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MASTER THESIS

The globalisation of the Chinese financial sector

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DECLARATION OF AUTHORSHIP

Hereby I declare that I compiled this master thesis independently, using only the listed literature and resources, and the thesis has not been used to obtain a different or the same degree.

Prague, January 1, 2015

Signature

Abstract

In this thesis we have studied China's financial sector globalisation by analysing the determinants of Chinese banking sector profitability, and the relationship between GDP growth and FDI inflows. For estimating the Chinese banking sector profitability, we applied system GMM estimation on the annual data of 56 banks currently in China. The time period of the data is from 2002-2011. We found out that both internal and external factors have impact on the Chinese banking sector profitability. As we have expected financial sector globalisation has positive impact on the profitability of banking industry. For analysing the impacts of financial sector globalisation in terms of FDI contribution to the Chinese economy, we have tested the relationship between FDI and GDP by running the VAR model on the macro data over the time period of 1987-2011. We have found that GDP growth explains the rapid development of FDI, and FDI indirectly influences the GDP growth by influencing the domestic investments.

JEL Classification: G11 G15 G21 G23

Keywords: financial sector globalisation, banking sector profitability, FDI, GMM, VAR

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Contents

Master Thesis Proposal	7
1 Introduction	10
2 Chinese financial sector	12
2.1 Banking sector	12
2.1.1 Regulation framework & banking sector structure	12
2.1.2 Banking sector development process.....	15
2.2 Foreign Direct Investment in China	19
2.2.1 FDI development process	19
2.2.2 FDI distributions in China	21
3 Literature Review	23
3.1 Financial sector globalization and banking sector profitability.....	23
3.2 Casualty between FDI and GDP	28
4 Methodology	32
4.1 Hypothesis#1: Globalization of Chinese financial sector has positive impact on the profitability of Chinese banking industry.....	32
4.1.1 Data.....	32
4.1.2 Variables	32
4.1.3 Model	35
4.1.4 Empirical findings	40
4.2 Hypothesis#2 most developed provinces in China have obtained more benefits from China's financial sector globalization than less developed ones.....	41
4.2.1 Data.....	41
4.2.2 Variables	41
4.2.3 Methodology.....	42
4.2.4 Empirical findings	46
4.3 Hypothesis#3 FDI has positive impact on China's GDP growth rate	48

4.3.1	Data.....	48
4.3.2	Variables	48
4.3.3	Model	49
4.3.4	Empirical findings	57
4.4	Summary of results	59
4.5	Further research opportunities	59
5	Conclusion.....	61
	References	63
	Appendix.....	68

LIST OF FIGURES

Graph 2-1: FDI new inflows to GDP (1978-2012).....	21
Graph 4-1: Average ROAA over provinces of China.....	43
Graph 4-2: ROAA comparison between developed provinces and less developed ones	45

LIST OF TABLES

Table2-1: Assets of banking institutions over total assets of banking sector.....	14
Table2-2: Foreign banks in China (2004-2011).....	17
Table2-3: Major events in “bring in and going out”	18
Table4-1: Variables sign assumptions.....	34
Table4-2: Summary statistics of used variables	38
Table4-3: One-step robust system GMM estimation.....	39
Table4-4: Variables sign assumptions.....	42
Table4-5: One-step GMM Estimation.....	44
Table4-6: Variables sign assumptions.....	49
Table4-7: ADF test for unit root.....	53
Table4-8: Johansen test for Cointegration.....	54
Table4-9: VAR model result.....	55
Table4-10:Granger test result	56
Table4-11: Overview of key empirical studies dealing with FDI and GDP.....	56

APPENDIX

A-1: Lag selection for Johansen cointegration test	68
A-2: Eigen value stability condition.....	68

ACRONYMS

ADF	Augmented dickey fuller Test
AIC	Akaike information criterion
CBRC	China banking regulation commission
DEA	Data envelopment analysis
ES	Efficient structure
FDI	Foreign direct investments
GMM	Generalized method of moments
GDP	Gross domestic product
GDI	Gross domestic investment
GRP	Annual rate of production of each province
ICBC	Industrial and Commercial Bank of China
LSDV	Least square dummy variables
LR	Likelihood ratio
MOFCOM	Ministry of Commerce People's Republic of China
OLS	Ordinary least squares
PBC	People's bank of China
ROAA	Return on average assets
SFA	Stochastic frontier approach
SCP	Structure-conduct-performance
VAR	Vector autoregression
VECM	Vector error correction model
WTO	World trade organization

Master Thesis Proposal

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Proposed Topic:

The globalisation of Chinese financial sector

Topic Characteristics:

The globalisation of Chinese financial sector has drew the world's attention since Chinese financial sector has become more and more important to the world economy, and the establishment of CIC(China Investment Corporation) gives the Chinese financial sector more active role to play on the financial global stage.

In my thesis I will introduce the process of globalisation of Chinese financial sector and its consequences. Globalization of Chinese financial sector is mainly measured by the sum of gross external assets and liabilities relative to GDP (Lane and Milesi-Ferretti, 2006). I will analysis the consequences of globalization by mainly analysis sovereign wealth fund and Banking sector development. Sovereign wealth fund played as an important vehicle by Chinese government for the globalization of financial sector, in this thesis its performance and role in the process of the globalization will be discussed. Furthermore, I will test if there is positive effect of financial sector globalization on growth of return on the investment of sovereign wealth fund, and also discuss if there is some room for improvement of investment strategy. This thesis will also include the discussion about potential risk of loss in investment. For impacts on banking sector I will test the correlation between the banking sector profitability and globalization to see if the globalization has positive impact on the banking sector profitability, and suggestions will be made for the future banking sector development.

The expected contributions of this thesis are as follows. First, it will provide summarized findings of the literatures over the similar topic. Second, it will provide with a comprehensive analysis of the overall effects of financial sector globalization by combine its impacts on the sovereign wealth fund and banking sector, which are considered as main stage that globalization performs. Third, the model for testing Chinese banking sector profitability (F safian, MS Habibullah, 2009) will be extended by adding financial globalization as one explanatory variable, by this extended model the main drivers of Chinese banking sector will be able to test comprehensively. This thesis will also include some suggestions for Chinese financial sector globalization based on the empirical results. Furthermore, new contribution will be made to the testing of the correlation between FDI and GDP in China.

Hypotheses:

- 1.The globalization of Chinese financial sector increases the rate of return on the investment of sovereign wealth fund
2. Globalization of Chinese financial sector and profitability of banking sector have positive correlation

3. FDI has positive impact on GDP growth in China

Methodology

For testing the impact of globalization of Chinese financial sector on the rate of return of the investment of sovereign wealth fund the simple linear regression model will be used. Four years data for the rate of return of the investment of the sovereign wealth fund is available in the annual report of the CIC (China Investment Corporation). Financial sector globalization is explanatory variable, and rate of return as a constant variable. I will employ linear regression for testing the correlation between financial sector globalization and profitability of banking sector, I will extend the model (F safian, MS Habibullah,2009) by adding the financial globalizaion as an explanatory variable, in this fixed effects regression model the dependent variable which is profitability of banking sector will be measured as ROA, the data can be obtained from Bankscope and IMF, and the annual reports of related banks. Vector Autoregression(VAR) model will be used for testing the correlation between FDI and GDP. The data is available at Chinese statistic year book, IMF, and World Bank.VAR is able to reflect the unknown relationships among the parameters, so it will give us more accurate testing result of the relationship between the FDI and GDP.

Outline:

Abstract

1, Introduction

2, Literature review

3, Empirical analysis

4, Conclusion

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Appendix

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1 Introduction

China has been experiencing a rapid economic growth in the last decades, its financial sector has also developed considerably. In this thesis we will study Chinese financial sector globalization by analysing the determinants of Chinese banking sector profitability, and correlation between foreign direct investment (FDI) inflows and economic growth of China.

We will investigate the contribution financial sector globalization has made to Chinese economy through analyzing the impact of financial sector globalization has on the Chinese banking sector profitability. Generalized method of moments (GMM) method will be used for this estimation. Furthermore, considering each province in China has different economy level, we want to see if impact the financial sector globalization has on the banking sector is also for those less developed provinces. From this we want to see if having a well-developed economy situation is pre condition for obtaining the benefits from the financial sector globalization.

Kose et al (2006) found that FDI is one of the most important channels through which financial globalization benefit the economy. Along with globalization of Chinese financial sector, the restrictions on the FDI inflows have been decreased remarkably, hence FDI has developed incredibly well in Chinese market since then and making China the biggest FDI recipient in the world. By applying the vector autocorrelation model, the relationship between GDP (gross domestic product) growth and FDI inflows will be analysed, we want to see if FDI development has a positive impact on economic growth of China.

In this thesis, we will mainly investigate the following three hypotheses using the methodologies mentioned above.

- Hypothesis#1 Globalization of Chinese financial sector has positive impact on the profitability of Chinese banking industry
- Hypothesis#2 Most developed provinces in China have obtained more benefits from the China's financial sector globalization than the less developed ones
- Hypothesis#3 FDI has positive impact on China's GDP growth rate

The rest of the chapters will be organized as follows: In the second chapter we will introduce the process of banking sector development. Second part of the chapter two is the introduction of FDI inflows in China. Third chapter is literature review. In this chapter the previous literature over the similar topics will be summarized based on the results they have obtained. The fourth chapter is methodology. In this chapter the methodologies that will be used for analysing each hypothesis will be included. We will first introduce the theoretical background of each methodology and then start with our testing process. In the end it is the interpretation of the results obtained by each methodology. The last chapter is conclusion. We will include empirical results of each hypothesis in the last chapter. Furthermore, some advices will be given for the purpose of improving the current policies of Chinese financial sector globalization.

2 Chinese financial sector

China's financial sector can be divided into two main categories, which are banking sector and non-bank sector. Chinese banking sector is the main body of the financial sector since it is the main funding source for the economic development. However, over the decades of rapid development, the non-bank sector has also become more and more important to the Chinese economy. The non-bank sector includes insurance companies, pension funds, fund management companies, securities firms, futures companies, qualified foreign institutional investors, banking asset management companies, and other non-bank financial institutions (Hilbers, 2001). The major four among all the non-bank institutions are fund management companies, insurance companies, securities firms, and qualified foreign institution.

