2007－DPS－130 (53)
2007－CSEC－ 36 (53)
2007／3／2

An Extended Network Service Pricing Model Considering Fair Relation Between Network Service Providers and Users

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Abstract

In this paper, we provide an evaluation model for marketable quality and profitability. We define the marketable quality as a qualitative aspect of profitability. We apply the real values of some leading manufacturing corporations in Japan to our proposed model to analyze its accuracy. From the analysis, we found that theoretical and real standard values of the marketable quality indicator were very close. This shows that the proposed model has a good approximation. From the fair relation of network service providers and users, we present the network pricing guidelines and extend our proposed network service pricing model considering network externalities.

1 Introduction

Now the economy society is shifting from the economies of scale to the quality enhancement. For this reason, the achieved standard profitability depends on the free competition between corporations. This is a very important concept that should be considered to evaluate the corporation profitability. The corporation profitability is conceptually considered to be a function of two variables: the qualitative and quantitative aspects. In fact, the quality and quantity are independent variables. But, for the profitability, there is a relation between them. However, in the best of our knowledge, there is no any research to deal with the measurement of a profitability function where the qualitative aspect is considered variable.

The Break-Even Point (BEP) ratio expressed in the following equation is used as an indicator related to profitability to measure the degree of safety against a risk of loss.

BEP Ratio = Sales at BEP / Sales = Fixed Costs / (Sales - Variable Costs)

This indicator is based on the profit graph presented by Knoeppel [1]. Another profitability indicator (relative annual profit) has been obtained from the rate of operation and the rate of operation at the BEP [2].

Relative Annual Profit = Rate of Operation / Rate of Operation at BEP = Marginal Profit / Fixed Costs

We consider the relative annual profit as a profitability indicator in this study. We define the marketable quality based on the quality aspects of products and services provided by corporations. In order to define the quality, Garvin [3] considers five viewpoints, i.e., transcendent, product based, user based, manufacture based and value based as main approaches. We define the marketable quality as a qualitative aspect of profitability (value based).

In this work, we present an evaluation model for both: marketable quality and profitability. In order to increase profitability by enhancing the marketable quality, we present the network service pricing model considering the fair relation between providers and consumers. Furthermore, we enhance our network service pricing model considering network externalities.

The paper is organized as follows. In the next section, we present a model to evaluate the marketable quality and profitability. In Section 3, we give the econometric methodology. In Section 4, we present network service pricing guidelines and the extended network service pricing model. Finally, in Section 5, we give some conclusions.

2 Proposed Model

2.1 Basic Variables

If a certain corporation consists of m kinds of processes or divisions for a certain period, we consider the capacity (total available operating time) of process i be T_i^c, and its costs (fixed costs) be F_i, where $i = 1, \ldots, m$. The necessary capacity (the

Table 1: Annual relevant indicator values in the manufacturing industry.

Item	Year												
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
r	1.128	1.159	1.207	1.214	1.198	1.154	1.109	1.087	1.100	1.127	1.146	1.135	1.098
Est. β	77.09	76.59	81.77	83.82	85.55	83.62	76.49	72.92	72.06	73.77	74.20	77.34	71.34
AGAV	28.37	29.41	32.78	35.19	37.49	33.58	32.45	31.30	32.12	33.56	35.08	34.51	31.15
AFC	37.49	38.93	41.73	45.08	49.14	45.92	46.38	45.30	47.82	48.40	50.10	50.63	48.63
β_0	0.606	0.574	0.561	0.569	0.596	0.628	0.622	0.617	0.596	0.581	0.565	0.600	0.592
$E(\beta)$	79.48	77.72	77.00	77.44	78.93	80.68	80.36	80.08	78.93	78.11	77.22	79.15	78.71

total necessary time of operation) of process i is assumed to be T_i and the marginal profit which is calculated as the value of sales minus the variable costs (activity costs) is assumed to be M.

