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Downside Risk of Chinese ADRs in the US Exchanges

By

ZHU Yan Fang

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Sommaire

Les États-Unis sont le deuxième marché préféré, juste après Hong Kong, auprès duquel les entreprises chinoises continentales lèvent des capitaux internationaux. Pendant ce temps, les « ADR » chinois (en anglais « American Depositary Receipt », un certificat représentant un certain nombre d'actions étrangères à échanger aux États-Unis) représentent un tiers de tous les « ADRs » dans les bourses américaines.

Cette étude se concentre sur le risque de baisse de 149 « ADRs » chinois qui ont fait une entrée publique en bourse jusqu'à l'année 2014. Nous évaluons leur performance entre 2007 et 2015.

Nous construisons 5 portefeuilles à pondération égale triés par le facteur de charge de risque de baisse ($\beta^{-} - \beta$, dans cette étude) pour les « ADRs » chinois et pour toutes les actions ordinaires de NYSE et NASDAQ. Comparativement à la stratégie des portefeuilles de quintile haut-bas des actions ordinaires américaines, les portefeuilles de quintile haut-bas des ADR chinois apportent un rendement anormal négatif de -1,3%*** par mois (-15,6% par année) au cours de la crise financière 2007-2010, et un rendement anormal positif de 2,6%** par mois (31,2% par année) après la crise. Les analyses complémentaires nous indiquent que les rendements anormaux ne se rapportent pas clairement ni à l'effet ADR ni à l'effet de l'industrie.

L'appréciation de la monnaie chinoise a un impact positif sur la performance des « ADRs ». Le marché boursier américain a un impact plus significatif sur le rendement des ADR que le marché domestique. Notre régression multifactorielle montre que toutes les choses étant égales par ailleurs, une augmentation d'un écart type du facteur du marché américain entraine un rendement anormal de 1,06%*, semblable à un rendement supplémentaire de 1,03%** causé par l'augmentation d'un écart-type du taux de change.

Les « ADRs » chinois dans leur ensemble affichent du risque de baisse de 15% supérieur. Pour chaque unité du risque de baisse, les agents averses au risque exigent une prime de risque annuelle de 19%*** pour les ADR chinois, contre 7.2%*** pour les actions ordinaires sur le marché américain.

Mots clés : « ADRs » chinois ; risque de baisse ; rendement anormaux ; prime de risque.

Summary

The United States is the second favorite market, right after Hong Kong, for Mainland Chinese companies to obtain international funding. Meanwhile, Chinese ADRs (American Depositary Receipt, a certificate representing a certain number of foreign shares to be traded in the US) represent one third of all ADRs in the US exchanges.

This study focuses on the downside risk of 149 Chinese ADRs that did an IPO until 2014. We evaluate their performance between 2007 to 2015.

We construct 5 equal-weighted portfolios sorted on the loading factor of downside risk ($\beta^{-}-\beta$ in this study) for Chinese ADRs and for all the common stocks in NYSE and NASDAQ. Compared with the strategy of high-low portfolios of the US common stocks, the high-low portfolios of Chinese ADRs bring negative abnormal return of -1.3%*** per month (-15.6% per annum) during 2007-2010 in financial crisis, and positive abnormal return of 2.6%** per month (31.2% per annum) after the crisis. Further analyses show that the evolution of the abnormal returns is neither due to a pure ADR effect nor to an industry effect.

The appreciation of Chinese currency positively impacts the performance of ADRs. The US stock market has a more significant impact on the return of ADRs than does the home market. Our multi-factor regression over 2007 to 2015, shows all other things being equal, that a one standard deviation increase in the factor of the US market brings a 1.06%* abnormal return, similar to 1.03%** additional return caused by the increase of one standard deviation in the exchange rate.

Overall, the Chinese ADRs display a 15% higher downside risk β^{-}. For each unit of the downside risk, the risk averse agents require an annual risk premium of 19%*** for Chinese ADRs compared with 7.2%*** for common stocks in the US markets.

Keywords: Chinese ADRs; downside risk; abnormal returns; risk premium.

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Chapter 1

Introduction

The Economic Reform in China started in the late 1970s and aimed to speed up the modernization of Mainland Chinese economy. Since then, the GDP in China has had an unprecedented growth with an yearly compounded growth rate of 9.5% from 1978 to 2013. The Chinese government opened the market to attract foreign investors, at the same time the companies operating in China have been going overseas to be listed on stock markets and getting international investments and capital. Hong Kong is the first choice for Chinese companies to enter the international stock markets, followed by the United States, and then the United Kingdom.

In the year of 1993, the first Chinese companies went through an IPO process and offering American Depositary Receipts, a certificate representing a certain number of foreign shares to be traded in the US markets. Until the end of 2014, there had had 159 IPO Chinese ADRs, which represented one third of all ADRs in the US exchanges.

There are studies(Cao-Alvira and Rodríguez, 2016; Luo et al., 2012; Schaub, 2010; Zhang and King, 2010) in comparing the performance of Chinese ADRs with the common stocks in US, either by the market models or by firm-matching method, the results and conclusions differ. The reasons could be that, first, the required excess returns change over time when the sampling periods change. Second, the one factor market model, which ignores impacts from other factors, might not be accurate to evaluate the individual stocks especially for ADRs, which engage more ADR specific risks than the common stocks. Finally, the criteria to select peer companies are in question.

Ang et al. (2006) incorporate the downside risk when checking the performance of US common stocks on NYSE through 1963 to 2001, and indicate that the downside risk shows high explanatory power in evaluating the performance of stocks. In addition, the researchers calculate a downside risk premium of around 6% per annum, which confirms the risk averse theory that the rational agents require additional returns to undertake the downside risk rather than the upside risk.

The study of Ang et al. (2006) focus on the common stocks in the US, so all ADRs are excluded. In our study, we aim to find out the following questions: whether there exists some abnormal returns for Chinese ADRs by controlling the common stocks in the US? What are those possible explanatory factors? If the downside risk is a loading factor significantly explaining the differences in stock returns, what is the situation of downside risk of Chinese ADRs? And finally, what is the downside risk premium of Chinese ADRs?

We use the same methodology as that of Ang et al. (2006) to calculate unconditional risk (β) and conditional downside and upside risks (β^- and β^+). Furthermore, we treat the Chinese ADRs and the common stocks on the US markets as two groups. Then for each of them, we sort on the loading factor ($\beta^- - \beta$, the relative downside risk) and construct 5 equal-weighted portfolios. The high-low strategy, long high downside risk portfolio and short low downside risk portfolio, brings an abnormal return of -1.3%***[1] per month (-15.6% per annum) during 2007-2010 for holding Chinese ADRs by controlling the common stocks in the US, and positive abnormal return of 2.6%** per month (31.2% per annum) after the crisis from 2011 to 2015. Further analyses show that the evolution of the abnormal returns is neither due to a pure ADR effect nor to an industry effect.

The appreciation of Chinese currency positively impacts on the performance of ADRs. The US stock market has a more significant impact on the return of ADRs than the home market. Our multi-factor regerssion over 2007 to 2015 shows all other things being equal, that a one standard deviation increase in the factor of the US market brings a 1.06%* abnormal return, similar to 1.03%** additional return caused by the increase of one standard deviation in the exchange rate.

Overall, the Chinese ADRs display a 15% higher downside risk β^-. For each unit of the downside risk, the risk averse agents require an annual risk premium of 19%*** for Chinese ADRs compared with 7.2%*** for common stocks in the US markets.

In this chapter, we explain what is a Chinese ADR in section 1.1; then in section 1.2,

[1] In the text of this thesis, the symbols of *, ** and *** denote the results have a significance at the 90%, 95% and 99% levels respectively.

we introduce the concepts on downside risk; finally in section 1.3, we discuss our empirical design.

1.1 Chinese ADRs

This section introduces the terminology used in this study. We briefly explain the terms of ADRs in the US and the China Concepts Stock. Then, we review the IPOs of Chinese ADRs.

1.1.1 Types of ADRs

Introduced to the financial markets in 1927, an American Depositary Receipt (ADR) is a stock that is traded in the United States and issued in U.S. by a depositary bank, but representing a certain number of shares of a corporation outside of the US. For investors, ADRs are traded just like regular stocks while exposing investors to ADR-specific risks - information asymmetric, political and/or exchange rate.

ADRs are either *sponsored* or *unsponsored*. If the foreign company has no formal agreement with a specific depositary bank to issue ADRs, then more than one bank issue *unsponsored* ADRs, which could be traded in the non-public markets or Over-the-Counter (OTC) market.

A *sponsored* ADR is issued by one specific depositary bank. In the public markets, there are three levels of *sponsored* ADRs: Level-I ADRs are available only in the OTC market with the loosest requirements from the Securities and Exchange Commission(SEC); Level-II and Level-III ADRs are available in a major exchange, either the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) or the National Association of Securities Dealers Automated Quotations (NASDAQ), with higher requirements. Level-III ADRs allow the issuers to do public offerings and raise capital on a U.S. exchange. They have the highest visibility in the U.S. financial markets. We often refer to them as IPO ADRs.

1.1.2 China Concepts Stock

"*China Concepts Stock* is a set of stock issued by companies whose assets or earnings have significant activities in Mainland China"(Arquette et al., 2008). This definition is slightly different from Chinese stock, which could require a company to be registered in China. Actually, the *China Concepts Stock* focuses more on the places of operation and the resources of revenues. However, we are going to use Chinese ADR instead of China Concepts ADR in order to keep it simple in this study. Furthermore, we need to understand that not all *China Concepts Stocks* are ADRs, because they include as well those common stocks, either from IPO [2] or from reverse merge operations.

On US exchanges, we find half of the companies from China are IPOs, and the other half are reverse mergers. Jindra et al. (2015) identify 106 IPOs, including both ADRs and common stocks, and 101 new reverse mergers between 2000 and 2010. A new reverse merger is possible either by having targeted a shell company already trading on an exchange market or by having merged first a shell company in OTC Bulletin Board and gradually entering major stock exchanges. IPO ADRs, the level-III ADRs, have the least asymmetric information as full documents disclosure is required for IPO, as well as the relevant information to investors in the quarterly and yearly reports to SEC. They are generally bigger firms because the cost of IPO process oversea is already unaffordable for small companies.[3]

In brief, *China Concepts Stock* in exchanges could include either ADRs or common stocks, either from IPO activities or from reverse merge operations. Thus, our targets of IPO Chinese ADRs in US is one portion, around 50% of total China Concepts stocks in three major exchanges.

[2] Companies that IPO common stocks are actually fulfil the listing requirements of SEC as US companies. While, based on the fact that the business activities of those companies are highly concentrated in Mainland China, their stocks are labelled as China Concepts securities as well.

[3] Siegel and Wang (2013) show us an review of reverse merge operations of 1139 between 1996 to 2012 from all foreign companies. They don't distinguish Chinese mergers from others, but we still could get a rough idea about the reparation of the reverse mergers. In the article, they point that 37/1139(3.2%) firms start with major exchange, and 111/1139 (9.7%) firms are first in OTC markets and end up in major exchanges. Most of the reverse mergers, 991/1139(87%), are not shown in the exchanges.

1.1.3 IPO and delisting of Chinese ADRs

Jay R. Ritter records the IPO activities in the US and updates annually the list on his personal website. The list in table A.1 shows that from 1980 to 2014, there are totally 8460 IPOs in the US exchanges, of which 852 (10.1%) are IPO from countries other than the US and 163 (1.9%) are IPO from Mainland China. Furthermore, 46.7% [4] of foreign IPOs are ADRs while 89% of Chinese IPOs are ADRs. In total, Chinese ADRs represent 36.4% of all IPO ADRs. In the following part, we present two IPO samples.

On July 26th, 1993, Shanghai Petrochemical Limited did an IPO in Hong Kong [5] stock market and listed on the same day their ADRs (Ticker: SHI) in NYSE with ADR ratio of 1:100 common stocks. This was the first IPO China Concepts ADR in U.S. and raised capital of $ 342.6 million during the IPO procedure. As dual-listed stocks, investors could theoretically either buy/sell ADRs in U.S. or buy/sell common stocks in HK. Again in theory, investors could buy ADRs in U.S. and sell the corresponding numbers of common stocks in HK to realise arbitrage profits if there was, and vice versa.

On September 19th, 2014, ALIBABA Group (Ticker: BABA) realised a capital up to US$ 25 billion in NYSE, the biggest ever IPO worldwide hitherto with the ADR ratio 1:1 common stock (in Bermuda). The common stocks are not traded in any market. Thus the ADRs are single-listed, and we refer to them as homeless ADRs. In fact, single listing is the new trend for new ADR IPO.

From 1993 to the end of 2014, we identify 149 IPOs of Chinese ADRs in total in the three major exchanges in US. They are level-III ADRs with various ADR ratios. Around 10 of them are dual-listing ADRs, and most of the companies prefer single listing, especially in more recent IPOs.

[4]The relative low percentage (46.7%) of ADRs in total foreign IPOs could be the reason that Canadian companies could directly IPO common stocks in US and no ADRs needed.

[5]The stock market in Mainland China started to develop since early 1990th with more strict rules, thus HongKong is an alternative market to involve international capitals for Mainland Chinese companies.

1.2 Downside risk

In a world with uncertainties, the value of an asset would vary according to the regimes of the markets. If an asset value tends to move downward in a declining market more than other assets, the downside risk of such asset is higher than others. Risk averse agents will normally ask for higher return for holding assets with higher downside risk. Ang et al. (2006) check whether there exists a downside risk premium in the common stocks in NYSE for a long period of 30 years resulting in a premium around 6% per annum.

However, the level of risk aversion could vary according to the change in stages of the economic cycle, especially before and after a recession. Srivastava (2013) indicates the typical agent shows risk appetite before the financial crisis and then extreme risk aversion after the financial crisis of 2008.

The conditional β^- mesures the level of covariance of an asset when the market declines. Another good loading factor to reflect the downside risk is the relative β^-, that is $\beta^- - \beta$, which is self-adjusted to check the change of risk level in the worse market compared with its own overall risk.

1.3 Study overview

The objective of this paper is to study the downside risk of Chinese ADRs. As mentioned before, we focus on Chinese ADRs of 149 companies that did an IPO from 1993 to 2014, and check their performance between 2007 to 2015. We construct equal-weighted portfolios to compare the holding period returns of various downside risk portfolios. Note that equal-weighted portfolios give more weight to small companies than do value-weighted portfolios. We adopt an equal-weighted sorting scheme.

We first divide the Chinese ADRs into 5 groups according to 3 different risk factors, β, β^- and $\beta^- - \beta$, and compare the returns of highest and lowest factor loading portfolios from 2007 to 2015. We find that $\beta^- - \beta$ is significant in distinguishing the performance of Chinese ADRs. During the crisis from 2007-2010, the highest $\beta^- - \beta$ portfolio gets a return of -18.97% per annum less than the lowest one; and after the crisis, the highest downside risk portfolio gets higher return of 32.37% per annum than the lowest one.

Second, we compare the strategy of high-low portfolios (long the portfolio of high downside risk and short the portfolio of low downside risk) of Chinese ADRs with the strategy of high-low for common stocks in the US markets. We perform regressions of the difference in portfolio returns on Carhart (1997) four-factor model, an extent of theFama and French (1993) three-factor model. The regressions show us that the abnormal return, α, is significantly different from zero. We get an abnormal return of -1.3%*** per month(-15.6% per annum) during the finance crisis and +2.6%*** per month (31.2% per annum) after crisis.

Third, we do further analyses to check the evolution of the abnormal returns by two-years periods. Other possible effects, either the pure ADR effect or the industry effect, are verified as well. From the further analyses, we find the evolution of the abnormal returns have the tendency of auto-correction. Neither the pure ADR effect nor the industry effect has a clear impact on the results of Chinese ADRs.

Fourth, in order to better understand the performance of Chinese ADRs, we check the possible factors of explanation, including exposure to exchange rates and the stock market index. We compare the index in US of S&P 500 and the index in China of SHCOMP. The results show that the appreciation of Chinese currency has always positive impact to the return of Chinese ADRs all the time. The stock market of US shows more significant influence on the portfolio abnormal return of Chinese ADRs for years of 2007-2008 and 2011-2015, and the Chinese index explains the abnormal performance during the 2009-2010 sample period.

Finally, we use the Fama-MacBeth method to do the cross-sectional regressions. For all Chinese ADRs, the risk premium of each unit of downside risk is 19%*** per annum from 2007 to 2015. During the same period, the risk premium of the common stocks in US exchange markets of NYSE and NASDAQ is 7.2%*** per annum, which is similar to 6.9%*** of common stocks in NYSE from 1963 to 2001 studied by Ang et al. (2006).

Overall, our study has three main contributions to the literature. First, we identify the downside risk as an important factor to explain the performance of Chinese ADRs. The group with the highest downside risk of Chinese ADRs is the most fluctuating group during the crisis, they under-perform -1.3%*** per month (-15.6% per annum) compared with the common stocks in the US market after controlling for the low downside risk groups; after the crisis, they over-perform 2.6%*** per month(31.2% per annum) compared with the benchmark.