2.1 Banking sector

Chinese banking sector is the main funding source for the Chinese enterprises. Hence for testing the consequences of the globalization of the financial sector, we will start with analysing its impact on the banking sector. We want to see if the globalization has made a positive contribution to the Chinese economy by increasing the profitability of Chinese banking sector.

2.1.1 Regulation framework & banking sector structure

Before 1979 Chinese banking sector was dominated by the people's bank of China (PBC). PBC was not only responsible for providing banking services but also worked as a regulatory institution. This central banking system was called mono-bank system.

In this system all the banks were centralized and government owned. Since early 1980s, during the first period of banking sector reform (1979 to 1993), Chinese banking industry transformed to the new banking system. PBC was separated from the rest of the banks and no longer holds normal banking functions. Those banking services transferred to other big state-owned banks (Bank of China, Industrial and Commercial Bank of China, China Construction Bank, and the Agricultural Bank of China).

During the second reform (1994 to 2004), the main attention was on the regulations of banking sector. It is considered as a crucial step for further banking sector reform, since then most of PBC' regulatory functions have been taken by the China banking regulatory commission (CBRC). PBC only remained the functions of central bank of China and focuses on the monetary policy and other few regulation functions since then.

Thus there are two main regulation institutions exist in the Chinese banking system now. They are China banking regulatory commission (CBRC) and people's bank of China (PBC). The main functions of CBRC in terms of supervisory and regulatory are: 1) Promote the financial stability and financial innovation; 2) Increase Chinese banking sector's international competitiveness; 3) Set supervisory and regulatory boundaries in a proper amount and avoid unnecessary controls; 4) Encourage competition fairness and orderliness; 5) make sure accountability of both the supervisor and the supervised institutions are clearly defined; 6) efficiently and cost-effectively employ the supervisory resources. The main goal of PBC related to the banking sector regulations are mitigating and preventing the systemic financial risks for the purpose of financial stability, furthermore regulating financial markets

(including the inter-bank lending market and bond market, as well as gold and foreign exchange market).

Along with the transformation of regulatory framework of banking sector, the structures of banking institutions have been also diversified. By 2012 Chinese banking system had four major types of banking institutions, which are large commercial banks, joint-stock commercial banks and small- and medium-sized rural financial institutions plus postal savings bank. Large commercial banks accounted for 46.1 percentages of total assets of banking sector in 2012 response for almost half of the market. Joint-stock commercial banks took 18.0 percentages, which is second largest in banking institutions.

The assets of each institution type over total banking assets have increased in last 10 years (table 2-1). However, large commercial banks are still the main drivers of Chinese banking industry, and account for almost half of the total banking assets.

Table 2-1: Assets of banking institutions over total assets of banking sector

institutions /year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
policy banks and CDB	7.9%	7.9%	8.0%	8.1%	8.2%	9.1%	8.9%	8.2%	8.4%	8.6%
large commercial banks	60.0%	58.5%	57.6%	56.5%	54.7%	52.6%	52.3%	50.3%	48.5%	46.1%
joint-stock commercial banks	11.1%	11.9%	12.2%	12.7%	14.0%	14.3%	15.2%	16.0%	16.6%	18.0%
city commercial banks	5.5%	5.6%	5.6%	6.0%	6.4%	6.7%	7.3%	8.4%	9.0%	9.5%
rural commercial banks	0.1%	0.2%	0.8%	1.2%	1.2%	1.5%	2.4%	3.0%	3.8%	4.8%
rural cooperative banks	/	/	0.8%	1.1%	1.2%	1.6%	1.6%	1.6%	1.3%	1.0%
urban credit cooperatives	0.5%	0.6%	0.6%	0.4%	0.3%	0.1%	0.0%	0.0%	0.0%	—
rural credit cooperatives	9.9%	10.0%	8.6%	8.0%	8.3%	8.4%	7.0%	6.9%	6.5%	6.1%
foreign banks	1.6%	1.9%	2.0%	2.2%	2.4%	2.2%	1.7%	1.9%	1.9%	1.8%
new-type rural financial institutions and postal savings banks	3.4%	3.5%	3.8%	3.8%	3.4%	3.6%	3.5%	3.8%	3.9%	4.1%

Sources: Calculated by the author based on the data obtained from the CBRC Annual Report 2012

2.1.2 Banking sector development process

China allowed first foreign bank entered Chinese market even before China joined the World Trade Organization (WTO). However, due to the existence of the geographical restrictions, as well as the limited services foreign banks were allowed to provide, the Chinese banking sector still was considered as in a relatively closed stage at that time.

In 1997, the door of Chinese banking sector slightly opened to the foreign banks. Foreign banks were allowed to provide RMB loans to foreign-funded business in the big cities like Shenzhen and Shanghai. However, foreign banks' functions still were limited on the lending side.

In 2001, China joined WTO. According to the WTO accession agreement, China agreed to gradually open its financial market to the foreign investors in the following years. Since then the new chapter of the Chinese banking industry has begun. Along with the opening up, more and more foreign banks entered into the Chinese banking sector.

In 2002 the 'Rule of the Administration on Equity Investment by Foreign Financial Institutions' was announced by PBC, which makes it possible for foreign financial institutions to buy shares from Chinese banks. It is considered as an important transformation period for the Chinese banking sector since it is a start of the joint banking structure between Chinese banks and foreign institutions.

From the end of 2006, a further development on banking sector was made by allowing the foreign banks offer all banking services in local currency (RMB) not only to all provinces but also to Chinese households (García-Herrero et al, 2006). With this deepen opening up, the competition between Chinese domestic banks and foreign banks had increased significantly.

In 2008, the main agenda was banking strategy reform, especially reforms of those major commercial banks and rural credit cooperatives. Besides these two types of banking sectors, the other banking institutions were also under the strengthening supervision process. In the end of the 2008, the total numbers of 196 foreign banks have set up 237 representative offices in China. The numbers of fully foreign-funded banks in China have increased to 28. Furthermore, 2 joint-venture banks, and 2 fully foreign-funded finance companies were established in the same year. 58 foreign bank branches, and 27 locally incorporated foreign banks (in 2012 the number increased to 37) were licensed to engage in Chinese currency business. 51 foreign banks were granted permission to do derivatives trading (CBRC, 2008). Even though 2008 was a difficult year for financial sector globally because of the financial crisis, but in the case of foreign banks in China, 2008 was still a year of a great success.

In the end of 2009, 1.71 percentage of total banking assets in China came from foreign banks. Foreign banks' liabilities increased to RMB 1.182 trillion, which is 1.59 percentage of the total banking sector liabilities. Compare with the significant results achieved by the foreign banks in China, 2009 was also a successful year for Chinese banks. By the end of 2009, 5 large Chinese commercial banks have set up 86 branches and subsidiaries overseas. Acquired or invested in 5 foreign banks (CBRC, 2009).

In 2010, those five major commercial banks have completed their public listing (CBRC, 2010). This important step not only opened a wider world to these commercial banks but also accelerated the speed of Chinese financial sector development. Because of this important step Chinese banks had made a well preparation for the further development. At the end of the 2010, the top five Chinese banks' total overseas assets have already reached RMB 3.53 trillion, and average

annual growth above 20% (Chen, 2011). End of 2011, 25 locally incorporated foreign banks (number reached 30 in 2012) and 25 foreign bank branches were authorized to engage in derivatives transactions in China, and 5 (number increased to 6 by 2012) locally incorporated foreign banks were authorized to issue RMB financial bonds (CBRC, 2011).

Industrial and Commercial Bank of China (ICBC) and other Chinese banks have also developed rapidly by accelerating its progress in going abroad. Five commercial banks have set up 105 banking institutions overseas. And also acquired or invested in ten foreign banking institutions. Furthermore, eight small-and medium-sized commercial banks have set up 14 overseas institutions (CBRC, 2011).

Table 2-2: Foreign banks in China (2004-2012)

Unit: RMB 100 million, percent

Item/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Assets	5,823	7,155	9,279	12,525	13,448	13,492	17,423	21,535	23.804
As of the total banking assets	1.84	1.91	2.11	2.38	2.16	1.71	1.85	1.93	1.82

Sources: CBRC annual reports

By the end of 2012, 3 locally incorporated foreign banks were approved to issue credit cards. In the same year, foreign banks accounted for 1.82 percentages of total banking assets in China (CBRC, 2012). Overall since 2004 the percentage of total assets of foreign banks over total banking assets in China has constantly increased over time. However, a drop appeared between 2007 and 2009, which probably was caused by the financial crisis. But since 2009 along with the recovering of economy situation the

percentage reached another constant growing path (Table 2-2). From the summarization (table 2-3) below we can see the main steps in the development process.

Table 2-3: Major events in development of Chinese banking system

Time	Bring in (Foreign banks' major progress)	Going abroad (Chinese banks' major progress)
1997	Allowed to provide RMB loans (Foreign companies and foreign individuals	
1998		The bank of China had 552 branches oversea
1999	Allowed to set up branches in all central cities in China	
2001	Allowed to operating experimental Chinese currency businesses.	
2002	Allowed to buy share from Chinese banks, Foreign companies and foreign individuals	
2006	Allowed to offer all bank services in local currency, no geographical restrictions, Chinese individuals (all restrictions lifted)	
2008	Allowed to engage in Chinese currency business	
2009		Major Chinese commercial banks have set up 86 branches and subsidiaries oversea
2010		5 major Chinese commercial banks completed the public listing
2011	Authorized to engage in derivatives transactions, and issue RMB financial bonds	
2012	Approved to issue credit cards	

Sources: information mainly gathered from CBRC reports

2.2 Foreign Direct Investment in China

As further deepening of the financial sector globalization, the restrictions on the FDI has been gradually lifted, which mains more alternative funding sources are available for the enterprises and other borrowers in China. Because funding sources and technology are crucial to the economic growth, so FDI is believed to have a positive impact on Chinese economy. Fung et al (2002) pointed out that FDI can lead to indirect productivity gains through spillovers. However, some argue that China's high GDP growth rate is the reason for FDI development over those years not the other way around, so according to this argument it is hard to say that FDI has made positive contribution to the China's economy. Hence by examining the relation between FDI and GDP, we will be able to see if FDI has positive impact on Chinese economy, which means if financial sector globalization is beneficial to the China economy.

