December 2006

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Performance-Based Marketing on the Internet

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ABSTRACT
Along with the wide use of the Internet, online advertising expense is soaring in the last decade. There are many pricing strategies for online advertisement, including fixed fees, click-through rates, and performance-based commission rates (i.e., referral fees). The trend towards profitability, along with better tracking tools, has resulted in less interest in fixed rates and more interest in performance-based commission rates, first adopted by Amazon.com. The key merit of performance-based advertising is that a publisher can choose which product or company to advertise based on its unique knowledge of viewers’ shopping preferences. Based on extant theories on advertisement, this paper investigates the equilibrium interaction between publishers and advertisers. A model with M publishers and one advertiser is established and the optimal strategies for both parties are discussed. We find that the advertiser’s optimal commission rate decreases when product price increases or the opportunity cost of the publisher decreases. Interesting extensions and implications of the findings are discussed as well.

Keywords
Performance-based Marketing, online advertisement, commission rate, analytical model.

INTRODUCTION
Along with the wide use of the Internet, the growing popularity of online advertising is evidenced in eMarketer’s December 2004 Report (Butler, 2004) on online advertising spending (Figure 1). Online advertising soared from $0.3 billions in 1996 to $8.1 billions in 2000. Although it had decreased in 2001 and 2002, online advertising spending is increasing again and estimated to grow to 16 billions in 2007. The growth rate of US online media spending in 2003 is 6.3%, higher than the growth rate of total media spending (4.7%).

Figure 1: U.S. Online Advertising Spending (in billions).
Online advertising has many pricing strategies, including fixed advertising space fees, CPM (cost per 1000 impressions) click-through rates (i.e., cost per click), and performance-based commission rates (i.e., cost per action). Among these different forms of advertising, the latter two are new forms of advertising on the Web. For click-through rates, a publisher is paid for every click of ads regardless whether a lead converts into sales. Merely getting visitors to a site had value when Web site traffic was generally accepted as a measure of success. However, for some time now, online advertisers and publishers have realized that high traffic is not an adequate measurement of success for an online campaign. The trend towards profitability, along with better tracking tools, has lead to more interests in performance-based commission rates, i.e., an advertiser only pays when desired actions such as a purchase are taken by leads from a publisher.

Since Amazon.com rolled out the first performance-based marketing program (also called affiliate program) in 1996, many online retailers have adopted similar advertising strategy of their own. Performance-based marketing is a form of online advertising where an advertiser pays for a result (e.g., product purchase) rather than reaching particular audience. Although many e-commerce sites have had an affiliate program now, the optimal commission rate for an advertiser and the optimal advertising strategy for a publisher are rarely explored and discussed yet. The aim of this paper is to investigate the equilibrium interaction between publishers (web portals) and advertisers (firms). A model with M publishers and one advertiser is established and the optimal strategies for both publishers and the firm are discussed.

This study is based on extensive literature on advertising and relates to the growing emphasis on online advertising as a way to acquire customers and increase profitability. Here are some tentative conclusions: (1) Publishers’ decisions of advertising are independent of their online traffic. Their dominant strategies are a function of commission rate, product price and conversion rate; (2) The optimal commission rate and profit of the advertiser change with the price of the product. Higher priced products require lower commission rates and generate a higher profit for the advertiser; (3) The optimal commission rate and profit of the advertiser change with the competition in the product market. Higher competition leads to higher commission rate and lower profit; (4) The main findings hold when conversion rate is endogenous as a function of price. However, if price elasticity is high, the optimum advertiser profit may decrease when price increases; (5) The advertiser’s profit will be higher if it has complete information of all potential publishers. The profit difference between the two scenarios (with and without complete information) is especially significant when a publisher’s opportunity cost is high; (6) Conclusions (2) and (3) do not change when the assumption of linear opportunity cost is relaxed; (7) When fixed advertising fees are adopted, the advertiser will not advertise with small publishers whose traffic is lower than certain level.

The rest of the paper will be organized as follows. In section 2, extant research on the economics of advertising is reviewed. Detailed information on performance-based marketing is provided in section 3, together with its economic roles. The analytical model and its assumptions are laid out in section 4. Section 5 analyzes the results. Some extensions are discussed in section 6. Finally, the paper ends with limitations, conclusions and future research directions.

