HOT MONEY AND CHINA'S STOCK MARKET BUBBLE: EFFECTIVENESS OF CHINA GOVERNMENT'S POLICIES

BY

CHUA POH CHOO
KOH CHIN MIN
LEONG MEI HWEI
TEE LEEYING
YEOW SIAU HUAN

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

(4) The word count of this research report is 12572.

Name of Student:	Student ID:	Signature:
1. CHUA POH CHOO	09ABB02569	_____
2. KOH CHIN MIN	10ABB04620	_____
3. LEONG MEI HWEI	09ABB04982	_____
4. TEE LEEYING	09ABB02588	_____
5. YEOW SIAU HUAN	09ABB02589	_____

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LIST OF ABBREVIATIONS

RMB	Renminbi
GDP	Gross Domestic Product
USD	United States Dollar
US	United States
FDI	Foreign Direct Investment
ADF	Augmented Dickey-Fuller
PP	Philips-Perron
SSE	Shanghai Stock Exchange
AR	Autoregressive
MA	Moving Average
LSSE	Log of Shanghai Stock Exchange Composite Index
LHM	Log of Hot Money Inflows
LEX	Log of Exchange Rate of China Yuan to USD
LMS	Log of Money Supply
OLS	Ordinary Least Square
ML	Maximum Likelihood
MSE	Mean Square Error
MAE	Mean Absolute Error
RMSE	Root Mean Square Error
AIC	Akaike's Information Criterion
F_SSE	Forecasted Shanghai Stock Exchange Composite Index
HM	Hot Money

PREFACE

This research paper is submitted in partial fulfillment of the requirement for Bachelor of Business Administration (Hons) Banking and Finance.

This paper is conducted under the title of "Hot Money and China's Stock Market Bubble: Effectiveness of China Government's Policies". Massive flows of funds into China market from year 2003 to year 2008 have caused the effect of tremendous increment in China's stock price. Chinese government was concerning on the impact of the huge inflows of short term funds into its market and has implemented several policies to cool down the volume of short term funds. It hence triggered our interest to carry out research on whether the increased price in the stock market which is caused by hot money inflows will bring out bubbles in China stock market and the effectiveness of polices taken out by the Chinese government to reduce the impact of stock price bubble.

This paper provides an idea of the effect of hot money in the stock market in China and the effectiveness of polices taken out by the Chinese government to reduce the impact of stock price bubble to the readers.

ABSTRACT

This paper aims to find out whether increased stock price which is caused by hot money inflows will turn into stock market bubble in China from year 2003 to year 2008 and the effectiveness of policies taken out by Chinese government in reducing the impact of stock market bubble. The sample size of this paper is from year 1991 to year 2011 in quarterly basis for Equation 1 to test for the existence of bubbles in Shanghai Stock Exchange while quarterly data from year 1991 to year 2010 for Equation 2 to identify whether hot money caused stock market bubble in China in year 2008.

In order to forecast the value of SSE, Box-Jenkins method is being applied together with unit root test, ACF, PACF, MSE, RMSE, and MAE. While Zhang and Huang's Model later being used to test whether hot money inflows in China will cause bubbles in SSE in year 2008. Effectiveness of China government in implementing its policies to reduce the amount of inflow of short term funds in the stock market is then measure via the graph generated by Zhang and Huang's Model.

Box-Jenkins model has proven the presence of bubbles in SSE while Zhang and Huang's model affirmed that hot money inflows in China have caused bubbles in SSE. China government has also successfully implemented effective policies to reduce the amount of hot money in SSE in year 2008.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

In this era, stock market bubble has no longer became an unfamiliar term to us as there are many well-known historical events such as Dutch Tulipmania in year 1634, South Sea Bubble in year 1720 and Dot Com bubble in year 2000. Basically, bubble tends to burst when there is a crash after a long upward movement in the prices and the bursting will bring huge negative impacts to the economy (Chan, McQueen & Thorley, 1998). For example, South Sea Bubble in year 1720 (also called Enron of England) happened after Britain and Spain went into war. Though battle occurred, but investors did not stop from purchasing the company's stock but even more investors were coming in to this market. At this point of time, the South Sea Company was not generating much profit together with a poor management team. Speculators were purchasing at an overvalued price and when management realized this situation, they sold off all of their shares before the bubble popped. South Sea Bubble burst when panic selling took place after the information spread among investors. Consequently, the economy is badly affected by the busting of the bubble (Colombo, n.d.a). Figure 1.0.1 below shows that the South Sea Bubble started to crash at the mid-1720 after a significant upward movement in the prices at the beginning of the year 1720.

From the historical events, it triggers researchers' interest in finding out the factors behind the occurrence of stock market bubble. Lots of researches have been carried out in the past and factors like speculation and asymmetric information are the common results from those findings. However, hot money or so-called short term capital inflows have becoming a more prominent factor which is now commonly used as an important variable in recent research to find its relationship with stock market bubble.

Figure 1.0.1: The inflated South Sea Bubble

Source: Business Insider

Recent years, China has experienced massive flows of hot money and accounted approximately USD 1.75 trillion from 2003 until March 2008 (Martin & Morrison, 2008). According to Jian Chang, the economist at Barclays Capital in Hong Kong, massive inflow of hot money causes the Renminbi (RMB) to appreciate and interest rate to increase in China relatively to other countries (Flatt, 2011b). Other than this, the changes of China's exchange rate system in July 2005 to managed float system also fuelled the hot money inflows to China (Palash, 2005). These conditions have increased the Chinese Government's concern on the long term impact of short term capital inflows to China's stock market. Referring to the paper by Feng, Lin and Wang (n.d.), it is proven that the huge hot money inflows have significantly and vigorously increased the stock price in China.

These findings spark the curiosity to find out whether or not the increased stock prices(which is caused by hot money inflows) will then turn into a stock market bubble in the China. Since the hot money inflows has accounted to the highest point in 2008, it is interesting to examine the existence of stock market bubble in China in the year 2008 which is caused by the massive hot money inflows.

As mentioned earlier, the bursting of stock market bubble will bring huge negative impacts to the country. Generally, bursting of bubble will negatively affect the aggregate growth and distribution (Baker, n.d.). The wealth effect[1] has reduced the national savings and the mis-investment of investors caused wastage of millions, or even billion dollars in the stock market (Gomme, 2005). In addition, the misperception on real wage caused by the inflation will also indirectly cause to the unemployment problem in a country.

More specifically, the bursting of Dot Com Bubble in 2001 had caused 50% of IT-related companies to liquidate (The Dot-Com Bubble and its Aftermath, 2007). Thousands of IT experts were laid off and found it competitive to enter the job market. Moreover, The United States government's tax revenues on capital gain also reduced from $120 billion in 2000 to $51 billion in 2003 (Baker, 2003).

It is noted that bursting of stock market bubble will not benefit the economy. Thus, if there were stock market bubble in China in year 2008, China Government may carry out necessary policies to reduce the impact of the bubble and prevent it from bursting. However, it is not necessary that every policy taken out by the government will show preferable results. For example, government who wish to recover from nominal shock may tend to boost the spending to stimulate the Gross Domestic Procuct (GDP) but this is normally ineffective in the long run as it will create inflation issue instead of boosting the GDP in the country (Sumner, 2011). Thus, it is interesting to examine the effectiveness of Chines Government policies in reducing the stock market bubble.

1.1 Research background

In the recent years, the number of study and research done by previous researchers on stock market bubbles has significantly increased. According to Tirole (1985), in order

[1] Investors, who are holding stocks as investments, getting poorer and poorer when the value of the stocks fell after the bubble burst.

to create bubble, three (3) conditions must be fulfilled, which includes durability, scarcity and common beliefs. On the other hand, Tirole (1985) and Weil (1987) stressed that bubble will never exist in an efficient country and this supported by Ventura (2012) that bubble only appears and expands in countries with low productivity.

Generally, the stock market bubbles can be divided into two (2) types, which are rational and irrational bubble. Rational bubble is more likely to happen with strong historical examples such as the major bubbles: South Sea Bubble in 1720 and Dot com bubble in 2000 are categorized as rational (Hong, Scheinkman & Xiong, 2008; Chan et al., 1998).

Perhaps, it has been a great interest for researchers to identify the factors which could cause the occurrence of stock market bubbles. Hot money or so-called short term capital inflows have becoming a more prominent factor which is now commonly used as an important variable in recent research to find its relationship with stock market bubble.

According to Rzepkowski and Chevallier (2004); Tung and Baker (2004); Prasad and Wei (2005), hot money is equal to non-foreign direct investment (non-FDI) capital inflows. And, it is sensitive towards the increment of interest rate (Zhang & Huang, 2011).

Decrease in interest rate helps to alleviate hot money inflow but it triggered asset bubble as real interest rate reaches negative[2]. This is agreed by Kaliva and Koskinen (2008) that inflation reduces the probability of bubbles. It signifies that bubbles tend to be coupled with low inflation periods. This was due to the different momentum in the movement. Inflation moved in a faster pace and when it reaches the highest point in the cycle, it starts to reduce. At the same time, the bubble, which is at a lower

[2] Real interest rate = Nominal interest rate – inflation.

speed, is in the expansion process. With this, Kaliva and Koskinen (2008) strongly support that bubble used to couple with low inflation period.

