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Bank profitability and inflation: the case of China

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Abstract

This study examines the determinants of bank profitability in China over the period 2003-2009. The determinants are divided into three groups: bank-specific, industry-specific and macroeconomic variables. The two-step General Method of Moments (GMM) system estimator is used. The results show that there is a positive relationship between bank profitability, cost efficiency, banking sector development, stock market development and inflation. We report that low profitability can be explained by higher volume of non-traditional activity and higher taxation. Moreover, we confirm that there is a competitive environment in Chinese banking industry. Furthermore, we propose policy actions that should be taken to improve bank profitability in China.

1. Introduction

The banking sector in China plays an important role in the development of financial system and the economy as a whole. At the end of year 2008, the total deposits of the whole banking industry account for more than 20% of GDP, higher than the 2006 and 2007 figures (17.5% and 16.8%, respectively). Further, the problem of undercapitalization and a huge amount of non-performing loans demand prompt solution. The profitability of the banking sector in China is still below international standards (Garcia-Herrero *et al.*, 2009). Understanding the factors influencing the profitability of banking sector is helpful to solve these problems and is essential for bank managers, government and shareholders.

A comprehensive banking sector reform with the aim of transforming banks into market functioning and profitability institutions was started by the Chinese government in 1997. The four state-owned commercial banks (SOCBs)[1] which serve as the lending arms of the state owned enterprises (SOEs) are the focus of the reform. There are mainly two ways in terms of restructuring, one is capital injection, and the other one is to carve out the non-performing loans (NPLs).

This article seeks to examine the factors influencing the profitability of the Chinese banking sector over the period 2003-2009. This period is the final round of reform which focuses on banking modernization and partial privatization. The government and banking regulatory authority allow foreign share purchases of any domestic bank, and the banks are encouraged to be listed on Chinese stock exchanges in order to improve their management, all of which are supposed to have a positive effect on bank profitability. Although there have been several studies investigating the profitability in developed countries, empirical works on factors affecting the profitability of banks in developing countries, such as China, are relative scarce. This is the first study which investigates three different groups of determinants affecting Chinese banking profitability, namely the bank-specific, industry specific and macroeconomic variables. The first group of determinants of profitability involves bank size, credit risk, liquidity, taxation, capitalization, cost efficiency, non-traditional activity and labour productivity. The second group of determinants describes industry-structure factors that affect bank profitability which are concentration ratio, banking sector development and stock market development. The third group relates profitability to the macroeconomic environment within which the banking system operates; in this context, we include inflation among the explanatory variables.

In this study, we include most comprehensive variables in analyzing the profitability in the Chinese banking industry. Some of the variables are very important in the development of banks and the policy making by the government. One of the variables is labour productivity, which reflects the recruitment and management skills

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[1] The four state-owned commercial banks are Industrial and Commercial Bank of China(ICBC), China Construction Bank(CCB), Agricultural Bank of China(ABC) and Bank of China(BOC), Bank of Communication is classified as the new state-owned banks, so the total number of state-owned banks in China is 5.

of banks that is very important aspect of banking reform in China. The other variable, which is called non-traditional activity, is an indicator of the development of banking sector; we consider it to test whether the banking industry has been transferred from traditional deposit-loan services to non-traditional activities oriented through several grounds of reforms. These variables are not considered by most of the studies in the context of Chinese banking industry. Furthermore, inflation is very important in the country's economy in the way that it exacerbates the so called friction in credit market which is more severe in developing countries such as China. The financial intermediaries ration credit leads to lower investment. The present and future productivity may suffer, implying a low economic activity (Boyd and Champs 2006).

Nevertheless, inflation has important effects on banks under different aspects. First, the bank lending is influenced by inflation. According to Boyd and Champ (2006), some economist find that countries with higher inflation normally have small banking and equity market, the amount of loan made by banks decreases through ration credit especially to private sector. Second, the profitability is also affected by inflation. Boyd and Champ (2006) find that there is a negative relationship between inflation and bank profitability under the condition that banks may not be immediately aware that inflation has stepped up. This paper examines these hypotheses using recent data from China, i.e. banking and inflation data, to test the effect of inflation on bank profitability.

Our empirical results show that the profitability of Chinese banking sector is explained by a lower volume of non-traditional activity, lower taxation, well-developed banking sector, stock market and higher inflation. We also find that profitability seems to persist to a moderate extent, which implies that departures from a perfectly competitive market structure in China banking industry may be not that large.

The paper is divided into six sections. Section 2 reviews the existing literature on the determinants of bank profitability. Section 3 outlines the empirical methodology. Section 4 describes the Chinese banking market and data used. Section 5 presents the main results and section 6 summarizes and concludes.

2. Literature review

There is a large amount of literature that examines the role of different factors in determining the EU bank performance (Molyneux and Thornton, 1992; Staikouras and Wood, 2003; Goddard *et al.*, 2004). The determinants of European bank profitability are firstly evaluated by Molyneux and Thornton (1992) for the period 1986-1989. The results show that liquidity is negatively related to bank profitability. In addition, Staikouras and Wood (2003) examine the determinants of banks profitability in the EU for the period 1994-1998. Using OLS and fixed effects models, the empirical findings show that the profitability of European banks may be influenced by factors related to changes in the external macroeconomic environment.

The performance of European banks across six countries is investigated by Goddard *et al*. (2004). They find a relatively weak relationship between size and profitability. The significant and positive relationship between off-balance business and profitability is shown only for the UK.

There is a large number of studies on profitability of US banks (Smirlock, 1985; Rhoades, 1985; Berger, 1995a; Goddard *et al*., 2001). Firstly, Rhoades (1985) uses data from 1969-1978, and reports that there is a positive relationship between risk and bank profitability in the US. Smirlock (1985) examines the profitability of US banks during the period 1973-1978; the empirical findings suggest that size is negatively related to bank profitability. Berger (1995a) uses data from 1980s, and reports that profitability is positively related to market power and x-efficiency. The profitability of US banks is also investigated by Goddard *et al*. (2001). Using data for the period 1989-1996, the empirical results show that scale economies and productive efficiency are positively related to profitability, while bank size has negative impact on the profitability of the US banking industry. Further, the determinants of foreign banks profitability based in Australia are considered by Williams (2003) for the period of 1989-1993. He finds that GDP growth of a foreign bank's home country and non-interest income are positively and significantly related to bank profitability.

