

Effect of Bank Regulation on Financial Sector in China

By

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Abstract

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This paper tests whether changes in bank regulation will have any impact on financial sectors in China. The historical data on stock prices of the “big four” banks are collected through 2008 to 2013. To study the impact of bank regulation in this time period, this paper focused on several major changes that the banks have made before. The results show that only exchange rate and personal savings have the major effect on the volatility of the banks stock prices. In other words, regulating the exchange rates and personal savings will help the banks to predict their future performance of the financial sector.

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Chapter 1: Introduction

1.1 Purpose of study

The goal of this paper is to examine whether or not changes in bank regulation will have any impact on financial sectors in China. Because of the recent concerns about a slowdown of China's economic growth, the real estate market and others government debt are hidden risks to the financial sector in China domestically and internationally. Additionally, policy makers and others have a very real interest on the background to changes in banking regulations and if these regulations will hurt the banks in the long term.

1.2 Background

Bank regulation by governments gives the banks certain restrictions, guidelines and requirements to create transparency between the bank and its business partners such as individuals and corporations. The objectives of bank regulation are many faceted. There is an outstanding concern to reduce systemic risk and the risk that bank creditors will be exposed. However, there are number of other factors, that require regulation, and they include protecting banking confidentiality, credit allocation and may also include espousing corporate social responsibility

The minimum requirement for bank regulations is the maintenance of minimum capital ratios. This sets a framework on banks' capital and influences the capital requirements for each country. There is another requirement which is called a reserve requirement that sets the minimum reserves of banknotes and demand deposits, which each bank must hold (Koziol, 2013).

In China, there are "big four" banks, which are the Bank of China (BOC), Agricultural Bank of China (ABC), Industrial and Commercial Bank of China (ICBC) and the China Construction Bank (CCB). All are majority government-owned commercial banks. In 1995, according to Central Bank law, the central bank of China- People's Bank of China (PBOC) has the full right to set the interest rate for commercial banks and also has the right to trade in government bonds. But on April 28th 2003, the supervisory role of the People's Bank of China (PBOC) was taken over by the China Banking Regulatory Commission (CBRC), where the goal is to help the People's Bank of China (PBOC) to focus on the currency policy and the macro economy, maintain a safe and sounding banking system and also to improve bank supervision.

Among the "big four", Industrial and Commercial Bank of China (ICBC) is the largest bank in China that has the greatest total assets, total customers and total employees, and also ranks in the top five largest banks in the world. In the sector of trading and foreign-exchange

transactions, the Bank of China (BOC) plays an important role among others. In the agricultural sector, Agriculture Bank of China has the specialization in banking services to rural institutions, village enterprises and farmers. For the China Construction Bank (CCB), its focus is on the business of long-term projects such as housing development in urban areas and infrastructure development projects, which are the medium to long-term credit projects. Besides the “big four”, there are also lots of stated- owned banks that provide funds to the “big four” and support their performance. For example, the Agricultural Development Bank of China (ADBC), is one of the new “policy” banks that can reduce the direct spending of the government to the biggest four commercial banks. It also focuses as a fund provider to the rural areas. There are also some city commercial banks, second tier commercial banks and Trust and Investment Corporations such as Bank of Beijing and China CITIC Bank (Yan).

1.3 Need for Study

Based on the stability and high growth in China’s economy in the last few years, the financial sector has been successful. Because the banking sector is the most important of the Chinese financial system it will impact state-owned enterprises (SOEs) directly. As a result this study will concentrate on the banking sector in order to analyze and predict the future performance of the financial sector. Moreover, there is always the notion of “too big to fail”. With the concentration of banking,

changes in regulatory structures and in lending rates and currency rates will have a significant impact. This will also influence monetary policy, the oil price and personal savings that can influence economic growth and the real estate market.

1.4 Statement of Problem

Based on the recent bank regulation of the lending rate and the goal of monetary policy, people have lots of concerns and interest on whether these changes will have any benefit to the financial sector in China. From the recent news, due to the slowing down trend in economic growth and exports, there will be attempts to improve economic growth and quality of that growth (Yu, 2011). Therefore, in order to maintain the goal of the monetary policy and the stability of the real estate market, banks may need new policies. Moreover, any changes in the lending rate and the exchange rate will have feedbacks to domestic consumption and savings which will also affect economic growth. Therefore, it is really valuable to analyze the changes in bank regulations to forecast the financial performance of China. Moreover, the profitability of banks will be affected by these macroeconomic variables.

