Research of Excess Returns of the Liquidity Risk of each Sector in Chinese Stock Market

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Abstract: Liquidity is an important property of the security market, and it is one of the important factors influencing the price behavior and a key indicator of market efficiency. During the process of stocks trading, liquidity risk can increase the transaction costs. At present, foreign studies generally believe that liquidity risk can lead to excess returns on the stock market. However, as an emerging market, Chinese stock market has its own unique properties in price limits, volatility, quote depth and delivery system. Researches cannot agree with each other on excess returns coming from liquidity risk, and the models of liquidity risk are inconsistent. To establish an effective model of liquidity risk to measure its impact on the stock markets is an important aspect of the current study.

Based on domestic and abroad researches and the current situation of Chinese stock market, we put forward a new index to measure liquidity risk. Selecting the A-share data of more than 900 listed companies in Shanghai Stock Exchange from July 1, 2006 to December 31, 2008 , we distinguish industries and study the stocks' excess return of the liquidity risk during bull and bear market periods based on the stock yield, market yield and stock liquidity risk. At the same time, the impact of the size of companies, the carrying amount of market capitalization ratio, the proportion of outstanding shares on stock returns is also taken in consideration to measure the excess returns of stocks on the basis of the multi-factor. The innovation of this paper is: At first, considering the continuity and stability, we establish new measurement of liquidity risk and combine the stock price with its volume on the day and the previous day; secondly, considering the impact of the market factor, company size, liquidity risk on the excess returns of stock, we make an empirical analysis and a comparative analysis of the excess returns coming from liquidity risk on each sector of stocks based on a panel data model. It will have great significance on investigating the efficiency of capital markets, asset pricing and liquidity risk management.
Key words: Liquidity Risk; Excess returns; Panel Data; Stock market

I. Introduction

The three attributes of the financial assets are profitability, safety and mobility. The stock liquidity is the possibility of large volume of rapid transactions at lower cost without changing the current stock price, and it contains three dimensions: time, price and volume. The liquidity of the securities market makes the smooth progress of the secondary market trading possible. Liquidity makes it possible to optimize the allocation of capital resources through the securities markets. Financial crises are accompanied by the sudden loss of market liquidity and as an important part of the market microstructure and risk management, liquidity rouse widespread interest in academia.

A. Foreign research background

In other countries, the study of liquidity is more distant, and scholars are not consistent in the concept of liquidity. Tobin (1958) explored the meaning of liquidity for the first time; [1] Smithson (1995) thought the liquidity risk was the uncertainty of the transaction costs and market value caused by the market (or assets) that lacked liquidity; [2] Bangia (1999) divided liquidity risk into exogenous liquidity risk and endogenous liquidity risk. The former was determined by the common factors for all securities and the latter was related to the size of transactions. When the number of transactions was not greater than the quote depth, the transaction would not affect the market price, and the investors would be only faced with exogenous liquidity risk; when the transaction size exceeded the depth of market quotations, the transaction would affect the price and investors would be faced with both exogenous and endogenous liquidity risk. [3] Some early scholars also studied the effect of

scale and the book-market value effect. Banz (1981) first discovered the effect of scale, and showed that both the total rate of return and the risk-adjusted rate of return were negatively correlated with the size of the company by empirical analysis; [4] Rosenberg, Reid and Lanstein (1985) found the book-market effect, and the excess return of 0.36% per month could be got if the ratio of the book and market value was greater in the years 1973-1984. [5]
The financial scholars' study on the liquidity risk premium is relatively mature, and many scholars believed that there was liquidity risk premium. Amihud and Mendelson (1986), who first proposed the liquidity premium theory, deduced the relational model (also known as the A.M model) of the expected return and the bid-ask spread, and they measured the liquidity by the relative bid-ask spread, and made an empirical test of the AM model using the data of the 1960-1980 New York stock exchange;[6] Acharya and Pedersen (2005) proposed a new theoretical model of the liquidity risk premium, i.e. the liquidity-adjusted CAPM, and they expressed the sensitivity of specific stock liquidity to the fluctuation of market liquidity using the covariance of the market liquidity and the market rate of return. They found that the expected rate of stock return was positively related to the liquidity risk, assuming that the unit transaction cost was not affected by trading position without considering the endogenous liquidity risk. [7] Of course, some scholars believed that the liquidity risk premium did not exist, or there was no significant relationship between liquidity risk and asset returns or even negative correlation. Brennan (1996) using NYSE data from 1984 to 1991 found that the level of liquidity and the stock returns were negatively correlated, but this relationship was not sound; [8] Chordia et al. (2001) measured liquidity by trading volume and took the volatility of trading volume as an indicator of the liquidity risk, and found that the expected rate of return was negatively correlated with trading volatility, that was, the expected rate of return was negatively correlated with the liquidity risk. [9]
Many empirical studies have also shown the effect of scale, the value effect and the liquidity risk premium. Although the phenomenon in the stock market was generally confirmed in the United Kingdom, United States, France and other developed countries, the conclusions of the emerging markets were different. Rouwenhorst (1999) found the effect of scale and the value effect, based on 20 emerging markets in the International Finance Corporation (IFC), but the portfolio's rate of return and the turnover were positively correlated;[10] Bekaert (2007) found that the expected return and liquidity showed a significant positive correlation in many emerging markets.[11]

B. Domestic research background

In the country, some scholars have also explored the measurement of liquidity and the liquidity risk premium. Huang Feng (2007) thought that liquidity reflected the impact of trading volume on trading prices, and the price fluctuation caused by the emergence of new information should be excluded, and the disclosure of new information was often occurred during non-trading hours, for which he used the price amplitude ((the highest price - the lowest price) / the opening price) to substitute the molecule of Amihud indicator.[12] Li Yuanhui and Ding Huiping (2009) found the liquidity levels of different industries and different regions were different using VAR approach based on samples selected from the Shanghai and Shenzhen Stock Exchange. From the industry' point of view, the medicine and bio-products industry showed larger liquidity risk in the Shanghai Stock Exchange, and the wood, furniture industry showed greater liquidity risk in the Shenzhen Stock Exchange. From a regional perspective, the liquidity risk of the western region was higher than the other two regions. And the overall liquidity risk level of the stock in the Shenzhen Stock Exchange was slightly higher than that in the Shanghai Stock Exchange. [13] Wang Mingtao and Zhuang Yaming (2011) proposed the concept of target liquidity. They found strong correlation of the lack of liquidity and its volatility through an empirical test based on the 148 A-shares listed on the Shanghai Stock Exchange and the target liquidity had a significant impact on liquidity risk. They also showed that the liquidity risk of the bull phase was significantly less than that of the bear phase and the size of the stock market capitalization had little effect on liquidity risk. [14] At the same time, scholars have also been exploring the effect of scale and the value effect. Lu Jing and Tang Xiaowo (2004) showed that the effect of scale did not exist in the Chinese stock market;[15] Li Yihong and Wu Shinong (2003) believed that research results were affected by the liquidity indicators, the empirical method, the structure of estimated data, the policies and important events;[16] Zhou Fang and Zhang Wei (2011) made an empirical