Moreover, the profitability of bank-specific, industry-specific and macroeconomic determinants of South Eastern European credit institutions is examined by Athanasoglou *et al*. (2006). The empirical study shows that bank size, credit risk, and capitalization have significant impacts on profitability, while the concentration is positively related to bank profitability. In terms of macroeconomic variables, the results are mixed among different countries.

Fewer studies have looked at the bank performance in emerging countries. The performance of domestic and foreign banks in Thailand during the period of 1995-2000 is investigated by Chantapong (2005). He finds that the profitability of foreign banks is higher than domestic banks.

Guru *et al*. (2002) examine bank profitability for Malaysia during 1986-1995. The results show that efficient expense management is one of the most significant factors in determining the bank profitability. In terms of the macroeconomic variables, inflation is found to have a positive relationship with bank profitability while the negative relationship is obtained between interest rate and bank profitability.

The impact of bank characteristics, financial structure and macroeconomic conditions on Tunisian banks' profitability is examined by Ben Naceur and Goaied (2008) for the period 1980 to 2000. The results suggest that the capitalization and overhead expenses are positively related to profitability, while bank size exhibits the negative effect. There is a positive relationship between stock market development and bank profitability while no effect is found in terms of macroeconomic conditions.

The studies investigating the profitability of Chinese banking sector are relatively scarce. The performance of the big four[2], joint-stock and city commercial banks in China is compared by Shih *et al.* (2007) using principle components analysis. The results indicate that the joint-stock commercial banks perform better than state-owned and city commercial banks. They argue that there is no relationship between bank size and performance. Further, Fadzlan and Khazanah (2009) examine the determinants of profitability of four state-owned and twelve joint-stock commercial banks during the period of 2000-2007. The empirical findings suggest that size, credit risk and capitalization are positively related to profitability, while liquidity, overhead cost and network embeddedness have negative effects. The results also show that there is a positive impact of economic growth and inflation on bank profitability.

Garcia-Herrero *et al.* (2009) explain the low profitability of Chinese banks for the period 1997-2004. The results suggest that capitalization, share of deposits and x-efficiency are positively related to bank profitability, while there is a negative effect of concentration on bank profitability. Furthermore, the empirical findings indicate that state-owned commercial banks are the main drag of bank profitability in China whereas joint-stock commercial banks tend to be more profitable.

Heffernan and Fu (2008) use economic value added and net interest margin to examine the determinants of performance for four different types of banks (state-owned, joint-stock, city commercial and rural commercial banks). The empirical findings suggest that bank listing and efficiency exert significant and positive influence on bank performance. Real GDP growth rate and unemployment are found to be significantly related to bank profitability. There are no effects of bank size and off-balance-sheet activities on bank profitability. Finally, rural commercial banks outperform the state-owned, joint-stock and city commercial banks.

3. Market and Data Description

3.1 Review of Chinese Banking industry

Until 1978, Chinese financial system followed the mono-bank model and was operated based on socialist principles. The People's Bank of China (PBOC) played the dual role as central and commercial bank. A two tiered banking system, consisting of the PBOC and State-Owned banks, was established during the first stage of financial reform over the period 1979-1992. PBOC was free to serve as central bank. In order to create a comprehensive environment and enhance supervision in the banking sector, the Chinese Banking Regulatory Commission (CBRC) and various ownerships of banks were established during the second stage of reform from 1993 to present.

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[2] Big four include the following banks: ICBC, ABC, BOC and CCB.

Established by the state council in 2003, the CBRC is the primary government agency and point of control for the commercial banks. The CBRC is responsible for the supervision of the commercial banking operations, but also formulate rules and regulations, authorize the establishment, changes, termination and scope business of the banking institutions and conduct an onsite examination and offsite surveillance of their operations. The objective is to protect the interest of depositors and maintain market confidence through prudential and effective supervision.

The Chinese banking sector comprises five state-owned commercial banks[3], twelve joint-stock commercial banks[4] (JSCBs), a big number of city commercial banks (CCBs), policy lending banks, credit cooperative and foreign banks. The state-owned commercial banks are assigned sector policy objectives, previously in the hand of the PBOC under the mono-bank system. However, with the creation of the policy lending banks in 1994, their responsibilities have been restricted to commercial lending purposes. Further, the stockholders of JSCBs are made up of a diversified group which includes local government as well as private and state-owned enterprises. On the other hand, CCBs are local joint-stock commercial banks established by local government, enterprises and residents. The establishment of the Shenzhen city cooperative bank in July 1995 can be taken as the starting point when China's city commercial banking network begins its rapid, though arduous, development on the Chinese financial platform. Unlike their JSCB counterparts, the CCBs are not allowed to operate at the national or regional level, which is their major competitive disadvantage. Therefore, due to their lack of scale, the CCBs have to rely heavily on traditional lending activities with interest income consists of approximately 95% of CCBs' total revenue. In addition, the CCBs' competitive advantage stems from its strong relationship with local business fraternities and retail customers. By the end of 2007, there are 124 city banks in China. Their assets totalled RMB 3340 billion, possessing a market share of 6% among all depository banking institutions (Rowe *et al.*, 2009).