2.2.1 FDI development process

China started its economic reforms in 1978. Along with China's opening up of its economy, some barriers on the FDI had gradually removed. Since then, FDI has increased constantly. In the beginning of China's economic reforms, the amounts of FDI inflows were not that high. But in the mid-1980s, FDI growth significantly increased.

In 1985, development triangles¹ were established for encouraging the foreign investments (Chen et al., 1995). After the development triangles' establishment, in 1986, new regulations and provisions on FDI were established for encouraging FDI inflows in the process of economic development. FDI was distributed to the export-

¹ *Yangtze River delta, Pearl River delta in Guangdong, and Min Nan region in Fujian*

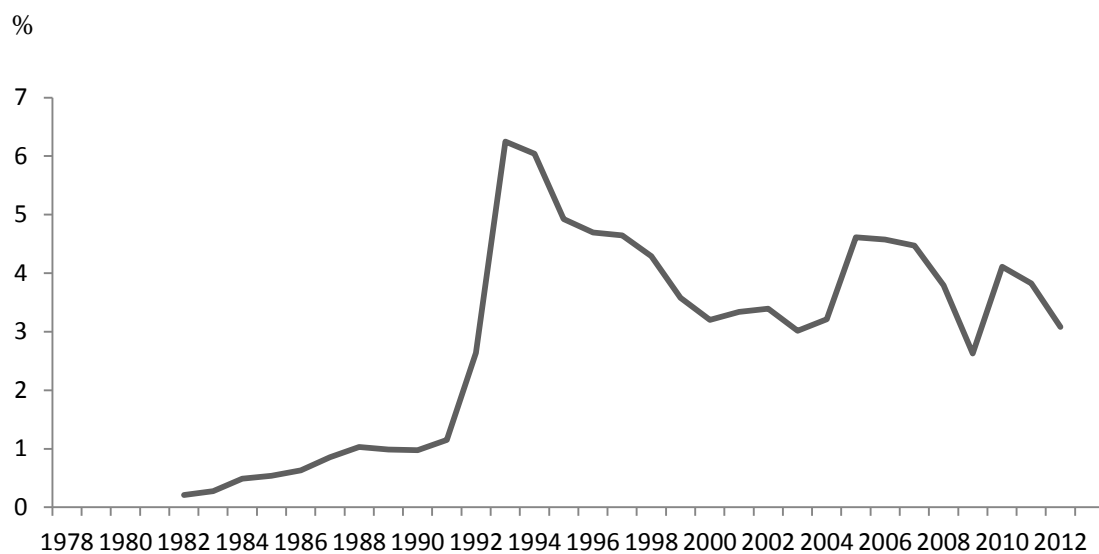
oriented joint ventures, especially for those with advanced technologies (Fung et al, 2002). From the time period of 1980 to 1995, the growth rate of FDI in China reached 40% (Zhao and Du, 2007).

The “Provisional Guidelines for Foreign Investment Projects” took effect in 1995. It allowed FDI deepen (with less restrictions) into the energy, agriculture, banking, insurance, telecommunications, transportation, high-technology industries, and basic raw materials. Furthermore, foreign investors were allowed to take advantage of the rich natural resources. In the period of 1999 to 2000, FDI showed a significant decrease from its highest level but the total amount was still high with more than US\$ 40 billion a year (Fung et al, 2002).

By 2012 China has already become the largest FDI recipient in the world. In June 2013, the number of newly approved foreign-invested enterprises reached to 2,021, and the utilized foreign investment reached USD 14.389 billion (MOFCOM, 2013).

Overall, since 1980s the total foreign direct investment over GDP has increased dramatically and reached a peak in 1993. The overall growth trend is constant around 5 percentages since 1994 (Graph 2-1).

Graph2-1: FDI new inflows to GDP (1978-2012)



Source: The world bank

2.2.2 FDI distributions in China

In the beginning of the FDI development In China, FDI were distributed mainly to the coastal cities, especially the original four special economy zones² where the economy situation were better than the other cities. It is believed that FDI were mainly attracted by the cities with good economic conditions. During the time period of 1983-2000, around 88 percentages of FDI are received by the coastal regions (Fung et al, 2002). Hence for making the balance of the FDI's regional distribution for the purpose of equal development of the economy, actions were needed for drawing the FDI to the places with most needs.

In the early stage of FDI development, FDI had five major types, which are cooperative enterprises, equity joint venture, offshore oil exploration, and wholly foreign-owned enterprise (Broadman and Sun, 1997). In the beginning, FDI were only targeted to the less value-added services, and did not open to the high technology

² Shengzhen, Xiamen, Shantou, Zhuhai

sectors. However since 1995 more restrictions on sector distribution were removed and FDI were able to deepen into more high-value-added sectors since then.

Unbalanced distributions of FDI over locations and sectors were not good for overall economy development. According to Cheng and Kwan (2000), large regional market, good infrastructure, and preferential policy are major factors that attract the FDI. Hence considering the above factors that influence the FDI distributions, Chinese government responded to the unbalanced distributions by applying the following policies: Infrastructure facilities of the less developed cities have been improved, and similar approaches have been applied into the different sectors by using encouragement policies for helping the less competitive sectors gain benefits from the FDI and to accelerate the economic growth (Broadman and Sun, 1997).

3 Literature Review

3.1 Financial sector globalization and banking sector profitability

Many research studies have investigated the correlation between financial market structures and banking efficiency. Some found that changing market structure by opening up the banking sector can increase the efficiency of the banking industry and leads to a better profitability for banking sector. It is because globalization can increase the competitiveness of local banking industry, and it also can bring the new technology to the local banking sector. It also increases the banks' capital by the joint shares with foreign banks, which would eventually lead to the increase of the efficiency of local banks, so overall increase the banking sector profitability. Thus they consider that accelerating the banking sector reform process and increase its profitability by deepening the globalization of financial sector is a right path to take for Chinese government.

However, some empirical studies on the other hand came up with results showing that there is no significant correlation between macro-economic situations and banking sector profitability. Most of the researches are based on the examples of banking sector in developed markets, there are rare studies that based on the Chinese financial sector. From the chapter 2, we can see that Chinese banking sector started its opening up relatively late but has achieved a great success, so it has unique characteristics compare with other developed and emerging markets.

Most of the previous studies have analysed the profitability of banks by analysing the combined effects of internal and external factors. Internal factors are mainly bank-specific determinants, and external determinants are those macroeconomic indicators. In this part the literature over the similar topics will be divided into the three categories based on their empirical results.

- External factors have influence on banking sector profitability

Chen et al (2005) analysed the efficiency of Chinese banking sector over the period of 1993-2000. They found that the cost efficiency level in terms of both technical efficiency and allocative efficiency³ has been improved since the financial deregulation in 1995. They obtained this empirical result by investigating 43 Chinese banks by applying X-efficiency⁴ or frontier analysis. They used data envelopment analysis (DEA⁵) to examine these banks' cost efficiency. Fu and Heffernan (2007) used the stochastic frontier approach (SFA) on Chinese banking during the 1985-2002, and they found that state-owned commercial banks are less X-efficient than joint-stock banks. They suggested that increase of privatization and more foreign banks' participation should improve the Chinese banks' X-efficiency. Ariff and Can (2008) applied a Tobit regression for examining the influence of ownership type, size, risk profile, profitability and key environmental changes on the bank efficiency. After analyzing the data over the time period of 1995 to 2004, they found that it is necessary

³ A firm's Technical efficiency is the ratio of the input usage of a fully efficient firm producing the same output vector to the input usage of the firm under consideration. Allocative efficiency measures the firm's success in choosing the cost minimizing combination of inputs. (Chen et al , 2005)

⁴ X-efficiency comprises technical and allocative efficiencies. It measures whether banks are efficiently mixing its inputs. (Chen et al , 2005)

⁵ Data envelopment analysis (DEA) measures the relative efficiencies of decision making units that use similar inputs to produce similar outputs, and the multiple inputs and outputs are incommensurate in nature (Li and Reeves, 1999). It is used to analysis how well is the set of organizations are using their multiple inputs to produce multiple outputs when there is a known efficient production function or this function is easy to specified (Sherman and Gold, 1985). Coelli et al(2005) pointed out that EDA involves the use of linear programming methods to construct a non-parametric piece-wise surface over the data.

to speed up the banking sector reforms process in China, since joint-stock banks are more cost- and profit-efficient⁶ than state-owned banks, furthermore medium-sized banks are significantly more efficient than small and large banks. Berger et al (2009) found that bank's efficiency was improved after foreign investment has been made. They conducted this analysis by examining the 38 Chinese commercial banks between time periods of 1994-2003 using cost and profit efficiency measurements. Barros et al (2011) examined the data from the Chinese banks over the time period of 1998 to 2008, by applying the Data Envelopment Analysis (DEA) method, and the Inverse B-convex, they couldn't observe the influence of firm size and ownership on bank efficiency. Their empirical results further suggest that after China joined the WTO, the overall efficiency of banks has improved over time. Sufian and Habibullah (2012) analysed the data of commercial banks in China during the period 2000–2007. By applying the generalized methods of moments (GMM) they found that greater economic integration, cultural proximity, as well as greater political globalization have positive influence on banks' profitability.

- Internal factors have influences on banking sector profitability

Naceur (2003) investigated the determinants of the Tunisian banking industry profitability by applying the balanced panel data regressions over the period of 1980-2000. Ten main deposits banks are included in this paper. Taken inflation and GDP as macro-economic variables, they found that both inflation and GDP have no impact on bank's interest margins and profitability in Tunisian, only internal variables such as amount of capital and bank loans have impacts on the profitability of banks.

