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Institutional investors' effects on Stock Price Synchronicities:

------Evidence of Shanghai Stock Exchange

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Abstract

The tendency of stock prices always attracts investors' attention, which is related to their earnings. So it is increasingly concerned that what information will affect the stock markets and how the stock market reacts to investors' investment strategy. So this paper investigates the phenomenon of stock price synchronicity in Shanghai Stock Exchange, and what reflects stock price synchronicity in terms of firm-specific information and institutional investors' characteristics. We use the proxy of stock price synchronicity: R-square statistic is decreasing within the time period, as which reflects the maturity procedure of the China's equity market. Based on stock market information and institutional specific information from 2007 to 2012, we find a significantly negative relation between stock price synchronicity and institutional investors' shareholdings, and domestic institutional investors have larger effects than foreign institutional investors because of the easy access to firm-specific information. Moreover, the inner associated relation between firm-specific information and institutional investors' characteristics is explored.

Key words: Stock price synchronicity, Domestic institutional investors, Qualified foreign institutional investors, firm-specific information, investment strategy, Shanghai stock exchange.

Abbreviations

SYNCH	Stock price synchronicity
SSE	Shanghai Stock Exchange
SZSE	Shenzheng Stock Exchange
CSRC	China Securities Regulatory Commission
RMB	Renminbi, Chinese currency
CSMAR	Chinese Stock Market Accounting Research
DII	Domestic Institutional Investors
FII	Foreign Institutional Investors
QFIIs	Qualified Foreign Institutional Investors
NBSC	National Bureau of Statistics of the People's Republic of China
SOE	State-owned Enterprises
WTO	World Trading Organization
GDP	Gross Domestic Product
CAPM	Capital Asset Pricing Model
NYSE	NewYork Stock Exchange

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1. Introduction

Synchronicity means coincidence during time, a factor which is independent of space and time (Jung, C. G., 1985). That means two or more events are unrelated but moves at the same step. The phenomenon that individual firm's stock price is moving with the market index is called stock price synchronicity. For example, while the market index of one equity market goes up, individual firm's stock price is going up as well. According to the study stock price synchronicity, investors get this information of the markets and make investment strategies afterwards. Stock price synchronicity can be used in practice, since it has been proved by Morck (2000).

Base on Morck's (2000) theory, stock price synchronicity is a phenomenon that individual firms' stock prices are going up and down with the market. The higher the stock price synchronicity, the higher is probability that the particular stock price trend can be explained by the market. In his paper, stock price synchronicity is related to macro market condition, such as GDP, and micro effects as firm's structural information. The latter researches identify and prove Morck's theory, but most of researchers concentrated on analyzing developed markets in US and Europe, only a few were working on emerging markets like China.

Concerning Yin (2010), stock price synchronicity is connected to institutional investors' characteristics. The shareholding ratio of the institutional investors, the number of institutions, and trading amount are well analyzed. As Warner (1993) state, the specific exposure information of the firms is also key factors in affecting stock price synchronicity. With regard to these researches, the main purpose of this paper is to find the relationship between stock price synchronicity of Shanghai Stock Exchange and institutional investors' properties. Firm-specific information is employed as control variables.

Thereby, three research questions are coming up:

1) Is Chinese stock price synchronicity increasing or decreasing?

2) Is firm-level information important in affecting the stock price synchronicity?

3) Which kind of institutional investors' characteristics is playing an important role in the stock price synchronicity?

By analyzing stock price synchronicity, all participants in this market are getting benefits. For individual investors, they can choose investment strategy by considering the different levels of stock price synchronicity of the firms; For institutional investors, other institutions' investment strategy and firm-specific information exposure are the things they caring about. For firms, the reaction of investors is valuable for them to plan for future development.

The panel data analysis is used in this paper twice. Firstly, the panel regression of the proxy of stock price synchronicity is calculated. The database in SSE consists of 905 firms since 2007 to 2012, and it is daily data of individual firms and the market. Secondly, the explained variable is stock price synchronicity and the independent variables are institutional investors and firm-specific information. This panel regression consists of 48 firms in cross-sectional dimension and 24 quarters in period dimension.

There are certain limitations in our research. I might get opposite results against our theoretical sources. According to Morck (2000), the synchronicity will decrease if the GDP of the country increases. The result of this paper might increase in stock price synchronicity in some years. Moreover, almost all researches are written before 2007, but the time period I are going to analyze is after the subprime crisis. The choice of variables will also affect our empirical results, the chosen of a few firm-specific information leads to the bias between our result and the practical condition.

This dissertation is organized as follows: Section 2 states the summary and review of theories and background; Section 3 demonstrates hypotheses development based on these; Section 4 presents the research methods, including the data, the measurements of synchronicities and empirical model under this research; Section 5 provides the data collected, the empirical results and analysis and robustness checks. Section 6 presents our conclusion.

2. Theory and background

2.1. **China's Stock market**

The economic growth rate in China the recent three decades has been dramatic. The average annual growth rate is around 10% from 1978 to 2012. China's GDP reached ￥51.9 trillion in 2012[1]. Thus, China has become the world's third largest economy. The economic scale and the equity market are inter-correlated. After drawing attention to magnificent economic growth, Chinese equity market is beginning to be paid more and more concerns, and plenty of companies formed as professional investors and begin to invest in China's two stock exchanges. With fast economic growth, thereby came the foundation of two main stock exchanges in China's mainland: SSE and SZSE. The SSE established in Nov, 26th, 1990, and it is governed by CSRC. After more than 20 year's development, SSE has become the most important stock exchange in China considering the listed companies, the listed shares and the total market value. Till the end of 2012, there were 954 listed companies, 998 listed stocks. The total market value of stocks reached 15.9 trillion yuan (The unit of RMB), and the float market capitalization was 13.4 trillion yuan. Numbers of national economic pillar enterprises, key enterprises, basic industries and high-tech companies are listed. They help to raise funds for development of the China's economy.[2] The Shenzhen Stock Exchange (SZSE), which is also governed by CSRC, established in 1990. SZSE uses a multi-tier capital market system. By the end of 2012, the SZSE had 1,411 listed companies, with 484 in Main Board, 646 on the SME and 281 on the ChiNext. The total capitalization was about 6.7 trillion yuan.

A shares and B shares are traded in both SSE and SZSE. A-shares are called as RMD-denominated Ordinary Shares, which is valued and traded in RMD. A-shares can only be traded by domestic investors and selected foreign institutional investors, which can also be called as QFIIs. Oppositely, B-shares are defined as domestically listed foreign investment shares, and another name of B-shares is RMB special shares, B shares are valued in RMB but traded in USD. Before 2001, B-shares can only be traded by foreign traders, since 2001, domestic investors can also trade with B shares. In this paper,I am going to analyze the different effects of foreign and domestic institutional investors on A-shares.

2.2. **Stock price synchronicity**

2.2.1. Definition of stock price synchronicity

Synchronicity is a meaningful coincidence in time, a factor which is independent of

[1] Source: http://www.stats.gov.cn/english/
[2] Source: http://english.sse.com.cn/ & http://www.szse.cn/main/en/

space and time (Jung, C. G., 1985). That means two or more events are unrelated but move at the same step. In Roll's research (1988), he recommended that stock price synchronicity measures the extent to which stock prices in one markets move together and depends on the relative amounts of firm-level and market-level information capitalized into stock prices.

As for the academic definition of stock price synchronicity by Roll (1988) and Morck (2000), the following equation is the very first version of stock price synchronicity:

$$f_t = \frac{max[n_t^{up}, n_t^{down}]}{n_t^{up} + n_t^{down}}$$

where n_t^{up} is the days of single stocks that raised in the past period t, n_t^{down} is the days of that stocks that dropped in the past period t. f_t means the max proportion of stock price that either goes up or down. The number lies between 0.5 and 1. If one market's f_t is reaching up to 1, its market is mostly synchronous, and vice versa.

As I have mentioned before, this measurement is intuitive but not related to contemporary business model, so Morck came up another measurement index: R^2. This measurement index comes from CAPM, which is most widely used business model in analyzing companies' return considering market's return. And his empirical model is basically formed as:

$$Ret_{it} = \alpha_i + \beta_i Rm_{it} + \varepsilon_i$$

where, for firm i and day t, Rm is the A-share market return calculated by the A-share market index, Ret is the individual stock daily return and ε represents the random errors. This A-share market return is from the official daily announcement. The equation above let us effectively connect the individual firm total return variation with the market-specific factor.

R^2 is another proxy of stock price synchronicity because it measures how many percentages of the model is explained by the market. The number of R^2 lies between 0 and 1. The higher the R^2, the higher is the synchronicity.

2.2.2. Synchronicity in developed andemerging markets

This concept extends the previous theory in stock market. Mrock(2000)found that developed markets have less synchronous co-movements in stock markets while in emerging markets the co-movements are significant. According to his theory, there are three main determinants in explaining potential synchronicity in stock markets: First, undiversified firm-level information, information asymmetry can increase stock price synchronicity accordingly. The second, developing countries with emerging markets have poor protection of private property. The last, poor protections of public investors also affects stock price synchronicity. Li et al. (2004) also proved the same idea that

low- income countries have more relative co-movements in stock markets, but he also states there are other factors affecting the synchronicity apart from the size and the structure of the entire market.

Table 2.1 Stock price synchronicity all over the world

Panel B		Panel C	
Country	% stocks moving in step (f_j)	Country	R_j^2
United States	57.9	United States	0.021
Canada	58.3	Canada	0.062
France	59.2	U. K.	0.062
U. K.	63.1	France	0.075
Sweden	66.1	Sweden	0.142
India	69.5	India	0.189
Greece	69.7	Greece	0.192
Mexico	71.2	Mexico	0.29
China	80	China	0.453
Poland	82.9	Poland	0.569

Data source: Morck (2010)

This table demonstrates the stock price synchronicities of ten chosen countries in both methods. In this table, I can see developed markets, United States, Canada, France, U. K., and Sweden. These five countries have relatively low stock price synchronicity. Considering emerging markets as India, Greece, Mexico, China and Poland, the table shows comparably high stock price synchronicity. For example, United States has 57.9% in f and 0.021 as R^2, but China has 80% co-movements and 0.453 in R^2. So United States has the lowest stock price synchronicity among the countries all over the world, and that is why United States is usually marked as benchmark country when measuring other countries' stock price synchronicity. Then he came up with a model that compared the target country's stock price synchronicity with the benchmark country America. The American market has been defined as the least synchronous equity market all over the world because of its mature trading system and professional investors. Morck calculate a statistic by using the Central Limit Theorem to check the difference between target country's stock price synchronicity

and US's stock price synchronicity.

$$\frac{(f_{US} - f_t)}{\sqrt{f_{US}(1 - f_{US})/n_{US} + f_t(1 - f_t)/n_t}}$$

If this statistic model is not significant, it indicates that the tested country's stock prices is not significant compared with the America's market, in other words, the tested country's stock prices is not significantly synchronous compared to U. S.. However, if the statistic test is significant, then I say the tested country's stock price is significantly synchronous.