3.2. Data Description

Our banking data is composed of annual figures from 101 Chinese banks over the period 2003-2009. The banks used in this study are five state-owned commercial banks, twelve joint stock commercial banks and eighty four city commercial banks. Furthermore, sixteen of them have already been listed on the stock exchanges in China, hence the profitability of these banks is highly important for the shareholders. Since not all banks have available information for all years, we opt for an unbalanced panel not to lose degrees of freedom (i.e. the number of time series responses for each unit is different; hence, the panel is unbalanced). In total, our sample contains

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[3] These are: Bank of China (BOC), Industrial and Commercial Bank of China (ICBC), Agricultural Bank of China (ABC), China Construction Bank (CCB), and Bank of Communication.
[4] These are: China Minsheng Banking Corporation, China Citic Bank, Shanghai Pudong Development Bank, China Merchant Bank, Gungdong Development Bank, Hua Xia Bank, ShenZhen Development Bank, Evergrowing Bank, Industrial Bank, China Everbright Bank, China Zheshang Bank and China Bohai Bank.

197 observations[5]. The bank specific information is mainly obtained from Bankscope database maintained by Fitch/IBCA/Bureau Van Dijk, which is considered as the most comprehensive database for research in banking. The industry specific and macroeconomic variables are retrieved from the website of China banking regulatory commission and the World Bank database. The list of the variables used to proxy profitability (including the notation), its determinants and descriptive statistics are presented in the following table (Table 1). A summary of the expected effects of the determinants, in accordance with the theory and previous literature, are also included. More information about these effects is given in the next Section.

Table 2 shows summary statistics of the variables used in the present study. We find that ROA is lower than NIM. There is a small difference in terms of bank size, cost efficiency and liquidity comparing with other bank-specific variables (as seen from the Min and Max values). The maximum amount of non-traditional business engaged by the banks achieved is found to be 128.42, while the minimum amount is of -34.22. The differences between the Min and Max values of banking sector development and concentration are smaller than stock market development and inflation, which suggests that the banking variables (of banking sector) are more stable than stock market and macroeconomics in China.

<<Table 1 - about here>>

<<Table 2 - about here>>

Furthermore, Figure1 shows the inflation rate in China over 2003-2009. In 2003, the inflation rate is 1.16%, the lowest point over the above period, while it achieves the highest point in 2008, i.e. 5.86%. Notice that this is the highest inflation rate since 1997 due to the severe winter storm happened that year.

<< Figure 1 – about here >>

4. Methodology

When estimating bank profitability, either measured by the ROA or NIM, we face a number of challenges. First, it is endogeneity: more profitable banks may be able to increase their equity more easily by retaining profits. The relaxation of the perfect capital markets assumption allows an increase in capital to raise expected earnings.

Another important problem is unobserved heterogeneity across banks, which may be very large in the Chinese case given differences in corporate governance. Finally, the profitability could be very persistent for Chinese banks because of political interference.

We tackle these three problems together by moving beyond the methodology used in previous studies on bank profitability. Most previous studies use fixed or random

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[5] Similar study has been conducted by Shen and Lu (2008) who use 49 bank-level observations to investigate the effect of different ownership structures on the profitability and risk of bank in China.

effects[6]. In this paper, we employ the General Method of Moments (GMM), which firstly used by Arellano and Bond (1991). GMM is widely used in the investigation of determinants of bank profitability. For instance, Athanasoglou *et al.* (2005) apply GMM to a panel of Greek banks; Liu and Wilson (2009) and Dietrich and Wanzanried (2010) also use a GMM approach for the Japanese and Switzerland banking industries, respectively. This methodology accounts for endogeneity. The GMM estimator uses all available lagged values of the dependent variable plus lagged values of the exogenous regressors as instruments which could potentially suffer from endogeneity. In our case, the variables treated as endogenous are the dependent variables and capitalization. The GMM estimator also controls for unobserved heterogeneity and for the persistence of the dependent variable. Overall, this method yields consistent estimations of the parameters.

4.1 Performance measures (ROA and NIM)

Previous literature has used several measures of profitability, such as the ROA and NIM (as reported before). ROA is widely used to compare the efficiency and operational performance of banks as it looks at the returns generated from the assets financed by the bank. For this reason, we choose ROA as one of our optional dependent variables. Using ROA as dependent variable, we also provide convenience in comparing our results to other findings reported in the literature. Figure 2a shows the profitability of SOCBs ,JSCBs and CCBs over the examined period. In general, the profitability of SOCBs and CCBs is higher than JSCBs, while the profitability of SOCBs is higher than CCBs for the period 2003-2005 and 2007.

<< Figure 2a - about here>>

Another measure of profitability is the return on equity (ROE). ROE reflects the capability of a bank in utilizing its equity to generate profits. Though not used widely as ROA, it is also a standard indicator to compare financial performance among different banks in developed countries.

Further, the NIM variable is used, which is focused on the profit earned on lending, investing and funding activities. Figure 2b shows that: (i) the lowest and highest profitability is obtained by CCBs in 2003 and 2008, and (ii) the profitability of CCBS is higher than SOCBS in 2005-2006 and 2009. The profitability of JSCBs is the lowest among these three groups of banks.

In this study, ROA and NIM are used as the performance measures, following a recent study by Fadzlan and Khazanah (2009). ROE is not considered in this study due to the fact that ROA and NIM are better representatives of bank profitability in China (see Fadzlan and Khazanah, 2009).

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[6] Fixed or random effects are used by Maudos and Fernandez de Guerara (2004) and Claeys and Vennet (2005), while Generalized Least Square and Weighted Least Square are employed by Angbazo(1997) and Demirguc-Kunt and Huizinga(1999).

4.2 Bank-specific variables

The bank-specific variables included in our empirical analysis are LNTA (log of total assets), PL (loan loss provisions/total loans), LA (loans/assets), TOPBT (tax/operating profit before tax), ETA (shareholder's equity/total assets), OETA (overhead expenses/total assets), NIITA (non-interest income/total assets), and TRNE (total revenue/number of employees).