study on the scale effect, the value effect and the liquidity risk premium in China's stock market through improving the Fama three-factor model and the LACAPM. They proposed a new non-liquidity indicator to measure liquidity risk combined with turnover by improving the indicator raised by Amhuid (2002) and they thought "liquidity premium" existed and there was some intrinsic correlation of the liquidity, company size and the book-market ratio. [17]

By numerous researches, some scholars believed that liquidity risk premium existed in the Chinese stock market. Wu Wenfeng et al. (2003) used the ratio of the absolute value of day yield and the transaction amount to represent non-liquidity, and found that the indicator and the earning rate were positively correlated, that was, and there was compensation for liquidity risk in China's stock market.[18] Of course, some scholars hold the opposite view that there was not liquidity risk premium phenomenon in the domestic stock market, such as Xi Honghui (2006) measured the stock liquidity by daily volatility-adjusted turnover and non-liquidity indicators, and analyzed the relationship of the liquidity, its volatility and stocks' expected returns finding a significant negative correlation of the expected return and stock liquidity levels in the control of other factors that affected stock returns and showing fluctuations of the liquidity could not explain the expected stock returns.[19] Some scholars believed that the liquidity risk and the expected stock returns influenced each other. Yang Chaojun and Wang Lingzhi (2011) showed a kind of bidirectional causality between the fluctuation of liquidity and the rate of return based on the causality test of fixed effects VAR. [20]

On the whole, you can find that liquidity risk is a hot issue of the domestic financial research. Many scholars have proposed their own views on the measurement of liquidity risk and its premium, but have not reached the same conclusion yet, mainly due to the difference of liquidity indicators, the situation of China's securities market and the impact of policies, major events or other factors. Empirical results vary greatly if different liquidity indicators, different samples or different analysis methods are selected.

C. Significance

The liquidity of the stock market is an important indicator to evaluate the quality of the security market. For investors, the liquidity is valuable, and the better liquidity, the lower transaction costs and the impact of trading volume on the price is smaller, and the market is more stable, and investors have more confidence in the market, and the allocation of resources will be more efficient. By studying the liquidity premium of China's securities market, we can not only be able to recognize the risk aversion of investors, but also investigate the efficiency and order of the securities market, in order to guide the pricing of financial assets and financial risk management. Therefore, the study will help to enhance market liquidity assessment, to guard against liquidity risks, to further improve the trading mechanism of the securities market, to strengthen the information disclosure system, to reform the situation of split share, to improve the confidence of investors, to make the stock market more stable. It will have important meaning to academia, investors, and the Securities Regulatory Commission.

At present, the conclusions of the study on domestic liquidity premium are not consistent, and the problem of liquidity is still a difficult and hot issue in the financial field. This paper is based on studies at home and abroad and the current situation of China's stock market. We improve the original indexes and propose a new indicator of liquidity risk. We distinguish industries and study the stocks' excess return of the liquidity risk during bull and bear market periods based on the stock yield, market yield and stock liquidity risk. At the same time, the impact of the company size, the carrying amount of market capitalization ratio, the proportion of outstanding shares on stock returns is also taken in consideration to measure the excess returns of stocks. The research considers both exogenous liquidity risk and endogenous liquidity risk, and adapts to the order-driven stock market in our country. It will have great meaning to investigating the efficiency of capital markets, asset pricing and liquidity risk management.

II. Empirical Analysis

A. Index selection

1) Liquidity indicator (NL)

Scholars have proposed many indicators to measure liquidity considering the bid-ask spread, trading volume, transaction amount, turnover, etc. On the basis of previous studies, we put forward a new indicator called NL.

$$NL_t = \frac{\left(P_t^h - P_t^l\right)/P_{t-1}^c}{T_t}$$

Among them, P_t^h refers to the highest stock price for the day, P_t^l the lowest stock price, P_{t-1}^c the closing stock price the day before, T_t the turnover for the day. The indicator leads to organic combination of the price and volume. The molecule uses the relative bid-ask spread rather than the absolute bid-ask spread or the daily yield to enhance the comparability and mitigate the impact of the events and announcements or other non-trading factors. We take the stock closing price the day before into account for the T +1 securities trading system. The denominator selects the turnover rather than the absolute volume or transaction amount is based on the comparability, because the absolute volume and transaction have trends and such suspicions can be avoided by choosing the turnover.

2）Size of the company

Most of the existing researches show that the scale effect, also known as the effect of small companies, exists in our stock markets. Banz(1981) pointed out that the size of the company had a significant impact on the expected return of the stock, and after a lot of researches by domestic and foreign scholars, the conclusion was confirmed and they pointed out that a higher rate of return would be got by investing in stocks with smaller market value. Due to the split share structure and other historical reasons, shares are divided into tradable shares and non-tradable shares in China' stock market, and the latter cannot be freely traded in the secondary market, which means that the actual stock supply is greater than the number of currently outstanding shares and the market value calculated according to the current stock prices actually is overestimated. Therefore, when we examine the relationship between stock returns and firm sizes, some scholars think it will be more accurate to measure the size of the company using the market value calculated according to tradable shares, because all trading, stock prices, yield and other indicators are for the outstanding shares, and only tradable shares can be traded in the secondary market. At the same time, some scholars, such as Chen Shou, Chen Libo (2002), believed that there was no essential impact on the sort of the yields of the investment combination with different scales. After analysis, this paper selects the market value of tradable stocks (i.e. the closing price multiplied by the number of outstanding shares), and uses its historical average level of the sample to measure the size of the company in order to make a distinction among small, medium, big cap stocks and make comparative analysis of the excess returns caused by liquidity risk of stocks with different sizes.

