Retail core banking services information asymmetry case study using the small market model adjustment

MARTINA HEDVIČÁKOVÁ1, IVAN SOUKAL1, JAN DRAESSLER2

1 Department of Economics, 2 Department of Informatics and Quantitative methods
University of Hradec Králové
Rokitanského 62, Hradec Králové 500 03,
CZECH REPUBLIC
martina.hedvicakova@uhk.cz, ivan.soukal@uhk.cz, jan.draessler@uhk.cz

Abstract: - The paper is focused on information asymmetry on the retail core banking services products for physical entities in the Czech Republic. The consumer does not have an overview considering all of the offered prices. The paper presents a small market model based on the idea of the costs of the information and probability of savings from better price finding – performs a case study of rational behavior under the conditions of information asymmetry, because the final price of the product consists of the tariff and costs on search for the product too.

Key-Words: - information asymmetry, retail core banking services, Stigler’s model, small market problem, mainstream client, expected price, search costs, Czech republic.

1 Introduction

Information asymmetry is a situation where one side of the market benefits from the information advantage at the expense of the second one. This results in the market non-equilibriality. Since the first ground-breaking (or there can be said “neoclassical paradigm-breaking”) thoughts of I. Fisher, R. Knight and F. A. Hayek we can’t study the market any more without information assessment – the market of retail core banking services, mostly known as current accounts, (thereinafter only as RCBS) is not an exception.

Information asymmetry in financial sector was and it is studied closely. Still the main fields of study were the loan, insurance and investment markets, but not the RCBS one. European Union (thereinafter only as EU) authorities, such as the Directorate-General for Health and Consumers Protection, have focused on this issue for the first time 6 years ago in [1]. There the sub goal of removing the undue barriers associated with all types of bank accounts and to improve the competition between service providers was declared. In the following years there were repeatedly (e.g. in studies [2], [3]) named and proved two real RCBS market problems – tariffs’ opacity and hard product comparison. Both are typical empirical examples of information asymmetry. Both can be answered by the market and also by the authorities (e.g. education of the clients, basic financial literacy as points out [4]). The question is: how to make rational consumer decision under those conditions? And what are the conditions on the targeted RCBS market?

2 Formulation of the problem – price asymmetric information

The question of consumer decision under the information asymmetry (represented by uncertainty) gained new meaning in the breakthrough paper [5]. What Stigler claimed about his products can be applied on banking products too, to be more specific current account on RCBS market. Stigler is solving the situation when the consumer tries to find the best price by doing the search – or better the searches. Search will be meant the process of canvassing of one supplier. Applying his idea – Stigler’s approach shifts the consumer’s optimum (consumer’s surplus maximization) along the marginal utility curve by adding a new product price component (within the frame of the cardinalistic theory). There was introduced a new way of rational consumer behavior by the balance of marginal costs and marginal returns on information. Marginal returns are achieved through known price(s) and the best found price.

We decided to use the basic idea and to rework the original model for specific Czech Republic RCBS market needs. The problem is what are the costs of the search on RCBS market? They definitely exist and EU research indicates that those costs might be very high because of information asymmetry. It is difficult for client to compare and
to find the cost optimal product providing all the demanded services.

In microeconomical point of view RCBS for mainstream client would be normal non-luxurious goods with income elasticity \( e_m \in (0,1) \) and almost perfect substitution goods within the RCBS market, because there are no fundamental differences among the e-banking accounts. We presume the same range of services for all e-banking activated accounts used by mainstream client (for mainstream usage pattern see chapter no. 4). Quality of services is hard to monitor because the main quality indicator (except the correct enter in the books when the payment is done) is how fast client’s order will be executed. This is also the same due to EU legal harmonization process, to be more specific it is an impact of the Dir. 2007/64/ES that sets for most of the payment types an enumeration of how long the payment can take.

So why the EU still emphasizes client mobility when microeconomic conditions are mostly met? Because client mobility is very low abhorrent to easy substitution from the economical point of view. What prevents the substitution? Information asymmetry is one of the main reasons but how strong the asymmetry is? Let us try to model it on RCBS market.