⁶ *Cost efficiency refers to a firm's minimization of costs reflected by how close its cost is to what a best-practice firm's would be for producing the same amount of outputs which are sold at certain prices with the given prices of Inputs. Profit efficiency measures how close a bank comes to generating the maximum profit given an amount of inputs and outputs as well as a level of their prices (Ariff and Can, 2008).*

Furthermore, they also found that the disintermediation of the Tunisian financial system is favourable to the banking sector profitability. Athanasoglou et al (2008) examined the Bank-specific, industry-specific and macroeconomic determinants of bank's profitability by applying the Generalized Method of Moments (GMM) technique to a panel of Greek banks in the period of 1985–2001. They concluded that capital is important in explaining bank profitability and that increased exposure to the credit risk lowers profits. Furthermore, they found that labour productivity growth has a positive effect on banking sector profitability, the bank-specific factors are important to the profitability of Greek banks. Ramadan et al. (2011) used data in the period of 2001-2010 intervals of 10 Jordanian banks, and by applying balanced panel data linear regression model they found that banks with high capital ratio tend to earn more profit through translating the safety advantage into profit, same with Athanasoglou et al (2008) they also found that increased exposure to credit risk in Jordanian banking sector lowers profits. Their results show that size of bank has no big influence on profitability of banking sector. Karimzadeh et al (2013) covered eight top commercial banks in India over the period of 2003–2011. By using return on assets (ROA) as a measurement of the profitability of banks and run the regression model, they found that the size of the banks makes important contribution to their profitability. Furthermore, Karimzadeh et al also found that there is positive correlation between the rate of transforming deposits into loans and the profitability of the banks.

- Both external and internal factors contribute to the profitability

Sufian and Habibullah (2009) used a linear regression model over the time period of 2000-2005. They found that all the determinants variables (both internal and external)

have statistically significant impact on Chinese banks' profitability. However, impacts are not similar across different bank types.

- No effects on banking sector performance

Except the literature with empirical results that internal and external factors have influence on the banking sector profitability, there are some other empirical studies on the other hand came up with results that there is no significant relationship between internal or external factors and banking sector profitability in China. Yuan (2006) concluded that before the entrance of foreign banks, Chinese banking sector was close to the perfect competition state. Yuan suggested in this paper that since existence of perfect competition of Chinese banking sector before the WTO accession, so no further rise of competition would appear by opening up the banking sector. The author applied the Panzar–Rosse method for estimating the competitiveness of Chinese banking sector in the time period of 1996-2000. Ye et al (2012) analysed a panel data of the 14 largest nationwide banks in China during 1998–2007, and found that both the structure-conduct-performance (SCP)⁷ and the efficient structure (ES)⁸ hypotheses can't be applied to China. Furthermore, they also found that technical efficiency has a significant impact on the profitability of banks.

⁷ *Structure-conduct-performance (SCP) is used to estimate the relationship between market structure and various aspects of bank conduct and performance (Hannan, 1991). Bain (1951) found that the degree of market concentration in an industry affects the level of competition, and thus influence the conduct of the firms within the industry. So SCP paradigm suggests that market structure to some extent influence bank's competitive behavior and their performance.*

⁸ *Efficient structure (ES) hypotheses implies that higher profit are derived from the higher efficiency as well as lower cost (Ye et al, 2012). ES was proposed by Demsetz(1973).*

3.2 Casualty between FDI and GDP

The causality between FDI inflows and economic growth has been intensively studied. Some argue that FDI plays an important role in the process of accelerating economic growth. However, many believe that it is the other way around which is the rapid economy growth attracts more FDI. Different studies came up with different conclusions based on the different methodologies they applied, and different assumptions they held, and most importantly the different economies that they analysed.

Some previous studies did their investigations based on the one-way causality assumption between FDI and GDP. They believe that FDI can stimulate growth for the host countries. However, some recent studies have been able to test a two-way causality that exists between FDI and economic growth. Their results reveal that economic growth has also impact on the FDI. Hence in this part, the relative literature will be divided into two categories based on the assumption of one- way causality and two-way causality.

- One-way causality

Borensztein et al (1998) investigated the effect of FDI on economic growth in a cross-country regression framework. They gathered data for FDI flows from industrial countries and 69 developing countries over the last two decades. They found that FDI contributes to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy. Zhang (2006) applied a cross-section panel data from the time period of 1992-2004 into an aggregate

production function, and included real output, labor input, stock of domestic capital, stock of FDI, total factor productivity level into the model. It is found in this paper that FDI seems to contribute to China's economic growth through direct investments, which means by raising productivity and promoting export, as well as externality effects (facilitating transition and diffusing technology). Yao (2006) used Arellano and Bond's dynamic panel data estimating technique on panel data set, which includes 28 Chinese provinces over the period 1978–2000. It is found that both exports and FDI have a strong and positive effect on economic growth. Zhao and Du (2007) used vector autoregression (VAR) approach for examining the causality between FDI and economic growth in China. Data over time period of 1985-2003 was included in this model. They found that the two-way causality between FDI and economy growth in China is not highly significant. China's economic growth attracts FDI, and FDI stimulates the economic growth to some degree. However, the result is not significant. They confirmed that FDI does not have obvious booster effect on China's economic growth. Mah (2010) examined the causality between FDI inflows and economic growth in case of China using a small sample cointegration test with data during the period 1983–2001. The empirical result of this paper shows that the economics growth has caused the increase of the FDI inflows. Vu et al (2008) used an augmented production function on the data over the period of 1985-2002, and allowed FDI to directly affect GDP growth and also to indirectly affect growth by enhancing labor productivity. They found that FDI has a significant and positive effect on economic growth through labor productivity in China. Like Yao (2006), Agrawal and Khan (2011) also found that FDI has positive impact on economic growth in China. They included GDP, Human Capital, Labor Force, FDI and Gross Capital Formation into their model, and then by running the Ordinary Least Squares (OLS) estimation for the data in the time

period of 1993-2009. They concluded that FDI promotes economic growth, and 1% increase in FDI would result in 0.07% increase in GDP of China.

- Two-way causality

Liu et al (2002) investigated the causal links between trade, economic growth and FDI by applying the VAR model to the quarterly data over the time period of 1981-1997. The bi-directional causality between economic growth, FDI and exports has been revealed. There are four variables included in this model: GDP, FDI, Imports, and Exports. Choe (2003) analysed the causal relationship between FDI, economic growth, and gross domestic investment (GDI) over the period of 1970-1995. By applying a panel VAR model, it is found in this study that FDI Granger-causes economic growth, and economic growth also Granger-causes FDI, however, the effect is more stronger from economic growth to FDI than from FDI to growth, it is suggested in this paper that strong associations between these three doesn't necessarily mean that high FDI inflows or GDI rates accelerate the economic growth. Li and Liu (2005) analysed a panel data for 84 countries during the period of 1970-99. They applied the single equation and simultaneous equation system techniques for the investigation, and found that there is a significant endogenous relationship between FDI and economic growth from the mid-1980s on-wards. Their result shows that FDI not only directly promotes economic growth by itself but also indirectly does it by the interaction terms. Turkcan and Yetkiner (2010)'s empirical results show that FDI growth and economic growth have an endogenous relationship, that FDI growth and economic growth are significant determinants of each other. Furthermore, they also found that export growth rate and human capital are statistically significant determinants of both FDI growth and economic growth. They used a panel dataset for 23 OECD countries during the time period of 1975-2004. They estimated a two-equation simultaneous

equation system with the GMM that treat FDI growth and economic growth as endogenous variable.

4 Methodology

4.1 Hypothesis#1: Globalization of Chinese financial sector has positive impact on the profitability of Chinese banking industry

4.1.1 Data

Data of 56 banks in China over the time period of 2002-2011 is used. Data is available at Bankscope database. The Bankscope database has been widely used in the financial sector analysis because of its wide range of banking data in the world. The annual data of the banks in China is applied into the model according to the location distribution and data availability. Bank of China is excluded from the model because of its functions as central bank. Macro specific data is mainly obtained from the World Bank data base. The data obtained by Lane and Milesi-Ferretti (2006) for measuring the Chinese financial sector globalization is used for this study.

4.1.2 Variables

Variables are selected based on the work done by Athanasoglou et al (2008) and Sufian and Habibullah (2009).

4.1.2.1 *Dependent variable:*

According to the previous literatures from Kosmidou (2008), Sufian and Habibullah (2009), and Naceur and Omran (2011), the return on average assets (ROAA) has been proved as an indicator with relatively high accuracy for measuring the profitability of banks. Hence we will continue to follow the previous papers and choose ROAA as a measurement of banks' profitability. ROAA is calculated as new income over total assets, it shows how efficient is the bank's operation in terms of the managing its assets.

4.1.2.2 *Independent variables:*

1. Bank-specific variables:

Loan loss reserves to gross loans (llsgl) indicates the quality of the loan a bank holds. Bank is in a better situation, if it has lower loan loss reserves to gross loans ratio.

Net loans to total assets (nlta) is an asset quality measurement ratio, which calculates the percentage that the loan portfolio takes over the total assets.

Log of total assets (ln_ta) is a variable that measures the size of the bank.

Log of total deposits (lndep) is believed to have a positive correlation with banks' profitability.

Liquid assets to deposits and short-term funding ratio (lastf) is the indicator of bank's liquidity. High lastf may reveal the fact that bank is facing a high opportunity cost by holding too much liquid asset. However, too low lastf can also mean the risk of liquidity is high.

2. Macro specific variables:

Financial sector globalization (nfagdp) is measured by the sum of gross external assets and liabilities relative to GDP (Lane and Milesi-Ferretti, 2006). We expect a positive impact nfagdp has on the banking sector profitability.

Natural log of GDP (gdp), the performance of GDP has impact on overall activities in the economy, and it influences the demand and supply of bank's services. In the developed Countries with advanced financial sector, GDP is believed to have a positive impact on the bank's performance.

Real annual interest rate (interest) considered as a crucial element to bank's profitability, since interest rate is directly correlated with bank's income earned by lending, and its cost by collecting deposits.