Second, our tests on Chinese specific factors support the opinion that the change in the exchange rate is an import factor to explain the performance of ADRs. The strong Chinese currency will bring positive effects to the returns of ADRs. The market performance of US explains more the abnormal returns than does the home market. All other things being equal, the increase of 1% in exchange rate of CN Yuan to US Dollar will bring 1.94%** abnormal return. Or if the exchange rate increases one standard deviation of 0.53% will bring 1.03%** extra return and if the monthly US index residuals move up one standard deviation of 6 697 points, the additional abnormal will be 1.06%*.

Finally, we calculate the required premium of the downside risk to all Chinese ADRs and get 19%*** per annum, much higher than the downside risk premium of 7.2%*** of all common stocks in US NYSE and NASDAQ.

The rest of the thesis is structured as follows. Chapter 2 presents the literature and hypotheses. Chapter 3 discusses the data and provides descriptive statistics. Chapter 4 constructs the methodologies. Chapter 5 presents the empirical analyses, and Chapter 6 concludes.

Chapter 2

Literature Review and Hypothesis

2.1 Literature review

As a special form in the US exchanges, ADRs are traded like common stocks to investors, but they are not really common stocks. For investors, buying ADRs means they might take the risks of higher level of asymmetric information because of the differences in language, cultures, and accounting systems. Furthermore, investors have to look into specific risks, such as information asymmetric, political, exchange rate. On the other hand, high risk might means high return for investors. Anyhow, ADRs provide a convenient way for investor to benefit the high-speed development of an economy or the outstanding performance of specific foreign companies. ADRs might be a good choice to diversify the portfolios and hedge the US market risks of portfolio.

There are two main perspectives to evaluate the performance of ADRs. First, the researchers check the abnormal returns of all ADRs, either compare with the selected control group in US or the control group in the home economy; Second, several studies look at the country specific explanative factors to understand the performance of ADRs.

2.1.1 Abnormal returns of ADRs

Schaub (2010) record that the 3-year post-IPO returns of Chinese ADRs, issued from 1990 to 2002, are 2.28% higher than that of the S&P 500 Index. However, he finds that the performance is not stable. The ADRs listed before 1998 and trading through the US bull market lost over 26% relative to the S&P 500 and those listed after 1 January 1998 outperformed the market index by nearly 40%. Furthermore, the author separate the original locations of ADRs, and find that the Mainland companies outperform more than 100% compared with Hong Kong companies. Zhang and King (2010) get 3-year holding period return of -37.04% for Chinese ADRs issued between from 1993 to 2005, after S&P 500 index adjusted. Meanwhile, the authors examine the abnormal return using the single market model, the returns of Chinese IPOs in U.S. fall to -61.37% in 3 years. This indicates the possibility that the returns of Chinese ADRs are explained not only by the market.

Luo et al. (2012) and Cao-Alvira and Rodríguez (2016) select peer companies in US. Luo et al. (2012) control the size and Book/Market ratio for ADRs that issued during 1993 to 2010. The results show that the mean of 3-year holding period abnormal returns is 26.2%, while the median is -14.6%. The authors also show that dual-listed companies perform better than those single-listed. Cao-Alvira and Rodríguez (2016) control the IPO date from 2004 to 2010, their 3-year holding returns of single-listed companies are better than those dual-listed companies, while they are not as good as the control companies in US.

Arquette et al. (2008) compare the price of 11 dual-listing ADRs during 1998-2006, the common stocks traded in Mainland China and the ADRs traded in US are from the same company. After the adjustment of ADR ratio and exchange rate, law of one price is always violated. Most of the time, ADRs are traded under discount, which is in line with the opinion of Fernald and Rogers (2002), who document that the foreign shares were sold intentionally low with deep discounts to attract global investors. While these shares are identical, foreigners have generally paid only about one-quarter the price paid by domestic residents.

2.1.2 Explanatory variables

Arquette et al. (2008) demonstrates that the changes in exchange rate alone account for approximately 40% of the total variation of ADRs. Other factors of market-wide and company-specific sentiment could be an alternative explanation. [1] In contrast, Zhang (2013) conclude there is no obvious relationship between the return of Chinese ADRs and the currency exchange rate.

Previous studies provide mixed evidence on whether trading location has an impact on stock prices movements (Chan et al., 2003; Froot and Dabora, 1999; Phylaktis and Manalis, 2005). Most of the studies specialised on Chinese ADRs show that the performance of ADRs are more affected by their trade market.(Cheng et al., 2008; He and Yang, 2012; Suh, 2001;

[1] In the footnote 15, author point out that similar results are obtained if we use the current exchange rate, the weekly change in exchange rates, or expected changes using shorter duration futures contracts.

Wang et al., 2013). Such influence is explained by the market sentiment, which indicates that each country's market is governed by its own market sentiment. Shares traded in the US market are affected by US market. But they don't consider the factor of exchange rate, which is pointed to be the most important factor by Arquette et al. (2008).

Bin et al. (2003) study the determinants of ADR prices and find that trading location (U.S. market) and foreign home equity market both affect ADR prices, as well as exchange rates. However, they do not examine which factor impacts ADR prices more.

2.1.3 Downside risks

The Capital Asset Pricing Model (CAPM) shows that a stock's market beta is an indicator to its expected excess return. The factor of beta represents the systematic risk of a certain stock. The bigger the beta is, the higher the expected excess return could be. However, Bawa and Lindenberg (1977) suggest that it is necessary to separate downside from upside betas as the required returns could be asymmetric to compensate the undertook risks.

As most of the agents are risk-averse, we would expect an risk premium when holding a stock with higher correlation when the market declines. Anyhow, the earlier researchers (Harlow and Rao, 1989; Jahankhani, 1976) don't find clear evidences about the downside risk premium as they didn't include all individual stocks under a cross section base.

Ang et al. (2006) use daily returns of common stocks on NYSE to study the downside risk premium between the year of 1969 to 2003. They investigate the realised factor loadings, and find a downside risk premium of around 6% per annum.

2.2 Hypothesis

This study is an extension of the study of Ang et al. (2006) to examine the downside risk of Chinese ADRs. And, this trial is also a new perspective to evaluate the performance of Chinese ADRs. In this study, we have three main hypotheses.

Hypothesis 1: Chinese ADRs perform in accordance with their downside risk. In the context that investors in US notice and require certain downside risk premium for common stocks as suggested by Ang et al. (2006), it is reasonable to assume that they evaluate the Chinese ADRs using the same principal.

Hypothesis 2: The performance of Chinese ADRs relative to US common stocks could vary within the stages of economy cycle. As shown by Schaub (2010), the ADRs perform differently in the bear or bull markets. Drehmann et al. (2012) indicate that the market sentiments in the trading market change with the economic cycles. Our sample period is from January 2007 to December 2015, which has the financial crisis of 2008 in between. The financial circle in Appendix A.2 shows that at the beginning of 2007, the financial situation started a declining trend. So, in this thesis, we define the period of January 2007 to December 2010 as the crisis period and then the after crisis period.

Hypothesis 3: The change of exchange rate would have impacts on the overall performance of the Chinese ADRs. Traditionally, it is not a freely convertible currency and has an official fixed exchange rate to US dollar. From 1994 to 2004, the middle exchange rate of US/CN is always above 8.27. However, since 2005, the Chinese government has started to accept a floating policy with the daily change in exchange rate varying within 1%. Until the end of 2015, US to CN exchange rate had been falling to 6.22. Based on this context, the exchange rate could be an explicative factor to the performance of Chinese ADRs after 2005.

Chapter 3

Data

We first define "who" will be included in this study; then introduce the resources used to get the the necessary information to do the analysis in the study.

3.1 Sample

We focus on the IPO Chinese ADRs in three main stock markets in the US, NYSE, NASDAQ and AMEX. In order to understand the performance of Chinese ADRs in the context of US market, we choose the common stocks traded in NYSE and NASDAQ as the controls in our study.

3.1.1 Chinese ADRs

To get a full list of Chinese ADRs, we use several resources. The website of the bank of New York[1] gives a list of existing Chinese ADRs, excluding the delisted ones; Thomson Reuters SDC New Issue Database identifies IPO activities, but not specified on ADRs; google finance, EDGAR database of US SEC and website of imeigu[2] are resources to cross check and identify Chinese Concept ADR. Finally, we look into the list of yearly IPO Chinese ADRs on the website of Prof. Jay R. Ritter[3] as reliable reference to identify the number of Chinese IPO ADRs each year.

Table 3.1 shows the total 149 ADRs being listed in US exchanges during 1993 to 2014, excluding those stocks while 52 of them delisted until the end of 2015. Figure 3.1 is helpful to check the corresponding listing year of those delisted securities. We don't include the newly listed ADRs in 2015 because the observation period is too short. Table 3.1 clearly indicates that in the years from 1993 to 2003, NYSE is almost the only market for Chinese ADRs. Starting in 2004, the new lists in NASDAQ accelerate and end up to 65 (44%) out of 149 ADRs by the end of 2014. NYSE market has most of the Chinese ADRs with 82(55%) listed and AMEX has the rest 2.

[1] https://www.adrbnymellon.com/directory/drs-by-country-profile?country=CN
[2] http://www.imeigu.com, an open resource focus on the China Concept Stocks in US
[3] https://site.warrington.ufl.edu/ritter/ipo-data/

Table 3.1: Number of Chinese ADRs in US exchanges

Date	List			Delist		
	NYSE	Nasdaq	sub total	NYSE	Nasdaq	sub total
1993	1	0	1	0	0	0
1994	1	0	1	0	0	0
1996	1	0	1	0	0	0
1997	4	0	4	0	0	0
1998	1	0	1	0	0	0
2000	3	1	4	0	0	0
2001	2	0	2	0	0	0
2002	1	0	1	0	0	0
2003	1	1	2	0	0	0
2004	2	8	10	0	0	0
2005	1	7	8	1	0	1
2006	3	3	6	0	0	0
2007	17	10	27	0	0	0
2008	0	1	3	1	0	1
2009	4	4	8	0	0	0
2010	22	13	35	0	0	0
2011	7	4	11	4	3	7
2012	1	2	3	4	5	9
2013	4	2	6	6	6	12
2014	6	9	15	7	6	13
2015	-	-	-	4	5	9
sum	82	65	149	27	25	52

3.1.2 Control series

To understand the performance of Chinese ADRs in the context of US stock markets, we select several series of control, like *non Chinese ADRs, common stocks in NYSE and/or in NASDAQ*(ADRs excluded). The combination of NYSE and Nasdaq markets is our main control series based on the fact that Chinese ADRs are mostly listed half:half there with the percentage of 55% and 44% in NYSE and NASDAQ, respectively.

3.2 Data collection

Based on the list in Table 3.1 and the graph in Figure 3.1, we have totally 40 Chinese ADRs available in the US stock markets by the end of 2006. To obtain enough observation for our statistic analysis, we set the analysis period to be from January 2007 to December 2015.

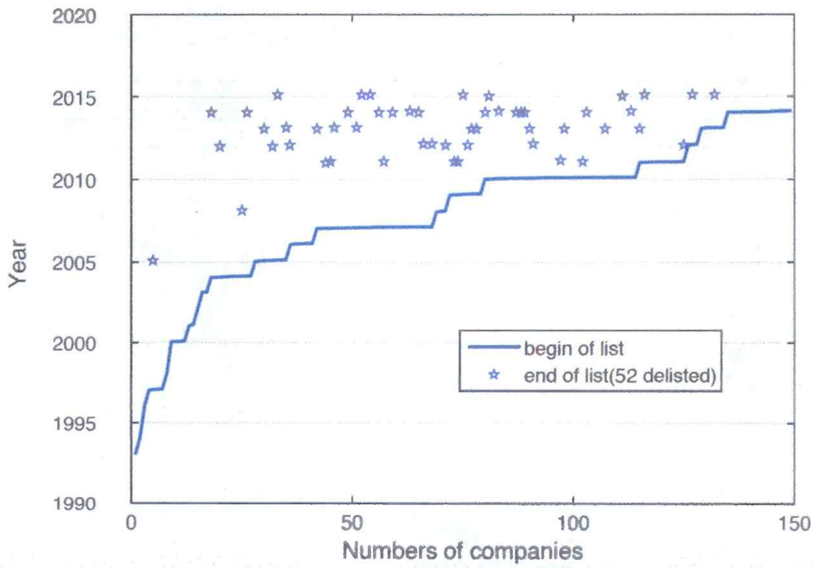


Figure 3.1: Listing and delisting of Chinese ADRs through time

The vertical distance between the starting point and its corresponding point in the line indicates the years of listing in the market. For example, the only company delisted in 2005 was formally listed in 1997.

We check daily returns of ADRs/stocks, the risk free rate, Fama-French factors as well as some Chinese specific factors.

3.2.1 Daily performance

CRSP (Center for Research in Security Prices) is the source from which we get the daily exchange records of US stock markets. Different criteria are applied to the data series as follows:

- The *Chinese ADRs* is a list of tickers from the preparation step in 3.1.1. We first exclude some tickers, which are used by formerly delisted ADRs from other countries.
- The *non Chinese ADRs* in NYSE and NASDAQ markets are identified by CRSP share code 31. We then exclude Chinese ADRs.
- The *stocks in NYSE and NASDAQ* are set to be the common stocks with share code

10 or 11 in the CRSP.

Finally, we get four series of data, the Chinese ADRs, the non Chinese ADRs, NYSE stocks and NASDAQ stock from January 2007 to December 2015. Table 3.2 shows the summary of number in each series.

Table 3.2: Number of stocks

	Chinese ADRs	non Chinese ADRs	NYSE	Nasdaq
Minimum	40	220	1247	2032
Median	93	229	1282	2223
Maximum	114	311	1334	2520

3.2.2 Other market information

Other market information includes risk free rate, Fama-French three factors together with one factor of momentum, stock index in different areas (US, China) , as well as the exchange rates of Chinese and Hong Kong currencies with the US dollar.

Regarding the risk-free interest rate, we use the yield to maturity of one-month treasury bond. The daily rates are available in the database of Fama-French factors as they are used to calculate the market excess return in the database.

The database of "Fama French & liquidity factor" listed in WRDS provides also four market factors, which are Market Excess Return, SMB, HML and UMD, at monthly frequency.

We use Bloomburg to get the daily stock index of S&P 500 in US, SHCOMP of Shanghai Composite Index in China.

We also include the daily exchange rates from Datastream between the Chinese Yuan¥and US Dolloar$, or between Hong Kong Dollar$ and US Dollar$.

Chapter 4

Methodology

We now introduce the methodology of our analysis step by step. First, we use different risk criteria to construct the equally weighted portfolios and check their performance in returns; Second, we do Carhart four factors regression to verify the abnormal returns; Third, we include further analyses to consolidate the results; Fourth, we add Chinese specified factors to improve the explication power of regression; Finally, we make Fama-MacBeth cross section regression and specify the downside risk premium of Chinese ADRs.

4.1 Construction of portfolios

The method to construct equally weighted portfolios for the performance comparison is very much like what Ang et al. (2006) used. We first calculate the beta (β) and conditional betas (β^+ and β^-) for each stock, then use those betas (or the difference between them) as criteria to sort all stocks into five portfolios, and finally check if the yearly returns are significantly different between the portfolios with the highest and lowest criteria.

4.1.1 βs and yearly return

For each stock, we calculate three betas, β, β^- and β^+ by using one-year's daily return from the beginning of month t_1 to the end of month t_{12}. Meanwhile, the yearly excess return is achieved by using the equation (4.4). All the three βs and the yearly excess return are recorded as the performance of month t_1 for the stock i. At monthly frequency, we repeat the calculation for each stock.

$$\beta = \frac{cov(r_i, r_m)}{var(r_m)} \tag{4.1}$$

$$\beta^- = \frac{cov(r_i, r_m | r_m < \mu_m)}{var(r_m | r_m < \mu_m)} \tag{4.2}$$

$$\beta^+ = \frac{cov(r_i, r_m | r_m > \mu_m)}{var(r_m | r_m > \mu_m)} \tag{4.3}$$

$$R_i = \prod_{t=1}^{252} (1 + RET_{i,t}) - \prod_{t=1}^{252} (1 + r_{f,t}) \tag{4.4}$$

In which, r_i is the daily excess return of stock i; r_m is the daily excess return of the market; μ_m is the average daily excess return during one year; r_f is daily risk free rate; RET_i is the daily return of stock. We exclude the stocks having less than 7 months' records in one year's interval.

Thus, the first month of our study is Jan., 2007, for which we use daily records from January to December 2007. The last month is January 2015, which is based on the information from January 2015 to December 2015. Overall, we get 97 months' time series results for each stock.

4.1.2 Sorting criteria

As in Ang et al. (2006), we use β, β^-, β^+, $\beta^- - \beta$, $\beta^+ - \beta$ and $\beta^+ - \beta^-$ as criteria to sort the Chinese ADRs and the control stocks every month, and equally divide them into 5 groups from the lowest to the highest value of criteria. We construct equal-weighted portfolios and then calculate the average yearly return of quintile portfolios over 97 months. As our yearly returns have month overlaps, the t-statistics are computed using Newey et al. (1987) heteroskedastic-robust standard errors with 12 lags for analyzing the high-low strategy performance.

