Aalto University

Mat-2.4177 Seminar on Case Studies in Operations Research

Project plan 22.2.2013
Determinants of cash usage in Baltic countries

Client: SEB

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1. Background

The use of cash is decreasing whereas new payment methods like cards, e-payments and mobile-payments are gaining more users. The global volume of payment transactions using direct debits, credit transfers, cards and checks has been increasing with an annual rate of 6.8% during 2001 – 2009 (Anon. 2012). The largest non-cash payment market is the United States covering more than 40% of the total market. The second largest market with 20% of total market is Europe. In the Euro area the volume of card payments involving non-monetary institutions has increased over 32% from 2007 to 2011, while value of the these transactions has increased 22% over the same time period reaching now over 1146 EUR billions (ECB 2013a).

Decreasing use of cash can benefit people, countries and monetary institutions. Going cashless can be a convenient and safe option for consumers. Countries can use electronic payment systems to fight the shadow economy because, unlike cash, electronic payment systems leave a mark of each transaction. For banks, alternative payment methods cause less operational risks than handling cash, and they also increase efficiency and decrease costs.

In Estonia, the relative importance of card payments has increased from 24% to 63% during 2000 – 2011 (ECB 2013b). The relative importance of card payments in Estonia is higher than on average in the European Union, and higher than in the other Baltic countries (Fig 1.). However, it has not yet been studied what the determinants of card or cash usage are in Estonia. Understanding customer behaviour and factors that affect cash usage in Estonia help SEB to cost-efficiently develop services to drive the Baltics towards a cashless region.

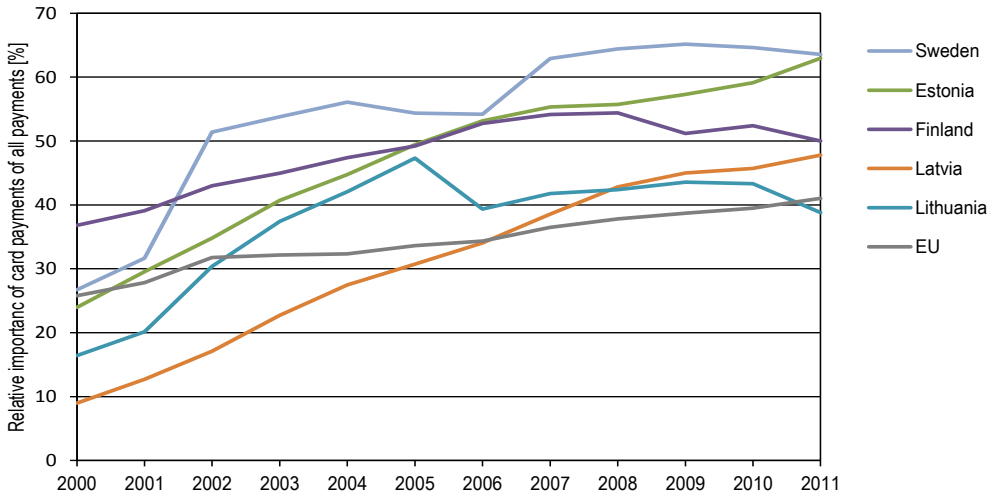

Figure 1. Relative importance of card payments compared to all payment transactions. Only cards issued in the reporting country are included. Data from European Central Back (ECB 2013b).

This project is carried out within the course Mat-2.4177 Seminar on Case Studies in Operations Research The client of the project is SEB Estonia.

2. Research questions and expected results

The aim of this project is to study the factors that determine cash use in Baltic countries using Estonia as an example. In this project we address following main research questions:

1) What factors affect cash usage in Estonia?
2) Can these factors be used to identify customer segments that differ in their cash usage?
3) Have these customer segments responded differently to changes in, for example, ATM network?
4) Where the customer segments use their cards?

The expected result of the study is a description of the factors that impact cash use in Estonia, and a segmentation of customers by different cash use profiles.