Chapter 2: Literature Review

2.1 The Chinese banking system

To understand the main characteristics of the Chinese banking system provides the basis to help understand the steps that a bank should take to reform. Firstly, China has an absolutely large banking system and bank credit continues to grow. Secondly, there are four large Commercial Banks, the “big four”, which are majority state-owned and they have a large concentration of the total assets of the banking sector. They have a major role in corporate lending and granting credits. Besides these four large Commercial Banks, the rest of the banks in China are relatively small, which is the main reason for the high interest margin.

However, the weight of the total assets has been shifted from the four large Commercial Banks to the other banks such as City Commercial Banks and Joint-Stock Commercial Banks, and this process has been called “equitization” (Martin, 2012). After the conversion, the services of the banks have been diversified in not only corporate but also in personal financial services, and in the case of overseas, minority ownership (see Table 2.1).

Table 2.1 Size and Ownership of China's Equitized Commercial Banks

Bank	Market Capital	State Holdings of Outstanding Shares	Major U.S. Holdings of Outstanding Shares
Agricultural Bank of China	1.010 trillion	83.13%	None
Bank of China	0.265 trillion	67.53%	None
Bank of Communications	366 billion	26.52%	None
China Construction Bank	1.401 trillion	57.0%	Bank of America – 10.9%
Industrial and Commercial Bank of China	1.359 trillion	70.7%	American Express – 0.2% Goldman Sachs – 4.9%

Sources: home page of banks

The Chinese banking system has had a history of poor asset quality and poor profitability with a ratio of nonperforming loans at 20% and a 3.05% of ROE and 0.14% of ROA, all below the international standards (Garcia-Herrero, 2006).

Another feature is the weakness in corporate governance and the pervasive government ownership. As has been mentioned clearly, there

are also some local banks in China known as city commercial banks, such as Shaihai Pudong Development Bank and Guangdong Development Bank. These banks are fully controlled by their respective local governments. Starting from 2004, both city commercial banks and rural cooperative banks were transformed to Joint-Stock Commercial Banks, but the local government still holds the largest amount of shares. Due to the limited size of these local banks, they should not be able to compete with the “big four” banks and equitized banks. Moreover, these local banks have the priority to be chosen to manage the pension funds and government-related accounts or provinces, finances by the local government. Besides the local banks, there are also “Private” Commercial Banks and the best-known and the largest one is China Minsheng Bank, which is the first non-government controlled joint-stock commercial bank.

Foreign-owned banks are another type of “Private” Commercial Banks. Based on the research on the China Banking Regulatory Commission, there are 37 wholly foreign-owned banks, 1 wholly foreign-owned finance company and 2 foreign joint-venture banks, which are incorporated in China, with 270 subsidiaries or branches (see Table 2.2). Ninety foreign banks opened their home branches in China. Therefore, among the 27 provinces and 45 cities, there are 360 separate foreign banks that operate in China and own 1.83% of China’s total banking assets (Martin, 2012).

Table 2.2. Foreign Banking Establishments in China

	Foreign Banks	Wholly Foreign-owned Banks Incorporated in China	Joint Venture Banks Incorporated in China	Wholly Foreign-owned Finance Companies Incorporated in China
Number of Entities	N/A	37	2	1
Branches or Subsidiaries	90	260	9	1

Source: China Banking Regulatory Commission, 2010 Annual Report

Finally the banking system has a weak institutional framework due to the loose supervision and regulation. The government makes decisions for the central bank and regulatory bodies. The other weakness is that the bankruptcy law is insufficient.

2.2 Logic of Bank regulation

The main purpose of bank regulation is to provide stability to the system by protecting the savings of small depositors in particular and reducing the expose of risk for governments and taxpayers of having to provide bailouts. From the microeconomic side, changes in regulations have also been geared to making the banking system more competitive and

innovative by building incentives. However, this can cause moral hazard.

