**2018 May Day MCM**

**Problem B: RMB Loan Scale Allocation and Profit of Commercial Bank**

The simple model for commercial bank loans is to absorb deposits from the clients, deposit Legal reserves (Legal reserve ratio: 15.5 % for large financial institutions and 12 % for small and medium-sized financial institutions; 1.62% Legal reserve interest rate), set aside a certain proportion of the provisioning level (Commercial banks assume payment and settlement of financial intermediation to meet liquidity security), and the remaining funds are used for loan placement or other asset allocations.

For commercial banks, the increase of loans scale is limited by their deposits scale, which means it is only when the deposits are effectively increased that banks can have sufficient funds for loans. Specifically, if the proportion of a commercial bank in total national deposits is relatively stable, the annual increase in the amount of deposits is limited by the growth of total social capital. From the perspective of economic indicators, the growth of social deposits is closely intertwined to macroeconomic indicators such as GDP, CPI, and industrial value-added (Annex 1 is the macroeconomic indicators for 2010-2017 and the forecast for 2018).

In the loan allocation models, commercial banks usually used the pre-distribution and annual limit management models, that is, the one-time pre-distribution of the annual scale at the beginning of the year to each branch, and no longer increase the loan amount during the year. While, there are many disadvantages in this model. For example, it would ignore the actual amount of disposable loans, changes in the environment and demand during the year, resulting in low efficiency and poor flexibility. At present, in terms of most commercial banks, its loan scale growth is determined by deposit growth, and a combination of deposits and loans will be considered; internal and external synergies, and asset-liability dynamic balance also belong to common models. Commercial banks must strive to obtain the largest revenue of the whole bank, balance regional development differences, and mobilize the enthusiasm of all units in the industry. Meanwhile, it is still necessary to support the country's major projects, key policies, people's livelihood projects and the effective development of the real economy.

For the medium-sized commercial bank A, the development of deposit loans in its provincial branches for the past three years is shown in Annex 2. Please refer to the relevant literature and information, and grasp the business model of the commercial bank, then on the basis of a full understanding of the future economic, interest rate, exchange rate and other policies and trends, please answer the following questions. (The historical data on deposits and loans in Annexes 2, 3 and 4 are for reference)

1. Assume that the bank has no other sources of funds besides customer deposits, and does not consider provisioning levels for the time being. Based on the historical data of Annex 2 on total deposits and loans of Commercial Bank A and the historical data of macroeconomic indicators in Annex 1, please establish a mathematical model and predict the increase in deposits and loans of the Bank in 2018.

2. Assume that the bank has no other sources of funds besides customer deposits, and does not consider provisioning levels for the time being. Based on the results of the problem 1 forecast and the related data in Annex 3, please establish a mathematical model and give the loan scale allocation scheme of commercial Bank A for 2018 such that the entire bank’s incremental net interest on deposits and loans will be maximized, and fill your distribution plan in Table 1.

3. If commercial bank A will issue 50 billion Yuan 15-year common debt on May 1, 2018 (the interest rate is approximately 5.1%), without considering the provision level, please combine these conditions to further optimize Problem 2 and re-design the allocation plan for the loan scale of each branch of commercial Bank A; then let the bank’s net interest on incremental deposit and loan interest be the largest, and fill your allocation plan in Table 1.

4. In order to ensure normal daily transactions, each branch needs to reserve a certain amount of provision funds every day (The lack of reserve funds can easily cause customer dissatisfaction. Severely, it can cause social panic and trigger a run; vise verse, excessive reserve funds will reduce banks Profitability level) to ensure the lowest provisioning level (provision level = provision fund / deposit balance). Assume that the behavior of each client's deposit and withdrawal is random, please establish a mathematical model according to the daily deposit and withdrawal transaction data of each branch in Annex 4 for 2017 and calculate the minimum required amount for daily operations of commercial Bank A branches at the given confidence level 99% for 2018. And fill the results in Table 1.

5. On the issue of loan scale allocation, relationships between benefits and risks, corporate operations and international policy orientation, regionalization differences and the fair assessment of branches should be [judiciously](http://cn.bing.com/dict/search?q=judiciously&FORM=BDVSP6&mkt=zh-cn) [resolved](http://cn.bing.com/dict/search?q=resolved&FORM=BDVSP6&mkt=zh-cn) to achieve a win-win or multi-win situation, please improve the above models and give relevant suggestions.

Note: All data are hypothetical data.

Table 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Unit: 100 million Yuan** | | **Question 2** | **Question 3** | **Question 4** |
| No. | Branches | Loan Scale Allocation | Loan Scale Allocation | Provision funds for 2018 |
| 1 | Beijing |  |  |  |
| 2 | Jiangsu |  |  |  |
| 3 | Guangdong |  |  |  |
| 4 | Zhejiang |  |  |  |
| 5 | Shanghai |  |  |  |
| 6 | Shandong |  |  |  |
| 7 | Henan |  |  |  |
| 8 | Hubei |  |  |  |
| 9 | Anhui |  |  |  |
| 10 | Sichuan |  |  |  |
| 11 | Liaoning |  |  |  |
| 12 | Hebei |  |  |  |
| 13 | Chongqing |  |  |  |
| 14 | Hunan |  |  |  |
| 15 | Shanxi |  |  |  |
| 16 | Shaanxi |  |  |  |
| 17 | Tianjin |  |  |  |
| 18 | Guangxi |  |  |  |
| 19 | Jilin |  |  |  |
| 20 | Yunnan |  |  |  |
| 21 | Fujian |  |  |  |
| 22 | Jiangxi |  |  |  |
| 23 | Heilongjiang |  |  |  |
| 24 | Xinjiang |  |  |  |
| 25 | Guizhou |  |  |  |
| 26 | Gansu |  |  |  |
| 27 | Hainan |  |  |  |
| 28 | Inner Mongolia |  |  |  |
| 29 | Ningxia |  |  |  |
| 30 | Qinghai |  |  |  |
| Total branch | |  |  |  |