Market efficiency for two classes of stocks in China: state owned and private companies

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Abdi Abdirahman Huang Renyuan

Umeå Sweden
2012-05-29
Summary

The fast-growing economy in China attracts the world’s interests, which includes the Chinese stock markets. The market efficiency of Chinese stock markets is widely discussed by researchers in different approaches. The involvement of government in stock markets is a unique case in the financial world.

By this paper, we are answering the question that is the degree of market efficiency of state-owned companies different from that of private companies in Chinese stock markets. This will bring us knowledge about Chinese stock markets as well as the impact from ownership, market value and management styles on market efficiency.

To clarify the influence from government involvement in stock markets, we select 938 stocks distinguished by ownership structure. This quantitative study is preceded on daily data from 2007 to 2011. We use auto correlation, Chi-square test, and linear regression together with Spearman’s correlation to test our hypothesis. The degree of market efficiency of each ownership group is examined and compared to each other. Market efficiency related to ownership and market capitalization are inspected if they are anomaly factors in Chinese markets.

The empirical results indicate that the degree of market efficiency of state-owned companies is significantly different from the degree of market efficiency of private-owned companies in China. The market capitalization is one of the existing anomaly factors in Chinese stock markets, as well as it is correlated with degree of market efficiency to some extent. For state-owned enterprises, active management on stock market does not provide a better market efficiency compared to passively managed companies.

**Keywords:** Efficient Market Hypothesis, Random Walk, Degree of Market efficiency, Anomaly, Chinese stock markets, State-owned enterprises, Ownership, Market Capitalizations.
Contents

Acknowledgements I
Summary II
Contents III
List of Tables and Figures 1

Chapter 1: Introduction 2
  1.1 Background 2
  1.2 Knowledge Gap 6
  1.3 Research Question 6
  1.4 Research Purpose 7
  1.5 Audience 7
  1.6 Delimitations 7
  1.7 Disposition 8
  1.8 Glossary 9
  1.9 Abbreviation list 9

Chapter 2: Methodology 11
  2.1 Preconceptions: 11
  2.2 Choice of subject 11
  2.3 Research Philosophy 12
    2.3.1 Ontology 12
    2.3.2 Epistemology 13
    2.3.3 Axiology 14
  2.4 Research Approach 14
  2.5 Research Strategy 15
  2.6 Research Method 15
  2.7 Time Horizon: 16
  2.8 Research Design: 16
    2.8.1 Research Objectives 16
    2.8.2 Research Process of our study 17
  2.9 Source of Literature 18
  2.10 Criticism of Literature: 18

Chapter 3: Theoretical Framework 20
  3.1 Theories 20
    3.1.1 Efficient Market Hypothesis (EMH): 20
    3.1.2 Random Walk Theory: 21
    3.1.3 Degree of Market efficiency 22
    3.1.4 Capital Asset Pricing Model 23
### Contents

3.1.5 Value at Risk (VaR) 24
3.1.6 Anomalies: 25
3.1.7 Behavioral Finance 29
3.1.8 Chinese Capital Markets and State-Owned Enterprises (SOEs) 29
3.2 Literature Review 30
3.3 Summary of Theoretical Framework 33

**Chapter 4: Empirical Study** 36

4.1 Accessing and Adjusting Data 36
4.2 Data Description: 37
4.3 Data Analysis Procedure 37
4.3.1 Step 1: Log Return 37
4.3.2 Step 2: Normality Test 37
4.3.3 Step 3: Autocorrelation Test: 38
4.3.4 Step 4: Ownership Recognizing 39
4.3.5 Step 5: Comparing the Market Efficiency of Different Classes of Stocks 39
4.3.6 Step 6: Illustrating the influence of market value 40
4.3.7 Step 7: Anomaly Test 41
4.4 Methodological Criticism 42

**Chapter 5: Findings and Analysis** 44

5.1 Test the Homogeneity of Degrees of Market Efficiency among Ownership Groups 44
5.2 Market Value and Market Efficiency 46
5.3 Anomalies Test 51
5.3.1 Anomaly: Ownership and Market Efficiency 51
5.3.2 Anomaly: Market Value 54
5.4 Findings and discussion 55
5.5 Summary Our Findings 56

**Chapter 6: Discussion and Conclusion** 58

6.1 Discussion and Conclusion 58
6.1.1 Discussion 58
6.1.2 Conclusion 59
6.1.3 Contributions: 60
6.2 Further Research 60
6.3 Credibility Criteria 61
6.3.1 Validity 61
6.3.2 Reliability 62

**Reference List** 63

**Appendix** 67

- Appendix I: Market Value Deciles for Portfolios Setting 67
- Appendix II: Normality Test for Log Return of Detailed Ownership Groups 67
- Appendix III: Log Return for Stocks in Different Ownership Groups and Different Efficiency
## Contents

<table>
<thead>
<tr>
<th>Level</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix IV: Mean of Log Return</td>
<td>69</td>
</tr>
<tr>
<td>Appendix V: Relationship of Log Return and Relative Parametric VaR</td>
<td>70</td>
</tr>
</tbody>
</table>

71
List of Tables and Figures

Tables:

Table 1: A and B share markets overview 3
Table 2: The number of QFII from 2003 to 2011 5
Table 3: Previous studies on the weak form efficiency for Chinese stock markets 32
Table 4: The overview of data 37
Table 5: Number of stocks following normal distribution 38
Table 6: Number of stocks with/without (partial) autocorrelation 38
Table 7: The ownership structure of Chinese stock markets 39
Table 8: Overview of Chinese stock markets: ownership and market efficiency 44
Table 9: Chi-square test: market efficiency and ownership 45
Table 10: Chi-square test: market efficiency and management of state-owned companies 46
Table 11: Chi-square test: market efficiency and market value portfolios 48
Table 12: Spearman's correlation test of market value and log return 54

Figures:

Figure 1: Summary of Chinese stock market and GDP from 2000 to 2009 4
Figure 2: The research 'onion' 12
Figure 3: The research 'onion' of our study according to Saunder et al. 18
Figure 4: Random walks and bounds 22
Figure 5: Market efficiency histogram classified by ownerships and market value portfolios 49
Figure 6: Degree of market efficiency of all portfolios in each ownership groups 49
Figure 7: Market efficiency histogram classified by detailed ownerships and market value portfolios 50
Figure 8: State-owned companies' degree of market efficiency in all portfolios 51
Figure 9: Boxplot of log return for ownership groups 52
Figure 10: Log return and relative parametric VaR of efficient and non-efficient Chinese stocks grouped by ownership (see also Appendix IV and V) 53
Figure 11: Scatterplot of market value and log return for Chinese stocks 55
Chapter 1: Introduction

In this chapter, we present the background of Efficient Market theory and Chinese stock markets. Then we introduce the existing knowledge gap, followed by our research problem and the choice of subject. The limitations and disposition of the study are defined and can be found in the end of this chapter.

1.1 Background

Market efficiency mainly concerns how the prices of stocks reflect all the information available in the market. In 1970, Eugene Fama developed Efficient Market Hypothesis, which results in three levels of market efficiency: weak form, semi-strong form, and strong form (Fama E. F., (1970)). Ogden et al. (2003) describe the three levels, “In weak form, a security’s price reflects all information that may be contained in the security’s historical prices. In semi-strong form, a security’s price reflects all publicly available information. Finally the market is strong form efficient if a security’s price reflects all information, both public information and information held privately.”

There is a substantial amount of research and studies about market efficiency. Many of these studies indicate that the fair price of security can be achieved if many rational investors actively trade the stock when they have information that may impact the stock price. There is one group of scholars who believe that certain ownership structures may have an impact on market efficiency. For example, block trading can actually improve the short-term market efficiency (Edmans, (2009)). The price of stock is adjusted when institutional investors sell or buy the security according to their insight.

In contrast, some parties involving the security market are inactive either for short-term or for long-term. Restricted shares are not transferable until certain conditions are fulfilled. Owners of restricted shares cannot response to any information during the lockup period forced by law or binding contract. However, they can long the share in the market. And, government is another type of inactive player in the market. In some cases, the government just holds the securities and is resistant to any kind of information or performance changes of companies. This means that the government would neither buy nor sell the shares at any price. Based on existing theories, the inactive holding position may lead to a less efficient situation. On the other hand, the government establishes the supervisory institution and perfects laws and regulations to improve the efficiency of the stock markets (OECD, 2005). Still, empirical studies are needed to determine whether the government’s passive management of its stock holdings has effects on the degree of market efficiency.
Chapter 1: Introduction

When discussing the ownership structure of a company, it can be separated into three situations based on their holding position: 1) Dominant. One party owns the largest proportion of shares, and has major influence the company performance. 2) Non-dominant but significantly owning. One party owns a large proportion of shares, and has minor influence on the company performance but not determinate. Normally they show on the list of shareholders. 3) Non-significantly owning. One party owns some of shares but has little or no influence on the company performance. This paper mainly focuses on the first two situations, dominant and significantly owning. Within this framework, the companies can be separated into three groups: Government Dominant, Pure Private Dominant and the rest in between or with other ownerships (i.e. collective ownership). Only government dominant and pure private dominant situations are discussed.

China is the world’s most populated country and its economy has gone through some fundamental changes after its economic reforms started in the late 1970s. China has since the reform policies been developed from a central-planned economy to a market-oriented economy. However, there are some adjustments still needed for the country to be considered as a full market-oriented economy, inasmuch the state sector still has a major role in the Chinese economy. Its economic reforms created new incentives for individual initiative and led to a sharp increase in productivity or performance, mainly due to a better use of resources.

To accelerate the capitalization, the Chinese government established two stock markets, Shanghai (SSE) and Shenzhen (SZSE) in 1990. This increased the economic ties with the rest of the world. To involve foreign capital, a B-share market was established from the very beginning of the Chinese stock markets. The first B-share IPO was in 1991. The B-share market was limited to those investors who are foreign citizens from countries or regions outside of Mainland China. The domestic individual investors were only allowed to be involved after 2001. The B-shares are traded in either USD or HKD. In 2001, China formally joined and became a member of the World Trade Organization (WTO). This gives them a greater access to the foreign markets but it also allows the world to access the Chinese markets. (Information can be found in Table 1.)

Table 1: A and B share markets overview

<table>
<thead>
<tr>
<th>A-share markets</th>
<th>B-share markets</th>
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<tbody>
<tr>
<td>1990: First IPO</td>
<td>1991: First IPO (Only for foreign investors)</td>
</tr>
<tr>
<td></td>
<td>2001: Domestic individual investors were allowed to invest in B-shares</td>
</tr>
<tr>
<td></td>
<td>2003: QFII policy applied (Foreign institutional investors were involved)</td>
</tr>
</tbody>
</table>
At present there are two stock exchanges in Mainland China, Shanghai stock exchange (SSE) and Shenzhen stock exchange (SZSE). Both of the stock exchanges serve under the control of central government. The establishment of stock markets should stimulate Chinese economy for decades.

According to the Figure 1, both Chinese economy and stock markets grow rapidly from 2000 to 2009. The economy grows constantly, while the stock market increases with fluctuations. The number of listed companies’ both A and B share have increased year by year, as well as the securities accounts. The increasing securities accounts imply more and more investors to participating in Chinese stock markets. Although the Chinese stock market is extremely risky in some years (the total market capitalizations exceeding annual GDP in 2007), it is still a growing and interesting market.

GDP data are coming from China statistical yearbook 2010, National Bureau of Statistics of China (NBSC) 2011.

Figure 1: Summary of Chinese stock market and GDP from 2000 to 2009

One interesting factor about Chinese stock markets is that stocks of State-owned public companies are available. State-owned public companies are those dominated by state or government and are listed in the stock markets, the shares are owned by the government but are only traded in rare cases. This situation is uncommon in western countries: only a few listed companies involve government as their shareholders, and few of them are controlled or dominated by government. As a previous planned economy, the Chinese government still controls many companies. From the very beginning, and even currently, state-owned companies are playing an essential role in both the Shanghai and Shenzhen Stock Exchange (SSE and SZSE). Most of the listed companies in 1990 were state-owned companies. Today, the state-owned companies are still making up a large
proportion of the total Chinese stock market value. The State-owned listed companies are generally stable, profitable and taking advantage from the government’s policy-making.

Meanwhile, the fast growing economy of China is attracting foreign capital to invest in the domestic capital market. The Qualified Foreign Institutional Investors (QFII) are allowed to invest directly in A-share markets since 2003. The growing sizes and numbers of the QFII are showing the interest of being involved in the Chinese security market (Table 2). By 2012 Feb 9, there are in total 142 QFIIs in total (China Securities Regulatory Commission, (2012)). China is not only a diversification alternative for foreign investors, but also a hedge tool against their domestic market. According to YiHao Lai and Jen-Ching Tseng’s research (Lai & Tseng, (2010)), Chinese stock markets are both a hedge and also a safe haven for G7 stock markets based on its low dependency of international stock market. Regardless of the rapid economic growth in China, Chinese stocks should be considered to been put into the portfolio for both individual and institutional investors.

Table 2: The number of QFII from 2003 to 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>New QFII</th>
<th>Total QFII</th>
</tr>
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<tbody>
<tr>
<td>2003</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>2004</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>2005</td>
<td>7</td>
<td>33</td>
</tr>
<tr>
<td>2006</td>
<td>18</td>
<td>51</td>
</tr>
<tr>
<td>2007</td>
<td>0</td>
<td>51</td>
</tr>
<tr>
<td>2008</td>
<td>23</td>
<td>74</td>
</tr>
<tr>
<td>2009</td>
<td>19</td>
<td>93</td>
</tr>
<tr>
<td>2010</td>
<td>13</td>
<td>106</td>
</tr>
<tr>
<td>2011</td>
<td>29</td>
<td>135</td>
</tr>
</tbody>
</table>

Source: China Securities Regulatory Commission CSRC 2012.

