSE has been more or less stable for the past decade, with the exception of two prominent peaks witnessed in late 2007 as well as late 2014. The large increase in the value of shares listed on the SSE and their immediate plunge within a year's time span for both 2007 and 2014 depict an obvious stock market bubble and burst. In fact, the Chinese stock markets are much prone to experience stock market bubbles, where the prices of shares do not reflect the actual value of the listed companies, due to the Chinese investors' speculative nature. In details, According to the SSE's official website, individual investors accounted for more than 26% of the listed A-shares and more than 85% of trading value in China, while only 16% of investors were professional institutional investors. This reflects the lack of knowledge of investors active on the stock exchange, which makes the market in general a short-term and retail-oriented market. Speculation leads to large volatility on the stock market, reflected in the SSE Composite Index's unstable nature.[44]

In 2006, the index rose dramatically by 242.21% within one year to a peak of 6,036.28 points in October 2007, to then drop within the next year by 71.73% to a low of 1,706.7 points in November 2008. As for the recent stock market bubble, the SSE composite index rose by 57.7% y-o-y from 2,023.75 in June 2014 to 4,785.36 points in June 2014. Then, on "Black Monday" (August 24, 2015), a gloomy day for all Chinese investors if not worldwide investors, the stock market bubble burst and the SSE Composite Index lost 8.5% of its value in one day, marking the worst day since the Asian financial crisis. Analysts around the world have explained this stock market crash as the reflection of

[44] Shanghai Stock Exchange, 2015

China's deteriorating economy and the beginning of a new global financial crisis, this time caused by an emerging economy.

4. China's Macroeconomic Indicators

It is important to support our analysis regarding China's economy with some macroeconomic indicators such as the exchange rate, the gross domestic product, foreign direct investment, the balance of trade, fiscal debt and fiscal balance. All these indicators are especially relevant for China's economy and reflective of its situation for the past decade.

a. <u>The RMB/USD Exchange Rate</u>

The Chinese Yuan and more specifically its devaluation, has long been a topic of controversy, especially for the already existing economic powers in the world such as the United States. China has long intervened in the setting of the Chinese Yuan or Renminbi (RMB) exchange rate in efforts to internationalize its currency, enhance its financial standing in the East Asian region as well as the world and reduce the Chinese firms' exposure to the US Dollar. As the Chinese Yuan grows stronger, Shanghai will be able to become a regional and global financial hub and China might be able to compete with the United States for the world reserve currency status in the long run. China's efforts to internationalize the economy have materialized, with the RMB becoming the 5th most traded currency worldwide, in terms of value of customer initiated and institutional payments, according to SWIFT (Society for Worldwide Interbank Financial Telecommunication) Watch's report on world payment currencies for 2014. In details, the

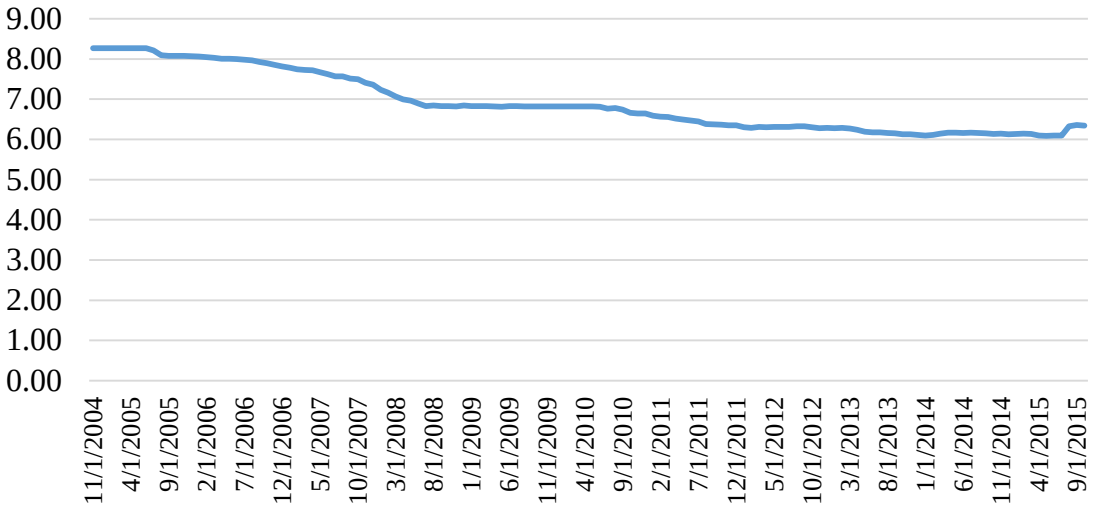
RMB advanced from the 7th world payment currency to the top 5th in nearly one year, to surpass both the Swiss Franc and the Canadian dollar, lagging behind the US Dollar, the Euro, the British Pound and the Japanese Yen only. As at December 2014, transactions effected in the Chinese Yuan would have accounted for nearly 2.2% of global payments by value.[45]

However, this strong appreciation of the Chinese Yuan has a great impact on China's trade balance, as its currency loses great advantage against other trading competitors and partners, which would affect China's export market stability. This is why the People's Republic of China has been accused, over time, of a currency war or currency manipulation to enhance China's export sector and maintain competitive advantage. In fact, the RMB most recently experienced a shocking devaluation, as China decided to alter the way it sets the initial trading value of the RMB each day. In more details, on August 11th, 2015, the Chinese Central Bank decided to set the initial trading value of its RMB based on the previous closing price, versus its previous way (adopted since 1994) based on a pre-determined midpoint price around which the currency is allowed to fluctuate during the day. The previous way of setting the initial price represented a tightly controlled exchange rate policy, and Chinese officials regard the new way as a step forward towards a market-oriented approach, reflecting the natural forces of supply and demand in the market. As a result of the new exchange rate policy, the RMB was devalued by 1.9%, the largest devaluation to date. The Chinese Central Bank denies the accusations of a currency war, and rather focuses on China's effort to reform the economy and therefore move towards

[45] Society for Worldwide Interbank Financial Telecommunication, 2015

more open, market-oriented policies. This step was undeniably much appreciated and taken into consideration by the IMF with regards to the implementation of its 2008 reform package, aimed at increasing the country's voting rights and letting China and other prominent emerging markets have a larger say in important global financial decisions.[46]

The following chart depicts the RMB/USD exchange rate fluctuations over the past decade:



Source: OANDA Historical Exchange Rates

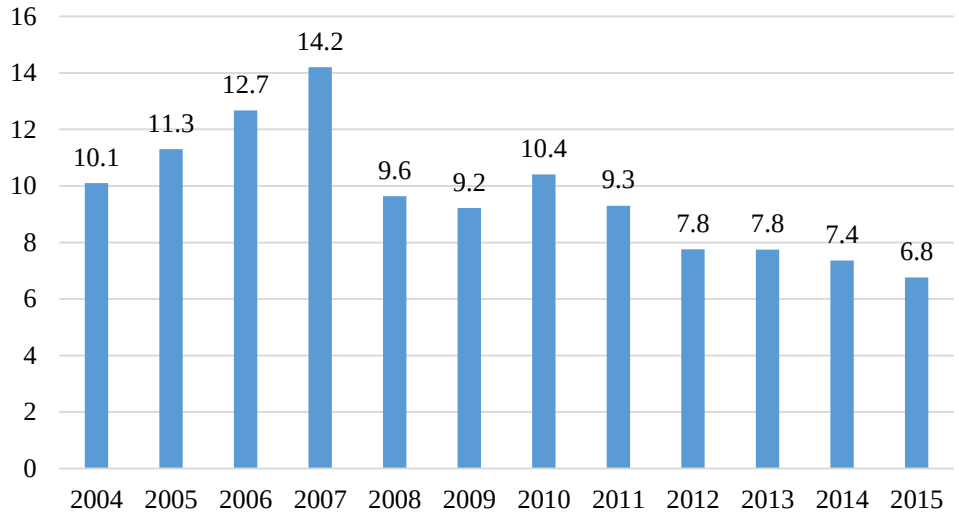
Figure 7 RMB/USD Historical Exchange Rates

It is clear, then, that the RMB has been growing stronger over time and becoming increasingly internationalized, with an RMB/USD exchange rate slowly decreasing over time, from over 8.2 RMB/USD in late 2004, to around 6.1 RMB/USD in July 2015. The small jump in the exchange rate later on reflects the Central Bank's move to reform its

[46] Wei, 2015

exchange rate policy, which devalued the Chinese Yuan, reaching an exchange rate of 6.2 RMB/USD in August 2015. As at the end of October 2015, the USD/RMB exchange rate would have reached 6.34, reflecting an increased devaluation of the currency and a successful move from the Central Bank of China to stimulate its economy through its exports sector.

b. The Gross Domestic Product (GDP)



Source: IMF World Economic Outlook

Figure 8 China's Gross Domestic Product (GDP) Growth (%)

From the mid-1990s to the early 2000s, China had been experiencing outstanding levels of growth, reaching a peak of 14.2% GDP growth in 2007. China owes its high levels of growth to its reformist new government, aimed at opening up the economy and internationalizing the currency. However, China, like most of other major global economic

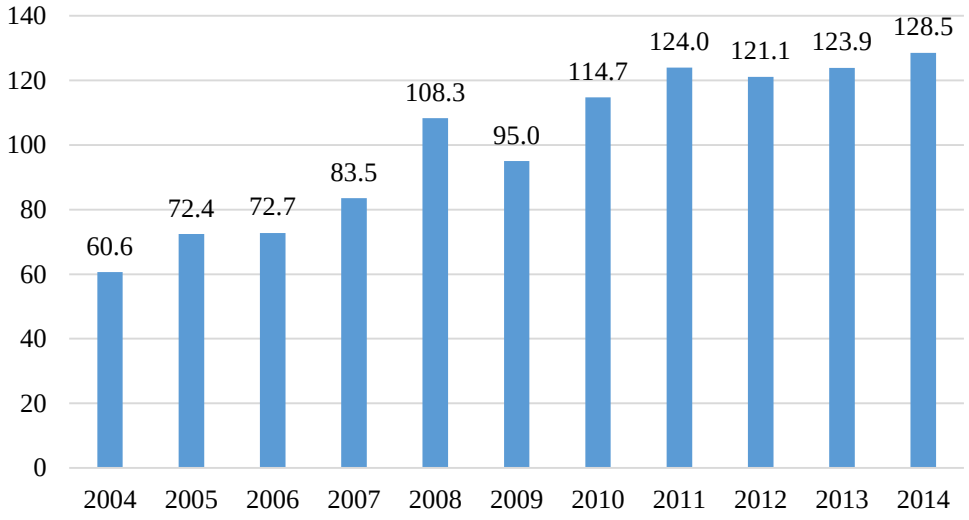
players, has been hit by the global financial crisis of 2008, especially due to its trading relationships with the Western economies such as the United States. Consequently, GDP growth dropped to 9.6% in 2008, then a trough of 9.2% in 2009, dragging the world economic growth down with it as well. China then decided to implement its own stimulus package including an expansive monetary policy to boost investment and consumption in the economy. The stimulus package was a success and helped China regain its momentum, with a 10.4% GDP growth in 2010. However, in recent years, and mainly due to the strengthening of its currency and reaching a status of global economic superpower rather than emerging economy, China witnessed a plunge in its GDP growth levels, averaging around 7.45% in the past four years, and expected to have reached a low of 6.8% by the end of the year 2015.[47]

c. Foreign Direct Investment (FDI)

According to the UNCTAD (United Nations Conference on Trade and Development) World Investment Report 2015, China represented the largest destination for FDI inflows, which represent the net inflows of investment into a country, for the year 2014, with $128.5 billion of Foreign Direct Investment going into China's economy, accounting for 10.45% of global FDI inflows worldwide, followed by Hong Kong ($103.3 billion; 8.41% of global FDI inflows worldwide) and the United States ($92.4 billion; 7.52% of global FDI inflows worldwide).[48]