3）Proportion of outstanding shares

According to the analysis above, the stock supply will be greater with the lifting of the ban of non-tradable shares, and stock prices should theoretically decline. Therefore, this paper takes the proportion of tradable shares into account when measuring the excess returns of stocks. For certain stocks, the rate of return should be lower with the increase of the proportion of shares in circulation. Investors will have expectations on companies with lower proportion of tradable shares that more stocks will be traded. In addition, it is difficult to transfer the non-tradable shares timely at ideal prices because of relevant laws and regulations, so investors will ask for higher returns. This paper uses the ratio of the quantity of outstanding shares and that of total shares to measure the proportion of outstanding shares.

4）The ratio of book-market value

This paper also considers the impact of the ratio of book-market value, i.e. the value effect, on stock returns. As early as the 1980s, Stattman (1980), Rosenberg, Reid, and Lanstein (1985) found the average rate of returns of the stocks in the U.S. stock market was positively correlated with the ratio of book-market value, i.e. higher ratio of book-market value could result in higher average yield, and the average yield of stocks with lower ratio of book-market value was often lower. The phenomenon is known as the value effect. This paper takes the ratio of book-market value as a factor of stock returns, and uses the ratio of net assets per share and the closing price per share to measure it.

B. Data selection

This paper aims to study the relationship of the liquidity risk and the excess returns of stocks and makes comparative analysis of the excess returns caused by liquidity risk of the stocks with different market trends and different sizes in different industry sectors. In addition to liquidity risk, the impact of the proportion of outstanding shares and the ratio of book-market value on stock excess returns is also taken into account. According to the Industrial

Classification Guidelines of the China' Securities Regulatory Commission, listed companies are divided into 13 categories, including agriculture, forestry, animal husbandry, fisheries (The industry code is A); extractive industries (B); manufacturing (C); electricity, gas and water production and supply (D); construction (E); transportation and warehousing (F); the IT industry (G); wholesale and retail trade (H); finance and insurance (I); real estate (J); social services (K); communication and cultural industries (L); comprehensive (M) etc. And the manufacturing sector is the largest.

This paper selects daily stock data of each industry during the bull phase, i.e. from July 1, 2006 to October 16,2007 (the Shanghai A-share Index rose to 6395.76 points from 1784.46 points), and the bear phase, i.e. from October 16, 2007 to December 31, 2008 (the Shanghai A-share Index fell to 1911.79 points from 6395.76 points), as a sample. The sample includes stocks listed on the Shanghai A-share, and stocks with ST, S, SST, *ST, S*ST and long-term suspension (continuous period of suspension is over 40 days) were removed taking our special trading system as well as the effectiveness and comparability of data into account, and the final sample contains 507 shares. The data generated includes the highest price, lowest price, closing price, turnover, stock yield, the proportion of tradable shares and the yield of the SSE A-Share Index. All the raw data is from the RESSET database. This paper uses the Eviews6.0 as the major analysis software in order to ensure the reliability of the results.

C. Empirical process and results

1）Panel data model

This paper establishes a panel data model, and makes empirical analysis of the relationship of the excess return of stocks and the liquidity risk, the ratio of book-market value, the proportion of tradable shares or other factors. The form of the model is:

$$Y_{it} = \alpha_{it} + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \mu_{it}$$

Where $i = 1,2,3,\ldots,n$; $t = 1,2,3,\ldots,m$; Y_{it} refers to daily excess returns of stocks, i.e. stocks yield subtracts the yield of the SSE A-Share Index, X_{1it} refers to non-liquidity indicators, i.e. the NL, and X_{2it} the proportion of tradable shares, X_{3it} the ratio of book-market value.

2）Empirical results

At first, the paper analyzed the manufacturing sector. It included two steps: first, we made the overall analysis of the industry during the bull and bear phase respectively to examine the existence of the impact of the liquidity risk premium, the value effect and the proportion of outstanding shares on the excess return; second, we made similar analysis of the small-cap, medium-cap, large-cap stocks and compared with the overall analysis and examined if there were significant differences within the industry or not.

Table 1.Redundant Fixed Effects Tests (C)

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.2741	-299170	0.1480
Cross-section Chi-square	37.0034	29	0.1461

Table 2.Correlated Random Effects - Hausman Test (C)

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.6924	2	0.0001

The analysis results show that the impact of the proportion of outstanding shares on the excess return is not significant. Through F test (Table 1),the Hausman test (Table 2) and the estimation of model coefficient (Table 3), we find the individual fixed effects model is more suitable to analyze the manufacturing sector in the bull market phase, and the coefficients of non-liquidity indicator and the ratio of book-market value are negative, so it can clearly be seen the liquidity premium does not exist for the manufacturing industry, and it can even be said that the liquidity risk and stocks yield are negatively related, and the value effect does not exist. The similar analysis results are found in the bear phase. The results can be seen from the appendix.

Table 3.Estimation of Model Coefficient (C)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.0043	0.0008	5.49	0.00
β_1	-0.0806	0.0189	-4.26	0.00
β_3	-0.0062	0.0016	-3.84	0.00

The paper also comparatively analyses the small-cap, medium-cap, large-cap stocks in both the bull phase and bear phase. In the bull phase, for the large-cap stocks, to choose the individual random effects model is more appropriate, and it can be seen from Table 4 that the non-liquidity indicator and the ratio of book-market value is not significant, so there are no liquidity premium and value effects; for

the medium-cap stocks, the individual fixed effects model is more suitable, and we can see from Table 5 that there are no liquidity risk premium and value effects; for the small-cap stocks, to select the individual fixed effects model is more suitable, and Table 6 shows that the stock excess returns are negatively correlated with liquidity risk and there is no value effect. In the bear phase, the paper also makes a similar analysis and the similar results are got. The results can be seen from the appendix.