Capitalization (ETA) has been demonstrated to be an important factor in explaining the performance of financial institutions. Its impact on bank profitability is ambiguous. A lower capital ratio suggests a relatively risky position; one might expect a negative coefficient on this variable. (Berger, 1995). However, there are five reasons to believe that higher capitalization should foster the profitability. First, banks with higher capital ratio engage in prudent lending. Second, banks with more capital should be able to lower their funding cost (Molyneux, 1993) because large share of capital is an important signal of creditworthiness. Third, a well capitalized bank needs to borrow less in order to support a given level of assets. This can be important in emerging countries when the ability to borrow is more subject to stops. Fourth, capital can be considered a cushion to raise the share of risky assets, such as loans. When market conditions allow a bank to make additional loans with a beneficial return, this should imply higher profitability. Finally, an increase in capital may raise expected earnings by reducing the expected cost of financial distress including bankruptcy (Berger, 1995).

Bank size (LNTA) is generally used to capture potential economies or diseconomies of scale in the banking sector. This variable controls for cost differences, product and risk diversification. There is no consensus on the direction of influence. On the one hand, a bank of large size should reduce cost because of economies of scale and scope (see Akhavein, Berger and Humphrey, 1997; Bourke, 1989; Molyneux and Thornton, 1992; Bikker and Hu, 2002; Goddard, Molyneux and Wilson, 2004). In fact, more diversification opportunities should allow to maintain (or even increase) returns while lowering risk. On the other hand, large size can also imply that the bank is harder to manage or it could be the consequence of a bank's aggressive growth strategy. Eichengreen and Gibson (2001) suggest that the effect of bank size on its profitability may be positive up to a certain limit. Beyond this point, the impact of its size could be negative due to bureaucratic and other factors. Hence, the size-profitability relationship may be expected to be non-linear.

Furthermore, the literature argues that reduced expenses (OETA) improve the efficiency, and hence, raise the profitability of a financial institution, implying a negative relationship between the operating expenses ratio and profitability (Bourke, 1989; Jiang *et al.*, 2003). However, Molyneux and Thornton (1992) find that the expense variable affects European banking profitability positively. They argue that

high profits earned by firms in a regulated industry may be appropriate in the form of higher salary and wage expenditures. Their findings support the efficiency wage theory, which states that the productivity of employees increases with the wage rate. This positive relationship between profitability and expense is also observed in Tunisian case study (Naceur, 2003) and Malaysian study (Guru *et al.*, 2002). The proponents argue that these banks are able to pass their overheads to depositors and borrowers in terms of lower deposit rates and/or larger lending assets.

Changes in credit risk (PL) may reflect changes in the health of a bank's portfolio (Cooper, Jackson and Patterson, 2003), which may affect the performance of the institution. Duca and McLaughlin (1990), among others, conclude that variations in bank profitability are largely attributable to variations in credit risk. Since inverse exposure to credit risk is normally associated with decrease firm profitability. This triggers discussion concerning not the volume but the quality of loans made. In this direction, Miller and Noulas (1997) suggest that the financial institutions being more exposed to high risk loans increase the accumulation of unpaid loans and decrease the profitability.

Banks are also subject to direct taxation (TOPBT) through corporate tax and other taxes. Although the tax rate on corporate profit is not a choice for banks, yet, the bank management should be able to allocate its portfolio to minimise its tax. Since consumers face an inelastic demand for banking services, most banks are able to pass the tax burden to the consumers. Such a positive relationship between the tax variable and profitability is confirmed by Demirguc-Kunt and Huizinga (1999), Bashir (2000) for banks in Middle East and Jiang *et al.* (2003) for banks in Hong Kong.

Liquidity (LA), arising from the possible inability of banks to accommodate decreases in liabilities or to fund increases on the assets' side of the balance sheet, is considered an important determinant of bank profitability. A larger share of loans to total asset should imply more interest revenue because of higher risk. Thus one would expect a positive relationship between liquidity and profitability (Bourke, 1989). Graham and Bordeleau(2010) argue that profitability is improved for banks that holding some liquid assets, however, there is a point at which holding further liquid assets diminishes a bank's profitability.

Empirical evidence from Athanasoglou *et al.* (2005) for banks in Greece shows that there is a positive and significant relationship between labour productivity (TRNE) and bank profitability. This suggests that higher productivity growth generates income that is partly channelled to bank profits. Banks target high levels of labour productivity growth through various strategies that include keeping the labour force steady, ensuing high quality of newly hired labour, reducing the total number of employees, and increasing overall output via increasing investment in fixed assets which incorporate new technology.

Another important determinant, which is supposed to influence the bank profitability, is the non-interest income ratio (NIITA). When banks are more diversified, they can generate more income resources, thereby reducing its dependency on interest income which is easily affected by the adverse macroeconomic environment. The result of Jiang *et al.* (2003) show that diversified banks in Hong Kong appear to be more profitable. However, fee-income generating businesses actually exert a negative impact on banks' profitability (Gischer and Juttner, 2001; Demirguc and Huizinga, 1999). They attribute such a finding to the fact that those fee-income generating businesses, such as trades in currencies and derivatives, credit cards provisions, are subject to more intense competition, especially on an international basis than those traditional interest income activities.

4.3 Industry-specific variables

Studies by Smirlock (1985), Bourke (1989), and Staikouras and Wood (2003) suggest that industry concentration has a positive impact on banking performance. The more concentrated the industry is, the greater the monopolistic power of the firms will be. This, in turn, improves profit margins of banks. However, there are also some studies that report conflicting results. For example, Naceur (2003) reports a negative coefficient between concentration and bank profitability in Tunisia. Also, Karasulu (2001) finds that the increasing concentration does not necessarily contribute to profitability of the banking sector in Korea.

Many studies in the banking literature investigate whether financial structure plays a role in determining banking performance[7]. In general, a high bank asset-to GDP ratio implies that financial development plays an important role in the economy. This relative importance may reflect a higher demand for banking services, which in turn, attracts more potential competitors to enter the market. When the market becomes more competitive, banks need to adopt different strategies moves in order to sustain their profitability.

Demirguc-Kunt and Huizinga (1999) present evidence that financial development and structure variables are very important. Their results show that banks in countries with more competitive banking sectors, where bank assets constitute a large portion of GDP generally have smaller margins and less profitable. Also, they notice that countries with underdeveloped financial system tend to be less efficient and adopt less-than-competitive pricing behaviours. In fact, for these countries, greater financial development can help to improve the efficiency of the banking sector.

