

HEDONIC PRICING ANALYSIS OF DSL INTERNET SERVICES IN THE U.S.

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ABSTRACT

This paper identifies the key explanatory characteristics of DSL services in the U.S. that govern the pricing of the services. Hedonic approach was followed to select a set of explanatory variables; then Box-Cox methodology was employed to determine the appropriate data transformation that produced the optimal model fitting. There are three explanatory variables identified; they are the number of dynamic IPs, the upload speed, and the number of email accounts. The most important explanatory variable in this model is the number of dynamic IP, which determines how many users in the same household can access the Internet simultaneously.

INTRODUCTION

Internet has forever changed many facets of human activities. The competitiveness of businesses has thus been gradually tied to the ability to leverage the potential of Internet, and that of countries and regional economies, their Internet infrastructure. It is not surprising that IMD (International Institute for Management Development), IDC (International Data Corporation), and EIU (Economist Intelligence Unit) have adopted Internet infrastructure as one of the factors for assessing the competitiveness of countries and regions.

A decade ago, dial-up access was a common offering in the household Internet service market, because broadband service was not widely available and the Internet applications then usually did not require the transmission of multimedia data. As the Internet is well marching into the second decade after its commercialization, broadband Internet access is becoming more available and affordable. Many Internet users consider broadband access a necessity due to ever increasing Internet applications and the multimedia demands on the Internet. The future growth of Internet activities depends on not only the net penetration, but also the broadband service penetration. At present, three major types of broadband services are available in the household market, namely, DSL, cable and satellite.

The penetration of satellite Internet service has been slow, as the service is relatively costly and the bandwidth is not comparable to that of DSL and cable services. Cable Internet service started out as a popular choice, because it is often offered through the same physical wiring of the existing cable TV. However, its market share is gradually decreasing [1][2]. The technology of cable Internet service mandates bandwidth sharing among subscribers in the same network, resulting congestion or bandwidth degradation with increasing subscriptions. Though an unnecessary worry, users also indicated concerns over security issues caused by the transmission of both the cable TV service and cable Internet service over the same physical line [3][4]. According to the market overview of the second quarter of 2004, DSL has almost pulled ahead in the market share battle in the U.S. [5][6].

In the U.S., DSL is customarily offered as bundled services in the household market. Therefore, it is hard to discern on the surface what factors really dictate the price. From the microscopic perspective, the pricing is of great interest both to the sellers and the buyers; from the macroscopic perspective, the

pricing can translate to affordability and penetration. Thus this study attempts to identify the key factors that determine the pricing of DSL service. The result of this study should aid the potential users of DSL services to sort out the maze of pricing practices, and the marketers to devise effective pricing strategies.

METHODOLOGY

This section explains the method of data collection, describes how independent variables are selected based on the hedonic approach [7], and how λ^* is determined by following the Box-Cox methodology [8]. The data for DSL service offerings were collected through searching engines and corporate websites. The duration of data collection is from the early September till the end of November of 2004. This study selected top ten DSL services providers for data collection purpose. They together account for nearly 80% of DSL Internet service market share [9]. The data set consists of 30 observations. Based on Triplett's three principles of hedonic approach, 7 variables, which were contract duration, installation fee, download speed, upload speed, static IP, dynamic IP, number of email accounts respectively, were initially selected. The selection of variables is refined by statistical justification. The further screening of variables is necessitated by the desire to eliminate potential colinearity. It turned out that only upload speed, dynamic IP, and number of email accounts passed the significance test ($p < 0.05$). They were entered to the final pricing model.⁵ After the variables for the final pricing model were determined, the Box-Cox methodology was employed to learn the appropriate data transformation. The inverse regression model provides better fit with the data set. Therefore, inverse function is the preferred model.

ANALYSIS AND IMPLICATIONS

In the final model, there are three explanatory variables. Among them, DYNIP is the most important one, as the corresponding coefficient is significant and has the largest magnitude. This is probably because the number of dynamic IPs determines how many users in the same household can access the Internet simultaneously with an added router, access point, switch, or hub. On the other hand, IP addresses now are scarce resources, as Internet population has been growing in an exploding rate. Consequently, providing dynamic IPs rather than static IPs temporarily resolves the urgent need for IPs and enables ISPs to continue serving existing and prospective customers, and buys more time for ISPs to find other solutions.

One interesting and counter-intuitive result is that the coefficient for DYNIP is negative, meaning the more dynamic IPs provided, the cheaper the price. The probable explanation is the price war. For example, the fiercest price war prompted SBC to introduce services priced comparable to competitors', but with more dynamic IPs provided. SBC provided ten dynamic IPs on average for each of its service offerings. Being a follower in DSL market, Covad, unable to compete head-on with SBC's offering of larger number of dynamic IPs, it introduced services with static IPs to household market at comparable price of the dynamic IP offerings of other ISPs.

The second most important explanatory variable is UPSPED, the upload speed. Perhaps slow upload speed is more of a concern than slow download speed. It is most likely that all ISPs provide fast enough download speed, hence download speed is of no concern. Since the inception of commercial Internet, it has been widely assumed by everyone, including the ISPs, that household Internet users are more of information receivers than information producers or providers, leading to the belief of clever and economic design of an asymmetry configuration of slower upload speed and faster download speed (Borg, 1997; Speta, 2000). This assumption may need to be reverted in the Twenty-first century, as there are more Internet users become active information providers.

The last explanatory variable is NEMAL, the number of email accounts provided. Most ISPs provide more than one email account for each subscription, for example, BellSouth, SBC, Verizon, Covad, Alltel, Cincinnati Bell, Century Tel and others. This variable is not as important as DYNIP and UPSPED, indicating that it is no longer a factor that can effectively differentiate ISPs.

CONCLUSION

In this research, through hedonic approach and Box-Cox methodology, key characteristics of DSL Internet services, which determine the price, were identified. They are the download speed, the number of dynamic IP, and the number of email accounts. The appropriate data transformation for the U.S. market was found to be when $\lambda = -1$, which leads to an inverse function modeling. The most important explanatory variable in this model is the number of dynamic IP, which determines how many users in the same household can access the Internet simultaneously with the addition of a home router. The next important variable is the upload speed. Its importance implies that household users in the U.S. may engage in more content creation than content receiving activities than other regions [10], thus the demand for upload speed is not much less than the download speed.

FUTURE RESEARCH

Due to time and geographical limitations, not all the possible independent variables were captured in the current data set, such as various bundling promotions, DSL market share of incumbent telcos, customer's impression on ISPs. They can be included in the future model. Moreover, a longitudinal study will certainly be of great interest, as the technology is constantly advancing. However, one important area of study is the duplication of this research in regions outside of U.S., if globalization of U.S. DSL services is desirable. Many countries in the Europe and the Asia-Pacific region have dedicated considerable effort and investments to boost household Internet penetration. Countries on Scandinavia, such as Sweden, Finland, Denmark, and those in the Asia-Pacific region, such as Taiwan, Japan, Korea, and Singapore, are the ones that have very high Internet penetration, and thus worth close investigations.

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