Consistent with Shiller (1996) finding which states that low inflation is allied with positive economic expectations. Guo and Huang (2009) mentioned that, by the end of 2007 US Fed fund rate reached 2% while in China one year rate stated at 4.14% which was the benchmark for People's Bank of China (PBC). Since the manage float exchange rate was adopted by China from July 2005, RMB has appreciated about 22% against USD. Huang and Guo (2007) believed that, RMB will stand up a strong position against USD. As a result, the widening of the interest gap and the strong position of RMB against USD will create strong inflows of hot money into China.

In the paper of Gao, Li and Gu (2012); Martin and Morrison (2008), hot money may be a factor that caused stock market bubble. Therefore, the occurrence outflow of hot money is believed to cause bubble bursts and destabilizing the financial market (Guo & Huang 2009). Sarno and Taylor (1999) showed us that a sudden capital outflow was a major factor in the 1997 East Asian Financial Crisis. Domowitz, Glen and Madhavan (1997) explained that when there is outflow, all players are struggling to exit the market.

As stated by Zhang and Huang (2011), hot money inflows increase tremendously right after the global financial crisis. Bouvatier (2010) mentioned that the expectation on Renminbi (RMB) exchange rate and differential of interest rate in US and China are two major factors explaining the inflow of hot money. The excessive hot money has led to the accumulation of international reserve in China which in turns providing excess liquidity to banking sector, expanding credit excessively and thus, promoting high inflation.

Even Chinese Government had tried to control the flow by imposing additional regulations, but people still manage to find alternative ways to inject hot money into China. Zhang and Huang (2011) again said that, China has made adjustment for

capital account by providing a legal way for hot money inflows yet, most part of the short term capital flows into China via illegal channels such as mis-invoice in trade transaction. Martin and Morrison (2008) commented that the 11% of hot money in China is came from under-value of imports and 10% from over-value exports, abnormal short term borrowing, capital inclusion and abjuration of FDI's profit repatriation, individual remittance and illegal transfer.

The ineffective regulations on hot money inflows in China caused the aggregate hot money inflow, reaching a high point which accounted about USD 1.75 trillion from 2003 until March 2008 (Martin & Morrison, 2008).

The continuous flow of hot money flows into China has raised the concern of Chinese Government towards property and stock market bubble in China (Safe underscores stance on hot money, 2011). And this triggers the interest to find out how likely excessive hot money inflow will cause bubble in China's stock market.

1.2 Problem Statement

Recent years, China has experienced huge inflows of hot money and accounted approximately USD 1.75 trillion from 2003 until March 2008 (Martin & Morrison, 2008). The accelerated inflows of hot money to stock market have raised the concern of this paper on the impact of hot money to the China stock market in the year 2008.

Historical cases like Dot Com Bubble in year 2000 has brought lessons that bursting of stock market bubble bring lots of negative impacts to the society and economy in a country. As mentioned earlier, the bursting of bubble has caused serious unemployment as well as economic slowdown in the western counties. For instance, Webvan, an online grocery store which found in 1999 was worth $1.2billion that time (German, n.d.). However, the crush of the bubble in 2000 put Webvan into liquidation and caused 2,000 people to lose their jobs. The negative impact of bubble burst to the

economy becoming more obvious when there are more and more companies came to liquidation at the same time, including the Boo.com (liquidate in May 2000), eToys.com (liquidate in March 2001) and Flooz.com (liquidate in August 2001) (Weber, 2011).

Thus, if there were stock market bubble in China in the year 2008 which is caused by the hot money inflows, it is believed that Chinese Government will try their best to slow down or reduce the impacts of bubbles by carrying out different types of policies. As mentioned earlier, it is not necessary that all policies taken out by government will show preferable results. Therefore, it is interesting to find out the effectiveness of policies taken out by China Government in reducing the stock market bubble.

1.3 Research Objectives

1.3.1 General Objectives

Generally, there are two main objectives in this paper. First objective is to find out the existence of stock market bubble in China while the second objective is to examine the effectiveness of government policies in reducing the bubble size.

1.3.2 Specific Objectives

The two major objectives can be subdivided as follows:

- To identify the hot money in China stock market.
- To identify the existence of stock market bubble in China in year 2008 which is caused by the hot money.

- To examine the effectiveness of policies taken out by China Government to reduce the impact of bubble in China stock market and prevent it from bursting.

1.4 Research Questions

The purpose of this paper is to answer the following questions:

1. Is there hot money in China stock market?
2. Is there stock market bubble in China in the year 2008, which is caused by hot money?
3. Do China Government successfully perform their job to reduce the bubble occurs in the stock market?

1.5 Significance of the Study

This study is significant and important as it comes to many interests to identify whether hot money will cause stock market bubble to occur in China and this has also been a hot issue being discussed in China concurrently. Past studies only showed that hot money flowed into China and increased the stock prices without proven that the hot money will fuel stock market bubble in China in year 2008. Thus, the findings of this paper provide better insight on the true impact of hot money in the stock market. Hot money is not merely increase the stock prices, but also fuels stock market bubble.

In addition, this paper creates more awareness on the inflow of short term capital into a country. Hot money can be beneficial in providing liquidity, but, excessive liquidity will create its drawbacks. Hence, this study may alert policy makers from other

countries to prevent such event from happening in their countries by being more cautious over the amount of hot money inflows into their countries.

Lastly, the findings of this paper on the effectiveness of government policies in reducing the bubble in China stock market help to boost the confidence level of the Chinese and investors towards their government. As mentioned earlier, it is not necessary that all policies taken out will bring preferable result. Thus, if the policies taken out by China Government are effective in reducing the bubble, it shows that Government is not only providing the lip service, but walks the talk. The locals can trust their government in future for the government planning and action.

1.6 Chapter Layout

This paper is organized as follows. Chapter 1 is the introduction and comprehensive view on the research areas. Chapter 2 further explains the research areas with literature review. Chapter 3 focuses on data and methodology. Chapter 4 presents and discusses on the major findings. Chapter 5 summarizes and concludes the findings and discusses on the implications and limitations.

1.7 Conclusion

In short, this paper focuses on identifying the effects of excessive short term capital flow (hot money) in China on the stock market. It aims to investigate whether accelerated hot money in China will cause stock market bubble in China in the year 2008. If there were stock market bubble, it is also interesting to examine the effectiveness of government policies in reducing the impact of bubble. A more comprehensive review on the major themes will be presented in the next chapter.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In the last decades, many findings were done on the factors behind the occurrence of stock market bubble. Speculation, investor behaviors and asymmetric information were the common factors found in the papers. However, only few researchers pay close attention to the effects of hot money on the bubble.

In this paper, the main concern is to find out the effects of excessive hot money in China's stock market bubble in year 2008. Previous studies done by other researchers on the topic relevant to the main theme will be reviewed and evaluate in this chapter. Comprehensive review of existing papers on important variables, major findings and theoretical frameworks will also been presented in this chapter.

This chapter will be structured as follows. The next section presents the review of literature on the stock market bubble done by various researchers. It is followed by the factors behind occurrence of stock market bubble in Section 2.2 and continued with the hot money issue in Section 2.3. Here, it will present a clearer picture on the relationship between hot money and stock market bubble and how it relates to China's case. It is then end with a small conclusion on the summary of Chapter 2 in Section 2.4.

2.1 The Stock Market Bubble

Bubble occurred when asset is overvalued form its fundamental price. According to Steimetz (2008), stock market bubble comes into presence in the early 1600s in Europe. The first stock market bubble in the world is the Dutch Tulipmania in year

1634, followed by the South Sea bubble in year 1720, and then it emerged into internet bubble when trading of electronic stocks becoming popular in 2000. The Dot Com bubble in 2000 is the latest event in the historical timeline of bubble bursting.

According to Market Bubble (n.d.), there are 4 phases for a bubble, including the birth, sustenance, bursting of bubble and the aftermath. Some bubble may stop at stage 2 while some may pass through the whole cycle. During phase 1, the bubble births when there is news that someone makes a good profit in the stock market. Other investors will follow the trend by buying shares with the hope that they can sell them at a higher price for capital gain. During phase 2, the bubble started to grow bigger and bigger. And when it comes to phase 3, the bubble burst when there is a crash after a long upward movement in the prices. Eventually when it comes to the last phase, investors who experience huge losses will blame the brokers and banks for misleading them in the market.

Generally, stock market bubble can be divided into two basic types, the rational and irrational bubble. The details of both bubbles will be discussed in following section.

2.1.1 The rational bubble

According to Chan, McQueen and Thorley (1998), the rational bubble is defined as deviation of stock price from its fundamental value without taking irrational investors into account. Rational investors persist in buying stocks even it is over-valued as they believe that they can sell it at higher prices when the stock prices continuously deviate further from their fundamental values (Harrison & Kerps, 1978; Chan et al., 1998).

Rational bubble is further divided into speculative rational bubble, stochastic bubble, rational price bubble and many more based on the major cause behind the event. The main idea behind the rational bubble is that the investors are

still willing to purchase stock even if the price is higher than its fundamental value as long as they believe they can enjoy price appreciation by selling it at a price higher than the purchase price to other investors. In this paper, it focuses on rational bubble as significant historical examples such as South Sea Bubble and Dot Com bubble are considered rational (Harrison & Kerps, 1978; Chan, McQueen & Thorley, 1998).