Although more and more foreign investors invest in the Chinese stock markets, it is still a small proportion of their total investments. According to Swedish investment fund association (Fondbolagens förening, 2012), the net assets of Swedish funds invested in Chinese stock markets is 7575 million SEK, which is less than 1% of total 887 billion SEK of Swedish equity funds, while over 40 billion SEK equity fund are invested in Nordic, Eastern Europe, and other European countries. The small proportion indicates the unwillingness of Swedish funds to invest in Chinese stock markets. The lack of knowledge for the Chinese stock markets prohibits the Swedish funds to take Chinese securities into their portfolio. Language, culture, and business environment in China are completely different from those in Sweden. For those who are interested or have plans to start investing in China, they might wonder if the stock markets of China are efficient.
Chapter 1: Introduction

In this paper, we select sample companies from Shanghai and Shenzhen stock markets. A shares and B shares for same company are included separately to check the efficiency of state-owned listed companies of Chinese stock markets.

1.2 Knowledge Gap

As far as we know, there are no previous conducted studies or research on comparing the market efficiency of state-owned companies and private companies. Most of the existing research regarding the ownership and market efficiency are mainly focusing on how financial institutions’ trading activities improve the short-term information efficiency (Wang, et al., (2011)). There are numbers of evidences showing that institutional ownership significantly improved the market efficiency. Still, the influence of government ownership is unknown. By our research, we try to clarify if the market efficiencies of state-owned companies are significantly different from private owning companies in Chinese Stock markets. We intend to bring more knowledge on the efficiency of the Chinese stock markets, based on the facts that they are unique when considering the proportion of state-owned stocks.

As we believed, this knowledge gap is interesting for not only the players on Chinese stock markets, but also, the investors and scholars who are focused on the involvement of government in financial market. On one side, by bridging this knowledge gap, we can provide the players in Chinese markets break-through knowledge. On the other side, we hope our study can become a reference for those who are researching on Efficient Market Hypothesis or the involvement of government in countries even where SOEs are not listed.

Thus, the research question comes out.

1.3 Research Question

The research question is formulated as following:

Is the degree of market efficiency of state-owned companies different from that of private companies in Chinese stock markets?

To simplify our research, we separate in to several sub-questions to answer this question:

1. Is the degree of market efficiency of state-owned companies different from private companies or the companies with other ownerships?
Chapter 1: Introduction

2. Is there any difference in efficiency between actively managed and passively managed state-owned companies?
3. Is there any relationship between market value and degree of market efficiency?
4. Is any of the following anomalies existing in Chinese stock markets? Ownership, market value, and market efficiency.

1.4 Research Purpose

The purpose of this paper is to examine if there are any differences of efficiency between state-owned companies and private companies. In order to solve this problem, the efficiencies of companies with different ownership are tested, and will be compared between different categories. We firstly identify the degree of market efficiency of state-owned companies and private companies, and categorize them by their market value or management style. By comparing companies’ degree of market efficiency in different groups, we illustrate the influence from these category factors. Thereafter, the effects of the size of sampled companies are verified by the test of efficiency differences between the companies with various sizes.

1.5 Audience

This research is aiming for disclosing the impact from different ownership on the market efficiency in Chinese markets. We believe that the result may provide knowledge about the Chinese stock markets. Thus, the investors, both institutional and individual, who invest or are interested in Chinese stock markets, are the primary audience of our thesis. Whilst, we study the data based on the Efficient Market Hypothesis, the scholars who either agree or challenge the EMH theory may also exploit our conclusion in their arguments. Considering that we study the government involvement in the capital market, this paper may end up with a practical advice for Chinese government. Also, for those other countries that are trying to intervene the stock markets, our research may be one of the references due to the government and market interaction. Besides, financial analysts, portfolio advisors and financial community in general are also the target groups for our study.

1.6 Delimitations

First, in this paper, only Shanghai and Shenzhen stock exchange markets are concerned. Hong Kong stock exchange is materially different from the mainland markets, even though many Chinese blue chip companies are listed in the Hong Kong market.

Second, as most of government dominated companies are having large size in capital
terms, size may be one of the factors which may mislead the conclusion, thus the test regarding the efficiency on different companies with various share volumes are made to isolate the effects of size. The current size of each company is used to distinguish.

Third, the time period of selected data is from 2006 Dec 31 to 2011 Dec 31 and the companies are selected only if the base dates are before 2006 Dec 31. This means that the companies that IPOed after 2006 Dec 31 are not included. During this period, the Chinese stock markets got its historical peak (Shanghai composite index: 6124.04) and also suffered the global financial crisis.

Furthermore, language is another important issue that should be considered. Most of our referred literatures are documented in English, while many studies in Chinese are ignored for language cause. This may be the limitation of our research.

1.7 Disposition

Chapter 1: Introduction
The background information of Chinese stock markets and concepts of efficient market are presented in Chapter 1. The research problem of this paper is formulated right after describing existing knowledge gap. The research purpose and delimitations show the aim of this research.

Chapter 2: Methodology
In this chapter, by arguing scientific philosophy, positivism is used in this paper. Then we explain why quantitative research approach is conducted rather than qualitative research. We propose our research procedure according to the theory and the aim of our research.

Chapter 3: Theoretical Framework
In the third chapter we introduce the theoretical framework, by reviewing and contrast previous studies authoritative in the field of market efficiency. Moreover, to provide a concrete base to a further analysis, theoretical choices will be argued.

Chapter 4: Empirical Study
This section covers the relevant data collected in this study to achieve our goal, here the data is analyzed by applying statistical tests. We, furthermore, formulate our hypotheses for further examinations.

Chapter 5: Findings and analysis
In this chapter, we mainly present the observations, and with the help of statistical tools, we try to answer the research question of this paper.
Chapter 1: Introduction

Chapter 6: Discussion and Conclusion
We include our conclusions with the discussions in this chapter, and the further research is also suggested. Credibility is discussed based on both reliability and validity dimensions.

1.8 Glossary

State-owned Enterprises: Are those companies that are listed in the stock markets and dominates by the state.

Private-owned Enterprises: Companies are recognize as private owned if it has individual shareholding as it is actual control.

Long position: The investor in this position will profit if the price of the assets increase

Short position: The investor who sold the contract will profit if the price of the assets decreases.

Actively Managed: Implies the companies use stock repurchase for private offering and other strategies.

Passively Managed: Are those companies that have consistently stable holding power in the examined period.

Market Capitalization:

Market value: Is the current or recently-quoted price for a market-traded security.

Abnormal return: Is how the actual returns differ from the predicted return.

1.9 Abbreviation list

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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>EMH</td>
<td>Efficient Market Hypothesis</td>
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<tr>
<td>SOE</td>
<td>State-owned Enterprise</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Developement</td>
</tr>
<tr>
<td>SSE</td>
<td>Shanghai Stock Exchange</td>
</tr>
<tr>
<td>SZSE</td>
<td>Shenzhen Stock Exchange</td>
</tr>
<tr>
<td>NYSE</td>
<td>New York Stock Exchange</td>
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<tr>
<td>IPO</td>
<td>Initial Public Offering</td>
</tr>
<tr>
<td>WTO</td>
<td>World trade Organization</td>
</tr>
<tr>
<td>QFII</td>
<td>Qualified Foreign Institutional</td>
</tr>
<tr>
<td>CSRC</td>
<td>Chinese Security Regulatory Commissions</td>
</tr>
<tr>
<td>SASAC</td>
<td>Supervision and Adminstration Commission</td>
</tr>
<tr>
<td>HR</td>
<td>Human Resource</td>
</tr>
<tr>
<td>CAPM</td>
<td>Capital Asset Pricing Model</td>
</tr>
<tr>
<td>VaR</td>
<td>Value at Risk</td>
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Chapter 1: Introduction

PEAD  
Post-earning Announcement Drift

I.I.D.  
Independent and Identically Distributed
Chapter 2 : Methodology

The methodology chapter describes how we proceed in the process of creating this paper. We begin by introducing the different research philosophy and the stance taken in this research process. Then we also explain and discuss the research approach, data collection methods, research design and source of literature. Finally, the research philosophy defines how the researchers assessed and developed their knowledge.

2.1 Preconceptions:

Obviously, Bryman and Bell (2011, p. 29-30) demonstrates that possibility for researchers to be influenced by previous experience and background is high. And to deal with the values and personal biases, the researchers have to act neutrally and to process the research based on the fact.

The authors of this study are two students that have significant different backgrounds. By doing a master thesis in finance, both of us have studied business for four years, and one of us has work and investment experience in Chinese capital market. Together with our financial statistics knowledge, we are sufficient to conduct this research. Furthermore, we believe that our research will be unbiased and objective without subjective preconceptions.

The interpretations in this thesis would be based on facts and data that we collected from reliable sources. In addition, we proceed our analysis and conclusions independently and unprejudiced.

2.2 Choice of subject

Our theoretical and practical background facilitated various discussions on many interesting research opportunities. From the start, we are attracted by the Efficient Market Hypothesis. As one of us has investment experience in Chinese stock markets, as well as its fast growing economy, we decide to investigate if Chinese stock markets are efficient or not. After reading the Edmans’ “Blockholder trading, Market Efficiency, and Managerial Myopia” (2009), we realize that the ownership may improve the market efficiency by trading activity. To connect this with our research target, the government is a crucial and unique player in the Chinese stock markets, and it is believed that the government is not as active as other players in the markets. Thus we finalize our
research to explore the market efficiency differences between private companies and government-owned companies in Chinese stock markets.

2.3 Research Philosophy

Johnson and Clark (2006) argued that the important issue is not whether their research should be philosophically informing, but how well they are able to reflect upon their philosophical choices and defend them in relation to the alternatives they could have adopted (Saunders et al., 2009, p. 108). This emphasizes that, what makes sense, is how well the process adopts the philosophical choices. The philosophy should be based on good arguments rather than being informing and shaped in a philosophical way. In this section, we will discuss three concepts of scientific philosophy: ontology, epistemology and axiology. In Figure 2.1 the research ‘onion’ shows the general picture of the research methodology alternatives on different levels.

Source: © Mark Saunders, Philip Lewis and Adrian Thornhill 2008

Figure 2: The research 'onion'

2.3.1 Ontology

Ontology, which extends both objectivism and subjectivism, carries on the assessment with the nature of reality. The research based on objectivism indicates that social entities exist in reality but are independent and external to social actors, whereas subjectivism assumes that social entities are not independent and external to social actors. The
Chapter 2 : Methodology

subjectivists believe that reality is created by perceptions and consequent actions of the social actors concerned with their existence (Saunders et al., 2009, p. 110-111).

In this paper, we study the efficiencies of different classes of companies in the Chinese stock markets. It is believed that the efficiencies independently exist in the world, and can be observed, categorized and measured. Also, this concept does not rely on the social actors. Correspondingly, the social entities that we are interested in this research, stocks in Chinese markets, are independent and external to social actors. Thus we choose objectivism as our ontological standpoint.

2.3.2 Epistemology

Epistemology defines what constitutes the philosophical underpinning of acceptable knowledge in a field of study. This enables us to gain a comprehensive knowledge and different procedures of explanation. That is, what is acceptable or legitimate with the way the researcher is doing this study. The epistemology theory can be seen as a requirement to follow the research procedure that is appropriate in different fields of studies (Saunders et al., 2009, p. 112).

Furthermore, the research process reflects two major views that contradict each other. They are positivism and interpretivism. Their initial meanings and how they are related to the different research will be summarized as following.

According to Bryman and Bell (2011, p. 15) positivism is an epistemological position to which reality should be derived from the methods of the natural sciences and applied to the social reality. This means that the researcher should not be influenced by different values and no values should affect the subject of the study.

Contrarily, interpretivism advocates that it is necessary for the researcher to understand differences between humans in the role as social actors. This idea reflects things differently. More important, the researcher has to adopt an emphatic stance in order to gain insight in the social world of the research subject and understand the world from their point of view (Saunders et al., 2009, p. 116). Consequently, many consider that an interpretivist perspective is highly appropriate in the area of business and management research, particularly organizational behavior, marketing, and human resource (HR) management.

In essence, the mentioned theories are well adopted depending on whether it is used as a positivism or interpretivism research. If the selected research is based on positivism then the researcher adopts the philosophical stance of the natural science. In positivism, in a research strategy the author has to collect existing theories to develop testable
hypotheses, which in turn tests by further researcher that would result whether to confirm or refute the theory in the research findings (Saunders et al., 2009, p. 113-114).

To resubmit our research question presented in chapter 1, it would be logical to base our research under the positivism philosophy. This means that the knowledge of something is true if we perceive it as it is. There, the researcher is examined for explanations as truthfully as possible. The same applies to our study since it is composed to collect data/information to discover and analyze the research question. The philosophy guided us to accomplish our goal through testing different theories, and therefore the positivism philosophy is appropriate to conduct our research.

### 2.3.3 Axiology

Axiology is the philosophical theory of value and value judgment that deals with all stages of the research process to improve the credibility of research results. Heron (1996, cited in Saunders et al., 2009, p. 116) enhanced the theory and argued that researchers exhibit the skills of the theory by being able to express their values and value judgments that are based on the research they are conducting and how they proceed. This is also used as a guideline for their research. We are attempting to process our research in a critical way without any presumptions. The sampling size should be large enough to conduct a significant test, as the theories are used in appropriate manner. By all likewise efforts, it might improve the credibility of our study.

