



Spectrum: Its Value and Valuation

Exploring Market-Based Spectrum
Management and the Value of Radio-Frequencies
As a Public Good

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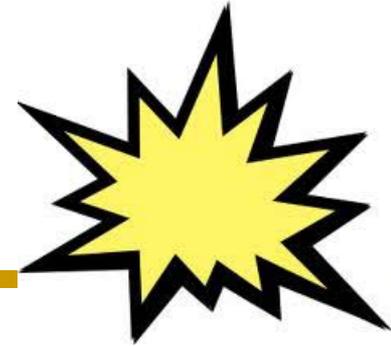
Introduction

- Liberalization has fundamentally changed the way we view and manage spectrum
- New paradigms of spectrum management
 - Property rights model
 - Spectrum “commons” approaches
 - “Command and control” approach
- For operator-driven services, such as IMT, the property rights model has become predominant
 - This has led to a growing **economic** predominance in views of spectrum – i.e., its growing **commoditization**





Spectrum: Exploding Demand



- By the end of 2010, there were 5.3 billion mobile wireless subscriptions globally, including 940 million subscriptions to 3G services.
- Mobile communications and Internet are converged onto the same platforms
- With the race to be part of Info Society, spectrum for mobile data is being increasingly seen as a building-block to national economic prosperity.
- Meanwhile, there are multiple ways to assign spectrum
 - License-exempt/class license
 - First-come, first served
 - Administrative decision (beauty contest)
 - Competitive bidding





Valuing Spectrum

- Market Valuation is used for several purposes:
 - Regulatory fees (initial and recurring)
 - Initial spectrum assignments (auctions and tenders)
 - Secondary markets
- Several approaches can be taken:
 - Income approach – Determining the value of services that can be marketed using spectrum as an input
 - Market comparable approach – Deriving value through comparison with the same or similar spectrum rights marketed elsewhere (i.e. benchmarking)
- Net Present Value (NPV) Calculation
 - Calculates the sum of discounted cash flows from a project and compares them to the capital outlay and ongoing costs for the project
 - Can use a LRIC, fully allocated and “bottom up” approach to gauge investment costs





Opportunity Cost

- Definition: The value of the next-best choice in a series of choices, or the value of something one forgoes in order to choose something else.
 - E.g. – In choosing a Corvette over a Mustang, the value of the Mustang represents the opportunity cost.
 - This provides a rough threshold valuation – had the value of the first choice been less than the opportunity cost, one might've picked the second choice.
- Opportunity cost in spectrum – The value that justifies investing in that spectrum opportunity rather than another investment opportunity
- **Problem:** Moving beyond arcane economic theory





Competitive Bidding

- Auctions, public tenders
 - Single-round, closed bid submissions
 - Multiple-round, open bid processes
- Valuation is used to assess the opportunity
 - **Regulators** set reserve amounts/price floors and treasury revenue estimates
 - Can be expressed as price per megahertz pop
 - **Potential bidders and financial backers** use valuation to estimate bidding opportunity and determine participation
 - Results set true floor of spectrum value





Secondary Trading

- The Pioneers: UK, Australia, New Zealand, US
 - Results: Somewhat “thin”
- The theory: Leasing and trading help:
 - Get spectrum into the hands of entities willing and able to use it,
 - Sets ongoing value of spectrum, and
 - Provides a safety net for initial auction failures
- Valuation: Different dynamics for secondary markets
 - Spectrumholder will need to generate profits from leasing
 - MVNO expectation of lower cost for spectrum inputs
 - Spectrumholder may perceive “private value” of foreclosing competition



Administered Incentive Pricing (AIP)

- An indirect costing regime
- Notable proponent is the UK's Ofcom
- Based on opportunity cost assessment
- Designed to act as a proxy for market forces
- Embodied in regulatory fees paid by essentially all users, including govt. entities
- Incentive is to induce holders to release spectrum in order to reduce fees.



Valuation: An Inexact Science

- **The reality:** spectrum valuation is kinetic, not static
 - “Intrinsic” variables are innate in the spectrum band:
 - Propagation characteristics
 - Manufacturing focus on the band
 - Degree of global harmonization
 - “Extrinsic” factors – depend on the specific market
 - Physical characteristics: topography, geographic isolation, climate, etc.
 - Socio-economic characteristics: demographics, population density, economic growth
 - General legal and political framework
 - The overall political, regulatory and business environments
 - Spectrum management and telecom regulatory regime
 - Market structure
 - Competition policy
 - Competitive bidding rules
 - Technology neutrality or service restrictions





Regulatory Factors

- **Regulations applying to spectrum use**

- Spectrum caps
- Service & network neutrality
- License renewal periods and processes



- **Market structure and competition policy**

- How many operators granted licenses
- Roaming rules
- Secondary markets – leasing, resale, disaggregation



- **Bidding rules and processes**

- Bidding discounts or set-asides
- Transparency & Accountability



Non-Commodity Viewpoints

- Unlicensed uses

- WiFi – an unlicensed success story
- Determining the value of unlicensed spectrum



- Public safety, public service and government uses – they have economic value, too

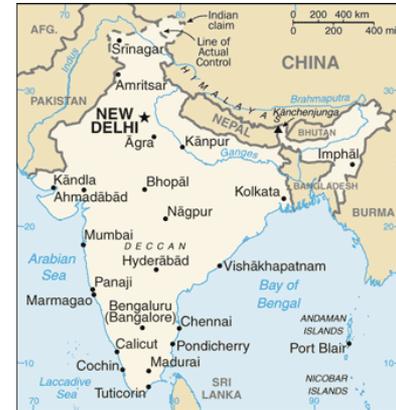
- Public safety – a “third rail” for spectrum pricing
- How do taxpayers “bid” for spectrum
- The tightening space for government spectrum uses



Fees and Auction Revenues:
Government Rent-taking or Legit
Recovery of National Asset Value?

Case Study: India

- 2010 3G and BWA auctions
- DOT expected USD 8 billion in revenues; auctions raised nearly USD 23 billion
- Held two sequential auctions
- BSNL & MTNL required to pay highest private bid for licenses received pre-auction
- Other licenses awarded in multiple-round simultaneous bid auctions
- High bids raised concerns of overbidding and under-capitalization





Case Study: New Zealand



- Policies for renewing fixed-term licenses
- Determination: Incumbents could renew by paying a market-oriented renewal fee, or relinquish spectrum
- Two approaches used to determine market-oriented fee:
 - TV and radio broadcasting – An income approach, based on past and forecasted revenues
 - Cellular – *Optimal Deprivation Valuation* approach estimated the cost of modifying the incumbent network to maintain a given level of service following a marginal reduction in spectrum rights.
- Both TNZ and Vodafone accepted the renewal price offer





Issues To Discuss

- What situations call for non-commodity-based distribution of spectrum access?
- How can we broaden consideration of spectrum's economic value in the context of unlicensed, public safety and government uses?
- Are current economic models for spectrum valuation sufficiently robust to avoid undervaluing or overbidding?
- Do potential bidders have sufficient information on spectrum opportunities to engage in competitive bidding effectively?



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