[47] International Monetary Fund, 2015

[48] United Nations Conference on Trade and Development, 2015



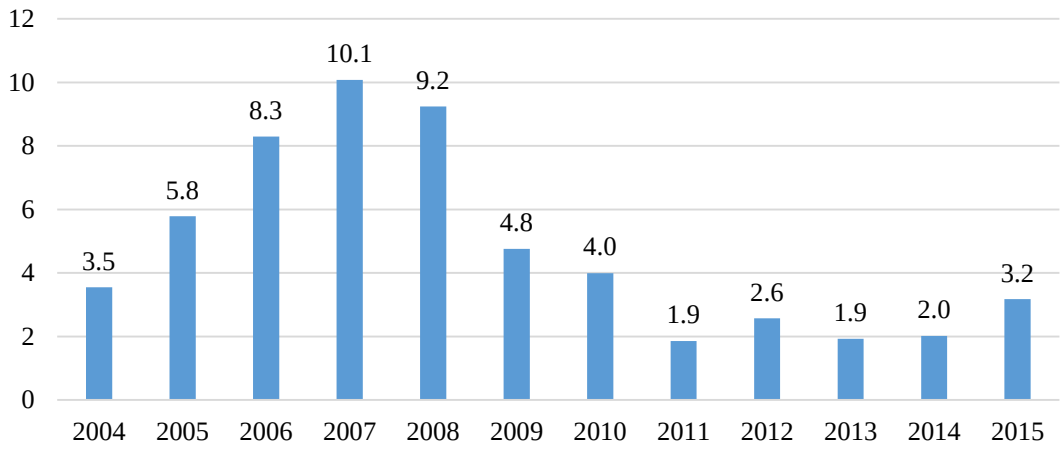
Source: UNCTAD World Investment Report 2015

Figure 9 China's Foreign Direct Investment (FDI) ($ billions)

As for the historical performance of the FDI inflows to China, they have been growing for over a decade, especially thanks to the "opening-up" reforms undertaken by the Communist Party and the government. FDI inflows reached $108.3 billion in 2008, mainly due to the flight of capital from the Western economies then in trouble because of the global financial crisis and into emerging markets such as China. The figure kept growing ever since 2010, reaching $128.5 billion as at end-of-year 2014.

d. Current Account Balance

The current account balance represents a country's difference between the inflow and outflow of goods & services, assets and capital- a figure that includes the country's balance of trade (exports & imports of goods & services).



Source: IMF World Economic Outlook

Figure 10 China's Current Account Surplus (% of GDP)

Looking at China's current account balance, which has been registering a surplus for the past decade and more, we realize that it has been on an upward trend from 2004 to 2007, reaching a peak of 10.1% of China's GDP for the year 2007, but started dropping ever since to reach around 2% of GDP by the end of 2014. This is mainly due to China's loss of competitive advantage due to its currency's appreciation, which has brought China's exporting sector backwards. In addition to the declining exports, a strong demand has been accompanying China's expansion into a prominent global superpower, reflected in the country's rise in imports. Current account balance is expected to slightly increase to 3.2%

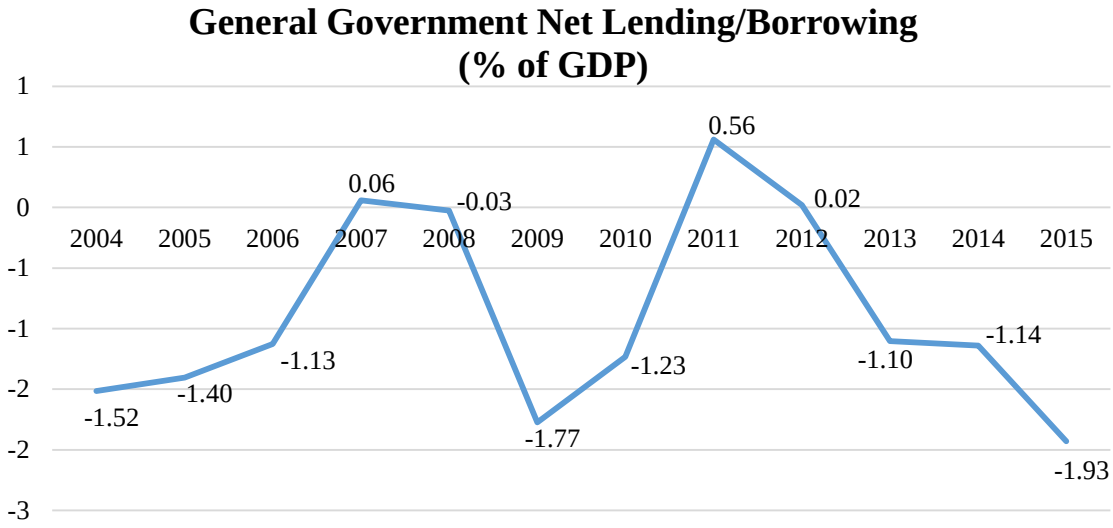
by the end of 2015, reflecting a slight improvement in China's economy thanks to its more "market-oriented" exchange rate policy reform that caused the largest devaluation in the Chinese Yuan in the second half of the current year.

e. Total & Fiscal Debt

China's growing unsustainable debt levels have been alarming analysts and economists around the world, fearing a global financial recession triggered by a debt crisis originating from the second largest economy in the world, China. In details, ever since the global financial crisis of 2008, China decided to stimulate its economy and entice investment by largely increasing its levels of borrowing. It is worth noting, in fact, that some analysts fear that China's growth has been due to excess investment levels as opposed to a consumption-led growth. According to Mckinsey & Company's Global Institute's report on world debt levels in early 2015 titled "Debt & (Not Much) Deleveraging", "China's debt quadrupled since 2007", reaching $28 trillion and an alarming debt-to-GDP ratio of 282% in 2014, higher than the United States', Australia's, Germany's, and Canada's levels as well as above the average for emerging economies. Rising levels of debt are expected to drag the economy down if not carefully managed and decreased.[49]

As for the government's fiscal balance as a percentage of GDP, China's government managed to register near-zero level surpluses for two small periods in the past decade: in 2007 and in 2011-2012.

[49] McKinsey Global Institute, 2015



Source: IMF World Economic Outlook

Figure 11 China's Government Net Lending/Borrowing (% of GDP)

As for the other periods, China's fiscal deficit fluctuated between a low of 1.10% and a high of 1.77% of GDP recorded in 2009, as a result of the quantitative easing undertaken by the Chinese Central Bank following the global financial crisis of 2008. Nevertheless, China's fiscal deficit does not exhibit alarming results, which may relieve investors worldwide from their concerns regarding a Chinese debt crisis (or a government default). According to the McKinsey Global Institute report, China will probably be able to prevent its country's debt levels from dragging down the global economy by its government's ability to bailout its financial sector in case of a crisis.

CHAPTER IV

TIME SERIES ANALYSIS

A. Data & Methodology

In order to test the relationship between the Chinese stock market and markets around the world, we decided to build an empirical model using E-views that includes the stock market prices of relevant exchanges worldwide. As a result, we have divided the world into four separate groups: the GCC countries (Bahrain, Qatar, Oman, Kuwait, Saudi Arabia (KSA), UAE (Dubai & Abu Dhabi)), the Asian countries (Japan, Korea, Indonesia, Taiwan), proxies for the developed economies around the world (The United States, the United Kingdom, France, Germany), and the oil market. Empirically, each of the countries is represented by the daily values of the main stock index of that stock market, collected from Thomson Reuters' platform. As for the GCC countries, we have constructed a GDP-weighted index to include all six stock markets, with the UAE's main index being an average of Dubai's and Abu Dhabi's indices.[50] Data for the GDP was collected from the IMF's World Economic Outlook Database:

Daily data for the Shanghai Stock Exchange (SSE) composite index, the New York Stock Exchange (NYSE) Composite index & the Dow Jones Industrial Average (DJIA) (for the US), the CAC40 (France), the FTSE100 (the UK), the Nikkei (Japan),

[50]gcc=(bahrain*gdp_bahrain+kuwait*gdp_kuwait+oman*gdp_oman+qatar*gdp_qatar+ksa*gdp_ksa+uae*gdp_uae)/(gdp_bahrain+gdp_kuwait+gdp_oman+gdp_qatar+gdp_ksa+gdp_uae)

Jakarta Composite index (Indonesia), Korea Composite index (Korea), Taiwan Composite index (Taiwan), and Brent Crude oil has been collected from Google Finance, ranging from the 4th of January 2010 to the 31st of October 2015, accounting for a total of 2,127 observations. It is worth noting the period begins in 2010 to take out the effects of the global financial crisis of 2008, after which recovery only started to take place as of 2010. Our analysis consists of empirically studying, using E-views, the Chinese stock market prices, represented by the time series "china".

Before starting our in-depth analysis concerning regional and world markets and their relationship to the Chinese market, we need to conduct basic tests on our data, including the Jarque-Bera normality test and unit root tests.

1. Unit Root Testing

There are two possible tests for the stationarity of a time series or the existence of a unit root: The Augmented Dickey-Fuller test and the Phillips-Perron test. Both these tests have three possible alternatives for testing for stationarity: Trend and Intercept, Intercept, and none. We always start with the first case (trend and intercept) at level and we check for the significance of the trend; if we find that there's a unit root and that the trend is insignificant, we proceed to the second case and we repeat the procedure but with the constant. Finally, if the latter is not significant, then we conduct the test at level-none. The null and alternative hypotheses of these tests are as below:

H_0: Variable has a unit root (non-stationary)

H_1: Variable doesn't have a unit root (stationary)

2. Johansen Cointegration Test

The Johansen Cointegration Test is used to determine whether there exists a long-term relationship among our studied non-stationary variables. The Johansen Cointegration Test conducts two tests simultaneously, which are the Trace test and the Max-Eigenvalue test. Both these tests will indicate the number of existing cointegrating equations at the 5% level of significance. The higher the number of cointegrating equations or vectors, the stronger the long-run relationship between the time series.

3. Granger Causality Test

Granger causality tests help us define the direction of causality between each two variables, in other words, we will be able to know which one of our variables' past values help me predict (or Granger cause) another. In details, there are four possible outcomes to this Granger Causality test (considering our two variables to be x & y): x Granger causes y; y Granger causes x; there exists a bi-directional causality between x & y; or x & y are independent, i.e. neither of the two Granger causes the other.

Here, the null hypothesis states that the excluded variable does not Granger cause the dependent variable. In details, a low p-value (<0.05) means that we reject the null and hence the excluded variable Granger causes the dependent variable; and a high p-value (>0.05) means that we fail to reject the null at the 5% level of significance and that the excluded variable does not, in fact, Granger cause the dependent variable.

It is worth noting that the Granger causality test is conducted on stationary variables. This means that we need to take the first difference of each of our stock market

indices before proceeding with our causality testing in the case of the absence of any cointegrating equation between the studied variables. However, it is important to point out that, in the case of the existence of a cointegrating equation, we need to apply the Vector Error Correction Model (VECM) on our studied variables before proceeding with the Granger causality test.

4. Impulse Response Function

The impulse response function (IRF) studies the relationship between two time series and usually supports what we have observed in our Granger causality analysis. In details, the impulse response function shows how a certain time series' current and future values respond to a one standard unit shock to another. Since the impulse response function is based on a VAR model, all the variables included should be stationary. Hence, we will take the first difference of the indices' values in the absence of cointegration or apply the IRF in the VECM framework.

5. Variance Decomposition

Variance decomposition helps us analyze even further the relationship that exists between the Saudi stock market returns and the world markets. In fact, as its name states, this function decomposes the variance of our studied variable into the variance due to each of the shocks made to the rest of the variables in the VAR model.

B. Results

1. Histogram & Descriptive Statistics

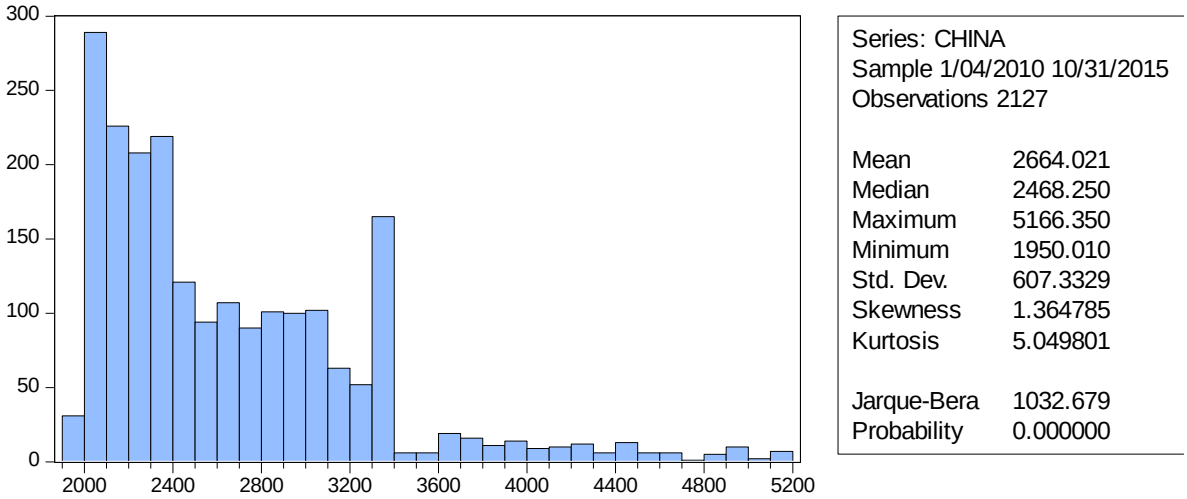


Figure 12 "China"'s Histogram & Descriptive Statistics

The above descriptive statistics show that the values are distributed around a mean of 2,664.021, with a median of 2,468.250. As for the series' standard deviation, showing the volatility of the stock market returns, it indicates a value of 607.3329.