Table4-1: Variables sign assumptions

Variables	Description	Hypothesized relationship with profitability
<i>Dependent</i>		
roaa	Return on average total assets of the bank	NA
<i>Independent</i>		
<i>Bank specific</i>		
llsgl	Loan loss reserves to gross loans	-
nlta	Net loans to total assets ratio	-
ln_ta	Log of total assets	+
lndep	Log of total deposits	+
lastf	Liquid assets to deposits and short-term funding ratio	+
<i>Macro indicator</i>		
nfagdp	sum of the gross external assets and liabilities relative to GDP	+
gdp	Natural log of GDP	+
interest	Real annual interest rate	+

4.1.3 Model

Considering the possible existence of endogeneity, persistence, and omitted variable bias in the model, as well as the dynamic panel features of our data, we will use the Generalized Method of Moments (GMM) for our estimation. GMM is introduced by Arellano and Bover (1995). By applying the GMM, we believe that above concerns will be under control. Stata will be used as the main software for our analysis.

4.1.3.1 Estimation procedure

Since our panel data has small T (time period) but with many individuals, and also the possible correlation our data has among the independent variables, as well as possible non-exogenous of the independent variables (because of the possible relationship with past error term and current error term), we believe that system GMM would be a better fit for our estimation.

First we have the following data generating process (Roodman, 2009)

$$y_{it} = \alpha y_{i,t-1} + x'_{it} \beta + \varepsilon_{it}$$

$$\varepsilon_{it} = \mu_i + v_{it}$$

We can see from above that the disturbance term ε_{it} has two components, in which μ_i indicates the fixed effects and the v_{it} represents the idiosyncratic shocks. The disturbance satisfies the following condition:

$$E(\mu_i) = E(v_{it}) = E((\mu_i v_{it})) = 0$$

Finally we obtain the following form by rewriting the above equations:

$$\Delta y_{it} = (\alpha - 1) y_{i,t-1} + x'_{it} \beta + \varepsilon_{it}$$

According to the study of Nickell (1981), we consider a possible existence of a correlation between $y_{i,t-1}$ and hidden fixed effect in the disturbance term. And

because of our panel data's feature with small T and many variables, so it doesn't satisfy the condition for this endogeneity to die out, in which case the model needs to have large T. For the above reasons we are not able to conduct an OLS estimation on our model since it will be inconsistent and cause bias.

For solving the possible endogeneity problem we are facing, there are three main possible solutions. First we can transform the data and try to eliminate the fixed effect, which is the main concept of difference GMM (Arellano and Bond, 1991; Arellano and Bover, 1995). The second approach would be applying the system GMM method to address the fixed effect, in which case we will remove the endogeneity by instrumenting the $y_{i,t-1}$ as well as other endogenous variables with those variables which are uncorrelated with fixed effects. We can do it by employing the least square dummy variables (LSDV)⁹ estimation. Third common approach is the within group estimation. However, due to the fact that within estimation might have biased standard errors, hence the dynamic panel bias will not be able to be eliminated (independent variables are still correlated with error term even with transformation), so we will not choose the within group estimation for our final analysis either. Based on the above analysis we believe that GMM would be a better choice for our investigation.

We have difference GMM in the following form:

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \Delta x'_{it} \beta + \Delta v_{it}$$

$$\Delta y_{i,t-1} = \Delta y_{i,t-1} - \Delta y_{i,t-2}$$

$$\Delta v_{it} = v_{it} - v_{i,t-1}$$

⁹ LSDV can take the fixed effect out of the error term by using the dummies for the variables.

Even though the difference GMM estimation has advantage in terms of eliminating the endogeneity within the model, however this estimation is based on the differenced form, in the case of missing of y_{it} , the Δy_{it} and $\Delta y_{i,t+1}$ will also be missing, so there will appear a gap in the data set. Thus for avoiding this problem, Arellano and Bover (1995) pointed out an orthogonal deviations method, in which case the problem would be solved by finding the future available observations' average, and then subtracts this average from the variable. Now having this gap problem under control, we can now choose to apply the system GMM. System GMM also allows for the time invariant dummy variables, which makes it even suitable for our data.

4.1.3.2 System GMM estimation

System GMM satisfies the following equation:

$$\Delta y_{i,t} = \alpha y_{i,t-1} + \beta x_{i,t} + \gamma M_{t-1} + \delta W_t + \mu_i + v_{it}$$

$y_{i,t}$ -bank's performance in year t

$y_{i,t-1}$ -bank's performance in year $t-1$

M_{t-1} -vector of bank's bank-specific variables

W_t -vector of macro-economic variables

The main form of our GMM estimation is as follows:

$$ROAA_{j,t} = \beta_1 ROAA_{j,t-1} + \beta_1 \sum \text{Bank specific variable}_{j,t} + \beta_2 \sum \text{Macro economic variable}_t + \mu_i + v_{it}$$

μ_i - unobserved bank specific effect

v_{it} -error term

j -refers to individual bank

t -refers to time

j,t -refers bank j 's performance at time t

Plugging all the variables into the model introduced above we have:

$$roaa_{j,t} = \alpha roaa_{j,t-1} + \beta_1 llsgl_{j,t} + \beta_2 nlta_{j,t} + \beta_3 ln_ta_{j,t} + \beta_4 Indep_{j,t} + \beta_5 lastf_{j,t} + \beta_6 nfa/gdp_{j,t} + \beta_7 gdp_{j,t} + \beta_8 int_{j,t} + v_{it}$$

4.1.3.3 Estimation results

Table4-2: Summary statistics of used variables

Variables	Mean	Standard Deviation	Minimum	Maximum
roaa	0.8886837	0.7001732	-0.97	8.58
llsgl	2.382673	2.039911	0	22.02
nlta	53.78729	13.62172	9.08	95.39
ln_ta	4.043933	1.003221	2	6
Indep	3.861345	1.006138	1	6
lastf	33.72428	46.70688	2.51	738.46
nfragdp	0.1912	0.076828	0.065	0.319
gdp	10.59	1.595396	9.1	14.2
interest	2.587	0.6689788	1.98	4.14

Calculated by author

We used Arellano-Bond (1991) one step system GMM estimation. However, the standard errors are biased. Thus following the Windmeijer (2005)'s suggestion we employed the finite sample correction model to our estimation for getting a robust estimates of the variance covariance matrix. Our final result is presented in table 4-3.

There are two main approaches to test the validity of the GMM estimation. First is to apply the Sargan test for overidentifying restrictions. Second is to test the serial correlation in the first-differenced residuals. However, Sargan test for over identifying restrictions cannot be calculated after the one step robust estimation, because sargan test is inconsistent in this case (Roodman, 2009). Hence according to the Roodman (2009) we applied the overidentification test based on the Hansen statistic. The results

of Hansen test as well as Arellano-Bon zero autocorrelation tests are included in the table 4-3.

Table4-3: One-step Robust System GMM Estimation

Variables	Coefficient	Std.Err.	p- value
L1 roaa	0.0549637	0.1786958	0.758
llsgl	-0.108766	0.0747845	0.146
nlta	-0.0184104	0.0083116	0.027
ln_ta	-0.2718582	0.2349459	0.247
lndep	0.2570424	0.2244497	0.252
lastf	0.0031247	0.0055345	0.572
nfagdp	2.369912	0.5737545	0.000
gdp	0.0088425	0.0308098	0.774
interest	0.0868848	0.0750574	0.247
_cons	1.306543	0.735847	0.076
<i>WC-Robust</i>			
<i>Arellano-Bond test for zero autocorrelation</i>			
<i>Order 1 : Z= -2.8947 P value=0.0038</i>			
<i>Order2: Z=-0.95434 P value=0.3399</i>			
<i>Test result : There is no autocorrelation</i>			
<i>Hansen test for over identification restriction</i>			
<i>Hansen's J chi2(1)=0.059062 (P=0.8080)</i>			
<i>Test result: Our model is valid</i>			
<i>Calculated by author</i>			

As in table 4-3, we can see that we have obtained two significant variables, which are nlta and nfagdp. We will include the detailed analysis of obtained result in the next section. As presented in the table 4-3, Arellano-Bond test revealed the fact that our model is valid, because the first lag is significant in terms of the serial correlation and second lag is insignificant. Furthermore, according to the Hansen test result presented in table 4-3, which has non-significant statistic, we cannot reject the null hypothesis. Thus overidentification restrictions are valid. So now we can confirm that our estimation is correct.

4.1.4 Empirical findings

For testing our hypothesis, we have conducted the following estimation. First, one step system GMM estimation has been used by applying the orthogonal deviation transform instead of the difference GMM estimation. Second, because of the biased of the one step GMM estimation, Windmeijer (2005) finite sample correction has been applied. After obtained our estimation result, the Arrellano-Bond test and Hansen test have been applied. The rest of chapter is the detailed analysis of each explanatory variable.

As we have expected, the globalization of Chinese financial sector has a positive impact on the profitability of China's banking sector. It shows that increase the level of globalization has significantly increased the ROAA.

According to the result presented in table 4-3, Net loans to total assets ratio shows a negative correlation sign, which is in lines with our expectation. Because higher loans bring higher risk into the banks and higher risk is also the reason for the possible loss.

From the above results and analysis, we can see that Chinese banking sector profitability is influenced by both the internal and external factors. Our result is in lines with result obtained by Sufian and Habibullah (2012).

4.2 Hypothesis#2 most developed provinces in China have obtained more benefits from China's financial sector globalization than less developed ones.

4.2.1 Data

Data is mainly obtained from the Bankscope database and the statistic year books of China. Data of 21 provinces during the time period of 2002-2011 will be analysed. Provinces are selected based on the banking sector data availability. Mean of banks' indicators of each province has been calculated by author.

4.2.2 Variables

Variables are selected based on the papers from Athanasoglou et al (2008), Sufian and Habibullah (2009), and obtained empirical results from our hypothesis#1.

Dependant variable:

Following the hypothesis #1, ROAA will be continually chosen as our dependent variable. We will take the average of the all chosen banks' ROAA in each province for each year.

Independent variables:

Bank specific variables

Bank specific variables are mainly obtained from the hypothesis#1 by taking the average of the each variable of banks in each province.

Macro variables:

Financial sector globalization (nfagdp) is expected to have a positive impact on each province's banking sector profitability.