LITERATURE REVIEW: THE THREE VIEWS OF ADVERTISING

Advertising has been a prominent feature of modern economic life (Bagwell, 2001). Consumers encounter advertising messages as they watch TV, read newspaper, or listen to the radio. Now, they run into advertisement when surfing the Internet.

There are three views of advertising. First, the persuasive view suggests that advertising primarily affects demand by changing taste and creating brand loyalty, which in turn, reduce demand elasticity and increase prices. This stream of research believes that advertising can create brand loyalty, deter entry, and lead to more concentrated market, due to the presence of an advertising scale economy (Braithwaite, 1928, Kaldor, 1950, Robinson, 1933). Empirical research also shows that advertising intensity exerted a positive and significant influence on profits, which is consistent with the persuasive view that advertising creates brand loyalty and deters entry (Bain, 1956, Comanor and Wilson, 1967).

Second, the informative view posits that advertising primarily affects demand by conveying information, which in turn, increases demand elasticity and competition, and lowers the prices (Butters, 1977, Ozga, 1960, Stigler and Becker, 1977). As proposed by Stigler (1977), consumers may be imperfectly informed when there are search costs associated with obtaining information regarding the location, price and quality of available products. Advertising provides consumers with information and tends to reduce the level of prices and the extent of price dispersion, just as would a reduction in search costs. In contrast to the persuasive view, advertising is not used by established firms to deter entry. Instead, advertising facilitates entry, since the entrants can use it to provide price and quality information to consumers (Bagwell, 2001). Benham (1972) empirically testified that the ability to advertise (as determined by state law) was associated with lower prices in eyeglasses retail market.
Finally, the complementary view believes that advertising primarily affects demand by exerting a complementary influence in the consumer’s utility function (Stigler and Becker, 1977). For example, advertising may serve as an input that enables the consumer valuing “social prestige” to derive more prestige when the advertised product is consumed (Bagwell, 2001). In summary, the economic analysis of advertising has moved through several phases. There are no one-size-fits-all conclusions as to the effects of advertising. In some specific industries, one economic role of advertising may be stronger than another one. Next, we introduce performance-based marketing and its economic roles.

PERFORMANCE-BASED MARKETING

Introduction

Performance-based marketing is a form of online advertising where an advertiser pays the publisher for a results rather than reaching particular audience. A website or web portal (the publisher) advertises products or services offered by another website (the advertiser) in exchange for a commission on sales. Specifically, the publisher displays hyperlinked banners, ads, or texts of products on its website and is paid a commission (i.e., referral fee) by the advertiser when a visitor takes a specific action. A desired action can take many forms, varying from site to site. Examples include sales of products, membership registrations, newsletter subscriptions, software downloads, or any activity beyond simple page browsing. A publisher can participate in any affiliate program set up by any advertiser (unless the advertiser finds illegal content on the publisher’s website). For instance, Amazon.com pays all participating publishers from four to seven percents of sales if a customer clicks through the publisher and makes a purchase; eBay pays between forty percents and seventy percents of its revenue (not sales); and Staples.com offers three percents to eight percents depending on sales amount and product category.

Performance-based marketing can be a win-win solution for both online retailers seeking to build their web presence, customer base and sales, and web portals hoping to capitalize on their traffic and monetize their content. For advertisers, performance-based marketing is risk free compared to a fixed fee or click through rate. An advertiser does not need to pay if no sales and/or profit occur. Though the accurate sales increase due to affiliate referrals cannot be found, it is reported that online retailers typically see an increase between fifteen to forty percents, according to Commission Junction1, one of the major affiliate marketing solution providers. The critical decision an advertiser need to make is the commission rate, which has not yet been analyzed extensively. The long-term success of an affiliate program is dependent on the ongoing support of its affiliates. The advertiser need to ensure its commission rate is both profitable for itself and attractive to publishers against competing advertisers’ terms.