The histogram shows that the data for the Chinese stock market returns are skewed to the right or positively skewed, since the tail of the distribution is to the right. In addition, the positive value of the skewness statistic (1.364785) supports our previous statement. Since the Skewness and the Kurtosis statistics for a normal distribution are respectively 0 and 3, and those of "china" are respectively 1.364785 and 5.049801, we conclude that our time series is not normally distributed. In details, the Jarque Bera statistic of 1,032.679 has

a probability of 0, indicating that the null hypothesis that the series is normally distributed should be rejected.

Hence, "china", the Chinese stock market prices are not normally distributed.

2. Unit Root Test

a. Augmented Dickey-Fuller Test

Null Hypothesis: CHINA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 6 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.926664	0.6400
Test critical values:	1% level	-3.962376	
	5% level	-3.411929	
	10% level	-3.127864	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CHINA)
Method: Least Squares
Date: 01/09/16 Time: 18:16
Sample (adjusted): 1/11/2010 10/31/2015
Included observations: 2120 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHINA(-1)	-0.002670	0.001386	-1.926664	0.0542
D(CHINA(-1))	0.094499	0.021610	4.373014	0.0000
D(CHINA(-2))	-0.106645	0.021704	-4.913678	0.0000
D(CHINA(-3))	0.041501	0.021827	1.901347	0.0574
D(CHINA(-4))	-0.001233	0.021818	-0.056533	0.9549
D(CHINA(-5))	0.019688	0.021685	0.907871	0.3640
D(CHINA(-6))	0.115745	0.021592	5.360571	0.0000
C	4.961570	3.691148	1.344181	0.1790
@TREND(1/04/2010)	0.002085	0.001373	1.517897	0.1292
R-squared	0.035481	Mean dependent var		0.088000

Adjusted R-squared	0.031826	S.D. dependent var	37.91689
S.E. of regression	37.30864	Akaike info criterion	10.08056
Sum squared resid	2938374.	Schwarz criterion	10.10459
Log likelihood	-10676.40	Hannan-Quinn criter.	10.08936
F-statistic	9.707096	Durbin-Watson stat	2.001682
Prob(F-statistic)	0.000000		

Table 4 ADF Test at Level-Trend & Intercept for "China"

The ADF test at level- trend and intercept exhibits a high p-value for the ADF-statistic equal to 0.6400. However, if we look at the p-value of the trend, we notice that it is not significant at the 5% level (p-value = 0.1292).

We therefore proceed to testing for the existence of a unit root at level-intercept:

Null Hypothesis: CHINA has a unit root
Exogenous: Constant
Lag Length: 6 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.588668	0.4882
Test critical values:	1% level	-3.433237	
	5% level	-2.862701	
	10% level	-2.567434	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CHINA)
Method: Least Squares
Date: 01/09/16 Time: 18:17
Sample (adjusted): 1/11/2010 10/31/2015
Included observations: 2120 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHINA(-1)	-0.002128	0.001339	-1.588668	0.1123
D(CHINA(-1))	0.095101	0.021613	4.400251	0.0000
D(CHINA(-2))	-0.106131	0.021708	-4.889098	0.0000
D(CHINA(-3))	0.042126	0.021830	1.929745	0.0538
D(CHINA(-4))	-0.000586	0.021820	-0.026874	0.9786

D(CHINA(-5))	0.020304	0.021688	0.936193	0.3493
D(CHINA(-6))	0.116358	0.021595	5.388271	0.0000
C	5.741354	3.656352	1.570241	0.1165

R-squared	0.034429	Mean dependent var	0.088000
Adjusted R-squared	0.031228	S.D. dependent var	37.91689
S.E. of regression	37.32015	Akaike info criterion	10.08071
Sum squared resid	2941581.	Schwarz criterion	10.10207
Log likelihood	-10677.55	Hannan-Quinn criter.	10.08853
F-statistic	10.75804	Durbin-Watson stat	2.001796
Prob(F-statistic)	0.000000		

Table 5 ADF Test at Level-Intercept for "China"

Similarly, the p-value of the ADF-statistic is larger than 0.05 (0.4882), but the constant is not significant either.

We finally proceed to test for stationarity at level-none:

Null Hypothesis: CHINA has a unit root
Exogenous: None
Lag Length: 6 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.259273	0.5929
Test critical values:	1% level	-2.566053	
	5% level	-1.940973	
	10% level	-1.616599	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CHINA)
Method: Least Squares
Date: 01/06/16 Time: 20:24
Sample (adjusted): 1/11/2010 10/31/2015
Included observations: 2120 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHINA(-1)	-7.70E-05	0.000297	-0.259273	0.7955
D(CHINA(-1))	0.094070	0.021610	4.353057	0.0000

D(CHINA(-2))	-0.107294	0.021703	-4.943851	0.0000
D(CHINA(-3))	0.041089	0.021828	1.882443	0.0599
D(CHINA(-4))	-0.001707	0.021816	-0.078252	0.9376
D(CHINA(-5))	0.019329	0.021687	0.891284	0.3729
D(CHINA(-6))	0.115232	0.021590	5.337209	0.0000

R-squared	0.033302	Mean dependent var	0.088000
Adjusted R-squared	0.030557	S.D. dependent var	37.91689
S.E. of regression	37.33309	Akaike info criterion	10.08093
Sum squared resid	2945015.	Schwarz criterion	10.09962
Log likelihood	-10678.79	Hannan-Quinn criter.	10.08777
Durbin-Watson stat	2.001484		

Table 6 ADF Test at Level-None for "China"

Here, the p-value of the ADF-statistic is equal to 0.5929 (> 0.05). This means that we cannot reject the null that the series has a unit root at the 5% level of significance. Hence, the time series "china", representing the Chinese main stock market index values, is non-stationary or has a unit root according to the ADF test.

We conduct the same unit root test on all other series, i.e. "GCC", "Oil", "France", "Germany", "UK", "NYSE", "DJIA", "Japan", "Indonesia", "Korea", "Taiwan", and conclude that they are all non-stationary at the 5% level of significance except for "UK", "DJIA" and "Korea", which indicate the absence of a unit root at the 5% level of significance.[51] Since our analysis partly relies on studying the long-term relationship between the Chinese market and each of the chosen countries using the Johansen cointegration test, we will have to let go of these three stationary variables. In details, as we previously explained, the Johansen cointegration test can only be conducted on non-

[51] View Appendix for Results

stationary variables. This will not cause a problem since we already have proxies for China's main trading partners worldwide as well as regionally.

b. Phillips-Perron Test

Null Hypothesis: CHINA has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 18 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.903889	0.6521
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1432.636
HAC corrected variance (Bartlett kernel)	1824.527

Phillips-Perron Test Equation
Dependent Variable: D(CHINA)
Method: Least Squares
Date: 01/09/16 Time: 18:30
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHINA(-1)	-0.002438	0.001400	-1.741880	0.0817
C	4.069347	3.732726	1.090181	0.2758
@TREND(1/04/2010)	0.002341	0.001385	1.690896	0.0910

R-squared	0.002206	Mean dependent var	0.065287
Adjusted R-squared	0.001266	S.D. dependent var	37.90091
S.E. of regression	37.87691	Akaike info criterion	10.10797
Sum squared resid	3045783.	Schwarz criterion	10.11596
Log likelihood	-10741.77	Hannan-Quinn criter.	10.11089
F-statistic	2.346775	Durbin-Watson stat	1.831528
Prob(F-statistic)	0.095925		

Table 7 PP Test at Level-Trend & Intercept for "China"

The PP test exhibits a high p-value of 0.6521 at level-trend and intercept, but an insignificant trend (p-value = 0.0910). We proceed to conduct the PP test at level-intercept:

Null Hypothesis: CHINA has a unit root
Exogenous: Constant
Bandwidth: 18 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.556992	0.5045
Test critical values:	1% level	-3.433228	
	5% level	-2.862698	
	10% level	-2.567432	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1434.565
HAC corrected variance (Bartlett kernel)	1845.824

Phillips-Perron Test Equation
Dependent Variable: D(CHINA)
Method: Least Squares
Date: 01/09/16 Time: 18:31
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHINA(-1)	-0.001833	0.001354	-1.353816	0.1759
C	4.946652	3.698109	1.337617	0.1812

R-squared	0.000862	Mean dependent var	0.065287
Adjusted R-squared	0.000392	S.D. dependent var	37.90091
S.E. of regression	37.89348	Akaike info criterion	10.10838
Sum squared resid	3049885.	Schwarz criterion	10.11370
Log likelihood	-10743.20	Hannan-Quinn criter.	10.11033
F-statistic	1.832817	Durbin-Watson stat	1.830173
Prob(F-statistic)	0.175939		

Table 8 PP Test at Level-Intercept for "China"

Similarly, the PP test exhibits an insignificant constant at level-intercept, meaning that we should conduct the test at level-none:

Null Hypothesis: CHINA has a unit root
Exogenous: None
Bandwidth: 18 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.274891	0.5872
Test critical values:	1% level	-2.566050	
	5% level	-1.940973	
	10% level	-1.616599	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1435.774
HAC corrected variance (Bartlett kernel)	1824.087

Phillips-Perron Test Equation
Dependent Variable: D(CHINA)
Method: Least Squares
Date: 01/06/16 Time: 20:23
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CHINA(-1)	-6.72E-05	0.000301	-0.223363	0.8233

R-squared	0.000021	Mean dependent var	0.065287
Adjusted R-squared	0.000021	S.D. dependent var	37.90091
S.E. of regression	37.90052	Akaike info criterion	10.10828
Sum squared resid	3052454.	Schwarz criterion	10.11094
Log likelihood	-10744.10	Hannan-Quinn criter.	10.10925
Durbin-Watson stat	1.831864		

Table 9 PP Test at Level-None for "China"

Finally, the Phillips-Perron test at level-none shows that we cannot reject the null hypothesis that the series has a unit root. Hence, "china" is a non-stationary series according to the PP test as well.

We obtain similar results for the remaining time series, except for "UK", "DJIA" and "Korea". The PP test therefore also proves that the UK main stock index, FTSE100, the Dow Jones Industrial Average "DJIA" and the Korea Composite index should be put aside in our analysis.

In conclusion, the Chinese stock market is a weak-form efficient market, meaning that past prices and returns are already incorporated in the value of the stock market index, and that investors cannot use past data to generate extraordinary profits.

In order to proceed with our analysis, we need to make our time series stationary by generating its first difference. Let "dchina" be the first difference of the Chinese main stock market index values. Both the ADF and PP tests on the first difference of the "china" series show that "dchina" is a stationary series that does not have a unit root.

3. Johansen Cointegration Test

a. <u>World Markets</u>

In order to study the relationship between China and the world stock markets, we choose five different indices from around the world: the CAC40 index for the French stock market, the FTSE100 index for the UK stock market, and the NYSE and DJIA indices for the US markets. As previously mentioned, we ignore the "DJIA" and "UK" time series as they are stationary:

Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA FRANCE GERMANY NYSE
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.021632	76.68508	47.85613	0.0000
At most 1 *	0.011204	30.23514	29.79707	0.0445
At most 2	0.002307	6.304035	15.49471	0.6596
At most 3	0.000658	1.398456	3.841466	0.2370

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.021632	46.44994	27.58434	0.0001
At most 1 *	0.011204	23.93111	21.13162	0.0196
At most 2	0.002307	4.905580	14.26460	0.7537
At most 3	0.000658	1.398456	3.841466	0.2370

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 10 Johansen Cointegration Test for Chinese & World Markets

Here, both the Trace and the Max-Eigenvalue tests indicate the presence of two cointegrating equations between the Chinese stock market and the world markets at the 5% level of significance.

b. Asian Markets

Asian stock market indices include those of Indonesia, Japan, Taiwan, and Korea. The latter being stationary, we include the first three time series only.

Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA INDONESIA JAPAN TAIWAN
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.011046	47.14754	47.85613	0.0582
At most 1	0.006420	23.55443	29.79707	0.2199
At most 2	0.003888	9.874712	15.49471	0.2905
At most 3	0.000753	1.600287	3.841466	0.2059

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.011046	23.59311	27.58434	0.1496
At most 1	0.006420	13.67972	21.13162	0.3919
At most 2	0.003888	8.274425	14.26460	0.3515
At most 3	0.000753	1.600287	3.841466	0.2059

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

Table 11 Johansen Cointegration Test for Chinese & Asian Markets

Both the Trace and Max-Eigenvalue tests indicate the existence of no cointegrating equations at the 5% level of significance among the Asian stock markets,

including China. This means that there exists no long-run relationship between the stock market returns in the East-Asian region and those of China.

It is worth mentioning that when studying the long-term relationship between China and each of the studied Asian countries (pairwise), we notice the existence of two cointegrating equations between the Chinese and Indonesian stock markets according to the Trace test. The following table shows the results obtained using E-views:

Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA INDONESIA
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.005535	17.29078	15.49471	0.0265
At most 1 *	0.002586	5.500834	3.841466	0.0190

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.005535	11.78995	14.26460	0.1188
At most 1 *	0.002586	5.500834	3.841466	0.0190

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

Table 12 Johansen Cointegration Test for Chinese & Indonesian Markets

This indicates the existence of a long-term relationship between the Shanghai Stock Exchange Composite index and the Jakarta Composite index, Indonesia's main stock market index.

c. GCC Markets

GCC stock markets include those of the Kingdom of Saudi Arabia, the United Arab Emirates (Abu Dhabi and Dubai), Qatar, Oman, Kuwait and Bahrain. Instead of comparing the Chinese stock index to each GCC country's main stock index, we created, using E-views, a GDP-weighted index for the GCC countries. Data for the GDP was collected from the IMF's World Economic Outlook Database:

Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA GCC
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.003020	9.979606	15.49471	0.2823
At most 1	0.001673	3.555425	3.841466	0.0593

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.003020	6.424181	14.26460	0.5594
At most 1	0.001673	3.555425	3.841466	0.0593

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

Table 13 Johansen Cointegration Test for Chinese & GCC Markets

Both the Trace and Max-Eigenvalue tests indicate the existence of no cointegrating equations at the 5% level of significance between China and the GCC stock markets. This means that there exists no long-run relationship between the stock market returns in the GCC region and those of China.

d. Oil Markets

In our analysis of the oil markets and their relationship to the Chinese stock markets, we have chosen to take the daily values of the Brent Crude oil, as it is the most relevant when it comes to Asian markets.

Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA OIL
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.003611	7.788733	15.49471	0.4883
At most 1	4.97E-05	0.105577	3.841466	0.7452

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.003611	7.683156	14.26460	0.4118
At most 1	4.97E-05	0.105577	3.841466	0.7452

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

Table 14 Johansen Cointegration Test for Chinese & Oil Markets

Knowing that China's demand for oil is ever-growing, we would suspect the existence of a type of relationship between oil markets and the Chinese stock markets. However, both the Trace and Max-Eigenvalue tests indicate the existence of no cointegrating equations at the 5% level of significance between China and the oil markets. This means that there exists no long-run relationship between the stock market values in the People's Republic of China and the oil markets. We could test for another type of relationship between the two time series using Granger causality testing, which tests for the existence of a short-run relationship.

Johansen Cointegration Test between	Trace Test	Max-Eigenvalue Test	Conclusion
China & World Markets	2 cointegrating vectors	2 cointegrating vectors	Semi-strong long-run relationship
China & Asian Markets	0 cointegrating vectors	0 cointegrating vectors	No long-run relationship
China & GCC Markets	0 cointegrating vectors	0 cointegrating vectors	No long-run relationship
China & Oil Markets	0 cointegrating vectors	0 cointegrating vectors	No long-run relationship

Table 15 Summary for Johansen Cointegration Tests

Since the Chinese stock market prices are not cointegrated with the prices on any of the stock indices regionally (in the Asian region), in the GCC region, and in the oil markets, portfolio diversification is possible with assets from the Chinese stock market combined with assets from Asian, GCC, and oil markets. As for the proxies for world markets, it seems like China has a long-term relationship with the CAC40, FTSE100 and NYSE indices combined all together, but no long-run relationship whatsoever with each one separately.[52]

[52] View Appendix for results

4. Granger Causality Test

a. World Markets

Since the Chinese markets are cointegrated with the proxies for the world markets, we applied the Vector Error Correction Model (VECM) to our VAR model and then proceeded with our Granger causality testing:

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 01/09/16 Time: 19:54
Sample: 1/04/2010 10/31/2015
Included observations: 2124

Dependent variable: D(CHINA)

Excluded	Chi-sq	df	Prob.
D(FRANCE)	5.180610	2	0.0750
D(GERMANY)	4.389074	2	0.1114
D(NYSE)	2.064741	2	0.3562
All	10.71149	6	0.0977

Dependent variable: D(FRANCE)

Excluded	Chi-sq	df	Prob.
D(CHINA)	1.908286	2	0.3851
D(GERMANY)	7.138073	2	0.0282
D(NYSE)	1.337282	2	0.5124
All	10.22347	6	0.1156

Dependent variable: D(GERMANY)

Excluded	Chi-sq	df	Prob.
D(CHINA)	2.700619	2	0.2592

D(FRANCE)	170.8137	2	0.0000
D(NYSE)	4.378329	2	0.1120
All	180.9259	6	0.0000

Dependent variable: D(NYSE)

Excluded	Chi-sq	df	Prob.
D(CHINA)	0.492307	2	0.7818
D(FRANCE)	0.833723	2	0.6591
D(GERMANY)	1.833135	2	0.3999
All	3.074551	6	0.7994

Table 16 Granger Causality Test for Chinese & World Markets

The high p-values (>0.05) show that there exists no bidirectional Granger causality between the stock markets of China and each of France, Germany and the US. In other words, the Chinese stock market movements do not Granger cause the world stock market activity; and vice-versa.

b. Asian Markets

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 01/09/16 Time: 20:02
Sample: 1/04/2010 10/31/2015
Included observations: 2124

Dependent variable: DCHINA

Excluded	Chi-sq	df	Prob.
DINDONESIA	12.03472	2	0.0024
DJAPAN	2.134413	2	0.3440
DTAIWAN	0.953873	2	0.6207

All	14.82759	6	0.0216

Dependent variable: DINDONESIA

Excluded	Chi-sq	df	Prob.
DCHINA	5.342171	2	0.0692
DJAPAN	2.452838	2	0.2933
DTAIWAN	2.954498	2	0.2283
All	10.48790	6	0.1056

Dependent variable: DJAPAN

Excluded	Chi-sq	df	Prob.
DCHINA	4.969035	2	0.0834
DINDONESIA	1.052755	2	0.5907
DTAIWAN	5.572887	2	0.0616
All	12.02059	6	0.0615

Dependent variable: DTAIWAN

Excluded	Chi-sq	df	Prob.
DCHINA	2.403071	2	0.3007
DINDONESIA	3.176243	2	0.2043
DJAPAN	5.291517	2	0.0710
All	10.80408	6	0.0946

Table 17 Granger Causality Test for Chinese & Asian Markets

As for the Asian countries and their relationship to the Chinese stock market, results show that there exists a unidirectional Granger causality relationship between the Indonesian and Chinese stock markets (low p-value=0.0024) . This means that the Chinese

stock market activity Granger causes the Indonesian stock market activity; but the converse is not true.

c. GCC Markets

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 01/08/16 Time: 14:14
Sample: 1/04/2010 10/31/2015
Included observations: 2124

Dependent variable: DCHINA

Excluded	Chi-sq	df	Prob.
DGCC	0.443229	2	0.8012
All	0.443229	2	0.8012

Dependent variable: DGCC

Excluded	Chi-sq	df	Prob.
DCHINA	0.010720	2	0.9947
All	0.010720	2	0.9947

Table 18 Granger Causality Test for Chinese & GCC Markets

The high p-values (>0.05) show that there exists no bidirectional Granger causality between the stock markets of China and the GCC countries. In other words, the Chinese stock market movements do not Granger cause stock market activity in the Gulf; and vice-versa.

d. Oil Markets

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 01/08/16 Time: 14:17
Sample: 1/04/2010 10/31/2015
Included observations: 2124

Dependent variable: DCHINA

Excluded	Chi-sq	df	Prob.
DOIL	0.068234	2	0.9665
All	0.068234	2	0.9665

Dependent variable: DOIL

Excluded	Chi-sq	df	Prob.
DCHINA	1.220591	2	0.5432
All	1.220591	2	0.5432

Table 19 Granger Causality Test for Chinese & Oil Markets

Finally, the Granger Causality Block Exogeneity Wald test shows that the Brent Crude Oil does not Granger cause Shanghai Stock Exchange's main stock index, or vice-versa.

As a conclusion, we realize that there exists a long-run relationship but no short-run relationship between the Chinese stock market activity and each of the world markets. As for the SSE Composite index and the Asian, GCC, and oil markets, there exists no relationship whatsoever, except for a unidirectional short-run relationship with the Indonesian main stock index.

5. Impulse Response Function

a. World Markets

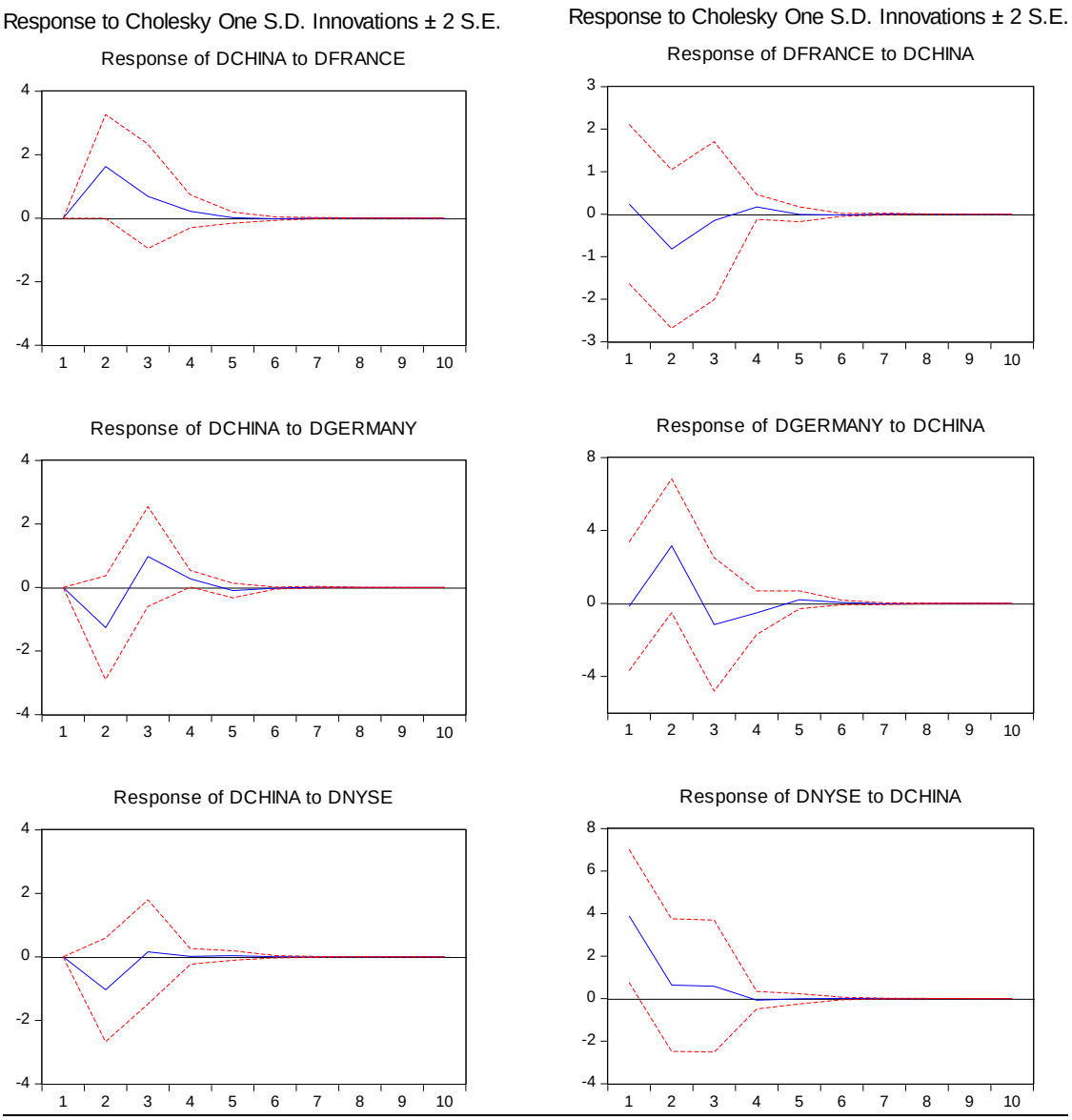


Figure 13 Impulse Response Function for Chinese & World Markets

The impulse response functions show that the world market returns do react to a one standard deviation shock to the Chinese stock market returns. In details, the response reaches around -1% in the second period for France and 3% for Germany in the second period as well and both die out only after the seventh period. As for the response of the NYSE index to a shock in China's stock market, the response is immediate and reaches around 3% then decreases gradually to less than 1% in the third period and dies out after the fifth period only.