There is a minimum required level (minimum passing level) to purchase a product considering a sacrifice (price or fee) from the customers' side related to the quality of products or services given by a corporation. This means the minimum level to be achieved, even if the sacrifice is small. In this way, any quality level can be quantified theoretically by comparing with the minimum passing level. Therefore, we consider the minimum passing level as P_0 and the other levels as P.

2.2 Model Indicators

2.2.1 Rate of Operation Indicator

In our study, the rate of operation of a corporation β, is expressed in Eq. (1) as the average value of the rates β_i. The capacity cost values are used as weights for each process [2].

$$\beta = \frac{\sum_i \beta_i F_i}{\sum_i F_i} = \frac{\sum_i T_i f_i}{F} \tag{1}$$

Hence, $\beta_i = \frac{T_i}{T_i^c}$, $f_i = \frac{F_i}{T_i^c}$, $F = \sum_{i=1} F_i$.

Eq. (1) can be seen as a degree of used capacity costs.

The rate of operation of the manufacturing industry in Japan is estimated by the Ministry of International Trade and Industry and the Economic Planning Agency, and the Ministry of Economy, Trade and Industry [4, 5]. The weighted average values are calculated by using added values of the rate of operation for each item which are considered as indicator of the rate of operation. Estimated values of the rate β of operation for each year are shown in Table 1. The corporation Average Gross Added Value (AGAV) and Average Fixed Costs (AFC) for each year [6] show that there is a high positive correlation (Correlation Coefficient (CC)= 0.721) between them. For this reason, we can apply the data of the rate of operation in Table 1 to the corporation rate of operation.

2.2.2 Profitability Indicator

The indicator representing relative annual profit only in the time dimension can be obtained as follows [2]. The ratio of marginal profit to necessary capacity costs (the amount of use of capacity costs) is defined as the following marginal profit rate:

$$\gamma = \frac{M}{\sum_i T_i f_i}. \tag{2}$$

The inverse number of γ is α, which is the minimum utilization rate of the capacity costs (the minimum rate of operation) required to cover capacity costs F at the marginal profit rate γ. If the minimum capacity cost required to cover F is considered to be F_0,

$$\alpha = \frac{F_0}{F} = \frac{\sum_i T_i f_i}{M}. \tag{3}$$

This equation can be obtained by using this relation: $F_0 \frac{M}{\sum_i T_i f_i} = F$.

Therefore, the general relative profitability r can be measured by the ratio of β to α:

$$r = \frac{\beta}{\alpha} = \frac{M}{F}. \tag{4}$$

This parameter is considered as the relative annual profit.

2.2.3 Marketable Quality Indicator

The indicator P is impossible to be used as an evaluation indicator to compare the quality aspects of corporations. In order to build a quality indicator to compare product quality of corporations, we combine P with time and corresponding costs. The evaluation of the minimum passage level P_0 is based on the capacity costs as input and marginal profit as output for a certain rate of operation B ($0 < B \leq 1$) and capacity costs per rate of operation F/B [7]. The parameter B is the rate of operation of the BEP, when the production is made at the minimum passage level $P = P_0$. The marginal profit $V(P_0, \beta)$ when the rate of operation differs from B in the minimum passage level $P = P_0$ is obtained by: $V(P_0, \beta) = \frac{F}{B}\beta$.

If marginal profit increases in proportion to the evaluated level P, the marginal profit $V(P, \beta)$ at the evaluated level P and the rate β of operation is computed by the following equation:

$$V(P, \beta) = P\frac{P}{P_0}\frac{\beta}{B}. \tag{5}$$

The marginal profit of Eq. (5) on the corporations' side plus the variable costs is considered as the price (fee) which the consumers should pay (sacrifice). By considering the input (costs) indicator corresponding to output of the evaluated level in Eq. (5), we obtain Eq. (6).

$$\text{Input (Cost) Indicator} = \frac{F}{B}\beta \tag{6}$$

Therefore, the relative value of P can be obtained by the ratio of output indicator Eq. (5) to the conditional input indicator Eq. (6) under the rate of B operation.