Banking regulation concerns the ability of creditors to monitor the lending risks, agency issues and from both the micro and macroeconomic sides, banking regulation concerns preventing and if this is not possible, managing bank crises in terms of the stability of the banking system (Biggar and Heimler, 2005).

There are list of bank regulatory provisions: 1) new entry and branching restrictions; 2) controls on interest rates and other prices; 3) ownership linkages on financial institutions; 4) banks can only hold limits of asset in their portfolios; 5) deposit insurance; 6) set requirements on capital-adequacy; 7) provision for the quantity of the liabilities requirements; 8) set requirements of formal rules for enterprises; 9) receive “lender of last resort” as assistance in the event of bank difficulty; 10) special rules for failing banks and merger events; 11) rules for the payment systems that will affect the banking sector (Biggar and Heimler, 2005).

Starting from the 1970s, many countries have already processed with bank regulation and reregulation, for example control of interest and lending rates, restrictions on investing in financial institutions, line-of-business and entrance of foreign financial institutions and control of the foreign exchange transactions and international capital movements (Biggar and Heimler, 2005). As one of the world’s largest economies,

Chinese banking regulation will have a huge effect not only on the own country's financial sector, but given its foreign exchange reserves and holding of assets offshore, also on the international market.

2.3 Steps taken in banking regulation

The start- point for the regulation is to shake-up the institution of the Chinese banking system. The first step was taken in 1984 with the substitution of the mono-bank system with a multi-tiered one, with the separation of the central banking functions. Following this step was the separation of commercial banking from the economic development strategic priorities. In the end, in 1994 policy lending banks were established in order to take over the development purpose projects from State-Owned Commercial Banks (García-Herrero, Gavilán and Santabarbara, 2006).

In the more recent context, there have been several steps in this 'shake-up'. The first was to restructure the banking system. Since the Chinese banking system is still suffering poor asset quality and poor profitability, restructuring has been the most important steps in bank reform. On banking regulation state-owned Commercial Banks have been the main concentration with two different steps: 1) capital injection, 2) Nonperforming loans clean-up.

Capital Injection

During 1999-2000, the government reduced the reserve requirement in order to eliminate the banks' liquidity so that the banks could obtain government paper. And then the receipts of this purchase were transferred back to these banks as fresh capital by the government. This process happened between the "big four" banks and the Asset Management Companies, where the total transferred amount was USD 170 billion. On December 2003, USD 22.5 billion of capital from the country's official international reserves was injected in the Bank of China and China Construction Bank. On April 2005, there was another amount of capital from the official international reserves of USD 15 billion that was injected into the Industrial Commercial Bank (García-Herrero, Gavilán and Santabarbara, 2006).

Nonperforming loans clean-up

Nonperforming loans are collected and restructured into equity through Asset Management Companies. These companies can also issue bonds and can pay the nonperforming loans using the borrowed capital from financial institutions. Moreover, they can also recommend companies for listing and restructure SOEs.

There were three waves in restructuring. First is that each of the Asset Management Companies received nonperforming loans at face value of

8% of GDP from the Stated-Owned Commercial Banks and issued a 10 year bond with an annual 2.25% coupon for 83% of that amount and paid the remaining 17 percent in cash (García-Herrero, Gavilán and Santabárbara, 2006). Second is that the companies use auctions to transfer nonperforming loans. The method is that the highest bidding company will receive the nonperforming loans. Last, part of the nonperforming loans, USD 30 billion was transferred to the Ministry of Finance (García-Herrero, Gavilán and Santabárbara, 2006) and the rest of the nonperforming loans, with a face value of \$55 billion were bought by the People's Bank of China. In the end, the amount that People's Bank of China bought was auctioned at 26% of the face value to Asset Management Companies (García-Herrero, Gavilán and Santabárbara, 2006).