### 2.4 Research Approach

There are basically two different approaches to the study, which explain the links between theory and reality, namely deductive and inductive methods. Our study will take a deductive research approach. It is suitable for descriptive studies since the researchers have tested existing theories and hypotheses. The deductive research approach enables the researcher to be independent in his or her observing but in an operational way measure the facts. As Locke mentioned in his argument of inductive and deductive method, “deduction involves going from the general to the particular.” (Locke, (2007))

In contrast, an inductive approach is making the researcher gather data/information, which is then analyzed in order to formulate a theory. The inductive approach is often used for a qualitative rather than a quantitative study (Saunders et al., 2009, p. 125-126).

The deductive method allows us to be objective and is more suitable for our study since the purpose of our study is to examine if there are any differences of the efficiency between state-owned companies and private companies. Building hypotheses and
testing would be the tools implied through a usage of existing literature and theories under the study. We base our study on deductive approach to process this study.

2.5 Research Strategy

There are multiple research strategies that can be conducted to a solid research, for example: experiment, survey, case study, archival research, etc. According to Saunders et al., (2009, p. 141), ‘what is most important is not the label that is attached to a particular strategy, but whether it will enable you to answer your particular research question(s) and meet your objectives’. Based on our research approach, archival research is the strategy that is able to provide the answer to our research question. The data of listed companies’ stock price and capital size as well as ownership, which are going to be analyzed, are recorded and documented. Thus, archival research will be conducted as the strategy of this thesis.

2.6 Research Method

There are two different methods that define how a researcher collects, uses and analyzes empirical data: quantitative and qualitative. Both methods are widely used in business management research and are distinguished in different ways. The characteristic of quantitative research is gathering data/information in the form of numbers and this eliminates the occurrence of any subjective judgments. The qualitative research tends to be subjective and focuses more on interviews and data categorizing than numbers. This gives a better understanding of the key concepts (Saunders et al., p. 151-152). Yet, other than this, Thurston et al. (2008, p. 3) argue that the mixed method is an option to combine methods from different paradigms as one. A mixed method research is which the researcher collects, analyses and mixes inferences in both quantitative and qualitative research into one single study. The module is useful when to supplement one research-information to another by using different data sources.

As the authors of this thesis, we have to manage our empirical data in an objective way so that the study can be generalized in a reliable manner, and a generalization can only be made if we operate trustworthy observations of data/information in companies listed in China. Examining data/information in the companies listed in China will clarify the implication of our research question. The data analyses we have chosen in this study are based on existing theories and not to create any new theory. We have therefore applied a quantitative approach to analyze data collection of large number of companies listed in the Chinese market.
2.7 Time Horizon:

In a study, either a cross-sectional or longitudinal can be chosen in time horizon. (Saunders et al., 2009, p. 155) A cross-sectional study grasps to inspect a particular phenomenon, within a short time frame. It is more suitable to use a cross-sectional method when comparing different segments. Longitudinal study, on the other hand, is a research set a period of time, namely to trail the effect of variables being studied. Since we examine the different degrees of market efficiency between state-owned and private listed companies, the cross-sectional study is more appropriate to conduct to our research. We believe that the time horizon of the last five years may provide us reliable observations. It may be argued that the five years is not a short time period. However, considering our aim of this research is to compare market efficiency between different segments in Chinese stock markets, it constrains our time horizon as cross-sectional. If we were attempting to illustrate how the market efficiency situation has changed over years, the longitudinal method should be applied. The data collection and data analysis will be discussed in the empirical part.

2.8 Research Design:

Research design is the model that is based on theoretical considerations to distinguish the way we think and how we conduct to our study. Bryman and Bell (2011, p. 40) demonstrate that the research design is a framework of how a researcher collects and analyses data and its procedures. This framework is further described by Greener (2008, p. 38) who remarkably indicates that a research design is a grand plan of approach to a research topic. He even highlights: before designing the research topic, it must have been assessed and considered various views on truth both knowledge and social entities. Saunders et al., (2009, p. 136) refer to the same formulation as above. There they mean that a research design is attended as a guide in answering the research question. The method consists to how we have preceded our study.

2.8.1 Research Objectives

The research objectives of our study are clearly stated in our early discussion of research question. We are trying to determine if the degree of market efficiency is different when we compare state-owned public companies and private companies.

To achieve the objective, we have decided to break down into following steps:

1. Examine the market efficiency of individual companies, and compare the sampled companies by two classes: state-owned and private.
2. Compare the sampled companies based on the capital size of companies to
illustrate the size’s influence on market efficiency.
3. Testify the existence of anomalies in Chinese stock markets.
4. Finalize the result from data, and answer the research question.

This enabled us to decide our approach to research design as a base of the setting research objectives.

2.8.2 Research Process of our study

To choose an appropriate research philosophy, it is very important to gain a correct understanding of the way we portrayed our research question. In previous sections we have discussed different research philosophies that might be the stances of our research process. We examined which philosophies were more suitable for the research. As the research mainly focuses on descriptive study, it tends to apply to positivism with deductive approach because of its research question. Based on these considerations, this study is highly adopted a quantitative method. Finally, we also conduct archival strategy to the study, as it applies to descriptive study and uses of administrative records and documents as a principal source of data (Saunders et al., 2009, p. 150). To exam the market efficiency we need to use price data and other relevant information about the companies. Thus, archival strategy suits our research. Our study is based on a cross-sectional time horizon. Here we present our research design by our own research ‘onion’
Chapter 2 : Methodology

Figure 3: The research 'onion' of our study according to Saunder et al.

2.9 Source of Literature

In our study, we want to refer to peer-reviewed materials that have scientific acceptance. To weigh this up we selected books, articles, journals and web-based sources that support the objective of our research.

The books we chose are mostly related to our research field. And some of them are widely used as course literatures. In addition, the books regarding to the methodology and statistics are also used as a guideline to support our thesis. The articles and journals are mainly accessed from Google Scholar search engine and the Scopus database from the Umeå University Library. We collected extensive international business articles and journals by exploring the keywords such as ‘market efficiency’, ‘degree of market efficiency’, ‘Chinese stock market’ and etc. We choose the most relevant ones to extent our knowledge about our study. And the web-based sources are used only if they are officially published by governments, institutions and companies.

2.10 Criticism of Literature:

To justify the quality of different sources it is important to consider the relevance and its scientific foundation (Saunders et al., 2009, p. 93).

The books acquired in this paper are believed to be good quality and relevant to our study. Being as course literatures implies that they define and explain the concept detailed and thorough. They provide a clear view of the concepts that are related to our research.

These articles and journals are published in various years range from late 1960 to 2010. As time passes, the main concepts of these articles are developed in a consistent way, which means that they are reliable to be referred to. Some articles may come up to result conflict to others, mainly because of the different methods they are using regarding the same issue. These conflicts in fact reflect the different views of previous researchers and the complicated market situations. This required us as authors to review them in a more critical approach, thus enhance the solidity of our research.

Also, the web-based sources contribute to the reliability of our study, although, they are not as solid as scientific articles. Government and institutions are regard as authorities, the data and information from them are approbatory and widely used. The used data and information from the listed companies are under direct of CSRC standard and are provided to the public investors. Thus, the reliability of these sources is ensured.
Chapter 2 : Methodology

As mentioned above, the selection of the literature is assumed to prove the quality of this research and to fulfill the requirements and conditions to conduct a scientific research
Chapter 3: Theoretical Framework

This chapter explicates the relevant Efficient Market theories to answer our research question. We start from the Efficient Market Hypothesis, followed by Random Walk Theory. Capital Asset Pricing Model and Value at Risk are used as the instruments to conduct this paper. At the same time, we include those concepts conflict or challenging the Efficient Market theories. Previous studies about the efficiency of Chinese markets are deposited as referred material.

3.1 Theories

3.1.1 Efficient Market Hypothesis (EMH):

Fama Eugene developed the Efficient Market theory in 1970 based on previous research, such as Samuelson’s random walk theory in 1965. The Efficient Market theory, in general, asserts that the price of securities should fully reflect all available information. The price of the security should always be the fair price. Thus, if market is efficient, no one can achieve abnormal return compared to average level. The mathematical way to describe EMH is that:

$$P_t = \frac{E[P_{t+1} | Info_t]}{1 + r Info_t}.$$  \[3.1\]

Where, $P_t$ is the price of securities at time $t$, equal to $E[P_{t+1} | Info_t]$, the rational expectation of securities at time $t + 1$ by given value-based information $Info_t$ at time $t$, divided by expected return $1 + r Info_t$.

In Fama’s 1970 research, he distinguished three situations of market based on different efficient levels. They are weak form, semi-strong form, and strong form.

Weak form: Price of the security fully reflects all historical information that may be contained in the historical prices and returns. In a weak form market, the price cannot be predicted based on previous prices or return. In mathematic term, if the price or return of the security shows as below, it means it is not a weak form:

$$P_{t+1} = f P_t \quad \text{or} \quad r_{t+1} = f r_t.$$  \[3.2\]

Where $r_t$ is the return of the security at time $t$, and $r_{t+1}$ is the return at time $t + 1$. It indicates that the price or return of the security is somehow related to its previous price of return. Investors cannot forecast the future price of the stock based on securities’ historical data, if the market is in weak form.

Semi-strong form: Price of the security fully reflects all public information (available to
all market participants). Public information includes the previous prices of the stock, financial reports of the companies, and other relevant news or information that regard to the listed companies. In contrast, some private information or so-called insider information can influence the price of the stock, such as new contract, unexpected tax or debt waive, acquisition from other companies and etc. This kind of private information is only available for small groups of people, who are insiders of the stocks like top managers, investment bankers, and major shareholders. But, the insider trading is prohibited in most of countries, and it is also forbidden in China (Ogden et al., 2003).

Strong form: Price of the security fully reflects all available information (both public and private). In strong form market, historical and public information are used to price the securities by public investors, and insiders are using private information to adjust the security’s price also. Thus no one can beat the market. The return would be the same no matter the investors are following an active strategy or a passive strategy. There is no existing strong form market in the world. First of all, insider trading is forbidden in most countries over the world, it is impossible that stock price reflects the value of inside information. Empirically, insiders can achieve abnormal return by trading on private information, which conflict with strong form hypothesis. On the other hand, funds or investors can beat the market just by ‘luck’. The returns of hundreds of thousands funds and investors should follow a normal distribution, thus, beat the market situation appears time to time (Ogden et al., 2003).

3.1.2 Random Walk Theory:

The random walk model was mentioned first by French mathematician Bachelier in 1900. Other researchers later develop this theory (Paul Cootner 1964, Paul Samuelson 1965, and Eugene Fama 1970). The theory demonstrates that the previous movement in the market price cannot be used to anticipate the future prices. In other words, stock price movements are unpredictable and impossible to foresee which direction the price will move; either will be up or down. So no individuals can beat the market. This theory is well commonly used when we talk about the market efficiency.

\[
\begin{align*}
S_t & = S_0 + \mu t + \sigma \epsilon_t, \\
\sigma \epsilon_t & \sim N(0,1)
\end{align*}
\]

Or

\[
S_t = S_0 + \sum_{i=1}^{t} D_t
\]

Where

\( S_0 \) is the start point of security price. \( D_t \) is the price difference between time \( t-1 \) and time \( t \), or so-called steps. \( D_t \) is independent with mean \( \mu \) and standard deviation \( \sigma \). So

\[
E(S_t) = S_0 + \mu t \quad \text{with} \quad \text{Var}(S_t) = \sigma^2 t.
\]

The mean \( \mu \) is the drift that indicates the general direction of the random walk (Ruppert, 2004, p. 82). If \( D_t \) is normally distributed, then the process of \( S_0, S_1, \ldots, S_t \) is a random walk.
Mean and bounds (mean plus and minus one standard deviation) on a random walk with $P_0 = 0$, $\mu = 0.5$, and $\sigma = 1$. At any given time the probability of being between the bounds (dashed curves) is 68% if the distribution of the steps is normal.


**Figure 4: Random walks and bounds**

In the reality, the return is more commonly used in financial world. And natural logarithm return is more convenient for measuring multi-period returns. It simplifies the product of returns by summing up single period log returns.

$$r_t = \log 1 + R_t = \log \left( \frac{P_t}{P_{t-1}} \right), \quad [3.4]$$

Or

$$P_t = P_0 \exp(r_t + r_{t-1} + \ldots + r_1)$$

Only if $r_1, r_2, \ldots r_t$ are following independent $N(\mu, \sigma^2)$.

By the influence of log return of security prices, the random walk process should be changed into geometric random walks or exponential random walk.

However, the geometric random walk model implies that future price changes are independent of the past and therefore not possible to predict, but it does not imply that one cannot make money in the stock market (Ruppert, 2004, p.83). In most cases, the mean $\mu$ is positive, thus an upward trend exists to the random walk. Considering that, only future deviations from the trend cannot be predicted, still the trend itself can be foreseen once $\mu$ is estimated (Ruppert, 2004, p.83). This is a condition that matches the weak form efficient market. The geometric random walk is the theory we are mainly concerned in this paper.