A publisher, who makes decisions about which product to advertise, can participate in affiliate programs with a low cost and potentially gain substantial revenues. Many companies, such as Commission Junction, Clickbank.com, and Linkshare, provide free tracking service for publishers. However, a publisher tries hard to attract viewers to its website and advertising space online is not unlimited. It is not willing to lose visitors for short term commission by placing too much irrelevant advertisement on its website. In other words, there are opportunity costs for a publisher to promote a particular product or firm. Meanwhile, a publisher has better and unique information of its viewers compared to an advertiser. It can self-select which advertiser’s affiliate program is most profitable. This self-selection is particular beneficial for small publishers who may not be able to attract advertisers with a fixed advertising rate or CPM.

The Roles of Performance-based Marketing

Performance-based marketing can not only increase sales by providing product information, but also build trust and a sense of community that are essential for brand loyalty (Reichheld and Schefter, 2000). Thus, the informative role of performance-based marketing is to increase a product or an advertiser’s web presence by providing product information to the viewers of the publisher. Performance-based marketing is especially suitable for advertisers focusing on performance and lack of big advertising money to burn. Meanwhile, the persuasive and complementary role of affiliate marketing is to influence customers’ preference and/or utility by harvesting the trust and senses of community that have already been built among viewers of a publisher or between the publisher and its viewers.

Asymmetric Information and Publisher Self-selection

The key merit of performance-based marketing is that publishers can take advantage of their private information about their own viewers. For small publishers flourishing on the Internet, performance-based marketing is especially beneficial. Clients

1 http://www.cj.com/
with high online advertising spending usually only target big publishers and Internet portals like NYTimes.com or Yahoo.com. Thus, small publishers may not have enough advertising income by selling web space for a fixed fee. However, if they have better information on the buying preference and interests of their viewers, they can self-select the affiliate programs from which they can make more profit. For instance, a website or online community specializing in fishing should have better information about what fishing products viewers prefer. Comparing to advertising irrelevant products, it can advertise preferred products and potentially gain a good commission income. By doing so, the publisher also provides richer and more useful information to retain current viewers and to attract more visitors. In the following sections, we build an analytical model to examine the optimal strategies and profits for advertisers and publishers.

THE MODEL

In this section, a model is described with one advertiser producing one product and $M$ publishers making decisions whether to advertise this product. The timing and nature of decisions by the advertiser and publishers are as follows. First, the advertiser announces the commission rate ($r$) and product price ($P$). Given these, publisher $j (j=1...m)$ decides whether to advertise. For simplicity, we assume the following in the discussion:

- There are $N$ potential buyers of the product. Each potential buyer frequently visits one and only one of $M$ publishers’ websites;
- The proportion of potential buyers visiting publisher $j$ is $a_j$, $j=1...m$, $\sum a_j = 1$;
- Publisher $j$ knows its visitors’ conversion rate $k_j$ of the product priced at $P$;
- Publisher $j$ has an opportunity cost $c_j$, which is a linear function of its traffic: $c_j = \Phi(a_jN) = \beta \cdot a_j N$;
- The advertiser does not have the information about each $a_j$ and $k_j$, but knows the distribution of $a_j$ and $k_j$:
  - $f(a) = \lambda e^{-\lambda a}$
  - $g(k) = 1$, where $0 \leq k \leq 1$
- The unit cost of product is zero.

THE EQUILIBRIUM

The Publisher’s Strategies

Publisher $j$ has two strategies: {advertise, not advertise}. Its optimal profit is shown in equation (1).

$$\max (\pi_j - c_j)$$

if $\pi_j < c_j$ (The dominant strategy is “not advertise”)

$= 0$

if $\pi_j \geq c_j$ (The dominant strategy is “advertise”)

$= rP a_j N k_j \cdot \Phi(a_jN)$

which is $k_j \geq \frac{\Phi(a_jN)}{N\beta}$, i.e. $k_j \geq \frac{\beta}{rP}$

Proposition 1: Publisher $j$’s dominant strategy is “advertise” when

$$k_j \geq \frac{\beta}{rP},$$

which is independent of the publisher’s traffic or market share ($a_j$).

Proof: refer to equation (1).

