
Spectrum Valuation Project, part two
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# Introduction:
# Radio Frequency Spectrum

- Normally referred to as spectrum
- A valuable and limited resource used for all forms of commercial and public sector wireless communication: Mobile, Radio and television broadcast, broadband links, aeronautical and maritime navigation, satellite command and communication.

# Radio Spectrum

- Electro magnetic radiation is the propagation of energy which travels through space in the form of waves including visible spectrum (light) infrared, ultraviolet and X rays.
- Radio Spectrum is the portion of electromagnetic spectrum which carries radio waves.

# Range

- The boundaries of spectrum are defined by the frequencies of the transmitted signals, generally ranging from 9KHz (1000 cycles per second) –300GHz (billion cycles per second)

# Band & Usage

| Frequency | Band | General Use |
|---|---|---|
| 9KHz | V/low F | Long/ distance radio |
| 30KHz | Low F | Naval Broadcast |
| 300KHz | Medium F | Aero comm |
| 3000KHz | High F | Sound broadcast |
| 30Mhz | Very high F | Private radio |
| 300Mhz | Ultra high F | TV Broadcast |
| 3000Mhz | Super high F | Radar |
| 30GHz | Extremely high F | B/band Wireless |

# Key Characteristics

- Higher the frequency the lower the distance propagation capability and the higher the information carrying capacity of the signal.
- Use is a function of those characteristics.
- Note: the UHF band 300 – 3000 MHz is suitable for transmission of a wide variety of services and is therefore in great demand

# Important Considerations Re: Spectrum Benefit

- Expansion of Manufacturing capability.
- Creation of new radio services/industries.
- Increased employment.
- Cost effective availability of social services.
- Backward & Forward Linkages:

i. Equipment supply.
ii. Market research.
iii. IT support.

# BDT & the Economics of Spectrum Management

- 2001 SG3 referred to Report SM 2012 (ITU-R) urging the BDT to organize seminars to treat with economic aspects of spectrum management.

Prime concern:

- To develop appropriate methods to ensure that developing countries obtain adequate financial resources to facilitate efficient spectrum management.

# Importance of Adequate Financial Resources

- Facilitate new spectrum-using services
- Permit services to operate at acceptable interference-free levels;
- Ensure that the population is not taxed unnecessarily in order to permit commercial spectrum users to operate.

# Spectrum Market

Strong growth in demand for spectrum for commercial purposes.

- Internationally, derived demand for commercial spectrum has been driven largely by growth in demand for mobile services and attendant infrastructure, (e.g.fixed terrestrial links which require spectrum to facilitate mobile the services).

- With the advent of internet access over mobile handsets and developments in convergence technology, (SMS, MMS) demand for commercial spectrum is certain to accelerate, even in the near future.

# Market Value of Spectrum

commercial value that must be managed in a manner that ensures efficient utilization the resource.

- **Imperative to efficient spectrum management methodology is the formulation/adoption/adaptation of market oriented spectrum formulae that enable reasonably accurate estimation of economic values of frequencies, particularly in commercial bands.**

# Estimating Market Value

- Since the advent of the use of radio Frequencies as a communication medium , licence fees for spectrum usage have been determined primarily by two methods:

a) Fee structure which invariably pegged annual charges at some percentage of gross/net profit.

b) Fee structure which simply ensured coverage of fixed administrative costs.

- Under these systems, spectrum hording has been easy and incentive to introduce more spectrum-efficient technology …….almost absent.

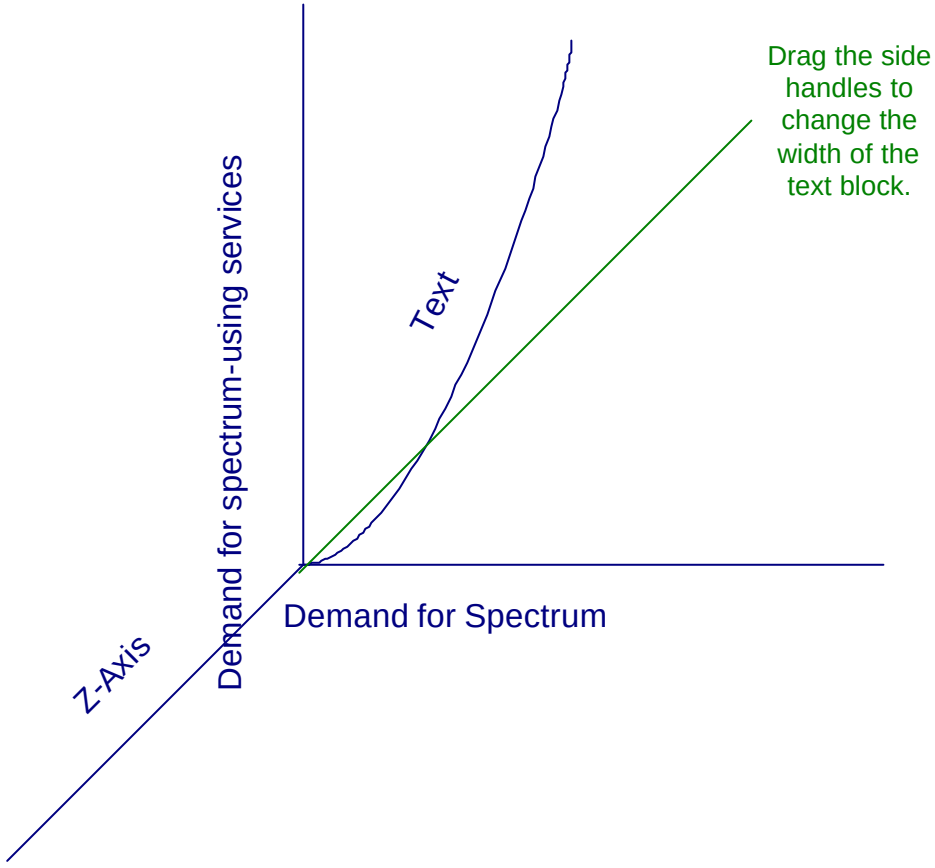
# Problem

- Studies indicate that spectrum reserved for commercial uses, and not assigned to its highest value user (market value) represents a misallocation of the resource, a sub-optimal investment decision that benefits the user at the expense of the wider economy of the country.
- Case in point: whenever high capacity fixed radio link is under-priced, it is usually more economical for an operator not to use cable on its trunk network.
- This may be good economics for the operator but poor for the country.