Stock market becomes larger, more active and more efficient as countries become richer. Hence, developing countries generally have less developed stock markets. A substantial body of literature (e.g. King and Levine, 1993a; King and Levine, 1993b; Demirgüç-Kunt and Maksimovic, 1998; Levine and Zervos, 1998; Rajan and Zingales, 1998; Demirgüç-Kunt and Huizinga, 1999; and Demirhuc-Kunt and

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[7] See Hassan and Banshir (2003), Demirguc-Kunt and Huizinga (2000).

Huizinga, 2001) have shown that stock market development leads to higher growth of the firm, industry and country level. Specifically, Demirguc-Kunt and Maksimovic (1998) show that firms in countries with an active stock market grow faster than predicted by individual form characteristics.

Empirical evidence from Demirguc-Kunt and Huizinga (1999) and Bashir (2000) show that banks have greater profit opportunities in countries with well-developed stock markets. They argue that the larger equity markets in these countries give the banks operating therein greater opportunities to expand their profits. Stock market development leading to increased profitability for banks indicates complementarities between bank and stock market finance, growth and development. This is because stock market development and resulting improved availability of equity finance to firms reduce their risks of loan default, increase their borrowing capacities and allow them to be better capitalized. Also as stock markets develop, improved information availability on publicly traded firms makes it easier for banks to evaluate and monitor credit risks associated with them, simply put developed stock markets generate more information about firms that is also useful for banks. This tends to increase the volume and decrease the risk of business for banks, making higher profit possible. Alternatively, the legal and regulatory environment that makes stock market development possible may also improve the functions of banks.

4.4 Macroeconomic variables

To measure the relationship between economic conditions and bank profitability, the annual inflation rate is used. Inflation is an important determinant of banking performance. In general, high inflation rates are associated with high loan interest rates and high income. Perry (1992), however, asserts that the effect of inflation on banking performance depends on whether inflation is anticipated or unanticipated. If inflation is fully anticipated and interest rates are adjusted accordingly, a positive impact on profitability will be exerted. Alternatively, unexpected raises in inflation causes cash flow difficulties for borrowers which can lead to premature termination of loan arrangements and precipitate loan losses. Indeed, if the banks are sluggish in adjusting their interest rates, there is a possibility that banks cost may increase faster than bank revenue. Hoggarth *et al*. (1998) also conclude that high and variable inflation may cause difficulties in planning and negotiating loans.

The findings of the relationship between inflation and profitability are mixed. Empirical studies of Guru *et al*. (2002) for Malaysia and Jiang *et al*. (2003) for Hong Kong show that high inflation rates lead to higher bank profitability. The study of Abreu and Mendes (2001) nevertheless report a negative coefficient of inflation for European countries. In addition, Demirguc-Kunt and Huizinga (1999) notice that banks in developing countries tend to be less profitable in inflationary environments particularly when they have a high capital ratio. In these countries bank cost actually increase faster than bank revenue. Besides the inflation, GDP growth is supposed to considered, however, because there is a multicollneality problem, this variable is

excluded from this study. In this study, we only consider inflation as an important macroeconomic variable of the Chinese economy. Shen and Lu (2008) use the GDP as the key macroeconomic variable to explain the bank profitability in China. However, this study uses inflation to: (i) examine the determinants of bank profitability in China and (ii) compare the results from inflation with those from GDP.

4.5 Econometric specification

We present a model which is able to capture the effects of bank-specific, industry-specific and macroeconomic variables on profitability in China. Bank profits show a tendency to persist over time, reflecting impediments to market competition, informational opacity and/ or sensitivity to regional/macroeconomic shocks to the extent that these are serially correlated (Berger *et al.*, 2000); therefore, we adopt the model proposed by Athanasoglou *et al.* (2008) where its dynamic specification includes lagged dependent variable among the regressors. Our GMM model is based on a general model which has the following linear form:

$$II_{it} = c + \sum_{j=1}^{j} \beta_j X_{it}^j + \sum_{l=1}^{l} \beta_l X_{it}^l + \sum_{m=1}^{m} \beta_m X_{it}^m + \varepsilon_{it} \qquad \varepsilon_{it} = v_{it} + u_{it} \quad (1)$$

Where II_{it} is the profitability of bank *i* at time t, which i=1,.....,N, t=1,.....,T, c is the constant term. X_{it}'s are the explanatory variables and ε_{it} the disturbance term, with v_{it} the unobserved bank-specific effect and u_{it} the idiosyncratic error. This is a one-way component regression model, where $v_{it} \sim$IIN(0, σ_v^2) and independent of $u_{it} \sim (0, \sigma_u^2)$. The X_{it}'s are grouped into bank-specific X_{it}^j, industry-specific X_{it}^l and macroeconomic variables X_{it}^m.

Equation (1) augmented with lagged profitability has the form (Athanasoglou *et al.* 2008):

$$II_{it} = c + \delta II_{i,t-1} + \sum_{j=1}^{j} \beta_j X_{it}^j + \sum_{l=1}^{l} \beta_l X_{it}^l + \sum_{m=1}^{m} \beta_m X_{it}^m + \varepsilon_{it} \qquad (2)$$

Where $II_{i,t-1}$ is the one-period lagged profitability and δ the speed of adjustment to equilibrium. A value of δ between 0 and 1 implies that profit persists, but will eventually return to their normal level. A δ value close to 0 means that the industry is fairly competitive (high speed of adjustment), while a value of δ close to 1 implies less competitive structure (very low adjustment).