Table 2.3. Asset Management Companies disposal of Nonperforming loans in 2005

Asset Management Companies	Stated-Owned Chinese Banks	Asset transferred (USD billions)	Share of banks loans outstanding	NPL resolved	NPL resolved (%)	Cash recovery
Orient asset management	BOC	32.3	20.4	12.9	39.9	2.9
Great Wall asset management	ABC	41.8	24.6	25.8	61.8	2.7
Cinda asset management	CCB	45.0	21.7	18.56	41.2	6.2
Huarong asset management	ICBC	49.2	17.9	25.9	52.6	5.1
Total		168.3	20.7	83.2	49.4	16.9

Source: PBC, CRBC, annual reports, BIS working paper NO. 115

The second step for bank regulation is that the Chinese government always seeks for financial liberalization because the Chinese banking system is massive and complicated due to national conditions and long-term development. In order to achieve liberalization, the government took several actions: introducing market practices, interest rate liberalization, allowing foreign competition and controlling the exchange rate.

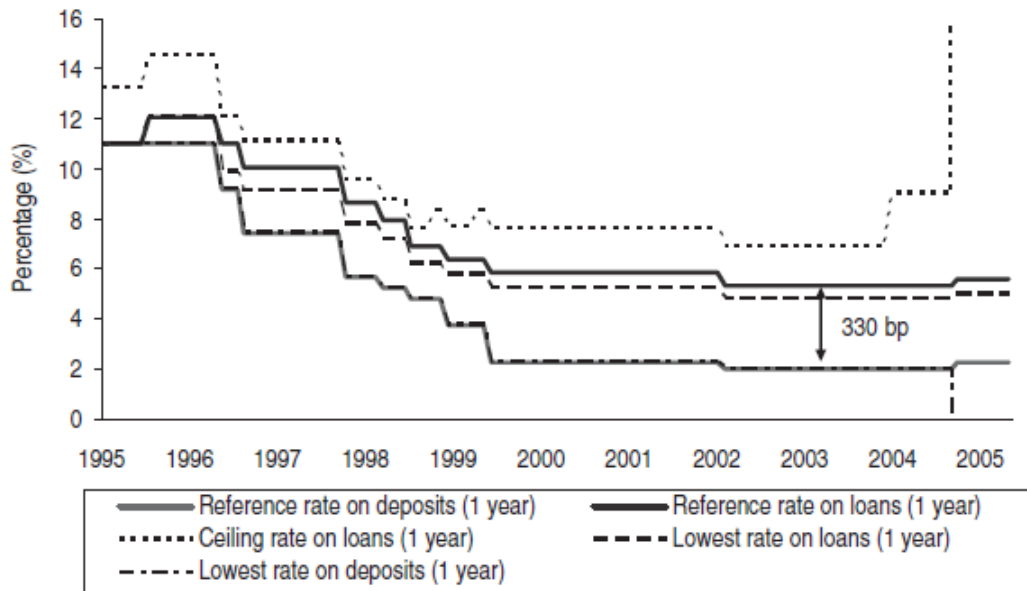
Introducing market practices

The Chinese government started reducing the government intervention in the banking system in 1990s. During this decade, several actions were taken, such as reducing reserve requirements, discouraging banks from stowing liquid assets and encouraging them to manage assets. In the meantime, State-owned Chinese Banks were given more power to decide their lending.

Interest rate liberalization

Liberalized interest rates greatly improved resource allocation in the financial markets. Although the liberalization has not yet been achieved, the sequences are still gradually moving on. At the very first, interest rate in money markets and bond markets were liberalized, then moving on to loans, deposits and currencies and there was no limit in the lending rate and deposit rate. But there is a small difference between the deposit rate and reference lending. For example (see Figure 2.1), the difference hovered at 330 basis points until 2006. In April 2006, when the difference was widened in 27 basic points, bank offers a safe margin in order to maintain a high net interest margin (García-Herrero, Gavilán and Santabarbara, 2006).

Figure 2.1 China's Banking Reform



Source: CEIC

Allowing foreign competition

China joined into the World Trade Organization (WTO) in 2001, which was taken as a signal that China was ready to open up its banking system to foreign affiliates. Compared to 2001, foreign banks could offer all banking services in China, even offer services to households, which was a huge step forward by the end of 2006.