As for the opposite effect of a one standard unit shock in the world stock markets on the Chinese stock market index, the response is positive for France starting the second period, peaks at around 2% at the second period and dies out after the seventh period. As for both Germany and the US markets, the response is negative, reaches around -1% in the second period, becomes slightly positive after the third period and dies out after the seventh as well.

b. Asian Markets

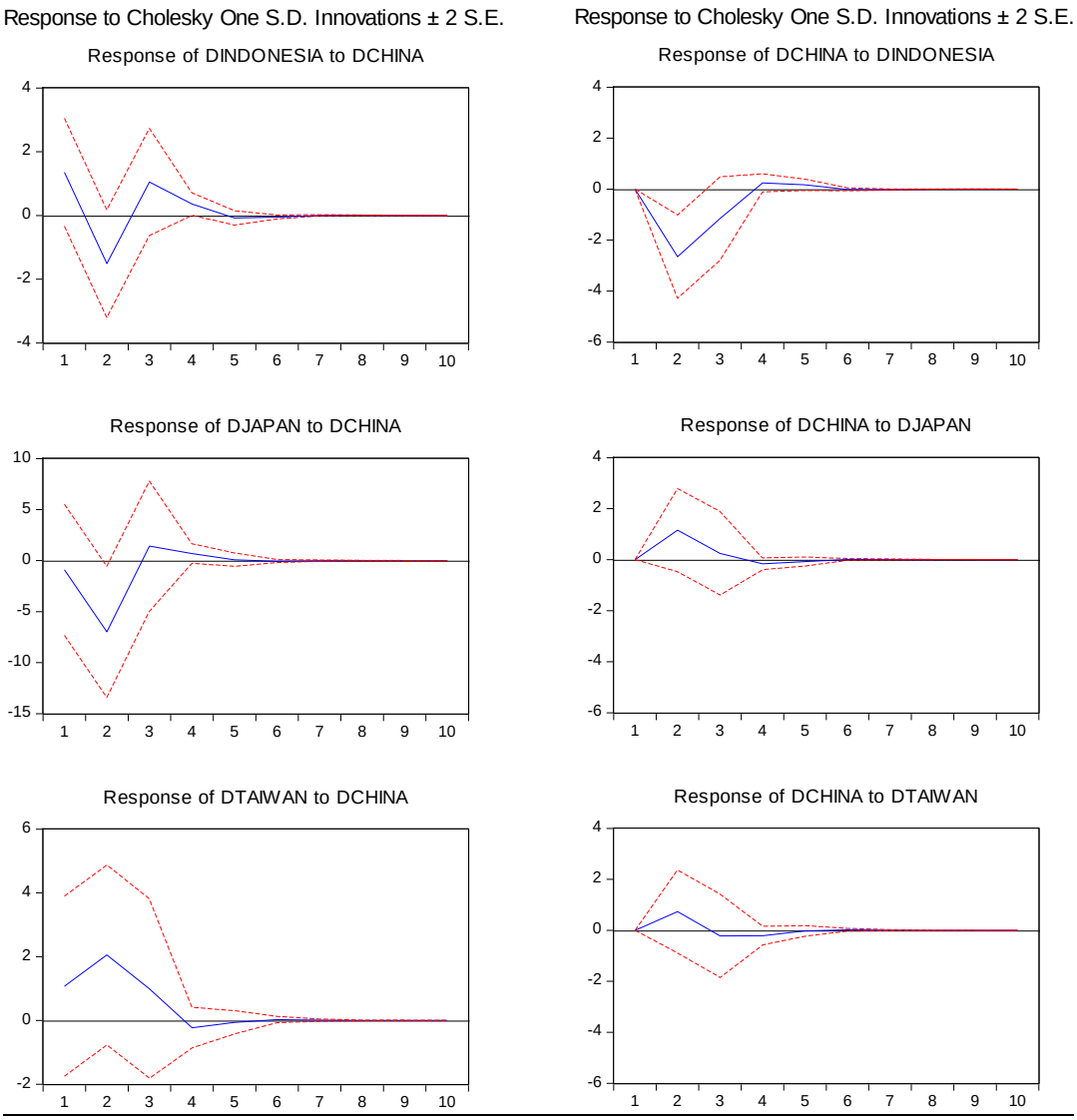


Figure 14 Impulse Response Function for Chinese & Asian Markets

Even though Indonesia turned out to be the only Asian country with which China has a short-run relationship, it seems like Japan is the country that reacts the most to a one standard deviation shock to China's stock market. In fact, the response starts off negative

and reaches a peak of around -7% in the second period, then turns positive and reaches 1% in the fourth period, and finally dies out after the fifth.

As for China's response to shocks to each of the three countries' stock markets, it starts off positive and reaches less than 1% in the second period for each of Japan and Taiwan, while it starts off negative at 2% for Indonesia and dies out after the seventh period.

c. GCC Markets

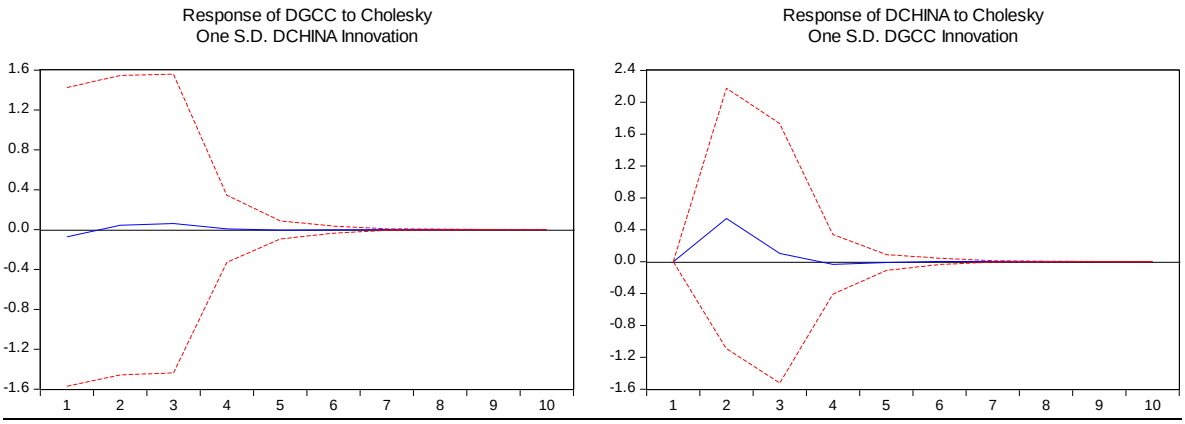


Figure 15 Impulse Response Function for Chinese & GCC Markets

The response of China's stock market activity to an impulse in the GCC stock market activity seems to be larger than the opposite, i.e. the response of the GCC stock market activity to an impulse in the Chinese stock market activity. In fact, the former reaches a peak of 0.5% as at the second period and dies out starting the fourth. The latter impulse response seems to be negligible. In other words, the GCC markets do not react to an impulse in the Chinese stock markets.

d. Oil Markets

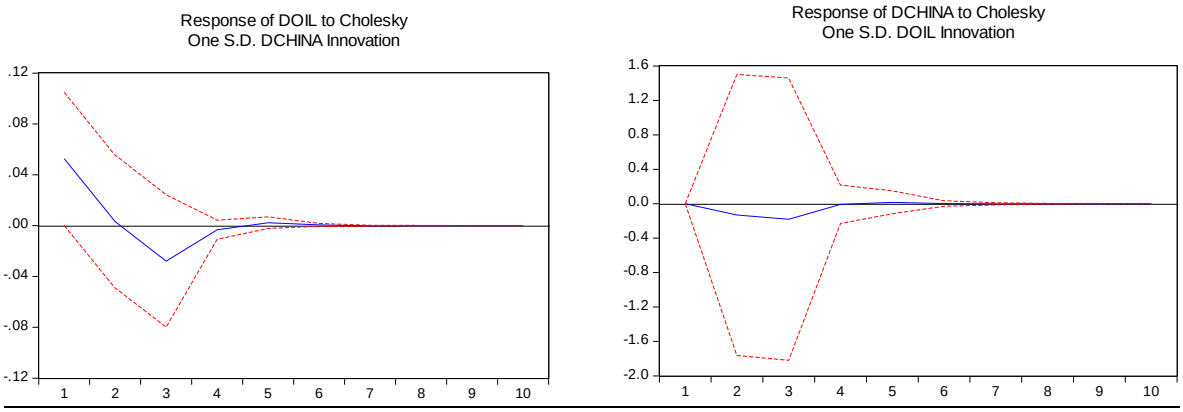


Figure 16 Impulse Response Function for Chinese & Oil Markets

Finally, the Chinese stock markets respond to a one standard deviation shock in Brent Crude Oil prices in a similar fashion as the oil markets respond to a one standard deviation unit shock to Chinese stock markets. The response reaches around 0.02% in the third period and dies out after the fourth.

6. Variance Decomposition

a. World Markets

Variance Decomposition of DCHINA: Period	S.E.	DCHINA	DFRANCE	DGERMANY	DNYSE
1	37.54610	100.0000	0.000000	0.000000	0.000000
2	37.77987	99.62665	0.185628	0.112088	0.075634
3	37.96726	99.53054	0.216149	0.176746	0.076566
4	37.97456	99.52243	0.219280	0.181745	0.076546
5	37.97590	99.52168	0.219279	0.182400	0.076640
6	37.97601	99.52163	0.219298	0.182435	0.076640
7	37.97602	99.52162	0.219298	0.182440	0.076641
8	37.97602	99.52162	0.219299	0.182441	0.076641
9	37.97602	99.52162	0.219299	0.182441	0.076641
10	37.97602	99.52162	0.219299	0.182441	0.076641

Variance Decomposition of DFRANCE: Period	S.E.	DCHINA	DFRANCE	DGERMANY	DNYSE
1	43.12863	0.003062	99.99694	0.000000	0.000000
2	43.18045	0.038908	99.76232	0.130940	0.067835
3	43.22284	0.040047	99.57993	0.306901	0.073117
4	43.22577	0.041565	99.57758	0.307397	0.073462
5	43.22588	0.041566	99.57724	0.307449	0.073749
6	43.22589	0.041587	99.57717	0.307487	0.073752
7	43.22589	0.041587	99.57717	0.307487	0.073752
8	43.22589	0.041587	99.57717	0.307487	0.073752
9	43.22589	0.041587	99.57717	0.307487	0.073752
10	43.22589	0.041587	99.57717	0.307487	0.073752

Variance Decomposition of DGERMANY: Period	S.E.	DCHINA	DFRANCE	DGERMANY	DNYSE
1	81.34191	0.000404	3.366505	96.63309	0.000000
2	84.83126	0.138792	10.72731	89.08333	0.050566
3	84.97366	0.156941	10.75450	88.83090	0.257651
4	84.98404	0.160513	10.75196	88.82895	0.258575
5	84.98471	0.161036	10.75281	88.82757	0.258585
6	84.98475	0.161066	10.75281	88.82751	0.258612
7	84.98476	0.161071	10.75281	88.82751	0.258612
8	84.98476	0.161071	10.75281	88.82751	0.258613

9	84.98476	0.161071	10.75281	88.82751	0.258613
10	84.98476	0.161071	10.75281	88.82751	0.258613

Variance Decomposition of DNYSE: Period	S.E.	DCHINA	DFRANCE	DGERMANY	DNYSE
1	72.12723	0.291013	0.047534	0.050041	99.61141
2	72.13802	0.298719	0.067074	0.052459	99.58175
3	72.18757	0.304834	0.067516	0.115378	99.51227
4	72.18924	0.304930	0.071736	0.115680	99.50765
5	72.18926	0.304931	0.071750	0.115684	99.50764
6	72.18927	0.304931	0.071750	0.115695	99.50762
7	72.18927	0.304931	0.071751	0.115695	99.50762
8	72.18927	0.304931	0.071751	0.115695	99.50762
9	72.18927	0.304931	0.071751	0.115695	99.50762
10	72.18927	0.304931	0.071751	0.115695	99.50762

Table 20 Variance Decomposition for Chinese & World Markets

We decompose the variance of the Chinese stock activity owing to shocks to the world stock markets. Starting the second period, 0.19% of the variance is due to shocks in the French stock index CAC40, 0.11% is due to shocks to the German stock index DAX, and only 0.076% due to the US's NYSE shocks. By the 10th period, shocks to CAC40 would constitute a larger share in SSE's variance of 0.22% while DAX shocks would represent around 0.18% of the variance and NYSE would remain at around 0.076%.