$$\text{Conditional Relative Value} = \frac{P}{P_0} \tag{7}$$

However, the relative value of Eq. (7) is possible only between corporations having the same B. Thus, it is impossible to make a relative evaluation by Eq. (7), because of different comparison conditions. For this reason, we carry out a more general comparable evaluation for the qualitative aspects of corporations. We deal with this problem as follows [8]. For a certain corporation and for a certain period, a point (β, r) for each value of β and r is considered. There exists a function $r(\beta)$ of β, that is, a point-set where the marketable quality is the same. The set of points (β, r) which can theoretically exist is considered to be R, and we consider also another set which is assumed to be Q (Q is a subset of R). If the price function is expressed as $u(\beta)$, all points in the set Q are included in the following equation:

$$r(\beta) = u(\beta)\beta . \quad (8)$$

The price function can be considered as a fair relationship when a rate of profit increases due to an increase in the rate β of operation ($\frac{dr(\beta)}{d\beta}$) (profit on the corporations' side) and the rate of reduction in the total price ($-\beta\frac{du(\beta)}{d\beta}$) (profit on the customers side) are equal. This can be obtained by solving the following differential equation.

$$2\beta\frac{du(\beta)}{d\beta} + u(\beta) = 0 \quad (9)$$

$$u(\beta) = \frac{c}{\sqrt{\beta}}, \quad c: integration\ constant$$

There exist price functions when the rate of profit increase and the rate of price reduction are equal within a region where the integration constant c is a positive number. An incremental profit and a reduction in the total price on a reasonable price function at the rate β of operation are both expressed by the following equation.

$$r(\beta) = \int_0^\beta \frac{dr(\beta)}{d\beta}d\beta = \int_0^\beta -\beta\frac{du(\beta)}{d\beta}d\beta = c\sqrt{\beta} \quad (10)$$

Eq. (10) shows a fair relationship between the relative annual profit and the rate of operation. If the rate of operation at the BEP where fixed costs (capacity costs) can be just covered by an incremental profit is considered to be β_0, the integration constant c can be obtained by Eq. (10): $c\sqrt{\beta}_0 = 1$. From this equation, we get: $c = \frac{1}{\sqrt{\beta_0}}$.

Therefore, from the Eq. (10) of relative annual profit, we obtain the following equations:

$$r(\beta) = \sqrt{\frac{\beta}{\beta_0}} \quad (11)$$

$$0 < \beta_0 \leq 1 . \quad (12)$$

By Eq. (11), we classify the point $(\beta, r) \in R$ by considering β_0 as a relative profitability of the qualitative aspect from the viewpoint of fair relationship between β and r [9]. The smaller β_0 is, the greater the marketable quality becomes in the sense that the profitability r becomes greater for any rate of operation as shown in Fig.1. The value of β_0 is calculated by following equation by using Eq. (4) and Eq. (11).

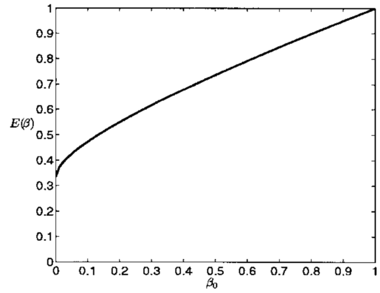

Figure 1: Relationship between $E(\beta)$ and β_0.