Endogeneity, unobserved heterogeneity and correlation between regressors and lagged dependent variable make fixed or random effects not suitable for the estimation. Arellano and Bond (1991) derive a consistent GMM estimation for this model. It is a single left hand-side variable that is dynamic depending on its own past realizations. The Arellano and Bond (1991) estimation uses all available

lagged values of the dependent variable and lagged values of the exogenous regressors as instruments; it is called difference GMM. This method is criticized by Arellano and Bover (1995) and Blundell and Bond (1998) who argue that the GMM difference estimator is inefficient if the instruments are weak. Hence, they develop a new method which is called GMM system estimator and includes lagged levels as well as lagged differences. Roodman (2006) argues that GMM difference and system estimation can solve the problems of endogeneity, unobserved heterogeneity, autocorrelation and profit persistence. Bond (2002), however, argues that the unit root property makes the difference GMM estimator bias while the system GMM estimator yields a greater precision result. Hence, in our paper, the two-step GMM estimator (Liu and Wilson, 2009) is used to conduct the empirical analysis.

Table 3 provides information on the degree of correlation between the explanatory variables used in the multivariate regression analysis. The matrix shows that, in general, the correlation between the independent variables is not strong suggesting that multicollinearity problems are not severe or nonexistent. Kennedy (2008) points out that multicollinearity is a problem when the correlation is about 0.8, which is not the case here.

<< Table 3 – about here>>

5.   Empirical results

We investigate empirically the determinants of bank profitability using annual data for 101 Chinese banks over the period 2003-2009. The complementary measures of bank profitability, ROA and NIM, are used (as discussed above).

One of the issues confronted is to examine whether individual effects are fixed or random. As indicated by the Hausman test on model (2), the difference in coefficients between fixed and random model is zero, providing evidence in favour of a random effect model. However, the least squares estimator of random effect model in the presence of a lagged dependent variable among the regressors is both biased and inconsistent. As mentioned in the methodology section, the two-step system GMM estimation is used in order to get robust results.

There are mainly two reasons to use ROA as one of the measurement of bank profitability. First, it shows the profit earned per unit of assets and reflects the management ability to utilise banks' financial and real investment resources to generate profit (see Hassan and Bashir, 2003). Furthermore, Rivard and Thomas (1997) argue that bank profitability is best measured by ROA because it is not distorted by higher equity multipliers.

Table 4 shows the results from the econometric models. Starting with ROA, a high significant coefficient of lagged profitability variable confirms the dynamic character of model specification. For example, δ takes a value of approximately 0.22, which means that profits seem not to persist; it implies that departures from a perfectly

competitive market structure in the Chinese banking sector is small. In contrast, Garcia-Herrero *et al.* (2009) find that the statistical evidence for profit persistence in Chinese banking sector is stronger.

In terms of taxation, the variable is negatively related to the bank profitability of Chinese bank, indicating a negative relationship between taxation and bank profitability. The more taxes paid by the bank, the higher cost incurred by the bank, thus decrease the profitability. The result is supported by Hameed and Bashir (2003) for Islamic banks from Middle East.

The coefficient of credit risk entered the regression model with a negative sign and statistically significant indicating a negative relationship between credit risk and bank profitability. Fadzlan and Royfaized (2008) find the same result in terms of Philippine banking industry. This result is also supported by Liu and Wilson (2009) for Japanese banks. Millar and Noulas (1997) suggest as the exposure of the financial institutions to high risk loan increases, the accumulation of unpaid loans would increase and profitability would decrease. However, the result of positive relationship is found in Chinese banking industry by Fadzlan and Khazanah (2009).

We find that cost efficiency is highly significant and positively related to ROA; this is in line with Abreu and Mendes (2001) for banking industry in Portugal, Spain, France and Germany. It is also a testimony that banks have the ability to pass the overhead expenses on customers through increasing lending rate and decreasing deposit rate.

The negative and significant relationship between non-traditional activity and ROA implies that financial institutions that derive a higher proportion of their income from non-interest sources, such as fee-based services, tend to report a lower level of profitability. The empirical findings are not in line with those reported by Canals (1993); he suggests that revenues generated from new business units have significantly contributed to improve bank performance. However, this result is in line with Wu *et al.* (2007) for Chinese banks. One explanation is that the main motivation for Chinese banks to develop non-traditional activities is to attract new customers rather than boost the profit; as a result, the fee charged for the non-traditional services is very low, in some cases; this leads to a decrease in profitability.

Concerning the impact of labour productivity, it is positively related to profitability of Chinese banks, indicating a positive relationship between bank profitability and labour productivity. This is in line with Athanasoglou *et al.* (2005) for Greek banks. This result suggests that higher productivity growth generates income that is partly channelled to bank profits. Banks target high levels of labour productivity growth through various strategies that include keeping the labour force steady, ensuring high quality of newly hired labour (reducing the total number of employees) and increasing overall output via increasing investment in fixed assets which incorporate new technology.

Turning to the industry specific factors, the concentration is significant and the sign of the coefficient is negative indicating that there is a negative relationship between

concentration and bank profitability. This is in line with Garcia-Herrero *et al.* (2009) for the Chinese banking industry and Naceur (2003) for Tunisian banks.[8] We also report a positive and significant effect of banking sector development on bank profitability in China.

Further, a large proportion of bank assets in GDP indicate that there is a high demand of bank services. According to the circumstance of banking industry in China, the establishment of a new bank involves a very complicated procedure, and the requirement and decision made by the government to open a new bank is very strict. This makes a potential competitor difficult to enter the market, because the demand is increasing which makes the profitability of existing bank increase.

The sign of stock market development is positive and this variable is significant at 1% level indicating there is a positive relationship between stock market development and bank profitability. This finding confirms the empirical results of Ben Naceur (2003) for Tunisian banks who suggests that as stock market enlarge, more information become available. This leads to an increase number of customers to banks by making easier the process of identification and monitoring of borrowers. Consequently, this will contribute to a higher profitability. The positive relationship between stock market development and bank profitability shows that there are complementaries between stock market and banking development in China (this is in line with the theory).

Turing into the macroeconomic variable, inflation is found to be significantly and positively related to bank profitability. This implies that during the period of our study inflation is anticipated which gives banks the opportunity to adjust the interest rates accordingly, resulting in revenues that increase faster than costs, with a positive impact on profitability. This result is consistent with the findings by Pasiouras and Kosmidou (2007) for EU as well as Fadzlan and Khazanah (2009) and Garcia-Herrero *et al.* (2009) for Chinese banks.

In order to check the robustness of the result, the NIM is used as an alternative dependent variable while the C3 ratio is used instead of C5 ratio. The C3 and C5 ratios are the proportion of the largest three or five banks in terms of total assets to the assets of the whole banking industry.

In terms of the NIM, we can see that most of the results are similar to what we obtain from ROA; However, we find that there is a negative and significant impact of bank size on bank profitability in China. This result is not in line with Fadzlan and Khazanah (2009). Herffernan and Fu (2008) find that there is insignificant relationship between bank size and profitability. The negative effect of bank size on profitability could be due to bureaucratic reasons when banks become extremely large. This is also reported by Pasiouras and Kosmidou (2007), Ben Naceur and Goaid (2008).Furthermore, credit risk is significantly and positively related to NIM.

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[8] This is in direct contrast with the structure-conduct-performance (SCP) hypothesis and the findings of Demirguc-Kunt and Huizinga (1999) and Hassan and Bashir (2003).

This result is confirmed by Fadzlan and Khazanah (2009) for the Chinese banking industry. Thirdly, liquidity is found to be significantly and positively related to NIM. This is in line with Fadzlan and Khazanah (2009); therefore, a larger volume of loan will generate higher interest revenue because of higher risk.

<<Table 4 - about here>>

6. Summary and conclusion

This paper examines the determinants of profitability of five SOCBs, twelve JSCBs and eighty-four CCBs covering the period from 2003-2009. Bank-specific, industry-specific variables and a macroeconomic variable (inflation) are considered. We use unbalanced bank-level panel data with totally 197 observations. Bank profitability is measured by two different variables, the ROA and NIM.

The empirical findings suggest that higher cost efficiency, lower volume of non-traditional activity, higher banking sector and stock market development tend to increase profitability of Chinese banks. There are mixed findings about the effect of risk on Chinese banking profitability in terms of ROA and NIM; in particular, small bank size seems to increase the NIM of Chinese banks, while the higher NIM can also be explained by the higher liquidity of Chinese banks. Higher labour productivity leads to higher ROA of Chinese banks. The positive relationship found between inflation and profitability in Chinese banking sector reflects the fact that the inflation in China can be fully anticipated and the interest rates are adjusted accordingly. This further implies that revenues increased faster than costs. This result is in line with Pasiouras and Kosmidou (2007) for the European banks, Fadzlan and Khazanah (2009) and Garcia-Herrero *et al.* (2009) for Chinese banks.

In summary, cost efficiency, non-traditional activity, banking sector development, stock market development and inflation are related to bank profitability in China, no matter if ROA or NIM is used as dependent variable. However, credit risk is negatively related to ROA, but positively related to NIM; liquidity and bank size are significantly related to NIM but not ROA, and labour productivity has a positive effect on ROA only.

The findings of the current study have considerable policy relevance. First, Chinese banks should take emphasize on the improvement of labour management and training skills, the purpose of which is to increase their productivity and boost the profitability. Furthermore, the government should gradually continue to open the banking and stock market, as the well development of the financial sector is helpful in increasing banks' profitability in China.

Due to the fact that the results reported here are in line with previous studies for European banks (e.g. Pasiouras and Kosmidou, 2007), the current study can be extended by testing the relationship between inflation and other macroeconomic variables, such as GDP, with bank competition to see whether similar results can be

obtained using data from EU, US and China. The cost efficiency in this study is proxied by the ratio of overhead expenses over total assets. Further research should also consider other efficiency variables as well as the slack based model and bootstraps techniques for testing and measuring efficiency of large and small Asian banks. Finally, we should examine the profitability of Chinese banks using data from branches (location-to-location).

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Table 1 Variables considered in this study

variables	notation	measurement	Expected effect	type	source

ROA		Net income/total assets		Bank-specific	bankscope
NIM		Net interest income/earning assets		Bank-specific	bankscope
Bank size	LTA	Log of total assets	?	Bank-specific	bankscope
Credit risk	LLPTA	Loan loss provisions/total loans	-	Bank-specific	bankscope
liquidity	LA	Loans/assets	?	Bank-specific	bankscope
taxation	TOPBT	Tax/operating profit before tax	+	Bank-specific	bankscope
capitalization	ETA	Shareholder's equity/total assets	?	Bank-specific	bankscope
Cost efficiency	CE	Overhead expenses/total assets	?	Bank-specific	bankscope
Non-traditional activity	NTA	Non-interest income/gross revenues	?	Bank-specific	bankscope
Labour productivity	LP	Gross revenue/number of employees	+	Bank-specific	bankscope
concentration	C(3) C(5)	Total assets of largest 3 or 5 banks/total assets of the whole banking industry	?	Industry-specific	China bank regulatory commission (CBRC)
Banking sector development	BSD	Bank assets/GDP	-	Industry-specific	CBRC
Stock market development	SMD	Market capitalization of listed companies/GDP	+	Industry-specific	World bank
inflation	IR	Annual inflation rate	?	macro	World bank

Notes: + means positive effect, - means negative effect, ? means no indication.

