BIG DATA: ONE APPROACH TO PROCESSING ATM DATA

Iana Bondarenko
Oles Honchar Dnipropetrovsk National University, Ukraine, iana.s.bondarenko@gmail.com

Valery Turchyn
Oles Honchar Dnipropetrovsk National University, Ukraine, vnturchyn@gmail.com

Today all banks use a wide network of automatic teller machines (ATM). Such a network creates various problems to the banks. One of the main problem is that how much cash amount should be uploaded into the ATM. Uploading large cash amount leads to an increase in loss of profit through dormant assets in ATM, uploading small cash amount leads to increase in the currency transportation and servicing costs.

Bank staff have solved the problem of uploading cash amount intuitively, empirically by observing the work of each ATM on-line. But this approach is not effective, because it requires additional costs and depends on many other objectively random factors, such as problems with transport (traffic jams), weather conditions and so on. The development of effective method is needed to organize the process of uploading cash in ATM correctly and most convenient in the interests of the bank and the clients.

The work of an ATM should be organized so that *standard service quality* is implemented. Today it is accepted that at least one note should be in an ATM before the time arrival of encashment (in other words, cash should always be in ATM), and the maximum unloading cash amount must not exceed 10% of the uploading cash amount. Costs for support such standard service quality are very high. In this paper a probability model of the work of an ATM is presented to forecast uploading cash amount. Standard service quality is defined as probability of rejection for client in withdrawing cash.

Problem formulation. Let S_{up} is uploading cash amount, Δ - critical cash balance at which it is necessary to appoint ATM encashment. What should be S_{up} and Δ in order to costs for ATM encashment were minimal for a given standard service quality?

Standard service quality. Let S is the value of accumulated cash amount which were withdrawn till the moment t. Denote $S_k=S_{up}-\Delta$, where S_k is the value of accumulated cash amount at which it is necessary to appoint ATM encashment. Let $\tau(S_k)$ is moment when the accumulated amount S exceeded the S_k for the first time. For given constant α

$$P\{S-S_k \geq \Delta\} \leq \alpha$$

on the segment $[\tau(S_k), \tau(S_k)+24]$.
It is means that if we select α, for example, is *0.01*, then *99%* of clients who applied for cash, get it at this ATM during 24 hours after the moment $\tau(S_k)$. The higher standard service quality requires the greater cash balance in the ATM before 24 hours till encashment. We regulate quality of service using the level Δ.

Distribution of accumulated cash amount S which were withdrawn and distribution of the moment $\tau(S_k)$ when the accumulated amount S exceeded the S_k for the first time were identified. Optimal uploading cash amount S_{up} and optimal cash balance Δ before 24 hours till encashment, which provides *99%* standard service quality were determined.

References

Simutis R. Cash demand forecasting for ATM using neural networks and support vector regression algorithms/ Simutis R., Dilijonas D., Bastina L. // EurOPT' 2008, May 20-23, 2008, Neringa, Lithuania: selected papers. Vilnius. p. 416–421.