Intuitively, the performance of Chinese ADRs in the stock market could be changed by the events of the financial crisis in 2008. Accordingly, we separate also l the total observation period into two time horizons, from Jan.,2007 to Dec.,2010 and from Jan.,2011 to Jan.,2015.

4.2 Four-factor regressions

We regress to check the significance of abnormal return of Chinese ADRs compared with the benchmarks, the common stocks in NYSE and/or in NASDAQ exchanges.

We note that the difference of realized returns between high-low portfolios of Chinese ADRs as $DIFF^{h-l}_{CN}$, and that of the control sample as $DIFF^{h-l}_{Control}$. The dependent variable is the difference of the two strategies on monthly basis.

$$y_t = (1 + DIFF^{h-l}_{CN,t})^{1/12} - (1 + DIFF^{h-l}_{Control,t})^{1/12} \quad (4.5)$$

Where $DIFF^{h-l}_{CN,t}$ is the difference of realized returns between the high-low portfolios of Chinese ADRs; $DIFF^{h-l}_{Control,t}$ is the difference of realized returns between the high-low portfolios of control group. As we have yearly return in monthly frequency, we use (4.5) to get an average monthly difference between two strategies.

Then we use the Fama-French 3 factors together with the factor of momentum to do regressions as (4.6) and check the significance of abnormal return of α.

$$y_t = \alpha + b_1 \cdot MKEX_t + b_2 \cdot SMB + b_3 \cdot HML + b_4 \cdot UMD + \epsilon_t \quad (4.6)$$

Where y_t is the monthly difference in returns between two high-low strategies; t is from 1 to 97 representing January 2007 to January 2015; MKEX is the excess return to risk free rate on a value-weighted market portfolio; SMB is the return on zero-investment, factor-mimicking portfolio for size; HML is the return on zero-investment factor-mimicking portfolio for book-to-market; UMD is the return on a zero-investment, factor-mimicking portfolio for momentum; ϵ is the residuals of the OLS regression. The t-statistics of significance of α and b is robust-tested by Newey et al. (1987) 12 lags correction. The modified R^2 is kept as an indicator of the quality of regression.

4.3 Further analysis

Three types of further analysis are used in this study. First, we study the evolution of the abnormal return every two years, which provide four sub-periods; then we use the non Chinese ADRs as control to identify if there exist a pure ADR effect; finally, we check the industry distributions of the high-low portfolios of Chinese ADRs and the common stocks in the US markets to investigate if the performance is a pure industry distribution effect.

4.3.1 Evolution of Abnormal Return

To better understand the evolution of the abnormal returns through time, we repeat the four-factor regression of (4.6) by two years' interval. In this case, the regression is based on 24 month observations.

4.3.2 ADR effect

To identify any ADR specific risk, we use the series of Non-Chinese ADRs to do further regression analysis.

The Non-Chinese ADRs are used to replace Chinese ADRs in the equation of (4.5) to prepare the new dependent variable, the benchmark keeps with all common stocks in NYSE and NASDAQ. The abnormal returns between high-low Non-Chinese ADRs strategy and that of the US markets are checked and compared with the abnormal returns between Chinese ADRs and the US market.

4.3.3 Industry distribution

We double check the industry distribution of the low-high portfolios of Chinese ADRs and those of the whole exchange markets in US. The portfolios change every months, so the industry distribution evolved over 97 months.

The industry distribution are presented on a percentage basis. We check the difference of high-portfolio of Chinese ADRs and high-low portfolio of common stocks in the US NYSE and NASDAQ exchange markets.

4.4 Chinese specific factors

In addition to the four explanatory factors, we check whether Chinese specific factors might influence the performance of ADRs. According to our hypothesis, the possible factors could be the US market index, China market index, the change of exchange rates between US dollar and Chinese Yuan and that between US dollar and Hong Kong dollar.

The stock markets in the world are somehow mutually dependent, meaning the covariation between the stock index in China and S&P500 in US could influence the explication power documented in our study. To separate a pure market specific factor, we make two regressions, (4.7) and (4.8), to verify the mutual impacts of US index and the Chinese index. Then we use the residuals of the regressions, μ_i or ν_i, as the US market or Chinese market factors. The treatments to get index residuals also help to reduce the correlations between the new factors and the existing four factors in regressions, especially S&P 500 and the market excess return.

$$CNmarket_i = \alpha_i + \beta \cdot USmarket_i + \mu_i \tag{4.7}$$

$$USmarket_i = \alpha_i + \beta \cdot CNmarket_i + \nu_i \tag{4.8}$$

Where i is the daily index from Jan. 1st of 2007 to the end of 2015; CNmarket is the market index of Shanghai Composite Index (SHCOMP) in Mainland China; USmarket is the index of S&P 500; μ_i is the CN market residuals; ν_i is the US market residuals.

We add daily residuals of μ_i or ν_i in each month to get the monthly based residuals as the fifth and the sixth explicative factors in addition to the four-factor regressions of (4.6).

For the monthly change of exchange rate, either the CN/US or HK/US, we use the exchange rate in the end of month t divided by that in month t-1, minus 100% .

4.5 Fama-MacBeth regressions

Fama-MacBeth regression helps us to analyze the downside risk premium. Ang et al. (2006) find, from 1963 to 2001, there exists a downside risk premium of 6% per annum in NYSE. We are going to check the risk premium of Chinese ADRs by the Fama-MacBeth regression as demonstrated in (4.9), as well as that of the common stocks in the US markets from 2007 to 2015.

$$y_{i,t} = \alpha + b1 \cdot \beta^-_{i,t} + b2 \cdot \beta^+_{i,t} + \epsilon_{i,t} \tag{4.9}$$

Where i indicates the company i, ranging from 1 to 149 when doing the regression for Chinese ADRs; t is the month in time series from 1 to 97; $\beta^-_{i,t}$ is the conditional β between company i and the market when the market return is lower than its average at time t; $\beta^+_{i,t}$ is the conditional β between company i and the market when the market return is higher than its average at time t; the independent variable is the yearly holding period return of company i beginning with month t; ϵ is the residuals of regression. The t-statistics of significance of the coefficients of α and b are robust-tested by Newey et al. (1987) 12 lags correction. The adjusted R^2 is kept as an indicator of the quality of regression.

Chapter 5

Results and discussion

In this chapter, we first provide the statistics about different risk factors of Chinese ADRs, those of common stocks in US exchanges markets (including NYSE and NASDAQ), as well as those of Non-Chinese ADRs; then demonstrate the equal-weighted average returns and risk characteristics of Chinese ADRs by choosing different loading factors of risks, as well as the corresponding performance of the control series sorted on the loading factor of downside risk; then we use the OLS regression on Fama-French 3 factors tegether with one momentum factor to check the abnormal returns of Chinese ADRs compared with the control. Moreover, we perform further analyses and we discuss the Chinese specific factors that might influence the performance of ADRs. Finally, we present our results of downside risk premiums by applying the cross section regressions of Fama-MacBeth.

5.1 Statistics of the factor loadings

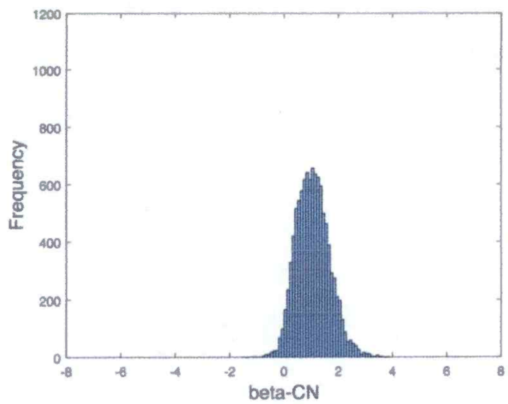
In this section, we present the statistics of the factor loadings, β, β^-, β^+ and $\beta^- - \beta$ first for the Chinese ADRs, then for the US markets (NYSE combine with NASDAQ) and finally for the Non-Chinese ADRs.

For US markets and Non-Chinese ADRs (see tables 5.2 and 5.3), the mean value of factor loadings β, β^-, β^+ are all close to 1, thus the mean of downside risk of $\beta^- - \beta$ are around zero. However, the Chinese ADRs (see table 5.1), have β^- at 1,20 on average, which indicates that Chinese ADRs as a group are higher in downside risks compared with the controls.

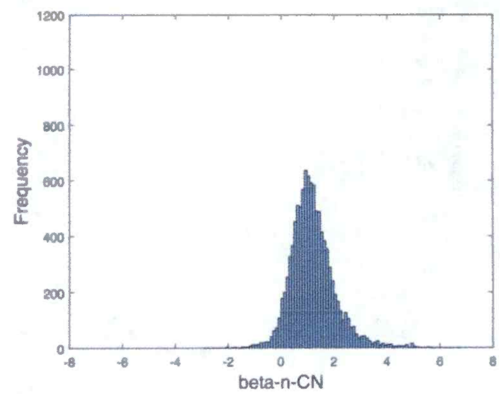
Table 5.1: Summary statistics of βs of Chinese ADRs

	Min.	Max.	**Mean**	Median	S. D.	Skew.	Kurt.	Num of Obs
β	-1.41	3.87	**1.06**	1.03	0.62	0.37	3.42	10292
β^-	-2.89	6.74	**1.20**	1.12	0.85	0.89	5.96	10292
β^+	-5.86	5.51	**0.92**	0.93	0.80	-0.11	5.49	10292
$\beta^- - \beta$	-3.69	4.80	**0.14**	0.08	0.51	1.15	8.92	10292

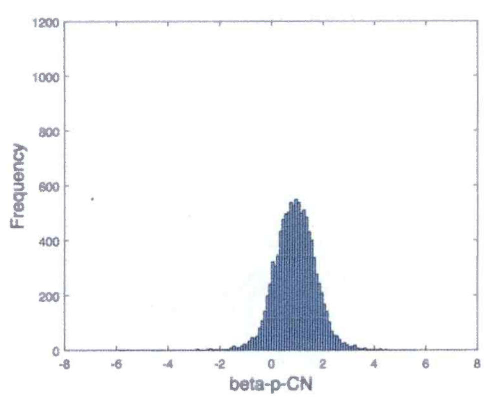
Figure 5.1: Histogram of different factor loadings of Chinese ADRs



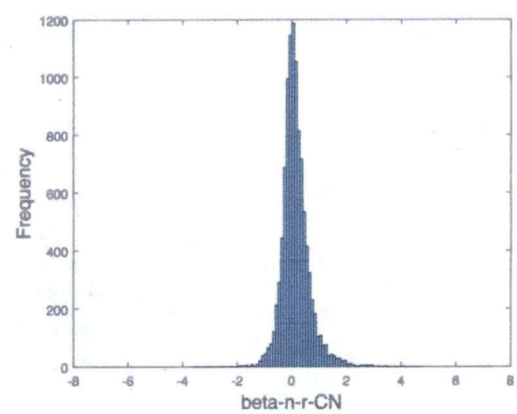
(a) Histogram of β



(b) Histogram of β^-



(c) Histogram of β^+

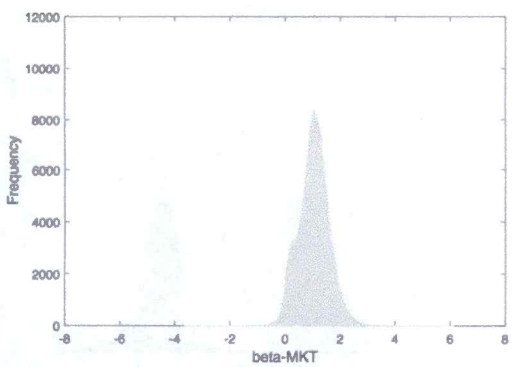


(d) Histogram of $\beta^- - \beta$

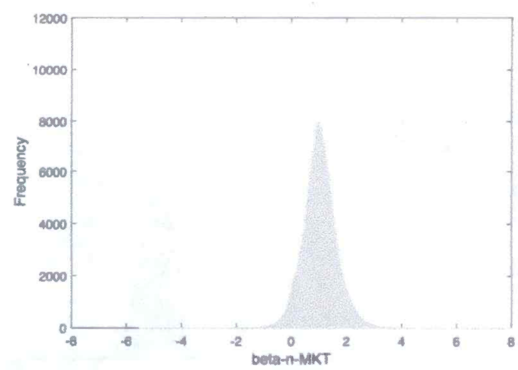
Table 5.2: Summary statistics of βs of the US markets

	Min.	Max.	**Mean**	Median	S. D.	Skew.	Kurt.	Num of Obs
β	-3.66	6.10	**1.03**	1.04	0.55	0.10	3.55	343048
β^-	-5.49	11.35	**1.03**	1.01	0.64	0.36	7.46	343048
β^+	-18.78	9.43	**0.95**	0.97	0.72	-0.37	12.83	343048
$\beta^- - \beta$	-5.80	6.77	**0.00**	-0.01	0.37	0.69	14.58	343048

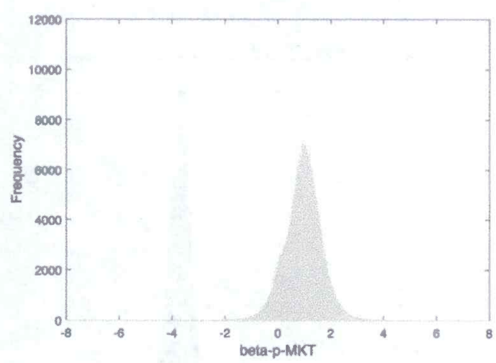
Figure 5.2: Histogram of different factor loadings of the US market



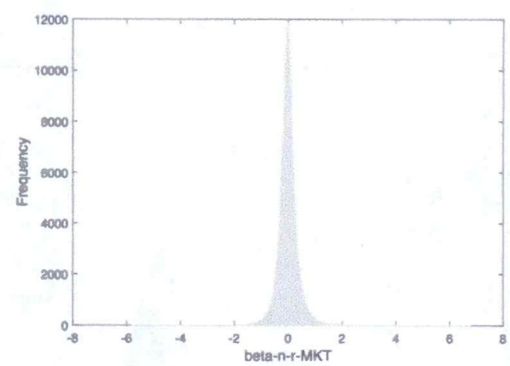
(a) Histogram of β



(b) Histogram of β^-



(c) Histogram of β^+

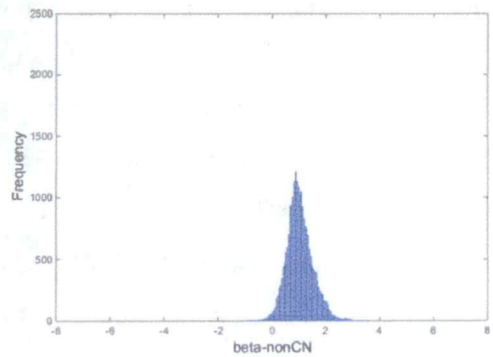


(d) Histogram of $\beta^- - \beta$

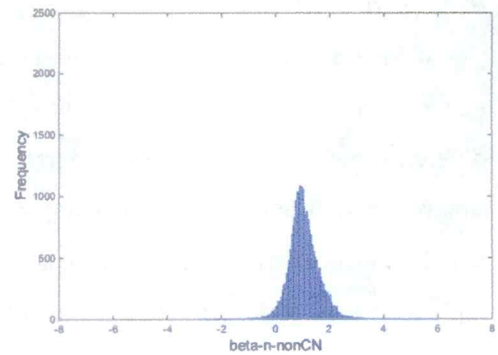
Table 5.3: Summary of statistics of βs of Non-Chinese ADRs

	Min.	Max.	**Mean**	Median	S. D.	Skew.	Kurt.	Num of Obs
β	-0.94	3.50	**1.03**	0.98	0.48	0.43	3.89	23222
β^-	-2.89	6.04	**1.06**	1.01	0.56	0.33	6.70	23222
β^+	-6.50	5.28	**0.99**	0.97	0.64	-0.37	8.75	23222
$\beta^- - \beta$	-2.54	6.50	**0.03**	0.02	0.33	2.25	38.18	23222

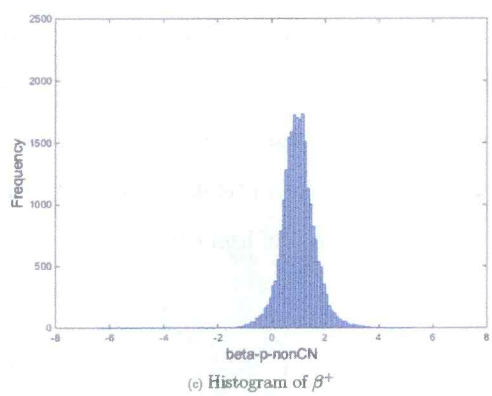
Figure 5.3: Histogram of different factor loadings of Non-Chinese ADRs



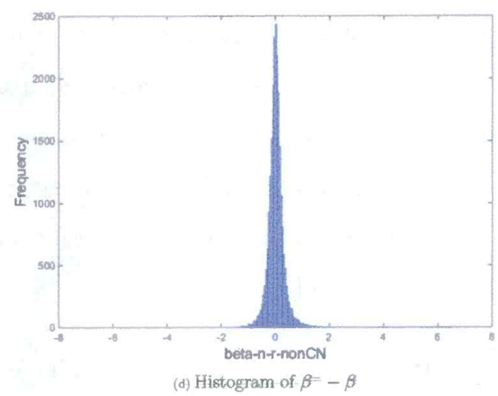
(a) Histogram of β



(b) Histogram of β^-



(c) Histogram of β^+



(d) Histogram of $\beta^- - \beta$

5.2 Group portfolios

5.2.1 Quintiles of Chinese ADRs

We present in table 5.4 the equal-weighted average returns and risk characteristics of Chinese ADRs in US exchanges from January 2007 to January 2015, with last sample period from January 2015 to December 2015. From panel A to panel C, we use three different risks of β, β^- and β^--β to construct the quintile portfolios. The column labeled "Return" reports the average return in excess of the one-month Treasury-bill rate over the next 12 months (same period as that used to compute β, β^-, β^+). The row labeled "High-low" reports the difference between the returns of portfolio 5 and portfolio 1. The entry labeled "t-stat" in square brackets is the t-statistic computed using Newey et al. (1987) heteroskedastic-robust standard errors with 12 lags for the High-low difference. The columns labeled "β", "β^-","β^+" report the time series and cross-sectional average of betas over the 12-month holding period.

As shown in panel A of table 5.4, each panel includes three mini-tables, one whole period evaluation from January 2007 to January 2015, and two sub-period evaluations from January 2007 to December 2010 and from January 2011 to January 2015. In panel A, the portfolios are sorted on realised β. None of the t-values in the mini-tables shows statistical difference, so the "high-low" portfolios are not very much different in terms of yearly returns. It indicates that the realised β doesn't reflect the risk premium of Chinese ADRs during the sampling period.

Panel B lists the results of Chinese ADRs sorted on realised β^-. Similar to Panel A, none of the three high-low differences is significantly different from zero. It shows that in our case, the t-values of portfolios sorted on β^- are again not significant enough to demonstrate the risk premium of Chinese ADRs in the market.

Panel C lists the results of Chinese ADRs sorted on realised $\beta^- - \beta$. Though the whole period analysis doesn't show a significantly different result, the following two sub-period tables both present statistically significant t-values. For the first sub-period from January 2007 to December 2010, the return of high loading factor portfolio is significantly smaller, -18.97%*, than that of the low one. By contrast, for the second sub-period of January 2011 to January 2015, the high relative β^- portfolio earns 32.37%* more in excess return than that of the low portfolio. Obviously, the high-low difference changes the sign, from negative to positive, in two sub-periods. It helps us understand why we couldn't get a significant different result for the whole period analysis. Actually, the results in table 5.4 support our assumption that the performance of Chinese ADRs could be different before and after the financial crisis of 2008 in the US.

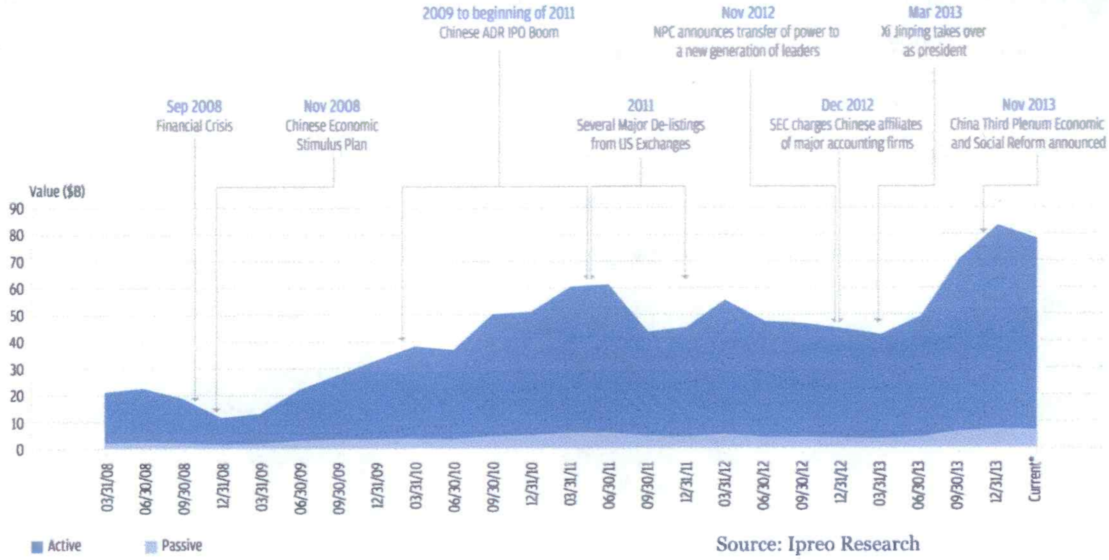


Figure 5.4: Dollar invested in Chinese ADR over years

Figure 5.4 shows that agents reduced their investment into Chinese ADRs during the period of financial crisis in the US. The reduced demand pushed down the price of Chinese ADRs to the new supply-demand balance. Under such context, the returns of Chinese ADRs became negative. Anyhow, it is a little bit surprise that, during the financial crisis in the US, the China Concept stocks didn't become popular to US investors. The extremely risk averse agents during the crisis prefer to sell Chinese ADRs than to buy and hold them.

High risk stocks bring deep negative returns during 2007-2010. Since 2011, the return of the highest relative β^- group realised extremely high yearly return of 30.91%, while the lowest downside risk portfolio turns negative (-1.46%).

Our results differ from Ang et al. (2006) mainly in one aspect. Their study shows the quintile 5 and quintile 1 differences are always significant regardless of being sorted on β, β^- or β^--β, with the results of 10.43%[t=4.96], 11.78%[6.64] and 6.64%[7.70] respectively. Furthermore, portfolios sorted on β^- show the biggest difference in return between top-low quintiles, up to 11.78%. Portfolios sorted on β^--β have the highest power in the statistic significance, which gets up to 7.70 in t-value. Our results demonstrate the significance only when sorting portfolios by β^--β. Anyhow, as we study only 93 Chinese ADRs in the median level from 2007 to 2015 instead of more than one thousand common stocks in NYSE from 1963 to 2001, it is not surprising to get less statistic significance as the weight of each stock is relatively important for the whole portfolio. From another point of view, our study confirms that the grouping method of β^--β shows the highest t-value in the difference of Holding Period Returns between high and low portfolios, higher than the t-value of portfolios sorted on β or β^-.

Table 5.4: Yearly Returns of Chinese ADRs in NYSE and NASDAQ

Panel A: Chinese ADRs sorted on realized β

	(years: 2007-2015)					(years: 2007.01-2010.12)					(years: 2011.01-2015.01)			
Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+
1 Low β	1.51%	0.31	0.40	0.17	1 Low β	-6.76%	0.44	0.49	0.30	1 Low β	9.62%	0.18	0.32	0.04
2	8.31%	0.75	0.86	0.59	2	4.29%	0.82	0.86	0.71	2	12.26%	0.67	0.86	0.48
3	10.01%	1.06	1.14	0.94	3	5.21%	1.13	1.18	1.03	3	14.72%	1.00	1.10	0.85
4	12.83%	1.40	1.51	1.25	4	14.34%	1.41	1.40	1.40	4	11.35%	1.40	1.61	1.11
5 high β	18.33%	1.94	2.19	1.70	5 high β	12.21%	1.83	1.97	1.79	5 high β	24.33%	2.04	2.40	1.61
High-low	16.82%	1.63	1.79	1.53	High-low	18.97%	1.40	1.48	1.49	High-low	14.71%	1.86	2.08	1.57
t-stat	[1.16]				t-stat	[1.44]				t-stat	[0.59]			

Panel B: Chinese ADRs sorted on realized β^-

	(years: 2007-2015)					(years: 2007.01-2010.12)					(years: 2011.01-2015.01)			
Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+
1 Low β^-	5.84%	0.43	0.25	0.41	1 Low β^-	1.04%	0.52	0.39	0.45	1 Low β^-	10.54%	0.34	0.10	0.37
2	2.21%	0.80	0.80	0.72	2	-0.24%	0.86	0.84	0.79	2	4.62%	0.74	0.76	0.64
3	11.10%	1.07	1.15	0.95	3	10.32%	1.12	1.12	1.07	3	11.87%	1.03	1.17	0.83
4	12.53%	1.36	1.53	1.17	4	10.73%	1.40	1.43	1.35	4	14.29%	1.31	1.62	0.99
5 high β^-	19.58%	1.80	2.37	1.43	5 high β^-	7.83%	1.73	2.10	1.59	5 high β^-	31.09%	1.87	2.63	1.27
High-low	13.74%	1.37	2.12	1.03	High-low	6.79%	1.21	1.71	1.15	High-low	20.55%	1.53	2.53	0.91
t-stat	[0.89]				t-stat	[0.42]				t-stat	[0.84]			

Panel C: Chinese ADRs sorted on realized $\beta^- - \beta$

	(years: 2007-2015)					(years: 2007.01-2010.12)					(years: 2011.01-2015.01)			
Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+
1 Low relative β^-	6.14%	1.11	0.69	1.17	1 Low relative β^-	**13.90%**	1.17	0.83	1.25	1 Low relative β^-	**-1.46%**	1.04	0.55	1.10
2	10.39%	1.07	0.97	1.05	2	**12.41%**	1.11	1.00	1.11	2	**8.41%**	1.04	0.94	0.98
3	11.43%	1.06	1.14	0.94	3	**8.50%**	1.08	1.10	1.00	3	**14.30%**	1.04	1.17	0.87
4	10.64%	1.00	1.29	0.76	4	**1.17%**	1.02	1.18	0.88	4	**19.91%**	0.98	1.39	0.65
5 high relative β^-	13.10%	1.26	2.03	0.78	5 high relative β^-	**-5.07%**	1.30	1.80	1.04	5 high relative β^-	**30.91%**	1.22	2.25	0.53
High-low	6.97%	0.15	1.34	-0.39	High-low	**-18.97%**	0.12	0.97	-0.21	High-low	**32.37%**	0.18	1.70	-0.57
t-stat	[0.50]				t-stat	**[1.76*]**				t-stat	**[1.96*]**			

This table shows the equal-weighted average returns of each quintile portfolio and its risk factors of Chinese ADRs in the US exchanges sorted on realised betas. At the beginning of each month, we calculate the risk factors of β, β^-, β^+ for each ADR listed using daily returns during the following 12 months. For each risk factor, we divide stocks into quintiles(1-5) and construct equal-weighted portfolios. The number of stocks varies across time from 7 to 26 in each portfolio. The column labeled "Return" shows the yearly average excess return over the one-month Treasury-bill.The row labeled "High-low" includes the difference in returns between portfolio 5 and portfolio 1. The "t-stat" in square brackets is the t-statistic robust-tested by Newey-West (1987a) heteroskedastic-autocorrelation-robust method with 12 lags for the difference between High-low groups. The columns with the name of "β", "β^-","β^+" are the cross-section and time series average of betas over the one-year holding period. The sample period in study is from January 2007 to December 2015, the last 12-month period included is from January 2015 to December 2015, and be noted as the performance of January 2015. The frequency of observations is at a monthly base. the symbols of *, ** and *** denote the results have a significance at the 90%, 95% and 99% levels respectively.

5.2.2 Quintiles of US markets

For the control series, we use the loading factor of β^{-}-β to construct quintile portfolios. Table 5.5 lists the equal-weighted average returns and risk characteristics of each control series from January 2007 to January 2015, with the last sample period of January 2015 to December 2015. From panel A to panel D, we present the performance of the common stocks in NYSE, the common stocks in NASDAQ, the combination of two exchanges and the non-Chinese ADRs. The column labeled "Return" reports the average return in excess of the one-month Treasury-bill rate over the next 12 months (same period as that used to compute β, β^{-}, β^{+}). The row labeled "High-low" reports the difference between the returns of portfolio 5 and portfolio 1. The entry labeled "t-stat" in square brackets is the t-statistic computed using Newey et al. (1987) heteroskedastic-robust standard errors with 12 lags for the High-low difference. The columns labeled "β", "β^{-}","β^{+}" report the time series and cross-sectional average of equal-weighted individual stock betas over the 12-month holding period.

In panel A of table 5.5, we firstly present the results of the 8-year period of high-low portfolios sorted on relative β^{-} of all common stocks in NYSE. The statistically significant high-low premium is 6.56%**, equivalent to the result of Ang et al. (2006) at 6.64% from their 39-year sample period evaluation. When we separate the investment horizon into two, our results during the financial crisis, from 2007.01 to 2010.12, don't show clear risk premium, while the horizon followed, from 2011.01to 2015.01, gets 8.84%*** yearly extra return of the high downside risk portfolio.

Panel B of table 5.5 presents the performance of common stocks in the NASDAQ market. However, except for the risk premium of 5.45%*** in the second sub-period after the crisis, we don't get other statistically significant results.

Panel C of table 5.5 is the combination of panel A and B by using equal-weighted method. Based on the fact that there are more stocks in NASDAQ than in NYSE (shown in table 3.2), the results in panel C are driven more by the NASDAQ market than the NYSE market. Similar to panel B, we get the risk premium of 6.36%*** in the second sub-period, but not in the first period and the whole one.

Panel D of table 5.5 shows performance of non-Chinese ADRs. Their characteristics are not clearly demonstrated in this table because all three high-low difference are not significantly different from zero. This might be because the ADRs from many countries are very much diversified. An equal-weighted mix of all non-Chinese ADRs does not show strong characteristics in the way we do the analysis.

Table 5.5: Yearly return of common stocks in NYSE and NASDAQ

Panel A: NYSE Stocks sorted on $\beta^- - \beta$

Portfolio	Return (years: 2007-2015)	β	β^-	β^+	Portfolio	Return (years: 2007.01-2010.12)	β	β^-	β^+	Portfolio	Return (years: 2011.01-2015.01)	β	β^-	β^+
1 Low relative β^-	**7.84%**	1.39	1.02	1.45	1 Low relative β^-	8.53%	1.44	1.09	1.53	1 Low relative β^-	**7.17%**	1.35	0.95	1.37
2	**11.42%**	1.19	1.06	1.19	2	9.26%	1.20	1.08	1.23	2	**13.54%**	1.18	1.05	1.16
3	**11.85%**	1.10	1.08	1.08	3	7.70%	1.09	1.06	1.07	3	**15.92%**	1.12	1.11	1.08
4	**12.95%**	1.10	1.19	1.02	4	8.11%	1.07	1.15	1.00	4	**17.68%**	1.12	1.22	1.04
5 high relative β^-	**14.40%**	1.27	1.60	1.04	5 high relative β^-	12.75%	1.30	1.60	1.08	5 high relative β^-	**16.01%**	1.24	1.59	1.00
High-low	**6.56%**	-0.13	0.57	-0.41	High-low	4.22%	-0.14	0.51	-0.45	High-low	**8.84%**	-0.11	0.63	-0.37
t-stat	**[2.12**]**				t-stat	[0.82]				t-stat	**[2.90***]**			

Panel B: NASDAQ Stocks sorted on $\beta^- - \beta$

Portfolio	Return (years: 2007-2015)	β	β^-	β^+	Portfolio	Return (years: 2007.01-2010.12)	β	β^-	β^+	Portfolio	Return (years: 2011.01-2015.01)	β	β^-	β^+
1 Low relative β^-	6.85%	1.06	0.57	1.15	1 Low relative β^-	3.58%	1.03	0.58	1.14	1 Low relative β^-	**10.05%**	1.10	0.56	1.16
2	9.73%	1.00	0.83	0.99	2	4.66%	0.98	0.82	0.99	2	**14.70%**	1.01	0.85	0.99
3	11.34%	0.92	0.90	0.85	3	5.01%	0.88	0.86	0.83	3	**17.54%**	0.95	0.94	0.86
4	10.85%	0.86	1.01	0.72	4	4.83%	0.82	0.95	0.69	4	**16.74%**	0.91	1.07	0.75
5 high relative β^-	8.27%	0.83	1.41	0.50	5 high relative β^-	0.88%	0.74	1.25	0.44	5 high relative β^-	**15.50%**	0.92	1.57	0.56
High-low	1.42%	-0.23	0.84	-0.65	High-low	-2.70%	-0.28	0.67	-0.70	High-low	**5.45%**	-0.17	1.00	-0.60
t-stat	[0.72]				t-stat	[1.19]				t-stat	**[3.67***]**			

Panel C: NYSE and NASDAQ Stocks sorted on $\beta^- - \beta$

Portfolio	Return (years: 2007-2015)	β	β^-	β^+	Portfolio	Return (years: 2007.01-2010.12)	β	β^-	β^+	Portfolio	Return (years: 2011.01-2015.01)	β	β^-	β^+
1 Low relative β^-	7.14%	1.17	0.72	1.24	1 Low relative β^-	5.24%	1.15	0.74	1.26	1 Low relative β^-	**9.00%**	1.18	0.70	1.22
2	10.18%	1.08	0.93	1.07	2	6.19%	1.07	0.92	1.08	2	**14.08%**	1.08	0.94	1.06
3	11.54%	1.00	0.98	0.95	3	6.02%	0.97	0.95	0.93	3	**16.94%**	1.03	1.02	0.97
4	12.06%	0.97	1.10	0.86	4	6.53%	0.94	1.04	0.83	4	**17.48%**	1.01	1.15	0.89
5 high relative β^-	10.00%	0.95	1.45	0.65	5 high relative β^-	4.53%	0.90	1.34	0.62	5 high relative β^-	**15.36%**	1.01	1.55	0.68
High-low	2.86%	-0.21	0.73	-0.59	High-low	-0.71%	-0.26	0.60	-0.64	High-low	**6.36%**	-0.17	0.85	-0.54
t-stat	[1.39]				t-stat	[0.24]				t-stat	**[4.35***]**			

continuing of table

Panel D: Non Chinese ADRs sorted on $\beta^- - \beta$

Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+	Portfolio	Return	β	β^-	β^+
(years: 2007-2015)					(years: 2007.01-2010.12)					(years: 2011.01-2015.01)				
1 Low relative β^-	3.87%	1.10	0.76	1.18	1 Low relative β^-	6.18%	1.07	0.79	1.20	1 Low relative β^-	1.62%	1.12	0.72	1.17
2	6.67%	1.04	0.95	1.06	2	6.50%	1.04	0.97	1.08	2	6.85%	1.04	0.94	1.05
3	8.17%	0.99	1.01	0.98	3	8.05%	1.02	1.04	1.02	3	8.28%	0.97	0.98	0.94
4	7.75%	1.00	1.13	0.94	4	6.98%	1.03	1.15	0.98	4	8.51%	0.98	1.12	0.89
5 high relative β^-	5.57%	1.00	1.44	0.77	5 high relative β^-	12.00%	1.03	1.39	0.83	5 high relative β^-	-0.73%	0.97	1.50	0.72
High-low	1.70%	-0.10	0.69	-0.41	High-low	5.83%	-0.05	0.60	-0.37	High-low	-2.35%	-0.15	0.78	-0.45
t-stat	[0.46]				t-stat	[1.34]				t-stat	[0.46]			

This table shows the equal-weighted average returns of each quintile portfolio and its risk factors of all control series, the common stocks in NYSE, common stocks in NASDAQ and all non-Chinese ADRs on the two exchanges sorted on the realised relative β^-. At the beginning of each month, we calculate the risk factors of β, β^-, β^+ for each stock listed by using daily returns during the following 12 months. We divide stocks into quintiles(1-5) and construct equal-weighted portfolios. The column labeled "Return" shows the yearly average excess return over the one-month Treasury-bill.The row labeled "High-low" indicates the difference in returns between portfolio 5 and portfolio 1. The "t-stat" in square brackets is the t-statistic robust-tested by Newey-West (1987a) heteroskedastic-autocorrelation-robust method with 12 lags for the difference between High-low groups. The columns under the name of "β", "β^-","β^+" are the cross-section and time series average of betas over the one-year holding period. The sample period in study is from January 2007 to December 2015, the last 12-month period included is from January 2015 to December 2015, and be noted as the performance of January 2015. The frequency of observations is at a monthly base. the symbols of *, ** and *** denote the results have a significance at the 90%, 95% and 99% levels respectively.

5.3 Abnormal returns by regressions

To better understand the downside risk premium of Chinese ADRs in comparison with that of the control series, we include multi-factor linear regressions in section 5.3 and check if the abnormal returns are significantly different from zero.

We present the regressions based on loading factor of unconditional β in Table 5.6, and those based on loading factor of downside risk, relative β^-, in table 5.7.

5.3.1 Groups sorted on β

In table 5.6, the high-low groups are sorted on β. By applying the 4 factors regression(4.6), we compare the returns of Chinese ADRs with the common stocks in NYSE in the first block, with the common stocks in NASDAQ in the second block, and with the market portfolio (combination of common stocks in NYSE and NASDAQ) in the last block. Each block includes three regressions that are different in time periods, one whole period and two sub-periods.

The results show us that none of the nine regressions gets abnormal return, because α is not significantly different from zero. The adjusted R^2 are slightly improved but still low, if we separate the whole period into two sub-periods of during financial crisis and after crisis. Nevertheless, it is not a surprise to see that the α in table 5.6 are not statistically significant. As we notice in last section 5.2 when evaluating the group portfolios, we confirm here that the β could hardly be used as sorting criterion to show the difference in performance of portfolios of Chinese ADRs.

Table 5.6: Abnormal return, portfolios sorted on β

	Chinese ADRs vs. NYSE market			Chinese ADRs vs. NASDAQ market			Chinese ADRs vs. NYSE-NASDAQ		
	2007.01 -2015.01	I, 2007.01 -2010.12	II, 2011.01 -2015.01	2007.01 -2015.01	I, 2007.01 -2010.12	II, 2011.01 -2015.01	2007.01 -2015.01	I, 2007.01 -2010.12	II, 2011.01 -2015.01
α	0.013	0.010	0.022	0.007	0.006	0.011	0.008	0.006	0.015
	[1.23]	[0.78]	[1.61]	[0.76]	[0.76]	[0.79]	[0.86]	[0.64]	[1.05]
Mkt_Excess	0.13	0.11	0.01	0.06	0.07	0.00	0.08	0.07	0.01
	[1.23]	[0.88]	[0.11]	[0.76]	[0.68]	[0.039]	[0.95]	[0.71]	[0.065]
SMB	-0.29	-0.62	0.43	-0.09	-0.33	0.48	-0.15	-0.41	0.47
	[1.65]	[-5.09***]	[1.28]	[-0.59]	[-3.28***]	[1.28]	[-0.95]	[-4.15***]	[1.29]
HML	0.50	0.54	0.79	0.18	0.02	0.96	0.27	0.17	0.91
	[2.55**]	[3.65***]	[1.72*]	[0.92]	[0.14]	[2.07**]	[1.60]	[1.71*]	[1.92*]
UMD	0.48	0.51	-0.09	0.11	0.10	-0.12	0.22	0.22	-0.11
	[2.80***]	[4.07***]	[-0.49]	[1.64]	[1.6]	[-0.67]	[2.26**]	[2.87***]	[-0.59]
R^2_adjusted	0.17	0.31	0.06	-0.017	0.01	0.11	0.03	0.12	0.09

This table lists the OLS linear regressions based on the equation of $y_i = \alpha + \beta X_i + \epsilon_i$. The explanatory factors are Carhart 4 factors in monthly frequency. The dependent variable is the average monthly return of high-low portfolios of Chinese ADRs minus high-low portfolios of controls, including the common stocks in NYSE, in NASDAQ and in both markets, as shown in (4.6). The securities are sorted on the risk factor of β and the portfolios are equally weighted. The constant factor, "α", is the abnormal return we target to check. For each control pairs, we make three regressions of the whole period analysis of 97 months, and 2 sub-periods of 48 months and 49 months respectively. In square bracket are the t-values of each coefficient after robust-tested by Newey et al. (1987) with 12 lags to correct the heteroskedasticity and autocorrelation. *, ** and *** denote significance at the 90%, 95% and 99% levels respectively.

5.3.2 Groups sorted on relative β^-

Table 5.7 shows three blocks of nine regressions with portfolios sorted on $\beta^- - \beta$.

The block of the first three regressions compares the performance of Chinese ADRs with the common stocks in NYSE. Even though the whole period regression doesn't show a significant abnormal return, two sub-period regressions do show that Chinese ADRs get negative abnormal return, monthly -1.7%***, during the crisis period and positive abnormal return, monthly +2.4%*, after the crisis. Based on the fact the the sign of abnormal return changes from negative to positive in two sub-periods, it explains well why the α in the whole period regression isn't statistically different from zero.

The second block is the regressions of Chinese ADRs versus common stocks in NASDAQ. Similarly, when comparing with NYSE market, the whole period regression doesn't show clear abnormal returns, while Chinese ADRs have negative monthly abnormal return of -1.2%** during the crisis and monthly positive abnormal return of 2.7%** after the crisis.

In the third block, we combine all common stocks in NYSE and NASDAQ into one market portfolio by applying the equal-weighted method. Thus, the results of abnormal returns are in between those of two separate markets, more close to NASDAQ market as it contains 70% more stocks than NYSE. Chinese ADRs show monthly abnormal return of -1.3%*** during the crisis and +2.6%** afterwards.

Overall, the downside risk factors of Chinese ADRs leads to negative abnormal return during the financial crisis period of 2007 to 2010, bringing positive abnormal return after the crisis.

Table 5.7: Abnormal return, portfolios sorted on downside risk factor, $\beta^{-} - \beta$

	Chinese ADRs vs. NYSE market			**Chinese ADRs vs. NASDAQ market**			**Chinese ADRs vs. NYSE+NASDAQ**		
	2007.01 -2015.01	I, 2007.01 -2010.12	II, 2011.01 -2015.01	2007.01 -2015.01	I, 2007.01 -2010.12	II, 2011.01 -2015.01	2007.01 -2015.01	I, 2007.01 -2010.12	II, 2011.01 -2015.01
α	0.000	**-0.017**	**0.024**	0.004	**-0.012**	**0.027**	0.003	**-0.013**	**0.026**
	[0.008]	[3.40***]	[1.73*]	[0.42]	[-1.90**]	[2.26**]	[0.29]	[-2.29***]	[2.07**]
Mkt_Excess	0.22	0.19	-0.03	0.23	0.24	-0.07	0.23	0.23	-0.06
	[2.12**]	[3.36***]	[-0.25]	[1.94*]	[3.46***]	[-0.73]	[2.02**]	[3.65***]	[-0.56]
SMB	-0.19	-0.22	0.49	-0.27	-0.29	0.38	-0.24	-0.26	0.43
	[-1.15]	[-2.12**]	[1.68*]	[-1.87*]	[-3.02**]	[1.52]	[-1.57]	[-2.74***]	[1.60]
HML	0.42	0.22	1.15	0.22	-0.01	0.95	0.29	0.07	1.02
	[1.69*]	[1.81*]	[2.01**]	[0.93]	[-0.18]	[1.77*]	[1.20]	[0.75]	[1.85*]
UMD	0.12	0.09	-0.33	0.08	0.05	-0.32	0.08	0.06	-0.33
	[1.28]	[2.25**]	[-1.34]	[1.01]	[1.55]	[-1.40]	[1.04]	[1.69*]	[-1.42]
R^2_adjusted	0.07	0.13	0.16	0.05	0.12	0.12	0.05	0.12	0.14

This table lists the OLS linear regressions based on the equation of $y_i = \alpha + \beta X_i + \epsilon_i$. The explanatory factors are Garhart 4 factors in monthly frequency. The dependent variable is the average monthly return of high-low portfolios of Chinese ADRs minus high-low portfolios of controls, including the common stocks in NYSE, in NASDAQ and in both markets, as shown in (4.6). The securities are sorted on the risk factor of $\beta^{-} - \beta$ and the portfolios are equally weighted. The constant factor, "α", is the abnormal return we target to check. For each control pairs, we make three regressions of the whole period analysis of 97 months, and 2 sub-periods of 48 months and 49 months respectively. In square bracket are the t-values of each coefficient after robust-tested by Newey et al. (1987) with 12 lags to correct the heteroskedasticity and autocorrelation. *, ** and *** denote significance at the 90%, 95% and 99% levels respectively.

5.4 Further analysis

Our control series in this section is the US market portfolio, which is the equally weighted portfolio of all common stocks in NYSE and NASDAQ.

We include three types of further analysis to confirm the performance of Chinese ADRs compared with the market portfolio. First, we look into the abnormal returns more frequently, from every four years to every two years, to better understand the evolution over time.

Second, we verify whether the abnormal returns of Chinese ADRs is just an ADR effect resulting from the ADR specified risks, such as information asymmetric. Thus, we calculate the abnormal returns of all other ADRs and compare them with the abnormal returns of Chinese ADRs. Such kind of robustness test helps us to check whether a pure ADRs effect is included in our former analysis.

Finally, we need to confirm that the abnormal returns of Chinese ADRs are just because the allocation of industries, because even in the US markets we could often find that the performance of one industry is better than that of others. The abnormal returns we calculated in table 5.7 are based on the high-low portfolios of Chinese ADRs and that of the US markets, for which reason we compare the industry distribution of high-low portfolios of Chinese ADRs and that of the market portfolio to avoid the industry effect in the formation of abnormal returns.

5.4.1 Evolution of abnormal returns

In Panel A of table 5.8, we present 4 sub-period regressions together with other three longer period analysis, which are formerly listed in table 5.7, for comparison. The dependant variable is the average monthly return of high-low portfolios of Chinese ADRs minus high-low market portfolios, as shown in equation (4.6).

The abnormal return of Chinese ADRs of α in Panel A changes slightly from 2 sub-periods analysis to 4 sub-periods analysis. We get a monthly abnormal return of -1.3%*** in the first four-year regression, while the abnormal returns are cut to -1.5%* and -0.9%** if we regress every two years. The monthly abnormal return of the second four-year regression of 2.6%** is separated into 2.8%** and 1.7% (significance less than 90%). The evolution of the abnormal return is also visualised in figure 5.5.

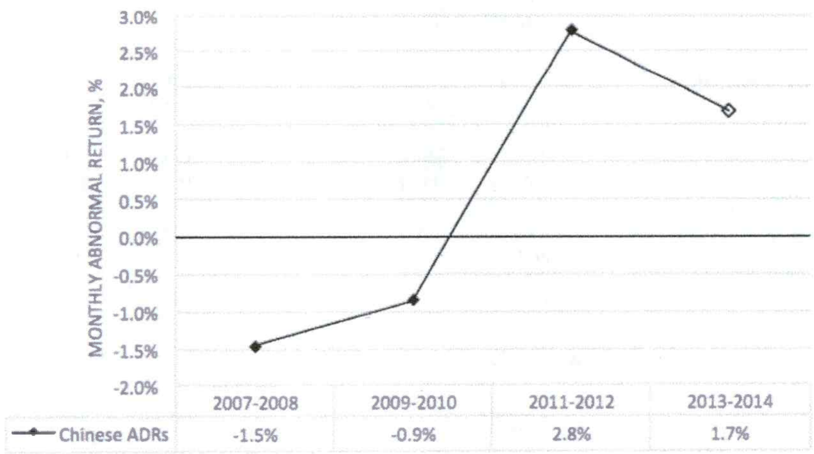


Figure 5.5: Abnormal Returns of Chinese ADRs in every two years

The abnormal return is "α", the constant factor, in the 4 factors regressions. The dependent variable is the difference between the high-low portfolios of Chinese ADRs and the high-low portfolios of the common stocks in NYSE and NASDAQ. All the portfolios are equally-weighted. The point shows in hollow when the abnormal return is not statistically significant from zero.

Figure 5.5 shows that the abnormal return has a certain trend of auto-correction to the point 0. It might indicate that in the long run, the effects of abnormal return will eventually disappear. If the holding period is long enough, the return on Chinese ADRs could be similar to that of the market portfolio of common stocks in the US. Anyhow, the relative short horizon of analysis limits us to do further investigation regarding the property of autocorrection. This point could be interesting for further study in the future.

Table 5.8: Further analysis, abnormal return in evolution and ADR effect

Panel A: further analysis of 4 sub-periods

	one period	2 sub-periods		4 sub-periods			
	2007.01 -2015.01	I , 2007.01 -2010.12	II, 2011.01 -2015.01	*I',* *2007.01* *-2008.12*	*II',* *2009.01* *-2010.12*	*III',* *2011.01* *-2012.12*	*IV',* *2013.01* *-2015.01*
α	0.003 [0.29]	-0.013 [-2.29***]	0.026 [2.07**]	**-0.015** [-1.79*]	**-0.009** [-2.38**]	**0.028** [2.34**]	0.017 [1.56]
Mkt_Excess	0.23 [2.02**]	0.23 [3.65***]	-0.06 [-0.56]	0.38 [4.64***]	0.07 [1.30]	-0.32 [-2.76**]	0.31 [1,.79*]
SMB	-0.24 [-1.57]	-0.26 [-2.74***]	0.43 [1.60]	-0.67 [-4.25***]	-0.09 [-0.50]	0.52 [1.56]	0.13 [0.73]
HML	0.29 [1.20]	0.07 [0.75]	1.02 [1.85*]	0.64 [2.93***]	0.08 [0.62]	1.97 [5.53***]	0.35 [1.08]
UMD	0.08 [1.04]	0.06 [1.69*]	-0.33 [-1.42]	0.16 [1.50]	0.06 [2.05*]	-0.81 [-3.79***]	0.13 [0.48]
R^2_adjusted	0.05	0.12	0.14	0.28	-0.13	0.37	-0.05

Panel B: further analysis of pure ADR effet

	one period	2 sub-periods		4 sub-periods			
	2007.01 -2015.01	I , 2007.01 -2010.12	II, 2011.01 -2015.01	*I',* *2007.01* *-2008.12*	*II',* *2009.01* *-2010.12*	*III',* *2011.01* *-2012.12*	*IV',* *2013.01* *-2015.01*
α	-0.001 [-0.40]	0.005 [2.09**]	-0.007 [-1.88*]	0.002 [1.56]	**0.009** [3.00***]	**-0.014** [-6.84***]	**0.002** [2.06*]
Mkt_Excess	0.00 [-0.15]	0.05 [3.64***]	-0.02 [-0.43]	0.04 [2.76**]	-0.01 [-0.16]	0.04 [2.77**]	-0.18 [-4.38***]
SMB	0.05 [0.95]	0.03 [0.69]	-0.04 [-0.70]	-0.06 [-2.80**]	0.07 [1.28]	-0.09 [-3.17***]	0.04 [1.23]
HML	-0.10 [-1.89*]	-0.10 [-3.90***]	-0.12 [-1.11]	-0.15 [-2.82**]	-0.03 [-0.49]	-0.15 [-3.97***]	-0.03 [-0.40]
UMD	-0.05 [-2.70***]	-0.03 [-2.25**]	-0.02 [-0.28]	-0.06 [-2.65**]	-0.01 [-0.47]	0.04 [2.72**]	-0.12 [-1.14]
R^2_adjusted	0.01	0.03	-0.04	0.12	-0.18	0.02	0.10

This table lists the OLS linear regressions based on the equation of $y_i = \alpha + \beta X_i + \epsilon_i$. The explanatory factors are Garhart 4 factors in monthly frequency. The dependent variable of Panel A is the average monthly return of high-low portfolios of Chinese ADRs minus high-low market portfolios. The dependent variable of Panel B is the average monthly return of high-low portfolios of non-Chinese ADRs minus high-low market portfolios. The securities are sorted on the risk factor of $\beta^- - \beta$ and the portfolios are equally weighted. The constant factor, "α", is the abnormal return we target to check. For each control pairs, we make seven regressions of the whole period analysis of 97 months, 2 sub-periods of 48 months and 49 months respectively and 4 sub-periods of 24 months except for the last sub-period of 25 months. In square bracket are the t-values of each coefficient after robust-tested by Newey et al. (1987) with 12 lags to correct the heteroskedasticity and autocorrelation. *, ** and *** denote significance at the 90%, 95% and 99% levels respectively.

5.4.2 Pure ADR effect

Panel B of table 5.8 shows the regressions with time horizons corresponding to Panel A. On the other hand, Panel B use the high-low difference of non-Chinese ADRs instead of the high-low difference of Chinese ADRs to subtract the high-low difference of the market portfolio of common stocks in US market.

In the comparison of 2 sub-periods regressions between Panel A and Panel B, we find that non-Chinese ADRs has positive abnormal return of 0.5%** in the first half horizon whereas it is -1.3%*** for Chinese ADRs. For the second half horizon in analysis, the non-Chinese ADRs has negative abnormal return of -0.7%*, which is positive of 2.6%** for Chinese ADRs. As the signs of the abnormal returns are opposites for the Chinese ADRs and non-Chinese ADRs, we believe that there isn't a pure ADR effects when verifying the performance of Chinese ADRs.

When look into the 4 sub-periods comparison, the signs are opposite in the second and third periods when both abnormal returns are statistically significant from zero. The dot curve in figure 5.6 presents the evolution of abnormal returns of non-Chinese ADRs, which also shows a possible property of autocorrection viewed from the long term. Compared with the line of Chinese ADRs, the trend is mostly opposite and the amplitude of fluctuation is much smaller, around 50% less.

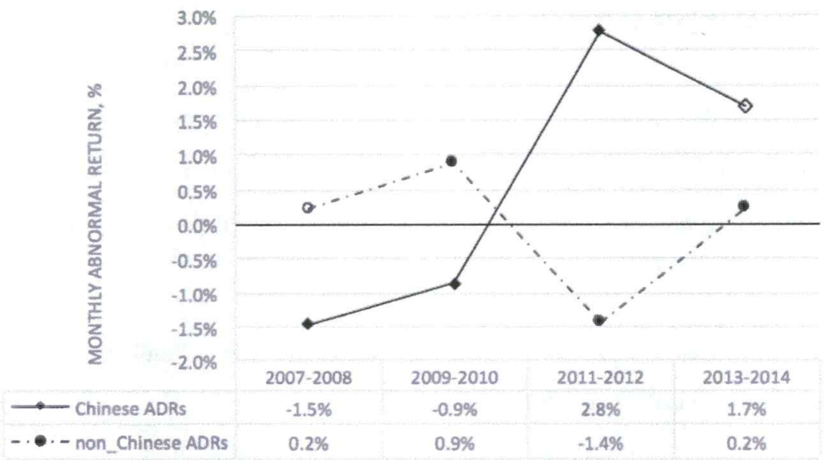


Figure 5.6: Abnormal Returns of different ADRs in every two years

The abnormal return is "α", the constant factor, in the 4 factors regression. The dependent variable is the difference between the high-low portfolios of Chinese ADRs (or high-low portfolios of non-Chinese ADRs) and the high-low portfolios of the common stocks in NYSE and NASDAQ. All the portfolios are equally-weighted. The point is in hollow when the abnormal return is not statistically significant from zero.

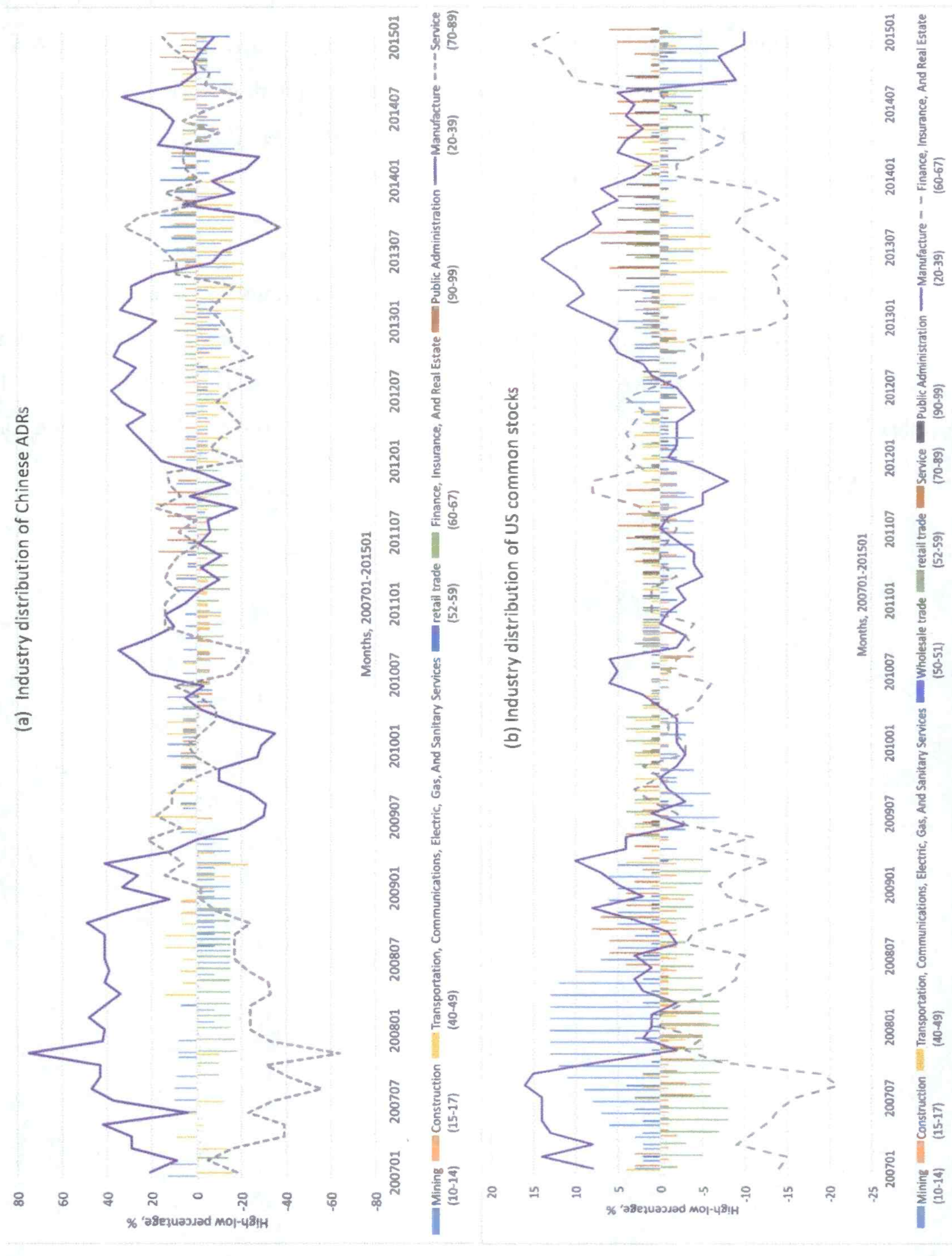
5.4.3 Industry distribution

Figure 5.7 shows the evolution of industry distribution of Chinese ADRs and the US stock market according to the SIC categories. We first calculate for each month the distributions of the highest and the lowest portfolios, then get the difference in distributions using high minus low portfolio, such as $SICdistribution\%^{high\_risk} - SICdistribution\%^{low\_risk}$. Figure 5.7 (a) presents the difference of high-low industry distributions of Chinese ADRs over time and Figure 5.7 (b) presents that of the US markets, including all common stocks in NYSE and NASDAQ. Both of the sub-figures use curves to represent two industries with the highest fluctuations, and all low fluctuate industries are shown in columns. The participation of the industry of Agriculture, Forestry, and Fishing (SIC<10) is negligible either for Chinese ADRs or for the US market, and we exclude this industry in Figure 5.7 to reduce the complexity of charts. We also exclude the industry of Wholesale Trade in Figure 5.7 (a) of Chinese ADRs as its percentage is always zero over time.

From Figure 5.7, we could see that the scale of y-axis is [-80, +80] for Chinese ADRs, the amplitude of variation is almost 4 times bigger than that of US market, which is at [-20, +25]. The manufacture is the most fluctuant industry in both cases, and the patterns of movements are more or less similar. The second industry in high variation is the Service for Chinese ADRs and the Finance, Insurance, and Real Estate for US markets. Both of them mostly vary inversely to the Manufacture industry.

We add together all 97 months of the industry distribution of Chinese ADRs (Fig. 5.7 (a)) and the US markets (Fig. 5.7 (b)). The overall difference of these two samples are shown in Figure 5.8. Generally, the manufactures from China are more in the high-risk portfolio and the the service are more in the low-risk portfolio. However, it doesn't show clearly the performance of Chinese ADRs are directly related to the industry distribution of the companies.

Figure 5.7: Difference of high-low portfolios in industry distributions



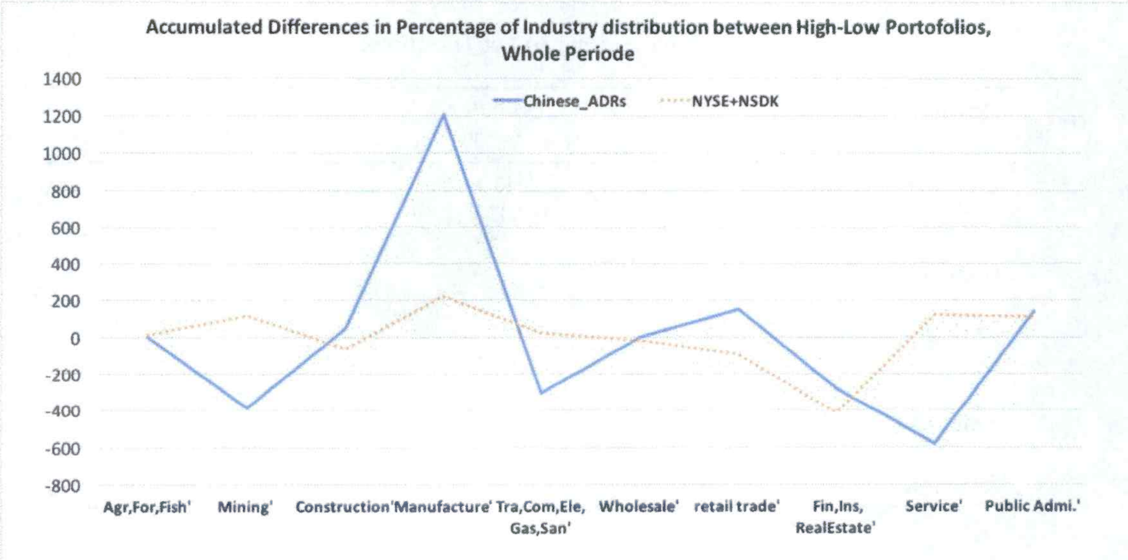


Figure 5.8: Overall industry distribution

5.5 Chinese specific factors

We check in this section three prospective factors, the index residuals of S&P 500 to Chinese index, the index residuals of Chinese index to the US index, and the change in exchange rates.

5.5.1 Index residuals

In the 4-factor regressions we control one factor of market excess return in the US, and we suppose the index residuals could perform in a different way to explain the abnormal returns of Chinese ADRs. However, we check the coefficients of correlation within factors, and the results are listed in table in Appendix A.2. As the coefficients of the Chinese specific factors are not as high as the correlations within commonly accepted control variables, the Fama-French 3 factors and the factor of momentum, we keep our hypothesis regarding the potential explanatory variables and study them one after another.

Table 5.9: Regressions to get the index residuals

Dependent variable	I, US index S&P 500	II, Chinese index SHCOMP
Intercept	1245.4 [47.94***]	2277.8 [30.74***]
US index (S&P 500)	–	0.41 [8.30***]
Chinese index (SHCOMP)	0.07 [8.30**]	–
Num. Obs.	2265	2265
R^2_adjusted	0.03	0.03

Figure 5.9: Index of S&P 500 and SHCOMP from China

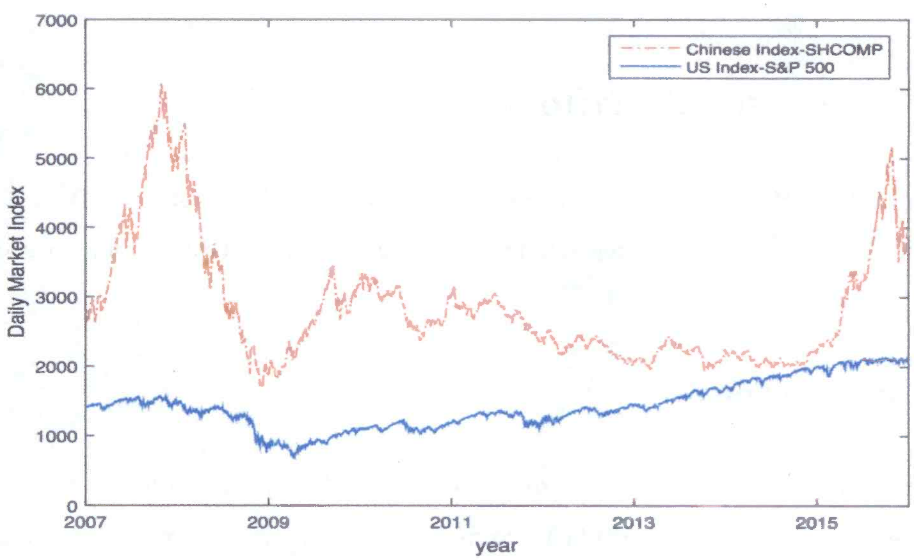
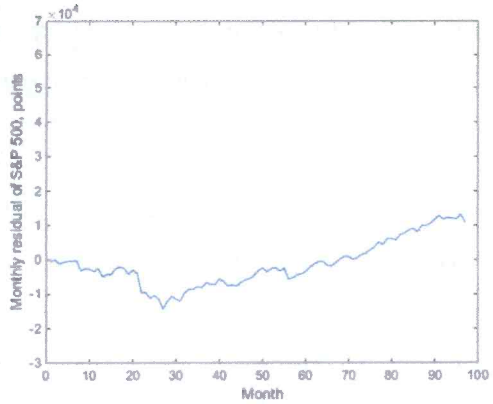


Fig. 5.9 shows two index of S&P 500 in the US and SHCOMP in China. The Chinese index shows high fluctuation over time, while their patterns show certain similar trends over time. We perform mutual index regressions to get the raw residuals of each market to the other one, as shown in table 5.9.

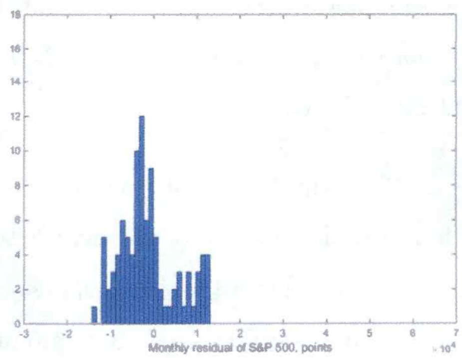
Table 5.10: Summary statistics of the index residuals

	Min.	Max.	**Mean**	Median	**S. D.**	Skew.	Kurt.	Num of Obs
US index residuals	-14 265	13 066	**-1 351**	-2 533	**6 697**	0.54	2.58	97
Chinese index residuals	-22 036	65 646	**-1 459**	-3 972	**17 811**	1.56	5.51	97

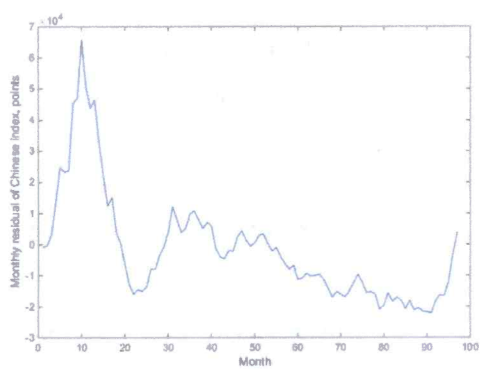
Figure 5.10: Index residuals of two stock markets



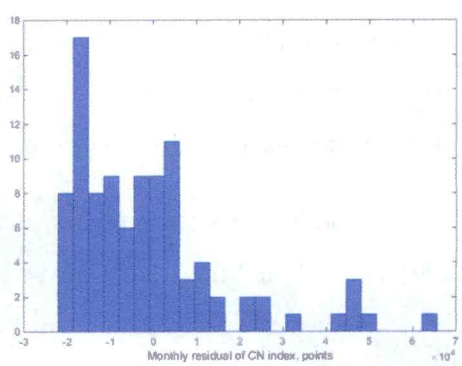
(a) Monthly US Index residuals



(b) Histogram of US index residuals



(c) Monthly Chinese index residuals



(d) Histogram of Chinese index residuals

We then add daily residuals to get the monthly index residuals. The statistics of both index residuals are shown in table 5.10. Together with the visualised graphs in figure 5.10, it shows that the Chinese index residuals are more fluctuated, and its standard deviation is almost 3 times higher that of US index residuals with similar mean values. The residuals of Chinese index display a higher positive skew.

We regress the index residuals, together with the 4 factors used in former study in section 5.4, to explain the difference in returns between the high-low portfolios of Chinese ADRs and the high-low portfolios of the US market. Panel C of table 5.11 includes the residuals of US index, and panel D includes the residuals of Chinese index as new independent factor.

In both Panel C and Panel D of table 5.11, we present 7 regressions on different time horizons. The t-values of the US index residuals in 4 sub-period regressions indicate that it is a factor with significant impact on the performance of Chinese ADRs. However, the Chinese index residuals in Panel D work well only in the second sub-period from January 2009 to December 2010.

The adjusted R^2 of 4 sub-period analysis are higher than those of long period, which indicates the dynamic of the market, the influences of each explanatory factor varying within periods. In panel C(US residuals as a new factor), except for the second 2 years period, the explicative power increases up to around 50%, better than the regressions in panel D(Chinese index residual as a new factor) and much better than the 4-factor regressions in table 5.8.

One advantage in Panel D is that the Chinese index residuals work very well in the the second 2-year regression as the adjusted R^2 is now 31%, increased from 3% in Panel C and -13% in the 4-factor regression in panel A of table 5.8.

He and Yang (2011) apply a regime switching model to weekly ADR index returns from 1998 to 2006, and find that Chinese ADRs are priced to the US market rather than their home market. Our results confirm their findings that in most of the time, the returns of Chinese ADR are more affected by the US market. But during the period of 2009 to 2010, which is not covered by their study, the Chinese index residuals show higher explication power to the abnormal returns of Chinese ADRs.

Table 5.11: Chinese specific factor, index residuals

Panel C: US Index residuals

	one period	2 sub-periods		4 sub-periods			
	2007.01 -2015.01	I , 2007.01 -2010.12	II, 2011.01 -2015.01	*I', 2007.01 -2008.12*	*II', 2009.01 -2010.12*	*III', 2011.01 -2012.12*	*IV', 2013.01 -2015.01*
α	0.005	0.000	0.027	0.004	0.029	0.051	0.078
	[0.55]	[-0.008]	[1.95*]	[0.71]	[2.64**]	[2.52**]	[11.54***]
Mkt_Excess	0.18	0.21	-0.06	0.12	0.09	-0.37	0.07
	[0.26**]	[3.83***]	[-0.51]	[2.08*]	[1.31]	[-2.83***]	[0.48]
SMB	-0.15	-0.19	0.41	-0.36	-0.11	0.40	0.06
	[-1.02]	[-1.45]	[1.58]	[-2.22**]	[-0.71]	[1.64]	[1.05]
HML	0.25	-0.03	0.96	0.15	0.00	1.28	0.01
	[1.07]	[-0.41]	[1.75*]	[0.48]	[0.05]	[3.00***]	[0.08]
UMD	0.02	-0.01	-0.36	0.01	-0.02	-0.77	-0.04
	[0.31]	[-0.47]	[-1.46]	[0.10]	[-0.90]	[-3.45***]	[-0.21]
US Index Residuals,points	1.82E-06	**2.49E-06**	-4.07E-07	**6.64E-06**	**4.65E-06**	**1.14E-05**	**-7.11E-06**
	[1.62]	[2.40**]	[-0.30]	[4.32***]	[3.68***]	[1.89*]	[-10.09***]
R2_adjusted	0.13	0.18	0.11	0.57	0.03	0.48	0.47

Panel D: Chinese Index residuals

	one period	2 sub-periods		4 sub-periods			
	2007.01 -2015.01	I , 2007.01 -2010.12	II, 2011.01 -2015.01	*I', 2007.01 -2008.12*	*II', 2009.01 -2010.12*	*III', 2011.01 -2012.12*	*IV', 2013.01 -2015.01*
α	0.002	-0.019	0.016	-0.024	-0.019	0.013	0.029
	[0.26]	[-2.40**]	[1.90*]	[-1.69]	[-4.11***]	[0.98]	[1.10]
Mkt_Excess	0.23	0.18	-0.10	0.27	0.11	-0.33	0.35
	[1.89*]	[6.16***]	[-0.86]	[3.46***]	[2.81**]	[-2.79**]	[1.82*]
SMB	-0.24	-0.14	0.44	-0.44	-0.11	0.52	0.11
	[-1.47]	[-1.31]	[1.75*]	[-3.61***]	[-1.02]	[1.60]	[0.62]
HML	0.30	-0.01	0.90	0.56	-0.41	1.58	0.31
	[1.32]	[-0.06]	[1.92*]	[3.48***]	[-5.31***]	[4.15***]	[0.90]
UMD	0.10	0.01	-0.33	0.13	-0.09	-0.71	0.01
	[1.32]	[-0.54]	[-1.47]	[2.01*]	[-2.75**]	[-4.01***]	[0.02]
CN Index Residuals,points	-4.52E-07	4.55E-07	-7.99E-07	4.70E-07	**3.41E-06**	-1.91E-06	7.47E-07
	[-1.21]	[1.51]	[-1.07]	[1.52]	[5.57***]	[-0.92]	[0.73]
R2_adjusted	0.08	0.17	0.13	0.37	**0.31**	0.39	-0.09

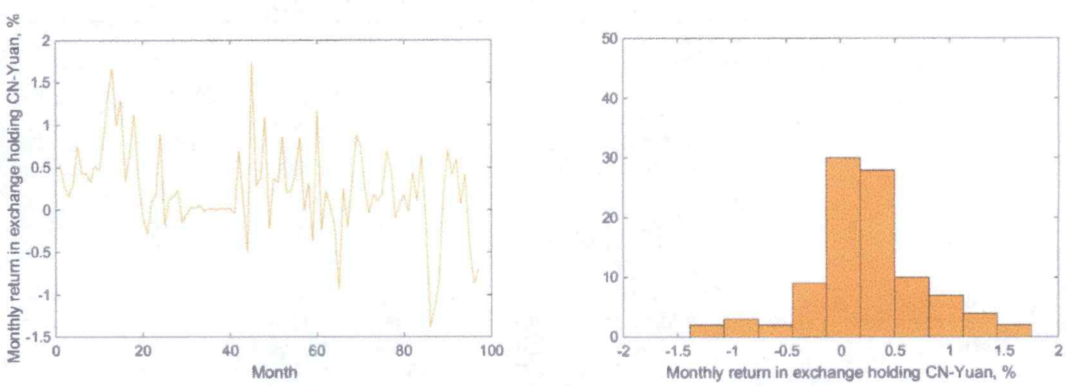
This table lists the OLS linear regressions based on the equation of $y_i = \alpha + \beta X_i + \epsilon_i$. The explanatory factors are Carhart 4 factors in monthly frequency. The new explanatory factor in Panel C is the US index residuals after the OLS linear regression of US index to Chinese index. The new explanatory factor in Panel D is the Chinese index residuals after the OLS linear regression of Chinese index to US index. The dependent variable of either Panel C or D is the average monthly return of high-low portfolios of Chinese ADRs minus high-low market portfolios. The securities are sorted on the risk factor of $\beta^- - \beta$ and the portfolios are equally weighted. The constant factor, "α", is the abnormal return we target to check. For each control pairs, we make seven regressions of the whole period analysis of 97 months, 2 sub-periods of 48 months and 49 months respectively and 4 sub-periods of 24 months except for the last sub-period of 25 months. In square bracket are the t-values of each coefficient after robust-tested by Newey et al. (1987) with 12 lags to correct the heteroskedasticity and autocorrelation. *, ** and *** denote significance at the 90%, 95% and 99% levels respectively.

5.5.2 Exchange rate

In addition, we investigate the currency exchange rate as another Chinese specific factor by using the rates of both HK/US and CN/US. The adjusted R^2 of the regressions show that the exchange rate of CN/US has more explication power, so we present here the results about the exchange rate between CN/US and the results of HK/US are listed in Appendix A.4.

The monthly fluctuation in the exchange rate between CN Yuan and US Dollar is presented in Table 5.12 and Figure 5.11. Both the mean and median value are positive, which indicate that the Chinese currency appreciates during most of the time in our study.

Figure 5.11: Fluctuations in exchange rates, CN/US



(a) Monthly fluctuation of CN/US exchange

(b) Histogram of fluctuation of CN/US exchange

Table 5.12: Summary statistics of monthly fluctuation in exchange rates, CN/US

	Min.	Max.	**Mean**	Median	**S. D.**	Skew.	Kurt.	Num of Obs
change of CN/US exchange rate	-1.39%	1.75%	**0.23%**	0.19%	**0.53%**	0.01	4.29	97

Table 5.13 shows that in the 4 sub-periods regressions, the appreciation of Chinese currency displays positive impact on the returns of Chinese ADRs. With each one percent increase in currency value, the return of Chinese ADRs will increase from 1.49%*** to 2.48%*. When we combine each two regressions of the 4 sub-periods into 2 sub-periods, the

impact of CN/US exchange rate becomes no more significant during the period of Jan., 2007 to Dec., 2010. While a little surprising, it might be related to the regression of the second 2-year sub-period holding the negative adjusted R^2 of -0.12, which indicate the regression itself does not have enough explication power.

Overall, the R^2 in Table 5.13 are smaller than those in Table 5.11. It indicates that the index residuals could have more explication power compared with the exchange rate. However, one positive point here is that the coefficients of the exchange rate is constantly positive. But the impact of index residuals shifts in positive and negative over time.

Table 5.13: Chinese specific factor, exchange rate

Panel E: CN/US exchanges	one period	2 sub-periods		4 sub-periods			
	2007.01 -2015.01	I, 2007.01 -2010.12	II, 2011.01 -2015.01	*I', 2007.01 -2008.12*	*II', 2009.01 -2010.12*	*III', 2011.01 -2012.12*	*IV', 2013.01 -2015.01*
α	0.001	-0.017	0.023	-0.023	-0.009	0.023	0.019
	[0.09]	[-2.45**]	[2.14**]	[-1.97*]	[-2.41*]	[1.99*]	[1.91*]
Mkt_Excess	0.23	0.21	-0.12	0.37	0.00	-0.37	0.15
	[1.88*]	[3.47***]	[-1.09]	[6.55***]	[0.03]	[-3.09***]	[1.38]
SMB	-0.26	-0.25	0.40	-0.69	-0.14	0.63	0.08
	[-1.75*]	[-2.24**]	[1.53]	[-3.45***]	[-0.90]	[1.92*]	[0.45]
HML	0.30	0.05	1.02	0.59	0.17	1.86	0.70
	[1.25]	[0.64]	[2.46**]	[2.15**]	[1.32]	[8.42***]	[2.61**]
UMD	0.08	0.04	-0.31	0.13	0.05	-0.73	0.36
	[0.99]	[1.32]	[-1.55]	[1.33]	[2.60**]	[-4.25***]	[1.43]
CN/US Exchange Return, %	0.90	0.70	**2.69**	**1.54**	**1.49**	**2.39**	**2.48**
	[1.31]	[1.44]	[2.97***]	[2.23**]	[3.06***]	[4.54***]	[2.08*]
R^2_adjusted	0.06	0.09	0.23	0.31	-0.12	0.39	0.08

This table lists the OLS linear regressions based on the equation of $y_i = \alpha + \beta X_i + \epsilon_i$. The explanatory factors are Carhart 4 factors in monthly frequency. The new explanatory factor is the monthly change of exchange rate CN/US. The dependent variable is the average monthly return of high-low portfolios of Chinese ADRs minus high-low market portfolios. The securities are sorted on the risk factor of $\beta^- - \beta$ and the portfolios are equally weighted. The constant factor, "α", is the abnormal return we target to check. For each control pairs, we make seven regressions of the whole period analysis of 97 months, 2 sub-periods of 48 months and 49 months respectively and 4 sub-periods of 24 months except for the last sub-period of 25 months. In square bracket are the t-values of each coefficient after robust-tested by Newey et al. (1987) with 12 lags to correct the heteroskedasticity and autocorrelation. *, ** and *** denote significance at the 90%, 95% and 99% levels respectively.

Table 5.14: Seven-factor regressions, with Chinese specific factors

Panel F: Exchange rate and index residuals

	one period	2 sub-periods		4 sub-periods				
	2007.01 -2015.01	I , 2007.01 -2010.12	II, 2011.01 -2015.01	*I', 2007.01 -2008.12*	*II', 2009.01 -2010.12*	*III', 2011.01 -2012.12*	*IV', 2013.01 -2015.01*	Mean (Std Dev)
α	-0.001	-0.013	0.009	-0.017	0.009	0.032	0.091	
	[-0.17]	[-1.38]	[1.08]	[-2.15**]	[1.23]	[2.66**]	[12.89***]	
Mkt_Excess	0.18	0.18	-0.11	0.14	0.05	-0.41	0.07	
	[1.94*]	[7.25***]	[-1.03]	[2.26**]	[0.84]	[-2.92***]	[0.53]	
SMB	-0.23	-0.14	0.35	-0.38	-0.16	0.47	-0.06	
	[-1.82]	[-1.71*]	[1.67]	[-5.04***]	[-3.26***]	[1.76*]	[-1.14]	
HML	0.30	0.00	0.84	0.29	-0.31	0.84	0.34	
	[1.41]	[0.04]	[2.73***]	[1.68]	[-3.93***]	[3.31**]	[2.83**]	
UMD	0.05	0.01	-0.21	0.08	-0.13	-0.55	-0.01	
	[1.00]	[0.50]	[-1.24]	[1.08]	[-5.21***]	[-4.52***]	[-0.09]	
CN/US Exchange Return, %	**1.94** [2.26**]	0.09 [0.12]	**2.63** [3.32***]	**1.49** [2.91**]	**1.45** [3.67***]	**2.99** [3.37***]	**2.49** [7.06***]	0.23% (0.53%)
CN Index Residuals, points	-4.45E-07 [-1.17]	3.15E-07 [1.06]	-1.19E-06 [-1.33]	1.94E-07 [0.83]	**3.01E-06** [9.42***]	-1.08E-06 [-0.95]	**1.32E-06** [4.42***]	-1 459 (17 811)
US Index Residuals, points	**1.58E-06** [1.66*]	1.18E-06 [1.12]	-6.51E-07 [-0.45]	**4.54E-06** [3.34***]	**3.62E-06** [4.38***]	**1.02E-05** [3.52***]	**-5.99E-06** [-11.43***]	-1 315 (6 697)
R^2_adjusted	0.23	0.16	0.23	0.61	0.44	0.5	0.62	

This table lists the OLS linear regressions based on the equation of $y_i = \alpha + \beta X_i + \epsilon_i$. The explanatory factors are Carhart 4 factors in monthly frequency. The Chinese specific factors include the change of CN/US exchange, the Chinese index residuals and the US index residuals. The dependent variable is the average monthly return of high-low portfolios of Chinese ADRs minus high-low market portfolios. The securities are sorted on the risk factor of $\beta^{-}-\beta$ and the portfolios are equally weighted. The constant factor, "α", is the abnormal return we target to check. For each control pairs, we make seven regressions of the whole period analysis of 97 months, 2 sub-periods of 48 months and 49 months respectively and 4 sub-periods of 24 months except for the last sub-period of 25 months. In square bracket are the t-values of each coefficient after robust-tested by Newey et al. (1987) with 12 lags to correct the heteroskedasticity and autocorrelation.
The Mean and Std Dev are the mean and the standard deviation of the independent variables of Chinese specific factors. *, ** and *** denote sgnificance at the 90%, 95% and 99% levels respectively.

