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Analysis of Urban Commercial Banks In Online Median Problem

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Abstract: The application of information technology and electronic revolution made a lot of new requirements on the reality of the development of traditional industries. In the professional background of endless variety advanced equipment, technology and the universal modular, cross-industry applications, financial institutions, as the first wave of industry acceptance of such radiation, important increasingly for the difference of the site selection and dynamics of institutions set up for continuing source of profit. Urban commercial banks more dependent on this confined to their own conditions. This study analysis competitive ratio of commercial banks online median problem, from the second-tier layout of the provincial capital city, extends the lower bound of competitive ratio of such field and proved that there is no constant competitive algorithm of the class problem in general and put forward views on improving the network location selection procession.

Key words: Financial ecology, bionics, differentiated marketing, genetic algorithm, performance

INTRODUCTION

Entering the new century, Web-based office makes the traditional commercial banking institutions in dismantling and merging faster network layout by a full decade after the last century into the expansion phase of the period focus of offensive and defensive. China's urban commercial banks are the birth of the era of combination products in a specific historical conditions of economic development based on specific financial bodies. China's urban commercial banks and other commercial banks have different course of development and destiny combined with long-term limit in the region operate this particular regulatory constraints.

limited to its own history, ability level and the capital size, urban commercial banks is subject to strong shock wave of the electronic information. At present, the urban commercial banks face unprecedented pressures and challenges: on the one hand there are four state-owned banks and joint-stock banks monopoly to intercept; the other hand, there is a vigorous reform of rural credit cooperatives catching-up, coupled with foreign banks eyeing, you can said that the next few years will determine the fate of a key urban commercial banks. In this context, it is extremely important the city commercial banks to conduct research and explore the business strategies. Studies have shown that China's urban commercial banks in the top 20% of the branches to create a bank for 60% of total revenue, while only 50% of the branches to create revenue by 15%. Therefore, to rationalize the number of bank branches in urban commercial banks is an important

factor in design of distribution channels. The establishment of branches in the management of cost control is particularly important, while increase the development of branch banks to become an important contemporary research questions in the firmness market.

THE THEORETICAL ANALYSIS AND APPLICATION OF NETWORK LOCATION PROBLEM

Network location problem have a very important and far-reaching impact both for public utilities or private company's strategic planning. General, the network shortest path between any two points is defined as the length of the distance between two points. If a point on the network to the rest of the maximum distance from the point of the smallest, then the point is known as the center, if the point to the rest of points and the minimum distance, the point is known as the median (center). In this study we focus on median problem. If the problem is to strive for in the n -point networks to find k points, making it a point to the rest of the k -point distance and minimum, this problem is well-known as k -center (k -median) median problem; it has proven the problem is NP-hard (Drezner and Hamacher, 2002).

Mettu and Plaxton established and studied the online median location issues in 2003 (Mettu and Plaxton, 2003). The output of their model is a sequence to be located and to ensure that each k -sequence of pre-order the costs all with the corresponding k -median problem close to the optimal solution cost. Specific performance metrics is to

use competitive ratio algorithms to measure, the competitive ratio as small as possible. Since the model is proposed, it is subjected to the attention of a growing number of management scientists (Current *et al.*, 2002). operations research and computer scientists, but little further research. Article in the Mettu and Plaxton, they proved that a metric space is busy central location problem the lower bound of competitive ratio is:

$$2 - \frac{2}{n-1}$$

where, n is the number of points which is now the best known lower bound results.

K-center location problem is a very basic site selection model, the actual location of the problem or it is a k-center location problem, or is able to treat the issue as a sub-problem. Model calculation, taking into account the complex nature of the treatment in practice often is to build into a static, deterministic mathematical model. However, the actual location in the process of decision-making process is often a long process and will be subject to a number of factors. Therefore, it is more realistic site for selection decision-making model building on a subject related to uncertain parameters affect the dynamic location model. In some studies, it has been taken into account uncertainties demand and costs in the literature (Dai *et al.*, 2006).