As for the decomposition of the world stock indices, we notice that, by the 10th period, shocks to the Chinese main stock index would account for 0.30%, 0.16%, and 0.042% of NYSE, DAX, and CAC40's respective variances.

b. Asian Markets

Variance Decomposition of DCHINA:

Period	S.E.	DCHINA	DINDONESIA	DJAPAN	DTAIWAN
1	37.50785	100.0000	0.000000	0.000000	0.000000
2	37.78099	99.37649	0.491949	0.093649	0.037911
3	37.96604	99.28256	0.579508	0.096992	0.040941
4	37.97470	99.27384	0.583423	0.098760	0.043976
5	37.97600	99.27151	0.585319	0.099157	0.044017
6	37.97614	99.27147	0.585325	0.099160	0.044046
7	37.97615	99.27144	0.585352	0.099164	0.044048
8	37.97615	99.27144	0.585352	0.099164	0.044048
9	37.97615	99.27144	0.585353	0.099164	0.044049
10	37.97615	99.27144	0.585353	0.099164	0.044049

Variance Decomposition of DINDONESIA:

Period	S.E.	DCHINA	DINDONESIA	DJAPAN	DTAIWAN
1	39.03272	0.121182	99.87882	0.000000	0.000000
2	39.10158	0.270031	99.67132	0.030419	0.028227
3	39.16575	0.340985	99.41106	0.105768	0.142185
4	39.16793	0.349151	99.40024	0.105971	0.144642
5	39.16809	0.349572	99.39952	0.106153	0.144751
6	39.16813	0.349729	99.39936	0.106154	0.144759
7	39.16813	0.349731	99.39936	0.106154	0.144759
8	39.16813	0.349733	99.39935	0.106154	0.144760
9	39.16813	0.349733	99.39935	0.106154	0.144760
10	39.16813	0.349733	99.39935	0.106154	0.144760

Variance Decomposition of DJAPAN:

Period	S.E.	DCHINA	DINDONESIA	DJAPAN	DTAIWAN
1	148.0885	0.003642	0.001512	99.99485	0.000000
2	148.6355	0.224481	0.004423	99.55184	0.219259
3	148.7249	0.233284	0.075301	99.44473	0.246682
4	148.7270	0.235398	0.075756	99.44217	0.246678
5	148.7272	0.235427	0.075784	99.44206	0.246724
6	148.7273	0.235441	0.075788	99.44204	0.246727
7	148.7273	0.235442	0.075788	99.44204	0.246728

8	148.7273	0.235442	0.075788	99.44204	0.246728
9	148.7273	0.235442	0.075788	99.44204	0.246728
10	148.7273	0.235442	0.075788	99.44204	0.246728

Variance Decomposition of DTAIWAN:

Period	S.E.	DCHINA	DINDONESIA	DJAPAN	DTAIWAN
1	65.08664	0.027192	0.213817	0.115166	99.64382
2	65.30607	0.125888	0.301460	0.196172	99.37648
3	65.41175	0.148547	0.366671	0.381732	99.10305
4	65.41228	0.149761	0.366666	0.382076	99.10150
5	65.41246	0.149849	0.366690	0.382075	99.10139
6	65.41247	0.149864	0.366696	0.382075	99.10136
7	65.41247	0.149865	0.366697	0.382076	99.10136
8	65.41247	0.149866	0.366697	0.382076	99.10136
9	65.41247	0.149866	0.366697	0.382076	99.10136
10	65.41247	0.149866	0.366697	0.382076	99.10136

Table 21 Variance Decomposition for Chinese & Asian Markets

Decomposing the variance of the variable representing the Chinese stock market activity “dchina”, we notice that we notice that, by the second period, shocks to the indonesian stock market index constitute around 0.49% of the Chinese variance and reach 0.59% by the tenth period. As for the Japanese and Taiwanese stock market index shocks, they only constitute 0.09% and 0.04% of the Chinese stock market index variance by the 10th period.

As for the variance decomposition of each of Indonesia, Japan, and Taiwan’s stock market indices, we notice that, by the 10^{th} period, China would account for 0.35%, 0.24% and 0.15% respectively.

c. GCC Markets

Variance Decomposition of DCHINA: Period	S.E.	DCHINA	DGCC
1	37.59963	100.0000	0.000000
2	37.76511	99.97947	0.020528
3	37.93256	99.97892	0.021082
4	37.93885	99.97884	0.021157
5	37.94006	99.97883	0.021165
6	37.94019	99.97883	0.021165
7	37.94020	99.97883	0.021166
8	37.94020	99.97883	0.021166
9	37.94020	99.97883	0.021166
10	37.94020	99.97883	0.021166

Variance Decomposition of DGCC: Period	S.E.	DCHINA	DGCC
1	34.50993	0.000443	99.99956
2	34.75851	0.000601	99.99940
3	34.76944	0.000905	99.99909
4	34.76976	0.000910	99.99909
5	34.76977	0.000911	99.99909
6	34.76977	0.000911	99.99909
7	34.76977	0.000911	99.99909
8	34.76977	0.000911	99.99909
9	34.76977	0.000911	99.99909
10	34.76977	0.000911	99.99909

Table 22 Variance Decomposition for Chinese & GCC Markets

The variation in the Chinese stock market prices is not due to the GCC countries in the first period. Starting the second period, shocks to the GCC countries would account for 0.021% of China's variance and remain steady at around 0.022% for later periods.

As for the variation in the constructed "gcc" index, only 0.00009% would be due to shocks in the Chinese main stock index.

d. Oil Markets

Variance Decomposition of DCHINA: Period	S.E.	DCHINA	DOIL
1	37.60295	100.0000	0.000000
2	37.76483	99.99880	0.001201
3	37.93256	99.99655	0.003455
4	37.93880	99.99654	0.003458
5	37.94004	99.99653	0.003474
6	37.94017	99.99653	0.003475
7	37.94018	99.99653	0.003475
8	37.94018	99.99653	0.003475
9	37.94018	99.99653	0.003475
10	37.94018	99.99653	0.003475

Variance Decomposition of DOIL: Period	S.E.	DCHINA	DOIL
1	1.209360	0.188771	99.81123
2	1.209528	0.189413	99.81059
3	1.209961	0.242527	99.75747
4	1.209966	0.243277	99.75672
5	1.209968	0.243627	99.75637
6	1.209968	0.243647	99.75635
7	1.209968	0.243649	99.75635
8	1.209968	0.243649	99.75635
9	1.209968	0.243649	99.75635
10	1.209968	0.243649	99.75635

Table 23 Variance Decomposition for Chinese & Oil Markets

Finally, the variance decomposition of the SSE prices due to shocks in the oil markets shows that in the first period, the variance of the Chinese stock market returns is 100% due to shocks of its own. Then, starting the second period, oil shocks would account for 0.001% of China's variance. By the 10th period, variance of the Saudi stock market returns would only be 0.003% owed to shocks in oil markets.

Variance in “oil” however, is 0.19% due to shocks to the Chinese stock index in the first period, and around 0.24% owed to shocks to the SSE Composite index by the 10th period.

We can summarize the results of the three tests (Granger Causality test, Impulse Response Function, and Variance Decomposition) in the table below:

Region	**Test**	**Result**
CAC40	Granger Causality	No Granger causality
	IRF	China to France: positive; large France to China: negative then positive; small
	Variance Decomposition	China: 0.22% owed to France France: 0.042% owed to China
DAX	Granger Causality	No Granger causality
	IRF	China to Germany: negative then positive; large Germany to China: positive then negative; large
	Variance Decomposition	China: 0.18% owed to Germany Germany: 0.16% owed to China

NYSE	Granger Causality	No Granger causality
	IRF	China to US: negative; large US to China: positive; large
	Variance Decomposition	China: 0.078% owed to US US: 0.30% owed to China
Indonesia	Granger Causality	China Granger causes Indonesia
	IRF	China to Indonesia: negative then positive; large Indonesia to China: negative then positive; large
	Variance Decomposition	China: 0.59% owed to Indonesia Indonesia: 0.35% owed to China
Japan	Granger Causality	No Granger causality
	IRF	China to Japan: positive; large Japan to China: negative then positive; large
	Variance Decomposition	China: 0.099% owed to Japan Japan: 0.24% owed to China

Taiwan	Granger Causality	No Granger causality
	IRF	China to Taiwan: positive then negative; small Taiwan to China: positive then negative; large
	Variance Decomposition	China: 0.044% owed to Taiwan Taiwan: 0.15% owed to China
GCC	Granger Causality	No Granger causality
	IRF	China to GCC: positive; small GCC to China: positive; small
	Variance Decomposition	China: 0.021% owed to GCC GCC: 0.0000911% owed to China
Oil	Granger Causality	No Granger causality
	IRF	China to Oil: negative; small Oil to China: positive then negative; small
	Variance Decomposition	China: 0.0035% owed to Oil Oil: 0.24% owed to China

Table 24 Summary for Granger Causality, IRF & Variance Decomposition

CHAPTER V

CONCLUSION

Recent worldwide stock market movements, especially declines, have been explained by financial and economic analysts by the Chinese economic slowdown. In fact, China has been suffering from a downturn in its economy, reflected by lower levels of GDP in the most recent years and an important stock market bubble burst in the early second half of 2015. On August 24th, 2015, a day named "Black Monday", the Shanghai and Shenzhen stock markets crashed and resulted in a total market capitalization loss of $4 trillion. This loss spilled over to markets worldwide like France, Germany, and the US. In fact, the latter's DJIA index witnessed an outrageous 1,089 point drop in one day, the largest drop since the global financial crisis started in 2007. China tried to stimulate its economy by lowering interest rates, but the Chinese were living in a deflationary environment and were not eager to spend and consume, let alone invest. Another effort to boost its exports and trade activity and perhaps lift its economy was the devaluation of its currency, the Renminbi, in the same month in 2015, by changing the way it is priced and redirecting it towards a more market-oriented approach.

Despite these recent witnessed downturns, China managed to become the world's second largest economy in the world, and the first in terms of PPP, the largest consumer of oil with increasing production and manufacturing, leading to one of the most highly competitive markets, with main trading partners being the US, the European Union, Japan, and South Korea. Also, its currency is now the fifth most traded currency worldwide, and

the country has managed to make its goals heard and achieved through the participation in worldwide organizations such as the IMF, the WTO, and G20. This has helped China not only push its own goals up the world agenda, but also the emerging countries' goals. China also established or was an important player in new organizations aimed at developing the Asian or emerging markets such as the New Development Bank and the Asian Infrastructure Investment Bank. As a result, analysts worldwide acknowledge the power of China and consider it to be the most successful model for an emerging economy in the 21st century.