There are many other empirical studies proving this phenomenon. Gilmore and McManus (2003) focus on short-term CEE markets Hungary, Poland and the German stock markets, while Voronkova (2004) demonstrates the long-term by using daily stock market data. Egert and Kocenda (2010) proved that Western Europe markets show fewer co-movements while Poland shows more synchronous movements. All these results are consistent with Morck's theory, China's stock market is the second most synchronous market, while Poland is the most synchronous one among all the markets.

2.2.3. Factors affecting synchronicity

Mrock (2000) analyzed the determinant from the aspects of firm-level information and marker-level information and found that emerging markets, compared to developed markets, produce less firm specific information. In his study, the dependent variables are co-movement f and synchronicity R^2, and the independent variables are macroeconomic volatility, country size, and economy diversification. That firm specific information is useful for investors to capture important information to judge the potential value of the firm in the future. Weak property rights discourage informed trading and thus prevent firm-specific information from being incorporated into stock prices (Chan &Hameed, 2005). Besides, Piotroski and Roulstone (2004) state that insiders and institutional investors make huge contribution to the produce of firm-specific information, and highly analized firm-specific information can reduce the stock price synchronization. Joseph and Darren (2004) also investigate three informed market participants – financial analysts, institutional investors and insiders. They find that synchronicity has a positive relationship with analyst forecasting activities and their tests show that institutional trading enlarges the influence of firm-specific information of future earnings news on the stock price.

As Xing and Anderson (2010) analyzed, stock synchronicity can be low in either good or bad firm-specific information environments because stock prices incorporate both public and private information. Moreover, they provide inversely U-shaped relation between synchronicity and public information. Above all these studies, I conclude that Morck analyzed macroeconomic and microeconomic variables in interpreting the

phenomenon of stock price synchronicity. One important factor he ignored is institutional investors' effects.

2.3. **Firm-specific information**

2.3.1. Private and Public information

The stock price of an individual firm reflects both market-wide and firm-specific information. If a firm exposure more firm-specific information, the R^2 statistic, which is defined as a proxy of stock price synchronicity, would be lower (Xing et al. 2010). The stock price of the firm is public, lower stock price synchronicity would be accompanying more public firm-specific information, ceteris paribus. Assume that high-quality information environment means more public firm-specific information of the firms, and then R^2 may or may not usually reflect this quality. As Chen et al (2007) points out, because the stock prices incorporate both private and public information, so high-quality information will include both private and public information. Considering the inequality of the actual stock prices that consists of both public and private information and the amount of firm-specific information the firm generates, the higher stock price synchronicity could imply either more or less information the market captures in different information systems. And that is where the U-shaped relation between synchronicity and public firm-specific information comes from. When introducing this U-shaped model of stock price synchronicity and firm-specific information, I know that either more or less information leads to high stock price synchronicity.

2.3.2. Synchronicity and firm-specific information

The firm-specific information is a key element of a market synchronicity. Several studies have investigated this character. For a stock market, the firm-specific information is a decisive factor of a stock price synchronicity (Warner, 1993). By analyzing firms' annual report, major events and key news, investors are able to understand firms' actual operation situation, like the profitability and debt paying ability, so that they have made a more considerate trading decision. There have been many papers have researched the importance of firm-specific information analysis (Diamond and Verrecchia, 1981). On the other hand, a high firm-specific market also means relatively consummate market order, management and laws. For example, in an emerging market, the firm-specific information may be less useful to risk arbitrageurs because the lack of protection for investors (Morck, 2000; Barclay 2007). Similarly, less firm-specific information is produced in emerging market (Chan and Hameed, 2005) because that it is too costly and inefficient. These researches above imply that the relationship between stock price synchronicity and the produce of firm-specific information is negative.

There are plenty of firm-specific events that investors are highly concerned about. For

instance, divestitures, initial public offerings, mergers and acquisitions, stock repurchases and seasoned-equity offerings. Based on Colak's study (2010), stock market returns seem to be the most common factor that drives major corporate events. Besides, the leverage of the firm, market value of the firm, the number of the firms in this industry are also widely used in analyzing the firm's current performance and potentials in the future.

2.4. **Institutional investors**

2.4.1. General definition of institutional investors

Institutional investors are commonly considered more important than individual investors because of their higher level of information and their better technology in dealing with financial information, either firm-specific or market information. This condition happens both in emerging and developed stock markets. According to Piotroski and Roulstone (2005), the actions of insiders, institutional investors, and financial analysts generate a continuum of informed trade that influences stock prices. And insiders are the most informed group with respect to the firms' operations.

As Chan et al (2006) claimed, there are numbers of researchers analyzing developed markets in America.Michael, Barclay and Jerold (1993) test NYSE samples and find how trade size and institutional features influence the stock prices. An exception is Chang et al. (2001), he examine analyst activity both in developed and emerging markets, they show that country-specific variables influence both the extent of analyst activity and the accuracy of analyst forecasts, and also prove that, the earnings of business groups are more difficult to forecast than the earnings of non-business group in emerging markets.

Generally speaking, the institutional investors are commonly treated as the 'weather vane' of the equity market. Because institutional investors have a large amount of investment fund, professional analysts analyze the true value of the company, and institutional investors spend more time in the equity market, institutional investors have significant effects in stock price compared to individual investors. Considering the education, professional background, decision making ability and strain capacity, institutional investors are better at interpreting the surplus control behavior (Balsam, 2002). Concretely, when facing large amount of market or firm information, the institutional investors are much better at using them than the individual investors (Gompers, 2002). For example, if the information of a listed firm is produced and spread by media, the individual investors are more likely "wild" about this stock. On the contrary, this feedback rarely happens in institutional investors (Barber, 2003). There also many other papers indicate that institutional investors can use firm-specific information efficiently and sometimes they are the fabricant of the information (Sloan, 1996; Zhu, 2007; Hou, 2008). I obtain the tendency of Chinese institutional investors' market proportion from the CSMAR database. It indicates that institutional investors prefer the firms' stock with high market value and the number of their

shareholdings is significantly increased.

2.4.2. Domestic and Foreign institutional investors

Before analyzing the importance of institutional investors, the difference in institutions and the ability in processing information are two key issues. As Bardhan (2000) studied, for developing countries, there is less sophisticated market institutions. That is the point that institutional investors are important. Moreover, in emerging markets, information is necessarily much more based on personal experience, which is to some extent explain the scene of high stock price synchronicity problem in emerging markets. Frenkel (2004) studied in this field and found the interrelation between investors and relevant information.

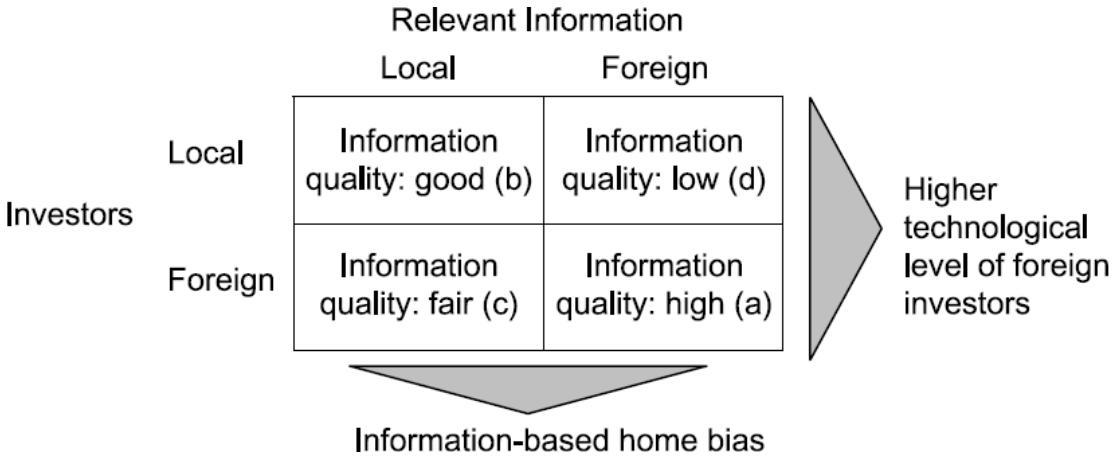
In his proposition, the information access of the market within two institutional investors can be separated into four groups. And the information quality can be ranked in order:

a. Foreign-Foreign field, foreign institution investors have high technologies in dealing with foreign information. The quality of information is 'high'.

b. Local-Local field, this is intuitive and the quality of information is 'good'.

c. Foreign-Local field, FIIs use their knowledge and ability to interpret local information, so the information quality is 'fair'.

Figure 2.1 Heterogeneous Distribution and Quality of Information in Emerging Markets (Source: Frenkel et al, 2004)



d. Local-Foreign field, DIIs do not have such ability in analyzing poor available foreign information, and then its quality is 'low'.

The dominance order of these four situations can be ranked as:

$$a > b > c > d$$

Based on this theory, the conclusion is obviously that, foreign institutional investors can reduce stock price synchronicity in local markets as well as domestic institutional investors because they have high technology to deal with information, but they have rare access to information than domestic institutional investors.

Other researchers collect institutional investors' data from Wind database. The data covers the period 2003-2009.Table 2.2 demonstrates the changes of numbers of QFIIs and DIIs.

Table 2.2 Distribution of funds by year (Source: Liu et al, 2012)

Year	QFII		Domestic Fund	
	No. of QFIIs	No. of firms that QFIIs invest in	No. of domestic funds	No. of firms that domestic funds invest in
2003	10	17	110	516
2004	24	35	161	1049
2005	31	122	218	1062
2006	44	196	301	1113
2007	49	154	346	893
2008	66	124	439	887
2009	85	210	557	1273
Mean	44	123	305	970

All these numbers are issued by CSRC in monthly reports. This table shows the number of qualified foreign institutional investors and domestic institutional investors in China. Besides, the number of institutional investors is increasing every yearexcept2008. That is because of sub-prime financial crisis. And most institutional investors are willing to invest in manufacturing industries, technologies and SOEs. Besides, FIIs have preference in transportation, metals, chemicals and machinery. Only very few foreign institutional investment are related to real estate, construction, media and culture. In conclusion, The stock price synchronicity in China should be decreasing.