Table 2: Standard distribution of profitability r.

r	β_0	$1 - F(\beta_0)$	$P(r - 0.1 < x < r)$
1.1	0.698	0.4168	0.4168
1.2	0.518	0.6272	0.2104
1.3	0.401	0.7461	0.1189
1.4	0.321	0.8181	0.0720
1.5	0.263	0.8651	0.0470
1.6	0.220	0.8968	0.0317
1.7	0.187	0.9191	0.0223
1.8	0.161	0.9354	0.0163
1.9	0.140	0.9476	0.0122
2.0	0.123	0.9569	0.0093
2.1	0.109	0.9640	0.0071
2.2	0.097	0.9698	0.0058
2.3	0.087	0.9743	0.0045
2.4	0.079	0.9778	0.0035
2.5	0.071	0.9811	0.0033
2.6	0.065	0.9834	0.0023
2.7	0.060	0.9853	0.0019
2.8	0.055	0.9871	0.0018
2.9	0.051	0.9885	0.0014
3.0	0.047	0.9898	0.0013
3.1	0.043	0.9911	0.0013

$$\beta_0 = \frac{\alpha^2}{\beta} = \frac{\beta}{r^2} \quad (13)$$

The β_0 is related to variables: P, P_0, B, and β. From Eq. (5) and Eq. (13), we get the following equation.

$$\beta_0 = \frac{P_0^2 B^2}{P^2 \beta} \quad (14)$$

Because point $(\beta, r) \in R$ corresponds to point (β_0, β), it is possible to measure the following profitability function consisting of two variables: the generally comparable quality indicator β_0 and the rate β of operation.

$$r(\beta_0, \beta) = \sqrt{\frac{\beta}{\beta_0}} \quad (15)$$

3 Econometric Methodology

3.1 Values of Marketable Quality

Let us look at Table 1 to see how our proposed marketable quality indicator β_0 approaches the real values. For the period from 1986 to 1998 from a total average viewpoint, β_0 shows major fluctuations. This period includes the period of the bubble economy of leading Japanese manufacturing corporations. The average value of β_0 for 13 years was 0.593.

To find the marketable quality indicator β_0, it is important to consider the difficulty of production on the producers' side and the sacrifice on the consumers' side [8]. The smaller is β_0 value (from 1 to 0) in Eq. (12), the greater is the incremental profit in Eq. (11). However, when β_0 is small, it is more difficult to realize the marketable quality on the producers' side. The sacrifice on the consumers' side is equal to the incremental profit on the producers' side.

In the case when β_0 is a value within the range of Eq. (12), its probability distribution is set independently from β in the following way. If the probability density function of β_0 is assumed to be $f(\beta_0)$, its value is obtained as Eq. (16) by using Eq. (11).

$$f(\beta_0) = \frac{\sqrt{\frac{\beta_0}{\beta}}}{\int_0^1 \sqrt{\frac{\beta_0}{\beta}} d\beta_0} = 1.5\sqrt{\beta_0} \quad (16)$$

Therefore, the expectation of the marketable quality indicator β_0 is obtained by Eq. (17).

$$E(\beta_0) = \int_0^1 \beta_0 f(\beta_0) d\beta_0 = \int_0^1 \beta_0 (1.5\sqrt{\beta_0}) d\beta_0 = 0.6 \quad (17)$$

By this expectation, the standard value of β_0 can be set equal to 0.6. Such theoretical standard value of β_0 nearly agrees with the average 0.593 of β_0 in Table 1.

3.2 Marketable Quality and Relative Annual Profit

The difficulty degree to realize the rate β of operation for each β_0 in Eq. (11) exceeding the BEP (within the range of $\beta_0 \leq \beta \leq 1$) is in proportional relation to the size of the incremental profit in Eq. (11). The probability density function of β is obtained by Eq. (18).

$$f(\beta) = \frac{\sqrt{\frac{\beta_0}{\beta}}}{\int_{\beta_0}^1 \sqrt{\frac{\beta_0}{\beta}} d\beta} = \left\{ 2\left(1 - \sqrt{\beta_0}\right)\sqrt{\beta} \right\}^{-1} \quad (18)$$

Therefore, the expectation of β is obtained by Eq. (19).

$$E(\beta) = \int_{\beta_0}^1 \beta f(\beta) d\beta = \frac{1}{3}(\beta_0 + \sqrt{\beta_0} + 1) \quad (19)$$

The $E(\beta)$ can be established as the theoretical standard value of β at β_0. Therefore, the standard relationship between the marketable quality indicator β_0 and relative annual profit r is derived by Eq. (20), where $E(\beta)$ is considered as a parameter. The r value can be obtained by putting Eq. (19) into Eq. (11).

$$r = \left\{ \frac{1 - \beta_0\sqrt{\beta_0}}{3(1 - \sqrt{\beta_0})\beta_0} \right\}^{0.5} \quad (20)$$

The r value and its incremental rate increase with the decrease of β_0. This represents a gradual increase in profitability (returns) by improvement of marketable quality.