In the paper of "Are there rational speculative bubbles in Asian stock markets", Chan, et al. (1998) who used "Duration Dependence & Conditional Skewness Test" and "Explosiveness Test" have proven that there was no stock market bubble in Asia. The research involved six Asian countries (*Hong Kong, Japan, South Korea, Malaysia, Thailand, and Taiwan*) and used data from year 1975 till 1994. Despite that this paper evidently proved that there was no bubble in stock market, it did not stop this paper from investigating stock market bubble in China by having different viewpoints in investigating the bubble outcome. This paper focuses on massive hot money flow in China as a foundation to evaluate the stock market bubble. The details on China case will be specified in section 2.6.

2.1.2 The irrational bubble

The feature of irrational bubble is the opposite of rational bubble. Irrational bubble occurred when the investors continue to buy the shares even though they knew that they cannot resell to realize the capital gain (Moinas & Pouget, 2009; Steimetz, 2008). The irrational behavior of the investors has caused to the occurrence of irrational bubble.

According to Moinas and Pouget (2012), irrational bubble occurred when backward induction took place. When there is price cap in the stock market, rational investors will refuse to be the last or second last traders in the market

as he cannot resell the stock to other traders when the stock price reached its cap. This creates the irrational bubble in the market. By working backward through adjusting the cap level, it helps to test on the rationality of investors in the stock market. In contrast, if the cap level is infinity and no one is sure to be the last trader in the market, then, rational bubble occurred.

The irrational bubble is less likely to happened (Moinas & Pouget, 2009) and thus, this paper will focus on the rational bubble instead of the irrational.

2.2 Factors Behind the Occurrence of Stock Market Bubble

Previous studies have shown that there were many factors causing the occurrence of stock market bubble. In Girdzijauskas and Streimikiene (2009) understanding, stock market bubble can be applied in financial market where there is an increase in the stock price in a particular industry followed by a drastic fall or crashed. Bubble scenario comes with 5 acts known as "displacement, take-off, exuberance, critical stage and crash". And according to Kindleberger and Aliber (2000), the first two stages, "displacement" and "take off", occur during share split.

According to Hong, Scheinkman and Xiong (2008), investors' different opinion on stock prices and short sell constrains are sufficient to create bubble. And the effort to correct the mispricing is ineffective once the bubble begins. This is supported by Delong, Shleifer, Summers and Waldmann (1990) that arbitrageurs have lost their ability to correct the mispricing when there is a short sell constraint in the market. It is difficult to balance back the mispricing when the price is driven too high and caused a lost in liquidity (Lamont & Thaler, 2003). The risk aversion behavior also stopped them from correcting the price to the right value. However, Abreu and Brunnermeier (2003) argued that this is not true as all arbitrageurs can collectively bring the stock price back to its fundamental value by combining the aggregate

resources that they have. It is not easy to group all the arbitragers together and thus there is a possibility bubble might happen due to the severe mispricing.

In addition, asymmetric information between the traders does cause stock market bubble (Allen, Morris & Postlewaite, 1993; Hong, Scheinkman & Xiong, 2008). Private information regarding firms' performance is not available to everyone and the belief of other agents is not a common knowledge in the market. As mentioned in the paper of Weil (1987), investors are only confident with their own belief. If they believed that stock will become worthless tomorrow, they will sell it as quickly as possible today and this creates stochastic bubble. On the other hand, if investors believed that they can enjoy price appreciation in stock investment, they will definitely buy high and then sell higher to others. All these reactions will reflect on the stock price and thus, Harrison and Kerps (1978) stressed that asymmetric information is not strong enough to create bubble in stock market, but the investors' behaviors, belief and actions do. As long as traders and investors believe that they can earn price appreciation before the bubble burst, they will neglect the true fundamental value of the investment which they hold on hand today (Allen, Morris & Postlewaite, 1993). However, Tirole (1982) on the other hand, mathematically proved that a rational trader will never enter to the market if he is aware of the existence of bubble in the market. This is because they are clueless on when will the bubble burst and other traders who realized their gains earlier will leave a negative-sum in the market. Hence, it is not worthwhile to enter into it anymore.

Besides, bubble also coupled with low inflation period as mentioned in Kaliva and Koskinen (2008). This is also supported with Blythe (2010) by an example of considering 18 stock market boom episodes that happened in the past 2 centuries in United States, inflation in each boom is below its average value outside of boom periods without exception. A low inflation rate triggers fall in interest rate during the period and hence boost the increment in stock prices during the boom. This is in line with research done by Shiller (1996) whereby low inflation is linked to positive economic expectation.

While in US case, classic liberal economists believed that central bank monetary policy is a prime cause of asset bubbles. This is supported by Fontinelle (2011) that when the central bank decides to print money, interest rate will fall below their natural rate which in turns leads the investors to invest through another channel thus fueling a bubble that will eventually burst. What is easy money? Easy money evidently caused bubbles and bursting of it leads to financial crisis. From McCormack (2012) it is noticed that excessive of easy money has cause Japanese financial crisis to happen in 1990. Easy money and open capital market caused the Asian financial crisis in 1997 and dot com bubble. The real estate bubble in Spain and US was also resulted from excessive easy money.

Furthermore, moral hazard problem behind "too-big-to-fail" theory also contributes to the occurrence of bubble (Sarno & Taylor, 1999). Financial institution can raise fund at a much lower rate than lending rate by involving in risky investment activities, such as stock speculating activity. As a result, a strong assets bubble will generate once the asset prices of the risky investment is push up and this makes the financial intermediaries to be sounder than they were which was echoed by Corsetti, Pesenti and Roubini (1998) as well as Krugman (1998). At the same time, firms grab the opportunity to issue shares at a price higher than its fundamental value to reduce their cost of capital (Gilchrist, Himmelberg & Huberman, 2005). Hence, when the bubble burst, assets prices starts to collapse and financial crisis take place. The unhealthy concept of putting failure risks as the least consideration will contribute directly to the occurrence of bubble in stock market.

In short, there are many factors behind the occurrence of stock market bubble. The hot money, which acts as the prominent factor in recent research to find its relationship with stock market bubble, will be discussed further in following section.

2.3 Hot money

Chari and Kehoe (2003) defined hot money as the short term funds or capitals to earn profit from the differences in interest rate and favorable exchange rate shifts where the funds or capitals flows from one country to another country. According to Flatt (2011a), hot money is the residual sum of total capital flow into a country after subtracting out long-term money flow in that particular country.

Hot money is said to be originated from developed, capital rich countries with lower interest rate and GDP growth rate compared to those countries with emerging market economies (Olanrewaju, 2013). Most of the countries experiencing hot money in flow were mainly caused by interest rates and exchange rates (Arias, 1994; Shiller, 1996; Carlson & Hernandez, 2002; Bouvatier, 2010).

A country receiving inflow of hot money can experience positive growth and benefits to the economic development (Is Hot Money a Recommended Means of Banking, n.d.; Neumann, Penl & Tanku, 2009). But massive flow of hot money brings negative impacts to a country such as costly government interventions, inflations and property bubbles, and disruption in macroeconomic policies (Wang, 2010).

2.3.1 Hot money in China

According to Martin and Morrison (2008), the aggregate hot money inflows to China have reached a high point which accounted approximately USD 1.75 trillion from 2003 until March 2008. This statistics has raised many concerns on the reasons behind strong hot money inflow into the developing country, China.

According to Martin and Morrison (2008); Bouvatier (2010), interest rate differential and exchange rate expectation are the two main factors that

attracted massive flow of hot money into China. Interest rate in China and US moves in an opposite direction. For instance, US's interest rate has been lowered nine (9) times to the current low of 2.00% in 2007 while China, on the other hand, has increased its interest rate from 2.52% to 4.14%. This creates favorable condition to invest in China and thus create incentive to move deposit from US to China for higher return. Tung and Baker (2004) supported this statement in their paper and state that higher interest rate helps to attract hot money and ultimately helps to promote macroeconomics stability. However, massive flow of hot money brings negative impacts to China too. To concern, hot money may cause stock market bubble in China, and this will be discussed in further details in other chapter.

Besides that, expectation that Renminbi (RMB) will strengthen over USD also cause hot money inflows to China (Bouvatier, 2010). In July 2005, the Chinese Government changed the fixed exchange rate policy to manage float policy, which allowed the value of RMB to fluctuate within a specific range on a daily basis. According to Morrison and Labonate (2009), the RMB has appreciated in value by 21.6% throughout the year 2008. This provides additional attraction for hot money inflow into China. This is why China has accounted about USD 1.75 trillion of hot money in March 2008 (Martin & Morrison, 2008).

Since the concern is on hot money inflows, there must be ways to measure the short term capital flow. Few measures have been used in previous studies which include residual measure, hot money measure, and trade mis-invoicing measure. Zhang and Huang (2011) modified the residual method refined by China's State Administration of Foreign Exchange (CSAFE) which defines hot money as below:

Hot Money = Change of the position for foreign exchange purchase – (Trade surplus + net inflow of FDI + net income in the current account + funds financed from foreign stock market)

Method or equation above shows that hot money is insignificant to the asset price. It is unrelated as China took many methods to sterilize the external surplus and keep the money aggregate in controlled growth rates thereby stabilizing the financial market liquidity.

