The Influence Factor Model for the Popularity of Mobile Phone without Considering the Price Factor

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Abstract. Based on the statistical data like economic development, social development, population indicator and so on, this paper establishes the linear regression model which influences the popularity rate of mobile phone users.

1. Introduction
Since the all-service operation in 2009, the duopoly competition of mobile phone has been broken, three competitors --China Mobile, China Telecom and China Unicom have created the competitive pattern. With the user scale expansion of China Unicom and China Telecom, the users of nationwide China Mobile begin to grow slowly, and the mobile phone users approach to saturation in several cities. Under such background, China Telecom operator begins to pay attention to excavation of the newly increased market potential and the upgrade strategy of market space of mobile phone users.

However, there are only a few of documents about the newly increased market demand and strategy research of the telecom operators in recent years. Du Juan (Du Juan, 2006) has done research on the relationship of the popularity rate of mobile phone and the replacement of fixed-line telephones, and testified the substitutional relation of them based on data of Shanghai, Guangdong, Tianjin etc, but the research of Du Juan only stayed in the replacement stage of mobile phone and fixed-line telephone, which is not suitable for current situation. Zhang Mingxin and Wei Lu (Zhang Mingxin and Wei Lu, 2006), with the basic investigation research framework of subjective demand and innovation diffusion, did questionnaire research in three rural market of Hubei Province, investigate the adopting and using situation of mobile phones of rural residents and its internal mechanism, and discussed on the expansion of mobile phone in rural market. This research aims at investigating the newly increased market influence factor model.

2. The influence factor model for the popularity of mobile phone without considering the price factor
The demands for something of consumers usually origin form the desire for that thing. Marshall considered that it was human beings’ desires that cased human beings’ activities, while new activities had produced new desires (Lian Yunjie, 2005). Later, the western economists defied demand as the quantity of products or service that consumer chose to buy under one price.
2.1. Research on the influence factor for the popularity of mobile phone market

1. Model assumption. Assume that the price and marketing strategy of operators of nationwide keep consistent.

2. Modeling indicator.
   (1) Per-capita GDP: gross regional domestic product / overall population at the end of year
   (2) Per-capita income: (town per-capita disposable income *town population+ rural per-capita net income* rural population)/ overall population at the end of year.
   (3) Urbanization level: town population/ overall population at the end of year.
   (4) Natural population growth rate: birth rate- death rate.
   (5) Growth rate of population increase: overall population at the end of year/ overall population of last year-1.
   (6) Occupancy rate of population above 65-year old: population that above 65-year old/ overall population at the end of year.
   (7) Occupancy rate of population less than 14-year old: population that less than 14-year old/ overall population at the end of year.
   (8) Occupancy rate of population at right age: 1-(6+7)
   (9) Occupancy rate of trans-provincial outflow population: trans-provincial outflow population/ overall population at the end of year.
   (10) Occupancy rate of communication expenditure: communication expenditure/ nonproductive expenditure.
   (11) Popularizing rate of internet user: user number of internet/ overall population at the end of year.

3. Model establishing (China Statistical Yearbook, 2012).
   Step 1: conduct statistical test on the dependency between the selective 11 indicators and mobile phone popularizing rate, reject the worse dependent 3 indicator (as shown in Table 1): natural population growth rate, occupancy rate of population above 65-year old, and occupancy rate of communication expenditure.

   | Variable                                      | Correlation Index | Significance Testing |
   |-----------------------------------------------|-------------------|---------------------|
   | Per-capita GDP                                | 0.849             | 0.000               |
   | Per-capita income                             | 0.836             | 0.000               |
   | Urbanization level                            | 0.815             | 0.000               |
   | Growth rate of population increase            | 0.519             | 0.003               |
   | Natural population growth rate                | -0.268            | 0.145               |
   | Occupancy rate of population less than 14-year old | -0.649            | 0.000               |
   | Occupancy rate of population above 65-year old | -0.214            | 0.247               |
   | Occupancy rate of trans-provincial outflow population | -0.576            | 0.001               |
   | Occupancy rate of communication expenditure   | -0.101            | 0.588               |
   | Popularizing rate of internet user            | 0.93              | 0.000               |

   Step 2: In order to find the result interpretability for the model, conduct factor analysis for 8 alternative indicators (the result as Table 2 shows), getting 4 key factors (economic development factor: mainly represents economic-growing GDP, resident income, urbanization and internet popularization etc; population composition factor: mainly represents the age structure of population; population growth factor: mainly represents the population increasing speed; and population mobility factor: mainly represents population mobility factor). These four factors can explain 96.7% amount of information of 8 variables, and compressing the quantity of variables, which is help to establish model,
explain the reason for influencing the popularizing rate, and find the method to improve the popularizing rate.