In table 5.14, we put together all three Chinese specific factors, the change of CN/US exchange rates, the US index residuals and the Chinese index residuals, to perform regressions. The regressions have the highest adjusted R^2 in comparison with those regressions with separated Chinese specific factor.

Again, we find the quality of 4 sub-periods analysis is better than regressions for 2 sub-periods, which indicates the dynamic of the markets. The appreciation of Chinese currency versus US dollar always keeps an positive impact on the returns of ADRs. The US index residuals show significant effects in all 4 sub-periods, the impacts are either positive or negative. However the Chinese index residuals are occasionally important to explain the abnormal return of Chinese ADRs. This might be because more than 90% of the Chinese ADRs are single listed in the US market, so they don't have strong correlation with the home market.

However, the quality of the one period regression is not lower than those of 2 sub-periods when we compare the adjusted R^2. It might mean that the dynamic market could move along a certain trend, which is clearer when observed within a longer horizon of time. From this point of view, we find that the value appreciation of Chinese currency in 1% will bring 1.94%** abnormal return of Chinese ADRs. The impact of each point of US index residual is low as 1.58E-06, but this factor is a monthly cumulated index residuals and hard to judge by each point. From an other point of view, if all other things being equal, the US index residuals moving up one standard deviation of 6 697 points could bring additional abnormal return of 1.06%*. Similarly, the appreciation of the home currency by one standard deviation of 0.53% could bring 1.03%* extra return.

5.6 Fama-Macbeth regressions

Table 5.15: Fama-MacBeth Regressions

Model	I, Chinese ADRs 2007-2015	Mean (Std Dev)	II, US market 2007-2015	Mean (Std Dev)	III, US NYSE (Ang et al., 2006) 1963-2001
Intercept	-0.089		-0.020		0.044
	[-3.40***]		[-4.41***]		[3.39***]
β^-	0.190	1.20	0.072	1.03	0.069
	[7.72***]	(0.62)	[11.41***]	(0.64)	[7.17***]
β^+	-0.042	0.92	0.044	0.95	-0.029
	[-2.01**]	(0.80)	[8.80***]	(0.72)	[-4.85***]
Num. Obs.	10292		343048		–
R^2_adjusted	0.04		0.01		–

We compare our results with the results in the article of Ang et al. (2006), the downside risk premium of US market is more or less stable at around 7%*** per annum. For Chinese ADRs, even the performance during recession period is negative, almost half of the ADRs are listed in/after 2010 with high positive returns. When doing the Fama-MacBeth regression, the weight of the second half of our period is higher and show overall the downside risk premium of Chinese ADRs to be 19%*** per annum, which is much higher than overall US markets.

In 2010, the number of IPO Chinese ADRs reached a record of 22, which indicates that this is a good year for companies according to the market timing theory. Rational managers will prefer IPO in a optimistic market.

In general, risk averse agents require higher downside risk premium of Chinese ADRs during expansion period, possibly higher than 19%*** per annum. However, such premium will not always hold, and in recessions high downside risk Chinese ADRs will bring negative returns.

Chapter 6

Conclusion

In this study, we incorporate the loading factor of downside risk to investigate the performance of Chinese ADRs. Ang et al. (2006) find successfully the downside risk premium required by risk averse agents after studying the common stocks in NYSE. There exist several questions in mind. Whether Chinese ADRs have the same downside risk with the common stocks in the US markets? Whether buying and holding the Chinese ADRs will bring abnormal returns and why? Will risk averse agents ask for downside risk premium from Chinese ADRs?

We focus on Chinese ADRs of 149 companies that did an IPO from 1993 to 2014, and check their performance between 2007 to 2015. We constructed equal-weighted portfolios to compare the holding period returns of various downside risk portfolios.

We sort and divide samples into quintiles according to the most efficient loading factor of downside risk, $\beta^{-} - \beta$ for the Chinese ADRs as well as the benchmarks of common stocks in the US market. The strategy of high-low portfolios of Chinese ADRs will bring different abnormal returns in different stages compared with the strategy of high-low for common stocks in the US(Table 5.7, block 3). During the crisis, Chinese ADRs under-perform -1.3%*** per month (-15.6% per annum); after the crisis, they over-perform 2.6%** per month (31.2% per annum) in comparison with the benchmark. The further analyses indicate that the abnormal returns are neither the pure ADR effect nor the industry effect. Also, we find that the the abnormal returns evolve over time with certain autocorrection behavior around point "0".

We also include some Chinese specific factors to explain the abnormal returns. The appreciation of Chinese currency shows always positive effect on the returns of Chinese ADRs. And the trading market of US has higher power of influence on the Chinese ADRs compared with the home stock market. According to our whole period regression from 2007 to 2015 (table 5.14), we find that the increase of 1% in exchange rate of CN Yuan/US Dollar will bring 1.94%** abnormal return. In other words, the exchange rate increases one standard deviation of 0.53% will bring 1.03%** abnormal return. Furthermore, if the monthly US index residuals move up one standard deviation of 6 697 points, the additional abnormal will be 1.06%*. The Chinese index has occasional effects on the performance of Chinese ADRs, but not always. The reason could be that more than 90% of the Chinese ADRs are single listed in the US market, and their correlation with the home market is weak.

The average downside risk, β^-, of Chinese ADRs is 1.2, around 15% higher than the average downside risk of common stocks in the US market. By applying the Fama-MacBeth regressions (table 5.6), we find that the risk averse agents ask for downside risk premium of Chinese ADRs is 19%*** per annum, compared with 7.2%*** per annum of common stocks in the US market at the same period. But, the high downside risk premium will not always hold, which could turn negative during recessions.

This study excludes the reverse merge stocks as well as the OTC market, which are smaller in size and higher in volatility than the ADRs in the main exchange markets. Results could be different if we extend the study into all Chinese Concepts Stocks and cover more capital markets in the US. Additionally, the number of our samples are somehow limited and the evaluation period might be not long enough. Finally, this study focuses on the performance of Chinese ADRs as a whole group, it could be interesting for portfolio manager to look into individual stock.

Appendix A

A.1 List of IPOs in U.S.

Table A.1: List of IPOs in U.S., 1980-2014

https://site.warrington.ufl.edu/ritter/ipo-data/

Table 14 (updated April 20, 2015)

The Market Share of Foreign Companies among U.S. Listings, 1980-2014

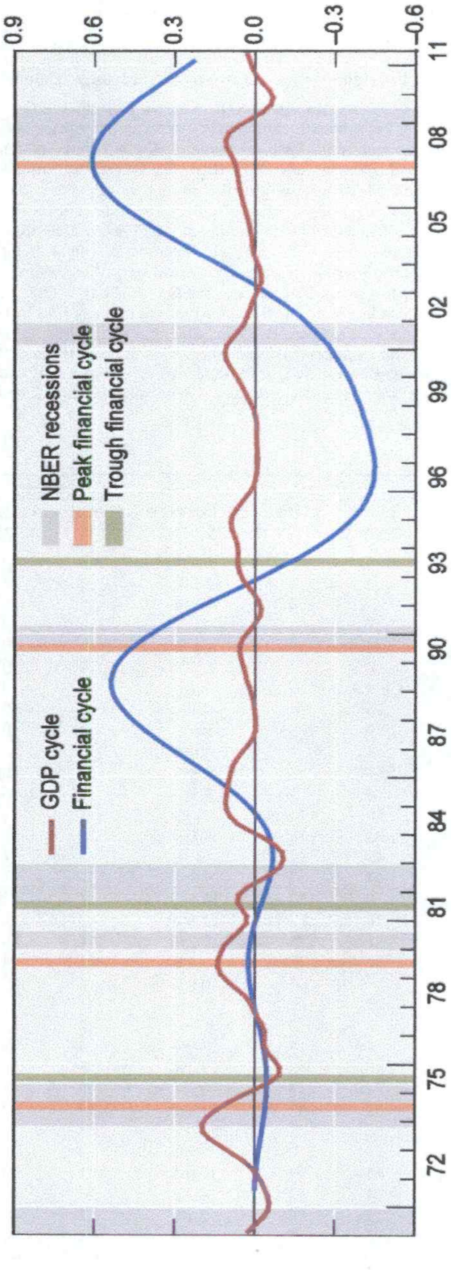
This table includes American Depositary Receipts (ADRs) as well as other IPOs, and so has a higher total number of U.S. IPOs. I continue to exclude IPOs with an offer price below $5.00 per share, unit offers, REITs, closed-end funds, natural resource limited partnerships, small best efforts IPOs, banks and S&Ls, and IPOs not listed on CRSP (this last screen limits the sample to NASDAQ, Amex, and NYSE-listed issues) within six months of the offer date. Bermuda-domiciled companies are included as foreign, irrespective of the main country of operations. Bermuda, Canada, China, Greece, Israel, the Netherlands, and the United Kingdom are the most common countries for IPOs that list in the U.S. Dealogic is the main source of information on foreign IPOs, because Thomson Financial frequently classifies a follow-on offering that simultaneously includes a U.S. listing as an IPO, as does the NYSE. I have deleted these listings (a list of more than 100 of them can be found in "SDC Corrections" on my IPO Data page) from the IPO counts when I have been able to identify them. The count for Chinese IPOs does not include those from Hong Kong, and excludes "reverse mergers" and best efforts IPOs. There are six bank IPOs of ADRs that are not counted (1 in 1988, 1 in 1993, 2 in 1994, and 2 in 2009). There were 4 additional foreign issues in 1981, but they did not get listed on CRSP until more than six months after the IPO.

Year	Number of IPOs	Domestic	Foreign		% Foreign	Chinese		% Chinese
			Total	ADRs		Total	ADRs	
1980	71	70	1	0	1.4%	0	0	0%
1981	192	191	1	0	0.5%	0	0	0%
1982	78	76	2	1	2.6%	0	0	0%
1983	451	446	5	0	1.1%	0	0	0%
1984	177	170	7	4	4.0%	0	0	0%
1985	187	184	3	0	1.6%	0	0	0%
1986	394	392	2	1	0.5%	0	0	0%
1987	285	281	4	0	1.4%	0	0	0%
1988	110	100	10	8	9.1%	0	0	0%
1989	119	110	9	6	7.6%	0	0	0%
1990	111	107	4	1	3.6%	0	0	0%
1991	289	278	11	3	3.8%	0	0	0%
1992	417	393	24	5	5.8%	0	0	0%
1993	527	487	40	18	7.6%	1	1	0.2%
1994	421	386	35	18	8.1%	3	2	0.7%
1995	478	436	42	17	8.8%	1	1	0.2%
1996	710	646	64	33	9.0%	1	1	0.1%
1997	509	430	79	35	15.5%	4	3	0.8%
1998	294	256	38	13	12.9%	2	1	0.7%
1999	502	451	51	25	10.2%	1	0	0.2%
2000	418	336	82	37	19.6%	7	4	1.7%
2001	83	74	9	4	10.8%	2	2	2.4%
2002	68	63	5	2	7.4%	1	1	1.5%
2003	66	60	6	3	9.1%	2	2	3.0%
2004	188	160	28	15	14.9%	9	9	4.7%
2005	172	142	30	13	17.4%	8	8	4.6%
2006	172	138	34	15	19.8%	9	7	5.2%
2007	190	138	52	31	27.4%	29	27	15.2%
2008	24	18	6	3	25.0%	4	4	16.0%
2009	49	38	11	8	22.4%	9	7	18.0%
2010	125	80	45	34	36.0%	33	32	26.2%
2011	93	70	23	12	24.7%	13	11	14.0%
2012	97	85	12	4	12.4%	2	2	2.0%
2013	167	139	28	10	16.8%	8	6	4.8%
2014	226	177	49	19	21.7%	14	14	6.2%
1980-2014	**8,460**	**7,608**	**852**	**398**	**10.1%**	**163**	**145**	**1.9%**

A.2 Financial and business cycles in the US

Graph 1

The financial and business cycles in the United States



Orange and green bars indicate peaks and troughs of the financial cycle measured by the combined behaviour of the component series (credit, the credit to GDP ratio and house prices) using the turning-point method. The blue line traces the financial cycle measured as the average of the medium-term cycle in the component series using frequency-based filters. The red line traces the GDP cycle identified by the traditional shorter-term frequency filter used to measure the business cycle.

Source: Drehmann et al (2012).

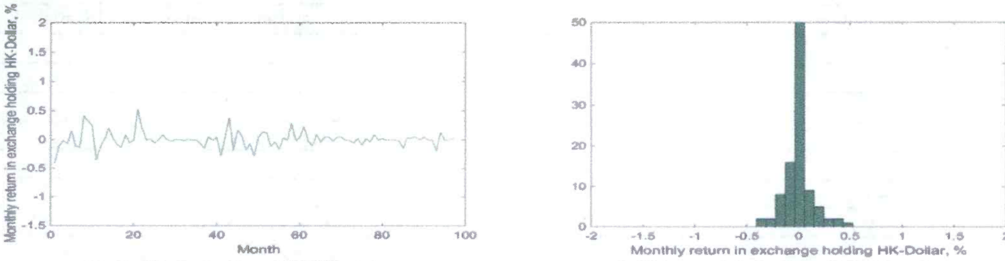
A.3 Correlation of explanatory variables

Table A.2: Correlation of explanatory variables

Coefficients of Correlation	Mkt_Excess	SMB	HML	UMD	CN/US Exchange	CN Index Residuals	US Index Residuals
Mkt_Excess	1.00	–	–	–	–	–	–
SMB	0.42	1.00	–	–	–	–	–
HML	0.39	0.25	1.00	–	–	–	–
UMD	-0.37	-0.17	-0.41	1.00	–	–	–
CN/US Exchange	0.05	0.11	-0.02	0.04	1.00	–	–
CN Index Residuals	-0.04	-0.02	-0.02	0.11	0.36	1.00	–
US Index Residuals	0.07	-0.11	0.01	0.19	-0.19	-0.37	1.00

A.4 Performance of HK/US exchange rate

Figure A.2: Fluctuations in exchange rates, HK/US



(a) Monthly fluctuation of HK/US exchange

(b) Histgram of fluctuation of HK/US exchange

Table A.3: HK/US exchange rate as explanatory factor

Panel G: HK_US exchanges							
	one period	2 sub-periods		4 sub-periods			
	2007.01 -2015.01	I , 2007.01 -2010.12	II, 2011.01 -2015.01	*I', 2007.01 -2008.12*	*II', 2009.01 -2010.12*	*III', 2011.01 -2012.12*	*IV', 2013.01 -2015.01*
α	0,003	-0,013	0,028	-0,014	-0,010	0,029	0,017
	[0,33]	[-2,05**]	[2,22**]	[-1,85*]	[-2,88**]	[2,50**]	[1,57]
Mkt_Excess	0,25	0,24	0,01	0,36	0,16	-0,31	0,31
	[2,92***]	[9,14***]	[0,12]	[6,63***]	[2,55**]	[-2,57**]	[2,99***]
SMB	-0,22	-0,26	0,59	-0,68	-0,11	0,71	0,27
	[-1,42]	[-2,46**]	[2,38**]	[-3,94***]	[-0,63]	[2,00*]	[2,09**]
HML	0,29	0,08	0,98	0,71	0,02	1,90	0,35
	[1,22]	[0,75]	[1,89*]	[2,74**]	[0,12]	[5,57***]	[1,20]
UMD	0,10	0,08	-0,44	0,20	0,07	-0,82	0,00
	[1,25]	[2,58**]	[-2,05**]	[1,91*]	[2,38**]	[-4,19***]	[0,01]
HK/US Exchange Return, %	-4,74	**-4,29**	**-14,23**	**-3,74**	**-4,30**	-5,78	**-15,04**
	[-3,15]	[-3,25***]	[-3,17***]	[-2,05*]	[-2,38**]	[-1,31]	[-3,04***]
R^2_adjusted	0,07	0,15	0,16	0,33	-0,16	0,35	-0,02

This table lists the OLS linear regressions based on the equation of $y_i = \alpha + \beta X_i + \epsilon_i$. The explanatory factors are Carhart 4 factors in monthly frequency. The new explanatory factor is the monthly change of exchange rate HK/US. The dependent variable is the average monthly return of high-low portfolios of Chinese ADRs minus high-low market portfolios. The securities are sorted on the risk factor of $\beta^{-}-\beta$ and the portfolios are equally weighted. The constant factor, "α", is the abnormal return we target to check. For each control pairs, we make seven regressions of the whole period analysis of 97 months, 2 sub-periods of 48 months and 49 months respectively and 4 sub-periods of 24 months except for the last sub-period of 25 months. In square bracket are the t-values of each coefficient after robust-tested by Newey et al. (1987) with 12 lags to correct the heteroskedasticity and autocorrelation. *, ** and *** denote significance at the 90%, 95% and 99% levels respectively.

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