It is worth mentioning that the global oil prices would influence the bank performance in various ways. Directly, it would affect the bank profit through oil related lending, excess liquidity in the bank system and the related business activity. Indirectly, fiscal spending will be affected by the oil income and this will influence bank profits and all firms via lending to the private sector. Also, the higher the oil prices, the higher the

domestic demand, and the higher the bank repayment and lending rates.

Controlling the exchange rate

In 2006, Chinese citizens were allowed to invest in foreign financial markets, although the investment position was limited. The growth of the amount invested in the foreign market was increased very fast in the next few years. The fast growing amount led to unbalanced capital inflows and outflows, and then the Chinese government started to control the exchange rate by regulating foreign currency transactions.

The last step for institutional shake-up is to improve regulation and supervision. In order to improve the regulation, the liberalization and restructuring measures have played a main role. The People's Bank of China established the non-fully compulsory international five-tier loan in 2002. However, at the end of 2005 all the banks were fully included with the five-tier loan and introduced peer group comparison as the new tool to improve the monitoring of the banks' nonperforming loans. In 2006, a bank's lending limit to the corporate sector and large SOEs were the concentration of the regulation. Moreover, a risk-based framework has been adopted for bank regulation and also it is in the guidelines for market risk, credit risk and operational risk. Finally, due to the early lack of legal protection for the supervisors, there was a consideration about the banks enforcement. Already some great efforts

have been made through the creation of shareholder boards with outside directors to improve bank corporate governance. But this is only a very small step (García-Herrero, Gavilán and Santabárbara, 2006).

2.4 Potential impact on the financial sector

Large banks would be most affected directly through the regulation since they dominate the global banking. Although bank restructuring made the effort in the asset quality improvement, the results for capitalization do not seem strong enough. The solvency ratio for 2003 was only 6.73% and the ratio of equity to assets 4.3%, which are all similar with the values before the regulation started (García-Herrero, Gavilán and Santabárbara, 2006). In fact, while the ratio equity to assets of the banking system has been positively impacted due to the capital injections, due to the large amount of the capital injection and only a few funds involvement, the aggregate ratio of equity to assets fell again. Regardless, the restructuring has reduced the nonperforming loans.

Through the liberalization process, government interference has been reduced, but compared to the international standards, the interference by the government is still too large and the competition between the “big four” banks is still too weak. In an analysis of Chinese banks to explain the fall in profitability, the most important part is the decline in inflation and real interest rates (García-Herrero, Gavilán and Santabárbara,

2006). Therefore, it seems like the regulation on the Chinese banking system only improved the asset quality, but did not bring a huge benefit for the whole financial sector.

Since all banks were nationalized under the People's Bank of China, it manages the monetary policy for the country. It is responsible for setting up the interest rate for intra-bank lending, controlling the supply of money and also setting reserve requirements for banks and other financial institutions (Martin, 2012). Moreover, the People's Bank of China can also offer the interest rate above and below the benchmark for loans and deposits in its monetary policy. For instance, due to the Wenchuan earthquake in May 2008, the floor mortgage rate was lowered by People's Bank of China to 70% of the benchmark. Demirguc-Kunt and Huizinga (2000) have confirmed that there is a link between profitability, inflation, interest rates and bank performance.

2.5 Objectives

According to the previous research, the importance of setting up the interest rate and inflation rate are diffusely confirmed. Moreover, many researchers have provided the solutions to regulate banks through nonperforming loans clean-up. However, there are still lots of factors that will affect the stock prices for the banks and also related to the financial sectors. Therefore, the main objective of this paper is to test the change of bank performance due to the change in the lending rate and exchange rate, oil prices and personal savings which are mostly commonly used.

Chapter 3: Methodology and Data

3.1 Models

Simple Regression Model

In order to examine the relationship between the lending rate, exchange rate, oil prices, personal savings and the stock price of the bank, a simple regression model will be used. This model will show how the regulation changes will affect the bank's stock price. In other words, it can reflect exactly the effect on the financial sector in China due to bank regulation.

$$Y = \alpha + \beta_1 X_L + \beta_2 X_E + \beta_3 X_o + \beta_4 X_p + \epsilon_i \text{ ----- } 3.1$$

where

Y: the stock price of the Bank of China. This price is related with any regulations that the bank made and the news exposure about the regulation changes such as changes in lending rate and exchange rate.

