International Settlements: Rate Alternatives

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Telecommunications Economics

Overview

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

Mechanics of Settlements

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

Accounting/Settlement Rates

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

International Revenues, USA

Price Differences & Settlements


Price Differences & International Settlements

Price Differences & Settlements


Price Differences & International Settlements

Price & Traffic Differences

Price & Traffic Differences


Price & Traffic Differences


Alternative Procedures

- Interconnection Fees
- Sender-keeps-all
- Resale and Callback
- Negotiated/Flexibility
- Cost-based/Benchmarking

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
- Benchmark
- Monopoly/Competitive
- Callback

Models (continued)

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

- \( q_0 \): joint service (two-way) traffic
- \( q_i \): international service (one-way) traffic
- \( Q = q_1 + q_2 \)
- \( c_0, c_1, c_2 \): average incremental costs and product specific (constant) marginal cost

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: Benchmark

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

thus

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

or

\[
D(q) \left[ 1 + 1/\eta \right] = dC(Q)/dq
\]
**Models: Benchmark**

- Price greater than Marginal Cost Factor

**Models**

- Competitive
- Benchmark
- Monopoly/Competitive

**Models: Monopoly/Competitive**

Maximize:

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

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:

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

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 \( c_o = 0 \)
Models: Monopoly/Competitive

Solving using Cramer's rule:
Let:
\[ \Delta = 3\beta^2 - 4\gamma^2 \]
\[ q_m = \frac{-2\beta c_m + (\beta + 2\gamma)c_c + a(\beta - 2\gamma)}{\Delta} \]
\[ q_c = \frac{(2\gamma - \beta)c_m - \beta c_c + 2a(\beta - \gamma)}{\Delta} \]

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

- Competitive
- Benchmark
- Monopoly/Competitive
- 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

Models: Callback

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<tr>
<th>price</th>
<th>No Callback</th>
<th>Callback</th>
</tr>
</thead>
<tbody>
<tr>
<td>settlement</td>
<td>($1.06)</td>
<td>$1.06</td>
</tr>
<tr>
<td>net revenue</td>
<td>$0.94</td>
<td>$1.06</td>
</tr>
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</table>
Models: Callback

<table>
<thead>
<tr>
<th></th>
<th>price</th>
<th>settlement</th>
<th>net revenue</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>($1.06)</td>
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<td>$0.12</td>
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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)

Policy Recommendations/Summary

- Cost-based Prices Confirmed
- Benchmarks Offers Improvement
  - Far from marginal costs
  - Could be tighten
- Callback Ineffective (in some cases)
- Inappropriate
  - Sender-keep-all (Bill-and-keep)
  - Fifty-fifty split
  - Value-based pricing

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