2.4.3. The effects of institutional investors on stock market

Institutional investors can affect markets. As Morck (2000) said, the rest of effects of his model are dealt by institutional investors. Tao (2009) found larger momentum in the stock prices by institutional trading, especially positive-feedback trading can move the stock prices further away from their fundamentals, which cause the unstable stock price. John, Jeffrey and Selim (2003) present that institutional or individual investors have different behaviors . And institutional investors make large amount of analysis on firms' fundamental values to estimate whether the new stock price follows its real value.

The utilization of firm-specific information affects the price synchronicity, and institutional investors are able to make use of it. The relationship between the institutional investors and the stock price synchronicity has been studied by Yin (2010). He sets institutional investors' ownership, the changes of institutional investors' shareholdings and the number of institutional investors as the independent variables and finds that all these factors have significant role in stock price synchronicity. However, the institutional investors can be divided into the DIIs and FIIs. As participants of the stock market, both DIIs and FIIs have their own advantages and disadvantages. According to Chinese Security Website, the CSRC issued the Open-end Securities Investment Fund Pilot Management Approach and in the same year the China National Council for Social Security Fund was established. In 2001, the capital market had the Open-end fund to the public for the first time and it replaced the Close-ended fund becoming the mainstream of fund market gradually. For foreign institutional investors, in 1994, the Chinese government started to allow foreign funds to invest in Chinese capital market, but at that time the FIIs could not invest A-share market until the new QFIIs was allowed in China's markets in 2003. QFII is a transition system that the qualified foreign institutional investors can invest A-share through this special fund. The number of QFIIs is 169 in 2012 with 374 hundred million dollar. Therefore, the relationship between stock price synchronicity and QFIIs need to be concerned.

Yin (2010) does a research on the relationship between institutional investors and stock price synchronicity. Then he does regression in testing institutional effects, the variables are China's institutional investors' ownership, the changes of institutional investors' shareholdings and the number of institutional investors. And all these variables are significant, and the changes of institutional investors' shareholdings contribute most compared to other two variables.

Kim et al (2014) analyze both foreign versus domestic institutional investors in emerging markets, and conclude that foreign and domestic short-term institutions in emerging markets are more actively involved in information-based trading than domestic long-term institutions, and the trading activities of the former facilitate the incorporation of idiosyncratic information into stock prices. The stock price synchronicity is essentially related with the intensity of trading by foreign and domestic investors.

2.5.**Panel Data Analysis**

Panel data analysis is commonly used in analyzing real world effects, and in this dissertation, panel data analysis is used as main model specification.

There are four main attractions of panel data. First of all, panel data admit the heterogeneity of countries, firms and products so as to reduce the bias of data. Second, panel data covers both time series and cross-sectional factor, providing much more information comparing to single cross-section or time series analysis. Third,

comparing with time series and cross-sectional models, panel data can detect and measure errors better, and panel data is suitable for more complicated behavioral models.

There are three main models in analyzing panel data: pooled regression, fixed effects model and random effects model. The simplest way to estimate panel data would be estimating a single, pooled regression on all the observations together. And the equation of pooling is:

$$y_{it} = \propto + \beta x_{it} + u_{it}$$

All data in pool regression is cross-sectional data, and thereby comes the problem, there might be heterogeneity, simply 'pretending' there is no dependence between observations on a variable and information lost. So pooling regression is intuitively implausible for my model.

In order to avoid biases when running the regression, I need more precise models in dealing with panel data. One is fixed effects model (FE model), and the other is random effects model (RE model). Fixed effects model for cross-sectional dimension and time series dimension allows some constant factors do not vary either across firms or across time. The fixed effects model is defined as:

$$y_{it} = \propto + \beta x_{it} + \mu_i + v_{it}$$

In fixed effects model, it can be understood as introducing different intercept terms for each CSU. And additionally, the fixed effects model can also been treated as introducing dummy variable in each unit. Moreover, the fixed effects can be used both in cross sectional and periodically dimension.

An alternative to the fixed effects model is the random effects model. Here presents the random effects model:

$$y_{it}^{*} = \propto^{*} + \beta x_{it}^{*} + \mu_{it}^{*}$$

The random effects model requires that there is no remaining correlation in the error terms. Comparing the fixed effects model, random effects model is generally efficient than fixed effect model because of fewer estimated parameters and the avoidance of the correlation of errors within CSU's. The problem is that the RE model has more strict assumptions. Sometimes, the empirical data does not satisfy the requirement of RE model. Random effects model can apply to both dimensions only if the panel data is balanced, so does mixed effects model.

After choosing the fixed effects or random effects, the tests are required to test whether the model is suitable. The redundant fixed effects test is used to test if the fixed effects model can be used. Meanwhile, Hausman test in the Eveiws program applies for test of random effects model.

3. Hypotheses development

Since the establishment of China's Stock Market in 1989, the DIIs have developed as an increasing proportion in the main body of investment. In the early age of Stock Secondary Market, the institutional investor is scarce inthe market. In 1997, the total number of Chinese stock account is 17,130 million, which includes 99.7% individual investors and only 0.3% institutional investors. However, these numbers became 47.84% and 52.16% respectively in 2009.

The total size of fund in Chinese financial market is 21 trillion in 2014. Qi, Huang and Chen (2005) do a research about the development of Chinese DIIs and find that the DIIs offer a significant boost for the decreasing of market volatility. By researching the 'bear market' of NASDAQ in 2000, Fougere and Shawky(2003) find DIIs own more low volatility stocks than the individual investors. There are some other papers proving this conclusion indirectly. Arbel, Carvel and Strebel(1983) and Comper and Metrick(2001) find the negative relationship between the institutional investors' ownership and the company size, which can be explained that DIIs disgust the firms with high risk, in other words, the small size firms.

Domestic institutional investors are apparently having their own superiorities in an emerging market. Firstly, the domestic policy superiority can straightly effect the invest scale and items of the two groups (Cai, 2011; Busse and Hefeken, 2007). In this paper, the writer expounds an emerging stock market's policy development and lists the effects of several fatal policy changes. Secondly, domestic investors are more acquainted with native market status than foreign investors (Barrell and Pain, 2008). The availability to new further information and interpersonal relationship are considered when I study this superiority, which is related to the cost control (Callen, Hope and Segal, 2005). The foreign institutional investors have higher costs to capture key information so that they are more likely to miss great trading or investing opportunity. Therefore, domestic institutional investors have inborn advantages and they can take use of them to make professional and reasonable trading so as to affect the market price synchronicity.

The stock price synchronicity is a concave function of China's domestic institutional investors' ownership and the changes of domestic institutional investors' shareholdings, since firm-specific information dominates the price synchronicity. Moreover, institutional investors, especially the domestic institutional investors, can take use of the information and they can promote each other. Finally, the domestic institutional investors may reduce the stock price synchronicity through firm-specific information. I thus test the following hypothesis:

> *H_{1a}: Stock price synchronicity is negatively related to the domestic institutional investors' ownership.*

H_{1b}: Stock price synchronicity is negatively related to the changes of domestic institutional investors' shareholdings.

Since Chinese government joined WTO, the government opened part of financial markets where not only FIIs (foreign institutional investors), but also QFIIs can invest in Chinese securities market. (Greenaway et al. 2011). Investment volume in 2010 is $19 billion compared to the beginning of the scheme in 2003, and by the end of September that year, about 93 QFIIs had been approved by the CSRC. QFIIs had become important participants in Chinese securities markets.

FIIs are interested in investing in emerging markets with fast-growing economy, and they have been the most important source of capital for emerging markets (Frenkel et al, 2004). According to Kang and Stulz(1997) and Dahlquist and Robertsson(2001), who analyzed data from Japan and Sweden respectively, their research showed foreign investors prefer holding more shares of manufacturing firms, larger firms, and firms with low unsystematic risk, low leverage, and those with large cash position. Covrig et al. (2006) proved that foreign investors tend to overweight stocks that are globally well known, while domestic investors prefer stocks with large dividended payouts. Other US markets researchers, Aggarwal et al. (2005), Bradshaw et al. (2004) and Leuz et al. (2009) provided similar theories. All these studies suggest that foreigners prefer to invest in stocks with less uncertain information to overcome their information disadvantages.

According to Chinese market, SOEs earned lots of attention because they canget large state subsidies and preferential financing, taxes and regulations, which is consistent with Bussey's (2012) theory. The SOEs are ruled and controlled by the Chinese government. Considering this, FIIs are interested in investing in these stocks since these stocks are easily predictable comparing to other stocks. SOEs are intensive in A shares and H shares, in our analysis, I only focus on analyzing foreign investors' effects in A shares. Based on Yin's (2010) research on institutional investors' effect on stock synchronicity, the amounts of institutional investors' shareholdings and changing amounts of institutional investors' shareholdings are negatively associated with the stock synchronicity, thus I come up the following hypotheses related to foreign investors and stock synchronicity::

H_{2a}: The amounts of foreign institutional investors' shareholdings are negatively associated with the stock synchronicity.

H_{2b}: The changing foreign amounts of institutional investors' shareholdings are negatively associated with the stock synchronicity.

4. Methodology

4.1.**Data collection method**

I collect the fundamental data from the DataStream database, which includes all the listed firms' daily stock prices（2007-2012） of SSE. The shareholding ratio of institutional investors, ROEs (return of equity) and leverage from Wind database. And the information of GDP is collected from NBSC. For all the stock prices data in the sample, I firstly sift it and remove some meaningless data for further analysis by following these rules: (1) delete the yearly data whose actual trading days are less than 150 days; (2) delete all the listed financial firms; (3) delete the firms with major assets restructuring; (4) delete the firms with missing data, and (5) delete the firms whose shareholding of QFIIs is less than 12 quarters.