Table 4.Estimation of Model Coefficient (C: large-cap)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.0032	0.0012	2.75	0.01
β_1	-0.0007	0.0210	-0.03	0.97
β_3	-0.0046	0.0025	-1.85	0.06

Table 5.Estimation of Model Coefficient (C: medium-cap)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.0077	0.0015	5.23	0.00
β_1	-0.2530	0.0485	-5.22	0.00
β_3	-0.0075	0.0027	-2.73	0.01

Table 6.Estimation of Model Coefficient (C: small-cap)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.0046	0.0016	2.95	0.00
β_1	-0.4132	0.0615	-6.72	0.00
β_3	-0.0008	0.0034	-0.23	0.82

In addition, the industry of wholesale and retail trade also accounts for a large proportion in Shanghai A-shares. Through the F-test (Table 7) and the Hausman test (Table 8), we see that the individual random effects model is more suitable for the industry in the bull phase, and it can be seen from the appendix that the coefficient of the illiquid risk indicator is negative, and there is no liquidity premium, and the liquidity risk and stock excess returns are negatively related, and there is no value effect. For the bear phase, conclusions are undifferentiated. After analyzing the large-cap, medium-cap, small-cap stocks, the result is similar, that is, there is no liquidity risk premium. The results can be seen from the appendix.

Table 7.Redundant Fixed Effects Tests (H)

Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.7364	-299,046	0.8456
Cross-section Chi-square	21.4070	29	0.8439

Table 8.Correlated Random Effects - Hausman Test (H)

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.4610	2	0.1772

Then, we similarly analyze other industry sectors like the comprehensive industry; social services; communication and cultural industries; real estate; finance and insurance; transportation; warehousing; electricity, gas and water production and supply industry; IT industry; construction; extractive industries; agriculture, forestry, animal husbandry and fisheries. And the same conclusion is reached. And the results can be seen from the appendix. This article also analyses the liquidity risk instead of the liquidity indicator we put forward with the other indexes proposed by other scholars, such as the indicators that use the average price of the highest and the lowest or that day closing price rather than the previous closing price as the denominator. The conclusions are compared with those we get using the liquidity indicator we proposed, and we find no difference does exist among different industry sectors or the large, medium and small cap. The liquidity risk premium does not exist and there is a certain degree of negative correlation of the liquid risk and the excess return.

III. Summary

It can be seen from the results that the excess return caused by liquidity risk does not exist. It is not consistent with the conclusions of many foreign and domestic scholars, and it shows that our stock market, as an emerging market, has its uniqueness, and it is fault to apply the conclusions of foreign markets to China's stock market blindly. In addition, through the literature review, we can know the conclusions of the Chinese stock market are not consistent, and some scholars believed that a positive correlation existed between the liquidity risk and excess stock returns, while some scholars believed that the liquidity risk premium did not exist or even a negative correlation of them was observed. And the conclusions of this paper support the latter. Due to different sample selections, index selections and so on, different conclusions can be got. For the selection of liquidity indicators, no coherent conclusion is reached.

However, the impact of liquidity risk on

the stock market cannot be ignored. As we all know, China's stock market is often known as the “capital market” or the “policy market”, and the instability of capital and policies bring large liquidity volatility to the stock market, and the contradiction of stock supply and demand in China’ stock market has been a prominent issue. Therefore, it is important to take more effective measures to strengthen the management of liquidity risk. This paper suggests: first, further improve the trading mechanism of China's stock market; second, strengthen the construction of the laws and regulations related to liquidity risk; third, learn from foreign experience and nurture powerful institutional investors to improve risk control system; forth, further build information disclosure system of the stock market; fifth, develop the philosophy of rational investment and reduce the incidence of “herding”.

Thank-you speech

After more than five months, we finally finish this paper. We overcome numerous difficulties and obstacles during the writing process through the help of classmates and teachers, and they gave us selfless guidance to help to make improvements of the paper. In addition, when we went to the school library to find materials, the teacher in the library also gave us a lot of support and help. Take this opportunity to express our most sincere thanks for all teachers! We also appreciate the scholars involved in this paper. This article refers to the research literature of many scholars, and without all you scholars’ research and inspiration, we will be very difficult to complete the writing of this thesis. Thank our friends, who gave and will give us a lot of valuable materials and enthusiastic help in the process of writing and publishing the paper.

Our academic standard is limited, and the paper is inevitable of shortcomings and we look forward to your criticism and suggestion!

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中国股票市场板块流动性风险的超额回报研究

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摘　要：流动性是证券市场的重要属性,是影响价格行为的重要因素和衡量市场效率的主要指标之一。在股票交易的过程中，流动性风险的存在使得交易成本增加。目前，国外研究普遍认为股票市场上存在流动性风险所带来的超额回报，然而中国股票市场作为新兴市场，在涨跌停板制度、波动性、报价深度、交割制度等方面有其独特之处，已有研究关于流动性风险超额回报是否存在的说法并不一致，流动性风险测度模型也不一致，建立有效的流动性风险衡量指标并测度其对股市的影响是当前研究的重要方面。

本文结合我国股票市场现状，在国内外已有研究的基础上，对原有指标进行了改进，提出了新的流动性风险指标（当日最高价、最低价之差比前一日收盘价与当日换手率的比值）。选取从2006年7月1日到2008年12月31日上海证券交易所900多家上市公司的A股数据作为研究对象，区分行业，以个股日收益率、市场日收益率和个股短期流动性风险水平为基础，分别研究其在牛市和熊市时期各行业股票流动性风险的超额回报情况，与此同时，还考虑了公司规模、账面市值比、流通股比例等对股票收益率的影响，在多因素基础上对个股的超额回报进行衡量。本文的创新点在于：第一，在考虑连续性和稳定性的基础上，提出了新的衡量流动性风险的非流动性指标，将当日和前一日的价、量数据有机结合；第二，本文基于面板数据模型进行实证分析，考虑市场因素、公司规模、流动性风险等对股票超额回报的影响，对股票市场各板块流动性风险的超额回报情况进行了对比分析。此研究对于考察资本市场的效率、资产定价和流动性风险管理具有重要的意义。