Table 2: Factor analysis for 8 alternative indicators.

| Explanatory amount of information for principal component | Quantity of principal component |
|----------------------------------------------------------|---------------------------------|
| 72.112                                                   | 1                               |
| 83.336                                                   | 2                               |
| 92.392                                                   | 3                               |
| 96.695                                                   | 4                               |
| 98.068                                                   | 5                               |
| 98.867                                                   | 6                               |
| 99.499                                                   | 7                               |
| 100                                                      | 8                               |

Step 3: Use 4 key factors as explanatory variables to conduct regression analysis for the popularizing rate of mobile phone, and output the prediction model.

\[ y = 0.756 + 0.144a_1 + 0.066a_2 + 0.033a_3 - 0.081a_4 \]  

Including:
- \( y \): the popularizing rate of mobile phone
- \( a_1 \): economic development factor; \( a_2 \): population composition factor; \( a_3 \): population growth factor; \( a_4 \): population mobility factor.

4. Model conclusion. The development of mobile phone connects intimately with economic development factor, population composition factor, population growth factor, and population mobility factor. In the area that with higher economic and social development, there will be higher market popularizing rate, while in the area that with lower economic and social development, there may be lower market popularizing rate.

2.2. Demonstrate based on the data of Hunan Province

Table 3: Statistical yearbook of Hunan Province/ relative data announced by operators

| Province  | Population(million) | Number of mobile phone users | Popularizing rate of mobile phone users | 1. Per-capita GDP(Yuan) | 2. Per-capita income of town disposable income and urban net income | Town resident family capita disposable income(Yuan) | Rural population(million) | Rural population growth rate | Population of right age occupa (above 65-year old) and below 14-year old occupa | 6. Mobility population occupancy (outflow working) | Trans-province outflow population(million) | 7. Communication expenditure(million) | 8. Internet users(million) |
|-----------|---------------------|-----------------------------|----------------------------------------|------------------------|-------------------------------------------------------------------|--------------------------------------------------|------------------------|------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------|---------------------------|-----------------------------|
| Hunan     | 6596                | 3749                        | 0.568                                   | 29880                  | 12104                                                             | 1844.1                                            | 2975                   | 6567                         | 3621                                                                        | 0.451                                                                        | 0.004                              | 0.7162                    | 0.212                       | 1396                         | 0.048                            | 1396                       |
Table 4: Four key factor data of Hunan output by SPSS

|        | a_1   | a_2   | a_3   | a_4   |
|--------|-------|-------|-------|-------|
| Hunan Province | -0.31802 | -0.16747 | -0.02690 | 1.47329 |

1. Model demonstration

Make the data of Hunan Province into the model (as Table 3 shows), four key factor data of Hunan output by SPSS (as Table 4 shows)

2. Demonstration conclusion. According to model calculation, the theoretical value of mobile phone popularizing rate of Hunan in 2011 is 57.87%, which is a bit higher than its actual value (56.8%). The model is proved, which explains the development of mobile phone connects correlatively with economic development factor, population composition factor, population growth factor, and population mobility factor, and the mobile phone popularizing rate of Hunan basically accord with the economic and social development status of Hunan. Firstly, the urbanization of Hunan is relatively low; rural population occupies high and the popularizing rate is low. The rural population of Hunan is 36.21 million, while the mobile phone popularizing rate in rural is only 55%, and there are 15.2 million of them without mobile phone. Secondly, there is high occupancy of old and young people. Statistical data displays that people of 0 to 14 occupy nearly 18%, about 11.8 million; people above 65-year old occupies more than 19%, about 6.0 million. According to the survey data, people of more than 71-year old occupy 11%, about 2.7 million. Children below 14-year old because of reasons like age, school regulation etc, occupies a relatively low popularizing rate. Thirdly, the mobility population occupies high; the outflow population mostly uses numbers of other province, while the people who come to Hunan seldom use Hunan number (20%).

3. Conclusion

There are four main factors influencing the mobile phone popularizing rate, but the outmost one is the price factor. In the almost three oligopoly telecom operator perfect competition market, the competition for mobile phone mainly represents as price competition. Due to the unbalanced tariff level in different area, the mobile phone popularizing rate is also unbalanced. But there is still space for mobile phone newly increased market.

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