The Advertiser’s Strategies

The advertiser’s maximum profit is specified in equation (3).

$$\max_r (\pi) = \int_a^b \left[ (1 - r) * P * \alpha N * k \right] dF(\alpha) dG(k)$$

Proceedings of the Twelfth Americas Conference on Information Systems, Acapulco, Mexico August 04th-06th 2006 1782
Substitute condition (2) into (3), we have

$$\pi = \frac{(1-r)PN(1-\frac{\beta^2}{r^2 p^2})}{2\lambda}$$

The first order condition is $$\frac{\partial\pi}{\partial r} = 0$$, then we have:

$$r^3 + \frac{\beta^2 (r-2)}{p^2} = 0$$

$$\frac{\partial\pi^2}{\partial^2 r} < 0$$, the optimal commission rate when price is $$P$$ is:

$$r = \frac{3\beta^2}{P^2} + \frac{4\beta^4}{p^2} + \frac{\beta^6}{p^6} + \frac{3\beta^2}{P^2} - \frac{4\beta^4}{p^2} + \frac{\beta^6}{p^6}$$

The optimal profit for the advertiser is:

$$\pi = \frac{(1-r)PN(1-\frac{\beta^2}{r^2 p^2})}{2\lambda}$$, where $$r$$ is calculated in equation (5).

**Proposition 2a:** The advertiser’s optimal commission rate decreases when product price increases, i.e., $$\frac{\partial r}{\partial p} < 0$$;

**Proposition 2b:** The advertiser’s optimal profit increases when product price increases, i.e., $$\frac{\partial\pi}{\partial p} > 0$$;

Proof: refer to equations (4) and (5), and Figure 2. Figure 2 visualizes the change of optimal commission rate and profit under different prices.

![Figure 2: The change of optimal commission rate and profit under different prices (β=0.02, λ=10, N=2000000)](image)
Proposition 3a: The advertiser’s optimal commission rate increases when the opportunity cost of publishers increases, i.e.,
\[ \frac{\partial r}{\partial \beta} > 0; \]

Proposition 3b: The advertiser’s optimal profit decreases when the opportunity cost of publishers increases, i.e.,
\[ \frac{\partial \pi}{\partial \beta} < 0; \]

Proof: refer to equations (4) and (5), and Figure 3.

Figure 3: The change of optimal commission rates and profits under different \( \beta \) (P=16, \( \lambda=10 \), N=2000000)

Proposition 3 posits that when opportunity cost increases, which may be a result of escalating competition between firms selling similar products, an advertiser needs to set up a much higher commission rate to attract publishers and its profit decreases accordingly due to competition.

SOME EXTENSIONS

Compare to Endogenous Conversion Rate

The simple model in section 5 has limitations because consumer behavior was assumed exogenous, with the conversion rate \( k_j \) fixed for publisher \( j \). We relax this assumption and find that taking into account the effect of price on the conversion rate does not change the main findings from those of the previous section.

Here, we assume that publisher \( j \) has a conversion rate \( k_j = k_j(1 - H(P)) \), where \( H(P) = tP \), and the distribution of \( k_j \) is the same as that of previous model. For Proposition 1, publisher \( j \)’s dominant strategy is “advertise” when \( k_j \geq \frac{\beta}{rP(1-tP)} \), which is still independent of the publisher’s traffic or market share \( (a_j) \). The optimal commission rate offered by the advertiser does not change, i.e., condition (5) holds, and the optimal advertiser profit is replaced with
\[ \pi = \frac{1}{2\lambda} P N (1 - \frac{\beta^2}{r^2 P^2}) (1 - tP). \]

Hence, as in the original model, \( \frac{\partial r}{\partial p} < 0 \). Whether Proposition 2b still holds depends on price elasticity \( t \). Figure 4 illustrates the optimum profits of the advertiser with different \( P \) and \( t \). When price elasticity is relatively low, \( \frac{\partial \pi}{\partial p} > 0 \); when price elasticity is high, the results change and increasing price may reduce profit. Proposition 3 is not influenced by the assumption of conversion rate.
Compare to the Scenario with Complete Information