关键词 ：流动性风险；超额回报；面板数据；股票市场

Appendix

Table I. Estimation Results

Industry	Bull phase					Bear phase				
Code (size)	Variable	Coef.	Std.	t-Stat.	Prob.	Variable	Coef.	Std.	t-Stat.	Prob.
A	c	0.0076	0.0018	4.27	0.00	c	0.0174	0.0025	6.97	0.00
	x_1	-0.5185	0.0871	-5.95	0.00	x_1	-0.4192	0.0612	-6.85	0.00
	x_3	-0.0037	0.0036	-1.01	0.31	x_3	-0.0195	0.0080	-2.45	0.01
	Prob.(F-stat.)=0.00 DW=1.8905					Prob.(F-stat.)=0.00 DW=1.7484				
A(Small-cap)	c	0.0113	0.0032	3.57	0.00	c	0.0169	0.0043	3.97	0.01
	x_1	-0.6448	0.1441	-4.48	0.00	x_1	-0.4425	0.0979	-4.52	0.00
	x_3	-0.0090	0.0060	-1.49	0.14	x_3	-0.0161	0.0137	-1.18	0.24
	Prob.(F-stat.)=0.00 DW=1.7905					Prob.(F-stat.)=0.00 DW=1.7076				
A(Medium-cap)	c	0.0065	0.0035	1.88	0.06	c	0.0205	0.0050	4.14	0.00
	x_1	-0.9867	0.2384	-4.14	0.00	x_1	-0.6358	0.1774	-3.58	0.00
	x_3	0.0077	0.0070	1.09	0.28	x_3	-0.0184	0.0127	-1.44	0.15
	Prob.(F-stat.)=0.00 DW=1.8883					Prob.(F-stat.)=0.00 DW=1.8696				
A(Large-cap)	c	0.0059	0.0027	2.17	0.03	c	0.0158	0.0042	3.74	0.00
	x_1	-0.2927	0.1244	-2.35	0.02	x_1	-0.3427	0.0863	-3.97	0.01
	x_3	-0.0047	0.0061	-0.76	0.45	x_3	-0.0209	0.0167	-1.25	0.21
	Prob.(F-stat.)=0.00 DW=2.0314					Prob.(F-stat.)=0.00 DW=1.7134				
B	c	0.0056	0.0024	2.33	0.02	c	0.0048	0.0023	2.11	0.04
	x_1	0.0269	0.0388	0.69	0.49	x_1	-0.0006	0.0108	-0.05	0.96
	x_3	-0.0200	0.0077	-2.60	0.01	x_3	-0.0161	0.0088	-1.83	0.07
	Prob.(F-stat.)=0.00 DW=1.8189					Prob.(F-stat.)=0.00 DW=1.7614				
B(Small-cap)	c	0.0083	0.0027	3.07	0.00	c	0.0077	0.0026	2.99	0.00
	x_1	-0.0858	0.0666	-1.29	0.20	x_1	-0.1156	0.0333	-3.47	0.00
	x_3	-0.0160	0.0067	-2.38	0.02	x_3	-0.0098	0.0062	-1.58	0.11
	Prob.(F-stat.)=0.00 DW=1.8227					Prob.(F-stat.)=0.00 DW=1.7499				
B(Medium-cap)	c	0.0094	0.0023	4.08	0.00	c	0.0062	0.0027	2.33	0.02
	x_1	-0.0512	0.0847	-0.60	0.55	x_1	-0.0461	0.0381	-1.21	0.23
	x_3	-0.0173	0.0040	-4.28	0.00	x_3	-0.0185	0.0072	-2.56	0.01
	Prob.(F-stat.)=0.00 DW=1.8161					Prob.(F-stat.)=0.00 DW=1.5889				
B(Large-cap)	c	0.0056	0.0024	2.33	0.02	c	0.0048	0.0023	2.11	0.04
	x_1	0.0269	0.0388	0.69	0.49	x_1	-0.0006	0.0108	-0.05	0.96
	x_3	-0.0200	0.0077	-2.60	0.01	x_3	-0.0161	0.0088	-1.83	0.07
	Prob.(F-stat.)=0.00 DW=1.8189					Prob.(F-stat.)=0.00 DW=1.7614				
C	c	0.0043	0.0008	5.49	0.00	c	0.0056	0.0007	8.16	0.00
	x_1	-0.0806	0.0189	-4.26	0.00	x_1	-0.0437	0.0073	-6.03	0.00
	x_3	-0.0062	0.0016	-3.84	0.00	x_3	-0.0045	0.0013	-3.43	0.00
	Prob.(F-stat.)=0.00 DW=1.7916					Prob.(F-stat.)=0.00 DW=1.7467				