4.2.**Stock price synchronicity**

For the measure to estimate stock price synchronicity I follow Morck (2000), Yeung and Yu (2000) and use the R^2 statistic from the market model. Usually a high synchronicity market has a high R^2. In the market model, Ferdinand, Jeong-Bon and Annie (2010) and Yin (2010) divided the total return variation into market part and industry part. However, the problem when this method is used in the emerging market is that it is difficult to distinguish the industry effect from the market effect, and when getting the calculation results, it can only reflect the firm-specific information rather than the industry-specific information (Kalok and Allaudeen, 2005). Therefore, I chose the single variable regression. The following market model for each fiscal year is:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_i \quad (1)$$

where, for firm i and day t, Rm is the A-share market return that is calculated by the A-share market index, Rit is the individual stock daily return and ε represents the random errors. This A-share market return is from the official daily announcement. The equation above let us effectively connect the individual firm total return variation with the market-specific factor.

After finishing the return regression, I will get series R^2 from series regression equations. However, these R^2s are bounded between [0, 1], so they are not good enough to be the dependent variables. There is potential problem with the standard R-square, because standard R-square will increase with the complexity of the model. So generally I always use adjusted R-square instead. Generally adjusted R-square is smaller than standard R-square. The transformation equation is:

$$\text{Adjusted } R^2 = 1 - \frac{(1 - R^2) * (n - 1)}{n - p - 1}$$

In the equation, n is the number of observations, p is the number of predictors, in this case, p equals one. Therefore, I use a standard econometric remedy and apply the logistic transformations to these variables. By doing this step, the transformation is:

$$\text{SYNCH}_{i,t} = log(\frac{R^2}{1-R^2}) \quad (2)$$

where R^2 is from the equation (1) for firm i and year t. According to this transformation, the measurement of stock price synchronicity becomes continuous. $SYNCH_{it}$ is the measure of stock price synchronicity for firm i. A high $SYNCH$ implies that the highly correlation between the individual firm and the market.

4.3.**Empirical Model**

In order to examine the effect of related issues related shareholdings by foreign versus domestic institutional investors on stock price synchronicity, I estimate the following panel regression model:

$$\text{Synch}_{i,t} = c_0 + c_1 lny_t + c_2 Lev_{i,t} + c_3 SROA_{i,t} + c_4 Ln\ MV + c_5 Ln\ Num + c_6 x_{i,t} + u_i \quad (3)$$

Where $\text{Synch}_{i,t}$ is logistically transformed price synchronicity variables, and it is explained variable. One the right side of the above regression model, I set some explanatory and control variables:

Lny_t represents per capita GDP at time t. Stock prices move together more in emerging markets with relatively low GDP, and there exists a negative relation between per capita GDP and stock price synchronicity. I take logistical transformation of per capita GDP as one control variable. The coefficient of this variable should be negative.

$\text{Lev}_{i,t}$ is the leverage of the firm i at time t. A firm's leverage ratio is total liabilities divided by total assets. To some extent, leverage shows the potential financial risk of the firm in the future, and it is one considerable factor of institutional investors.

$\text{SROA}_{i,t}$, is the standard deviation of return on asset of firm at time t. Piotroski's (2004) research have investigated the inversely related relationship between SROA and stock price synchronicity. SROA is measured by the standard deviation of ROA at t-1, t and t+1. As Yin (2010) demonstrates, within the increasing in the variance of the firm's profitability, the correlation between the firm-level operating and the tendency of the market is decreasing. The higher the variance in ROA, the less the synchronicity reflected in stock prices. So the coefficient of this variable is expected to negative.

LnMV: the log form of market value of the firm, this indicator can be used as a tool to

measure easy-to-ignore firm-specific information. This is a widely used firm indicator because it connects with other firm specific information, and the difference between information would affect stock price synchronicity. On the other hand, huge enterprises can lead the development direction of the whole industry, and investors purchase in these firms for long period holding. In this sense, the changes in stock prices will lead to low synchronous in the market, so this coefficient should be negative.

LnNum: the log form of the company numbers in this industry. The lower numbers of the firms in this industry, the higher the stock price synchronicity would be. So in this case, the coefficient of this variable should be negative as well.

$x_{i,t}$ are the explanatory variables I set to test the effects of both domestic and foreign institutional investors, and it includes four variables: D-Inst-$H_{i,t}$, D-Inst-$C_{i,t}$, F-Inst-$H_{i,t}$, and F-Inst-$C_{i,t}$. According to the previous research of institutional investors, I predict the coefficients of all these explanatory variables are negative

Domestic institutional investors shareholdings: D-Inst-$H_{i,t}$, which is calculated by (percentage of shares DIIs hold at the beginning of time t+ percentage of shares DIIs hold at the end of time t)/2.

Changes of domestic institutional investors shareholdings: D-Inst-$C_{i,t}$ which is calculated by the percentage of changes of domestic institutional investors' shareholdings of firm i at time t.

Foreign institutional investors shareholdings: F-Inst-$H_{i,t}$ which is calculated by (percentage of shares FIIs hold at the beginning of time t+ percentage of shares FIIs hold at the end of time t)/2.

Changes of foreign institutional investors shareholdings: F-Inst-$C_{i,t}$ which is calculated by the percentage of changes of foreign institutional investors' shareholdings of firm i at time t.

5. Empirical Results

5.1. **Data**

In this part, I collect a set of different information bundles from several sources. The data consists of three main parts: stock return of 1228 firms that listed in China's Shanghai stock exchange and Shanghai composite index during 2007-2012; firm-specific information, such as leverage, ROA and MV, macro and structure variables GDP and Number of firms in this industry and finally institutional investors' relevant information (holding of particular of firms and the shareholding changing during the same time period of stocks. All data is listed in the following table:

Table 5.1 Sources of the database

Data type	Data description	Source
Ri	Stock return of individual firm from 2007-2012	Datastream
Rm	Stock return of Shanghai Stock Exchange from 2007-2012	Datastream
GDP	Gross Domestic Product	NBSC[3]
Lev	Leverage of the firm: D/E	Wind
ROA	Return on Assets	Wind
MV	Market value of the firm	Datastream
Num	Number of firms in the same industry	Datastream
D_Inst_C	Domestic institutional changes in shareholdings	Wind
D_Inst_H	Domestic institutional shareholdings of stocks	Wind
F_Inst_C	Foreign institutional changes in shareholdings	Wind
F_Inst_H	Foreign institutional shareholdings of stocks	Wind

The stock prices of firms are daily data, and the rest of the data are quarterly. After collecting data from these sources, these data are transformed into the form I need for further analysis.

[3] National Bureau of Statistics of China

5.2. **Stock price synchronicity**

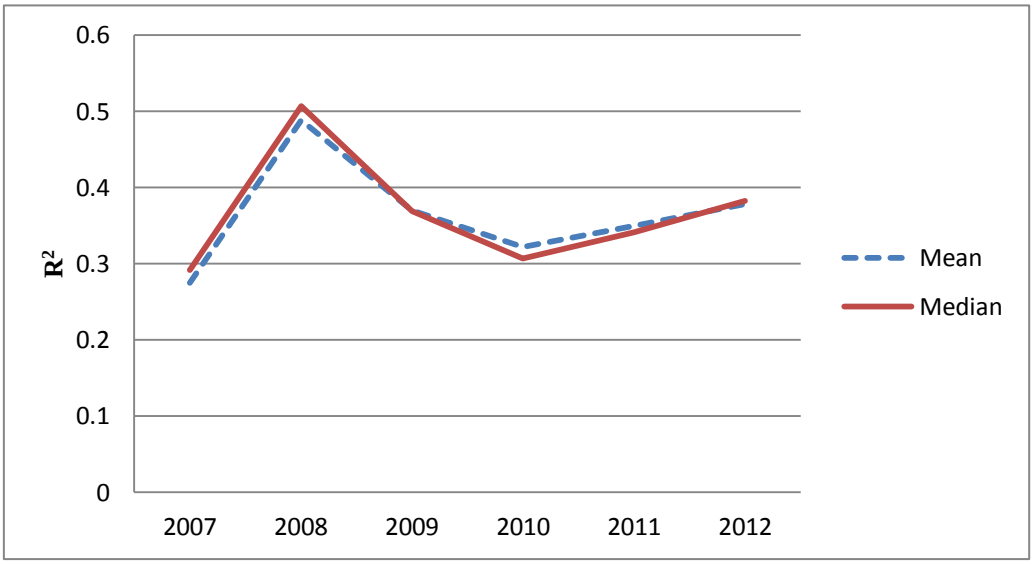
Table 6.2 presents the R-square of all the stocks listed in SSE. The R^2 statistics refer to the coefficient of determination for Equation (1). As shown in this table, I see that, on average, R^2 is approximately 35.96% that explained the markets, and the median is nearly 37.13%. As Morck (2000) studies, in 1994, the R^2 in Chinese equity market is around 45.3%, and Yin (2010) points out with the development of the market, the R^2 decreases to 41.94%. Without any doubt, this trend is positive and which represents the maturity of the Chinese markets.

Table 5.2 R^2 of the firms in the sample period

R^2	Mean	Std.Dev	Minimum	Median	Maximum
2007	0.2745	0.1180	0.0031	0.2912	0.5863
2008	0.4880	0.1400	0.0072	0.5064	0.8056
2009	0.3694	0.1249	0.0013	0.3687	0.7162
2010	0.3215	0.1350	0.0041	0.3062	0.7629
2011	0.3491	0.1311	0.0091	0.3407	0.7124
2012	0.3777	0.1562	0.0110	0.3820	0.7931
2007-2012	0.3596	0.1064	0.0025	0.3713	0.6440

I also separate the stock prices into six years, and make regressions again and record R^2 for each year. The value of R^2 in 2007, which is about 27.45%, shows the lowest stock price synchronicity. While in 2008, the R^2 is the highest among all these years because it rockets to 48.8%. In the coming four years, the stock price synchronicity decreases and remains constant with little fluctuation. As Figure 5.1 illustrates, I can figure out this time-varying-changes clearly.