Annual rate of production of each province (grp) is expected to have a significant correlation with ROAA.

Table4-4: Variables sign assumptions

Variables	Description	Hypothesized relationship with profitability
<i>Dependent</i>		
roaa	Average of return on average total assets of the banks in each provinces	NA
<i>Independent</i>		
<i>Bank specific</i>		
llsgl	Average loan loss reserves to gross loans	-
nlta	Average net loans to total assets ratio	-
ln_ta	Average log of total assets	+
lndep	Average log of total deposits	+
lastf	Average liquid assets to deposits and short-term funding ratio	+
<i>Macro specific</i>		
grp	Annual rate of production of each provinces	+
nfagdp	Sum of the gross external assets and liabilities relative to GDP	+
interest	Real annual interest rate	+

4.2.3 Methodology

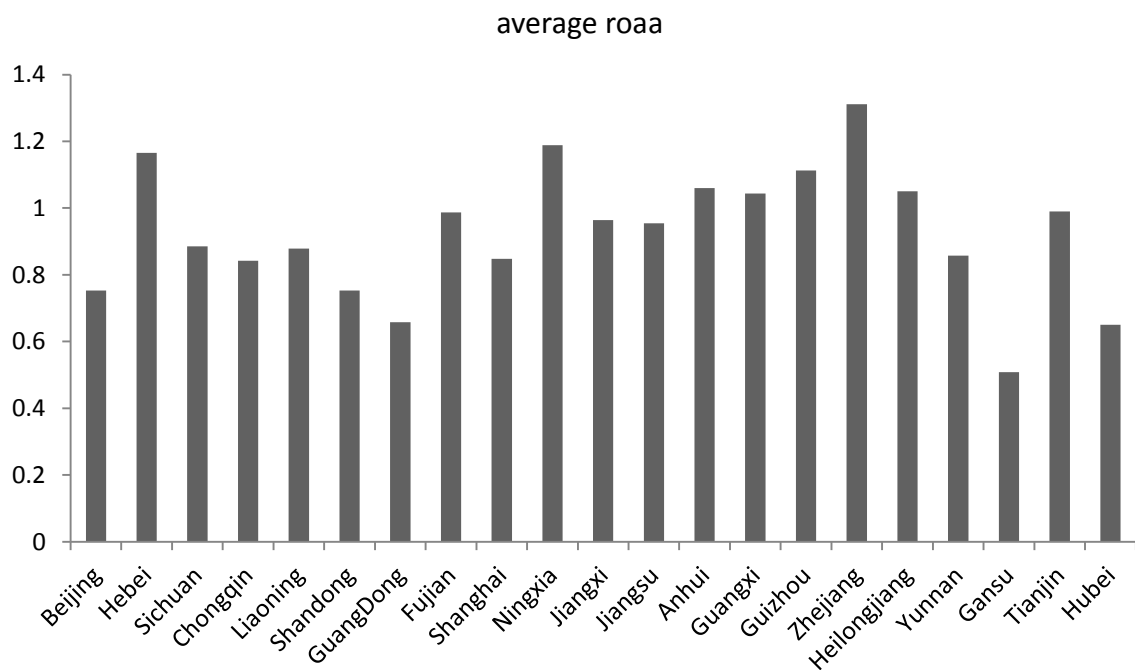
For testing the hypothesis#2 we will continue to apply the system GMM estimation as in hypothesis#1. The theoretical introduction of the model has already been introduced in the previous part, so in this part we will directly continue with our

testing process. We will test the following equation which we introduced in the hypothesis#1.

$$roaa_{j,t} = \alpha roaa_{j,t-1} + \beta_1 llsgl_{j,t} + \beta_2 eta_{j,t} + \beta_3 nlta_{j,t} + \beta_4 ln_ta_{j,t} + \beta_5 grp_{j,t} + \beta_6 lndep_{j,t} + \beta_7 nfa/gdp_{j,t} + \beta_8 int_{j,t} + v_{it}$$

Following part is the descriptive analysis of our data. In graph 4-1 is presented the average roaa of selected provinces.

Graph4-1: Average roaa over provinces of China



Source: BankScope database and author's calculation

From the graph 4-1 we can see that relatively developed provinces in China (for example Zhejiang and Hebei) have the higher average ROAA. We believe that those provinces with better economic situation get the most benefits from the globalization of Chinese financial sector. All those provinces that with highest average ROAA are ones that opened to foreign investors in the early stage of the China's opening up policy, which is introduced in the Chapter 2. However, for those less developed provinces like Gansu has relatively low average ROAA. Thus from the above

illustration we can see the importance of the each province's economic situation and the degree of financial sector globalization to overall banks' profitability. But the main financial center like Shanghai doesn't have the highest average ROAA as we can see in the graph 4-1. It is probably because as China's financial center, Shanghai has relatively high amount of banks currently operating in the market, and those banks are with different size and functions, thus there are some possible outliers that influence the average ROAA. But for the overall evaluation we can still see the trend that more developed provinces have the higher average ROAA. For further confirming this idea, we will continue with our following estimation.

4.2.3.1 System GMM estimation:

For testing our hypothesis, we have applied system GMM estimation. The result is presented in table 4-5.

Table4-5: One-step GMM Estimation

Variables	Coefficient	Std.Err.	p- value
L1 roaa	0.1607249	0.0814057	0.048
llsgl	-0.0180329	0.0574364	0.754
nlta	-0.0101322	0.0077686	0.192
ln_ta	0.0484321	0.1621971	0.765
Indep	-0.0285042	0.1594444	0.858
nfagdp	2.885813	0.6897948	0.000
grp	2.149849	0.9929519	0.030
interest	0.0461533	0.0529993	0.384
_cons	0.1636994	0.727933	0.822

Sargan test of overidentifying restrictions

H0: overidentifying restrictions are valid

chi2(43) = 43.35979

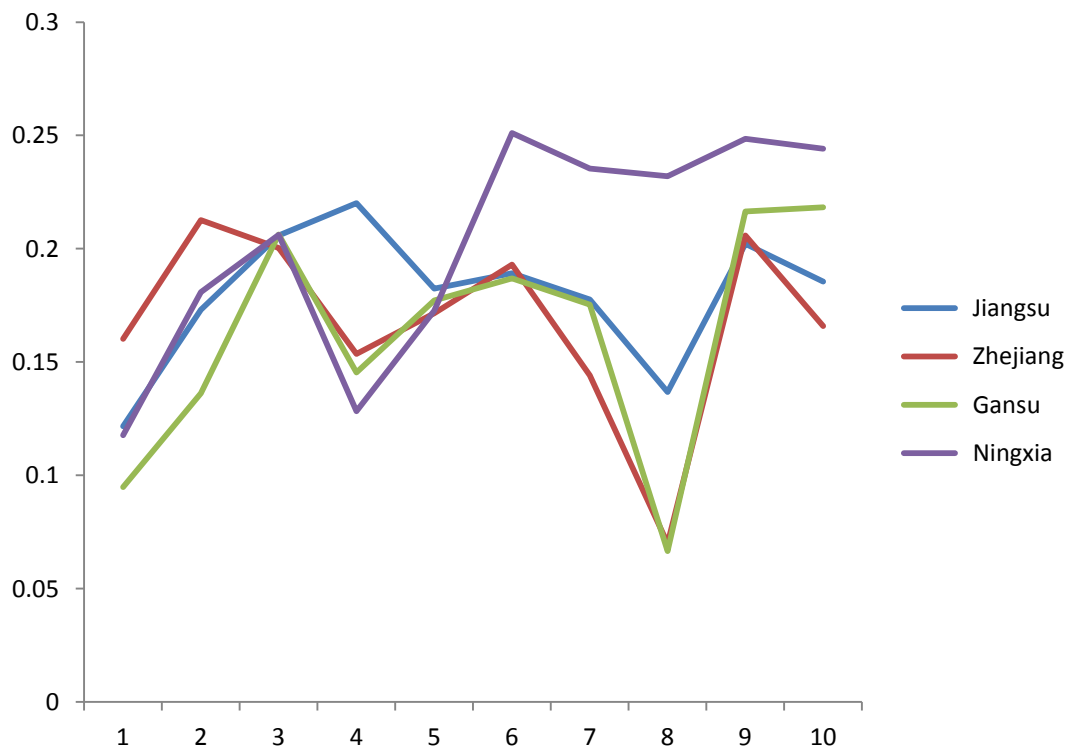
Prob > chi2 = 0.4560

Test result : This model is valid

Calculated by author

We have obtained above results by applying the one step system GMM estimation. As presented in table 4-5, *nfgdp* and *grp* show the strong significant connection with *roaa*. According to the Sargan test for overidentifying restrictions, our model is valid since we cannot reject the null hypotheses. Here we did not include the Arellano-Bond zero autocorrelation test, because it cannot be calculated for one step system GMM estimation. However according to Roodman (2009) overidentifying restrictions is the most important assumption for the validity of the GMM estimation, hence based on the Sargan test we still able to confirm that our result is valid. The detailed analysis of this result is presented in the next section.

Graph4-2: ROAA comparisons between developed provinces and less developed ones



1-10 indicates year 2002-2011

Calculated by author

4.2.4 Empirical findings

For testing our hypothesis#2, we have conducted the following estimations. First of all one step system GMM estimation has been used, and then it followed by the Sargan test for checking the over identifying restrictions problem. From the result obtained from Sargan test we confirmed that our result is valid. The rest part is the detailed analysis of each variable.

Financial sector globalization has a positive impact on the banks' profitability in all the provinces that we have analysed. And we can see from the table 4-5, financial sector globalization has the strongest correlation with ROAA among other variables.

As we have expected, each province' local grp has a positive correlation with average ROAA. Since roaa is closely correlated with financial sector globalization, and also cased on the illustration on the graph 4-2, we believe that most developed provinces in China have obtained more benefits from financial sector globalization than less developed ones. Provinces with better economic situation are more likely to draw more benefits from the globalization of Chinese financial sector. However this relationship can still be tested by other advanced economic methods in the future for further confirmation.

