Optimal Pricing of New Subscription Services: 
Analysis of a Market Experiment

Peter J. Danaher

Department of Marketing
University of Auckland
Private Bag 92019
Auckland
New Zealand

Ph: (64) (9) 373-7999
Fax: (64) (9) 373-7444
Email: p.danaher@auckland.ac.nz


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Appendix 4 : Usage Partial Derivatives

\[ \frac{\partial U}{\partial p^u} = \sum_{i=1}^{l} \sum_{t=1}^{T} \pi_t \exp \left( X_{it} \beta_i + \rho_{it} \sigma_i \right) \frac{\phi(E_{it})}{\Phi(R_{it})} \prod_{t=1}^{l} \Phi(R_{it}) \times \left\{ \beta_{1t} - \frac{\delta_{it} \phi(E_{it}) \rho_{it} \sigma_i}{\Phi^{2}(R_{it})} \left( R_{it} \phi(E_{it}) + \Phi(R_{it}) \right) + \sum_{t=1}^{l} \delta_{it} \phi(E_{it}) \right\} \]

and

\[ \frac{\partial U}{\partial p^w} = \sum_{i=1}^{l} \sum_{t=1}^{T} \pi_t \exp \left( X_{it} \beta_i + \rho_{it} \sigma_i \right) \frac{\phi(E_{it})}{\Phi(R_{it})} \prod_{t=1}^{l} \Phi(R_{it}) \times \left\{ \beta_{2t} - \frac{\delta_{2t} \phi(E_{it}) \rho_{it} \sigma_i}{\Phi^{2}(R_{it})} \left( R_{it} \phi(E_{it}) + \Phi(R_{it}) \right) + \sum_{t=1}^{l} \delta_{2t} \phi(E_{it}) \right\} \]

Appendix 5 : Revenue Partial Derivatives

\[ \frac{\partial \text{REVTOT}}{\partial p^u} = \sum_{i=1}^{l} \sum_{t=1}^{T} \pi_t \prod_{t=1}^{l} \Phi(R_{it}) + p^w \sum_{i=1}^{l} \sum_{t=1}^{T} \delta_{it} \phi(E_{it}) \prod_{t=1}^{l} \Phi(R_{it}) - \frac{p^w}{\partial p^u} \frac{\partial U}{\partial p^u} \]

and

\[ \frac{\partial \text{REVTOT}}{\partial p^w} = p^w \sum_{i=1}^{l} \sum_{t=1}^{T} \sum_{t=1}^{T} \delta_{2t} \phi(E_{it}) \prod_{t=1}^{l} \Phi(R_{it}) + U + p^w \frac{\partial U}{\partial p^w} \]