Figure 5.1 R^2 of SSE in different years

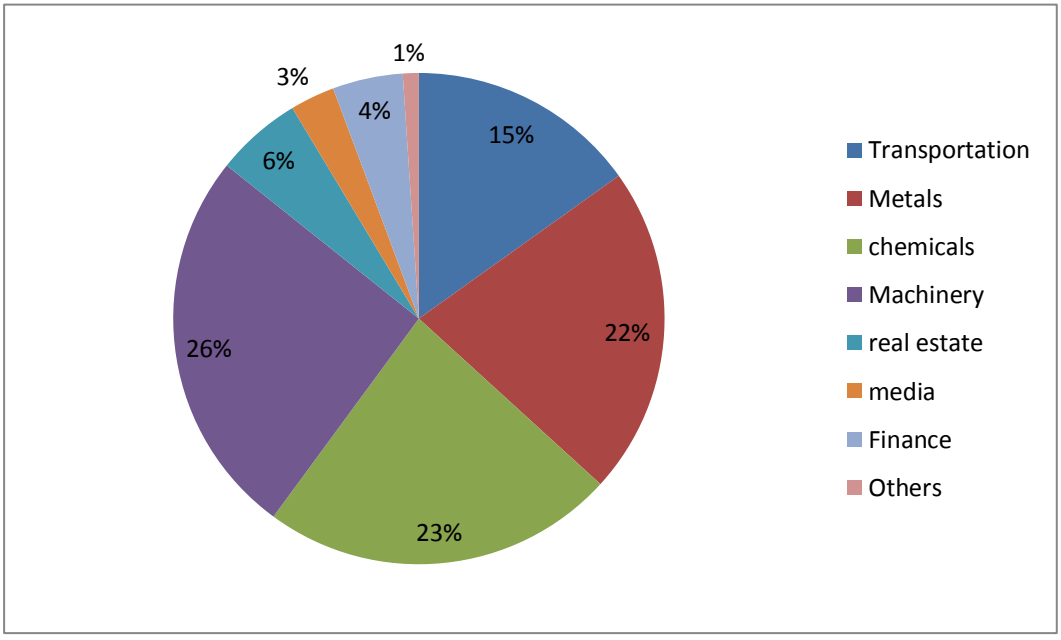


In 2007, the equity market in China shows prosperity, the earnings rate of the whole markets reached up to 50 times, both institutional and individual investors actively involved in trading, so the stock price synchronicity is the lowest. While during the end of 2007, the A-share markets collapsed x because of the sub-prime crisis, many investment institutions bankrupted and individual investors left the equity markets, so the markets were highly affected by those huge companies who survived during this period. And that is the reason why the stock price synchronicity went up in 2008. The rest four years show the aftermath of sub-prime crisis. With the recovery of the economy in the whole world, investors come back into the equity markets again, and this reduced the stock price synchronicity gradually and turned the whole markets into stable with predictable fluctuation.

5.3. **Foreign institutional investors**

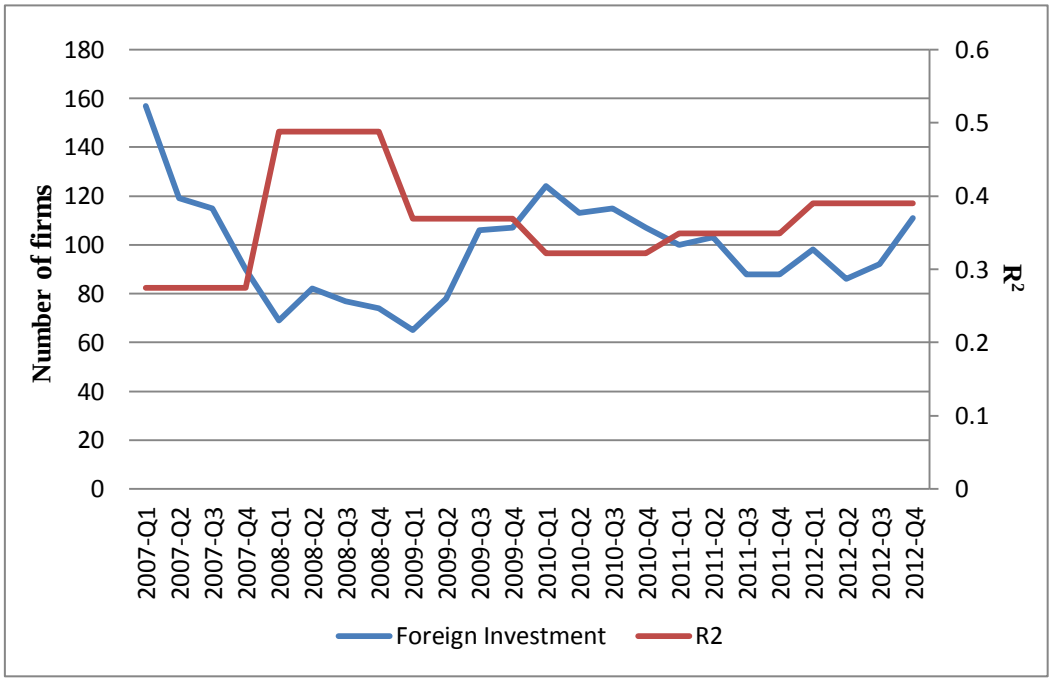
The primary data type of foreign institutional investors is the shareholdings of the stocks in SSE. Based on this information I can rearrange it into different forms. According to the companies foreign institutional investors invested in, I capture favorite companies they invest, and get the industry preference of foreign institutional investors. As Figure 6.2 show, machinery, chemicals, metals and transportation firms represents 26%, 23%, 22% and 15% respectively. And these industries are those foreign institutional investors would love to invest in. This result is perfectly fitted with Liu's research that his analysis indicates that FIIs have preference in transportation, metals, chemicals and machinery. The other fields are real estate, media and financial sectors, but these industries only play little weights in FIIs' investment strategy, because these industries are more volatile and easily replaced. As the proposition that foreign institutional investors would not invest in high risk industries, this phenomenon is reasonable.

Figure 5.2 Foreign institutional investment preferences



Then the time effects on foreign institutional investors are processed. I collect the quarterly data of the firms whose shares are held by foreign institutions, and compare materials with the stock price synchronicity during the same period. The results are as Figure 6.3 shows.

Figure 6.3 Foreign Investment and R^2 of the market



In this figure, the blue line is the number of firms foreign institutional investors invested in each period, the unit lies on the left axis. Meanwhile, the red line is the stock price synchronicity index: R^2. Cause the data of numbers of firms is quarterly but R^2 of the market is yearly data, so the red line in the figure has horizontal lines in each year. Intuitively, because of sub-prime crisis since 2007-2008, foreign institutional investors left China's equity markets. Along with the divestments, the firms that FIIs invested in are reducing as well. Conversely, the R2 goes up significantly. After years, FIIs started to reinvest in China's equity markets, then the number of firms that invested in were rising up, on the opposite, the R2 decreased accordingly. This contradiction happens all the time. This is consistent with our hypotheses that foreign investment has negative correlated with the stock price synchronicity. Next part would find out the correlation between these two indicators statistically.

5.4. **Descriptive statistics**

After rearrange the data, I get all the required type of data of the empirical model, and Table 6.3 reports the descriptive statistics of these data.

Table 5.3 Descriptive statistics of panel model

Variables	Mean	Std.Dev	Minimum	Median	Maximum
Dependent Variables:					
Synch	-0.436	0.930	-5.853	-0.368	1.660
Explanatory Variables:					
D_Inst_H	15.97%	15.96%	0.00%	11.64%	94.86%
D_Inst_C	25.00%	139.98%	-100.00%	-3.03%	2222.46%
F_Inst_H	1.68%	2.41%	0.00%	0.83%	19.96%
F_Inst_C	5.47%	73.44%	-100.00%	-0.01%	953.39%
Control Variables:					
SROA	0.0243	0.0285	0.0005	0.0154	0.2312
LnY	8.7958	0.2417	8.3835	8.8436	9.2844
LnMV	9.3363	1.2168	6.4029	9.1100	14.059
Lev	0.4995	0.1995	0.0501	0.4996	0.9204
LnNUM	4.6135	0.6834	2.8904	4.7449	5.6021
Observations	1055				

I have 1055 observations in our model, and three types of variables: dependent variables, explanatory variables, and control variables. Synch, is the transformation type of R-square. This transformation reduces the drawback of R^2 that is not continuous distributed. The mean and median of synch is -0.436 and -0.368. Secondly, D_Inst_H, D_Inst_C, F_Inst_H and F_Inst_C are explanatory variables. D_Inst_H and F_Inst_H were coming up by Yin (2010). These are shareholdings of domestic and foreign institutional investors. Yin also mentioned changes of shareholdings. The explanation of this variable is not exactly same as Yin's. He putted focus on the changes of stocks of institutional investors over whole changing stocks. I emphasize on the shareholding changes of institutional investors in one time compared to their own shareholdings last time joint point. The third, control variables, SROA, LnY, LnMV, Lev and LnNUM are structural variables that either directly or indirectly affect the firms. GDP, MV and NUM are used as logged form. The log transformation can make the value smaller without changing the characteristics and reduce the probability of heteroskedasticity. The mean and median of SROA are 0.0243 and 0.0154, while the mean and median of Lev are 0.4995 and 0.4996. Smaller the distance between mean and median means a higher fitness as a normal distribution. The mean and median of rest three control variables have larger gap and according to Jarque-Bera test, they are significantly not normal distributed, which will affect the results of the empirical model. Fortunately, large observations can reduce the disadvantage of non-normality problem.

In order to find out the correlation between the variables, I made a correlation matrix of all the variables. As Table 6.4 demonstrates, all four explanatory variables

Table 5.4 Covariance &Correlation Matrix

Covariance Correlation	SYNCH	SROA	LNY	LNMV	D_INST_H	D_INST_C	F_INST_C	F_INST_H	LEV	LNNUM
SYNCH	0.864									
	1.000									
SROA	-0.003	0.001								
	-0.119	1.000								
LNY	-0.006	0.002	0.058							
	-0.028	0.253***	1.000							
LNMV	0.132	0.002	0.013	1.479						
	0.117***	0.062**	0.043	1.000						
D_INST_H	-0.017	0.000	-0.005	0.044	0.026					
	-0.117**	-0.037	-0.117	0.227***	1.000					
D_INST_C	-0.048	-0.002	0.010	-0.002	0.028	1.958				
	-0.037	-0.047	0.031	-0.001	0.123***	1.000				
F_INST_C	-0.013	0.000	-0.006	0.006	-0.010	0.060	0.539			
	-0.019	-0.021	-0.032	0.006	-0.085	0.059	1.000			
F_INST_H	-0.002	-0.002	-0.001	-0.005	0.000	0.001	0.004	0.001		
	-0.074*	-0.116	-0.174	-0.173*	0.044	0.020	0.232***	1.000		
LEV	-0.007	0.001	0.001	0.056	0.004	0.005	-0.001	0.000	0.040	
	-0.038	0.080***	0.020	0.231***	0.130***	0.017	-0.008	-0.048	1.000	
LNNUM	-0.078	0.000	0.000	-0.047	0.011	-0.062	0.009	0.000	0.044	0.467
	-0.123***	0.019	-0.001	-0.056	0.100***	-0.065	0.018	-0.002	0.322***	1.000

, **, * shows the variable is significant at 10%, 5%, and 1% confidence level respectively*

have negative correlation regarding to Synch, and D_INST_H and F_INST_H are significant at 5% and 10% respectively. Moreover, the number of firms in the same industry shows significant negative correlation with Synch at 1% confidence level, this means within the increasing number in the industry, the stock price synchronicity will decrease, and this is an agreement of the theories I talked about in section 2. Though logged form of market value of the firm is significantly and positively correlated with Synth, based on Xing's inversely U-shaped model, more or less firm specific information can reduce the stock price synchronicity.