C(Small-cap)	c	0.0046	0.0016	2.95	0.00	c	0.0110	0.0017	6.50	0.00
	x_1	-0.4132	0.0615	-6.72	0.00	x_1	-0.1535	0.0218	-7.03	0.00
	x_3	-0.0008	0.0034	-0.23	0.82	x_3	-0.0066	0.0038	-1.74	0.08
	Prob.(F-stat.)=0.00 DW=1.7876					Prob.(F-stat.)=0.00 DW=1.7972				
C(Medium-cap)	c	0.0077	0.0015	5.23	0.00	c	0.0057	0.0011	5.33	0.00
	x_1	-0.2530	0.0485	-5.22	0.00	x_1	-0.0472	0.0120	-3.93	0.01
	x_3	-0.0075	0.0027	-2.73	0.01	x_3	-0.0034	0.0017	-2.01	0.04
	Prob.(F-stat.)=0.00 DW=1.7662					Prob.(F-stat.)=0.00 DW=1.7457				
C(Large-cap)	c	0.0032	0.0012	2.75	0.01	c	0.0018	0.0011	1.68	0.09
	x_1	-0.0007	0.0210	-0.03	0.97	x_1	-0.0092	0.0090	-1.02	0.31
	x_3	-0.0046	0.0025	-1.85	0.06	x_3	-0.0037	0.0026	-1.39	0.16
	Prob.(F-stat.)=0.00 DW=1.8558					Prob.(F-stat.)=0.00 DW=1.6870				
D	c	0.0055	0.0007	7.40	0.00	c	0.0045	0.0006	7.17	0.00
	x_1	-0.2186	0.0218	-10.05	0.00	x_1	-0.0477	0.0061	-7.80	0.00
	x_3	-0.0032	0.0016	-1.98	0.05	x_3	-0.0007	0.0013	-0.56	0.58
	Prob.(F-stat.)=0.00 DW=1.6987					Prob.(F-stat.)=0.00 DW=1.7648				
D(Small-cap)	c	0.0070	0.0022	3.23	0.00	c	0.0052	0.0021	2.43	0.02
	x_1	-0.5482	0.0955	-5.74	0.00	x_1	-0.1184	0.0245	-4.83	0.00
	x_3	-0.0018	0.0046	-0.39	0.70	x_3	0.0028	0.0049	0.58	0.56
	Prob.(F-stat.)=0.00 DW=1.7948					Prob.(F-stat.)=0.00 DW=1.8103				
D(Medium-cap)	c	0.0053	0.0020	2.70	0.01	c	0.0067	0.0016	4.20	0.00
	x_1	-0.2173	0.0540	-4.02	0.01	x_1	-0.1522	0.0242	-6.28	0.00
	x_3	0.0007	0.0039	0.18	0.86	x_3	0.0027	0.0019	1.44	0.15
	Prob.(F-stat.)=0.00 DW=1.6421					Prob.(F-stat.)=0.00 DW=1.6772				
D(Large-cap)	c	0.0068	0.0019	3.48	0.00	c	0.0030	0.0018	1.66	0.10
	x_1	-0.1258	0.0368	-3.42	0.00	x_1	-0.0076	0.0104	-0.73	0.46
	x_3	-0.0092	0.0036	-2.57	0.01	x_3	-0.0016	0.0041	-0.39	0.69
	Prob.(F-stat.)=0.00 DW=1.8286					Prob.(F-stat.)=0.00 DW=1.6629				
E	c	0.0087	0.0012	7.19	0.00	c	0.0080	0.0012	6.63	0.00
	x_1	-0.4387	0.0565	-7.76	0.00	x_1	-0.1618	0.0168	-9.65	0.00
	x_3	-0.0037	0.0019	-1.89	0.06	x_3	0.0011	0.0024	0.47	0.64
	Prob.(F-stat.)=0.00 DW=1.7719					Prob.(F-stat.)=0.00 DW=1.7076				
E(Small-cap)	c	0.0096	0.0020	4.73	0.00	c	0.0090	0.0020	4.47	0.00
	x_1	-0.4612	0.0819	-5.63	0.00	x_1	-0.1462	0.0253	-5.78	0.00
	x_3	-0.0047	0.0031	-1.54	0.12	x_3	-0.0010	0.0035	-0.28	0.78
	Prob.(F-stat.)=0.00 DW=1.6919					Prob.(F-stat.)=0.00 DW=1.7543				
E(Medium-cap)	c	0.0114	0.0025	4.55	0.00	c	0.0060	0.0022	2.76	0.01
	x_1	-0.6481	0.1525	-4.25	0.00	x_1	-0.1734	0.0360	-4.81	0.00
	x_3	-0.0066	0.0042	-1.55	0.12	x_3	0.0048	0.0046	1.03	0.31
	Prob.(F-stat.)=0.00 DW=1.7991					Prob.(F-stat.)=0.00 DW=1.6515				
E(Large-cap)	c	0.0063	0.0019	3.41	0.00	c	0.0090	0.0022	4.09	0.00
	x_1	-0.3348	0.0852	-3.93	0.01	x_1	-0.1759	0.0286	-6.16	0.00
	x_3	-0.0009	0.0030	-0.28	0.78	x_3	0.0008	0.0045	0.17	0.86

	Prob.(F-stat.)=0.00 DW=1.8364					Prob.(F-stat.)=0.00 DW=1.7072				
F	c	0.0049	0.0007	6.62	0.00	c	0.0063	0.0007	8.62	0.00
	x_1	-0.1995	0.0240	-8.31	0.00	x_1	-0.0475	0.0077	-6.17	0.00
	x_3	-0.0038	0.0017	-2.26	0.02	x_3	-0.0067	0.0016	-4.22	0.00
	Prob.(F-stat.)=0.00 DW=1.8267					Prob.(F-stat.)=0.00 DW=1.7406				
F(Small-cap)	c	0.0049	0.0015	3.38	0.00	c	0.0094	0.0016	6.02	0.00
	x_1	-0.3433	0.0528	-6.50	0.00	x_1	-0.1114	0.0173	-6.45	0.00
	x_3	0.0006	0.0036	0.16	0.87	x_3	-0.0082	0.0038	-2.13	0.03
	Prob.(F-stat.)=0.00 DW=1.7806					Prob.(F-stat.)=0.00 DW=1.7898				
F(Medium-cap)	c	0.0043	0.0012	3.57	0.00	c	0.0061	0.0012	5.09	0.00
	x_1	-0.2588	0.0427	-6.06	0.00	x_1	-0.0481	0.0138	-3.48	0.00
	x_3	-0.0003	0.0028	-0.09	0.93	x_3	-0.0054	0.0024	-2.22	0.03
	Prob.(F-stat.)=0.00 DW=1.9052					Prob.(F-stat.)=0.00 DW=1.6892				
F(Large-cap)	c	0.0045	0.0012	3.64	0.00	c	0.0032	0.0011	2.91	0.00
	x_1	-0.0830	0.0342	-2.43	0.02	x_1	-0.0087	0.0104	-0.84	0.40
	x_3	-0.0070	0.0027	-2.62	0.01	x_3	-0.0053	0.0023	-2.27	0.02
	Prob.(F-stat.)=0.00 DW=1.8319					Prob.(F-stat.)=0.00 DW=1.7405				
G	c	0.0044	0.0009	4.72	0.00	c	0.0071	0.0009	8.21	0.00
	x_1	-0.1784	0.0265	-6.74	0.00	x_1	-0.0393	0.0056	-7.01	0.00
	x_3	-0.0053	0.0024	-2.16	0.03	x_3	-0.0083	0.0024	-3.40	0.00
	Prob.(F-stat.)=0.00 DW=1.7645					Prob.(F-stat.)=0.00 DW=1.7728				
G(Small-cap)	c	0.0074	0.0020	3.80	0.00	c	0.0099	0.0018	5.43	0.00
	x1	-0.4064	0.0694	-5.86	0.00	x_1	-0.1432	0.0199	-7.19	0.00
	x3	-0.0099	0.0053	-1.87	0.06	x_3	-0.0032	0.0050	-0.64	0.52
	Prob.(F-stat.)=0.00 DW=1.7663					Prob.(F-stat.)=0.00 DW=1.7981				
G(Medium-cap)	c	0.0050	0.0016	3.12	0.00	c	0.0071	0.0016	4.49	0.00
	x_1	-0.2119	0.0528	-4.02	0.01	x_1	-0.0298	0.0076	-3.94	0.01
	x_3	-0.0048	0.0035	-1.37	0.17	x_3	-0.0096	0.0046	-2.10	0.04
	Prob.(F-stat.)=0.00 DW=1.7933					Prob.(F-stat.)=0.00 DW=1.7565				
G(Large-cap)	c	0.0032	0.0016	1.97	0.05	c	0.0051	0.0012	4.09	0.00
	x_1	-0.0969	0.0346	-2.80	0.01	x_1	-0.0252	0.0088	-2.87	0.00
	x_3	0.0001	0.0045	0.03	0.97	x_3	-0.0063	0.0036	-1.75	0.08
	Prob.(F-stat.)=0.00 DW=1.7382					Prob.(F-stat.)=0.02 DW=1.8002				
H	c	0.0042	0.0008	5.31	0.00	c	0.0053	0.0007	7.35	0.00
	x_1	-0.0496	0.0143	-3.45	0.00	x_1	-0.0126	0.0033	-3.87	0.00
	x_3	-0.0079	0.0019	-4.05	0.01	x_3	-0.0092	0.0018	-5.06	0.00
	Prob.(F-stat.)=0.00 DW=1.6911					Prob.(F-stat.)=0.00 DW=1.8120				
H(Small-cap)	c	0.0043	0.0016	2.75	0.01	c	0.0090	0.0016	5.81	0.00
	x_1	-0.1815	0.0462	-3.93	0.01	x_1	-0.1341	0.0188	-7.15	0.00
	x_3	-0.0035	0.0046	-0.77	0.44	x_3	-0.0039	0.0044	-0.89	0.37
	Prob.(F-stat.)=0.00 DW=1.6210					Prob.(F-stat.)=0.00 DW=1.7953				
H(Medium-cap)	c	0.0066	0.0014	4.80	0.00	c	0.0062	0.0013	4.64	0.00
	x1	-0.2233	0.0462	-4.83	0.00	x_1	-0.0064	0.0038	-1.68	0.09

