Analysis and Research on Private Information Pricing

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Abstract: The purpose of this paper is to solve the pricing problem of private information if it were going to enter the product market as a commodity. First, we classify the personal information and obtain the compensation value of the information that people are willing to sell through the statistical method, so as to form the basis of private information pricing system, construct the model of the willingness to pay, and get the price point. Second, consider the generational differences in risk-benefit ratios by establishing an equation for risk-efficiency ratios. The impact of age on the willingness to be paid based on age gets the effect of age on the model. We analyze the similarities and differences between PP, IP and PI from the perspective of market and law. Finally, software SPSS was used to analyze the correlation of multiple variables to get the information relevance.

Keywords: Private information; Risk-benefit ratios; Risk-efficiency ratios; SPSS

1. Introduction

With the popularity of Internet applications and people's reliance on the Internet, personal privacy issues have become increasingly prominent, different people and different fields have different attitudes toward private information, and when private information becomes valuable and quantifiable goods, people conduct a series of transactions which are accompanied by risks. As the regulator of the entire society, the government should analyze various factors and make reasonable decisions.

According to the annex, from the private information cost pricing, consider the various factors on the impact of cost pricing, study the following questions：

Choose a parameter system, establish a price model, and divide people into sub-groups with similar risks

Consider intergenerational differences in perceived risk-to-return ratios of PI and data privacy, the effects of age on the model, and similarities and differences in PI, PP, and IP.

Find a way to measure the relevance of human data, establish a network effect model for data sharing, consider the impact of data sharing on the price system, and consider whether the community has a responsibility to protect the privacy of citizens.

2. The Establishment of the Model

2.1. Problem 1. model building

This task requires us to measure the degree of risk, our train of thought is this: First of all based on different personal information risk exposure will be divided into personal information. Here, we consider dividing information rather than dividing individuals because it is difficult to measure aspects of an individual's situation. The nature and extent of the risks of the same type of personal information are similar. By dividing the information we have six parameters and their branches.

We use the method of investigation pricing to give the approximate price of the private information before it enters the market. We need a pre-investigation before the investigation. For each Aij, Determine the feasible pricing range. After that we issue a questionnaire to count the frequency of each price range, The average price for each Aij is calculated by weighted average.

$$WAT^{*} = \sum_{i=0}^{6} kiAi \ , \quad WAT = WAT^{*} + e$$

WTA*is observable price information , Ɛ is the error term. It is equally important to assume that each Aij in Ai. Count ω ij for the absolute value of Aij coefficient:

$$w_{ij} = 1\Pr^{yy} + 2\Pr^{yn} + 3\Pr^{ny} + 4\Pr^{nn}$$

$$\Omega_i = w_{ij} / \sum_{j=1}^{N} w_{ij}$$

At the beginning of the investigation, the respondent will be provided with the compensation value of bid and ask his/her wish. If the respondent replies "yes", then the compensation value bid1 of the lower limit will be given. If the respondent's answer is "Do not want", then give a higher amount of compensation value bidh. Thus, the probability of remembering four different responses is Pryy (willing/willing), Pryn (willing/unwilling), Prny (unwilling/willing), Prnn (unwilling/unwilling), and their expressions are: Pryy (bid, bidl)=Pr(bid≥WTA and bidl≥ WTA) = Pr(bidl≥ WTA)=G(bidl; q)

We call this model a willingness to pay model because it is constructed on the basis of the willingness of the privacy owner to pay. So what does it have to do with the degree of risk? Most people are risk averse people who are willing to pay higher prices for high-risk, private information. In other words, the level of risk is positively related to willingness to pay.

2.2. Problem 2. model building

In this task, we analyze the generational differences in risk-benefit ratios and then analyze the impact of population aging on our model . First, we introduce the concept of risk-return ratio. We construct the formula to calculate the return on risk. The risk compensation is the part which equals price minus its cost. Since the reason why the price of private information is higher than its cost is that the people' s willingness to accept the price in increasing due to risk aversion. We define the amount of risk compensation as below:

M-PIS= λ (WTA-PIS)

The risk rate of return is defined by the ratio of the amount of risk compensation to the price of the commodity. Let us suppose that ξ is the risk rate of return. The concrete formula of ξ is as follows:

$\xi = \lambda$ (WTA-PIS)/(1- λ)PIS + λ WTA

We further transform the formula to get the following result:

ξ =1-1/1+ λ (WTA-PIS)

According to opinion polls, the seniors are more conservative ,less risk-takingand more cautious about the risks of information disclosure. The price they would accept for any particular piece of private information is certainly greater. So their willingness to pay is greater. We enter the formula and we can draw the conclusion that the risk rate of return increases as age increases.

Then let us consider the influence of intergenerational change on our model. For the same generation, we can get a positive correlation between the price in its pricing system and the growth of age through the above analysis. For the community as a whole, it depends on the proportion of people of all ages in the total social population.

Let us think about the similarities and differences between PI , PPand IP. The same thing about PI and PP and IP is that they are all protected by law. PI has the "Privacy Protection Act" all around the world as well as private property and intellectual property protection of the relevant legal provisions. The difference is listed as below:

The judgment of the goods. Private property can be sold at fair value. PI and IP are not included because they are not in the market.

Risk scale. When PI and PP are quantified as commodities, PP takes a small risk and PI is easy to be leaked because many intermediaries may sell private information. The classification of assets. PI is not an asset, but IP is an intangible asset.

2.3. Problem 3. model building

We can use spss to conduct correlation analysis of multiple variables. We use pearson correlation (pci) as a correlation coefficient (To know the specific methods, see Appendix 1). If 0<|pci|<0.3, it is a non-linear correlation. If |pci|>0.3, it is a linear correlation. If 0.3<|pci|<0.5, it is a low correlation. If 0.5<|pci|<0.8, they are significantly related (moderately related). If |pci|>0.8, they are highly relevant.

Because of the difficulty of statistics and uncertainties caused by the data sharing, we borrowed artificial neural network model to establish a data sharing network model, which is referred to as DSNM. With the DSNM model, we can see how y0 changes by changing xi. Suppose each person has only one access to private information, sharing one information will bring L loss to the owner of the information. Then Q individuals have private information (sales of information as the number of people purchasing information). T% of whom have data sharing. The information provider actually obtains the loss of L = -t% * Q * N. Information buyers will get T = t% * Q * Nas a revenue. N is the actual amount of information leakage caused by a message sharing, which can be determined by the DSNM model. It is equivalent to the transfer of payments between consumers and suppliers. It will result in reduced supply and reduced demand. After several games, market will reach the final equilibrium price.

3. Strengths and Weaknesses

3.1. Strengths

Use a lot of statistical knowledge to deal with variables. For example, time Series Analysis, correlation Analysis of Multiple Variables and so on.

Use a lot of economic knowledge to make a good explanation of the problem and build the model.

The convergence between the models is better. The following model can make more use of the previous model.

4.A reasonable use of graphics to represent the effect of the impact on the model.

3.2. Weaknesses

Due to the lack of privacy-related data, we cannt give the right weight for the variables. So we cannot do sensitivity analysis and error analysis on the mode.

Due to the lack of relevant information on privacy and personal information, we cannot give privacy and personal appropriate quantitative criteria.

The establishment of some models is subjective. Therefore, it is hard to logically give reasonable explanations.

Due to lack of data, some analyzes are subjective and may not be consistent with reality.
Due to the lack of data, the selection of some variables is subject.

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