β_1 : the beta of lending rate, show the relationship between lending rate and the stock price. This coefficient represents the sensitivity of the stock price to the lending rate change.

X_L : lending rate, which is different due to the bank regulation changes.

β_2 : the beta of exchange rate, show the relationship between exchange rate and the stock price.

The coefficient represents the sensitivity of the stock price to the exchange rate change.

X_E : exchange rate, which is also different due to the bank regulation changes.

β_3 : the beta of oil prices, show the relationship between oil prices and stock price.

X_o : oil prices, which will affect the bank performance.

β_4 : the beta of personal saving, show the relationship between personal saving and stock price.

X_p : personal saving, which is affected by bank regulation and also effect the bank performance.

ϵ_i : error term, capturing the effect of other elements those are not employed in the simple regression function.

The absolute value of t is the main component that we need to observe to catch the relationship between the bank stock price and these factors.

3.2 Data Sources

The first simple regression model is to test how much the stock prices will be changed due to the bank regulations. Since this paper is focused on the “big four” banks in China, all historical data of banks’ stock prices were collected from Bloomberg. Similarly, in order to catch the volatility of the lending rate, exchange rate, and personal savings and oil prices for the past five years to ten years, the data from Bloomberg for these factors are extremely important for the research. It is worth to mention that for the oil prices, Ministry of Finance Japan Crude Cocktail was

chosen due to several reasons. First, Japan is one of the largest export partners of China. Second, the financial and stock markets of Japan are more reliable than other Asian countries. Last, the historical data of oil price for Japan are completely recorded in the Bloomberg Terminal.

3.3 Hypotheses

H₀₁: The stock prices of Bank of China are volatile due to bank regulation.

H₁₁: The stock prices of Bank of China are not volatile due to bank regulation.

H₀₂: The stock prices of China Construction Bank are volatile due to bank regulation.

H₁₂: The stock prices of China Construction Bank are not volatile due to bank regulation.

H₀₃: The stock prices of Agricultural Bank of China are volatile due to bank regulation.

H₁₃: The stock prices of Agricultural Bank of China are not volatile due to bank regulation.

H₀₄: The stock prices of Industrial and Commercial Bank of China are volatile due to bank regulation.

H₁₄: The stock prices of Industrial and Commercial Bank of China are not volatile due to bank regulation.

H₀₅: The average stock prices of “big four” bank of China are volatile due to bank regulation.

H₁₅: The average stock prices of “big four” Bank of China are not volatile due to bank regulation.

Chapter 4: Results of the Analysis

4.1 Data Overview

According to Table 4.1, there are around 60 data points in the data set for the Industrial and Commercial Bank of China. The oil prices, personal saving, exchange rate and lending rate are both negative with high volatility. This shows both of these factors played a major role in the bank regulation and have a huge impact on the bank stock price.

Table 4.1 Data Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
plp	59	-.0148387	.161562	-.4229337	.3492647
per	59	-.0026061	.0459261	-.0869178	.1039227
pps	57	-.0176967	.2930051	-.8968613	.387013
pop	57	-.0729756	.4894929	-1.567645	.5298922
plr	59	-.0064954	.1350764	-.4067796	.2027027

For the Bank of China (see Table 4.2) and China Construction Bank (see Table 4.3) show that there are around 59 data points in the data set. All of the variables are negative and have high volatility, which shows that these variables have a major impact on the bank stock price.

Table 4.2 Data Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
p1p	36	-.0184478	.2004713	-.5581396	.3691932
per	36	-.0024711	.0425971	-.0673711	.0997238
pps	36	-.0098164	.1924498	-.5207958	.2444323
pop	36	-.0184359	.2345074	-.508091	.3483382
plr	36	-.0045566	.105655	-.2354049	.1905488

Table 4.3 Data Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
p1p	59	-.0321948	.2677019	-.8405405	.4547686
per	59	-.0026061	.0459261	-.0869178	.1039227
pps	57	-.0176967	.2930051	-.8968613	.387013
pop	57	-.0729756	.4894929	-1.567645	.5298922
plr	59	-.0064954	.1350764	-.4067796	.2027027

For the Agricultural Bank of China, there are only 36 observations and this is because this bank was listed later than the other three banks. According to Table 4.4 all of the variables are negative and have high volatility, which shows that these variables have a major impact on the bank stock price and played a major role in the bank regulation.