Nanchang Urban Commercial Bank initiated by the establishment of Nanchang City in the original Nanchang 40 urban credit cooperatives, based on local financial in 1997, the establishment approved by the People's Bank of China. Registered capital is 1.182 billion Yuan; Nanchang Finance Bureau is the first largest shareholder. The existing first branches is 19, 135 outlets (including the independent ATM machine 51), more than 1,500 employees. In 2009 renamed as Nanchang Bank.

Nanchang business circle analysis: From the business layout view in Nanchang, Nanchang's business mainly concentrated in the core to 81 square central business districts, while Zhongshan Road, Beijing Road, Bayi Square, Fuzhou Road, Victory Road with professional features such as the formation of a business network-intensive, varied retail network. Zhongshan Road, Bayi Square in the east and west to the victory Road Pedestrian Street, as located in urban centers, "Zhongshan Road shopping district," have always been Nanchang business, "downtown center."

Almost all domestic or foreign large shopping malls, supermarkets, have worked in the Road, a variety of Chinese and foreign brands of clothes shops, specialty

snacks throughout the whole of Commercial Street, famous Rainbow Department Store, Parkson Department Store, HongKeLong, Nanchang Department Store and other shopping centers, as well as small commodities wholesale market-Nanchang - Longevity Palace is also gathered in this, making this road on the long steady stream of people and cars. According to statistics from related departments, usually shopping district of the traffic is 10 million passengers, while the holiday of up to 20-30 million passenger trips daily. According to the survey on the flow of people, business-level consumption, no one can match the current streets, so that some business professors said the mountain as "Jiangxi Business First Street."

There is no doubt to find suitable locations within the address in Zhongshan Road shopping district for Nanchang Bank to close everyday consumers.

Current branches location: Currently in the shopping district, Nanchang Bank have the following outlets: Head Office Business Department; Zhongshan Zhenhua branches; Zhongshan Baihuazhou branches; East Lake Hongdu branches; East Lake victory branches; East Lake Xiangbei branches; Minde Business Department; Minde Zhongshan road branches; Minde Fanrong road branch; the South Wanshou branches; the Southern Branch Takahashi; the social security branch of the Xiangnan; Xiangnan Ruzhong sub-branches and so on.

BANK ONLINE MEDIAN PROBLEM ISSUES

Nanchang, all the existing business of Nanchang bank is divided into the three-tier business including core banking business, growth business and seed business. through the integration of the three-tier service chain, access to today, tomorrow and future business strategies arrangement, focus on core business, in order to build profit zone businesses with a core business more competitive advantage.

Core business: The core business of providing financial services to SMEs (small and middle enterprises). Nanchang Commercial Bank achieves its scale and efficiency simultaneously increased with support of SMEs grows at the same time. Mainly through the provision of professional, efficient, thoughtful, rich variety of financial services and SMEs to establish risk-sharing, benefit sharing of long-term cooperation partnership.

Growth business: Growth business is consumer banking services. Consumer banking services, also known as the retail business, mainly for the region, provide consumers

with deposits, consumer credit, housing loans, checking accounts, credit cards, insurance(bank-insurance cooperation), stock(silver certificates Cooperation) and private banks and other financial services . Strong demand for personal financial services is the objective for the development of commercial banks laid a good foundation. "Package" of financial services to consumer banking revenue and gradually developed into the fastest-growing types of business has become one of the core businesses in Nanchang Commercial Bank.

Seed business: The seed business, intermediate business and provide financial services for large customers. Nanchang Bank currently does not have the advantage in these areas. Currently, businesses must be set the middle of the seed business future development as potentially profitable points.

The foreseeable future period of time, Nanchang Bank extending and carrying out financial activities should be focused primarily on urban residents, consumer links, from financial support to small and medium enterprises, micro-credit and consumer species identification, local economic development support. Therefore, the convenience of ATM machines and other business outlets and the choice of address are very important.

In this study, we consider the following actual situation: the premise the number in all the facilities already know needed to establish, we need to decide where to continue to build facilities (or facilities set). At the same time also requires that when the new facility is established, already establishment of facilities can not be removed without cause.