Moreover, firm specific information will affect the investment strategy of institutional investors. Market value of the firms, leverage and number of firms in the industry are significantly affecting the domestic institutional holdings at 1% confidence level. Considering about foreign institutional investors, non-firm-specific information is significantly correlated. This result is consistent with Frenkel's information dominance system. Foreign investors have high technologies and they are good at analyzing the information they got, but local institutional investors have easy access to local information, so the information plays a more important role in domestic institutional investors' strategy.

Last but not least, some other variables also show strong correlation, such as Lev and SROA, this is intuitive that within the leverage of the firm going up, the risk of financial distress of the firm goes up as well, and then investors would balance whether to invest or divestment and these trading behavior leads to high volatility. Others like Num and Lev, MV and Lev are also related to the theory of corporate finance.

5.5. **Regression results**

Following the research method of Yin (2010), I run the empirical model five times, four as univariate regression and one as multivariate regression. The reason is that I have four explanatory variables, and I want to see how single explanatory variable could explain the model, so I run single regression for explanatory variable once for each, and remain all the control variables constant. And then I run the multivariate model to see if previous variables are still significant enough to explain the stock price synchronicity. Table 6.4 demonstrates the results of all the five models.

In the table, each cell has two numbers inside. The above one is the coefficient of variable, and the below one is the t value. First of all, the data are just running as pool regression. Pool regression shows limited ability to explain the model, So the models in tables 5.5 are all using fixed effects model in cross-section dimension and none remedies in period dimension because of unbalanced data. The choice of model depends on redundant fixed effects model (or likelihood ratio test) and correlated random effects (or Hausman test).

Because of unbalanced database, the model can choose both fixed effects model, random effects either in cross-sectional and period dimension. These tests mentioned above are applied, and the results of tests list in Appendix C.

First, double fixed effects model is tested, according to the results all 5 models reject the null hypotheses in cross-sectional dimension and accept in period dimension, so I use fixed effects in cross-sectional dimension. Theoretically, random effects model has harder restriction and better ability in explanation. If Hausman test is accepted, I should use random effects model. After tests, Hausman tests are all rejected. So the model I used is fixed effects in cross-sectional dimension and no remedies in period dimension.

Table 5.5 Univariate and Multivariate regression results

	Model 1	Model 2	Model 3	Model 4	Model 5
C	3.0745	3.625151	3.1132	3.5494	4.0873
	2.75***	3.25***	2.78***	3.11***	-3.59***
SROA	0.3974	-0.0587	0.4588	0.3091	-0.2585
	0.36	-0.05	0.42	0.28	-0.24
LnY	-0.0330	-0.1056	-0.0490	-0.079637	-0.1431
	-0.29	-0.94	-0.44	-0.70	-1.25
LnMV	-0.3312	-0.3131	-0.3203	-0.3338	-0.3222
	-4.75***	-4.52***	-4.57***	-4.78***	-4.62***
Lev	-0.2646	-0.1120	-0.2748	-0.266881	-0.1054
	-0.72	-0.30	-0.74	-0.72	-0.28
LnNum	-0.1490	-0.1239	-0.1436	-0.1446	-0.1287
	-3.39***	-2.84***	-3.27***	-3.31***	-2.94***
D_Inst_C	-0.0320				-0.0162
	-1.69*				-0.84
D_Inst_H		-0.9523			-0.9290
		-4.13***			-3.90***
F_Inst_C			-0.0197		-0.0159
			-0.56		-0.43
F_Inst_H				-2.5648	-2.6141
				-1.98**	-1.97**
Adj. R^2	19.31%	20.43%	19.10%	19.39%	20.61%

, **, * shows the variable is significant at 10%, 5%, and 1% confidence level respectively*

According to correlation matrix of the variables, D_Inst_C and D_Inst_H have strong inter-correlation, while F_Inst_C and F_Inst_C also correlated highly at 1% confidence interval. So I extract the results and analyze them into two bundles. The model 1 and the model 2 are analyzed as one bundle and the model 3 and the model 4 as another bundle.

The model 1 explains the stock price synchronicity that explained by domestic institutional investors' changes in shareholdings. In this model, the coefficient of this

variable is -0.032, and it is significant at 10% confidence level. This means the shareholding changes of institutional investors have some effects in reducing the stock price synchronicity to some extent. However, domestic institutional investors' shareholdings in model 2 are much more important than the first one. The coefficient is -0.9523, which is larger than -0.032, and it is significant at 1% confidence level.

In model 3, I analyze the effects of foreign institutional investors' changes of shareholdings and the stock price synchronicity. The coefficient of this variable is -0.0197, and it is not significant even at 10% confidence interval, so I can conclude that investors in the market don't really care about foreign institutional investors' trading behaviors. On the contrary, in the model 4, foreign institutional investors' shareholdings is significant at 5% confidence interval, and the absolute value of its coefficient is -2.5648 that ranks the highest above all four explanatory variable

Above all these four models, the absolute value of coefficient of foreign institutional investors' shareholding is the highest, but the variable of domestic institutional investors' shareholding is the most significant one that reduces stock price synchronicity. This information proved Frenkel's assumption. Though foreign institutional investors have high technology and better knowledge in dealing with available information, which can reduce the stock price synchronicity and stable the market, domestic institutional investors have larger effects in reducing the stock price synchronicity in local equity markets. As I have mentioned in previous research, the position of foreign institutional investors is in c and position of domestic institutional investors is in b. Based on Frenkel's dominance theory, b is dominant over c. Thus our empirical results are consistent with theory: Domestic institutional investors play more critical role than foreign institutional investors in reducing local equity market's stock price synchronicity.

Then I run the multivariate regression again within all explanatory variables. When including all these variables, the variable D_Inst_C is no longer significant (t value is -1.69 and -0.84). The variable F_Inst_C remains insignificant. But D_Inst_H and F_Inst_H are still significant at 1% (t value is -4.13) and 5% (t value is -1.97) confidence level. This result illustrates the same fact as I talked about: Domestic and foreign institutional investors' shareholdings are the most significant variables among them. The adjusted R^2 is 20.61% for the multivariate regression, and 19.31%, 20.43%, 19.10% and 19.39% for each model respectively. The model with D_Inst_H is closest to the multivariate regression model, and that with F_Inst_H ranks second. This condition points out the same result as t-statistic value, the higher adjusted R^2, and better explanation of the whole model.

After analysis of correlation matrix and regressions of all models, the hypotheses are all rejected; all four explanatory variables show negative correlation with stock price synchronicity. Among those, domestic and foreign institutional investors' shareholdings are significant at 1% and 5% respectively.

The results showed that the stock price synchronicity would be lower for those companies with relatively high equity holdings by domestic and foreign institutional investors. Those investors also concerns about the trading behavior of domestic institutional investors to some extent, but they are not highly interested in foreign institutional investors' trading activities. According to the coefficient of the variables, all four explanatory variables negatively affect stock price synchronicity, which is consistent with our hypotheses, Moreover, firm-specific information also affects stock price synchronicity, institutional investors collect these data and translate these data into the form they need, and the trading behavior that containing firm-specific information is fit with the institutional investors' investment expectation. As the concept said by Warren Buffett 'Value investment', institutional investors' investment strategy is to create value, which will affect stock price synchronicity accordingly.

The answers of research questions are subsequently clear. The stock price synchronicity in SSE is decreasing gradually, except the year of financial crisis. Some of firm-specific information is significantly affecting stock price synchronicity while others are not. Among all four explanatory variables, shareholdings of DIIs and FIIs are playing critical role in SSE.

5.6. **Robustness check method**

In ideal circumstance, the sample size should be infinite, I can only deal with limited data, and during the choosing period, I transform raw data into the variables losing some of them, this will also affect our results. In the procedure of robustness checks, different methods are used to test the stability and the generality of the model. Some variables in the regression model may not be stable of the stock price synchronicity, so I transfer the variables into other forms, which will not change its characteristics. For instance, I change the variable per capita GDP into variations of per capita GDP to check if the correlation of the variables in the regression remains the same. so the sample size is limited. In ideal circumstance, the sample size should be infinite, I can only deal with limited data, and during the choosing period, I transform raw data into the variables I use in the model that lose some of them. As I add variables to the model, the available degrees of freedom exhausted quickly. For example, SROA is the standard deviation of return on assets at t-1, t and t+1, so for each firm in the sample loses two degrees of freedom at the beginning and the last.

5.6.1. Univariate and multivariate regression

Running regression of explanatory variables separately is one of the robustness check method. Because there are four explanatory variables in the model, so after running the multivariate regression, I run univariate regression four times to check if the model shows the same results. And I find out that most explanatory variables and control variables are at the same significance level. Then our results are not qualitatively affected.

5.6.2. Time period effects

One way to check whether our results are due to transitory time effects is to repeat our regressions by using data of each year. In this paper, the time period is 2007 to 2012, I run regressions for each year, and obtain identical conclusions, the only matter is the changing of the coefficients of the variables.

The major transitory event is at the end of 2007, the great depreciation in China's equity markets and the sub-prime crisis. The depreciation might be the aftermath of the financial crisis. In year 2008, the R-square is relatively higher than the rest of years, and which affects the investment strategy of institutional investors' strategy. Fortunately, the negatively correlated relation between stock price synchronicity and institutional investors remains the same.

5.6.3. Additional variables: small institutions.

Based on literatures, some researchers found that small institutions are also players in equity markets. So I collect data of small institutions as well as domestic & foreign institutional investors. The variables are small institutional investors' shareholdings, and the changes of shareholdings of small institutional investors. After running the multivariate regression within all the variables, I found that these both variables do have negatively relationship but the p-values are not significant enough. That is the reason that I abandon small institutions as target of analysis.