2.1 Large market and “How long we should search?” approach

Stigler in the paper [5] described the idea searching the minimal product price on the market and devoted to the efficiency of such searches. He assumed, finding the minimum price, the buyer would save. If the distribution of price is described by the function \( F(x) \), the distribution of minimum prices with \( n \) searches is then

\[
F_n = n\left[1 - F(x)\right]^n .
\]

In consequence of that idea the consumer is able to quantify specific saving depending on the founded price. There can be determined the expected value of the minimal price with \( n \) searches (of random sample on observations) by the formula

\[
E_n = \frac{b}{a} \int_a^b x\left[1 - F(x)\right]^{n-1} F'(x) \, dx ,
\]

expressed by Robert Sollow. The calculation is relatively easy, if the price is described by uniform distribution as Stigler assumed. Then there has to be considered the sufficiently large population of products on the market. Both presumptions are unfortunately too far from RCBS market reality – the RCBS market (current accounts) are considered as limited. Moreover, Stigler’s paper [5] does not specify the demand side or the consumer.

2.1 RCBS market and “What price we should search for?” approach

Stigler described process of searching for minimal price on the market. How to specify the importance of a minimum price and number of searches? From our point of view it is more suitable to search the fixed market price and describe the savings depending on the mean time of finding of the desired market price.

Suppose the fixed price (the market price is presumed as independent to the individual consumer) \( x \) is market price the customer requests. With respect to Stigler’s assumptions we can express the mean time (symbol of large letter \( T \)) as

\[
T(x) = \frac{1}{F(x)} .
\]

Then the expected savings can be expressed as the difference between the yield on the change of a product and costs to find the desired price. But the question is what price should be the desired one – (required as optimal)? The question will be answered in the next chapter.

The upper problem shows a need of Stigler’s model rework. In [5] the market is big, big enough to use the central limit theorem, which implies i.a. that if the consumer performs one search (finds the market price of the one supplier-bank) and the number of unexplored suppliers will drop down by 1, the influence on the total number of suppliers would be limit to 0. This is far from reality where e.g. in the Czech Republic there is RCBS offer consisted of 45 accounts only. When we ask how many products pass the criterion of demanded services of mainstream cluster, the number is as low as 34. Also we estimate that market price distribution is more likely normal than rectangular one (also Stigler admits this).

There were mentioned the costs of search. The problem of cost is also the problem of terminology. Costs are the term from the theory of firm mostly. Although the idea of information costs is not that far from the idea of costs, we prefer to include those “costs” into final analysis as part of the product price, respectively the “raise” (we chose symbol small letter \( r \)) of the final price.

3 Small market model

In our model we assume, the price distribution of all RCBS products’ prices is described by function \( F(x) \). On the other hand, from the perspective of the
consumer, the number of available products is limited. Range of the products on the market can be assumed as random sample from the sufficiently large population.

Let \( n \) be a number of available products and \( x \) be the price maximum that the client is willing to pay for RCBS. Thus expected number \( m \) of products cost less than or equal to the asking price (price ceiling) \( x \) is given by \( m \leq nF(x) \). Without loss of generality we can assume that the option at the product price can be determined such that \( m = nF(x) \) is fulfilled. Then the mean number of searches to be carried out to find the desired price is in small market model expressed by the formula

\[
(4) \quad T_n(x) = \frac{n + 1}{m + 1} = \frac{n + 1}{nF(x) + 1}.
\]

Now, let us consider the total expenditure of the searching as a combination of the fixed and the variable market price raise (market price search added “costs”)

\[
(5) \quad r_F + r_rT_n(x),
\]

then the saving, which is achieved in \( t \) months, can be expressed by

\[
(6) \quad S_t(x) = t(y - x) - r_F - r_rT_n(x),
\]

where \( y \) is the actual product price (we presume that consumer already has current account, its month price is \( y \)).

Searching is rational only for \( S_t(x) > 0 \). On the other hand, the client can achieve the optimal setting of price \( x \), if

\[
(7) \quad \frac{dS_t(x)}{dx} = -t - r_r \frac{dT_n(x)}{dx} = 0,
\]

is fulfilled. It is obvious such values exist only in some cases of combinations \( x, y, \) and \( t \). That is the empirical problem solved in the next chapter.

4 Real market data and the computation

Before the start of an analysis we have to declare that all of the amounts in euro are converted from czech crown by central foreign exchange spot rate EUR/CZK = 24.89, where EUR is the base currency.