	x3	-0.0044	0.0026	-1.73	0.08	x_3	-0.0108	0.0032	-3.38	0.00
	Prob.(F-stat.)=0.00 DW=1.7479					Prob.(F-stat.)=0.00 DW=1.8737				
H(Large-cap)	c	0.0040	0.0013	2.94	0.00	c	0.0037	0.0010	3.64	0.00
	x_1	-0.0116	0.0156	-0.74	0.46	x_1	-0.0122	0.0059	-2.07	0.04
	x_3	-0.0106	0.0043	-2.49	0.01	x_3	-0.0065	0.0024	-2.69	0.01
	Prob.(F-stat.)=0.00 DW=1.7408					Prob.(F-stat.)=0.00 DW=1.7949				
I	c	0.0034	0.0018	1.83	0.07	c	0.0014	0.0018	0.76	0.45
	x_1	-0.0151	0.0282	-0.54	0.59	x_1	0.0115	0.0159	0.73	0.47
	x_3	-0.0042	0.0058	-0.72	0.47	x_3	-0.0044	0.0034	-1.31	0.19
	Prob.(F-stat.)=0.9784 DW=1.9017					Prob.(F-stat.)=0.8161 DW=1.7868				
I(Small-cap)	c	0.0069	0.0030	2.29	0.02	c	0.0048	0.0040	1.19	0.24
	x_1	-0.0561	0.0332	-1.69	0.09	x_1	-0.0078	0.0261	-0.30	0.76
	x_3	-0.0109	0.0079	-1.38	0.17	x_3	-0.0125	0.0102	-1.22	0.22
	Prob.(F-stat.)=0.2876 DW=1.8678					Prob.(F-stat.)=0.6609 DW=1.8343				
I(Medium-cap)	c	0.0002	0.0034	0.06	0.96	c	0.0002	0.0026	0.08	0.93
	x_1	-0.0387	0.1273	-0.30	0.76	x_1	0.0216	0.0239	0.91	0.37
	x_3	0.0090	0.0102	0.88	0.38	x_3	-0.0036	0.0043	-0.84	0.40
	Prob.(F-stat.)=0.6778 DW=1.9783					Prob.(F-stat.)=0.5368 DW=1.6937				
I(Large-cap)	c	-0.0005	0.0042	-0.11	0.91	c	0.0001	0.0031	0.03	0.97
	x_1	0.1364	0.0711	1.92	0.06	x_1	0.0264	0.0353	0.75	0.46
	x_3	-0.0126	0.0191	-0.66	0.51	x_3	-0.0034	0.0049	-0.69	0.49
	Prob.(F-stat.)=0.1803 DW=1.9080					Prob.(F-stat.)=0.6853 DW=1.7461				
J	c	0.0071	0.0008	8.49	0.00	c	0.0087	0.0007	12.05	0.00
	x_1	-0.2634	0.0281	-9.38	0.00	x_1	-0.1347	0.0096	-14.08	0.00
	x_3	-0.0037	0.0019	-1.88	0.06	x_3	-0.0038	0.0012	-3.05	0.00
	Prob.(F-stat.)=0.00 DW=1.7811					Prob.(F-stat.)=0.00 DW=1.7748				
J(Small-cap)	c	0.0063	0.0015	4.20	0.00	c	0.0099	0.0016	6.33	0.00
	x_1	-0.4846	0.0722	-6.71	0.00	x_1	-0.2224	0.0279	-7.98	0.00
	x_3	0.0026	0.0038	0.68	0.50	x_3	-0.0012	0.0038	-0.32	0.75
	Prob.(F-stat.)=0.00 DW=1.8270					Prob.(F-stat.)=0.00 DW=1.7335				
J(Medium-cap)	c	0.0070	0.0015	4.66	0.00	c	0.0085	0.0012	6.87	0.00
	x_1	-0.3217	0.0571	-5.64	0.00	x_1	-0.1241	0.0156	-7.94	0.00
	x_3	-0.0011	0.0036	-0.32	0.75	x_3	-0.0030	0.0018	-1.67	0.09
	Prob.(F-stat.)=0.00 DW=1.7573					Prob.(F-stat.)=0.00 DW=1.8177				
J(Large-cap)	c	0.0049	0.0019	2.57	0.01	c	0.0072	0.0014	5.18	0.00
	x_1	-0.1003	0.0461	-2.18	0.03	x_1	-0.0986	0.0176	-5.59	0.00
	x_3	-0.0022	0.0052	-0.42	0.67	x_3	-0.0052	0.0026	-1.97	0.05
	Prob.(F-stat.)=0.3569 DW=1.7654					Prob.(F-stat.)=0.00 DW=1.7625				
K	c	0.0038	0.0011	3.40	0.00	c	0.0083	0.0011	7.58	0.00
	x_1	-0.1107	0.0298	-3.71	0.00	x_1	-0.1251	0.0166	-7.54	0.00
	x_3	-0.0062	0.0031	-1.97	0.05	x_3	-0.0051	0.0022	-2.36	0.02
	Prob.(F-stat.)=0.0244 DW=1.7124					Prob.(F-stat.)=0.00 DW=1.8277				
K(Small-cap)	c	0.0091	0.0024	3.78	0.00	c	0.0096	0.0022	4.33	0.00