The standard value of marketable quality $\beta_0 = 0.6$ based on the standard operation rate gives a profitability value r. This value can be calculated from Eq. (20) and will be:

$$r = 1.1486. \quad (21)$$

In following, the distribution of r can be obtained as shown in Table 2, by transforming Eq. (20) to Eq. (22) and applying this value to the distribution of β_0 in Eq. (16) [10, 11].

$$\beta_0 = \left\{ \frac{1 + \sqrt{12r^2 - 3}}{2(3r^2 - 1)} \right\}^2 \quad (22)$$

Then, the expectation of r is theoretically calculated as follows.

$$\begin{aligned} E(r) &= \int_0^1 r(\beta_0) f(\beta_0) d\beta_0 \quad (23) \\ &= \frac{1.5}{\sqrt{3}} \int_0^1 (1 + \sqrt{\beta_0} + \beta_0)^{0.5} d\beta_0 \\ &= 1.2649 \end{aligned}$$

Therefore, the effect in the standard value of the gradual increase of profitability due to improvement of marketable quality can be measured by the profitability of Eq. (23) minus profitability of Eq. (21), i.e. 0.116. The value of marketable quality for this effect is $\beta_0 = 0.437$.

4 Network Service Pricing Model

4.1 Network Service Pricing Guidelines

If a certain network provider has a network system for a certain period, we consider the total capacity of the network system to be T^c, its cost (fixed cost) F, and the necessary capacity of customers j in the given period t_j, $j = 1, \ldots, n$. We consider the fair relation between network service providers and consumers. Also considering the Eq.(11) and the relation between r and F ($r = M/F$), when r is equal to 1, the marginal profit M is the same with fixed costs F.

In Fig. 2 is shown the relation between β_0, β and r. If β_0 is constant and we increase β, then the r value is increased. Otherwise, if we consider β constant, the value of r is decreased with increase of β_0. However, when r is 1, the marginal profit M does not change when β is changed. In this case, the M can be considered the cost. Therefore, the network service provider costs (c_j) for customer j are computed as follows:

$$c_j = t_j f_0 + v_j \quad (24)$$

where, $f_0 = F / \sum_j t_j$ and v_j are variable service costs. The $t_j f_0$ value in Eq. (24) is the allocated capacity costs (fixed costs) for customer j when the marginal profit M is equal with fixed costs F and β_0 is equal to β. For example in Fig. 2, for $\beta_0 = 0.8$ the value of profitability r is equal to 1 when $\beta = 0.8$. The allocated capacity cost increases by decreasing β value.

By considering the standard value of marketable quality indicator of a provider as $\beta_0 = 0.6$ and the standard value of gradual increase of profitability related to $\beta_0 = 0.437$, we decide the value of β_0^*. The network service price (P_j) for customer j is calculated as follows:

$$P_j = (t_j f)\gamma + v_j \quad (25)$$

where, $f = F/T^c$, $\gamma = (\beta\beta_0^*)^{-0.5}$, $\beta = \sum_j t_j / T^c$.

On the other hand, if the network service price P_j for a customer j is given for a network market, we can compute the marketable quality indicator

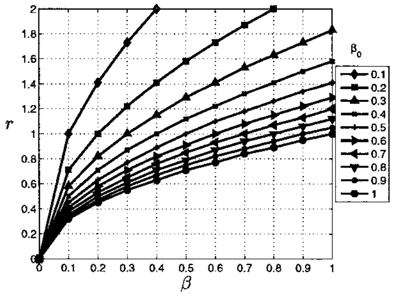

Figure 2: Relationship between r, β and β_0.