4.1 The demand side - mainstream consumer cluster identification

Stigler’s paper [5] specifies the demand side and the consumer only in general. For our purposes the demand side has to be described much more thoroughly (the suitable tool from the opposite point of view can be found at [6], [7]). As the data source there has been chosen the RCBS calculator project (thereinafter only as Calculator). This project is fulfilling main information asymmetry related goal EU has pointed out in 2007 and 2009 – free tool for easy product RCBS offer comparison. Knowledge base of the Calculator contains the tariff data of 13 banks (more that 98 % of the RCBS market in the Czech Republic) and their 46 accounts. Consumer just inputs his or hers individual usage of RCBS and the system advise the best 15 products, that offers all demanded services for best price. Since the pilot run during the winter 2009/2010 the Calculator used more than 35 000 of consumers (or there can be said respondents). For more information about this project please see [9].

Since the data source contains more than 35 000 Calculator’s input form fills, there have to be used effective algorithm for large databases. There was used a modified hierarchical method – two-step cluster analysis. Method is implemented e.g. in statistical software IBM PAWS 18. Analysis identified the mainstream cluster representing the RCBS usage pattern for the main group of consumers (RCBS bank clients) in the Czech Republic. The share of the mainstream client was 62 %. For more details about the methodic and clustering outcome, please see [10].

Still due to very specific data acquisition there are very important limitations of subsequent analysis interpretation. All of the analysis, presented in this paper, is limited to mainstream client that has:

- the current account offered on the RCBS market in the Czech republic,
- the Internet connection or uses the Internet for communication (65 % of the Czech population of age 17–74 years according the statistical survey in 2009, see [11]),
- the e-banking service activated, respectively has an account with PC access,
- at least the basic level of ICT literacy (is able to find and use the Calculator’s form),
- usage pattern close to the centroid of the computed mainstream cluster.

Still the population we are studying is very important, maybe a major one in the whole population of the RCBS clients in the Czech Republic.

4.2 The offer side - mainstream RCBS offer

There is being solved the small market problem. When there is taken into consideration the fact that mainstream client will automatically refuse the
premium or exclusive accounts, the number of RCBS offered products (or we can say providers – the banks) drops down to 28. Premium or exclusive products are cheap and very attractive but only after the consumer meets often very hard conditions (mostly as high balance as 20 000 – 40 000 € and high turnover). Net median wage in the Czech republic of 710 € [8] is far from that.

The mainstream acceptable products prices vary from 0 € to 8,72 € with mean of 4,99 € and standard deviation of 2,18 €, for better apprehension please see the chart lower.

Fig.1: histogram of current account prices for mainstream cluster usage pattern in the Czech Republic, source: own research.

4.3 The equilibrium - cost and savings determination

4.3.1 Economical expenses on search

As it was mentioned in problem formulation we are deriving the additional consumer expenses from the “price” of his time. The median value of time for the one cycle in our model (one month) is net median wage of 710 € computed from gross wage [8]. So the one minute of time spend on search is about 0,0733 €. This approach can be used when presumption of consumer labor offer/free time balance is met.

Deriving the time “costs” of one search is much more demanding task. Again we have to use a certain level of approximation or we can say abstraction. Due to extreme individual differences of ICT skills, bank terminology knowledge, IQ etc. there has to be chosen an interval approach. The time consumption of search was studied on rather extreme case of young man, with high ICT skills and above average banking terminology knowledge and above average IQ. This is interval lower limit – this consumer has below average time costs. In other words, time costs we observed are for the rest of the population higher. This is only a model situation and it needs further research. Still the idea, of using the well prepared consumer and analyze if his undeniable potential is enough to find optimal price under the information asymmetry without external expert comparison tool, might show an interesting results.

At first we have to declare that our user is not a “protouser” in other words he already knows his usage pattern from his previous experience. It can be easily derived from last account statements. The second initial task is to get the list of the RCBS providers – retail banks. This can be done using the Google by search for “bank”. There on the first three pages there are the links of all the 13 banks monitored by the Calculator. Banks’ web pages mostly well-arranged and consumer can easily find what and where are the retail accounts. Construction of the table with demanded services, usage frequencies and banks that provides RCBS took 32 minutes. This can be called as fixed cost or pre-search obligatory phase.

The second phase is the search itself, to be specific search one by one. One search consists of e-tariff search and noting down the individual services fees. Table will computed the price our model consumer will pay according the mainstream usage pattern. The problem was when the package accounts were found. Then we constructed the price by presumption of rationality, to be specific by the cost optimal settings of the package. One search in average took 21 minutes. An exception was the first search or rather it can be called the zero one. Presuming the consumer is not a proto-user, he knows his price for one (actual) account for minimal search costs.