5.6.4. Alternative measurement of variables

As described before, the variables can be transformed into other forms by construction. In the main empirical model, some of variables have already been transformed into logged form, for instance, the GDP, number of firms in this industry, and the market value of firms. After regressions for the original form of the variables, the property of the variables does not change, only the coefficient of those variables become smaller. Thus I got identical results.

6. Conclusion

Plenty of previous studies have studied stock price synchronicity in developed markets and emerging markets. There are two main branches: effects of firm-specific information and effects of institutional investors. Unfortunately, the study of China's equity market is ambiguous. Because of China's specialty, general concepts cannot explain the stock price synchronicity well. This paper brings a fresh perspective in understanding the China's equity market. The first part of this dissertation focuses on the stock price synchronicity of SSE, and the second part states DIIs and QFIIs' effects on the stock price synchronicity in China.

The results of stock price synchronicity are fit with our expectations. The R^2 was increasing during the great depression in 2007 and sub-prime crisis, and it was decreasing afterwards and then remaining stable. The average of R^2 of all years is 35.96%, which is lower than the value 45.3% (Morck, 2000) and 41.94% (Yin, 2010). This trend is optimistic for Chinese investors because the equity market is becoming mature stepwise.

Based on Xing's inversely U-shaped model (2010), firm-specific information do affect stock price synchronicity to some extent. A matching-based strategy is used in order to address this problem, and in consideration of regression results, the market value of the firm and the number of firms in the same industry are significant, while standard deviation of return on assets and leverage of the firms are not. However, leverage and SROA have indirect effects on stock price synchronicity since these two variables are significantly correlated with institutional investors' shareholdings, and institutional investors' shareholdings are highly significant with stock price synchronicity.

The most remarkable characteristic of institutional investors in affecting stock price synchronicity is the shareholding of the stocks of each firm. Empirical results illustrate that domestic institutional investors have impressive negative effects in diminishing stock price synchronicity, followed by foreign institutional investors' shareholdings. This is consistent with Frenkel's (2004) information dominance system between domestic and foreign institutional investors.

Concerning the results, local institutional investors are 'weather vane' of the whole market, because domestic institutions have advantages in investing in China's equity markets. First of all, CSRC publishes some of security policies in protecting local investors, either institutional or individual investors. Foreign institution investors have limitations that they cannot invest in all asset classes in China. Secondly, though foreign institutional investors have high technologies and better knowledge, domestic institutional investors have easy access to local information, and they can react quickly to the sensitivities. Thirdly, domestic institutional investors have larger fund than foreign institutional investors correspondingly. China's equity markets are the

main ‘battlefield’ for local investors, since FIIs cannot and will not invest all their funds in an emerging markets like China, because emerging markets have larger risks than developed markets.

In a view to empirical results, there awesome suggestion for participants in China’s market. For those individual investors who use ‘value-based investment’, will hold the stocks for a long period, and they can follow the investment strategy of institutional investors, especially local institutional investors. For those who prefer speculative trading in the market, should purposely hold the stocks of those firms with huge shareholdings as relatively lower-risky investment, and purchase some of stocks that institutional investors do not invest in. For domestic institutional investors, collecting and interpreting of foreign institutional investors’ investment strategy might help with their expanding. For foreign institutional investors, collecting domestic institutional investors’ shareholdings of firms is one valuable task, because DIIs are efficient in applying local information. For firms, moderate exposure of firm’s information can affect the stock price synchronicity of themselves and relatively higher effects in their industry. With regard to investors’ reaction to the exposed information, firms can evaluate the strategies they make.

The contribution of this paper lies in three aspects. First, the results indicate an optimistic phenomenon that the stock price synchronicity is decreasing in a macroeconomic aspect. Secondly, these results illuminate the role of foreign and domestic institutional investors in one large emerging market, China. Third, many elements of the measurement strategy used in this paper are generally applicable.

Our results raise difficult questions. If FIIs do not possess a superior investment technology, would they be better with the investment strategies such as investing in index funds to DIIs? The intercept in the empirical model is significant at 1%, so I can say there are some new variables that render intercept or explanatory variables into insignificant. These two questions can lead to the new research field, which could be usefully explored and followed in the further research.

References

Aggarwal, R., Klapper, L.&Wysocki. P.(2005). Portfolio preferences of foreign institutional investors., *Journal of Banking and Finance,* 29:12, 2919–2946.

Ajinkya, B., Bhojraj, S.&Sengupta P.(2005). The association between outside directors, institutional investors and the properties of management earnings forecasts. *Journal of accounting Research*, 43:3, 343-376.

Baltagi, B.H. (2001), Econometric Analysis of Panel Data, 2nd Edition, John Wiley and Sons, Ltd.

Balsam, S., Bartov, E. &Marquardt, C.(2002). Accruals management, investor sophistication, and equity valuation: Evidence from 10–Q filings. *Journal of Accounting Research*, 40:4, 987-1012.

Barber, B. M. &Odean, T.(2008). All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *Review of Financial Studies*, 21:2, 785-818.

Barclay, M. J. &Warner, J. B.(1993). Stealth trading and volatility: Which trades move prices?. *Journal of Financial Economics*, 34:3, 281-305.

Bardhan, P. K. (2000), Understanding Underdevelopment: Challenges for Institutional Economics from the Point of View of Poor Countries, *Journal of Institutional and Theoretical Economics*, 156:1, 216–35.

Barrell, R. &Pain, N.(1999). Domestic institutions, agglomerations and foreign direct investment in Europe. *European Economic Review*, 43:4, 925-934.

Bradshaw, M., Bushee, B.&Miller, G., 2004. Accounting choices, home bias, and U.S. investment in non-U.S. firms., *J. Acc. Res,* 42:x, 795–841.

Busse, M. &Hefeker, C.(2007). Political risk, institutions and foreign direct investment. *European journal of political economy*, 23:2, 397-415.

Bussey, J.(2012). U.S. attacks China Inc. *Wall Street Journal*, [Available: April 15th, 2015].

Callen, J. L., HOPE, O. L. E. K. &Segal, D.(2005). Domestic and foreign earnings, stock return variability, and the impact of investor sophistication. *Journal of Accounting Research*, 43:3, 377-412.

Chan, K. & Hameed, A.(2006). Stock price synchronicity and analyst coverage in emerging markets, *Journal of Financial Economics*, 80: X, 115-147.

Chen, Q., Goldstein, I., Jiang, W., 2007. Price informativeness and investment sensitivity to stock price. *Review of Financial Studies* 20, 619–650.

Cohen, R. B., Gompers, P. A. &Vuolteenaho, T.(2002). Who underreacts to cash-flow news? Evidence from trading between individuals and institutions. *Journal of financial Economics*, 66:2, 409-462.

Colak, G., N. Tekatli, 2010. Comovements in corporate waves. Working Paper, Florida State University.

Dahlquist, M.&Robertsson. G.(2001). Direct foreign ownership, institutional investors, and firm characteristics., *Journal of Financial Economics*, 59:3, 413–440.

Égert B, Koˇcenda E (2011) Time-varying synchronization of European stock markets. Econ Econ 40: 393, 407.

Frenkel, M. &Menkhoff. L.(2004). Are foreign institutional investors good for emerging markets? *The World Economy*, 27:8, 1275–93.

Gilmore CG, McManusGM (2003) Bilateral and multilateral cointegration properties between the German and Central European equity markets. Stud Econ Finan 21:1, 40–53.

Greenaway, D., Guariglia, A. & Yu, Z.(2011). The more the better? Foreign ownership and corporate performance in China, *Working paper of Durham-European Journal of Finance Special Issue Conference*, Durham University, Durham, UK.

Griffin, J. M., Harris, J. H. &Topaloglu, S.(2003). The dynamics of institutional and individual trading. *The Journal of Finance*, 58:6, 2285-2320.

Gul, F. A., Kim, J. B. &Qiu, A. A.(2010). Ownership concentration, foreign shareholding, audit quality, and stock price synchronicity: Evidence from China. *Journal of Financial Economics*, 95:3, 425-442.

Hongjun, Zhu.(2007). Does Chinese Security Analyst Increase the Market Efficiency?. *Finance Research.*

Hsin, C. W. & Tseng, P. W.(2012). Stock price synchronicities and speculative trading in emerging markets, *Journal of multinational financial management,* 22: X, 82-109.

Jung, C.G. (1985). *Synchronicity: An Acausal Connecting Principle*. London: Routledge.

Kang, J.& Stulz. R. (1997). Why is there a home bias? An analysis of foreign portfolio equity ownership in Japan. *Journal of Financial Economics*, 46:1, 3–28.

Kim, J. B. & Yi, C. H.(2014). Foreign versus domestic institutional investors in emerging markets: Who contributes more to firm-specific information flow? China

journal of accounting research 8: 1, 1-23.

Lakonishok, J., Shleifer, A. &Vishny, R. W.(1992). The impact of institutional trading on stock prices. *Journal of financial economics*, 32:1, 23-43.

Leuz, C., Lins, K.V. & Warnock, F. E.(2009). Do foreigners invest less in poorly governed firms? *Rev. Financ. Stud.*, 3245–3285.

Li, K., Morck, R., Yang, F., Yeung, B. (2004). Firm-specific variation and openness in emerging markets. *The Review of Economics and Statistics* 86:3, 658–669.

Lin, K. J., Karim, K. E. & Carter, C.(2015). Why does China's stock market have highly synchronous stock price movements? An information supply perspective, *Advances in accounting, incorporating advances in international accounting*.

Piotroski, J. D. & Roulstone, D. T (2004). The influence of analysts, institutional investors, and insiders on the incorporation of market, industry, and firm-specific information into stock prices, *The Accounting Review*, 79:4, 1119-1151.

Roll, R., (1988). R^2. *Journal of Finance* 43: X, 541–566.

Saunders, M., Lewis, P. &Thornhill, A. (2009). Research Methods for Business students. (5th ed.) . England: Prentice Hall.

Shu T. (2009). Does positive-feedback trading by institutions contribute to stock return momentum? 2007 *Chicago meetings paper*.

Xing X. & Anderson, R.(2011). Stock price synchronicity and public firm-specific information, *Journal of Financial Markets*, 14: X, 259-276.