# Examination of Basic Demand

- Demand for spectrum is derived demand.
- Positive Correlation between demand for services facilitated by spectrum and demand for spectrum.
- Demand for spectrum for non commercial uses, e.g. national security should not be assessed in like manner as demand for spectrum for commercial uses.

# Derived Demand for Spectrum



# Analytical Concept

- Like all natural resources, e.g. oil, the Market Oriented Pricing concept is that economic rent is applicable to commercial exploitation of spectrum to produce goods/services?

- Economic rent (license fee) could be captured on the basis of scarcity and differential use?

# Differential Rent

Differential Rent:

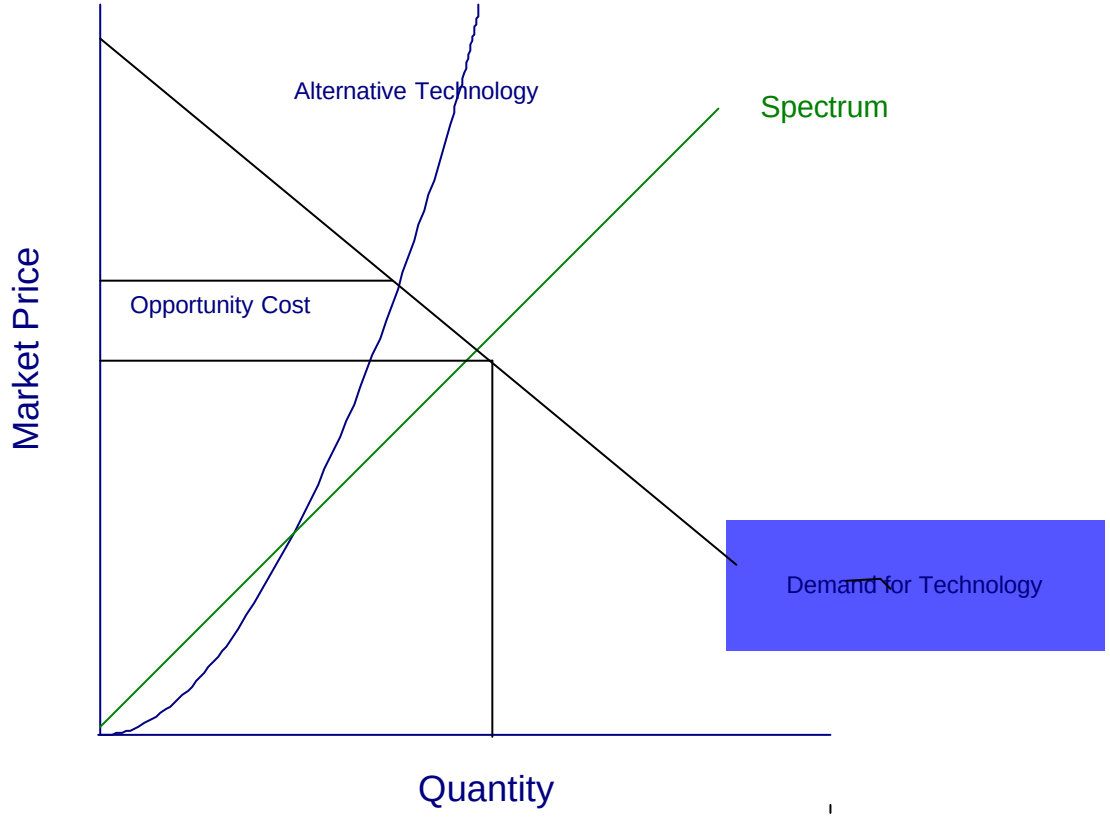
- Each frequency band has unique propagation characteristics that may be suitable for specific services.
- What is the impact of differential rent on spectrum value?

# Opportunity Cost and Economic Rent

- Opportunity cost is likely to play a major role in establishing economic rent.

- Opportunity cost impacts scarcity.
- Opportunity cost impacts differential usage.
- What is the impact of opportunity cost on the value of spectrum.

# Simulating Opportunity Cost



# Establishing Indicative Costs

- Spectrum management activities incur direct and indirect costs as well as secondary cost.
- Such costs should be covered by licensees who use spectrum, in particular usage for commercial purposes.

# Basics of Indicative Costs (Spectrum User fee)

Spectrum User Fee ($T_{su}$) = $f$($K_{sm}$, $A_{sm}$)

Where:

- $K_{sm}$ =Annual basic costs of spectrum Management (Direct + indirect)
- $A_{sm}$ = Secondary costs of spectrum use, as determined by:

i. Bandwidth used.

ii. Coverage area and population density of area.

iii. Spectrum Employment.

iv. Spectrum monitoring complexity.

v. Type of service.

# Estimating Cost Per Licence

Cost licence ($T_{sui}$) is therefore:

- $T_{sui} = [(K_{sm,})/n + (A_{smi})]$

- Where:

n is the total number of licences awarded.

# Thank you