4.3.1 Economical revenues on search

The basic idea is the same as Stigler’s one. When there is found cheaper product (account) additional saving (or we can say price reduction) is the difference of actual minimum (real or better probable minimum) and the new one. Still we are consuming (using) the account much longer than one month. The total price reduction has very strong correlation to time. The problem is even more complex when we have to declare market price stability that strongly determines the total expenses.
The question of how often the banks make fundamental tariff changes can be answered by past experience. We asked the expert P. Nacher (well known person in the Czech Republic for public basic finance literacy improvement projects). He estimates that those changes come at least once per 1.5 years, still he prefers one year. But the ration consumer cannot set one of the main parameters without the foresight margin. We presume the tariff stability of 8 months.

The final price paid for the account is then consisted of moth charges, initial costs on search, and costs of the performed search and all is multiplied by the number of months the product will be used. At the end of the subsection there has to be reminded that the consumer does not know what account will be discovered by the additional search. It can be only estimated.

4.4 The computation – optimal price under the information asymmetry conditions in the Czech Republic

As stated above, the prices of banking products for a specified client of the mainstream cluster can be described by the normal distribution (the market price distribution has passed the S-W test of normality in IBM PASW 18). The distribution parameters are estimated from the market prices computed by the Calculator system or the prices can be computed from the tariffs on the banks’ websites.

So, consider the market prices are described by the normal distribution with the parameters \( \mu = 4.99\, € \) and \( \sigma = 2.18\, € \). For the specified type of client, the number of suitable accounts is 28. With respect to text above, we get the market price raise (search costs) \( r_y = 32 \cdot 0.0733 = 2.35\, € \) and \( r_y = 21 \cdot 0.0733 = 1.54\, € \).

Following the idea of limited marked we can create the basic model of savings depending on parameters \( x, y \) and \( t \). With respect to frequency of more or less fundamental changes (we abstract from very small tariff changes) of the market prices of RCBS accounts, the return of the invested time and money, represented by the parameter \( t \), have to be adequately short – otherwise the search just does not pay off. So, parameter \( t \) is desired up to 8. For \( t > 8 \), we risk the price of chosen product changes before returning the invested costs of the search (market price raise). The consumer might estimate the tariff changes successfully, but it is highly unlike (even the banks are not able to predict behavior of their competitors) and so we abstract this option has zero influence.

For example using previous settings of consumer pattern, skills and tariff stability if the market price of actually used banking product is \( y = 4.5\, € \) and we ask the return \( t = 8 \) months, then, with respect to [5] idea and our model, we get the positive savings for desired market price \( x \in [1, 2, 3, 4] \) and the optimal value of desired market price is 2.19€. For the better understanding and overview of other market price situations, please see figure lower.

5 Conclusion

The information asymmetry in banking is not just the problem of loan market [12] it is present on the RCBS market as well. The Stigler’s model [5]
presents the idea that asymmetric information about prices generates costs for consumers that does not know all the prices on the market. We agree and we present the model that can be used for estimation of the RCBS optimal price the consumer should pay under certain conditions of his usage pattern, asymmetric information represented by costs on search, tariff stability and actually used product.

The information asymmetry on the RCBS market in the Czech Republic exists and so the real price of RCBS consists of market price and costs of the search for it. Information asymmetry determines the fees also from the offer side allowing higher profits – this factor can be one of the missing factors in the study [13].

Nevertheless even under its influence, there can be found lower market price for indispensable part of the consumer population. Our model shown how the rational consumer can face the information asymmetry – according to our case it is rational to search for better market price when actual one is around 4,26€. Still we have to keep in mind the limitations and presumptions such as normal distribution of the market prices, 8 month of tariff stability, mainstream e6banking activated client cluster, low search costs, actual RCBS offer in the Czech Republic, exchange spot rate, net median wage.

For the future the model can be used as a sort of information asymmetry indicator. In other words the tighter the range where the savings can be realized the higher the information asymmetry is (the higher the costs of search are).

6 Funding and acknowledgment
This paper is written in the frame of specific research “Adverzní výběr v prostředí retailového bankovnictví”, translated as “Retail banking adverse selection”, project number 2105, funded by Czech Republic Ministry of Education, Youth and Sport.

References:


