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Stock market volatility and bank performance in China

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Abstract

This paper evaluates the determinants of bank performance in China. In particular, we examine the effects of stock market volatility, competition and ownership on bank performance in China. The sample comprises a total of 11 banks (four state-owned and seven joint-stock commercial banks) listed in the Chinese Stock Exchanges. The period under consideration extends from 2003-2009. The Generalized Methods of Moments (GMM) difference and system estimators are applied. Empirical results show that high level of stock market volatility can translate into higher Return on Equity (ROE) and Excess Return on Equity (EROE). Rather than leading to improved profitability, the labour productivity has a negative impact on Economic Value Added (EVA). Ownership does not have any effect on the profitability of Chinese banking industry. The bank profitability in terms of ROE and EROE is lower in the banking industry with higher competition. When using the GMM with ROE-COC and ROE, we find that high taxation has a negative impact on both state-owned and joint-stock banks, while the capital level is negatively related to joint-stock commercial banks. With regards to the other two performance indicators (EVA and NIM), the result suggests that higher cost efficiency and labour productivity improve the performance of both state-owned and joint-stock commercial banks. Large volume of non-traditional activity is the explanation of poor performance of state-owned commercial banks, while higher credit risk, lower taxation and mature banking industry are helpful in improving the performance of joint-stock commercial banks.

1. Introduction

The banking sector plays an important role in the development of country's economy. Given the relationship between well-function banking sector and economic growth in China provided by Burzynska (2009), we focus on the knowledge of underlying determinants affecting the Chinese bank performance.

Because China is a centrally planned economy until 1979, the Chinese financial system has been operating under a mono-bank financial system. The People's Bank of China (PBOC) is the only bank allowed in China. It conducts monetary and foreign exchange policy, and is responsible for the management of foreign reserve, deposit etc.

A comprehensive banking sector reform was started by the Chinese government in 1997 with the aim of transforming banks into market functioning and profitable institutions. The four state-owned commercial banks (SOCBs) 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. Besides the restruction of SOCBs, important steps are taken by the government and bank regulatory authority to liberalize the banking system among which the ceiling on the lending rates and the floor on the deposit rates are lifted, the share of directed lending is reduced and capital account is opened up on a gradual basis (Garcia-Herrero et al. (2009)).

In the extant literature, there has been surprisingly no research focusing on the joint effects of stock market volatility, ownership and competition on bank performance in China. This article seeks to examine the factors influencing the bank performance in China over 2003-2009, the period of which reflects the extensive banking reform. During this period, foreign share purchases of any domestic bank is allowed by the government and banking authority and banks are encouraged to be listed on stock exchanges in China in order to improve their management; hence, all of which are supposed to have positive effects on bank performance. The aims of the study are as follows: First, it investigates whether the ownership has significant relationship with bank performance. Moreover, we link the stock market with bank performance to see whether the stock market volatility affects the bank performance in China. Third, we test whether bank competition influences bank performance in China. Finally, we consider the most comprehensive bank-specific, industry-specific and macroeconomic variables to analyse the bank performance in China. The current study tests the following hypotheses: 1) Performance of joint-stock commercial banks is better than state-owned commercial banks in China; 2) Stock market volatility has a positive impact on bank performance in China (monthly stock returns as industry-specific bank performance determinant are used; 3) High competition is helpful in improving the bank performance in China (interest rate spread as main indicator is considered). As far as we are concerned, this is the first study that

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considers all the factors mentioned above in testing bank performance of the Chinese banking industry.

The rest of the paper is structured as follows: section 2 reviews the literature on the determinants of bank performance. Section 3 describes the methodology and data used in this study. Section 4 presents the empirical results. Section 6 summarizes and discusses the future research.

2. Literature review

Relevant literature shows that bank performance is assessed by two separate approaches. One approach focuses on the efficiency estimation using non-parametric Data Envelopment Analysis (DEA) or Parametric Stochastic Frontier Analysis (SFA) (see Wezel 2010; Casu and Molyneux 2003; Fiordelisi et al 2010). Most of these studies focus on US and European countries. In terms of the Chinese banking industry, SFA is used by Berger *et al*. (2009) to analyze the cost and profit efficiency of 38 Chinese commercial banks with different ownership over the period 1994-2003. The empirical findings suggest that reducing state-ownership and increasing the foreign participation have favorable effects on bank efficiency in China. They report that big four state-owned banks[1] are by far the least efficient due to the accumulation of non-performing loans, while the foreign banks in China are most efficient. Further, one-step SFA approach is employed by Yao and Jiang (2010) to investigate bank efficiency in China over the period 1995-2008. The results are summarized as follows: first, bank efficiency has improved over the examine period. Second, Chinese joint-stock commercial banks and city commercial banks outperform state-owned commercial banks. Finally, foreign ownership participation has a negative effect on profit efficiency in the long term, while the initial public offering improves bank efficiency in the short term

Other relevant papers investigate the determinants of bank profitability using financial ratios such as ROA, ROE and the Net Interest Margin. There is a large literature that has investigated the determinants of bank profitability. The determinants of European bank profitability are first 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 bank 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 in the case of UK. The determinants of bank profitability in Greece during the period of EU financial

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[1] These include the Bank of China(BOC), China Construction Bank (CCB), Agricultural Bank of China (ABC) and Industrial and Commercial Bank of China (ICBC).

integration are investigated by Kosmidou (2008). The findings reveal that higher capitalization fosters bank's Return on Average Assets (ROAA), while the efficient expense management is one of the most significant factors in explaining low bank's Return on Average Assets (ROAA). In terms of the macroeconomic indicators, higher GDP is associated with higher bank's Return on Average Assets (ROAA), while inflation is found to have a negative effect on bank's Return on Average Assets (ROAA). The determinants of Interest Margin in Serbia are examined by Marinkovic and Radovic (2010); they suggest that higher interest rate risk tends to improve bank's interest margin, whereas risk averseness is negatively related to bank's interest margin. The determinants of Bank Margin of Islamic and conventional banks in Indonesia are evaluated by Hutapea and Kasri (2010). The result exhibits that interest rate volatility has a significant and positive effect on conventional Bank Margin, but a negative impact on Islamic Bank Margin.

By contrast, few studies look at the bank profitability in China. Shen and Lu (2008) use 49 observations to investigate the effect of ownership on Chinese bank profitability and risk. The result shows the profitability of joint-stock commercial banks and city commercial banks are higher than state-owned and policy banks. The impacts of financial development and bank characteristics on the operational performance of 14 Chinese commercial banks are investigated by Wu *et al.* (2007). The result shows that the ROA performance of the small share holding commercial banks is found to be superior to that of larger banks. Chinese bank's efforts to develop the non-traditional activities actually have a negative impact on the ROA. They argue that the longer a bank has been in existence, the worse of its ROA.

Fadzlan and Khazanah (2009) examine the determinants of profitability of four state-owned and twelve joint-stock commercial banks during the period 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. They argue that capitalization, share of deposits and X-efficiency are positively related to bank profitability, while the results show 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 rate are found to be significantly related to bank profitability. However, 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.

Few studies investigate the relationship between stock market volatility and bank performance. Albertazzi and Gambacorta (2009) use five performance indicators (Net Interest Income, Non-Interest Income, Operating Cost, Provisions, Profit before Tax, and Return on Equity) to investigate the influence of stock market volatility on bank performance for main industrialized countries (Austria, Belgium, France, Germany, Italy, Netherlands, Spain, United Kingdom and United States) during the period 1981-2003. They report that Net Interest Income, Non-Interest Income, Provision and Return on Equity are positively related to stock market volatility, while the stock market volatility is negatively related to Profit before Tax. Further, no relationship between stock market volatility and Provisions is reported. They conduct the similar research in which the taxation variable is considered, and instead of Return on Equity, they use Profit after Tax. The results show that Profit after Taxes, Non-Interest Income and Provisions are positively related to stock market volatility. However, Net Interest Income is significantly and negatively related to stock market volatility.

Emery (1971) uses entry into the market as a proxy for competition to measure its effect on bank profitability. The results indicate that competition has no significant impact on bank performance (this is in accordance with the finding by Hassan and Bashir (2003) for the Islamic banking industry). The determinants of performance of Islamic banks are examined by Haron (1996). The results suggest that Islamic banks in competitive market earn more than those which operate in a monopolistic market.

This study has the following contributions. First, it extends other recent studies in the same area of research. In particular, we extend the paper written by Goddard *et al.* *(*2010) on the determinants of bank profitability of eight European Union countries between 1992 to 2007 by using additional dependent variables and independent variables. Besides Excess Return on Equity (EROE), the Net interest Margin (NIM), Return on Equity (ROE) and Economic Value Added (EVA) are also used as dependent variables. In terms of independent variables, the stock market volatility, competition and ownership are taken into consideration which are ignored by previous studies. We also extend the study by Albertazzi and Gambacorta (2010) by investigating whether the competition influences the bank performance in China. The difference between lending and deposit rate is used as the main indicator of bank competition; competition- bank performance relationship is examined through the General Methods of Moments (GMM) model. Finally, this study extends the paper by Hefferman and Fu (2010) on the determinants of financial performance in Chinese banking by introducing Excess Return on Equity as one of the dependent variables. The Excess Return on Equity is defined as the Return on Equity minus the estimated Cost of Capital. It is an important profitability indicator, see Fiordelisi and Molyneux (2010).

3. Methodology and Data description

Excess Return on Equity

There are some indicators that can be used to measure the bank performance in China according to previous literatures. Garcia-Herrero *et al.* (2009) use ROA and Pre-provision Profit to proxy bank performance, while Heffernan and Fu (2010) use Economic Value Added and Net Interest Margin as the main performance indicators in Chinese banking industry. In terms of country-level comparison of bank performance, Non-Interest Income, Net Interest Income, Return on Equity, Provisions, Operating Cost are used (Albertazzi and Gambacorta (2009)). Fiordelisi and Molyneux (2010) argue that these indicators assume that the Cost of Capital is same for all banks; however, it normally varies between countries and between banks within each country. The Excess Return on Equity (defined as the Return on Equity minus the estimated Cost of Capital) is used in our study as a measure of bank performance. Return on Equity is the ratio of net income after tax to the shareholder's equity. The Cost of Capital is not observed directly, the procedure of its calculation is followed as below.

Following Sharfman and Fernando (2008), the Capital Asset Pricing Model (CAPM) can be estimated using monthly stock returns for all the banks in the sample, in order to obtain the systematic risk measure (beta) for all the banks. The risk free rate is the three-month interbank rate, and the market rate of return is obtained from the Shanghai Stock Exchange Composite Index. The calculation of Cost of Capital is given by the risk free rate of the year plus the product of the estimated beta and the equity market risk premium. King (2009) shows that the equity market risk premium can be proxied by using the average historical return on equity relative to the risk free rate. In our study, we use the annual stock return on Shanghai Stock Exchange Composite relative to risk free rate over the period 2003-2009.

Economic Value Added (EVA)

Stewart (1991) and Stern *et al.* (1995) use the economic value added as a measure of performance. Millar (2005) compares EVA with widely-used performance indicators such as ROAA and ROAE for 16 British banks over 1998-2003. He finds that EVA shows a better performance than ROAA and ROAE (as dependent variable). The calculation of the EVA, following the method by Uyemura *et al.* (1996), can be expressed as follows:

$$EVA_{it} = (operatingprofitaftertax_{it} - capitalch\arg e_{it}) / factorinputs_{it}$$

Where $capitalch\arg e_{it} = capital_{it} * \cos tofcapital_{it}$

$factorinputs_{it} = operating\cos t_{it} + \operatorname{int} ersrt\cos t_{it}$

Where EVA_{it} is the performance of bank i at time t, which i=1.......N; t=1.......T.EVA is adjusted for factor prices, the aim of which is to minimize the possible

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heteroscedasticity and scale effects in the model. In terms of the calculation of cost of capital, Hefferman and Fu (2008, 2010) combine the LBS-First Consulting (as reported in the Economist in 1992) and Wang (2006) index; this study uses CAPM[2] to calculate the Cost of Capital (as reported previously).

There are several methods that can be used to measure the bank performance. For example, Kousmidou *et al*. (2003) use the fixed effect to investigate the determinants of bank profitability in UK from the period 1992-2005. Furthermore, Hansan and Banshir (2003) examine the determinants of Islamic bank profitability during 1994-2001 using Generalized Least Square (GLS) method. However, in this kind of research we may face a number of problems which will make these methods unsuitable. First, endogeneity may make the results biased. Secondly, unobserved heterogeneity across banks cannot be measured accurately. In addition, if the regressors are correlated with the lagged dependent variable, the results will be inconsistent.

In order to solve these problems, Arellano and Bond (1991) develop the difference GMM which uses all available lagged values of the dependent variables and lagged values of the exogenous regressors as instruments. This method is criticized by Arellano and Bover (1995) who argue that the GMM difference estimator is inefficient if the instruments are weak. Hence, they develop a new method, GMM system estimator, which 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 persisitence. Bond (2002) argues that the unit root property makes the difference GMM estimator bias while the system GMM estimator yields a greater precision result. Our study employs both methods, using the following dependent variables: Return on Equity and Excess Return on Equity (difference GMM estimator), NIM and EVA (system GMM estimator).

The following GMM specification proposed by Goddard *et al*. (2010) is used for the empirical analysis of this study. We empirically examine to what extent the performance of Chinese banks are influenced by internal factors (e.g. bank's specific characteristics) as well as by external factors (e.g. macroeconomic, financial industry structure).

$$II_{it} = \delta II_{i,t-1} + \sum_{j=1}^{j} \beta_j X_{it}^j + \sum_{l}^{l=1} \beta_l X_{it}^l + \sum_{m=1}^{m} \beta_m X_{it}^m + \mu_{it} + v_{it}$$

Where

II_{it} : Bank I's performance measure in year t, namely, ROE, EROE, NIM and

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EVA, which are Return on Equity, Excess Return on Equity, Net Interest
Margin, Economic Value Added

$II_{i,t-1}$: Bank I's performance in year *t-1*

X_{it}^{j} : Bank specific determinants which affect the profitability which include: bank

size, credit risk, liquidity, taxation, capitalization, cost efficiency, non-

traditional activity and labour productivity

X_{it}^{l} : Industry specific determinants which affect the profitability which include: log

of total assets of banking industry, lending/GDP, banking sector development,

stock market development, concentration, stock market volatility, bank

competition

X_{it}^{m} Macroeconomic variables which affect the profitability which include money

market rate, inflation and GDP growth

μ_{it} : An unobserved bank-specific time-invariant effect

v_{it} : A disturbance term which is independent across banks.

Our study adopts the dynamic performance specification which is motivated by the
theory of persistence of performance and assumes that incumbent firms are capable
of preventing imitation. If so, the performance tends to persist from year to year. In
the case of Chinese banking industry, as explained in previous section, the
government exerts big influence on the bank operation to direct the state-owned
banks to make loans to large state-owned enterprises (the businesses of which are
supported by the Chinese government). In this way, the state-owned commercial
banks establish a good relationship with them, thus make them have the advantage
of keeping the profitable customers. Our model is to test whether the performance of
Chinese banks persists over time. The GLS and fixed effect estimators are not
suitable for this dynamic model.

The test on the degree of correlation between explanatory variables used in the
multivariate regression analysis is also conducted. The result shows that the
correlation between the independent variables is not strong suggesting that
multicollonearity problems are not severe or nonexistent[3].

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[3] These results are available upon request.

Data

Our sample uses annual figures from 11 banks over the period 2003-2009. The banks used in this study are four state-owned and seven National joint stock commercial banks listed in the Chinese Stock Exchanges. These are: the Bank of China (BOC), China Construction Bank (CCB), Industrial and Commercial Bank of China (ICBC), Bank of Communication, China Citic Bank, China Merchant Bank, China Minsheng Bank, Industrial Bank, Guandong Development Bank, Shanghai Pudong Bank, Hua Xia Bank. Since not all the above banks have complete information for every year, we opt for the unbalanced panel data not to lose degrees of freedom. In terms of the difference GMM estimator, we have totally 43 observations while 53 observations are obtained for the estimation of system GMM estimator. The bank specific information can be obtained from two main sources: (1) the Bankscope database maintained by Fitch/IBCA/Bureau Van Dijk, which is considered as the most comprehensive database for research in banking, and (2) the annual financial statements of the above banks. In addition there are three sources that can be used to obtain the industry specific and macroeconomic information. These are: The World Bank Database, The China Banking Regulatory Commission and The Bureau of Statistics of China. The list of variables to proxy profitability, its determinants and descriptive statistics are reported in Table 1.

<< Table 1- about here>>

4. Empirical results

Table 2a and Table 2b report the key empirical results based on the estimation of difference GMM and system GMM, respectively. In terms of standard econometric tests, the F test indicates the joint significance of the independent variables. The Sargan test confirms that there is no over identification, while the significant of AR (1) suggests that the null of no first-order correlation is rejected, while the insignificant AR (2) underlines that the null of second-order serial correlation cannot be rejected. This result is expected in a first-differenced equation, the assumption of which is that the original disturbance terms are not serially correlated.

Table 2a shows the results obtained from the difference GMM estimation, which uses the Return on Equity and Excess Return on Equity as dependent variables. We find that higher credit risk is a significant indicator in explaining the poorer bank performance in China. This is in line with Liu and Wilson (2009) for Japanese banking industry. The coefficient of taxation has a negative sign which implies lower taxation paid by the bank leads to a better bank performance in China. This is in accordance with Vong and Chan (2009) for the Hongkong banking sector. Capitalization is found to be positively related to bank performance, which underlines

that poor performance of banks in China is associated with low capitalization. This is not in line with Hasan and Bashir (2006) for the Islamic banking industry. Furthermore, using Average Return on Equity as the dependent variable, Hefferman and Fu (2010) find that the relationship between capitalization and bank performance is not significant. There are several reasons for this finding. First, banks with more capital need to borrow less in order to support a given level of assets, which is very important in emerging countries where the ability to borrow is more subject to sudden stops. Second, a well-capitalized bank is an important signal of good creditworthiness. Third, capital can be regarded as a cushion to raise the share of risky assets, such as loans. Banks are able to make additional loans with a higher beneficial return which leads to better performance.

Further, we find that there is a negative relationship between bank competition and bank performance in Chinese banking industry. The Structure-Conduct-Performance (SCP) hypothesis assumes that, in the highly concentrated market which has lower competition, the large firms tend to collude with each other to get high profits. Our result is in line with Athanasoglou *et al.* (2006) who use ROA to investigate its relationship with competition in South Eastern Europe banking industry. Log of total assets, which can be regarded as the indicator of banking sector development, is found to be positively and significantly related to bank performance. In other words, we confirm that the higher level of maturity of Chinese banking sector will lead to significant improvement of bank performance in China. This is in line with Albertazzi and Gambacorta (2009) for main industrialized countries (Austria, Belgium, France, Germany, Italy, Netherlands, Spain, United Kingdom and United States).

Furthermore, lending/GDP is significantly and positively related to bank performance, which indicates that the increasing loan made by banks each year makes them have better performance. This result is in line with Albertazzi and Gambacorta (2010) for the main industrialized countries (Austria, Belgium, France, Germany, Italy, Netherlands, Spain, United Kingdom and United States). They find that there is a positive relationship between lending/GDP and Profit before Taxes, Profit after Taxes, Net Interest Margin and Operating Cost for the banks they examine. In our study, we find that stock market volatility is significantly and positively related to bank performance in China. Hence, the more volatile the stock market is, the better performance the Chinese banks have. Using different performance measures, Albertazzi and Gambacorta (2010) report similar results. One explanation of this result is that consumers are more likely to deposit the money into banks than investing to the stock market which makes banks have better performance. This is due to the fluctuation of the stock market volatility. Investigating the annual Federal Reserve System's report of conditions for commercial banks, Angbazo (1997) argues that the influence of stock market volatility on interest rate on loans is more effective than that on deposit which makes banks perform better in terms of the traditional loan-deposit services. Albertazzi and Gambacorta (2009) argue that the demand for financial derivatives increases during the period of uncertainty (high

volatility) which leads to better performance in non-traditional businesses provided by Chinese banks. The sign of stock market development is negative and significant, indicating that there is a negative relationship between stock market development and bank performance in China. This finding is in contrast to the empirical results reported by Ben Naceur (2003) for Tunisian banks. However, our finding is in line with Liu and Wilson (2009) for the Japanese banks. A high market capitalization ratio means economic expansion, while the easy access for firms to finance through stock markets reduces bank's business opportunities which results in a deterioration of performance.

In terms of the macroeconomic variables, we find that there is a negative relationship between bank performance and money market rate; however, Albertazzi and Gambacorta (2009) find that the money market rate is positively related to Provisions and negatively related to Profit before Taxes. In our case when the money market rate rises, which indicates that the banks are short of money to make loans, this lends to a deterioration of bank performance. Furthermore, inflation is found to be significantly and positively related to bank performance in China, possibly due to the ability of Chinese banks' to forecast future inflation, which in turn implies that interest rate has been appropriately adjusted to achieve better performance. This may also be viewed as a result of bank customers' failure to anticipate inflation; banks can gain normal profit from asymmetric information. This result is consistent with the findings reported by Pasiouras and Kosmidou (2007) for EU as well as Sufian (2009) and Garcia-Herrero *et al.* (2009) for Chinese banks. Further, The GDP growth is found to be significantly and negatively related to bank performance in China. This result is consistent with Liu and Wilson (2009) for the Japanese banking industry. This result partially supports the view that high economic growth improves business environment and lowers bank entry barriers. The consequently increased competition dampens bank's performance.

<<Table 2a- about here>>

Table 2b shows the result from the system GMM estimator, where we report few significant variables compared to the difference GMM estimator. We find that, in terms of NIM and EVA, the lag values of these variables are positively and significantly related to the dependent variables; this is in line with Hefferman and Fu (2010) for the Chinese banking industry. We also find that credit risk is positively related to NIM. However, the negative relationship between credit risk and EVA is not supported by Hefferman and Fu (2010). No matter what kind of performance indicators are used, we find that taxation is significantly and positively related to bank performance. Furthermore, cost efficiency is positively related to NIM, which is not in line with Hefferman and Fu (2010). As argued by Blaug (2001), efficiency is the driving force in shaping the future of a market; the bank with higher efficiency will have more market share which leads to better performance. We further report that

there is a negative relationship between the labour productivity and EVA, which indicates that the higher productivity of labour decreases banks' EVA in China. According to the EVA formula explained in the Methodology part, Chinese banks spend lots of money to employ personnel and improve productivity factor, which further results in a decrease of EVA. In addition, ownership is not significantly related to bank performance in China.

<<Table 2b- about here>>

We also conduct the difference GMM and system GMM tests on state-owned commercial banks and joint-stock commercial banks separately which are shown in Tables 3a, 3b, 4a and 4b, respectively. The difference GMM estimator suggests that the performance of both state-owned and joint-stock commercial banks in terms of ROE-COC and ROE is negatively affected by taxation; while capital level has negative impact on performance of joint-stock commercial banks (this effect is insignificant for state-owned commercial banks). Table 3a also indicates that there is a positive effect of inflation on performance of state-owned commercial banks in terms of ROE-COC and ROE, whereas it suggests that money market rate exerts a negative influence on performance of state-owned commercial banks over the examined period.

<<Table 3a-about here>>

<<Table 3b-about here>>

Tables 4a and 4b show the results from system GMM estimator that we use to investigate the determinants of performance of state-owned and joint-stock commercial banking using two performance indicators (EVA and NIM). The findings suggest that the cost efficiency and labour productivity have positive impacts on the performance of state-owned and joint-stock commercial banks, while the non-traditional activity has a negative impact on the performance of state-owned commercial banks. This result can be explained by the fact that the staffs in state-owned banks lack the experience and knowledge in engaging in the non-traditional business which leads to poor performance. The poor performance of state-owned commercial banks can be explained by big bank size, high money market rate and high stock market volatility. In terms of the joint-stock commercial banks, the better performance can be explained by higher credit risk, lower taxation and large volume of banking industry assets.

<<Table 4a-about here>>

<<Table 4b-about here>>

5. Summary and conclusion

The main objective of this paper is to identify the determinants of bank performance in China using EVA, NIM, Return on Equity and Excess Return on Equity as dependent variables. The sample covers 11 banks (4 state-owned and 7 national joint-stock commercial banks listed in Chinese stock exchanges) over the period 2003-2009. We further examine whether the stock market volatility and bank competition influence the bank performance in China. In addition, we test if ownership influences the bank performance. Both the difference and system GMM estimators are employed. The results show that credit risk is negatively related to Return on Equity, Excess Return on Equity and EVA, whereas it is positively related to NIM. There is also a positive relationship between capitalization and Return on Equity, Excess Return on Equity. Cost efficiency is not significant in terms of Return on Equity, Excess Return on Equity and EVA, while positive relationship is found between cost efficiency and NIM. Labour productivity tends to have no effect on NIM, Return on Equity, Excess Return on Equity, but it is negatively related to EVA. We further report that there is a negative relationship between bank competition and bank performance in terms of Return on Equity and Excess Return on Equity. No matter what kind of methods or what kind of performance indicators used, taxation is always significantly and positively related to bank performance. Finally, we find that stock market volatility is positively related to bank performance in terms of Return on Equity and Excess Return on Equity. No significant effect is found between ownership and bank performance in China. The results show that difference GMM gives significant result in terms of the effects of GDP growth, inflation and stock market volatility on EROE (CAPM) and ROE. We do not get the same conclusion when the system GMM is considered, where inflation and stock market volatility parameters are not significant. Although this is not in line with previous empirical studies (Goddard *et al.* (2010)), our paper proves that the GMM difference estimator may be more efficient than GMM system estimator when calculating Chinese bank performance.

Moreover, we apply the different and system GMM estimator to state-owned and joint-stock commercial banks separately to comparing the determinants of performance between different ownerships. We find that, when the performance is measured by ROE-COC and ROE, high taxation has a negative impact on both state-owned and joint-stock banks, while the capital level is significantly and negatively related to joint-stock commercial banks. The result also indicates that state-owned banks perform better in a higher inflationary environment and when the money market rate is lower. With regards to the other two performance indicators (EVA and NIM), the result suggests that higher cost efficiency and labour productivity improve the performance of both state-owned and joint-stock commercial banks. Due to the fact that the staffs working in state-owned commercial banks lack the experience in engaging in the non-traditional businesses, the non-traditional activity negatively influences the performance of state-owned commercial banks. The higher

credit risk, lower taxation and mature banking industry are helpful in improving the performance of joint-stock commercial banks.

The current study has relevant policy implications. First, in order to increase the profit earned from the traditional loan-deposit services, the Chinese banks should make loans to the highly risk projects or companies, and control the expenses including both the operating and personnel expenses. Furthermore, the government and bank regulatory authority should make policy such as inject capital to SOCBs and write-off NPLs for them to reduce the degree of competition in order to make banks have better performance.

The current research can be extended and improved by the following ways: (i) we should use other methods (e.g. the Rosse-Panzar H statistic) to calculate the bank competition in China, and (ii) we should examine other determinants of bank performance in Asian countries and compare them with our results.

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Table 1 Descriptive Statistics

Variable	Definition	Mean	SD	Min.	Max.	Obs.
Dependent variables						
ROECOC	Excess return on equity	11.94	6.49	25.72	-9.08	75
ROE	Return on equity	0.15	0.06	0.3	-0.06	75
NIM	Net interest margin	2.64	0.34	3.35	1.86	75
EVA	Economic value added	0.231	0.11	0.45	0.0002	73
Independent variables						
GDP growth		11	1.73	14.2	9.1	77
inflation		2.6	2.14	5.86	-0.7	77
Money market rate	Three months inter-bank rate	3.03	0.75	4.3	1.71	77
Stock market volatility	Monthly Share return of stock exchange	0.09	0.65	1.2	-1.08	77
Stock market development	Stock market capitalization/GDP	76.89	48.19	177.6	33.1	77
Lending/GDP		0.01	0.0008	0.012	0.0097	66
Log of total assets		6.15	0.32	6.47	5.44	77
Bank size	Log of total assets of the bank	6.03	0.51	7.07	5.22	86
Credit risk	Non-performing loans/total loans	0.007	0.004	0.025	0.0008	84
liquidity	Loans/assets	0.56	0.06	0.684	0.439	86
taxation	Tax/operating profit before tax	0.42	0.12	0.829	0.103	83
capitalization	Shareholder's equity/total assets	3.8	2.99	8.32	-11.83	86
Cost efficiency	Overhead expenses/total assets	0.01	0.001	0.0144	0.008	83
Non-traditional activity	Non-interest income/gross income	10.196	5.61	29	1.4	84
Labour productivity	Total revenue/number of employees	0.01	0.004	0.019	0.002	81
C(3)	The total assets of largest three banks/total assets of the whole banking industry	14.54	1.96	16.29	10.19	77
Banking sector development	Total assets of the banking industry/GDP	77.16	1.03	78.41	75.27	66
competition	Lending rate/deposit rate	3.33	0.16	3.6	3.06	66

Sources: Bankscope, Worldbank database, individual bank's annual report, China banking regulatory commission, National Bureau of statistics of China.

Table 2a Empirical results (difference GMM)

Independent variables	ROE-COC(CAPM) coefficient	t-statistic	ROE coefficient	t-statistic
Lag 1 of dependent variable	-0.096	-0.70	-0.097	-0.72
GDP growth	-20.66	-2.77**	-0.21	-2.75**
Inflation	47.9	2.62**	0.48	2.60**
Money market rate	-183.03	-2.52**	-1.82	-2.49**
Stock market volatility	57.1	3.41***	0.57	3.39***
Stock market development	-0.83	-3.21***	-0.008	-3.19***
Lending/GDP	14447.9	2.34**	143.86	2.34**
Log of total assets	530.91	3.32***	5.29	3.30***
Bank size	16.19	0.64	0.16	0.65
Credit risk	-829.97	-2.61**	-8.32	-2.62**
Liquidity	-21.33	-0.8	-0.22	-0.81
Taxation	-22.83	-2.82***	-0.23	-2.82***
capitalization	0.82	2.07**	0.008	2.07**
Cost efficiency	-219.9	-0.29	-2.26	-0.30
Non-traditional activity	0.24	0.72	0.002	0.71
Labour productivity	280.25	0.43	2.66	0.41
competition	-16.37	-1.76**	-0.164	-1.76**
F test	5.2***		5.49***	
Sargan test	40.83		40.72	
AR(1) test	-2.68***		-2.69***	
AR(2) test	0.1		0.09	
observations	42		42	

Notes: *,** and *** denote significance at 10,5 and 1% levels, respectively.

Table 2b Empirical results (system GMM)

Independent variables	NIM		EVA	
	coefficient	t-statistic	coefficient	t-statistic
Lag 1 of dependent variable	0.44	5.79***	0.2	2.87***
GDP growth	0.07	1.87*	0.012	1.78*
Inflation	-0.006	-0.13	0.007	1.64
Stock market volatility	-0.09	-0.41		
Stock market development	0.0002	0.07		
Lending/GDP	-37.61	-0.34	5.005	0.51
Log of total assets	1.34	1.33		
Bank size	0.07	0.72	0.023	0.84
Credit risk	19.59	3.28***	-3.77	-2.63**
Liquidity	0.39	0.85	0.17	1.55
Taxation	-0.57	-3.01***	-0.504	-10.86***
capitalization	0.0006	0.07	0.0004	0.08
Cost efficiency	84.24	4.96***	-4.4	-1.00
Non-traditional activity	-0.005	-0.92	0.002	1.37
Labour productivity	9.2	0.88	-5.07	-1.95*
C(3)	-0.06	-0.51	0.004	0.18
Banking sector development	-0.11	-1.40	0.0008	0.12
competition	0.11	0.43	-0.022	-0.35
Ownership dummy	0.01	0.12	-0.02	-0.59
F test	1676.28***		205.73***	
Sargan test	86.68		104.55	
AR(1) test	-2.50**		0.038**	
AR(2) test	-0.78		-1.46	
observations	53		50	

Notes: Significant F test confirms the joint significance of all independent variables. Arellano-Bond for AR(1) in first difference rejects the null of no first-order serial correlation, but the test for AR(2) does not reject the null that there is no second-order serial correlation. This is consistent with what one expects in a first-differenced equation with the original untransformed disturbances assumed to be not serially correlated.

*,** and *** denote significance at 10,5 and 1% levels, respectively.