However, this contradicts with the research done by Guo and Huang (2009). They believed that stock price movements are highly correlated with the high liquidity of hot money. As a result, when an outflow of hot money happens it will cause the bubbles to burst and destabilizing the financial market. Domowitz, Glen and Madhavan (1997) supported this statement by providing evidence in their paper. By using Generalized Least Square, they have proven that the main factor contributed to the 1994 Mexican financial turmoil was hot money as hot money significantly caused the risen in the stock price in Mexico. Hot money is build up continuously over time, and when huge outflow happens, the entire player in the market wants to be the first to exit the market (Domowitz et al., 1997). Thus, when this happen it will trigger crisis as what happened in 1997 Asian Financial Crisis as there was a reversal of capital flow. Due to features of hot money which is short term in nature and highly liquid in the market, stock market bubbles might be created similarly to Asian Financial Crisis (Guo & Huang, 2009).

Since China is facing excessive hot money inflow as mentioned earlier, it will be an interesting study of finding out whether hot money will cause stock market bubble in China. In this paper, it focuses on Shanghai Stock Index for stock market bubble measuring. According to Guo and Huang (2009), Shanghai Stock Index increased from around 1,100 points until 6000 points in just 2 year times from year 2005 until 2007 which was approximately 483% gained. Yet, it started to drop until 2000 points at beginning of the year 2008 (*see Figure 2.3.1*). Hence, it is believed that hot money was behind these sudden movements in Shanghai Stock Index. By using generalized impulse response function, Guo and Huang (2009) showed that when there was

expansionary hot money shock, the stock price increased by 0.5% in the second month. These findings are in favor with the researches done by Martin and Morrison (2008) that speculative capital inflows will increase the share prices. In addition, the research done by Sarno and Taylor (2003) suggested that strong capital inflows create an asset price bubble in Latin America, which is consistent with World Bank report. It is interesting to find out whether or not China will experience the same thing as Latin America.

Figure 2.3.1: Trend of Shanghai Stock Exchange Composite Index (2005-2009)

Source: Yahoo Finance

In the year 2002, China had implemented qualified foreign institutional investors (QFIIs) programs that allowed the qualified foreign institutional investors to invest in China stock market (Feng, Lin & Wang, 2011). As a result, short-term capital started to flow in dramatically and at the same time causes the stock price to continue rising. By taking China as study case, Feng, Lin and Wang (2011) proved that the massive hot money inflows have significantly and persistently increased the stock price in China. This finding provides more support on this paper to find out whether hot money will fuel bubble in China's stock market.

In the research done by China: Hot Money Inflows a Burgeoning Problem (2009), it is expected that hot money will flow continuously after the revaluation of Renminbi (RMB) in 2005. Flatt (2011a); China: Risk Of Capital Flight Replaces Hot Money Concerns (2009) agreed that the country will face difficulty in controlling the large sums of foreign investment entering into China after the revaluation. Investors are eagerly waiting for this opportunity to take advantage of this strong currency and equity market, bringing fear towards China's government that speculative bubbles might arise (Jogi & Yuncken, 2010). Besides speculative bubbles, too large inflow of capital can cause downside risk like overheating and high inflation, reducing the competitiveness of export due to the appreciation of currencies (Combating "hot money", 2011).

However manager of the Ivy Pacific Opportunities Fund/A (IPOAX), believes the long-term impact of the Reminbi's revaluation will bring benefits to China, Asian nations and U.S. investors (Palash, 2005). It is supported by co-manager of the U.S. Global China Region Opportunities Fund (USCOX) as that thinks this revaluation will not hurt Chinese exports due to China's labor cost advantage. China's government had even tried to take some preventive measure to control the massive in flow of hot money. One of them was allowing the exporters to hold onto their foreign currency rather them remit it back (Flatt, 2011b). Since there are arguments on the impacts of excessive hot money inflows to the country, it leaves space for us to find out how far the massive flow of hot money will affect China's stock market.

Since past studies only proven that hot money has increased stock price and there is no evidence on the stock market bubble, it is interesting to find out whether or not the hot money will cause stock market bubble in China in year 2008 in this paper.

2.4 Conclusion

In short, this paper concerns on whether or not the hot money will cause stock market bubble in China in year 2008.Previous studies do provide evidences that hot money will increase stock prices. Therefore, this brings important information for us to carry on with this paper by studying the stock market bubble on the China's case. The methodology and data used will be further discussed in the next chapter.

CHAPTER 3: METHODOLOGY

3.0 Introduction

The purpose of this paper is to conduct an explanatory study or analytical study to develop and evaluate causal theories. This paper identifies if there were any causal links between the dependent variable (Shanghai Stock Index) and independent variable (Hot Money).

As this paper is concerning on hot money and stock market which both uses financial data, quantitative research is being carried out to identify problem based on testing a theory, measuring with numbers, and analyzing using statistical techniques and as well as, to determine whether the predictive generalizations of a theory holds true (Creswell, 1994). This paper looks into the existence of stock market bubble in China which is caused by hot money and also the effectiveness of policies taken out by China Government to reduce the impact of bubble in the stock market.

To ensure stationary of the data, ADF & PP have been employed and to avoid spurious regression. Besides, to test whether the bubble exists in China stock market or not, Box & Jenkins method is being run. While to increase the robustness of the result, Zhang and Huang's model is used to examine the effect of hot money towards Shanghai Stock index.

3.1 Target population

The title of this paper is "Hot Money and China's Stock Market Bubble: Effectiveness of China Government's Policies". As the name suggested, the target

population of this paper is China and Shanghai Stock Exchange (SSE) is choose to be the dependent variable.

3.2 Sampling Size

The sampling size is basically the total number of observations involved in a research. The estimation of unknown parameters will be more precise when the sampling size is big enough. In this paper, two equations are involved. Equation 1 is using quarterly data from year 1991 to 2011 while Equation 2 is using quarterly data from year 1991 to 2010, instead of 2011 due to the limitation of secondary data.

3.3 Secondary Data

To answer the research questions, secondary data is being used as the required historical data and information can easily be obtained from Datastream. Besides, the breadth of data available in secondary data was also one of the reasons it is being used (Crossman, n.d.). The secondary data used are change of position for foreign exchange purchase in USD hundred millions from People's Bank of China (PBC), trade surplus data (export -import in China) where International Monetary Fund was the source of both data in USD millions. Apart from that, the net inflow of FDI data was provided by World Bank GDF in USD millions. On the others hand, data of net income in current account in USD millions was provided by Oxford Economy. While for the dependent variable, the data of Shanghai Stock Index was extract from National Bureau of Statistic China.

3.4 Data Processing

3.4.1 Unit Root Test

For the past several years, unit root test became more popular, widely used for smaller sample size data and more sensitive to lag collection. It is important to examine the presence of unit root in the time series data (non-stationary). Non stationary time series does not have long run equilibrium mean value since the value of each observation deviates far from its mean value. Besides, variance depends greatly upon time as it causes it to become large over time. While stationary time series means that the time series data must exhibit constant variance, constant mean and constant covariance over the time (Kelly, 2012).

However, Introduction to Stationary and Non-Stationary Processes (2007) mentioned that, most of the economic and financial time series data such as Gross Domestic Product (GDP), exchange rate, inflation and others are non-stationary. It also stated that, if the data is non-stationary, it will give us unreliable and spurious outcome and provide poor forecasting. Hence to make the data stationary, the independent variables have to be differentiated at d times. If the independent variable prohibit I(2) in which it can be written as $Y_t \sim I(2)$, then it has to differentiate 2 times in order to make it stationary and thus become I(0). As a result, Augmented Dickey-Fuller (ADF) test is used to determine the stationary characteristic of the data. In addition, Philips-Perron (PP) test will be used to look for the stationary characteristic of the data.

3.4.1.1 Augmented Dickey Fuller (ADF) test

ADF test is used to check whether the time series data is unit root/non stationary. Dickey and Fuller (1979) mentioned that ADF test is the version of

Dickey Fuller that is used for more complicated and larger set of time series models. Yeow, Tan, Lim and Yeo (2008) stated that, ADF statistic used in the test is a negative number. As a result, the smaller the number, the stronger it is to reject the null hypothesis which states that there is unit root in the time series data. The hypothesis of ADF test as follow:-

H_0 : There is a unit root (Non-Stationary)

H_1 : There is no unit root (Stationary)

According to Gujarati and Porter (2009), it is a need to include the lagged values of the dependent variable AY_t and the sum of the lagged changed of variables. Thus, the ADF test includes a constant and trend and, forms the following equation:-

$$\Delta Y_t = \beta_1 + \beta_2 t + Y_{t+} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t=1} + \varepsilon_t$$

Where Y_t is the independent variable, Δ is the differencing operator, t is the time trend while ε_t is the white noise residual of zero mean. $\beta_1, \beta_2,$ s the wh$\alpha_i$is the parameter to be estimated. The number of lagged term (m) to be included is determined through Akaike or Schwarz information criterion. This is to ensure that the unbiased estimator for the coefficient of lagged dependent variable ΔY_{t-1}, δ can be obtained.

3.4.1.2 Phillips-Perron (PP) test

There is an alternative method of testing unit root in time series as proposed by Phillips and Perron (1988). Phillips and Perron (1988) modified the test statistic so that in the presence of serially-correlated errors, the needs of additional lag of the dependent variable are not required. Unlike ADF test that

introduce the lagged dependent variables as regressors, PP test modifies Dickey Fuller test statistic by correcting the heteroscedasticity and autocorrelation in the error term, ε_t non-parametrically. Mahadeva and Robinson (2004) mentioned that the advantage of this test can be used in wide set of problems however it relies on asymptotic theory in which this test will perform better in large sample size. When using PP test, it is needed to decide whether to include a constant, a constant and linear time trend or neither one of them. Apart from that, it is also needed to choose the method of estimating by using kernel-based sum of covariance or autoregressive spectral density estimation. As a result, it will then test on the stationary characteristic of the data using ADF and PP test to get more accurate result and to check the consistency of the results for both of the tests.

3.4.2 ACF

The autocorrelation of series Y at lag m is estimated by the following equation:

$$\tau_k = \frac{\sum_{t=k+1}^{T}(Y_t - \bar{Y})(Y_{t-m} - \bar{Y})}{\sum_{t=1}^{T}(Y_t - \bar{Y})^2}$$

Where $\bar{Y}$ is the sample mean of the series Y.

This is the correlation coefficient for values of the series at m period apart. If τ_1 has a non-zero value, it means that the series is first order serially correlated. On the other hand if τ_k dies off more or less with increasing lag m. Thus, there is a sign where the series follow low order of autoregressive (AR) process. While if τ_k drops to zero after a few lag of m period, the series is following a low order of moving average (MA) process.

3.4.3 PACF

The partial autocorrelation at lag m is the regression coefficient on Y_{t-m} when the Y_t is regressed on a constant ($Y_{t-1}, Y_{t-2}, \ldots\ldots\ldots, Y_{t-m}$). This is partial correlation since it measures the correlation of Y that are m periods apart after removing the correlation from the intervening lag. If the pattern of autocorrelation is the one that can captured by and autoregression of order less than m periods, hence the partial autocorrelation at lag m will be closed to zero. The partial autocorrelation of a pure autoregressive at order p, AR (p) cuts off at lag p while pure moving average process declines gradually to zero.

3.5 ARIMA Model

Autoregressive Integrated Moving Average (ARIMA) model is generalizations of the simple AR model in which there are three tools for modeling the serial correlation of the disturbance. The first tool is autoregressive (AR) term. Autoregressive model that has an order of p, AR (p) give the following form:-

$$\mu_t = \rho_1\mu_{t-1} + \rho_2\mu_{t-2} + \ldots\ldots + \rho_p\mu_{t-p} + \varepsilon_t$$

The autoregressive model might be following first order term, AR (1) or even a higher order of AR term. Each of the AR terms corresponds to the use of lagged value of residual in the forecasting equation for unconditional residual.

Second tool used is the integration order term, I. Each of the integrations corresponds to different series being forecast. If the integration follow first order, I (1) the forecasting model is designed by the first difference of the original series. In addition, if there were second order integrated component, I (2) and correspond to using second differences and so on.

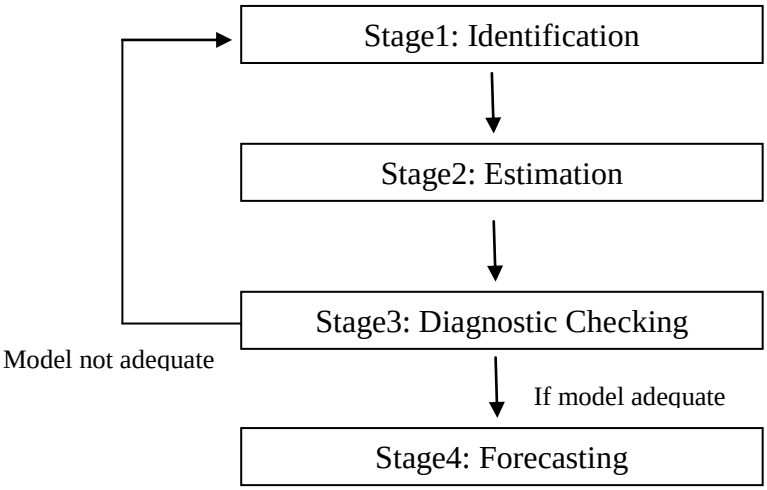
The last tool is Moving Average (MA) term. To improve the current forecast of moving average model, the lagged values of the forecast error was introduced to the model. First order moving average model uses the most recent forecast error while second order uses the forecast error two periods from the most recent forecast error. A moving average model that has an order of q, MA (q) gives the following form:-

$$\mu_t = \varepsilon_t + \theta_1\varepsilon_{t-1} + \theta_2\varepsilon_{t-2} + \ldots\ldots + \theta_q\varepsilon_{t-q}$$

3.5.1 Box-Jenkins

In this paper, Box-Jenkins method was used to determine the presence of bubbles in China stock market in year 2008. There are few other methods to test on the existence of bubble, including Billinearity test, co-integration test and logistic model. However, these methods are more focus on testing the bubble burst. Since bursting of bubble is not the major concern in this paper, Box-Jenkins method is chosen as it allows major objective to be met at a simpler and easier way.

Box-Jenkins methodology as proposed by Box and Jenkins (1976) consists of four stages which start with identification to find out the appropriate values p, d and q for the model. The second stage is estimation after the values of p, d and q has been found, the parameters of the model are estimated. Stage 3 is the diagnostic checking to check for heteroscedasticity and autocorrelation, if there were heteroscedasticity or autocorrelation it has to start all over from stages 1. If the model fit well, then proceed to stage 4 forecasting by using the past and current data available.



The equation for the ARIMA model as follow:-

$$LSSE_t = c + \sum_{i=1}^{n} \beta LSSE_{t-i} + \sum_{i=1}^{n} \beta \mu_{t-i} + v_t \qquad (Equation\ 1)$$

Where LSSE = Log of Shanghai Stock Exchange

μ_t =residual of the model

v_t = error term

Stage 1, identification involves in determining the order of the ARIMA model (p, d, and q). This is essential so that the model is appropriate to capture the dynamic features of the data. To determine the most appropriate model to be used, graphical methods are employed which involves autocorrelation function (ACF) and partial autocorrelation function (PACF). Thus by observing ACF and PACF, if the autocorrelation function dies off smoothly, and the partial autocorrelation function went zero after one lag, meaning that the first order of autoregressive model, AR (1) is appropriate. On the other hand, if the autocorrelation function went to zero after one lag and the partial autocorrelation function declined geometrically, first order moving average model, MA (1) would seem to be more suitable. If the autocorrelations appear

to have a seasonal pattern, it suggests the presence of a seasonal ARMA structure.

Stage 2, is the estimation of the parameters for the model specified in stage 1. The parameters can be estimated by using Ordinary Least Square (OLS) method, or Maximum Likelihood (ML) method. The dependent variable needs to be different if necessary to account the order of integration. Apart from that, if there were any AR and MA terms determine from stages 1, it should be added to the model before estimation.

The next stage is the diagnostic checking of the model, after estimation to determine whether the model is correctly specified and estimated adequately. Residual correlogram of ACF and PACF test will be used in diagnostic checking. If the model was not correctly specified, it is needed to return back to stage 1 and start all over again to obtain a more appropriate model. Thus Box-Jenkins method is known as an iterative process.

If the model was correctly specified and is adequate, it can proceed to 'forecasting' using the model with the AR, I and MA terms identified. Hence, it involves the forecast of future value of a series using its previous values or the previous values of error term. In this paper, one step forecast will be introduce in the forecasting where the forecast will only be generated for next observation only. This paper uses data of Shanghai Stock Exchange Index from 1991, Quarter 1 until 2004, Quarter 4 as the in sample observation and obtained the parameter value to forecast the next observation (2005, Quarter 1). Then, in order to obtain the forecast value for 2005, Quarter 2, the in sample observation will be increases by 1 Quarter, which is using the in sample observations from 1991, Quarter 1 until 2005, Quarter 1. The forecasting will then be continued until the observation for 2011, Quarter 4 is obtained. The forecasted index will then plot into a graph to compare with the actual index. The gap between the forecasted and actual index shows the

impact of hot money in stock market. Details of the findings will discuss on the following chapter.

3.5.2 Zhang and Huang's Model

Zhang and Huang (2011) modify the residual method refined by China's State Administration of Foreign Exchange (CSAFE) and define hot money as below:-

> Hot Money = Change of the position for foreign exchange purchase – (Trade surplus + net inflow of FDI + net income in the current account + funds financed from foreign stock market)

The Zhang and Huang's Model will be the Equation 2 used in this paper to test on the effect of hot money on Shanghai Stock Exchange Composite Index. Zhang and Huang model is chosen as it is the latest modified model from other residual method. Past researches do not test on the impact of hot money on bubble. It is more on the theoretical study on the impact of hot money on stock market. Thus, there is little, or even no comparison on the model used to test on the impact of hot money on the bubble.

3.5.2.1 Data Analysis

As shown above, Zhang and Huang's Model consists of five (5) types of secondary data. All data are obtained from Thomson Reuters Datastream.

Change of the Position for Foreign Exchange Purchase

There is positive relationship between the change in position of foreign exchange purchase and hot money and it can precisely reflect the total capital inflows to a country (Zhang & Huang, 2011).

Trade Surplus

According to Trade Surplus (n.d.), trade surplus is defined as the positive trade balance in a country, where the exports is more than the imports. There is negative relationship between trade surplus and hot money inflows as higher hot money inflow causes inflation which consequently leads to trade deficit (imports > exports) in a country (Martin & Morrison, 2008). For the data in this paper, the export and import data are used. Thus, it is needed to take export subtracting with the import to get the data of trade surplus in China.

Net Inflow of Foreign Direct Investment (FDI)

China's FDI is generally the investment made by companies/entities of other countries to China, which holds the lasting management interest in the invested companies/entities (Foreign direct investment, net inflows (Balance of Payment, current US$), n.d.).

Net Income in the Current Account

The net income in the current account is the difference between the income received (inflow to a country) and income payments (outflow from a country).

The income received includes the income from investment (interests and dividends), wages sent back by remittances and etc.

3.5.2.2 Research Framework

After testing the presence of stock market bubbles in Shanghai Stock Exchange Composite Index, equation below was form to determine whether the inflow of hot money (HM) to China will causes the stock bubbles in SSE Composite Index. In addition, lag term of money supply, (MS) and lag term of exchange rate of China Yuan to United Stated Dollars, (EX) was introduced as control variable in the model as well as lag term of SSE.

The equation is stated as below:-

$$LSSE = \beta_0 + \sum_{i=1}^{n} \beta_1 LSSE_{t-i} + \beta_2 LHM_t + \sum_{i=1}^{n} \beta_3 LHM_{t-i} + \beta_4 LEX_t + \sum_{i=1}^{n} \beta_5 LEX_{t-i} + \beta_6 LMS_t + \sum_{i=1}^{n} \beta_7 LMS_{t-i} \quad (Equation\ 2)$$

where LSSE = Log of Shanghai Stock Exchange Composite Index
LHM = Log of Hot Money Inflows
LEX = Log of Exchange Rate of China Yuan to USD
LMS = Log of Money Supply

Exchange rate and Money supply was introduced as according to Garza-Garcia and Yue (2010), these 2 variables having positive relationship toward the SSE Composite Index. Apart from that, all of the variable will be in the natural logarithm as this will provides advantage of stability of the data when there is a huge change occurred. On the other hands, the lag term was

introduced in order to capture the past effect of the variable toward the SSE.As mentioned by Garza-Garcia and Yue (2010), there is long term relationship exist between the macroeconomic variable and SSE. The optimal lag length for Equation 2 is determined by using the minimal Akaike Info Criterion (AIC).By implementing one step forecasting on the Zhang and Huang model, the value of next observation starting from 2005 quarter 1 will be obtained by the parameter estimated from the in sample observation (1991 quarter 1 until 2004 quarter 4).

3.6 MSE, RMSE and MAE

In practice, forecasts would usually be produced for the whole of the out-of-sample period, and used to be compared with the actual values. The difference between them aggregates in some way. The forecast error for observation i is defined as the difference between the actual values for observation i and the forecast made for it. The forecast error, defined in this way, will be positive if the forecast was too low and vice versa. As a result, it cannot add up the forecast error as the positive values will offset by the negative values. So, before sum the forecast error, it has to square the error or use the absolute value that will make all the values positive. Thus with the error squared and using the absolute value, it will get the mean square error (MSE) and mean absolute error (MAE) defined as:-

$$MSE = \frac{1}{T-(T_1-1)}\sum_{t=Ti}^{T}(y_{t+s}-f_{t,s})^2$$

$$MAE = \frac{1}{T-(T_1-1)}\sum_{t=Ti}^{T}|y_{t+s}-f_{t,s}|$$

Hyndman and Koehler (2005) mentioned that Root Mean Square Error (RMSE) is more preferable over Mean Square error as it is on the same scale of data. Thus, RMSE will be employed in this study to have a more consistent result of the forecast error. RMSE defined as:-

$$RMSE = \sqrt{\frac{1}{T-(T_1-1)}\sum_{t=Ti}^{T}(y_{t+s}-f_{t,s})^2}$$
$$= \sqrt{MSE}$$

3.7 Conclusion

This chapter shows an overview outline of the research from data analysis, data processing as well as the research methodology used for this study. Hence, it provides the understanding of how the research is being conducted. Data was collected from different sources by using Thomson Reuters Datastream with the sample period from year 1991 quarter 1 to year 2011quarter 4 for Equation 1 and year 1991quarter 1 to year 2010 quarter 4 for Equation 2 due to the limitation of secondary data. On the other hand, the data was being processed before converting into time series data. This was to ensure the consistency of data. Last but not least the statistical method employed including unit root test, autocorrelation function, partial autocorrelation function, mean square error, root mean square error, and mean absolute error and Box-Jenkins method for the forecasting. The empirical result will be further explained in Chapter 4.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

Data and results stated in previous chapter will be reported in this chapter. In the first part, unit root tests will be discussed to ensure that there is a stationary of the data found. In order to test unit root tests, Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests are being run. For ADF tests, lag length is based on Akaike's information criterion while PP test is based on Newey-West bandwidth estimation.

After running the unit root test to identify whether they are stationery or unit root, Box Jenkins Model will be applied to determine the presence of bubble in the China stock market while Zhang and Huang (2011) model is used to determine the influence of hot money towards the stock market bubble in SSE Composite Index.

4.1 Unit Root Test

The stationary of the macroeconomic series at level and the first difference of each series are tested using Augmented Dickey-Fuller (ADF) test and Phillips Perron (PP) test. For the Augmented Dickey-Fuller (ADF) test, the null hypothesis states that variables are unit root, in other words, the non-stationary exists in the time series data.

The result of ADF and PP test at level form as well as first difference are reported in Table 4.1.1. Based on Table 4.1.1, the t- statistics for ADF at level form for variables are greater than critical value at 1%, 5% and 10% except log Shanghai Stock exchange index and log hot money. This indicates that ADF test at level form are statistically not rejecting the null hypothesis even at 10% significant level except the variables which are log SSE Composite Index and log hot money. On the other hand,

the t-statistics for PP at level form for variables are greater than critical value at 1%, 5% and 10% except log SSE Composite Index is rejected at 10% significance level. This indicates that the null hypothesis of stationary shown in Table 4.1.1 is insignificant.

Besides that, when conducting the ADF test at first difference of all variables, the t-statistics for all variables are smaller than critical value at 1%, 5% and 10%. This indicates that the ADF test at first difference is rejected the null hypothesis of non-stationary is significant even at 1% significance level. A similar conclusion found in PP test, in this test, Table 4.1.1 shows that the t-statistic for all variables is smaller than the critical value at 1%, 5% and 10%. This indicates that the PP test at first difference is rejecting the null hypothesis of non-stationary at 1% significance level.

Table 4.1.1: Result of Unit Root Test for China (ADF and PP) in Level Form

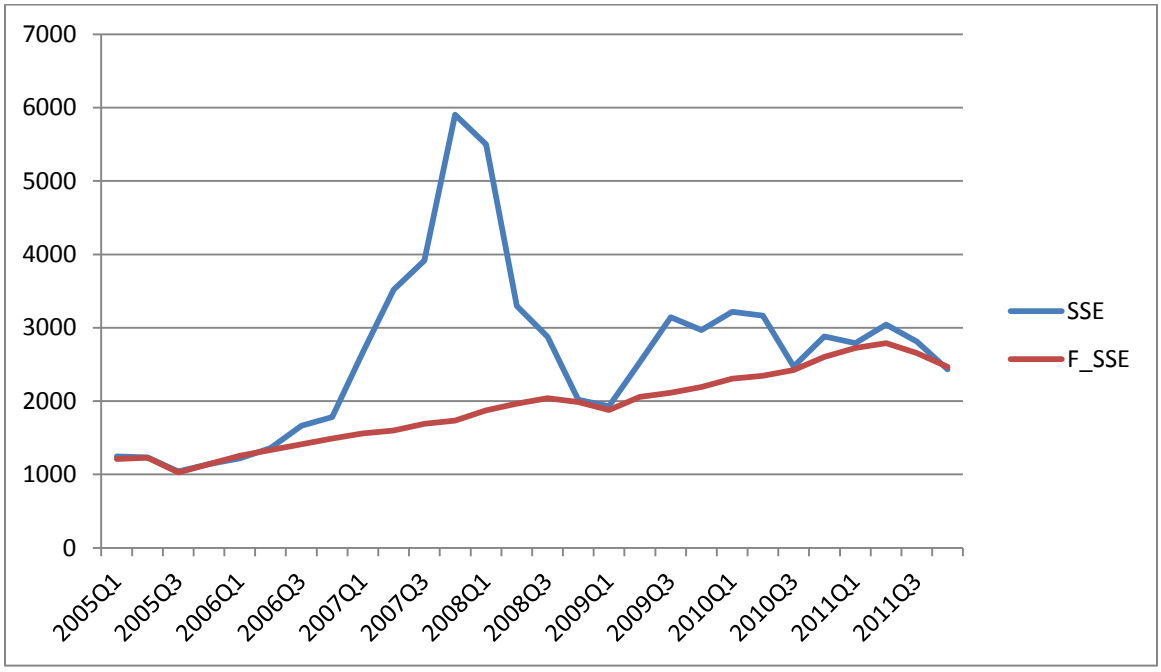
	Level Form				**First Difference**			
	ADF		PP		ADF		PP	
Level	Constant	Constant with trend	Constant	Constant with trend	Constant	Constant with trend	Constant	Constant with trend
LSSE	2.8652(1)***	3.303277(1)***	2.857079(1)***	3.413821(1)***	8.764899(1)*	8.907912(1)*	8.815567(1)*	8.935302(1)*
LHM	0.412784(1)	-3.953674(6)**	0.336809(1)	-2.801078(1)	7.535081(1)*	7.570134(1)*	7.535081(1)*	7.574327(1)*
LEX	-2.443271(1)	-1.961954(1)	-2.443271(1)	-1.917576(1)	8.640562(1)*	-9.07059(1)*	8.640562(1)*	9.127612(1)*
LMS	0.187649(1)	-2.616303(1)	0.187649(1)	-2.642899(1)	10.48136(1)*	10.43705(1)*	10.48136(1)*	10.43705(1)*

Note: *, **, *** indicates the rejection of the null hypothesis at 1%, 5% and 10% significance levels. Numbers in parentheses is the number of lags. Lag lengths for the ADF Unit Root Test are based on Akaike's information criterion. Phillips and Perron(PP) unit root test is based on kernel-based sum of covariance or autoregressive spectral density estimation. Unit root tests include a constant and linear time trend. The null hypothesis under ADF and PP tests is the presence of a unit root.

4.2 Box Jenkins

To forecast the SSE Composite Index, suitable model should be determined by using the correlogram of first difference (Appendix 1). All of the possible models are estimated to forecast the Log of Shanghai Stock Exchange Composite Index (LSSE) from 2005 Q1 until 2007 Q4. By using ARIMA (3,1,3) model, LSSE are forecasted from 2005 Q1 to 2011 Q4 with 1-step forecast method. After anti log the forecasted value of LSSE graph as below is obtained:-

Figure 4.2.1: Forecasting by Box Jenkins method



Note: SSE: Shanghai Stock Exchange Index

F_SSE: Forecasted Shanghai Stock Exchange Composite Index

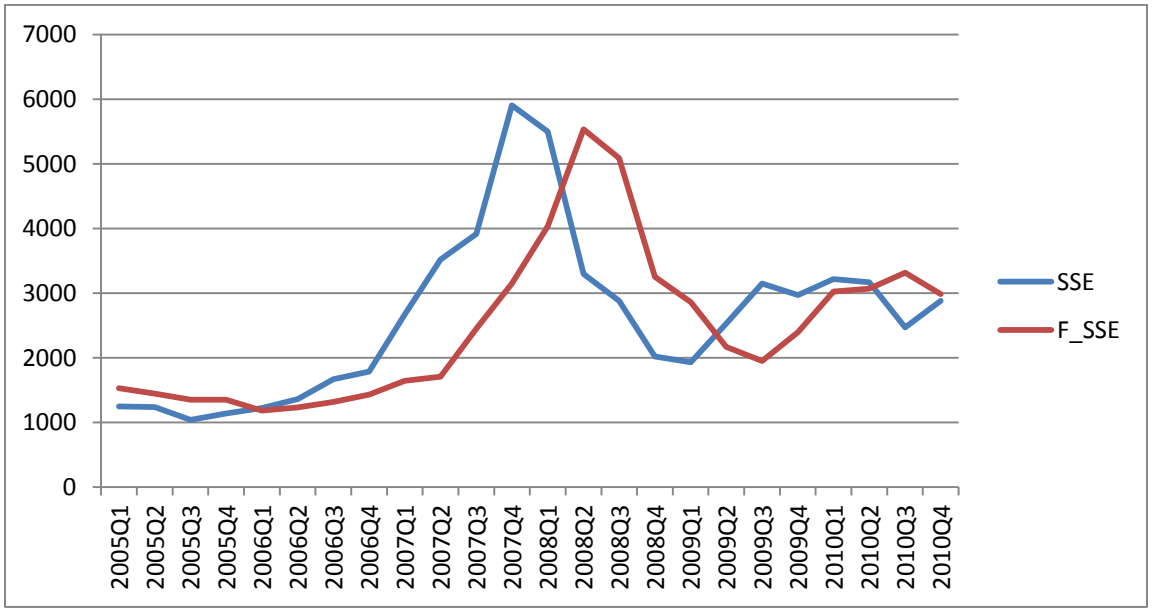
After forecasting for the entire selected period, the value of MSE, RMSE and MAE for the model are 0.18695, 0.43237 and 0.27299 respectively. In which the value of MSE, RMSE and MAE for ARIMA (3,1,3) found to be the lowest among all the

possible model and if can be conclude that ARIMA (3,1,3) is the most appropriate model for forecasting the SSE.

4.3 Zhang and Huang's Model

After testing the presence of stock market bubbles in SSE Composite Index, Equation 2 was form to determine whether the inflow of hot money (HM) to China will cause the stock bubbles in SSE in year 2008. In addition, money supply, (MS) and exchange rate of China Yuan to United Stated Dollars, (EX) are introduced as control variable in this model as well as lag term of SSE Composite Index. The analysis was run by, with the variables up to 4 lag terms. The best model was determined by minimum Akaike Info Criterion (AIC). The equation is used as one step forecasting to forecast the next quarter by using the past data from 2005 Q1 to 2010 Q4. The results were then anti log and graph was plotted along with the actual SSE as below:-

Figure 4.3.1: Forecasting by Zhang and Huang (2011) model



Note: SSE: Shanghai Stock Exchange Composite Index

F_SSE: Forecasted Shanghai Stock Exchange Composite Index

4.4 Discussion on Major Findings

Based on the Figure 4.2.1, bubbles is seen around the period of year 2006-2008 especially in year 2007 as there is a significant difference between the actual value of Shanghai Stock Exchange (SSE) Composite Index and forecasted Shanghai Stock Exchange (F_SSE) Composite Index. This is supported by Barboza (2008) mentioning that SSE Composite Index significantly drop around 45% on April 2008 from its high on October 2007. It is due to many individual investors and big corporations are investing in Shanghai Stock Market on year 2007 in order to gain 20 to 30 times profit and by year 2008, there was a huge sell-off in the market causing a drastic drop in the SSE Composite Index. It is hence proved that there is a huge stock market bubble in year 2007 whereby people purchase stocks at high price and sell it at a higher price to another buyers.

This is further agreed by Christ (2008) that SSE Composite Index has gained 483% from trough to peak since the bottoming in year 2005 which is caused by a massive speculative bubble. It is also affirm by Yang and Lim (2009) that bubble exists in China SSE market from year 2006-2007 as investors have huge demand in this market after SSE emerged from inactivity and inefficiency in year 2006 and the low interest rate offered by Chinese banks during that period of time has also cause money to flow into the stock market.

There are two main issues being proven from the Figure 4.3.1. The figure is breakdown into two parts for interpretation. The first part will be the time frame from 2006, Quarter 1 to 2008, Quarter 1; while the second part will be the time frame thereafter.

From the first part of the figure, it is clearly shown that there is a gap between the forecasted SSE Composite Index and the actual SSE Composite Index around 2006 Quarter 1 to 2008 Quarter 1, and it is increasing from time to time. As proven earlier, bubble exists in China stock market around the period of 2006-2008. Since the Zhang

and Huang model is tested on the impact of hot money, the gap has proven that the hot money inflow is the factor behind the occurrence of stock market bubble in China in year 2008.

From the second part of the figure, it is clearly shown that the index started to drop. The actual index started to drop on 2007, Quarter 4 while the forecasted index started to drop on 2008, Quarter 2.

The dropping of the index is not considered as bubble burst as this sudden drop did not have any major impacts on the investors, companies and China Government. (Knight, 2012). This is supported by Elliot (2012), mentioning that China emerged from the downturn of economy in a fast pace. Yao and Luo (2009); Hau (2011) showed that although there is dramatic drop in SSE Composite Index but the Gross Domestic Product, GDP of China is still increasing by more than 10% for the first few months of 2008. Therefore, the consumer in China may not be conscious of the sudden drop in SSE Composite Index as economy downturn due to the increase in income (Hau, 2011).

Since the significant drop of SSE Composite Index is not due to the bubble bursting, then, it shall credit to the effectiveness of government policies. China Government had implemented policies to minimize the impact of the hot money on the stock market bubble and it has successfully cooled down the overheated market in China (Song, 2007; Lin, 2007; Yan, 2007).

China shifts the monetary policy from prudent to tight monetary policy in order to prevent and curb the economy from overheating in the assets market (Song, 2007; Yan, 2007).In money supply wise, the government had increased the required RMB reserve ratios by 10 times from 9.5% to 14.5% in 2007 with the aim of limiting circulation of currency (Ji, Fang, & Zhao, 2012). This is to support reasonable credit growth and this adjustment in deposit reserve ratio has brought great impacts on the total money supply (Wang, 2009). By 2008, the total money supply started to decline,

and caused the overheated investment to be cooled down. In addition to the control of money supply, the China Ministry of Finance issued 600 billion Yuan of special bond at August, 200 billion Yuan at September and 34.9 billion Yuan at November (China to Issue 34.97 BLN Yuan of Special Treasury Bonds Next Week, 2007). The sale of these bonds is to help to ease the liquidity and control the money supply to prevent the economy of China from overheating. Apart from reserve ratio and issuing bond, the Central Bank of China also control the credit lending by tighten the quota of loans made as a part of to tighten the monetary policy (Prepare for tighter quotas on yuan and forex loans, 2008).

Knowing that the market was overheated in the year 2007, the authorities increase the interest rate by 6 times. After the increasing for the fifth time, the stock market started to descend (Wang, 2009). This was further supported by Yao, Luo and Loh (2011) who stated that the bank rate was lifted People's Bank of China four times from March 2007 to October 2008 and by the end of 2007 this action manage to cool down the overreacted stock market in China.