The People's Republic of China, established in 1949 by the Communist Party leader Mao Zedong, presents a very different and complicated institutional and political system characterized by the rule of the Communist party and its intervention in almost all aspects of the economy. It has been the only political party since the inception of the country, and largest party in the world, with the leader enjoying most of the power in decision-making, being both the Chairman of the Communist Party and the President of China since the early 1990s. The death of Mao Zedong, the founding father of the Communist Party of China in 1976, paved the way for a new era in China's economic history. Since then, the country has been more market-oriented and open to foreign markets and investment. However, the Communist Party remains a major pillar in the economy and is the main cause of the elitist, corrupt, non-transparent nature of the institutional framework of China, making foreign investors reluctant to invest in the country.

Our empirical analysis studies the long-term (through the Johansen Cointegration Test) and short-term (through the Granger Causality Test) relationships between the Chinese stock markets and worldwide stock exchanges by building a VAR model with

stock market indices as our variables. In details, we used the Shanghai Composite index, the most comprehensive and widely used index for the SSE, comprising all A-shares and B-shares, and the main stock indices for the US, the UK, France and Germany as proxies for world markets, the main stock indices of Japan, Korea, Indonesia, and Taiwan as proxies for Asian markets, a GDP-weighted index for the GCC markets (including Qatar, Kuwait, the UAE, Saudi Arabia, Bahrain, and Oman), and the daily prices of Brent Crude Oil. The model included 2,127 observations, ranging from 2010 to 2015, leaving out the global financial crisis of 2008.

Both ADF and Philips-Perron tests show that all our variables excluding the UK, the DJIA, and Korea, are non-stationary. This means that these markets are weak-form efficient, meaning that past prices and returns are already incorporated in the value of the index and that investors cannot generate extraordinary profits by observing past data. Proceeding with our analysis to the Johansen Cointegration test, we conclude that there exists a semi-strong long-term relationship between the Chinese markets and the world markets but no long-term relationship with any of the remaining regions. As for the Granger Causality test, it shows the existence of a unilateral short-term relationship between China and Indonesia only. This means that investors can use the Chinese stocks along with Asian stocks for portfolio diversification, however, Chinese stocks and world stocks (from the US, France, or Germany) cannot be included in the same portfolio as they are financially integrated.

As a conclusion, it is clear that China has been putting a lot of energy and effort into its economic reform plan, putting its communist or socialist ideology aside, and focusing on expanding the Chinese economy and helping it grow and open up to foreign

markets. China's ever-growing demand for oil is an indicator of China's flourishing manufacturing industry, China's largest and strongest economic sector. This attracts young talent and increased R&D investment, which will boost the economy even further.[53] However, China needs to implement structural changes to its political and institutional system in order to sustain its productivity growth. Inefficiencies and corruption are prominent in many sectors in the Chinese economy. For example, banks tend to lend disproportionately to governmental institutions and state-owned enterprises, which increases the risk of financial instability. In addition, SOEs tend to monopolize the rights and profits in industries such as the energy, transportation, telecommunication, banking, entertainment, education, and health care. Corruption and income inequality are therefore the results of such a corrupt and elitist system and the call for political reform is as important as that for a continuing economic reform.[54]

Also, China's growth and successful transition to an open, market-oriented economy largely depends on its ability to take the Chinese consumers out of this deflationary environment and encourage them to increase their consumption, thus moving a little further away from the focus on fixed investment and trade.[55]

[53] Rawski, 2011
[54] Zhu, 2012
[55] Morrison, 2015

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APPENDIX

This appendix includes the E-views results of the ADF and PP unit root tests conducted on the following time series: France, Germany, UK, DJIA, NYSE, Indonesia, Japan, Korea, Taiwan, GCC and Oil. It also includes the results of the Johansen cointegration tests in pairs for the following time series: China & France, China & Germany, China & NYSE, China & Japan, and China & Taiwan.

A. Unit Root Test

1. France

a. ADF Test

Null Hypothesis: FRANCE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.822415	0.1892
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FRANCE)
Method: Least Squares
Date: 01/06/16 Time: 20:31
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FRANCE(-1)	-0.006702	0.002375	-2.822415	0.0048
C	21.03942	8.026126	2.621366	0.0088
@TREND(1/04/2010)	0.005548	0.002134	2.599190	0.0094

R-squared	0.004092	Mean dependent var	0.415659
Adjusted R-squared	0.003153	S.D. dependent var	43.12418
S.E. of regression	43.05613	Akaike info criterion	10.36430
Sum squared resid	3935682.	Schwarz criterion	10.37229
Log likelihood	-11014.25	Hannan-Quinn criter.	10.36722
F-statistic	4.361067	Durbin-Watson stat	1.983603
Prob(F-statistic)	0.012879		

b. PP Test

Null Hypothesis: FRANCE has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 21 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.665506	0.2513
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1851.215
HAC corrected variance (Bartlett kernel)	1596.529

Phillips-Perron Test Equation
Dependent Variable: D(FRANCE)
Method: Least Squares
Date: 01/06/16 Time: 20:33
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FRANCE(-1)	-0.006702	0.002375	-2.822415	0.0048

C	21.03942	8.026126	2.621366	0.0088
@TREND(1/04/2010)	0.005548	0.002134	2.599190	0.0094

R-squared	0.004092	Mean dependent var	0.415659
Adjusted R-squared	0.003153	S.D. dependent var	43.12418
S.E. of regression	43.05613	Akaike info criterion	10.36430
Sum squared resid	3935682.	Schwarz criterion	10.37229
Log likelihood	-11014.25	Hannan-Quinn criter.	10.36722
F-statistic	4.361067	Durbin-Watson stat	1.983603
Prob(F-statistic)	0.012879		

2. Germany

a. ADF Test

Null Hypothesis: GERMANY has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.807102	0.1947
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GERMANY)
Method: Least Squares
Date: 01/06/16 Time: 20:37
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GERMANY(-1)	-0.007067	0.002517	-2.807102	0.0050
C	37.86068	13.60249	2.783364	0.0054
@TREND(1/04/2010)	0.019923	0.007345	2.712474	0.0067

R-squared	0.003760	Mean dependent var	2.258626
Adjusted R-squared	0.002822	S.D. dependent var	84.78554
S.E. of regression	84.66583	Akaike info criterion	11.71671

Sum squared resid	15218307	Schwarz criterion	11.72470
Log likelihood	-12451.86	Hannan-Quinn criter.	11.71964
F-statistic	4.006656	Durbin-Watson stat	1.975982
Prob(F-statistic)	0.018332		

b. PP Test

Null Hypothesis: GERMANY has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.801007	0.1970
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	7158.188
HAC corrected variance (Bartlett kernel)	7123.882

Phillips-Perron Test Equation
Dependent Variable: D(GERMANY)
Method: Least Squares
Date: 01/06/16 Time: 20:38
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GERMANY(-1)	-0.007067	0.002517	-2.807102	0.0050
C	37.86068	13.60249	2.783364	0.0054
@TREND(1/04/2010)	0.019923	0.007345	2.712474	0.0067

R-squared	0.003760	Mean dependent var	2.258626
Adjusted R-squared	0.002822	S.D. dependent var	84.78554
S.E. of regression	84.66583	Akaike info criterion	11.71671
Sum squared resid	15218307	Schwarz criterion	11.72470
Log likelihood	-12451.86	Hannan-Quinn criter.	11.71964
F-statistic	4.006656	Durbin-Watson stat	1.975982

Prob(F-statistic)	0.018332

3. UK

a. ADF Test

Null Hypothesis: UK has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.515440	0.0379
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UK)
Method: Least Squares
Date: 01/06/16 Time: 20:52
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UK(-1)	-0.012166	0.003461	-3.515440	0.0004
C	65.50003	18.50046	3.540454	0.0004
@TREND(1/04/2010)	0.008585	0.003091	2.777093	0.0055

R-squared	0.005820	Mean dependent var	0.404892
Adjusted R-squared	0.004883	S.D. dependent var	48.69748
S.E. of regression	48.57843	Akaike info criterion	10.60565
Sum squared resid	5009991.	Schwarz criterion	10.61364
Log likelihood	-11270.80	Hannan-Quinn criter.	10.60857
F-statistic	6.213924	Durbin-Watson stat	1.964472
Prob(F-statistic)	0.002038		

b. PP Test

Null Hypothesis: UK has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.524295	0.0370
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	2356.534
HAC corrected variance (Bartlett kernel)	2367.425

Phillips-Perron Test Equation
Dependent Variable: D(UK)
Method: Least Squares
Date: 01/06/16 Time: 20:52
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UK(-1)	-0.012166	0.003461	-3.515440	0.0004
C	65.50003	18.50046	3.540454	0.0004
@TREND(1/04/2010)	0.008585	0.003091	2.777093	0.0055

R-squared	0.005820	Mean dependent var	0.404892
Adjusted R-squared	0.004883	S.D. dependent var	48.69748
S.E. of regression	48.57843	Akaike info criterion	10.60565
Sum squared resid	5009991.	Schwarz criterion	10.61364
Log likelihood	-11270.80	Hannan-Quinn criter.	10.60857
F-statistic	6.213924	Durbin-Watson stat	1.964472
Prob(F-statistic)	0.002038		

4. DJIA

a. ADF Test

Null Hypothesis: DJIA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.902215	0.0121
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DJIA)
Method: Least Squares
Date: 01/08/16 Time: 13:29
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DJIA(-1)	-0.014136	0.003623	-3.902215	0.0001
C	141.7580	35.79456	3.960323	0.0001
@TREND(1/04/2010)	0.056763	0.014952	3.796431	0.0002

R-squared	0.007122	Mean dependent var	3.330000
Adjusted R-squared	0.006187	S.D. dependent var	102.8416
S.E. of regression	102.5230	Akaike info criterion	12.09946
Sum squared resid	22314775	Schwarz criterion	12.10745
Log likelihood	-12858.73	Hannan-Quinn criter.	12.10239
F-statistic	7.614582	Durbin-Watson stat	2.041186
Prob(F-statistic)	0.000507		

b. PP Test

Null Hypothesis: DJIA has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 15 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.713737	0.0216
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	10496.13
HAC corrected variance (Bartlett kernel)	9478.440

Phillips-Perron Test Equation
Dependent Variable: D(DJIA)
Method: Least Squares
Date: 01/08/16 Time: 13:29
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DJIA(-1)	-0.014136	0.003623	-3.902215	0.0001
C	141.7580	35.79456	3.960323	0.0001
@TREND(1/04/2010)	0.056763	0.014952	3.796431	0.0002

R-squared	0.007122	Mean dependent var	3.330000
Adjusted R-squared	0.006187	S.D. dependent var	102.8416
S.E. of regression	102.5230	Akaike info criterion	12.09946
Sum squared resid	22314775	Schwarz criterion	12.10745
Log likelihood	-12858.73	Hannan-Quinn criter.	12.10239
F-statistic	7.614582	Durbin-Watson stat	2.041186
Prob(F-statistic)	0.000507		

5. NYSE

a. ADF Test

Null Hypothesis: NYSE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.928048	0.1537
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NYSE)
Method: Least Squares
Date: 01/06/16 Time: 20:53
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NYSE(-1)	-0.008254	0.002819	-2.928048	0.0034
C	57.25305	19.20854	2.980605	0.0029
@TREND(1/04/2010)	0.017352	0.006531	2.656685	0.0080

R-squared	0.004027	Mean dependent var	1.474233
Adjusted R-squared	0.003089	S.D. dependent var	72.02303
S.E. of regression	71.91170	Akaike info criterion	11.39017
Sum squared resid	10978656	Schwarz criterion	11.39815
Log likelihood	-12104.75	Hannan-Quinn criter.	11.39309
F-statistic	4.292190	Durbin-Watson stat	1.988835
Prob(F-statistic)	0.013794		

b. PP Test

Null Hypothesis: NYSE has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 24 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.675666	0.2469
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5163.996
HAC corrected variance (Bartlett kernel)	4349.090

Phillips-Perron Test Equation
Dependent Variable: D(NYSE)
Method: Least Squares
Date: 01/06/16 Time: 20:56
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NYSE(-1)	-0.008254	0.002819	-2.928048	0.0034
C	57.25305	19.20854	2.980605	0.0029
@TREND(1/04/2010)	0.017352	0.006531	2.656685	0.0080

R-squared	0.004027	Mean dependent var	1.474233
Adjusted R-squared	0.003089	S.D. dependent var	72.02303
S.E. of regression	71.91170	Akaike info criterion	11.39017
Sum squared resid	10978656	Schwarz criterion	11.39815
Log likelihood	-12104.75	Hannan-Quinn criter.	11.39309
F-statistic	4.292190	Durbin-Watson stat	1.988835
Prob(F-statistic)	0.013794		