3. Materials and methods

3.1. Project tasks

Our planned project tasks are the following:

1) Familiarize us with the data and the backgrounds of the problem.
    a. Start writing a literature review on previous research on cash use determinants and trends in payment in Euro-zone or the US.
    b. Look various kinds of plots of the data and descriptive statistics. For example, the histogram of proportion of cash usage to sum of cash usage and card payments.

2) Identify customer segments.
    a. Identification based on common sense, for example considering men and women as different customer groups.
    b. Identification based on statistical methods.

3) Compare the cash usage of different segments by studying relevant figures and confirming the findings with appropriate statistical methods.
    a. For example, drawing box-plot figures of cash usage in different customer segments.
    b. Identification based on statistical methods

4) Study in which merchant categories cards are used first
    a. For example, the distribution of different types of card usage as a function of overall card usage.

5) Analyse the effect of different actions by the bank (changes in pricelist, branch network, ATM network) on different customer segments.
    a. A statistical model to explain the changes in time with the actions.

6) Validations and verification of the results.
    a. Validating that the general assumptions of the methods are appropriately satisfied.
    b. Estimating different models with part of the data and comparing the predictive power of the different models with the rest of the data.

The order of the actions is approximately in chronological with the following exceptions: task 1. b. can be completed simultaneously with everything else, task 4. can be done simultaneously with everything else.

3.2.Data

The data consists of real customer and transactions data of SEB. The data consists of personal characteristics of the customers, and the number and the volume of their transactions. The data on personal characteristics describe age, mother tongue, gender, location, income/salary, liabilities, usage of bank channels, possible unemployment, and children. The data also includes payment merchant category codes (MCCs), which indicate where cards have been used for purchases. The transactions data is aggregated monthly for each customer, and the time-series covers years 2007–2012. Background information for this study includes national and ECB statistics, changes in pricelist, possible closing of branches by regions, and closing of ATMs by regions.

To study the factors that determine cash use in Estonia, we focus on card purchases and cash withdrawals to limit the analysis to transactions that may involve cash. Electronic payments from one account to another are excluded from the analysis.

4. Project management

4.1.Project resources

Project group consists of Tuomas Lahtinen, Sami Remes, Anna Repo and Juho Roponen, who is working also as the project manager. The group members are three master’s students and one doctoral student who all major in systems and operations research.

The main contact of the project on the customer side is Lennart Kitt, who has also provided the group with most of the necessary data required for the completion of the project.

4.2.Project risks

Possibly the greatest problem would arise if the identification of the customer segments fails. That would have quite significant effects on all other research topics too. To mitigate this risk, the identification of segments will be the highest priority at the start of the project. If it should happen to fail we still have time to revisit the other research questions and possibly modify them. Other risk involving the research questions is that one or several of them might consume more time than anticipated, which is somewhat mitigated by the fact that we have several somewhat separate questions to study. We can also leave something out without endangering the whole project. The project schedule is also a risk in this project. There is plenty of work in this project and we have plenty of time, but the group is not working on the project full time, so it is very important to keep track of the progress of all parts of the project, and also make sure that we focus on essentials. To do this we have weekly meetings within the project group and report the results of those meetings and other progress on the project to our customer on weekly basis.

Another risk on a project like this is that the project group is not working together on anything other than just this project. Therefore someone in the project group might be unable or unwilling to continue the project due to illness or any number of other reasons. Due to this reason it is important that the communication within the project group works well, and everyone is updated about project progress and project group related circumstances. It is also important to keep up good team spirit within the group so that everyone is willing and able to do their personal best.

4.3.Project timetable

Task	February			March					April				May	
week	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Familiarization with data and topic														
Methods for customer segmentation														
Segmentation														
Literature review														
Card use analysis														
Analysis on the effects of the price list changes														
Validation, verification														
Project plan														
Midterm report														
Final report														
Presentations														

5. References

Anon. 2012. *World Payments Report 2011*. Capgemini, The Royal Bank of Scotland (RBS), and Efma, 60p.

ECB 2013a. *Statistics Pocket Book, January 2013*. Franfurt am Main, European Central Bank, 54 p.

ECB 2013b. *Transactions Per Type of Payment Instrument.* European Central Bank http://sdw.ecb.europa.eu. Accessed 13.2.2013