Table 2 Descriptive statistics of all variables

Name	Mean	Standard	Min	Max

		deviation		
ROA	0.007	0.006	-0.003	0.11
NIM	2.85	1.11	1.89	3.76
Bank size	4.67	0.95	0.71	7.07
Credit risk	0.009	0.007	-0.002	0.042
liquidity	53.39	9.35	17.97	83.25
taxation	0.41	0.37	-4.56	3.18
capitalization	5.1	2.97	-14	31
Cost efficiency	0.012	0.004	0.004	0.04
Non-traditional activity	13.91	15.2	-34.22	128.42
Labour productivity	0.008	0.004	3.50e-06	0.019
Concentration(C3)	14.54	1.95	10.19	16.29
Concentration(C5)	20.61	2.5	14.66	22.12
Banking sector development	51.98	15.49	16.86	63
Stock market development	77	49.47	31.9	184.1
inflation	2.5	2.17	-0.77	5.86

Table 3 Cross correlation matrix

	ROA	NIM	size	risk	liquid	taxation	Capital	Cost	Non-traditional activity	Labour	C(3)	C(5)	Banking sector	Stock market	inflation
ROA	1														
NIM	0.44	1													
size	-0.03	-0.3	1												
risk	-0.15	0.21	-0.22	1											
liquid	-0.04	0.26	0.03	-0.06	1										
taxation	-0.15	-0.02	0.03	0.15	0.3	1									
capital	0.07	0.2	-0.29	-0.0002	-0.09	-0.18	1								
cost	0.16	0.51	-0.15	0.17	0.21	0.06	0.09	1							
Non-traditional activity	-0.04	-0.53	-0.03	0.09	-0.41	-0.07	-0.03	-0.07	1						
Labour	0.19	0.11	0.29	-0.07	0.14	-0.09	0.02	-0.19	-0.26	1					
C(3)	-0.003	0.07	-0.08	0.15	-0.003	0.22	-0.12	-0.009	0.03	-0.01	1				
C(5)	-0.08	0.002	-0.04	0.15	0.04	0.24	-0.18	0.01	0.04	-0.07	0.98	1			
Banking sector	-0.03	-0.08	0	-0.07	-0.03	0.03	0.11	-0.01	0.1	0.07	-0.18	-0.17	1		
Stock market	0.29	0.31	-0.25	-0.05	0.1	0.03	0.14	-0.11	-0.08	0.1	0.24	0.06	-0.29	1	
inflation	0.06	0.15	-0.03	0.11	-0.1	0.04	-0.04	-0.02	-0.01	0.13	0.79	0.72	-0.21	0.35	1

Table 4 Empirical results (two-step system GMM estimation)

Independent variables	ROA		NIM	
	coefficient	t-statistic	coefficient	t-statistic
Lag of dependent variable	0.22***	4.45	0.25***	5.5
LTA	-0.0002	-1.56	-0.07**	-2.35
LLPTA	-0.08*	-1.86	52.41***	5.89
LA	-0.00002	-1.21	0.013***	2.89
TOPBT	-0.005***	-4.72	-0.54***	-3.76
ETA	-0.00004	-1.39	-0.014	-1.54
CE	0.42***	6.24	117.93***	7.14
NTA	-0.00003***	-2.92	-0.028***	-8.86
LP	0.24***	5.08	3.13	0.31
C(3)			0.002	0.17
C(5)	-0.00009*	-1.84		
BSD	0.00002***	3.97	0.009***	5.93
SMD	0.00002***	8.36	0.004***	10.74
IR	0.0003***	5.79	0.04***	4.43
F test	1397.01***		1234.98***	
sargan test	87.37***		228.84***	
AR(1) test	Z=-2.49	P=0.013	Z=-2.45	P=0.014
AR(2) test	Z=-0.37	P=0.713	Z=-1.74	P=0.082

- the Sargan test is the test for over-identifying restrictions in GMM dynamic model estimation.

- Arellano-Bond test that average autocovariace in residuals of order 1 is 0. (H_0: no autocorrelation)

- Arellano-Bond test that average autocovariance in residuals of order 2 is 0. (H_0: no autocorrelation)

- ***,**,* are significant at 1,5 and 10 percent significance levels, respectively

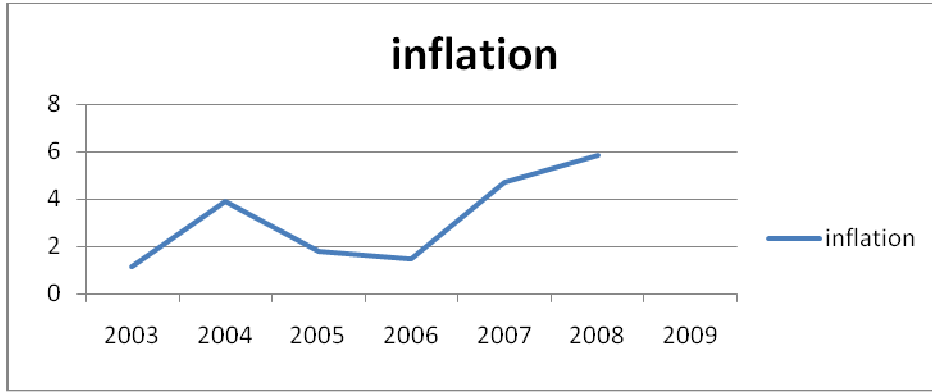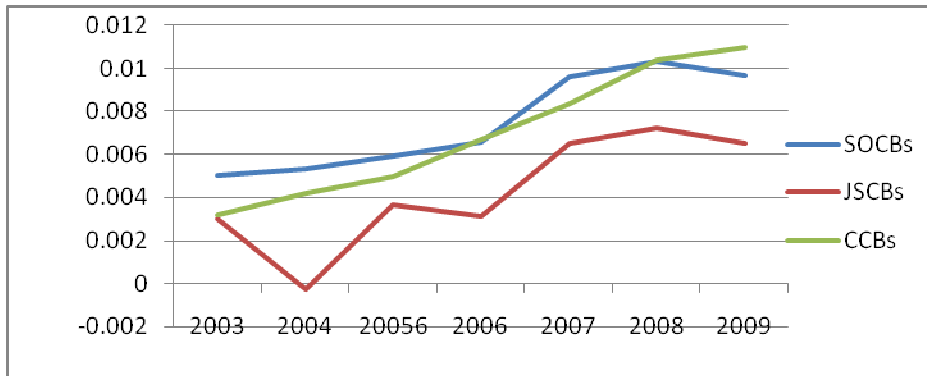Figure1 Inflation rate in China (2003-2009)

inflation

Figure 2 Profit changes of Chinese commercial banks (2003-2009)

2a ROA

2b NIM