	x_1	-0.4733	0.1172	-4.04	0.01	x_1	-0.1928	0.0395	-4.88	0.00
	x_3	-0.0119	0.0073	-1.63	0.10	x_3	-0.0053	0.0054	-0.98	0.33
	Prob.(F-stat.)=0.0002 DW=1.7509					Prob.(F-stat.)=0.0001 DW=1.8328				
K(Medium-cap)	c	0.0005	0.0019	0.25	0.80	c	0.0059	0.0016	3.80	0.00
	x_1	-0.0452	0.0307	-1.47	0.14	x_1	-0.0775	0.0207	-3.75	0.00
	x_3	-0.0049	0.0062	-0.01	0.99	x_3	-0.0017	0.0028	-0.61	0.54
	Prob.(F-stat.)=0.7322 DW=1.8273					Prob.(F-stat.)=0.0177 DW=1.9082				
K(Large-cap)	c	0.0066	0.0020	3.30	0.00	c	0.0108	0.0020	5.32	0.00
	x_1	-0.2475	0.0760	-3.26	0.00	x_1	-0.1501	0.0310	-4.83	0.00
	x_3	-0.0028	0.0043	-0.64	0.52	x_3	-0.0085	0.0038	-2.26	0.02
	Prob.(F-stat.)=0.0178 DW=1.6205					Prob.(F-stat.)=0.00 DW=1.7699				
L	c	0.0056	0.0068	0.84	0.40	c	0.0056	0.0068	0.84	0.40
	x_1	-0.4060	0.2128	-1.91	0.06	x_1	-0.4060	0.2128	-1.91	0.06
	x_3	0.0034	0.0327	0.11	0.92	x_3	0.0034	0.0327	0.11	0.92
	Prob.(F-stat.)=0.00 DW=1.8884					Prob.(F-stat.)=0.00 DW=1.8884				
L(Small-cap)	c	0.0056	0.0068	0.84	0.40	c	0.0056	0.0068	0.84	0.40
	x_1	-0.4060	0.2128	-1.91	0.06	x_1	-0.4060	0.2128	-1.91	0.06
	x_3	0.0034	0.0327	0.11	0.92	x_3	0.0034	0.0327	0.11	0.92
	Prob.(F-stat.)=0.00 DW=1.8884					Prob.(F-stat.)=0.00 DW=1.8884				
L(Medium-cap)	c	0.0056	0.0068	0.84	0.40	c	0.0056	0.0068	0.84	0.40
	x_1	-0.4060	0.2128	-1.91	0.06	x_1	-0.4060	0.2128	-1.91	0.06
	x_3	0.0034	0.0327	0.11	0.92	x_3	0.0034	0.0327	0.11	0.92
	Prob.(F-stat.)=0.00 DW=1.8884					Prob.(F-stat.)=0.00 DW=1.8884				
L(Large-cap)	c	0.0056	0.0068	0.84	0.40	c	0.0056	0.0068	0.84	0.40
	x_1	-0.4060	0.2128	-1.91	0.06	x_1	-0.4060	0.2128	-1.91	0.06
	x_3	0.0034	0.0327	0.11	0.92	x_3	0.0034	0.0327	0.11	0.92
	Prob.(F-stat.)=0.00 DW=1.8884					Prob.(F-stat.)=0.00 DW=1.8884				
M	c	0.0051	0.0008	6.51	0.00	c	0.0073	0.0008	9.49	0.00
	x_1	-0.2279	0.0297	-7.67	0.00	x_1	-0.0975	0.0093	-10.52	0.00
	x_3	-0.0035	0.0018	-1.95	0.05	x_3	-0.0021	0.0016	-1.29	0.20
	Prob.(F-stat.)=0.00 DW=1.7177					Prob.(F-stat.)=0.00 DW=1.7922				
M(Small-cap)	c	0.0030	0.0017	1.81	0.07	c	0.0097	0.0018	5.44	0.00
	x_1	-0.3452	0.0646	-5.34	0.00	x_1	-0.1990	0.0240	-8.29	0.00
	x_3	0.0052	0.0044	1.18	0.24	x_3	0.0023	0.0047	0.48	0.63
	Prob.(F-stat.)=0.00 DW=1.6614					Prob.(F-stat.)=0.00 DW=1.7698				
M(Medium-cap)	c	0.0053	0.0014	3.76	0.00	c	0.0077	0.0015	5.26	0.00
	x_1	-0.2144	0.0523	-4.10	0.00	x_1	-0.1217	0.0194	-6.28	0.00
	x_3	-0.0056	0.0032	-1.78	0.08	x_3	-0.0016	0.0033	-0.49	0.62
	Prob.(F-stat.)=0.00 DW=1.6845					Prob.(F-stat.)=0.00 DW=1.8166				
M(Large-cap)	c	0.0067	0.0014	4.93	0.00	c	0.0080	0.0012	6.45	0.00
	x_1	-0.2621	0.0640	-4.09	0.00	x_1	-0.1302	0.0174	-7.47	0.00
	x_3	-0.0041	0.0026	-1.56	0.12	x_3	-0.0005	0.0022	-0.23	0.82
	Prob.(F-stat.)=0.00 DW=1.7938					Prob.(F-stat.)=0.00 DW=1.8072				