From above estimation we can see that most developed provinces in China with relatively better economic situation are more likely to obtain more benefits from the Chinese financial sector globalization. Hence the overall impact financial sector globalization has on the banking sector profitability is not equally distributed. For the less developed area the influence is relatively small. So for increasing the overall impact, it is crucial to equally develop the provinces' economic situation. Over last decade, Chinese government has made some efforts on encouraging the economic

growth of the less developed provinces. We can see from the graph 4-2 that in last few years, less developed provinces have experienced high growth of grp compare with developed provinces. So it is believed that the encouragement policies are relatively efficient. However, due to the fact that those less developed provinces still way behind of those developed ones, so new economic policies should focus on the consistency of the policy implication.

4.3 Hypothesis#3 FDI has positive impact on China's GDP growth rate

4.3.1 Data

Data is mainly obtained from the World Bank. Macro data over the time period of 1987–2011 is included in our model. Due to the availability of the data, only annual data is used.

4.3.2 Variables

Variables have been chosen according to the previous literature that introduced in chapter 3.

GDP growth (gdp) is the annual growth rate. Except the possible influence GDP has from the other variables, we also expect that GDP growth rate in year t_{i-1} has positive influence on the GDP growth rate in year t_i .

Export of goods and services (egsg) is expected to have a positive correlation with GDP growth and also with export growth. Jun et al (2004) found a positive correlation between export and FDI. They concluded that increase of FDI will increase the provincial manufacturing export.

Foreign direct investment (fdi) is believed to have a bi-direction casualty with GDP growth (Li and Liu, 2005). We believe that foreign direct investment is indirectly correlated to the Chinese economy growth.

*Gross capital formation*¹⁰ (*gcf*), we consider a positive influence gross capital formation has on GDP growth, and we also believe that gross capital formation is influenced by the FDI inflows.

Population growth (*pg*) is expected to have a positive influence on GDP growth. Wang and Yao (2003) found that accumulation of human capital has positive impact on the economic growth of China.

Table 4-6: Variables sign assumptions

Variables	Description	Hypothesized relationship with other variables
gdp	Annual gdp growth rate	gdp->fdi, gdp->egsg. gdp->gcf, gdp->pg
egsg	Export of goods and services (annual % growth)	egsg->gdp, egsg->fdi
fdi	Foreign direct investment, net inflows (% of GDP)	fdi->gdp, fdi->egsg. fdi->gcf
gcf	Gross capital formation(% of GDP)	gcf->gdp, gcf->egsg
pg	Population growth (annual %)	pg->gdp, pg->fdi

4.3.3 Model

For estimating the relationship between GDP growth and FDI, the Vector autoregression model (VAR) will be employed. VAR has been widely used in the time series data analysis, and it has been proved from the previous literature as one of the most appropriate model for the GDP and FDI casualty study.

¹⁰“Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories“-World Bank

System of VAR includes m variables. Each variable is in the form of a linear function of p lags of itself as well as the rest m-1 variables. The general form of the VAR model with P lags is as follows (Hsiao and Hsiao, 2006).

$$y_t = \mu + \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + \Gamma_3 y_{t-3} + \dots + \Gamma_p y_{t-p} + \varepsilon_t$$

y_t - a vector of endogenous variables. In our case $y_t = (gdp, egsg, fdi, gcf, pg,)$

μ – constant vector

p -order of the lags

Γ -coefficient matrix

y_{t-p} -vector of lag endogenous variables

ε_t -random error term

4.3.3.1 Overview of estimation process

Stata software will be used for this estimation. First we will check the stationarity of the data by applying augmented dickey- fuller test (ADF). Before running the ADF test we will choose the optimal lag length. Second step is the lag length selection for the Johansen test. After we obtain the stationary variables with proper lag length, we will run the Johansen test for checking the cointegration, and according to the result obtained by the Johansen test we will choose the model between VAR and Vector error correction model (VECM). VECM will be chosen only in the case of existence of cointegration, otherwise the VAR model will be applied. Furthermore Granger causality test will be performed for the comparison with the results obtained from the VAR or VECM. After we obtain the estimation result we will run the stability test to check the validity of our results.

4.3.3.2 ADF test for stationary

As our data is time series data, the stationarity of the data need to be examined before running the model. For avoiding the autocorrelation, we will choose the augmented dickey- fuller test (ADF) instead of the Dickey-Fuller test (Said and Dickey, 1984) to test the stationarity. There are three types of ADF tests available, which are ADF test with intercept, ADF test with intercept and trend, and ADF test without intercept and trend. In our thesis we will run all three ADF models for comparison. If variables are nun stationary then we will need to take the first difference of the variables and then run the ADF test again. The null hypothesis of the ADF test is unit root exist (data is non-stationary), the alternative hypothesis is that there is no unit root. We can reject the null hypothesis when the test statistic is higher than the critical statistic value, in which case our variables are stationary. In our model we choose the 5% critical value.

ADF test without intercept and trend

$$\Delta y_i = \gamma y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-i} + \varepsilon_t$$

ADF test without trend and only with intercept

$$\Delta y_i = \alpha_0 + \gamma y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-i} + \varepsilon_t$$

ADF test with intercept and trend

$$\Delta y_i = \alpha_0 + \alpha_2 t + \gamma y_{t-1} + \sum_{i=1}^k \beta_i \Delta y_{t-i} + \varepsilon_t$$

$\Delta y_i = y_t - y_{t-1}$ - the first difference of y_t

ε_t - stochastic disturbance

4.3.3.2.1 Lag selection for ADF test

Before running the ADF test we first need to choose a lag length from the Akaike information criterion¹¹, or Schwarz and Bayesian information criterion (SBC)¹². In the case of these two information criterions that mentioned above suggest different lag length, we will then turn to the likelihood ratio (LR)¹³ test for our final lag length selection. LR consider as powerful estimation tool for lag length selection.

After testing the above three information criterions, we finally chose 6 as our lag length for our ADF test based on the LR. We have run all three ADF tests and chose the ADF test without trend for our further analysis since all the first difference of variables are stationary under this test. We present the result in Table 4-7.

¹¹ Akaike Information Criterion (AIC) is used for selecting the model for a set of data. It satisfies the following equation: $AIC=2k-2\ln(L)$, k is the numbers of the parameters, L is the likelihood function's maximized value. Having a several candidate models for the data, we choose the model with minimum AIC value.

¹² Schwarz information criterion has following form: $IC=\ln(\det\widehat{\Omega}_j)+\frac{j(T)}{T}$, $j=0,\dots,K$
 $\widehat{\Omega}_j$ indicates the maximum likelihood estimate of the variance-covariance matrix, and $\ln(\det)$ refers to the determinant of the corresponding matrix. We choose the model minimizes the criterion (Hatemi-J et al, 2009).

¹³ LR is used for choosing the lag order of the VAR model. LR choose the lag order by estimating the significance of the parameters for the each possible lag order. Sims (1980) pointed out that LR satisfies the following equation: $LR=(T-c)\log I \Omega_1 I - \log I \Omega_2 I$

T indicates the sample size, c refers to the number of the parameters within the VAR model, Ω_1 is used for revealing the maximum likelihood estimate of the variance-covariance matrix of the residual under null hypothesis, Ω_2 estimates it based on the alternative hypothesis.

Table 4-7: ADF test for unit root

Variables	Model 1	Model 2	Model 3
ADF test on the level series			
Gdp	-2.905	-2.774	-0.384
Fdi	(-4.625)*	(-3.78)*	-0.197
Gcf	-0.624	-1.18	1.196
Egsg	-2.217	-2.761	-0.926
Pg	-2.492	2.189	(-3.755)*
ADF test on the first difference series			
D.gdp	(-3.35)*	-3.494	(-3.436)*
D.fdi	-2.581	-2.889	(-2.593)*
D.gcf	-3.023	-2.957	(-2.179)*
D.egsg	(-4.385)*	(-4.428)*	(-4.503)*
D.pg	(-3.28)*	(-5.106)*	(-2.6)*

Model 1- only with intercept Model 2-with trend and intercept Model 3-no trend and intercept

**means significant in 5% critical value*

Calculated by the author

From above result we can see that all the variables are non-stationary at the level and stationary at first difference, which indicates the possibility of the cointegration in the model, so now we will move to Johansen conintegration test.

4.3.3.3 Johansen test of cointegration

Johansen test (Johansen, 1988) aims at finding the cointegration among the variables in the time series data. There exist two types of Johansen tests, which are with trace value and the other one is with the eigenvalue. The null hypothesis for the Johansen test with trace value is that trace statistics should be lower than tested statistics. However for the Johansen test with eigenvalue, the amount of eigenvalue is expected to be equal to the tested value.

Lag selection for Johansen test

Before we run the Johansen test we again should choose a lag length for the model. Here 2 is chosen as maximum lags based on the LR test. Our result is presented in Appendix (Appendix 1),

Johansen test for cointegration

By applying the Johansen test we will see if there is cointegration between variables. In the case of existence of cointegration we need to employ VECM model. The null hypothesis of Johansen test is there is no cointegration, the alternative hypothesis is that cointegration exists. The result of Johansen test is presented in table 4-8.

Table 4-8: Johansen test for cointegration

rank	parms	LL	eigenvalue	trace statistic	critical value
0	25	-164.88447	.	103.9948	59.46
1	34	-142.02629	0.87482	58.2784	39.89
2	41	-128.04669	0.71941	30.3192	24.31
3	46	-120.20882	0.50960	14.6435	12.53
4	49	-115.58357	0.34327	5.393	3.84
5	50	-112.88709	0.2174		

Calculated by author

From the table above, we can see that trace statistic is higher than critical value in all the rank level, hence there is no cointegration between variables. Now we will run the VAR model instead of VECM model.

4.3.3.4 VAR estimation

Following the result of lag length selection we obtained earlier, 2 will be still used as the optimal lag length for our model. The result of VAR is presented in the table 4-9.

