



# Spectrum: Its Value and Valuation

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

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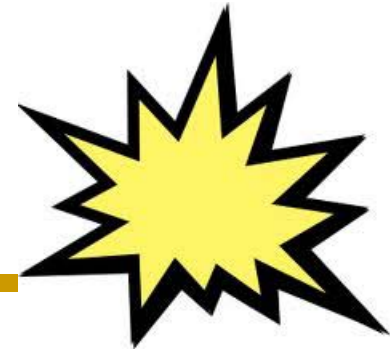
# Introduction

- 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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