If the advertiser has complete information \((a_i, k_j)\) about all the potential publishers, the best strategy for the advertiser is to offer a different commission rate for each publisher based on \(a_i\) and \(k_j\). According to condition (2), publisher \(j\) will advertise if \(r_j \geq \frac{\beta}{P_k_j}\). Thus, the advertiser can offer \(r_j = \frac{\beta}{P_k_j}\) to make publisher \(j\)’s profit equal to zero. The advertiser’s profit is:

\[
\pi_{\text{comp. inf}} = \sum_{j=1,m} \left\{ P(1 - r_j)k_ja_iN \right\} = \int_{a} \left[ 1 - \frac{\beta}{P_k} \right] * P * aN * k dF(\alpha) dG(k)
\]

\[
= \frac{NP(0.5 - \frac{\beta}{p})}{\lambda}
\]

Figure 5 shows that the advertiser’s profit will be higher if it has complete information about all potential publishers. The profit differences between the two scenarios (with and without complete information) are especially significant when opportunity cost is high. However, if the publisher shares information with the advertiser, its own profits will become zero. Hence, the publisher should have no motives to disclose its true conversion rate and traffic information.

**Figure 4**: The change of optimal profit under different prices and price elasticity \((\beta=0.02, \lambda=10, N=2000000)\)

**Figure 5**: Comparison of advertiser’s profits with complete vs. incomplete information.
Compare to the scenario with non-linear opportunity costs

In this section, we consider the scenario in which the opportunity costs for publishers are not a linear function of their market shares. Assume \( c_j = \beta \sqrt{\alpha_j N} \). In this case, publisher \( j \) will advertise a firm’s product when \( k_j \geq \frac{\beta}{Pr \sqrt{\alpha_j N}} \).

When opportunity costs are not linear, the publisher’s decision is not only based on \( P \) and \( r \), but also a function of its traffic \( \alpha_j N \). Following the similar steps as in section 5, we can calculate the profit for the advertiser as:

\[
\pi = \left( \frac{1 - r}{2} \right) \left( \frac{PN}{\lambda} - \frac{\beta^2}{Pr^2} \right)
\]

and the first order condition is:

\[
r^3 + \frac{\beta^2 \lambda(r - 2)}{P^2 N} = 0
\]

As shown in Figure 6, the optimal commission rates for the advertiser is much lower in the non-linear case due to the low opportunity costs for the publishers. The profit for the advertiser is also higher in the scenario of non-linear opportunity costs (Figure 7).

![Figure 6. Comparison of the optimal commission rate with linear vs. non-linear publisher opportunity costs.](image1)

<table>
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<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
<th>26</th>
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<td>1.993</td>
<td>1.766</td>
<td>1.594</td>
<td>1.458</td>
<td>1.349</td>
<td>1.257</td>
<td>1.180</td>
<td>1.114</td>
</tr>
<tr>
<td>r%(non-linear)</td>
<td>0.040</td>
<td>0.034</td>
<td>0.030</td>
<td>0.027</td>
<td>0.025</td>
<td>0.023</td>
<td>0.022</td>
<td>0.020</td>
<td>0.019</td>
</tr>
</tbody>
</table>

![Figure 7. Comparison of the optimal profits with linear vs. non-linear publisher opportunity costs.](image2)

Proposition 2 and Proposition 3 still hold in the scenario with non-linear opportunity costs. This sensitive analysis shows that Proposition 2 and 3 will not be influenced by the assumption of opportunity cost function.
Compare to the Scenario with Fixed Advertising Fee

Before the introduction of the Internet and tracking technology, advertising fee is usually fixed or negotiated between advertisers and publishers. Assume that there are still $M$ publishers. Each publisher sets up a fixed fee for a space on their media, which is $t = \zeta \sqrt{\alpha_j N}$. Then the expected profit for the firm to advertise with publisher $j$ is

$$\Pi = E(k_j)\alpha_j NP - t,$$

where $k_j$ is the conversion rate of publisher $j$. To be consistent with the model assumption in section 4, we assume that $k_j$ has an uniform distribution and

$$g(k) = 1, \text{ where } 0 \leq k \leq 1, \text{ and } E(k_j) = 0.5$$

Then,

$$\Pi = E(k_j)\alpha_j NP - t = \frac{1}{2} \alpha_j NP - \zeta \sqrt{\alpha_j N}$$