Table 4.4 Data Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
p1p	36	-.0184478	.2004713	-.5581396	.3691932
per	36	-.0024711	.0425971	-.0673711	.0997238
pps	36	-.0098164	.1924498	-.5207958	.2444323
pop	36	-.0184359	.2345074	-.508091	.3483382
plr	36	-.0045566	.105655	-.2354049	.1905488

4.2 Dicky-Fuller test

We can choose one of the “big four” to do the Dicky-Fuller test and represent the others, since we assume that all the banks are sharing the same regulation. For example, there are four factors that are changed by the bank regulation and will affect the stock price of the Industrial and Commercial Bank of China. Before running the simple regression model that was provided in the last chapter, it is worth to perform the Dicky-Fuller test first to see if the equation presents any unit root in the autoregressive model. The size of the sample will distinguish the critical value of the model.

Table 4.5 Result of Dicky-Fuller test

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. dfuller per
```

Dickey-Fuller test for unit root Number of obs = 12

Test Statistic	Interpolated Dickey-Fuller		
	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-8.911	-3.750	-2.630

MacKinnon approximate p-value for Z(t) = 0.0000

```
. dfuller pps
```

Dickey-Fuller test for unit root Number of obs = 12

Test Statistic	Interpolated Dickey-Fuller		
	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-3.423	-3.750	-2.630

MacKinnon approximate p-value for Z(t) = 0.0102

```
. dfuller pop
```

```
Dickey-Fuller test for unit root                      Number of obs =      12
```

Test Statistic	Interpolated Dickey-Fuller			
	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-2.072	-3.750	-3.000	-2.630

```
MacKinnon approximate p-value for Z(t) = 0.2560
```

```
. dfuller plp
```

```
Dickey-Fuller test for unit root                      Number of obs =      12
```

Test Statistic	Interpolated Dickey-Fuller			
	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-5.022	-3.750	-3.000	-2.630

```
MacKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller plr
```

```
Dickey-Fuller test for unit root                      Number of obs =      12
```

Test Statistic	Interpolated Dickey-Fuller			
	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-6.468	-3.750	-3.000	-2.630