Table 4-9: VAR model result

	D.gdp	D.fdi	D.gcf	D.egsg	D.pg
R-sq	0.6052	0.6814	0.3930	0.9079	0.8852
results	D.gdp->D.gdp	D.gdp->D.fdi	D.gdp->D.gcf	D.gdp->D.egsg	D.gdp->D.pg
	D.fdi->D.gcf	D.fdi->D.egsg	D.fdi->D.pg		
	D.gcf->D.gdp	D.gcf->D.egsg			
	D.egsg->D.egsg	D.egsg->D.pg			
	D.pg->D.fdi	D.pg->D.egsg	D.pg->D.pg		

Calculated by author

4.3.3.5 Test of the results

For testing the accuracy of our estimation we tested the stability of the model. The eigenvalues shouldn't exceed 1 if we want our model to be stable. Appendix 2 includes our testing results. From the result we have obtained we can conclude that VAR satisfies the stability condition, since all the eigenvalues are below 1.

4.3.3.6 Granger test for causality

We have included the Granger test (table 4-10) for the comparison with the results we have obtained from VAR model.

Table 4-10: Granger test result

Dependent variables	D.gdp	D.fdi	D.gcf	D.egsg	D.pg
D.gdp		0.359	0.049*	0.644	0.221
D.fdi	0.003*		0.005*	0.211	0.001*
D.gcf	0.008	0.078		0.557	0.862
D.egsg	0*	0*	0*		0.001*
D.pg	0.001*	0.04*	0*	0.011*	
Final results					
	D.gcf->D.gdp				
	D.gdp->D.fdi	D.gcf->D.fdi	D.pg->D.fdi		
	D.gdp->D.egsg	D.fdi->D.egsg	D.gcf->D.egsg	D.pg->D.egsg	
	D.gdp->D.pg	D.fdi->D.pg	D.gcf->D.pg	D.egsg->D.pg	

*indicates the significance of the result

Calculated by author

Table 4-11 Overview of key empirical studies dealing with FDI and GDP

Authors	Short description	Methodology and data used	FDI has direct positive impact on the economic growth
Li and Liu (2005)	Investigaing whether FDI affects economic growth	Single equation and simultaneous equation system techniques on a panel data for 84 countries during the time period of 1970-99.	Positive
Yao (2006)	Analyzing the effect of exports and foreign direct investments (FDI) on economic performance,	Arellano and Bond's dynamic panel data estimating technique on panel data set of 28 Chinese provinces over the period 1978–2000.	Positive
Vu et al (2008)	Estimating the impact of FDI on growth using sectoral data for FDI inflows in China	Augmented production function on the data over 1985-2002	Positive
Mah (2010)	Analyzing the causality between FDI inflows and economic growth in China	Small sample cointegration test with data during the period 1983–2001	Negative
Zhao and Du (2007)	Investigating the causality between FDI and economic growth in China	VAR approach on data over time period of 1985-2003	Negative
This study	Analyzing the impact FDI has on the economic growth in China	VAR model on the macro data over the time period of 1987-2011	Negative

Information gathered by author

Positive indicates that FDI has direct positive impact on economic growth

Negative indicates that FDI does not have direct impact on economic growth

4.3.4 Empirical findings

By applying the augmented dickey- fuller test, we found that all our variables are non-stationary at level and stationary at first difference, and then we used Johansen test for checking the possible cointegration. However, since all the trace statistics are higher than critical value, so we confirmed that there is no cointegration among the variables, hence VAR model has been chosen instead of VECM. We checked the validity of our results by applying the stability test, and concluded that our model is valid, and our results are correct. Furthermore we included the Granger causality test for the comparison purpose. However, in the end we found that in terms of the casualty between GDP and FDI both VAR and Granger causality test have the same testing results. The rest is the detail analysis of each individual variable.

GDP has impact on itself, and it also explains the growth of other four variables. So from this obtained result we can say that GDP growth of China is the crucial element for the development of other factors in China. Thus rapid growth of GDP has attracted more and more FDI inflows to China.

From the table 4-9 we can see that gcf has positive influence on gdp and egsg. Hence growth of gross domestic investment attracts more FDI and provides more funds for the economic development of China. Furthermore, increase of gcf can also explain the increase of the overall export of goods and services, and it believed to have a positive impact on China's economic growth.

Export of goods and services (egsg) has positive impact on itself. For example this year's good egsg performance can be explained by its own performance in last year.

Population growth in China has always been a hot topic. Population growth always has been related to China's rapid economic growth in terms of the low cost labour.

However, nowadays it is also about its strong consumer power. Based on the result obtained from VAR model we can see that population growth is one of the main drivers of the FDI inflows, export of goods and services, and itself. Increase of the population growth will benefit the export of goods and services more likely because of the huge labour market.

According to the result obtained from VAR model, we can see that FDI has positive impact on gcf, egsg, and pg. However, it doesn't have strong impact on the gdp growth. Furthermore, based on the result from Granger causality test we have obtained the same conclusion, in which GDP has positive impact on FDI but FDI is not strongly related to the economic growth of China.

From VAR' estimation result, we found that gdp, gcf have positive impact on China's GDP growth, and FDI has positive impact on gcf, egsg, and pg, thus we believe that FDI makes positive contribution to China's GDP growth through gross domestic investment. Furthermore, rapid growth rate of GDP has attracted more and more FDI into the Chinese market, so there is one way direct relationship between FDI and GDP, in which GDP influence FDI. However, we didn't find the direct influence FDI has on the China' GDP growth, but we found that FDI increases the gross capital formation, and gross capital formation makes positive contribution to GDP growth, thus we conclude that FDI indirectly influence the Chinese economy through the gross capital formation.

Comparing our results obtained from VAR model to the results from Granger causality test, we can see that both tests are able to identify the direct impact GDP has on FDI. And indirect impact FDI has on GDP through different channels.

4.4 Summary of results

- Hypothesis#1 Globalization of Chinese financial sector has positive impact on the profitability of Chinese banking industry
- Hypothesis#2 Most developed provinces in China have obtained more benefits from the China's financial sector globalization than the less developed ones.
- Hypothesis#3 FDI has positive impact on China's GDP growth rate

By applying the one step robust system GMM estimation, we found that there is a positive correlation between ROAA and globalization of Chinese financial sector. Hence we believe that hypothesis#1 is accurate. Furthermore, we found that net loans to total assets ratio has impact on the profitability of Chinese banking sector. We used the one step system GMM method for testing the hypothesis#2. We have obtained result that most developed provinces in China are likely obtain more benefits from financial sector globalization. However, those provinces with less developed economy may only take advantage of the financial sector globalization in the case of improved economy situation. Using VAR model for testing the hypothesis#3, we found that rapid growth of GDP is the reason for explaining the FDI development in China, and FDI can only indirectly influence Chinese economic growth by influencing the domestic investment.

4.5 Further research opportunities

Data of this research can be updated to see if the result is still the same. Furthermore, more variables can be added to the GMM estimation to see if there are other possible elements that might have influence on the profitability of Chinese banking sector. For studying the impact of financial sector globalization in terms of FDI's impact on the

economic growth, Future research can focus on the sector distributions and location distributions of FDI to see if there is a direct impact of FDI has on the other different sectors of the Chinese economy. Furthermore, the shadow banking system has arisen in many countries in the world including China, However, because of the lack of the data on the exact quantity of the shadow banking in China's financial sector, so we didn't include the study of the shadow banking in this thesis, however, we do believe that it is necessary and crucial to include the shadow banking estimation for the future research study on this topic to make a more comprehensive study on the globalisation of the Chinese financial sector.

5 Conclusion

In this thesis we have studied China's financial sector globalization through analysing the determinants of Chinese banking sector profitability, and relationship between GDP growth and FDI inflows. For estimating the Chinese banking sector profitability we applied system GMM estimation. We found that both internal and external factors can influence the Chinese banking sector profitability. Furthermore, as we have expected Chinese financial sector globalization has a positive impact on the Chinese banking sector profitability. According to our estimation on hypothesis#2, we found out that provinces with relatively good economy situation are likely obtain more benefits from the Chinese financial sector globalization. However this relationship can still be tested in the future for more advanced method. For addressing the correlation between GDP and FDI, we used VAR model.. We found that GDP growth explains the rapid development of FDI, and FDI has no direct influence on GDP growth , it can only indirectly influence the GDP growth by its influence on the domestic investment. According to the empirical results obtained from this study, we have following advices for the Chinese economic policies.

First, financial sector globalization has a positive impact on the profitability of the Chinese banking sector, hence further globalization of the financial sector is beneficial to the Chinese economy as long as it is within the risk tolerance.

Second, Attention should give to the equal economic development of the provinces in China. Continuous economy encouragement policies are needed for the less

developed provinces. By increasing the economic situation of less developed provinces to help them capture more benefits from the financial sector globalization.

Third, Since rapid growth of GDP is the reason for the increase of the FDI inflows, so it is important to keep the stable GDP growth.

Fourth, FDI has played an important role during the Chinese economy development process by influencing the domestic investment and other sectors. However, because of the uneven distribution of the FDI in different provinces, more encouragement policies should be carried out for balancing the FDI development over different locations and different business sectors.

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Appendix

Appendix 1 Lag selection for Johansen cointegration test

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-125				1.29103	14.4443	14.4783	14.6916
1	-92.039	65.919	25	0.000	0.608276	13.5599	13.7645	15.0438
2	-36.026	112.03*	25	0.000	0.045977	10.114	10.4891	12.8345
3	.	.	25	.	(-1.6e-49)*	.	.	.
4	2840.52	.	25	.	.	(-305.613)*	(-304.999)*	(-301.161)*
5	2821.68	-37.68	25	.	.	-303.52	-302.906	-299.068
6	2795.89	-51.57	25	.	.	-300.655	-300.041	-296.203

Appendix 2 Eigenvalue stability condition

Eigenvalue	Modulus
(-0.2796716+0.816229i)	0.862813
(-0.2796716-0.816229i)	0.862817
(0.4824375+0.5817311i)	0.755749
(0.4824375-0.5817311i)	0.755749
0.6446783	0.644678
(0.08794857+0.5778977i)	0.584552
(0.08794857-0.5778977i)	0.584552
(-0.4862957+0.3208948i)	0.582629
(-0.4862957-0.3208948i)	0.582629
0.2892928	0.289293