### 3.1.3 Degree of Market efficiency

As argued by Los in his essay 2005 “Measuring the Degree of Financial market
Chapter 3: Theoretical Framework

Efficiency”, in order to measure the degree of market efficiency, a new practical tool or instrument is needed to evaluate the risk level for both short-term and long-term nonlinear time horizons and for strict non-stationarity. ‘The empirical financial markets are just not as efficient as is theoretically assumed in the financial textbooks. The financial markets cannot be divided in black or white, and they cannot be separated into either inefficient or efficient. The financial markets exhibit a continuum of different degrees of efficiency. Since this is the empirically observed case, financial research has to concentrate on different issues.’ stated by Los (2005). In our thesis, we tend to interpret the degree of market efficiency differences between various ownerships and market capitalizations. An indicator is required to measure this concept. The degree of market efficiency is the measurement that to what extent the market unpredicted. For stock markets, one market having relatively more unpredictable stocks is believed more efficient than the one with more predictable stocks. Simply, we use the proportion of the stocks following Random Walk Theory as the measurement of the degree of market efficiency.

3.1.4 Capital Asset Pricing Model

CAPM model was first introduced by William Sharpe (1964), John Linter (1965) and Mossin (1966). It is designed to evaluate the performance of managed portfolios (Fama and French 2004). Sharpe illustrated that the covariance between the security’s return and that on market portfolio is the most important part. The equation of CAPM model is:

\[ E \, R_s = R_f + \beta (R_m - R_f) \]  \[3.5\]

Where \( E \, R_s \) is the expected return of the security or portfolio. \( R_f \) is the risk free rate, which in other word the return of a benchmark risk-free instrument. \( R_m \) is the market portfolio return. And \( \beta \) is the coefficient of the link between market portfolio and security or portfolio. This equation indicates that the individual security’s return should somehow correlate to the market return or relevant index return if the risk-free rate is excluded.

Moreover, the CAPM model is the theory grounded on assumptions, which simplify the reality. According to Bodie et al. (2009, p. 280), these assumptions are:

1. There are many investors in the market. None of them have an endowment are sufficient enough to affect the security prices by their own trades.
2. The holding period of investment is identical.
3. Investments are restricted. Investors are allowed to put their money only in a universe of publicly traded financial assets such as stocks and bonds, and risk-free borrowing or lending arrangements. It is also assumed that investors may borrow or lend any amount at a fixed, risk-free rate.
4. Taxes on returns and transaction costs on trades are irrelevant.
5. All investors are rational expected return-variance optimizers.
Chapter 3: Theoretical Framework

6. All investors have homogeneous expectations of the securities and share the same view of economy. All these assumptions should be reminded when adopting CAPM model.

Some researchers also criticize the model for its idealistic assumptions. The reality is more complex, i.e. taxation and transaction cost do exist. Not all investors are rational. In addition, investors do not always have homogeneous expectations of the securities.

3.1.5 Value at Risk (VaR)

Value at Risk is a measurement of risk firstly used by J.P. Morgan as an internal risk management system to illuminate the next-day potential losses on the bank’s entire portfolio. (Ruppert 2004, p. 346) Later, Value at Risk is widely used around the world for its flexibility to assess various risks of all types of securities. There are two kinds of Value at Risk, namely nonparametric and parametric VaR.

Nonparametric VaR is also known as quantile of a distribution. It is the value below which lies \( 1 - \alpha \) of the values, where \( \alpha \) is the confidence level. For instance, \( VaR \ 5\% \), \( T = -S \times r \ (the \ 5\% \ quantile \ of \ all \ returns) \) means that we are 95% sure that the largest loss of investment should not exceed \( S \) total investment times the 5% lowest return in \( T \) periods. Non-parametric VaR suits when the return of the security is following a non-parametric distribution. The non-parametric VaR is mainly concerning the historical data of the security return. (Ruppert 2004, p. 346-347)

If the return of security is following a parametric distribution, e.g. normal distribution, parametric VaR is a more appropriate method compare to nonparametric VaR. The parametric VaR is more accurate comparing to the non-parametric one. \( Para - VaR \ 5\% \), \( T = -S \times (\mu - 1.96 \cdot \sigma) \), \( N(\mu, \sigma^2) \) means that the largest loss of the security is \( S \) total investment times 5% quantile of the return in \( T \) periods (Ruppert, 2004, p. 348).

Furthermore, both parametric VaR and nonparametric VaR can be recognized as either relative or absolute (Jorion, 2007, p.108). Relative VaR is measuring how much money can be lost comparing to the project average return, while absolute VaR is the money lost relative to zero or without reference to the expected value (Jorion, 2007, p.108). The non-parametric VaR we mentioned above is absolute VaR, while the parametric one belongs to relative VaR. In this paper, assumed that we invest same amount of endowment into each individual stock and we are mainly concern about the stocks that have normal distribution returns. Considering that for normally distributed returns, parametric VaR provides a more precise picture of the risk level together with our interest of the relative loss based on stocks’ potential returns. We are employing relative parametric VaR to our study.


Chapter 3 : Theoretical Framework

3.1.6 Anomalies:

Anomalies or market inefficiency are found by empirical results that seem to be inconsistent the hypothesis of market efficiency (Schwert, 2003 p,940). In EMH, there is no possibility to obtain any abnormal returns if it is a strong-form market. Henceforth, it is impossible to observe any anomalies. In fact, none of real markets are running in the strong-forms. It is interesting to observe that some factors become anomalies in the global markets.

Here, in this paper, we categorize anomalies to five segments: time effect, size effect, value effect, momentum effect and other anomalies. These are widely known and observed in the western capital markets. We provide this information as important references for the challenge of the Efficient Market Hypothesis.

3.1.6.1 Time Effects

The time effect or seasonality is concerned about that investor can obtain abnormal returns by investing in particular period of time. In other word, the price of securities may follow a pattern based on the time horizon. Then investors could predict the price of securities. This is inconsistent with the weak-form efficiency. The time effect includes: the weekend effect, turn-off-month effect, January effect, turn of year effect, and other calendar effects.

In 1980, French (1980) observed that the average return to the S&P composite portfolio was consistently negative over weekends in the period 1953-1977; this effect is named as weekend effect. In the period of 1978 to 2002, the weekend effect is materially less than the previous period and not significant different from other weekdays. The effect seems to have disappeared or attenuated since its first documentation in 1980.

Turn of the Month Effect shows that the stocks returns are climbing up around the turn of the month. According to McConnell and Xu (McConnell & Xu, (2009)) ‘turn-of-the-month is defined as beginning with the last trading day of the month and ending with the third trading day of the following month.’ Frank Russell and Co. (Hensel & Ziemba, (1996)) have examined the returns of the S&P 500 over 65 years finding that U.S. large-cap stocks regularly gain more returns at the turn of the month. Together with other research, most of the positive return to stocks ensued during the turn-of-the-month interval for over 109 years.

According to Haugen and Jorion (Haugen & Jorion, (1996)) January month is conceivably the best known of anomalies behavior in security markets, and historically generates the highest abnormal returns in stocks as general. The reason of January effect is different from country to country. In America the effect can be explained that
Chapter 3: Theoretical Framework

Investors tend to sell their securities in December due to the tax-loss selling (Roll, 1983). Although, some countries do not use December 31st as tax-year end, the January effect still exists.

Turn of the year Effect is quite similar to January Effect. Keim (1983) and Reinganum (1983) investigated that the abnormal return to small firms occurs during the first two weeks in January. This can also be explained by Roll’s tax-loss selling hypothesis, since the small-cap companies have a high level of volatility and investors may suffer substantial short-term losses.

3.1.6.2 Size Effect

The size effect was firstly documented by Banz (1981) and Reinganum (1981). They found that small-capitalization firms in New York Stock Exchange (NYSE) were more profitable than those largest companies on average by using capital asset-pricing model (CAPM) from 1931-1975 (Schwert, 2003). The risk parameter of small firms may be underestimated and argued as the reason of size effect (Roll 1981 and Reinganum 1981). Christie and Hertzel (1981) explained that the current economic risk might be different from the historical risk for small-cap companies. The small-cap firms are becoming more and more risky considering their low level of survival probability, while the risk of CAPM model is associated with previous data. The risks of small-cap firms are underestimated by utilizing CAPM model.

In this paper, we study the companies listed in Chinese stock markets both state-owned and private. There is absolutely size disparity into those companies listed. The state-owned tend to be larger than the private. Besides, institutional investors are more in favor of state-owned companies, while individual investors prefer to put their money in private companies. Hence, we think size effect is interesting to observe in our study.

3.1.6.3 Value Effect:

According to Basu (1977, 1983) the anomaly of value effect states to the observation that firms with high earnings-to-price (E/P) ratios generate positive abnormal returns relative to CAPM. Including high dividend yields (D/P) stocks or stocks with high book-to-market (B/M) values in the portfolios are two strategies that may produce positive abnormal returns. These abnormal returns are related to the fundamental value of the companies. It stands for weak-form efficiency but challenges the semi-strong and strong forms. The value effect is argued that it is a fault in CAPM model rather than market inefficiency. Ball (1978) observed the evidence that supports this argument. And many other international researches are supporting the value effect by the data from different countries.
Chapter 3: Theoretical Framework

Fama and French (1992, 1993) considered that the size and value (in terms of book-to-market value of common stock) are two risk factors, which are missed from the CAPM model. Fama and French developed a three-factor model to improve the CAPM model by identifying the effects from size and fundamental value. The three-factor model is showing as follow:

\[
R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \gamma_i SMB_{it} + \delta_i HML_{it} + \epsilon_{it}, \quad [3.6]
\]

Where:
- \(R_{it} - R_{ft}\) is the expected return of portfolio by adjusted the risk.
- \(\alpha_i\) is abnormal performance.
- \(\beta_i\) is measuring the exposure to market risk.
- \(R_{mt} - R_{ft}\) is the market risk premium.
- \(SMB_{it}\) is the return difference between portfolios of small- and large-cap companies.
- \(HML_{it}\) denotes the return difference between portfolios of high and low B/M ratio firms.
- \(\gamma_i\) and \(\delta_i\) are regression coefficients related to \(SMB_{it}\) and \(HML_{it}\).
- While \(\epsilon_{it}\) is the noise.

Some may criticize about the three-factor-model. Since the model is based on the data of stocks from U.S. market, the model may be country specific (Griffin 2002). Data snooping is the other question raised by critics. Researchers also argue that the three-factor-model is conflicting with the observed Momentum Effects. The reason that the size and value indicators (B/M ratio) are risk proxies are not explained in Fama and French studies.

3.1.6.4 Momentum Effects

There are two momentum effects: Debondt and Thaler (1985) found the ‘contrarian’ effect whereby past losers (stocks with low returns in past three to five years) have higher average returns than past winners (stocks with high returns in past three to five years); while ‘continuation’ effect was observed by Jegadeesh and Titman in 1993 that recent past winner (portfolios formed on the last year of past returns) out-perform recent past losers.

3.1.6.5 Other Anomalies

Announcement Based Effects and Post-earning announcement drift (PEAD)
Both announcement based effects and Post-earning announcement drift are concerning that the market is reacting to the new information with lags. The market had to take three or four weeks to react to the new information in the 80’s, and it accelerated to two days currently. The new technologies (e.g., computer, internet) facilitate to achieve information diffusion and to react more efficiently.
Chapter 3: Theoretical Framework

IPO’s offerings and buy-backs
When the company comes to the Initial Public Offering (IPO) procedure, it is most likely that it faces two IPO-related anomalies: the IPO underpricing anomaly and the post-IPO underperformance anomaly. The first named anomaly is mainly coursed by spread offering price and the secondary market price, according to Ogden (2003, p.410). The second anomaly states that the IPOs underperform other stocks in the aftermarket for up to three years. Some studies explain that the Post-IPO underperformance is linked to small firm and low book-to-market ratio. Thus, it may be another symptom of size effect or value effect.

Insider transactions:
The relationship between transactions by managers and directors of the firms and the stock’s performance are documented many researches. Insider buying is considered as a signal that the insiders believe that the stocks of their firm are undervalued. Many researchers’ questions are still including: whether the gains are significant and whether they will occur in the future. The insider transactions are consistent with strong form efficiency, but most countries prevent this kind of trading. In addition, institutional investors can be recognized as insiders since they are digging deep into the companies and have more private information compared to the public. Numerous studies emphasize that the institutional investors improve the market efficiency by trading the stocks based on the information they obtained. This is the starting point of our research, considering that the government companies would only trade their stocks in rare cases no matter the performance of the companies or information they got. This is on the opposite side of institutional investors. Hence, it is interesting to discover how government ownership affects the market efficiency.

The S&P Game:
Shleifer, Harris and Gurel in 1986 figured that the stocks upswing immediately after being added to S&P 500 index. This appearance is repetitively observed by other researchers. The recent studies are also discussing about other indexes. Liquidity, transaction cost and intra-day trading are also believed as anomaly factors, since our research is mainly focusing on the informative efficiency, they will be excluded.

Additionally, most anomalies can be explained by data snooping. This phenomenon is about the result of certain researches are only applicable for the samples they collected or a particular time period in their studies. Some of the mentioned effects are disappeared or attenuated since they were first documented (Schwert 2003). The knowledge of anomalies benefit the investors if they utilize the strategy to arbitrage based on these anomalies. Therefore, the arbitrage position does no longer exist.

As we mentioned earlier, we are highlighting the market efficiency in the Chinese stock
markets by comparing the ownership, management style and market value. These factors may be the anomalies existing in the Chinese stock markets, and may provide the investors abnormal returns. We verify these factors based on the previous research methodology of anomalies.