This is a site to be determined by the number of sitting issues. In theory (Church, 2002), the best location the number of programs and sites are closely related, a different location number will determine the location of different points, so we can only consider how to set the location of the actual costs and the number in the same location under the optimal location of set costs as much as possible, we need to build a new facility at the same time we can not delete the existing facilities. In fact, the above constraints is to consider how to make the construction of facilities to be set to achieve the best in the current financial constraints in some cases, so we can consider using online algorithm and the relevant theories of competitive strategy to build models and research.

COMMERCIAL BANK LOCATION PROBLEM DESCRIPTION AND PROOF

Metric space location problem (commonly known as the online issue directly) can be mathematical description is as follows: Given a set of points defined on U and U on

a non-negative distance function $d:U \times U \rightarrow R^+$ and a positive weight function $W:U \rightarrow R^+$. We generally assume that the distance function d is a metric, that is, d non-negative, symmetric and satisfy the triangle infinitive, as well as $d(x, y) = 0$.only if $x = y$. At the same time the definition of a point x to a set of points S, the distance is $d(x, S) = \min_{y \in S} d(x, y)$ and S is the point set the number of points. $N = U$ Means all the number of customers, for any subset S, $S \subseteq U$, To define its cost is:

$$\text{cost}(S) = \sum_{x \in U} d(x, S)w(x)$$

The mathematical description of the online location problem is as follows: Find a subset of the sequence of $F_i, i = 1, 2, \dots, n. F_1 = I, F_1 \subset F_2 \dots F_n = U$ And $\text{cost}(F_i) \leq c * \text{opt}_i$, where opt_i is the I-median cost of the optimal solution to the problem, c called competitive ratio, the smaller c the better.

In order to make commercial banking institutions the largest gains within the region, we must select the appropriate location of the new Canadian outlets. To achieve this goal, we must first analyze the expected benefits the entire region, we can put our commercial banking customers into three categories: commercial agencies, industrial companies and residents.

A branch network is that it covers the benefits of efficiency and effectiveness of points (denoted as Q), set up its annual expenses of G, then its net income M as: $M = Q - G$.

Overhead spending years generally associated with the location, but we are talking about a fixed network, so G is a fixed value. This formula will be determined by the Q, while to determine Q, the most important is to determine the radiation area.

Determine the radiation region: To determine the net effectiveness of a branch network, the emphasis is in determining the bank's radiation area. First consider the location of the region of only two outlets, from the assumption that the benefits of effective point of its recent return from the banks, obviously, benefit points will be two outlets in the vertical line divided into two parts and each part-effectiveness point of are the property of belonging to the same side of the network. From the perspective of bank branches, the effectiveness of points with its same side property belonging to it, that is, the network's control area, is the Central region is the vertical division of radiation and with same side part.

Therefore, we can borrow the proliferation behavior theory of dynamic analysis radiation levels (Shiller, 2004). As time going on, the behavior system there are two opposing forces (Hamilton, 2007): The spread of the initial

behavior of the population depend on the adoption of the results of the spontaneous behavior, with the increase in acts of adopters participate, the proliferation of interpersonal communication between the source also increases, that the number willing to "spread" (acts of adopters) increase. The proliferation of late period, due to the impact of the size of the crowd, the number against the "spread" (potential adopters) reduced. Based on the above qualitative analysis of the proliferation behavior, behavioral model of the proliferation of quantitative research is as follows:

$$\frac{dN(t)}{dt} = p(m - N(t)) + \frac{qN(t)}{m}(m - N(t))$$

Constraints analysis: Setting up a business branch needs to consider a number of objective constraints conditions. In addition to the opening cost constraints, the main opponent is the same business industry the same kinds of operations on the impact of newly opened outlets; another immature local regional market outlets are also a significant impact on efficiency; third is the commercial bank itself at different levels of network layout caused by market duplication concerns, the market transition omissions, etc. So we can build dynamic optimization equations to deal with.

Commercial Bank location analysis: In the specific sitting of commercial banks, it is a very difficult problem, as reflected in the following two points: (1) Off-line form of k-center (k-median) problem which is a very difficult The issue has proved that the problem is NP hard.(2) We need to determine the n-sequence facilities to be built.