$$\alpha_j = \frac{\zeta^2}{p^2 N} \text{ and } \Pi(\alpha_j) < 0$$

$$\frac{\partial^2 \pi^2}{\partial^2 \alpha_j} > 0$$

Hence the profit function is convex and the maximum profit is

$$\Pi = \begin{cases} 
\frac{1}{2} \alpha_j NP - \zeta \sqrt{\alpha_j N} ; & \text{ when } \alpha_j > \frac{4 \zeta^2}{NP^2} \\
0 ; & \text{ when } \alpha_j \leq \frac{4 \zeta^2}{NP^2}
\end{cases}$$

Thus, the advertiser will always choose to advertise on the media with more viewers, if the required advertising budget is available. An advertiser will not advertise with a publisher whose market share ($\alpha_j$) is smaller than $\frac{4 \zeta^2}{NP^2}$.

Compared to performance-based advertising, fixed fee method has several characteristics: (1) Fixed fee advertising needs high advertising spending to achieve a high profit. It is not profitable to advertise with small publishers, whose $\alpha_j$ is small. (2) Fixed fee has a higher risk. While performance-based advertising always has a non-negative profit, advertisers pay a fixed fee may assume lost if the realized $k$ is too small. Different from performance-based advertising where publishers (with complete information) self-select which firm to advertise, it is usually the firm without complete information making decision about which publisher to use. Therefore, there is a higher risk associated with fixed fee advertising due to incomplete information. (3) Just one firm is considered in this study. Multiple firms may complicate the problem. If all advertisers are targeting the biggest publishers, the fixed fee for these publishers will increase due to competition.

Publisher’s Willingness and Ability to Change $k$ and $\alpha$

In the prior discussion, we focus on the profit maximization of the advertiser. The publisher is able to maximize its profit too. According to equation (1), publisher $j$’s profit is $(rP\alpha_j k_j - \beta a_j N)$, a function of $k_j$ and $a_j$, which, to some extent, can be influenced and changed by the publisher’s competition strategy. Publishers can make an effort to increase both $k$ and $\alpha$ to augment their profit.
CONCLUSIONS
In this paper, we build a model of performance-based marketing and examine the equilibrium interaction between the advertiser and publishers. The results show that a publisher’s decision in the second stage is solely based on its expectation of $k$, when product price and commission rate have been fixed by the advertiser in the first stage. Traffic $\alpha_j N$ does not influence a publisher’s optimal strategy. Under our model assumptions, we also find that performance-based marketing may be more profitable for expensive commercial product. The advertiser’s optimal profit increases when the price of the product increases. Finally, the optimal profit of the advertiser changes when market competition changes. Higher competition leads to higher commission rate and lower profit.

Some extensions to the model show that the advertiser can make more profit if it has complete information about the profiles of potential publishers ($\alpha_j$) and the profiles of customers visiting those publishers ($k_j$). The robust and generalizability of the results are also examined with the relaxation of some assumptions. We consider an endogenous conversion rate changing with product price, and we compare the scenarios with linear and non-linear opportunity costs. The analysis shows that price may influence the optimum profit of the advertiser when price elasticity is high, but opportunity costs do not influence the validity of proposition 2 and 3.

With the assistance of click-through and order-tracking technologies, advertising spending on the Internet can actually flow to small publishers with specialized customer segments or profiles. As implied in previous sections, with the same amount of advertising spending, a fishing website may bring more profit for a fishing product seller than a national newspaper.

This research represents one of the first attempts to explore the new advertising phenomenon on the Internet. Future research is promising in several directions. First of all, multiple advertisers competing to attract the same group of publishers can be examined in the future. We use opportunity costs to capture the competition between advertisers in this research. Future studies can consider the price and commission competition between advertisers selling homogeneous products too. In addition, consumers visiting multiple publishers should also be taken into account in the future study. Finally, other commission structures based on product categories and sales volume can be investigated. Keyword based online advertising (such as Google adSense and Yahoo Search Marketing) is also an interesting topic that has attracted some research attention recently.

REFERENCES