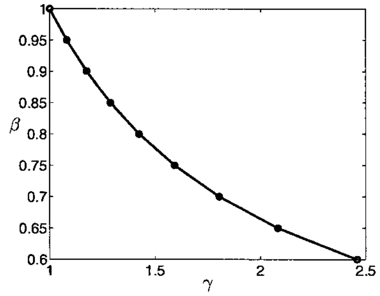

Figure 3: Relationship between β and γ.

value β_{0_j} for this customer j and the value β_0^* of a network service provider by using Eq. (26):

$$\beta_{0j} = \beta^{-1}\gamma_j^{-2} \quad (26)$$

where, $\gamma_j = M_j/t_j f_j$, $M_j = P_j - v_j$, $\beta_0^* = \beta^{-1}\gamma^{-2}$, $\gamma = \sum_j M_j / \sum_j t_j f$.

If the rate of operation β decreases, the network available capacity will increase. Thus, the network can serve a more larger number of users. Also, the quality of the network service can be improved by decreasing the total delay in sending information packets through the network. But, if the value of β is constant and the aggregate user demands increase more than the total network available capacity the delay will increase and the network quality of service will decrease, too. However, the measurement of β is necessary considering the providers profitability. We apply the theoretical standard value of β (Eq. (19)) in the proposed model to decide an approximate value of β. The smaller is β value, the smaller will be β_0. Thus, the marketable quality will increase as shown in Fig. 1. From Eq. (19), we have obtained the standard relationship between β_0 and profitability r as shown in Eq. (20).

A guideline of network pricing based on Eq. (20) can be given as follows. The relation between the marketable quality indicator β_0 and the theoretical standard value of the rate of operation β in Eq. (19) is transformed to the relation between β and γ (see Fig.3) using Eq. (13) and Eq. (19) as shown in Eq. (27).

$$\gamma = \frac{1 + \sqrt{3(4\beta - 1)}}{2(3\beta - 1)\sqrt{\beta}} \quad (27)$$

The maximum profitability point in Eq. (27) is when γ goes to infinite and β approaches to 1/3 from the infinite side. From the abovementioned considerations, we conclude as follows: the network service pricing for a customer can be obtained from the fair relationship between network providers and consumers; the decrease of the rate of operation β results in the decrease of marketable quality indicator β_0, thus the quality of service can be increased; a network pricing guideline can be obtained considering the relation between marginal profit rate γ and rate of operation β.

4.2 Extended Network Service Pricing Model

We extend our work on network service pricing by considering the influence of network externalities. There are many network externalities, but we concentrate here on the increase of the number of network users.

Let us consider that we have m providers, which we denote as $prov_i$, where $i = 1, 2, \ldots, m$. We consider that the number of users for a provider is n_i. In the case when the number of users for a provider is increased from n_{i1} to n_{i2}: $\sum_i n_{i1} << \sum_i n_{i2}$, we consider the influence that the increase of number of users has on the network service pricing. Based on this increase the parameters of Eq.(26) change as follows: marketable quality indicator β_{0i} changes from β_{0i1} to β_{0i2}; rate of operation β_i changes from β_{i1} to β_{i2}; average marginal profit rate γ_i changes from γ_{i1} to γ_{i2}; average necessary capacity t_i changes from t_{i1} to t_{i2}; unit capacity cost f_i changes from f_{i1} to f_{i2}; average marginal profit M_i changes from M_{i1} to M_{i2}.

In this case, based on the effect of "mass production", the average necessary capacity cost $t_i f_i$ will be decreased ($t_{i1}f_{i1} > t_{i2}f_{i2}$). Because, in our model, we consider the fair relation between providers and users, both the providers and users have the same marginal profit. However, by considering the effect of the network externalities, the users can get the following additional profit increase.