```
MacKinnon approximate p-value for Z(t) = 0.0000
```

From Table 4.5, we can see all the Z-value of D-fuller test for exchange rate, personal savings, oil prices and the lending rate are all less than 5 percent. Therefore, it shows that all the factors are stationary and there is no unit root for the model.

4.3 Regressions with all regulations

Table 4.6 shows the basic regression result between the Bank of China stock price volatility and all the changes in the exchange rate, personal savings, oil prices and lending rate due to the bank regulation. It clearly shows that there is a positive relationship between exchange rate, personal savings changes, oil price and bank stock price and a negative relationship between lending rate changes and bank stock price. From the table, we can see the absolute values of t-value of exchange rate and personal savings are really high, which shows that these two variables are statistically significant. Whereas, the absolute values of the t-value of the lending rate and oil price change are not quite significant.

Table 4.6 Result of Regression for Bank of China

Linear regression				Number of obs = 57		
				F(4, 52) = 5.74		
				Prob > F = 0.0007		
				R-squared = 0.3544		
				Root MSE = .27364		

p p	Coef.	Robust std. Err.	t	P> t	[95% conf. interval]	
per	6.781444	2.032125	3.34	0.002	2.703688	10.8592
pps	1.217524	.3491649	3.49	0.001	.5168734	1.918175
pop	.1522677	.1506056	1.01	0.317	-.1499445	.45448
plr	-.5006789	.5526715	-0.91	0.369	-1.609695	.6083376
_cons	.0103856	.0367252	0.28	0.778	-.0633089	.08408

Table 4.7 shows the basic regression result between the China Construction Bank stock price volatility and all the changes in the

exchange rate, personal savings, oil prices and lending rate due to the bank regulation. It clearly shows that there is a positive relationship between exchange rate, personal savings changes, oil price and bank stock price and a negative relationship between lending rate changes and bank stock price. From the table, we can see the absolute values of t-value of exchange rate and personal savings are really high, which shows that these two variables are statistically significant. Whereas, the absolute value of the t-value of the lending rate and oil price change is not quite significant, especially for the lending rate, the absolute value of t is nearly 0.1, which means that the impact of lending rate on the bank stock is really low.

Table 4.7 Result of Regression for China Construction Bank

Linear regression	Number of obs = 57
	F(4, 52) = 7.60
	Prob > F = 0.0001
	R-squared = 0.4225
	Root MSE = .2145

p1p	Coef.	Robust Std. Err.	t	P> t 	[95% Conf. Interval]	
per	5.41269	1.582234	3.42	0.001	2.237705	8.587676
pps	1.123083	.2541006	4.42	0.000	.6131928	1.632973
pop	.1128487	.1155914	0.98	0.333	-.1191024	.3447998
p1r	-.0355047	.3801103	-0.09	0.926	-.7982518	.7272423
_cons	.0194898	.0287035	0.68	0.500	-.0381079	.0770876

Table 4.8 shows the basic regression results between the Agricultural Bank of China stock price volatility and all the changes in the exchange rate, personal savings, oil prices and lending rate due to the bank

regulation. It clearly shows that there is a negative relationship between all these factors and bank stock price. From the table, we can see the absolute values of t-value are all less than three, which means these variables are not statistically significant. Therefore, the impact of all regulations on the bank stock is really low.

Table 4.8 Result of Regression for Agricultural Bank of China

Linear regression

Number of obs = 36
 F(4, 31) = 3.46
 Prob > F = 0.0188
 R-squared = 0.3613
 Root MSE = .17023

p\p	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
per	-7.218853	3.514301	-2.05	0.048	-14.38632	-.0513886
pps	-1.496607	.761691	-1.96	0.058	-3.050086	.0568721
pop	-.2469272	.304977	-0.81	0.424	-.868932	.3750776
plr	-1.299518	.8678096	-1.50	0.144	-3.069428	.470391
_cons	-.0614515	.0371359	-1.65	0.108	-.1371906	.0142876

Table 4.9 shows the basic regression result between the Industrial and Commercial bank of China stock price volatility and all the changes in the exchange rate, personal savings, oil prices and lending rate due to the bank regulation. It clearly shows that there is a positive relationship between exchange rate, personal savings changes, lending rate and bank stock price and a negative relationship between oil price changes and bank stock price. From the table, we can see the absolute values of

t-value of all these factors are not quite significant, which means that the impact of all regulations on the bank stock is really low.

Table 4.9 Result of regression for Industrial and Commercial Bank of China

Linear regression

Number of obs = 57
 F(4, 52) = 0.81
 Prob > F = 0.5261
 R-squared = 0.0534
 Root MSE = .16308

p\p	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
per	2.580781	1.485063	1.74	0.088	-.3992171	5.560779
pps	.3453531	.2167828	1.59	0.117	-.0896533	.7803596
pop	-.0508623	.0899165	-0.57	0.574	-.231293	.1295684
plr	.3648693	.3348671	1.09	0.281	-.3070907	1.036829
_cons	-.0018943	.0242432	-0.08	0.938	-.0505418	.0467532

Chapter 5: Conclusion

From the result of the mythology, it is clearly showed that exchange rate and personal savings are the main factors for the volatility of bank stock prices. Moreover, in most of the cases, they have positive relationships between these two factors and the stock price, which means that as the exchange rate and personal savings increase, the stock price of the bank will also increase. Based on the literature review, although it showed that setting up the interest rate and inflation rate are important and diffusely confirmed, the result of mythology showed that the interest rate and oil price do not have huge impact on bank stock price. It is somehow make sense that regulators and researchers had put wrong attention in the regulations, and this is why that there was no significant achievement in the bank regulation in recent years in China. Testing volatility of exchange rate and personal savings is the important part of the bank regulating research, and numerous methods could make further study on bank regulation on the financial sector. Therefore, regulating the exchange rate and personal savings will help the banks to predict their future performance of the financial sector, and also will have effect on the domestic economic growth.

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