Table 3a Empirical results for state-owned banks (difference GMM)

	ROE-COC		ROE	
	coefficient	T-statistics	Coefficient	T-statistics
Lag(1) of dependent variable	-0.003	-0.02	-0.009	-0.05
GDP growth	-3.91	-1.06	-0.04	-1.10
inflation	69.1	2.19*	0.68	2.20*
Money market rate	-250.06	-2.25*	-2.47	-2.24*
Stock market volatility	-48.56	-1.80	-0.48	-1.79
Stock market development				
Lending/GDP				
Log of total assets				
Bank size	93.49	1.74	0.94	1.76
Credit risk	-968.95	-2.11	-9.74	-2.14*
liquidity	17.99	0.22	0.17	0.21
taxation	-23.44	-2.41*	-0.23	-2.40*
capitalization	1.03	1.59	0.01	1.61
Cost efficiency	1560.12	0.91	15.31	0.90
non-traditional activity				
Labour productivity	3712.24	1.28	36.36	1.26
competition				
F test	8.43**		8.99**	
Sargan test	12.86**		13.01**	
AR(1)	-1.25		-1.24	
AR(2)	0.55		0.52	
observations	16		16	

Table 3b Empirical results for joint-stock commercial banks (difference GMM)

	ROE-COC		ROE	
	coefficient	T-statistics	coefficient	T-statistics
Lag(1) of dependent variable	-0.16	0.85	-0.16	-0.84
GDP growth	0.57	0.07	0.006	0.07
inflation	3.88	0.20	0.04	0.19
Money market rate	-9.73	-0.13	-0.09	-0.11
Stock market volatility	4.86	0.39	0.05	0.36
Stock market development	-0.12	-0.61	-0.001	-0.58
Lending/GDP	-1176.62	-0.22	-11.49	-0.22
Log of total assets	44.41	0.28	0.43	0.26
Bank size	2.34	0.09	0.02	0.09
Credit risk	-575.77	-1.34	-5.8	-1.33
liquidity	11.93	0.60	0.12	0.57
taxation	-33.32	-2.38**	-0.33	-2.35**
capitalization	-4.21	-4.86***	-0.04	-4.80***
Cost efficiency	-380.21	-0.65	-4.08	-0.69
non-traditional activity	0.36	0.82	0.004	0.83
Labour productivity	14.84	0.03	0.2	0.04
competition	1.24	0.18	0.013	0.188
F test	13.17***		13.34***	
Sargan test	20.16***		20.03***	
AR(1)	-3.05***		-3.11***	
AR(2)				
observations	26		26	

Table 4a Empirical results for state-owned banks (system GMM)

	NIM		EVA	
	coefficient	T-statistics	coefficient	T-statistics
Lag(1) of dependent variable	0.087	0.46	0.078	0.91
GDP growth	0.135	1.22	0.041	1.01
inflation	1.298	3.15	0.276	1.80
Money market rate	-4.33	-3.04**	-0.876	-1.71
Stock market volatility	-1.03	-2.81**	-0.138	-1.71
Stock market development	-0.003	-0.74	-0.002	-1.38
Lending/GDP				
Log of total assets				
Bank size	1.12	2.78**	0.257	2.01
Credit risk	-9.08	-0.62	-7.95	-1.75
liquidity	2.985	1.30	0.43	0.81
taxation	-0.36	-1.76	-0.54	-7.15**
capitalization	0.011	0.62	-0.006	-0.43
Cost efficiency	134.98	4.05***	6.09	0.50
Non-traditional activity	-0.05	-4.63***	-0.009	-2.39*
Labour productivity	234.03	2.68**	51.39	1.63
Competition				
Banking sector development				
Concentration				
F test	2078.56***		154.3***	
Sargan test	18.12***		13.17**	
AR(1)	-2.04**			
AR(2)				
observations	20		18	

Table 4b Empirical results for joint-stock commercial banks (system GMM)

	NIM		EVA	
	coefficient	T-statistics	coefficient	T-statistics
Lag(1) of dependent variable	0.48	3.67***	0.35	2.07*
GDP growth	0.22	0.02	-0.04	-0.22
inflation	-0.36	-0.02	0.18	0.47
Money market rate	0.89	0.01	-0.68	-0.47
Stock market volatility	-0.11	-0.40	-0.06	-1.01
Stock market development	-0.001	-0.17	-0.00002	-0.02
Lending/GDP	-8.51	-0.07	3.05	0.10
Log of total assets	3.39	2.18**	0.4	1.17
Bank size	0.103	0.42	-0.02	-0.21
Credit risk	34.31	2.47**	-9.68	-2.11*
liquidity	-0.6	-0.84	-0.39	-2.15**
taxation	-1.18	-2.68**	-0.2	-1.24
capitalization	-0.05	-1.75	-0.02	-2.40**
Cost efficiency	125.56	4.46***	2.18	0.31
Non-traditional activity	0.02	1.41	0.014	4.67***
Labour productivity	38.62	2.86**	3.67	0.88
Competition	0.28	1.01	0.005	0.951
Banking sector development	-0.26	-0.15		
Concentration	-0.41	-0.04	0.004	0.02
F test	1341.84***		77.89***	
Sargan test	35.28***		36.52***	
AR(1)				
AR(2)	-0.50			
observations	33		32	