1. One profit increase on the users side is by the decrease of the rate of operation β_i ($\beta_{i1} > \beta_{i2}$) based on the guideline model of Eq.(27) and the decrease of necessary capacity t_i ($t_{i1} > t_{i2}$) based on the effect of "mass production". There are also some other effects from the increase of the service quality.

2. Another profit increase on the users side is from the increase of information flow in the network. This is because, if the number of network users is increased, any user will get more information and the network resources will be used efficiently.

Let us consider the increase profit of Item 1 with x_i and increase profit Item 2 with y. The x_i

profit is a profit for each user, while profit y is a common profit.

Let us consider the average capacity cost $t_i f_i/\beta_i$ of $prov_i$. When the decrease rate of the average necessary capacity cost is higher than the decrease rate of the rate of operation, that is:

$$\frac{\beta_{i2}}{\beta_{i1}} > \frac{t_{i2}f_{i2}}{t_{i1}f_{i1}}, \quad (28)$$

then, the average capacity costs is decreased.

This partial decrease z_i for each user can be calculated as follows.

$$z_i = \frac{t_{i1}f_{i1}}{\beta_{i1}} - \frac{t_{i2}f_{i2}}{\beta_{i2}} \quad (29)$$

Assuming the fair relation between $prov_i$ and users, the average marginal profit M_{i2} considering the effect of network externalities can be calculated as follows.

$$M_{i2} = \frac{1}{2}(x_i + y) + M_{i1}(1 - \frac{\beta_{i1}z_i}{2t_{i1}f_{i1}}) \quad (30)$$

If we consider that the profit increase by y is higher than z_i, then $M_{i2} > M_{i1}$. Therefore, the profitability r_i of $prov_i$ will be increased from $r_{i1} = M_{i1}/(t_{i1}f_{i1}/\beta_{i1})$ to $r_{i2} = M_{i2}/(t_{i2}f_{i2}/\beta_{i2})$. Also, from Eq.(13) $\beta_{0i1} > \beta_{0i2}$. From these results, we conclude that by the enhancement of the marketable quality, the profitability is increased.

By looking to Fig.2, in the curve of each β_{0i}, the profit increase on the providers side and the reduction of total price on the users side are equal. This is because we have considered the fair relation between providers and users. If the β_{0i} changes from β_{0i1} to β_{0i2}, the profitability r_i increases from r_{i1} to r_{i2} and the profit for both is $r_{i2} - r_{i1}$. This means that by decreasing the marketable quality indicator (increase of the marketable quality), the profitability is increased. This also shows that this increase is based on the fair relation (fair relation oriented). The increase of the profitability r_i by enhancement of marketable quality β_0 is shown in Fig.3.

5 Conclusions

In this paper, we proposed an evaluation model for marketable quality and profitability considering relation between service providers and consumers. Based on our study we got the following results: the general average value of the marketable quality indicator is very close to the theoretical standard value 0.6 (60%); we considered the theoretical standard value of the rate of operation as a function of marketable quality indicator and obtained a profitability function where the profitability gradually increases due to the increase in marketable quality; we obtained a theoretical distribution of profitability by the profitability function and the theoretical distribution of marketable quality indicator and we found that our proposed model gives a good evaluation.

From the network service pricing guidelines, we concluded as follows: the network service pricing for a user can be obtained from the fair relationship between network providers and users; the decrease of the rate of operation results in the increase of marketable quality; a network pricing guideline can be obtained considering the relation between marginal profit rate and rate of operation.

Considering the effect of the network externalities on network service pricing model, we conclude as follows: the users can get additional profit increase by the decrease of the rate of operation, the effect of "mass production" and the increase of information flow in the network; the profit increase on the providers side and the reduction of total price on the users side are equal; by decreasing the marketable quality indicator (increase of the marketable quality), the profitability is increased; the increase of the profitability by enhancement of marketable quality can be derived using the proposed model.

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