3.1.7 Behavioral Finance

One of the major challenges for Efficient Market Hypothesis is that not all investors in the market are rational. Behavior finance is studying what psychology factors in earth affect the investment decisions (Ruppert, 2004, p. 435). Human behavior is difficult to predict. There are thousand Hamlets in thousand people's eyes. Different investors have different interpretation of same information. In fact, since the investors have different information, it is hard to achieve homogeneous expectations of the market. Cognitive biases are leading investors to an irrational situation: investors may have overconfidence of their predictions or overreact to the unforeseen information no matter how good or bad they are (Ruppert, 2004, p. 437). Human errors in reasoning and information processing are the key elements to explain the irrational investment decision, which is contradictory to the assumption of Efficiency Market Hypothesis that the investors in the market are rational.

It is argued that prices following random walks do not imply rational investing, because random walk behavior could also be due to random irrational behavior of investors (Ruppert, 2004, p. 437). Also, the short-term random walk of stock price does not indicate the price following random walk over long time horizons.

Irrational trading can be observed when economic bubbles come into stage. The price of assets is always overvalued right before the bubble burst. Overreaction is also one kind of irrational trading. Debondt and Thaler (1985) believed the momentum effect is due to the overreaction of irrational traders. Black (1986) named noise traders when investors react to irrelevant information. Under-reaction is used to explain that the earning surprise affects the stock price for two or three quarters rather than adjusting the price immediately. Meanwhile, there are empirical evidences that the large price changes may happen even if there is no relevant information coming to the public. Roll (1988) found that the correlation of returns of stock and public firm-specific news is lower than EMH theory states.

3.1.8 Chinese Capital Markets and State-Owned Enterprises (SOEs)

Since late 1970’s, China transfers to a market orientated economy, and boost rapidly for the last three decades. Standing with Brazil, Russia and India, China is one of the four most major spectacular emerging markets. The Chinese bond markets are still dominated by government bonds, central bank notes with a slowly developed credit
Chapter 3: Theoretical Framework

bonds market. In 2010, a total of RMB 9.51 trillion bonds was issued, 98.3 percent were from the inter-bank bond market. Central bank notes, government bonds and policybank debentures occupied 82.8 percent of the total issue (KPMG, 2011). The Chinese stock markets origin from early 1990’s, and have today become one of the largest stock markets in the world. The start of the Chinese stock markets is also regarded as the origin of the Chinese capital market.

As a socialism country, state-owned enterprises are the engines of the economy growth. U.S-China Economy and Security Review Commission categorizes state-owned enterprises into three types. First enterprises are fully owned by the state through the State-owned Assets and Supervision and Adminstration Commission (SASAC) from national level to the country level. Second, some enterprises are not officially considered as SOEs but are effectively controlled by their SOE owners through complex share holding structure. Finally, there are entities owned and controlled indirectly through SOE subsidiaries based inside and outside of China. Same as the Chinese economy, the Chinese stock markets are foundation on the State-owned Enterprises. OECD (2005) stated that 71.7% of Chinese listed companies are state-owned holding enterprises by the end of 2004.

To become a listed company, it may diversify the risk of company owner’s portfolio, decrease the leverage of the company and decrease the cost of capital; also, the oppunity of using stock and stock option as compensation to align the managers and employees with the share holders’ interest. (Ogden et al. 2003, p. 389-390) As a state-owned enterprise, to be a public company can improve the performance of the company by using shares or options as incentive device, even though most SOEs do not face finance distress, it still cut the capital cost by issuing public shares.

In China, it is common for state-owned companies to go public on both domestic and foreign capital markets.

In this paper, we inspect the market efficiency differences between state-owned companies and private companies which are listed in Shanghai and Shenzhen stock markets.

3.2 Literature Review

Numerous researches regarding to the Chinese stock markets have been done in last two decades. Bergstrom & Tang (2001) figured out that the B-shares were selling with a discount comparing to A-shares based on the data form 1995 to 1999. While He, Wu & Chen in 2001 illustrated that the B-share investors were facing a higher level of informed trading (with less information about Chinese markets comparing to the
Chapter 3: Theoretical Framework

domestic investors) and other market making costs that have ended up with higher return volatility.

There is no widely accepted uniform opinion if Chinese stock markets are efficient or not. Some researches concluded that the Chinese stock markets are not even standing for the weak form efficient. Hung (2009) examined the Chinese stock markets by using several Variance Ratio (VR) tests. He interpreted that according to the data from 1996 to 2005 Chinese stock markets were not weak form efficient. The Shanghai A share is the most efficient share. Together with Liu’s (2010) research, the result from his multiple methods examination of market efficiency does not support for weak form efficiency.

On the other hand, Groenewold et al. (2003) explored that Chinese stock market is efficient in weak form, although day of the week effect and holiday effect existed in Chinese markets. Fifield and Jetty in 2008 also concluded that Chinese stock markets are in the weak form efficiency. The data from 1992 to 2007, used by Charles and Darne indicated that A shares are weak efficient in both Shanghai and Shenzhen markets, but B-shares are not following random walk.

In general, there is no doubt that A shares are relatively more efficient than B shares, and the deregulation of B shares was made to improve the market efficiency. Also Groenewold et al. (2003) emphasized that the involving of banks are improving the market efficiency while Charles & Darne stated that including or excluding banks have no impact on market efficiency.
# Chapter 3: Theoretical Framework

## Table 3: Previous studies on the weak form efficiency for Chinese stock markets

<table>
<thead>
<tr>
<th>Weak form or not</th>
<th>Authors</th>
<th>Year</th>
<th>Methods</th>
<th>Time horizon</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Charles &amp; Darne</td>
<td>2009</td>
<td>VR</td>
<td>1992-2007</td>
<td>A-shares are weak efficient in both Shanghai and Shenzhen markets. Banks have no impacts on efficiency. B shares are not following random walk. Deregulation of B shares improves the efficiency.</td>
</tr>
<tr>
<td>Chinese stock markets are not weak form efficient.</td>
<td>Hung</td>
<td>2009</td>
<td>VR (lo-mac, Wright, Chode)</td>
<td>1996-2005</td>
<td>Shanghai A is more efficient than rest three Markets. Market efficiency is improved after relaxing the B-share regulation.</td>
</tr>
<tr>
<td></td>
<td>Tianshu Liu</td>
<td>2010</td>
<td>Multi methods (Unit Root, Autocorrelation BDSL, etc.)</td>
<td>2001-2008</td>
<td>Chinese markets are not weak form efficient.</td>
</tr>
</tbody>
</table>
In these studies, different methods are conducted to examine if the markets are efficient in weak form. They also cover the different time periods of the markets, varying from 1992 to 2008. It seems that even similar methods testing stock markets behaviors in same time period may end up to different conclusions (Fifield & Jetty, 2008 and Hung, 2009). All these indicate the complex and changing market situation of Chinese stock markets.

Some of the researchers also studied the market efficiency of Chinese stock markets in the perspective of semi-strong level. Su (2003) states that A-share investors do not appropriately predict the changes in earnings and fail to adapt to new earnings information immediately. Thus, abnormal returns can be achieved by exchanging on the earnings information, but it is only valid for A-shares. After investigating 76 firms, which issue both A-shares and B-shares. Chan et al. found that domestic investors either are more informative or react to the information faster than do foreign investors in 2007.

Since insider trading is prohibited in Chinese stock markets, and since some funds are providing better returns than others, we believe that strong form market efficiency cannot stand in Chinese markets. As far as we know, no strong form markets existing in the world theoretically or empirically, it is not interesting to review Chinese stock markets from the strong form perspective.

The Chinese stock markets are also a good place to implicate behavior finance theories. Demirer and Kutan (2006) figured out that herd formation does not exist in Chinese markets. It indicates that the Chinese investors are rational. They observed that return dispersions are much lower during extreme downside movements of the market comparing to those for upside movements. The findings support market efficiency. Wang et al. (2006) demonstrate that Chinese individual investors commonly underestimated the risk in stock markets. They have lower risk perception on subjective risks than objective risks. Hence, a speculative investment culture is formed among the individual investors in China. The institutional factors have greater impact on the investment decisions due to the collectivistic culture in China. According to Ren & Zhong (2011), the market reflects to the institutional purchases and sales inversely. The institutional sales influence more on price than institutional purchases.

### 3.3 Summary of Theoretical Framework

The Efficient Market Hypothesis developed by Fama and French is the guideline of our thesis. It is concerning about if market reacts to the new information of the company rationally and actively. There are three forms of Efficient Market: weak, semi-strong and strong. To test Efficient Market Hypothesis in any selected market, it always starts from examining the weak-form efficiency. One of most common methods applied to
affirm weak form efficient market is Random Walk theory. The Random walk theory states that the price of tomorrow should be independent from the price of today. Investors cannot predict the price by its historical price data in the market, which is in weak form. Based on Random walk theory, the degree of market efficiency is a measurement of market efficiency between different market segments. It is defined as the proportion of the stocks following Random Walk theory in each segment.

To evaluate the risk level of each stock, CAPM model and VaR are two widely used approaches. On the one hand, CAPM model is grounded on its assumptions. These assumptions drive the CAPM model hard to apply in the reality world. On the other hand, VaR is simply a reflection of its historical data. The VaR is more practical and close to the reality rather than CAPM model.

Anomalies are the challenges of the Efficient Market Hypothesis. Many different anomalies are observed and studied by academics. Time, size, value, and momentum are four main types of anomalies. Fama and French developed CAPM model to Three-Factor model in order to harmonize some of these anomalies effects. Together with behavioral finance theories, the reviewed literatures provide us a critical thinking when we discuss our research.

Based on previous research on institutional investors’ influence on the stocks short-term efficiency, we are interested to investigate various efficiency levels between the companies with different ownerships. Government ownership is widely debated before and after the financial crisis. We want to illustrate the impact of governmental owning on the financial market. As a growing economy and dominant by SOE, Chinese stock markets are fitting our study. Considering the proportion of SOE in the market and the population of SOE. We start our study by picking the companies only from SSE and SZSE rather than including Hong Kong’s stock market. The influence from State ownership in Hong Kong stock market is believed diminished by the lower proportion and its international trading environment. As a new approach of study, we think it is better to begin in a more specific market.

After all, we are going to generalize our own research model by combining previous literature framework:
We start our research by selecting samples in Chinese mainland markets; categorize them into different groups by ownership structures, sizes and different management styles. We test their market efficiency according to the Random Walk theory afterwards. To check if the companies in various ownership structures have a significant efficiency imparity, we compare the return of these companies on their risk levels indicated by the companies’ VaR. Also we test if all previous category criteria are anomalies in the Chinese stock markets. All of our study is under the Efficient Market Hypothesis.
Chapter 3: Theoretical Framework

Here is our model from and related theory framework:

![Diagram of the theoretical framework showing relationships between companies, ownership, management style, market value, and efficiency.](image-url)
Chapter 4: Empirical Study

This empirical chapter contains data collection process, description of our data and the formulation of our process procedure. The procedure comprises by seven steps and five hypotheses. The criticism of our methods is outlined in the end.

4.1 Accessing and Adjusting Data

The data that we utilized for the studying whether the degree of market efficiency of state-owned companies is different from the private companies in Chinese stock markets are accessed from Thomson Reuters DataStream in April 11th, 2012. We are only concerned with the equities listed in Shanghai and Shenzhen (noted as ‘Shenzen’ in DataStream) markets. Only companies listed before Dec 31st, 2006 are collected in order to match the time horizon. Both active and suspended stocks are taken in account. Active stocks are naturally interesting for researchers, while some of suspended stocks are also contributing on the efficiency of Chinese stock markets. Suspended stocks are classified into two different types: temporary and permanent. Temporary suspended stocks that can stop trading for a few days when material information will be disclosed or uncertain important issue happened to the company, such as shareholders meeting. Temporarily suspended stocks will become active stocks after suspension. On the other hand the permanent are those companies have deficits for years and in the process of bankruptcy or reorganize. They will not be able to trade for months or years. The permanent suspended stocks are excluded in our research considering they do not have sufficient non-zero daily return. Permanent suspended stocks are marked as ‘too few observations’. The dead stocks are not taken into account because there are only few companies delisted in China stock markets over the period of the study.

The daily-adjusted price of each company was derived from the DataStream data, while the information of ownership is taken from China Galaxy Securities’ trading software, Neptune and Hexun.com. China Galaxy Securities is one of the famous and largest securities trading firms in China. The software Neptune is providing the related information about the public companies ranging from their historical financial data to their operational decision. And the Hexun.com is an authoritative finance portal website, where people can find relevant information regarding to Chinese capital market. According to alexa.com's ranking, it is number 57 of top websites with highest daily views in China, and also the number 1 of those sites providing information specified on financial markets (Alexa 2012). Additionally, the total share numbers are also accessed from China Galaxy Securities.
4.2 Data Description:

Overview of data
There are 1543 companies listed in the Shanghai or Shenzhen stock markets from the period before Dec 31\textsuperscript{st}, 2006. 54 of them are not accessible from DataStream on the date April 11\textsuperscript{th} 2012. The study period covers 5 years and 60 months. For each company, 1305 daily-adjusted prices are collected. Eleven companies are excluded because of there are too few observations (less than 300 daily-adjusted prices). In total, there are 1478 valid companies that will be used in our research. (Shows in table 4.1.1)

Table 4: The overview of data

<table>
<thead>
<tr>
<th>Error</th>
<th>54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too few observations</td>
<td>11</td>
</tr>
<tr>
<td>Valid companies</td>
<td>1478</td>
</tr>
<tr>
<td>Total</td>
<td>1543</td>
</tr>
</tbody>
</table>

4.3 Data Analysis Procedure

4.3.1 Step 1: Log Return

To test if Chinese stocks are following random walk theory, or in other words, if Chinese stock markets are in weak form efficiency, we need produce log return from daily adjusted price.

\[ r_t = \log \frac{p_t}{p_{t-1}} \]

Where \( r_t \) is the log return.

4.3.2 Step 2: Normality Test

After testing if the distribution of log return \((r_t)\) for each company is independently normally distributed, we use both P-P plot and Q-Q plot together with skewness in SPSS to test the normality of log return distributions. Ruppert (2004, p. 85) points out that the skewness of the log returns should be close to zero. In our research, those companies, which have skewness more than 1, are not believed following normal distribution. According to the Central Limit Theorem, the independent and identical distribution can be converted into normal distribution in certain conditions. Considering that we have more than 1000 observations for each company, we test the normality of...
the log return for each company by P-P plot and Q-Q plot. To deny the log returns are normally distributed, it should be proved by both methods consistently.

**Table 5** is showing that there are 938 companies having log returns as normally distributed, and the rest 540 companies’ log returns are not normally distributed. Only those normal distributed log returns are used to test autocorrelation.

**Table 5: Number of stocks following normal distribution**

<table>
<thead>
<tr>
<th></th>
<th>Number of stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow the normal distribution</td>
<td>938</td>
</tr>
<tr>
<td>Not follow the normal distribution</td>
<td>540</td>
</tr>
<tr>
<td>Total</td>
<td>1478</td>
</tr>
</tbody>
</table>

**4.3.3 Step 3: Autocorrelation Test:**

According to the random walk theory, the return should not correlate to the previous return. To test the correlation of the log return time to time for each company, we utilize autocorrelation function of SPSS. Theoretically, the coefficient of autocorrelation should not exceed $\pm 0.05$ boundaries with 95% significant level. In our research, we loosen these boundaries to $\pm 0.10$ due to reality of Chinese stock markets (most listed companies have a coefficient within $\pm 0.05$ to $\pm 0.10$). Also, the purpose of this research is more about comparing market efficiency degree between different classes of companies, the loosen boundaries are acceptable. We set that: if a stock has any single day autocorrelation coefficient equal or exceeding $\pm 0.100$ boundaries, the autocorrelation exists.

**Table 6: Number of stocks with/without (partial) autocorrelation**

<table>
<thead>
<tr>
<th></th>
<th>Number of stocks</th>
<th>Percentage of total number</th>
<th>Largest single day (partial) autocorrelation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have autocorrelation</td>
<td>236</td>
<td>25.16%</td>
<td>0.364</td>
</tr>
<tr>
<td>Have only partial autocorrelation</td>
<td>18</td>
<td>1.92%</td>
<td>$\pm 0.106$</td>
</tr>
<tr>
<td>Have no autocorrelation</td>
<td>684</td>
<td>72.92%</td>
<td>Within $\pm 0.100$</td>
</tr>
<tr>
<td>Total</td>
<td>938</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

We produced 90-day lags autocorrelation to achieve a more precise result. From the table above we can figure that 72.92% of Chinese stocks have no autocorrelation, around quarter of all companies significantly have autocorrelation. 1.92% companies do not have autocorrelation but partial autocorrelation.
4.3.4 Step 4: Ownership Recognizing

By using the information provided by China Galaxy Securities and Hexun.com, we identify the ownership of each company that is valid for our research. We categorize the ownership into three different types based on its actual control. The ownerships are set as state-owned, private owned or other ownerships. The company is categorized as state-owned if its actual control is either government or Stated-owned Assets Supervision and Administration Commission (SASAC) at either local or national level. The company is recognized as private owned if it has individual shareholding as its actual control. Other ownerships are more complex, for example, institutions that their investment activities are not directly impacted by Chinese government such as university, or companies which are owned by labor union (collective ownership), foreign companies, or foreign institutions with complex ownership. Also, State-owned companies are distinguished into two different styles, actively managed and passively managed. Actively managed means that the companies used stock repurchases, private offerings or other strategies, which are led to a changed holding status. Passively managed companies are those consistently have a stable holding power during the examined period.

Table 7: The ownership structure of Chinese stock markets

<table>
<thead>
<tr>
<th>Ownership Type</th>
<th>Actively managed</th>
<th>Passively managed</th>
<th>Total</th>
<th>Log return are following normal distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>State-owned</td>
<td>720</td>
<td>192</td>
<td>912</td>
<td>463</td>
</tr>
<tr>
<td>Private-owned</td>
<td>461</td>
<td></td>
<td>461</td>
<td>278</td>
</tr>
<tr>
<td>Other ownerships</td>
<td>105</td>
<td></td>
<td>105</td>
<td>63</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1478</strong></td>
<td><strong>134</strong></td>
<td><strong>1612</strong></td>
<td><strong>938</strong></td>
</tr>
</tbody>
</table>

4.3.5 Step 5: Comparing the Market Efficiency of Different Classes of Stocks

In this step, we try to answer the research question of our thesis: “Is the degree of market efficiency of state-owned companies different from that of private companies in Chinese stock markets?” Degree of market efficiency of different ownership companies is measured by the proportion of the efficient ones among each ownership group. Since we classified three types of ownership groups, we start to answer our research question by identifying if the degrees of market efficiency are different through these three groups. To test the homogeneity of degree of market efficiency, we apply our Hypothesis 1:
Chapter 4: Empirical study

Hypothesis 1:
H₀: The degrees of market efficiency are the same among different ownership groups
Hₐ: At least one of ownership groups has a different degree of market efficiency from another one.

Or in mathematic term:
H₀: DoME_{state-owned} = DoME_{private}
Hₐ: DoME_{state-owned} ≠ DoME_{private}

Where DoE means degree of market efficiency
Chi-square test are used to testify this hypothesis

If the null hypothesis of Hypothesis 1 is rejected, a further test should be conducted to test if the degree of market efficiency of state-owned companies is different from private companies in Chinese stock markets.

Also, it is interested to know if the management of state-owned companies has any impact on market efficiency. A test is launched test to compare the degree of market efficiency between those state-owned companies that are either actively managed or passively managed. Thus, comes the Hypothesis 2:

Hypothesis 2:
H₀: The degrees of market efficiency are the same between actively and passively managed state-owned stocks
Hₐ: The degrees of market efficiency between actively managed and passively managed state-owned stocks are different.

Or:
H₀: DoME_{active} = DoME_{passive}
Hₐ: DoME_{active} ≠ DoME_{passive}

We use Chi-square test also to answer Hypothesis 2.

4.3.6 Step 6: Illustrating the influence of market value

As we mentioned previously, the size effect is one of the anomalies, which are in consist with Efficient Market Hypothesis. While, state-owned listed companies are more likely have a greater market capitalization, it is reasonable to refine the influence of market value.

To illustrate the influence of market value, we separate all stocks into 10 portfolios based on total market value of each companies at the end of 2011 Dec 31st. It is calculated by adjusted price at 2011 Dec 31st multiples the total market share of the stocks. For those stocks listed in B share markets, currency adjustment is made depending on the currency that they are trading with. We modify the stocks trading with foreign currency with its exchange rate on 2011 Dec 31st, which are 0.813 for Hong Kong dollar (HKD) and 6.319 for United Stated dollar (USD). We quote these exchange rates from Google finance.
In most cases, researchers (Banz, 1981, and Reinganum, 1981) are trying to compare between the portfolios with highest and lowest market value. But in our research, we try to illustrate all portfolios to have a clear view of the impact from market value.

**Hypothesis 3:**

H$_0$: The market efficiency is independent from the market value in Chinese stock markets.

H$_a$: The market efficiency is not independent from the market value in Chinese stock markets.

Or,

H$_0$: DoME$_1$ = $E$ DoME$_1$, DoME$_2$ = $E$ DoME$_2$, ..., DoME$_{10}$ = $E$ DoME$_{10}$

H$_a$: At least there is one DoME$_n$ = $E$ DoME$_n$

Where, DoME$_n$ means that the degree of market efficiency of number $n$ decile, and $E$ DoME$_n$ means the expected value of number $n$ decile’s degree of market efficiency.

The stocks are clustered by their market value on the end of 2011. Again, Chi-square test is easy and simple way to illustrate the relation between market value and market efficiency.

### 4.3.7 Step 7: Anomaly Test

According to Efficient Market Hypothesis, abnormal return cannot be obtained in efficient market. To reinforce our result, we are testing if abnormal return can be achieved by defined portfolio by ownership, market efficiency, or market capitalization. In previous research, abnormal return is illustrated as a higher return at similar or comparable risk level. The risk is measured by for example CAPM modal or Fama and French Three-factor model. Market risk are measured by relevant index, while in our case, it is unreasonable to have one or a few relevant index for each individual stocks. Thus we use the Value at risk as the risk indicator to examine if abnormal return can be achieved by our classification.

In this step, we begin with identifying if the abnormal return can be achieved due to the ownership together with market efficiency. A two-step test is used to accomplish this task.

**Hypothesis 4**

H$_0$: The average log returns of different ownership groups are the same no matter if it the return follows or not a random walk.

H$_{a1}$: At least one of ownership groups has a different average log return.

H$_{a2}$: Within each ownership group at least one sub-group can provide abnormal return.

H$_0$: $r_{stat-owned,efficient} = r_{private,efficient} = r_{stat-owned,non-efficient} = r_{private,non-efficient} = r_{other,efficient} = r_{other,non-efficient}$

H$_{a1}$: At least one of mentioned returns are different from others
Chapter 4: Empirical study

$H_{a2}: r_{a,b} > r_{\text{stat-own},x,y}$
where, $r_{a,b}$ means average log returns of a certain ownership; $r_{\text{stat-own},x,y}$ means the average log returns of sub-group with government ownership.
We are going to use descriptive statistic to test this hypothesis.

In the meantime, we are attempting to examine if size effect exists on Chinese stock markets. A Spearman correlation is tested to answer this question. We state our Hypothesis 5 as following:

**Hypothesis 5:**
$H_0$: The daily log return of individual stock has significant relationship with its market value in Chinese stock markets.
$H_a$: The daily log return of individual stock has no significant relationship with the market value in Chinese stock markets.
Or,
$H_0$: $\text{Rank } r_a = \text{Rank}(\text{market value}_a)$
$H_a$: $\text{Rank } r_a \neq \text{Rank}(\text{market value}_a)$
Where $\text{Rank } r_a$ is the rank based on a stock’s daily log return, while $\text{Rank}(\text{market value}_a)$ is the rank of a stock’s market value.
We use Spearman’s rank correlation test to investigate the relationship between daily log return and its market value.

**4.4 Methodological Criticism**

We can criticize the whole data analysis procedure from four perspectives.

First, including the temporary suspended stocks decreased the bias of the data. In light of the stocks are converting between active and temporary suspended status, as well as the period we access data is the time of annual report announcement, the stocks are more likely to be momentarily suspended at this time of year. It is more appropriate to include short-term suspended stocks in our data pool.

Second, the extension of autocorrelation coefficient boundaries may lead to a different result. Theoretically, most of Chinese stocks are not efficient if we do not extend the boundaries. Also, some of the stocks have a correlation coefficient close to 0.1 (0.099 for instance). These stocks are named as efficient stocks in our research, but it can also be treated as non-efficient one since they are not that much different from the stocks with 0.1 autocorrelation coefficient. On the other hand, the result of the percentage of the stocks following random walk can be changed as long as we narrow down our boundaries to other value. This influence would be discussed in the conclusion part.

Thirdly, we believe that the distribution of log return of individual stocks is not normal
only if both P-P plot and Q-Q plot state are not a normal distribution. This is a loosen criteria. The result of our test may be different if we strict the criteria that we only accept the stocks is normally distributed when neither plot can reject the normality.

And last aspect is that we do not use CAPM or Three-factor model when we examine the abnormal return. As we mentioned, it is hard to have a comparable index for each individual stocks. Also, other researchers are challenge the CAPM or Three-factor model for their underestimating market risk when testing the abnormal returns. (Christie and Hertzel, 1981) Value at risk, on the other hand, is the risk level from the individual stock itself. There is no estimation from the researchers.
Chapter 5: Findings and Analysis

We illustrate the relationship between market efficiency, ownership and market value in this chapter. Jointly, we test whether these three factors are anomalies to the Efficient Market Hypothesis in Chinese stock markets.

To answer our research question, we classified all stocks into three types of ownership: state-owned, private-owned and other ownerships. For those stocks are following normal distribution, we test their autocorrelation of the daily log returns. Those stocks having a greater than 0.1 autocorrelation coefficient are denoted as Non-efficient as well as those with a partial autocorrelation coefficient greater than 0.1. The rest are treated as efficient. The Table 8 shows the overview of the result of Chinese stock markets. In the Non-efficient column, the data in block means the stocks have a greater than 0.1 partial autocorrelation coefficient without a significant autocorrelation coefficient. The confidence interval of our research is set at 95%.

Table 8: Overview of Chinese stock markets: ownership and market efficiency

<table>
<thead>
<tr>
<th>Ownership Type</th>
<th>Efficient</th>
<th>Non-efficient</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>State-owned</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actively managed</td>
<td>345</td>
<td>109+(9)</td>
<td>463</td>
</tr>
<tr>
<td>Passively managed</td>
<td>103</td>
<td>28+(3)</td>
<td>134</td>
</tr>
<tr>
<td>Total</td>
<td>448</td>
<td>137+(12)</td>
<td>597</td>
</tr>
<tr>
<td>Private-owned</td>
<td>186</td>
<td>87+(5)</td>
<td>278</td>
</tr>
<tr>
<td>Other ownerships</td>
<td>50</td>
<td>12+(1)</td>
<td>63</td>
</tr>
<tr>
<td>Total</td>
<td>684</td>
<td>236+(18)</td>
<td>938</td>
</tr>
</tbody>
</table>

Note: the companies following random walk are recorded as efficient, otherwise, recorded as non-efficient.

5.1 Test the Homogeneity of Degrees of Market Efficiency among Ownership Groups

To answer the research question, we start from testing the homogeneity of degrees of market efficiency between different ownership groups. A Chi-square test suits our purpose.

Hypothesis 1:

$H_0$: The degrees of market efficiency are the same among different ownership groups

$H_a$: At least one of ownership groups has a different degree of market efficiency from
Chapter 5: Findings and analysis

another one.

**Table 9: Chi-square test: market efficiency and ownership**

<table>
<thead>
<tr>
<th>Market Efficiency</th>
<th>Ownership in general</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>State-owned companies</td>
<td>Private-owned companies</td>
</tr>
<tr>
<td>Non-efficient</td>
<td>149&lt;sub&gt;a&lt;/sub&gt;</td>
<td>92&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Efficient</td>
<td>448&lt;sub&gt;a&lt;/sub&gt;</td>
<td>186&lt;sub&gt;b&lt;/sub&gt;</td>
</tr>
<tr>
<td>Total</td>
<td>597</td>
<td>278</td>
</tr>
</tbody>
</table>

Each subscript letter denotes a subset of Ownership in general categories whose column proportions do not differ significantly from each other at the 0.05 level.

**Chi-Square Tests**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>7.778*</td>
<td>2</td>
<td>.020</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>7.670</td>
<td>2</td>
<td>.022</td>
</tr>
<tr>
<td>Linear-by-Linear Assoc.</td>
<td>1.051</td>
<td>1</td>
<td>.305</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>938</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.06.

According to the Table 9, the p-value of this Chi-square test is 0.020, which is less than 5% significant level. Thus we reject the null hypothesis of Hypothesis 1. We believe that the degree of market efficiency is different among ownership groups.

Meanwhile, the cross-tabulation shows: it is 95% sure that the degree of market efficiency of state-owned companies is different from that of private-owned companies. The degree of market efficiency for state-owned companies is 75.04%, and that for private-owned companies is 33.09%. These emphasizes that the state-owned companies are more likely to be market efficient than the private ones.

To clarify if the management of state-owned companies has impact on the degree of market efficiency, another Chi-square test is conducted.

**Hypothesis 2:**

H<sub>0</sub>: The degrees of market efficiency are the same between actively and passively managed state-owned stocks

H<sub>a</sub>: The degrees of market efficiency between actively managed and passively managed state-owned stocks are different.
Chapter 5: Findings and analysis

Table 10: Chi-square test: market efficiency and management of state-owned companies

Ownership * Market Efficiency Crosstabulation

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Market Efficiency</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-efficient</td>
<td>Efficient</td>
</tr>
<tr>
<td>Passively managed state-owned company</td>
<td>31_a</td>
<td>103_a</td>
</tr>
<tr>
<td>Actively managed state-owned company</td>
<td>118_a</td>
<td>345_a</td>
</tr>
<tr>
<td>Total</td>
<td>149</td>
<td>448</td>
</tr>
</tbody>
</table>

Each subscript letter denotes a subset of Market Efficiency categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
<th>Exact Sig. (2-sided)</th>
<th>Exact Sig. (1-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>.307^a</td>
<td>1</td>
<td>.580</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuity Correction^b</td>
<td>.194</td>
<td>1</td>
<td>.659</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>.311</td>
<td>1</td>
<td>.577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisher's Exact Test</td>
<td></td>
<td></td>
<td></td>
<td>.651</td>
<td>.333</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>.306</td>
<td>1</td>
<td>.580</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>597</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 33.44.
b. Computed only for a 2x2 table

This Chi-square test is showing that the p-value is 0.580 greater than significant level. It indicates that we cannot reject the null hypothesis of Hypothesis 2. In other words, it means the degrees of market efficiency of state-owned companies are the same no matter if it is actively managed or passively managed.

5.2 Market Value and Market Efficiency

To have a more accurate result of Chinese market efficiency, it is necessarily to inspect if the market efficiency is somehow correlated to market value or so called market capitalization. We set up 10 portfolios based on the market capitalization of each stock. The split points of each portfolio are showing in the Appendix I. To illustrate the relationship between market value and market efficiency, we use also Chi-square test. The hypothesis is stated as:
Chapter 5: Findings and analysis

**Hypothesis 3:**

$H_0$: The market efficiency is independent from the market value in Chinese stock markets.

$H_a$: The market efficiency is not independent from the market value in Chinese stock markets.

The table (Table 11) below figures that the p-value of this test is 0.001 that is much lower than significant level. So we reject the null hypothesis and accept the alternative hypothesis: the market efficiency is somehow related to the market value. Furthermore, the first-decile portfolio have a significantly lower degree of market efficiency compared to the 10th-decile portfolio. It implies that the stocks with lower market capitalization are more likely to be non-efficient.

Subsequently, both ownership and market value are impacted on the degree of market efficient. We try to identify this relationship more precisely by further analysis.
Chapter 5: Findings and analysis

Table 11: Chi-square test: market efficiency and market value portfolios

<table>
<thead>
<tr>
<th>Market Efficiency</th>
<th>Portfolio10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-efficient</td>
<td>46(a)</td>
<td></td>
</tr>
<tr>
<td>2nd-decile portfolio</td>
<td>28(a,b)</td>
<td></td>
</tr>
<tr>
<td>3rd-decile portfolio</td>
<td>23(b)</td>
<td></td>
</tr>
<tr>
<td>4th-decile portfolio</td>
<td>24(b)</td>
<td></td>
</tr>
<tr>
<td>5th-decile portfolio</td>
<td>21(a)</td>
<td></td>
</tr>
<tr>
<td>6th-decile portfolio</td>
<td>21(b)</td>
<td></td>
</tr>
<tr>
<td>7th-decile portfolio</td>
<td>20(b)</td>
<td></td>
</tr>
<tr>
<td>8th-decile portfolio</td>
<td>26(a,b)</td>
<td></td>
</tr>
<tr>
<td>9th-decile portfolio</td>
<td>25(a,b)</td>
<td></td>
</tr>
<tr>
<td>10th-decile portfolio</td>
<td>20(b)</td>
<td></td>
</tr>
<tr>
<td>Efficient</td>
<td>47(a)</td>
<td></td>
</tr>
<tr>
<td>2nd-decile portfolio</td>
<td>66(a,b)</td>
<td></td>
</tr>
<tr>
<td>3rd-decile portfolio</td>
<td>71(b)</td>
<td></td>
</tr>
<tr>
<td>4th-decile portfolio</td>
<td>70(b)</td>
<td></td>
</tr>
<tr>
<td>5th-decile portfolio</td>
<td>73(a)</td>
<td></td>
</tr>
<tr>
<td>6th-decile portfolio</td>
<td>73(b)</td>
<td></td>
</tr>
<tr>
<td>7th-decile portfolio</td>
<td>74(b)</td>
<td></td>
</tr>
<tr>
<td>8th-decile portfolio</td>
<td>68(a,b)</td>
<td></td>
</tr>
<tr>
<td>9th-decile portfolio</td>
<td>69(a,b)</td>
<td></td>
</tr>
<tr>
<td>10th-decile portfolio</td>
<td>73(b)</td>
<td></td>
</tr>
</tbody>
</table>

Each subscript letter denotes a subset of Portfolio10 categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>29,615(a)</td>
<td>9</td>
<td>.001</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>27,222</td>
<td>9</td>
<td>.001</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>10,411</td>
<td>1</td>
<td>.001</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>938</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 25.18.
Chapter 5: Findings and analysis

Figure 5: Market efficiency histogram classified by ownerships and market value portfolios

From the chart above, it is interesting to observe that there are more non-efficient private-owned companies than efficient ones in 1st-decile portfolio. This reveals the degree of market efficient is obviously various from the rest sub-groups.

Figure 6: Degree of market efficiency of all portfolios in each ownership groups
Chapter 5: Findings and Analysis

From the above chart, the private-owned companies have less degree of market efficiency than market average level. The state-owned stocks are at a similar level of market average degree of market efficiency. Also, the Figure 5 together with Figure 6 displays that although other ownerships group has few observations comparing with the other two groups, the degree of market efficient is relatively higher than both state-owned and private-owned companies. All this three groups have a trend that the degree of market efficiency is increased as the market value increasing, and, up to a certain level, the degree of market efficiency decreases but not significantly.

To interpret the degree of market efficiency of Chinese stock markets at a detailed level, we distinct state-owned companies into either actively managed or passively managed. The charts are changed, and show as following.

Figure 7: Market efficiency histogram classified by detailed ownerships and market value portfolios

Figure 7 presents that both passively managed state-owned company and private-owned companies are having a less than 50% degree of market efficiency in first-decile portfolio. Most companies are state-owned and actively managed. The passively managed state-owned companies are more likely to have small market capitalizations. In contrast, those large state-owned companies are tending to be actively managed. The companies with other ownerships are only conquering small proportion of Chinese markets.

In addition, Figure 8 demonstrates that the actively managed state-owned companies are having consistent degree of market efficiency with the market average level. Whilst, passively managed state-owned companies have a more fluctuate degree of market efficiency. Initially, the degree of market efficiency of these companies starts at a low
Chapter 5: Findings and analysis

value, but it increased along with the increase of the market value as similar as the companies with other kinds of ownerships.

![Figure 8: State-owned companies' degree of market efficiency in all portfolios](image)

5.3 Anomalies Test

In this section, we try to investigate if ownership and market value show anomalies, which would challenge the Efficient Market Hypothesis.

5.3.1 Anomaly: Ownership and Market Efficiency

**Hypothesis 4**

H$_0$: The average log returns of different ownership groups are the same no matter if it the return follows or not a random walk.

H$_{a1}$: At least one of ownership groups has a different average log return.

H$_{a2}$: Within each ownership group at least one sub-group can provide abnormal return.
To compare means between different ownerships, it is essentially needed to prove that the data from each group should follow normal distribution. Seeing each group has more than 30 observances and the normality test we made (see Appendix II), enabled us to compare means of the groups. The boxplot above discloses that all of the ownership groups have a uniform log return. Thus, we believe the abnormal return cannot be achieved by differentiating the ownership of the stocks.

**Figure 9: Boxplot of log return for ownership groups**

**Part I: Mean of log return**
Chapter 5: Findings and analysis

Part II: Relationship of log return and Relative parametric VaR

Figure 10: Log return and relative parametric VaR of efficient and non-efficient Chinese stocks grouped by ownership (see also Appendix IV and V)

These charts are not only plotting the risk and return trade-off of each ownership group, but also distributing the difference risk-return relationships between efficient and non-efficient stocks. The Part I indicates the abnormal return cannot be achieved by special ownership, moreover, efficient or not is neither one of anomaly dynamics. Although, efficient stocks and non-efficient stocks do not have significantly different average log return within or among each ownership group, it is interested to notice that in all four ownership groups, non-efficient stocks have a slightly higher log return on average level, and private companies have the highest average log return level.

In the Part II chart, we cannot detect any considerable intergroup or intragroup risk disparity. Still among those private-owned companies, some non-efficient stocks provide return at a relatively low risk level, and one of efficient stocks shows extremely risky with a marginally higher return. Overall, the efficient stocks’ log returns appear adequate relationships with VaR in most ownership groups. On the contrary, we perceive that all non-efficient stocks do not have a noteworthy correlation between log return and VaR, indicated by $R^2$ of each blue line. According to CAPM model, the log returns should somehow correlate to the risk level, which in our research is measured by relative parametric VaR; our findings from efficient stocks are coherent with CAPM model. However, the risk-return trade-off for those non-efficient stocks can be motivated: the stock with greater autocorrelation should be much easier to predict its future prices, as a result the volatility should decrease. In this case, risk should correspond to the autocorrelation coefficient rather than return level, while return is determined by previous return. It leads to the risk of non-efficient stock is independent from its return. The abnormal return is neither achieved by specified the efficiency in each ownership group.
Combining the analyses above, we cannot reject the null hypothesis. The ownership and market efficiency seem not to contain anomalies.

### 5.3.2 Anomaly: Market Value

To understand if the market value is an anomaly factor challenging the Efficient Market Hypothesis, we apply a spearman correlation test to illustrate if there is any relationship existing between market value and log return of Chinese stocks. As we mentioned that in CAPM model and Fama-French Three-factor-Model, risk is also included to interpret the internal relationship. In our research, considering there is no significant correlation (significant correlation means that $R^2 > 0.5$) between risk and return, as well as risk of stocks are not spread away from case to case. We simply use spearman’s correlation to determine if abnormal return can be achieved. Hereby the Hypothesis 5 states as below:

**Hypothesis 5:**

- $H_0$: The daily log return of individual stock has significant relationship with its market value in Chinese stock markets.
- $H_a$: The daily log return of individual stock has no significant relationship with the market value in Chinese stock markets.

We use SPSS to test the spearman correlation ignoring the distribution of both log return and market value. Spearman correlation offers a simple and direct method to construe the link between market value and return of individual stock.