6. Indonesia

a. ADF Test

Null Hypothesis: INDONESIA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.272953	0.1810
Test critical values:	1% level	-3.433228	
	5% level	-2.862698	
	10% level	-2.567432	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INDONESIA)
Method: Least Squares
Date: 01/06/16 Time: 20:39
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INDONESIA(-1)	-0.002669	0.001174	-2.272953	0.0231
C	12.15061	5.028543	2.416328	0.0158

R-squared	0.002426	Mean dependent var	0.884180
Adjusted R-squared	0.001957	S.D. dependent var	39.08105
S.E. of regression	39.04280	Akaike info criterion	10.16813
Sum squared resid	3237699.	Schwarz criterion	10.17346
Log likelihood	-10806.73	Hannan-Quinn criter.	10.17008
F-statistic	5.166316	Durbin-Watson stat	1.927561
Prob(F-statistic)	0.023128		

b. PP Test

Null Hypothesis: INDONESIA has a unit root
Exogenous: Constant
Bandwidth: 23 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.262246	0.1846
Test critical values:	1% level	-3.433228	
	5% level	-2.862698	
	10% level	-2.567432	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1522.906
HAC corrected variance (Bartlett kernel)	1284.383

Phillips-Perron Test Equation
Dependent Variable: D(INDONESIA)
Method: Least Squares
Date: 01/06/16 Time: 20:40
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INDONESIA(-1)	-0.002669	0.001174	-2.272953	0.0231
C	12.15061	5.028543	2.416328	0.0158

R-squared	0.002426	Mean dependent var	0.884180
Adjusted R-squared	0.001957	S.D. dependent var	39.08105
S.E. of regression	39.04280	Akaike info criterion	10.16813
Sum squared resid	3237699.	Schwarz criterion	10.17346
Log likelihood	-10806.73	Hannan-Quinn criter.	10.17008
F-statistic	5.166316	Durbin-Watson stat	1.927561
Prob(F-statistic)	0.023128		

7. Japan

a. ADF Test

Null Hypothesis: JAPAN has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.437429	0.3598
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(JAPAN)
Method: Least Squares
Date: 01/06/16 Time: 20:41
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAPAN(-1)	-0.004359	0.001789	-2.437429	0.0149
C	29.18306	14.11716	2.067205	0.0388
@TREND(1/04/2010)	0.029371	0.011255	2.609658	0.0091

R-squared	0.003233	Mean dependent var	3.964398
Adjusted R-squared	0.002294	S.D. dependent var	148.3817
S.E. of regression	148.2114	Akaike info criterion	12.83657
Sum squared resid	46635142	Schwarz criterion	12.84456
Log likelihood	-13642.27	Hannan-Quinn criter.	12.83949
F-statistic	3.442735	Durbin-Watson stat	2.104994
Prob(F-statistic)	0.032156		

b. PP Test

Null Hypothesis: JAPAN has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.371382	0.3945
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	21935.63
HAC corrected variance (Bartlett kernel)	19817.85

Phillips-Perron Test Equation
Dependent Variable: D(JAPAN)
Method: Least Squares
Date: 01/06/16 Time: 20:41
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAPAN(-1)	-0.004359	0.001789	-2.437429	0.0149
C	29.18306	14.11716	2.067205	0.0388
@TREND(1/04/2010)	0.029371	0.011255	2.609658	0.0091

R-squared	0.003233	Mean dependent var	3.964398
Adjusted R-squared	0.002294	S.D. dependent var	148.3817
S.E. of regression	148.2114	Akaike info criterion	12.83657
Sum squared resid	46635142	Schwarz criterion	12.84456
Log likelihood	-13642.27	Hannan-Quinn criter.	12.83949
F-statistic	3.442735	Durbin-Watson stat	2.104994
Prob(F-statistic)	0.032156		

8. Korea

a. ADF Test

Null Hypothesis: KOREA has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.644314	0.0264
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(KOREA)
Method: Least Squares
Date: 01/06/16 Time: 20:42
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
KOREA(-1)	-0.012034	0.003302	-3.644314	0.0003
C	22.42157	6.087397	3.683277	0.0002
@TREND(1/04/2010)	0.001036	0.000657	1.576063	0.1152

R-squared	0.006282	Mean dependent var	0.156787
Adjusted R-squared	0.005346	S.D. dependent var	15.93263
S.E. of regression	15.88999	Akaike info criterion	8.370665
Sum squared resid	536039.7	Schwarz criterion	8.378655
Log likelihood	-8895.017	Hannan-Quinn criter.	8.373590
F-statistic	6.710330	Durbin-Watson stat	1.953701
Prob(F-statistic)	0.001244		

b. PP Test

Null Hypothesis: KOREA has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.617439	0.0285
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	252.1353
HAC corrected variance (Bartlett kernel)	248.1298

Phillips-Perron Test Equation
Dependent Variable: D(KOREA)
Method: Least Squares
Date: 01/06/16 Time: 20:45
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
KOREA(-1)	-0.012034	0.003302	-3.644314	0.0003
C	22.42157	6.087397	3.683277	0.0002
@TREND(1/04/2010)	0.001036	0.000657	1.576063	0.1152

R-squared	0.006282	Mean dependent var	0.156787
Adjusted R-squared	0.005346	S.D. dependent var	15.93263
S.E. of regression	15.88999	Akaike info criterion	8.370665
Sum squared resid	536039.7	Schwarz criterion	8.378655
Log likelihood	-8895.017	Hannan-Quinn criter.	8.373590
F-statistic	6.710330	Durbin-Watson stat	1.953701
Prob(F-statistic)	0.001244		

9. Taiwan

a. ADF Test

Null Hypothesis: TAIWAN has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.218484	0.1998
Test critical values:	1% level	-3.433230	
	5% level	-2.862698	
	10% level	-2.567433	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TAIWAN)
Method: Least Squares
Date: 01/06/16 Time: 20:49
Sample (adjusted): 1/06/2010 10/31/2015
Included observations: 2125 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TAIWAN(-1)	-0.004356	0.001963	-2.218484	0.0266
D(TAIWAN(-1))	0.067093	0.021660	3.097535	0.0020
C	36.24135	16.32937	2.219396	0.0266

R-squared	0.006516	Mean dependent var	0.161369
Adjusted R-squared	0.005580	S.D. dependent var	65.32263
S.E. of regression	65.14013	Akaike info criterion	11.19237
Sum squared resid	9004148.	Schwarz criterion	11.20036
Log likelihood	-11888.89	Hannan-Quinn criter.	11.19530
F-statistic	6.958993	Durbin-Watson stat	1.995407
Prob(F-statistic)	0.000972		

b. PP Test

Null Hypothesis: TAIWAN has a unit root
Exogenous: Constant
Bandwidth: 12 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.075877	0.2547
Test critical values:	1% level	-3.433228	
	5% level	-2.862698	
	10% level	-2.567432	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4254.408
HAC corrected variance (Bartlett kernel)	4255.314

Phillips-Perron Test Equation
Dependent Variable: D(TAIWAN)
Method: Least Squares
Date: 01/06/16 Time: 20:50
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TAIWAN(-1)	-0.004078	0.001965	-2.075654	0.0380
C	33.95509	16.34164	2.077827	0.0378

R-squared	0.002024	Mean dependent var	0.162963
Adjusted R-squared	0.001554	S.D. dependent var	65.30730
S.E. of regression	65.25652	Akaike info criterion	11.19547
Sum squared resid	9044870.	Schwarz criterion	11.20080
Log likelihood	-11898.78	Hannan-Quinn criter.	11.19742
F-statistic	4.308338	Durbin-Watson stat	1.866368
Prob(F-statistic)	0.038046		

10. GCC

a. ADF Test

Null Hypothesis: GCC has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.518904	0.8278
Test critical values:	1% level	-2.566051	
	5% level	-1.940973	
	10% level	-1.616599	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GCC)
Method: Least Squares
Date: 01/06/16 Time: 20:35
Sample (adjusted): 1/06/2010 10/31/2015
Included observations: 2125 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCC(-1)	5.92E-05	0.000114	0.518904	0.6039
D(GCC(-1))	0.121717	0.021539	5.651110	0.0000

R-squared	0.014688	Mean dependent var	0.617110
Adjusted R-squared	0.014224	S.D. dependent var	34.72983
S.E. of regression	34.48194	Akaike info criterion	9.919689
Sum squared resid	2524256.	Schwarz criterion	9.925018
Log likelihood	-10537.67	Hannan-Quinn criter.	9.921640
Durbin-Watson stat	2.002822		

b. PP Test

Null Hypothesis: GCC has a unit root
Exogenous: None
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.524659	0.8291
Test critical values:	1% level	-2.566050	
	5% level	-1.940973	
	10% level	-1.616599	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1205.765
HAC corrected variance (Bartlett kernel)	1587.569

Phillips-Perron Test Equation
Dependent Variable: D(GCC)
Method: Least Squares
Date: 01/06/16 Time: 20:36
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCC(-1)	7.36E-05	0.000115	0.640688	0.5218

R-squared	-0.000140	Mean dependent var	0.633491
Adjusted R-squared	-0.000140	S.D. dependent var	34.72987
S.E. of regression	34.73230	Akaike info criterion	9.933687
Sum squared resid	2563457.	Schwarz criterion	9.936351
Log likelihood	-10558.51	Hannan-Quinn criter.	9.934662
Durbin-Watson stat	1.756116		

11. Oil

a. ADF Test

Null Hypothesis: OIL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=25)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.325349	0.8812
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OIL)
Method: Least Squares
Date: 01/06/16 Time: 20:46
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OIL(-1)	-0.001639	0.001237	-1.325349	0.1852
C	0.249124	0.144908	1.719185	0.0857
@TREND(1/04/2010)	-0.000104	4.64E-05	-2.236838	0.0254

R-squared	0.002461	Mean dependent var	-0.014605
Adjusted R-squared	0.001521	S.D. dependent var	1.208422
S.E. of regression	1.207503	Akaike info criterion	3.216396
Sum squared resid	3095.468	Schwarz criterion	3.224386
Log likelihood	-3416.029	Hannan-Quinn criter.	3.219321
F-statistic	2.618767	Durbin-Watson stat	1.967932
Prob(F-statistic)	0.073128		

b. PP Test

Null Hypothesis: OIL has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.335747	0.8785
Test critical values:	1% level	-3.962363	
	5% level	-3.411923	
	10% level	-3.127861	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.456005
HAC corrected variance (Bartlett kernel)	1.479348

Phillips-Perron Test Equation
Dependent Variable: D(OIL)
Method: Least Squares
Date: 01/06/16 Time: 20:47
Sample (adjusted): 1/05/2010 10/31/2015
Included observations: 2126 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OIL(-1)	-0.001639	0.001237	-1.325349	0.1852
C	0.249124	0.144908	1.719185	0.0857
@TREND(1/04/2010)	-0.000104	4.64E-05	-2.236838	0.0254

R-squared	0.002461	Mean dependent var	-0.014605
Adjusted R-squared	0.001521	S.D. dependent var	1.208422
S.E. of regression	1.207503	Akaike info criterion	3.216396
Sum squared resid	3095.468	Schwarz criterion	3.224386
Log likelihood	-3416.029	Hannan-Quinn criter.	3.219321
F-statistic	2.618767	Durbin-Watson stat	1.967932
Prob(F-statistic)	0.073128		

B. Johansen Cointegration Test

1. China & France

Date: 01/08/16 Time: 13:33
Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA FRANCE
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

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

2. China & Germany

Date: 01/08/16 Time: 13:36
Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend

Series: CHINA GERMANY
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

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

3. China & NYSE

Date: 01/08/16 Time: 13:41
Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA NYSE
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

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

4. China & Japan

Date: 01/08/16 Time: 13:39
Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA JAPAN
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	NA	NA	NA	NA
At most 1	NA	NA	NA	NA

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

5. China & Taiwan

Date: 01/08/16 Time: 13:44
Sample (adjusted): 1/07/2010 10/31/2015
Included observations: 2124 after adjustments
Trend assumption: Linear deterministic trend
Series: CHINA TAIWAN
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	NA	NA	NA	NA
At most 1 *	NA	NA	NA	NA

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	NA	NA	NA	NA
At most 1 *	NA	NA	NA	NA

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values