Appendix A: Variable definitions

Variable	Definition
Panel A:	
Stock price synchronicity	
R^2	coefficient of determination from the estimation of the estimation of the model in Eq. (1)
Synch	stock price synchronicity measured by $\log[R^2/(1-R^2)]$
Panel B:	
Explanatory Variables:	
D_Inst_C	Changes of domestic institutional investors shareholdings
D_Inst_H	Domestic institutional investors shareholdings
F_Inst_C	Changes of foreign institutional investors shareholdings
F_Inst_H	Foreign institutional investors shareholdings
Control Variables:	
SROA	Standard deviation of return on asset of firm at time t
Lny	Represents logged form of per capita GDP at time t
LnMV	Logged form of market value of the firm.
Lev	Leverage of the firm i at time t. A firm's leverage ratio is total liabilities divided by total assets.
LnNum	The log form of the company numbers in this industry.

Appendix B: Regression Results of Models

Model 1 D_INST_C

Dependent Variable: SYNCH
Method: Panel Least Squares
Sample (adjusted): 6/01/2007 9/01/2012
Periods included: 22
Cross-sections included: 48
Total panel (balanced) observations: 1056

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNUM	-0.148969	0.043938	-3.390432	0.0007
SROA	0.397393	1.092412	0.363776	0.7161
LNY	-0.032780	0.111970	-0.292760	0.7698
LNMV	-0.331170	0.069722	-4.749866	0.0000
LEV	-0.264618	0.368864	-0.717385	0.4733
D_INST_C	-0.032025	0.018903	-1.694137	0.0905
C	3.074475	1.116235	2.754326	0.0060

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.232819	Mean dependent var	-0.436341
Adjusted R-squared	0.193045	S.D. dependent var	0.929757
S.E. of regression	0.835207	Akaike info criterion	2.526611
Sum squared resid	699.6632	Schwarz criterion	2.775663
Log likelihood	-1281.051	Hannan-Quinn criter.	2.621018
F-statistic	5.853535	Durbin-Watson stat	2.163496
Prob(F-statistic)	0.000000		

Model 2 D_INST_H

Dependent Variable: SYNCH
Method: Panel Least Squares
Sample (adjusted): 6/01/2007 9/01/2012
Periods included: 22
Cross-sections included: 48
Total panel (balanced) observations: 1056

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNUM	-0.123940	0.043592	-2.843206	0.0046
SROA	-0.058716	1.091439	-0.053797	0.9571

LNY	-0.105579	0.112115	-0.941710	0.3466
LNMV	-0.313093	0.069196	-4.524756	0.0000
LEV	-0.112029	0.368319	-0.304164	0.7611
D_INST_H	-0.952343	0.230206	-4.136923	0.0000
C	3.625151	1.115845	3.248793	0.0012

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.243531	Mean dependent var	-0.436341
Adjusted R-squared	0.204313	S.D. dependent var	0.929757
S.E. of regression	0.829355	Akaike info criterion	2.512550
Sum squared resid	689.8936	Schwarz criterion	2.761602
Log likelihood	-1273.626	Hannan-Quinn criter.	2.606956
F-statistic	6.209568	Durbin-Watson stat	2.161651
Prob(F-statistic)	0.000000		

Model 3 F_INST_C

Dependent Variable: SYNCH
Method: Panel Least Squares
Sample (adjusted): 6/01/2007 9/01/2012
Periods included: 22
Cross-sections included: 48
Total panel (unbalanced) observations: 1055

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNUM	-0.143560	0.043872	-3.272264	0.0011
SROA	0.458831	1.093215	0.419708	0.6748
LNY	-0.049024	0.112198	-0.436940	0.6622
LNMV	-0.320298	0.069998	-4.575829	0.0000
LEV	-0.274777	0.369339	-0.743968	0.4571
F_INST_C	-0.019729	0.035506	-0.555660	0.5786
C	3.113167	1.118375	2.783653	0.0055

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.230956	Mean dependent var	-0.435597
Adjusted R-squared	0.191046	S.D. dependent var	0.929883
S.E. of regression	0.836355	Akaike info criterion	2.529403
Sum squared resid	700.8879	Schwarz criterion	2.778643
Log likelihood	-1281.260	Hannan-Quinn criter.	2.623885

F-statistic	5.786853	Durbin-Watson stat	2.166189
Prob(F-statistic)	0.000000		

Model 4 F_INST_H

Dependent Variable: SYNCH
Method: Panel Least Squares
Sample (adjusted): 6/01/2007 9/01/2012
Periods included: 22
Cross-sections included: 48
Total panel (balanced) observations: 1056

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNUM	-0.144638	0.043758	-3.305373	0.0010
SROA	0.309139	1.094030	0.282569	0.7776
LNY	-0.079637	0.113383	-0.702373	0.4826
LNMV	-0.333777	0.069731	-4.786642	0.0000
LEV	-0.266881	0.368648	-0.723946	0.4693
F_INST_H	-2.564759	1.293696	-1.982506	0.0477
C	3.549421	1.139245	3.115590	0.0019

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.233627	Mean dependent var	-0.436341
Adjusted R-squared	0.193895	S.D. dependent var	0.929757
S.E. of regression	0.834767	Akaike info criterion	2.525558
Sum squared resid	698.9265	Schwarz criterion	2.774610
Log likelihood	-1280.495	Hannan-Quinn criter.	2.619964
F-statistic	5.880035	Durbin-Watson stat	2.163431
Prob(F-statistic)	0.000000		

Model 5 All explanatory variables

Dependent Variable: SYNCH
Method: Panel Least Squares
Date: 05/26/15 Time: 18:25
Sample (adjusted): 6/01/2007 9/01/2012
Periods included: 22
Cross-sections included: 48
Total panel (unbalanced) observations: 1055

Variable	Coefficient	Std. Error	t-Statistic	Prob.

LNNUM	-0.128729	0.043769	-2.941082	0.0033
SROA	-0.258533	1.093944	-0.236331	0.8132
LNY	-0.143124	0.114095	-1.254430	0.2100
LNMV	-0.322164	0.069659	-4.624889	0.0000
LEV	-0.105391	0.368054	-0.286347	0.7747
F_INST_H	-2.614086	1.328862	-1.967162	0.0494
F_INST_C	-0.015901	0.036738	-0.432822	0.6652
D_INST_H	-0.929043	0.238122	-3.901538	0.0001
D_INST_C	-0.016164	0.019327	-0.836369	0.4031
C	4.087307	1.139573	3.586700	0.0004

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.247526	Mean dependent var	-0.435597
Adjusted R-squared	0.206098	S.D. dependent var	0.929883
S.E. of regression	0.828537	Akaike info criterion	2.513309
Sum squared resid	685.7867	Schwarz criterion	2.776657
Log likelihood	-1269.770	Hannan-Quinn criter.	2.613139
F-statistic	5.974908	Durbin-Watson stat	2.163866
Prob(F-statistic)	0.000000		

Model 6 Add additional variables

Dependent Variable: SYNCH
Method: Panel Least Squares
Date: 05/26/15 Time: 18:29
Sample (adjusted): 6/01/2007 9/01/2012
Periods included: 22
Cross-sections included: 48
Total panel (unbalanced) observations: 1054

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNNUM	-0.129608	0.044909	-2.886012	0.0040
SROA	-0.258331	1.093375	-0.236270	0.8133
LNY	-0.021883	0.134074	-0.163218	0.8704
LNMV	-0.329198	0.069967	-4.705027	0.0000
LEV	-0.124880	0.368473	-0.338912	0.7347
F_INST_H	-3.142191	1.358135	-2.313607	0.0209
F_INST_C	-0.017517	0.036746	-0.476716	0.6337
D_INST_H	-1.164596	0.268678	-4.334538	0.0000
D_INST_C	-0.016175	0.019338	-0.836469	0.4031
S_C	-0.005455	0.006491	-0.840356	0.4009

S_H	-0.389935	0.215038	-1.813329	0.0701
C	3.253496	1.235998	2.632283	0.0086

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.250875	Mean dependent var	-0.435312
Adjusted R-squared	0.208003	S.D. dependent var	0.930278
S.E. of regression	0.827894	Akaike info criterion	2.513593
Sum squared resid	682.6668	Schwarz criterion	2.786554
Log likelihood	-1266.664	Hannan-Quinn criter.	2.617072
F-statistic	5.851762	Durbin-Watson stat	2.164450
Prob(F-statistic)	0.000000		

Appendix C: Fixed Effects and Random Effects Model Test

Model 1 D_INST_C

Redundant Fixed Effects Tests
Equation: ALL
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.499632	(47,982)	0.0000
Cross-section Chi-square	246.749767	47	0.0000
Period F	1.179359	(21,982)	0.2606
Period Chi-square	26.302561	21	0.1951

Correlated Random Effects - Hausman Test
Equation: ALL
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	5	0.0000

Model 2 D_INST_H

Redundant Fixed Effects Tests
Equation: ALL
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.271363	(47,982)	0.0000
Cross-section Chi-square	237.576940	47	0.0000
Period F	0.995795	(21,982)	0.4656
Period Chi-square	22.251431	21	0.3851

Correlated Random Effects - Hausman Test
Equation: ALL
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	5	0.0000

Model 3 F_INST_C

Redundant Fixed Effects Tests
Equation: ALL
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.476526	(47,981)	0.0000
Cross-section Chi-square	245.815402	47	0.0000
Period F	1.296341	(21,981)	0.1672
Period Chi-square	28.877843	21	0.1170

Correlated Random Effects - Hausman Test
Equation: ALL
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	48.985888	5	0.0000

Model 4 F_INST_H

Redundant Fixed Effects Tests
Equation: ALL
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.471866	(47,982)	0.0000
Cross-section Chi-square	245.638256	47	0.0000
Period F	1.296174	(21,982)	0.1673
Period Chi-square	28.872490	21	0.1171

Correlated Random Effects - Hausman Test
Equation: ALL
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	5	0.0000

Model 5 All explanatory variables

Combine Variables
Redundant Fixed Effects Tests

Equation: Untitled

Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.263356	(47,978)	0.0000
Cross-section Chi-square	237.896982	47	0.0000
Period F	1.019026	(21,978)	0.4363
Period Chi-square	22.835451	21	0.3528

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	51.724224	8	0.0000

Model 6 Add additional variables

Redundant Fixed Effects Tests

Equation: Untitled

Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.320310	(47,975)	0.0000
Cross-section Chi-square	240.631583	47	0.0000
Period F	1.040861	(21,975)	0.4096
Period Chi-square	23.368184	21	0.3247

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	57.297895	10	0.0000