Traditional lower bound of competitive ratio is:

$$2 - \frac{2}{n-1}$$

where, n is the given number of points of space. We will improve this conclusion to a new competitive ratio.

According to the formula below, due to the empirical analysis of the data is discrete. The formula can be approximated as follows:

$$N(t+1) - N(t) = A_1 + A_2N(t) + A_3N^2(t) + \epsilon(t)$$

$\epsilon(t)$ is the time t's infinitesimals. A_1, A_2, A_3 are the undetermined coefficients, It is available to be the least-squares fitting through SPSS. Maybe get the three important parameters p, q, m in the model with A_1, A_2, A_3 :

$$m = \frac{-A_2 \pm \sqrt{A_2^2 - 4A_1A_3}}{2A_3}, p = \frac{A_1}{m}, q = -mA_3$$

If the Online Algorithm's first choice is a solid point, according to symmetry, we might assume that online algorithm A choice point X_1 , At this time the best algorithm opt hollow point is X_n , due to $\text{cost}(x_1) = 2(n-2)w+1$, $\text{cost}(x_n) = (n-1)w$. we can derive:

$$\frac{\text{cost}(x_1)}{\text{cost}(x_n)} = \frac{2(n-2)w+1}{(n-1)w} = \frac{4A_3(A_1 + A_2N(1) + A_3N(1)^2)w+1}{(-A_2 \pm \sqrt{A_2^2 - 4A_1A_3})w}$$

So a lower bound of competitive ratio in online algorithm is:

$$\min \left\{ \frac{4A_3(A_1 + A_2N(1) + A_3N(1)^2)w+1}{(-A_2 \pm \sqrt{A_2^2 - 4A_1A_3})w}, w \right\} \cdot w \geq 1$$

Solve:

$$w \approx \frac{8A_3(A_1 + A_2N(1) + A_3N(1)^2) - (\sqrt{A_2 - \sqrt{A_2^2 - 4A_1A_3}})}{2(-A_2 + \sqrt{A_2^2 - 4A_1A_3})}$$

$N(1)$ is the exist operating outlet profit in the year the first business outlets in the region after the official operation. At the same time to do normalized process.

CONCLUSIONS AND ANALYSIS

We consider the three first branches of Nanchang bank located in Nanchang, "Zhongshan Road commercial circle," Zhongshan Zhenhua branches; Zhongshan Baihuazhou branches; Minde Zhongshan road branches; In accordance their open and operating profit with the number of performance and service groups, to find a few changes in customer trends and future market size with the application behavior diffusion theory generally. We obtained as shown in the following table of A_1, A_2, A_3 and the related parameter values. The value of the data $N(1)$ can obtained from the Bank.

M-values were calculated as follows: $m_1 = -11.4681$, $m_2 = -6582$, $m_3 = 1.4375$

Then the value of w is: $w_1 = 0.2431$, $w_2 = 0.0752$, $w_3 = 0.3147$.

Table 1: Multiple regression under the regression coefficients and statistics

multiple regression	A2	A3	A1	r2	F	df
Zhenhua	-0.2106	1.525	-0.0062	0.9279	32.213	5
Baihuazhou	-0.0671	1.352	-0.0081	0.9701	76.244	5
Minde	-0.3681	2.867	-0.0032	0.9707	81.817	5

From the above data the following conclusions can be drawn:

- The lower bound of competitive ratio of these three branches is low; the impact of the results is no doubt that Nanchang bank's business activities by other state-owned commercial banks and joint-stock commercial banks
- Each W value of three outlets is different, indicating the location of Minde road branch is relatively satisfactory, in the Second is Zhenhua branch, Baihuazhou is the worst, it shows the highest concentration of pedestrian flow is not necessarily the most appropriate place of business, maybe more often crowd the site entrance is the best place
- Three outlets data is derived from the fifth-order lag, indicating a business outlets open at least have to wait five years to see whether a suitable site is suitable, there are too many unexpected phenomenon occurred, so the election the site is the test of decision-makers a strategic vision of the activities

This article borrow behavior of diffusion theory to analysis commercial banks online median location, from the empirical to assist decision-making, of course, it also need to further expand research.

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