International Settlements: Rate Alternatives

Network Economics & Finance

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Agenda

- Overview
- Alternative Procedures
- Modelling Approach
- Summary & Conclusions

International Settlements: An Analysis of Rates,
Communications & Strategies, Special Edition, IDATE, 2nd. Quarter, 1998, Montpellier, France and
* International Settlements: A Time for a Change*
James Alleman & Barbara Sorce
Proceedings of the Global Network 97 Conference
Calgary, 16 - 18 June 1997

Overview

- Accounting/Settlement Rates
- Mechanics of Settlements
- Recent Activities
  - International Telecommunication Union
  - United States Government

Accounting/Settlement Rates

- Settlement Rate
  - Bilateral negotiation
  - One-half of accounting rate

Mechanics of Settlements

- US $, SDRs, or Gold Francs
- Based on traffic differences

Telephone Revenues

Source: FCC

James Alleman Columbia University & University of Colorado
Observation

Accounting Rates are Intermediate/Interconnect Prices

Survey of the Literature

• Demand Analysis
• Asymmetry of Prices
• Models
• Policy Recommendations
Demand Analysis & Asymmetry

- Taylor, Lester, *Telecommunications Demand*
- Larsen, A. C. and Dale Lehman, *Symmetrical Pricing and Arbitrage*
- Larsen, A. C., Dale E. Lehman, and Dennis L. Weisman, "A General Theory of Point-to-Point Long Distance Demand"

Models: Policy

- Johnson, L. L., *Competition, Pricing, and Regulatory Policy in the International Telephone Industry*
- Alleman, J. H., P. N. Rappoport, and K. B. Stanley, "Alternative Settlement procedures in International Telecommunications Service"
- Ergas, Henry, and P. Paterson, "International Telecommunications Settlements Agreements"
- Frieden, Robert, "International Toll Revenue: Tracking the Inequities and Inefficiency"

Models: Duopoly

- Hakim, S. R. a. and D. Lu, "Monopolistic Settlement Agreements in International Telecommunications Agreements"
- Yun, Kyoung-Lim, Hyun-Woo Choi and Byong-Hun Ahn, "The Accounting Revenue Division in International Telecommunications: Conflicts and Inefficiencies"
- Cheong, K. A., and M. Mullins, "International Telecommunications Service Imbalances"

Models: Competitive

- Competitive
  - First-best
  - Cost-based prices
  - Fifty-fifty split
  - Sender-keeps-all (Bill-and-keep)

Models (continued)

\[ q_0: \text{joint service (two-way) traffic} \]
\[ q_i: \text{international service (one-way) traffic} \]
\[ Q = q_1 + q_2 \]
\[ c, c_i, c_0: \text{average incremental costs and product specific (constant) marginal cost} \]
Models: Competitive

Prices:
- \( a_i \): settlement
- \( p_i \): international (collection rate), country \( i, i = 1,2 \)

First-best prices are marginal costs:
- \( p_1 = c_0 + c_1 + c_2 \)
- \( p_2 = c_0 + c_1 + c_2 \)

Implies: \( a_1 = c_0 + c_2 \), \( a_2 = c_0 + c_1 \), \( p_1 = p_2 \)

Models: Competitive

- Cost-based Rates Efficient
- Benchmarking Improvement
- Inefficient
  - Divergence international rates
  - Fifty-fifty accounting rates
  - "Sender-keep-all" (Bill-and-keep)

Models: Competitive

- Competitive
  - First-best
  - Cost-based prices
  - Benchmark improvement
  - Fifty-fifty inappropriate
  - Sender-keep-all inappropriate
  - Bill-and-keep inappropriate

Models: Benchmark

\[
\max \pi = D(q)q - C(q)
\]

thus

\[
d\pi/dq = [dD(q)/dq]q + D(q) - dC(q)/dq = 0
\]

or \( D(q) [1 + 1/\eta] = dC(Q)/dq \)

Models: Benchmark

Price greater than Marginal Cost Factor

31-36
Models

- Competitive
- Benchmark
- Monopoly/Competitive

Models: Monopoly/Competitive

Maximize:

\[ \pi = D_m(q_c, q_m) q_m + [D_c(q_c, q_m) - c_c - c_0](q_c - q_m) - C(Q) \]

Specify demand as:

\[ D_m(q_c, q_m) = \alpha - \beta q_m - \gamma q_c \]
\[ D_c(q_c, q_m) = \alpha - \gamma q_m - \beta q_c \]
\[ \alpha, \beta, \gamma > 0 \text{ and } \beta^2 > \gamma^2 \]

Substituting:

Maximize:

\[ \pi = \left(\alpha - \beta q_m - \gamma q_c\right) q_m + \left(\alpha - \gamma q_m - \beta q_c\right) - c_c - c_0(q_c - q_m) - c_m q_m - c_m q_c - c_0 q_c \]

Solving for first order conditions, rearranging and collecting terms:

\[ 2(\gamma - \beta)q_m + (\beta - 2\gamma)q_c = c_m - c_c \]
\[ (\beta - 2\gamma)q_m - 2\beta q_c = c_c - \alpha \]

when \( c_c = 0 \)

Solving using Cramer's rule:

Let:

\[ \Delta = 3\beta^2 - 4\gamma^2 \text{ then} \]
\[ q_m = \left[-2\beta c_m + (\beta + 2\gamma)c_c + a(\beta - 2\gamma)\right]/\Delta \]
\[ q_c = \left[(2\gamma - \beta)c_m - \beta c_c + 2a(\beta - \gamma)\right]/\Delta \]
The ratio of $\gamma^2/\beta^2$ measures the degree of arbitraging the prices. We would expect to see $\gamma^2 \rightarrow \beta^2$ over time. Initially $\gamma^2$ would be closer to zero since as $\gamma \rightarrow 0$, the differentiation of the services is high and when $\gamma^2 \rightarrow \beta^2$ the services become more substitutable namely, this ratio would measure the ease of arbitrage.

[Shy, 1995, pp. 136 -7]

Models: Callback

$p_m$ = retail price or collection rate

$a_m$ = the settlement rate

If $p_m - a_m < a_m$ or $p_m < 2a_m$

monopoly gains from callback

<table>
<thead>
<tr>
<th>price</th>
<th>settlement</th>
<th>net revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2.00$</td>
<td>$(1.06)$</td>
<td>$0.94$</td>
</tr>
</tbody>
</table>

Models: Callback

<table>
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<th>No Callback</th>
<th>Callback</th>
</tr>
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Models: Callback, Monopoly

- No Incentive to Reduce Accounting Rate
- Settlement Improved
- Demand Stimulated
- Consumers/Producer Gain
- Trade Balance Deteriorates

Models: Callback, Competitive

- Neutral on Accounting Rate
- Settlement Exacerbated
- Demand Stimulated
- Consumers Gain
  (via trade effects)

Models

- Competitive
- Benchmark
- Monopoly/Competitive
- Callback

Policy Recommendations/Summary

- Cost-based Prices Confirmed
- Benchmarks - Improvement
  ▶ Far from marginal costs
  ▶ Could be tighten

Future Research

- Refine Models
  ▶ Estimation of demand functions
  ▶ Inclusion of callback/benchmark
  ▶ Ramsey pricing of settlements
- Estimation
  ▶ Callback effects
  ▶ Benefits of cost-based settlements
  ▶ Developing country losses