Since the main cause of the stock market bubble is due to hot money, different policies carried out by the government have successfully forced the hot money to flow out from the stock market to other markets. The hot money is suspected to flow in to China property market. Dreger and Zhang (2011) shows that the real housing price is 28% above long run equilibrium in 2008 and 35% in 2009 for Shanghai property market. Furthermore, the increase in housing price also happened to Beijing and Shenzhen where Shenzhen show an obvious increment compare to Beijing. Akshay (2011) stated that during January to August 2009 the housing price in Beijing increased by almost 70% while Shanghai housing price increased by around 47%.

Apart from property market, it is also suspected that the hot money flowed to commodity market as the China's Continuous Commodity Index (CCI) showed fast and strong recovery of around 112% although in 2008 the CCI drops around 48% due to the financial crisis (Colombo, n.d.b). Hot Money Returns to China (2009) also

mentioned that the hot money funds first entered the real market, consequently moved to stock market and was predicted to switch into commodity markets. Increase in commodity prices brings challenges and opportunities to China (n.d.) shows that, trade surplus in China lead to the inflows of fund into commodities that contribute to the rising of commodities price in China. It is further proven by Martin and Morrison (2008) that in July 2008, the consumer price index in China had risen by 7.9% over the first 2 quarters of 2008 over the same period in 2007 (contributed largely from food prices) and the producer price index increased by 7.6% which adds to China's inflationary pressures.

Furthermore, Colombo (n.d.b) stressed that there are "Luxury Bubble" such as "Wine Bubble" and "Art Bubble" in China when the Chinese get richer and richer. Investors may channel their money out from stock market to invest in markets that are having good respond from the wealthy Chinese speculators.

As a result, policies implemented by China Government are effective in controlling the stock market bubble. By referring to Figure 4.3.1, the forecasted SSE Composite Index started to emerge with the actual SSE Composite Index and this represents that the stock market bubble size is reducing. Thus, China Government had successfully implemented effective policies to reduce the impact of stock market bubble and prevent it from bursting.

Some may question on the inconsistent dropping timing of the actual and forecasted SSE. As mentioned earlier, the actual index started to drop on 2007, Quarter 4 while the forecasted index started to drop on 2008, Quarter 2. This may due to other minor contributory factors such as influence from subprime crisis. Since our main concern is on hot money rather than the global crisis, this leaves space for future researches to find out the relationship between crisis and stock prices.

4.5 Conclusion

Nonetheless, the unit root test of the data in the findings has a unit room of I(1). From Box Jenkins, it is found that bubble presence in the China SSE stock market. It is also proven from Zhang and Huang (2011) model that hot money positively influence and causes bubble. The dropped in stock price was not caused by the bubble burst, instead it was due to implementation of policies by China's government to reduce the bubbles. Hence, there is no significant impact towards the China's economy. Limitation, recommendation and policy implication will be discussed in Chapter 5.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATION

5.0 Introduction

This chapter will give a picture of the overall findings in this paper. Limitation on the research done in this paper will also be discussed in this chapter, followed by the policy implications and recommendations for future research.

5.1 Conclusion

Box-Jenkins model is used to test for the existence of bubbles in the Shanghai Stock Exchange Composite Index. Based on the Figure 4.2.1 shown, bubbles do exist in the market as there is a big gap between the actual SSE Composite Index and forecasted SSE Composite Index in year 2007. After affirmed the presence of bubbles in SSE, Zhang and Huang's model is being run to check whether hot money in China does influence the value of SSE Composite Index. From the result shown in Figure 4.3.1, it is a grim reality that hot money causes bubbles in SSE Composite Index as the graph in Figure 4.3.1 is in line with the result in Figure 4.2.1 that there is a huge gap in the year 2007. In order to avoid the bubbles in SSE market to burst, China government has implemented a few policies to reduce the amount of hot money in SSE market. The forecasted SSE Composite Index is then slowly converged with the actual value of SSE Composite Index showing that the government has successfully reduce the hot money effect on the SSE market.

In short, this paper has proven that hot money inflows do cause stock market bubble in China in 2008. However, the stock market bubble did not burst as China Government has carried out few policies to reduce the bubble size. Thus, this paper

also proven that policies carried out by government is effective in reducing the impact of stock market bubble.

There are few limitations found in this paper and recommendations for each limitation have been provided for future study. Besides, the major findings may raise the concerns towards hot money inflows to China and more policies can be carried out to reduce the hot money inflows.

5.2 Limitations of study

By using Zhang and Huang's model as Equation 2 for this paper, control variables of money supply and exchange rate are being added to the equation to test their impact on SSE Composite Index. There are a few more variables that should be added into the equation, but due to lag terms are being introduced into the equation, it will lower the degree of freedom of the equation. Hence, only 2 control variables are added to ensure that the number of control variable do not exceed the sample size.

Another limitation face in this paper is that it focuses on sole factor, the hot money impact on stock market bubble. It does not study other variables such as subprime crisis which may or may not bring impact to the stock market.

Besides, this paper only focuses on the effect of hot money in SSE market but not towards other sectors where hot money can also be seen.

5.3 Recommendations for future study

In order to get a more accurate result, more control variables should be added in but not to forget the sample size should be increased by using monthly SSE data instead

of quarterly SSE data in order to ensure that the sample size is large enough that it exceeds the amount of control variables included.

Besides, a broader scope of study on stock market bubble is recommended by including other variables such as subprime crisis in the research as this may help to see the bigger picture of stock market bubble.

As this paper is concerning on the existence of hot money and its effect towards China stock market, future researchers can also further their studies towards other sectors where hot money flows into after moving out from SSE market, for instance are like steel and property sector. Future researchers can even look into the effect of hot money towards other markets other than China market.

5.4 Policy Implications

There is finally a research to proof that hot money does cause stock market bubble in China in the year 2008. Past studies only showed that hot money flowed into China and increased the stock prices without proven that the hot money will fuel stock market bubble in China in year 2008. Since hot money is proven to cause stock market bubble, it creates awareness when there is massive inflow of hot money to a country. Tighter regulatory coordination shall take place to regulate the level of short term capital inflows to a country.

Besides, the effective government policies have boosted up the confidence of investors to invest in China stock market. They learnt that Chinese Government will not let the market to fail and this help to minimize the event of losses from their investments.

In addition, Chinese Government also gains a good image in realizing their promises to prevent any severe economy problem from happening in their own ground. It

becomes easier for them to carry out any plans or policies in the future as they started to get support from their people. This allows the China to stand strong as a good leader among the emerging countries.

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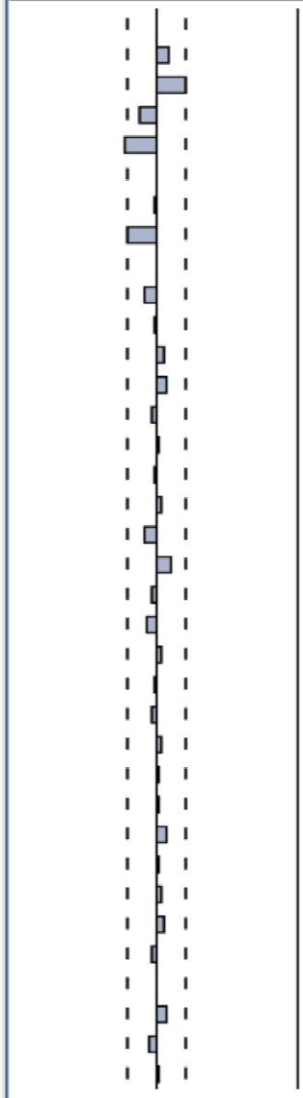
Appendix

Appendix 1: Correlogram of First Difference

Date: 02/01/13 Time: 03:52
Sample: 1991Q1 2011Q4
Included observations: 83



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.003	-0.003	0.0007	0.979
		2	0.096	0.096	0.8108	0.667
		3	0.207	0.210	4.6039	0.203
		4	-0.119	-0.130	5.8717	0.209
		5	-0.240	-0.304	11.091	0.050
		6	-0.004	-0.035	11.092	0.086
		7	-0.024	0.119	11.147	0.132
		8	-0.210	-0.113	15.285	0.054
		9	0.001	-0.103	15.285	0.083
		10	-0.096	-0.169	16.182	0.095
		11	-0.021	0.079	16.226	0.133
		12	0.043	0.107	16.412	0.173
		13	0.068	0.021	16.883	0.205
		14	-0.033	-0.168	16.997	0.256
		15	0.023	-0.091	17.051	0.316
		16	-0.010	0.021	17.061	0.382
		17	0.030	0.176	17.156	0.444
		18	-0.084	-0.141	17.922	0.461
		19	0.113	-0.009	19.328	0.436
		20	-0.040	-0.075	19.507	0.489
		21	-0.068	0.031	20.027	0.520
		22	0.034	0.040	20.160	0.573
		23	-0.014	-0.020	20.183	0.631
		24	-0.048	-0.097	20.461	0.670
		25	0.031	0.011	20.578	0.716
		26	0.019	0.005	20.621	0.761
		27	0.009	0.136	20.631	0.803
		28	0.069	0.014	21.249	0.815
		29	0.015	-0.055	21.278	0.849
		30	0.038	-0.036	21.466	0.873
		31	0.045	0.090	21.738	0.891
		32	-0.029	0.020	21.854	0.911
		33	-0.003	0.025	21.855	0.931
		34	0.066	0.004	22.486	0.935
		35	-0.059	-0.009	22.991	0.941
		36	0.011	0.011	23.008	0.954