The following table presents a 0.12 spearman correlation coefficient between market value and log return. And as the table states the correlation is significant at the 0.01 level, that is absolutely significant under our 95% confidence interval. Consequently, we cannot reject the null hypothesis. The statistic analysis implements the Log return increases along with the market value of the stocks at a weak correlation. Thereby, to some extent we believed abnormal return could be achieved by build portfolio with the stocks having higher market value.

**Table 12: Spearman's correlation test of market value and log return**

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Market Value</th>
<th>Log Return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correlation Coefficient</td>
<td>1.000</td>
</tr>
<tr>
<td>Spearman's rho</td>
<td>Market Value</td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>938</td>
</tr>
<tr>
<td>Spearman's rho</td>
<td>Correlation Coefficient</td>
<td>.120**</td>
</tr>
<tr>
<td></td>
<td>Log Return</td>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>938</td>
</tr>
</tbody>
</table>

**Note:** Correlation is significant at the 0.01 level (2-tailed).
Chapter 5: Findings and analysis

Furthermore, we should remind that the log return of the stocks we examined might be negative. As the chart above distributed, the stocks with highest market value tend to have a negative return. The negative return is always lower than the positive return. By separating all stocks into two categories, we test Spearman’s rho of both these two categories. It is 0.2256 for the positive whereas 0.1999 for the negative. It is more appropriate for us to state that for those stocks have negative returns, the higher market value indicates less loss. While for those with positive return, the log return rise as market value goes up.

![Market value and log return](image)

**Figure 11:** Scatterplot of market value and log return for Chinese stocks

5.4 Findings and discussion

As mentioned in Chapter 3, there are three key factors of this paper: ownership, management style and market value. Each of them is examined from two perspectives: if it can improve the market efficiency of the Chinese stock markets or if it can provide abnormal returns with a relatively lower risk level, in other word, if it is one kind of anomalies.

Government ownership can actually influence on the market efficiency. This can be explained by institutional investors’ influence. According to Edman’s research, the institutional investors promote the efficiency of stock by their long or short position. And in Chinese stock markets, the institutional investors invest more in favor of government owned companies. However, the ownership alone cannot provide abnormal returns according to our research.
Chapter 5 : Findings and analysis

Regarding to the companies controlled by government, the management style has no effect on the market efficiency. The passive management and active management are providing a similar degree of market efficiency. This result is sort of conflict with Efficient Market Hypothesis. Since, Chinese stock markets are obviously not in the strong-form, the active management of holding position should theoretical improve the market efficiency. The market efficiency is increased if all players in the market are having a homogeneous and rational expectation. The active management can be regarded as a signal of market expectation. Thus, the market efficiency of a certain stock should be determined by its management style based on EMH theory. This indifference should be explored in future.

As previously stated in Chapter Three, the market value is one of anomalies. According to our research, we figure that the size of the company is also an anomaly in Chinese stock markets. But, our results contradict to the Banz and Reinganum’s size effect. In Banz and Reinganum’s article, the small companies are more profitable comparing to those larger ones. However, in China, the big companies are providing higher return to investors comparing to those small ones. This is the difference of Chinese markets and western markets.

Here is our general results based on our model:

5.5 Summary Our Findings

From the statistical analyses we conduct, we find that:

1. Ownership does have influence on the market efficiency. The private companies
Chapter 5: Findings and analysis

are significantly less efficient comparing to the state-owned companies.
2. Management on the stock markets has no impact on degree of market efficiency of state-owned companies. There is no apparent difference on the market efficiency between actively managed companies’ and passive managed companies’ stocks.
3. Market value and market efficiency seem correlated. The stocks with small capitalizations are relatively less efficient than the large stocks.
4. Ownership and market efficiency cannot provide effective abnormal returns, although private companies and non-efficient stocks have a higher return level.
5. Market value is confirmed as an anomaly in Chinese stock markets. The stocks with larger size may end up with a greater return.
Chapter 6 : Discussion and Conclusion

We split this chapter into three sections. Discussion and conclusion synthesize our findings and our understanding of them, and how they compare with previous research. Thereafter, further research provides our suggestions and finally, we argue the credibility of our work.

6.1 Discussion and Conclusion

6.1.1 Discussion

As mentioned earlier in the theoretical chapter, there are many of researches about how institutional investors improve the market efficiency of the stocks. Our findings support the Efficient Market Hypothesis with practical evidence. Based on our study, government ownership is also enhancing the market efficiency, while private companies’ stock returns are less efficient in Chinese stock markets. We explain this phenomenon as hot money—which speculates on the government policy and market information—is playing an important role in Chinese stock markets. This hot money is extremely active on the market, but in most cases it drives the price far away from its rational level. It is more common to find hot money trading on private companies. The overreaction of hot money leads to less efficiency in private companies. In most cases, the hot money is speculated based on the ‘rumors’ on the market, and it can either be true or false. The private companies are reluctant to dispel these rumors, but for state-owned companies, it is required to clarify as soon as possible by regulators. Thus, the hot money is in favor of private companies. These outcomes provide us a new perspective to discuss the involvement of government in financial markets.

Funds, pensions, and foreign institution investors generally prefer to hold circulated shares of Chinese state-owned companies. Thus, the difference between state-owned and private companies may be explained by the institutional investors’ inside trading. The institutional investors are buying and selling stocks based on their insight review of the company. The price of the company stocks is adjusted significantly when institutional investors long or short the stocks considering their blockholding position. This may be an alternative explanation of state-owned companies with a higher degree of market efficiency.

Market value was observed as an anomaly of the Efficient Market Hypothesis. However, in our research, it also influences the degree of market efficiency. This result can be explained by the institutional investors, for example, funds and QFII are more in favor of the companies with large capitalizations due to the cost saving consideration. The
in institutional investors can improve the market efficiency by selling and buying stocks (Edmans, (2009)). On the other hand, small companies can be cheaply (with less money comparing to control the big companies’ price setting) manipulated by bankers (who have dominant position on the market). These differences in preference are believed as the reasons of our findings.

Since neither ownership nor degree of market efficiency is tested as anomaly for Efficient Market Hypothesis, we inspect whether market value would result in an abnormal return. As expected, it appears that the return of stocks with greater capitalization is superior to the ones with small market value. This contradicts the size effect documented by Banz and Reinganum in 1981.

It is important to keep in mind that we extend our autoregression criteria that we trade some of those non-efficient stocks as efficient. If the criteria narrow from 0.1 down to 0.05, the outcome may be completely different. Also, we observe the autoregression coefficient of 90-day lags. If the premise changes, the consequence of our study may change as well. Time horizon is another key issue to be considered. Our findings may not fit in other time periods of Chinese stock markets. Thus, we stress our conclusion is based on our criteria and this restricted time period.

6.1.2 Conclusion

We restate our research question before conducting conclusion:

Is the degree of market efficiency of state-owned companies different from that of private companies in Chinese stock markets?

We testify the impacts from market value on market efficiency in this thesis. After that we identify whether market capitalization and market efficiency as well as ownership are the anomaly factors in Chinese stock markets.

To answer our research question, the results from our statistical study of Chinese stock markets indicate that the degree of market efficiency of state-owned companies is significantly different from the degree of market efficiency of private-owned companies in China. Also, the market capitalization is one of the existing anomalies in Chinese stock markets, as well as it is correlated with degree of market efficiency to some extent. For State-Owned Enterprises, active management on stock market does not provide a better market efficiency compared to those passively managed companies.

The ontology of this research is objectivism. We conclude our findings based on the truth of the factors rather than affected by our own subjective interpretations. The choice of methodology enhances the solidity of the conclusions. Our quantitative research method with logical procedure ensures our results to be convincing. And, it is consistent with our positivism epistemology. The reliability of our study is strengthened by our archival approach.
6.1.3 Contributions:

The findings and conclusion we get from our research contribute both on academic and business. As Knowledge Gap section mentioned in Chapter 1, this kind of study has never done before in our scope of knowledge. The degrees of market efficiency are different between state-owned companies and private companies during these years. This conclusion branches out a direction of theory study.

For the investors who invest or are interested in Chinese stock markets, our findings enlighten that having ownership and market value as factors when they build their portfolios may improve their portfolio returns. Since stocks with higher market value are more efficient and more profitable in China, it is highly recommended to invest in these stocks. In addition, the state-owned companies with larger capitalizations are more efficient in general, and are suitable for the foreign investors to start with. We believe this study offers a new perspective of studying market efficiency and a new approach to understand Chinese stock markets culture.

Finally, the study promotes an innovative approach to explore market efficiency. That could be elaborated by more thorough analysis to establish a new critical point of view on the involvement of government in capital market.

6.2 Further Research

The subject of our study put forward a new field of Efficient Market Hypothesis. Further research is required to explore more deeply into this area. The reasons of the different market efficiencies between ownership groups are still unclear. We suggest further research to illustrate the hidden mystery. Together, we are not able to illuminate which is the decisive factor of market efficiency, ownership or market value. Meanwhile, this research can be developed by classify Chinese stocks by their industrial sectors or other segments in order to express the nitty-gritty of Chinese stock markets. It is also necessary to investigate the degree of market efficiency of Chinese stock market in different time horizons, as it changes time to time (Los, 2005).

The findings of the indifference effect of active and passive management on market efficiency are unexpected. The active management on stock market adjusts the stock price thus it should strengthen the market efficiency. This indifference should be studied in the future. It is correspondingly meaningful for private-owned companies. The passive management is similar as restricted stock for private companies. It is captivated to compare the market efficiency of the private companies before and after the limited period.

We also observe that the non-efficient stocks do not have significant correlation between risk and return. The determination of return for those non-efficient stocks may
be an interesting field to study.

Beyond that, we suggest to investigate the relationship of market value and degree of market efficiency in other markets. To identify either this kind of relation is unique in Chinese markets or it is universal in the world.

Last but not least, we suggest re-examining the correlation between market value and return of Chinese companies with Fama and French Three-factor model. It may improve the persuasion of our research.

6.3 Credibility Criteria

6.3.1 Validity

Validity deals with whether the findings actually are about the thing they appear to be about (Saunders et al., 2009, p. 157). Validity defines how well a variable measures what it is intended to measure. In other words, how well the research tools address the formulation problem.

While testing the autoregression of sample stocks, we have carefully double-checked if the individual stock's coefficient exceeds critical boundaries. Before analyzing the data, we also backward checked the ownership and market value data, in order to see if we input the information of the stocks with acceptable errors.

Besides, we use relative parametric Value at Risk as the only risk indicator based from the theory. In the real world, this measurement might become more complicated. When implementing to the complex derivatives, VaR can only measure the risk level of the derivatives themselves rather than reflect the hidden risk of underlying assets. By this point of view, the risk of investment can be misleading by VaR. However, we only use it to interpret the risk level of stocks. In fact, stocks are less complex than the derivatives. We believe VaR is proper for our research purpose.

External validity presents how appropriate our measurement reflects the reality. This criterion deals with how the authors have collected materials and data and how well the result of the study can be generalized to other research settings (Saunders et al., 2009, p. 158). We select date of 938 stocks for the time period of 5 years. This large group of data and time horizon ensure that we can provide a research reflects reality properly. However, the situation that government has great impact on the market is one of main characters of Chinese stock markets and it is unique. Therefore, our findings may not be appropriate for the rest markets in the world. Meanwhile, the Chinese stock markets grow rapidly in past decades, the markets themselves change time to time. The similar outcome might not be generalized for other time periods. The conclusions of our research are restricted to Chinese markets in 2007 to 2011.
Chapter 6 : Discussion and Conclusion

Based on these measurements we believe our research can be applicable to the real world setting and fulfill the internal validity issues.

6.3.2 Reliability

Reliability refers to the extent to which the data collection techniques or analysis procedures will yield consistent findings. It concerns whether the results that are found in the research can be found repeatedly in the same study (Saunders et al., 2012, p. 192). Data analyses are accompanied by theoretical framework and outlines of the purpose of the study and have been presented by criterion requirements. We used price data collected from DataStream, “the world’s largest financial statistical database”. We believe that these sources are highly observed and will not change overtime. As we clearly stated in empirical chapter, we are confident that ownership recognition can be repeated and should end up with same result as we got. Market value is calculated based on the price from DataStream and exchange rate based on the Google finance. All these data should not change overtime. This enables us to reduce unsystematic error and manipulation that means the research can be replicated without error.
Reference List


Reference List

Correlations. Rochester: University of Rochester.


Reference List

Elsevier, 937-972.
[Accessed 20th February 2012].
## Appendix

### Appendix I: Market Value Deciles for Portfolios Setting

<table>
<thead>
<tr>
<th>Statistics</th>
<th>MarketValue</th>
</tr>
</thead>
<tbody>
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<td></td>
</tr>
<tr>
<td>Valid</td>
<td>938</td>
</tr>
<tr>
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### Appendix II: Normality Test for Log Return of Detailed Ownership Groups

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<tr>
<th>ownership</th>
<th>logReturn</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Range</th>
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<td>.718</td>
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<td>.0004444315334</td>
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### Tests of Normality

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<th>Kolmogorov-Smirnov&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Shapiro-Wilk</th>
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<td>LogReturn</td>
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<sup>*</sup>. This is a lower bound of the true significance.

<sup>a</sup>. Lilliefors Significance Correction
## Appendix III: Log Return for Stocks in Different Ownership Groups and Different Efficiency Level

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Appendix IV: Mean of Log Return
Appendix V: Relationship of Log Return and Relative Parametric VaR

![Graph showing the relationship between log return and relative parametric VaR with data points for different ownership types and market efficiency levels.]