Canadian Transportation Agency

Office des transports du Canada

REGULATORY COSTING MODEL

Branch: Analysis and Outreach

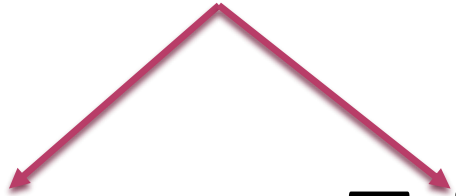
Directorate : Analysis and Regulatory Affairs

Canada

WHAT DO WE REGULATE ?

WHO ARE WE?:

Canadian Transportation Agency

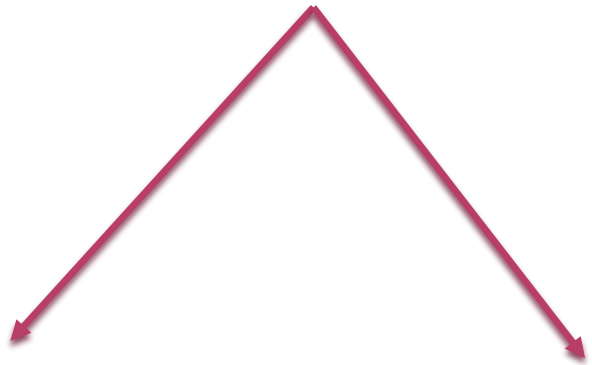


Regulator Tribunal

- We ensure that the national transportation system runs efficiently and smoothly
- We protect the human rights of persons with disabilities to an accessible transportation network
- We provide consumer protection for air passengers

REGULATION STRATEGY:

Averch & Johnson MODEL (1962):



Fixed Prices

Price Caps

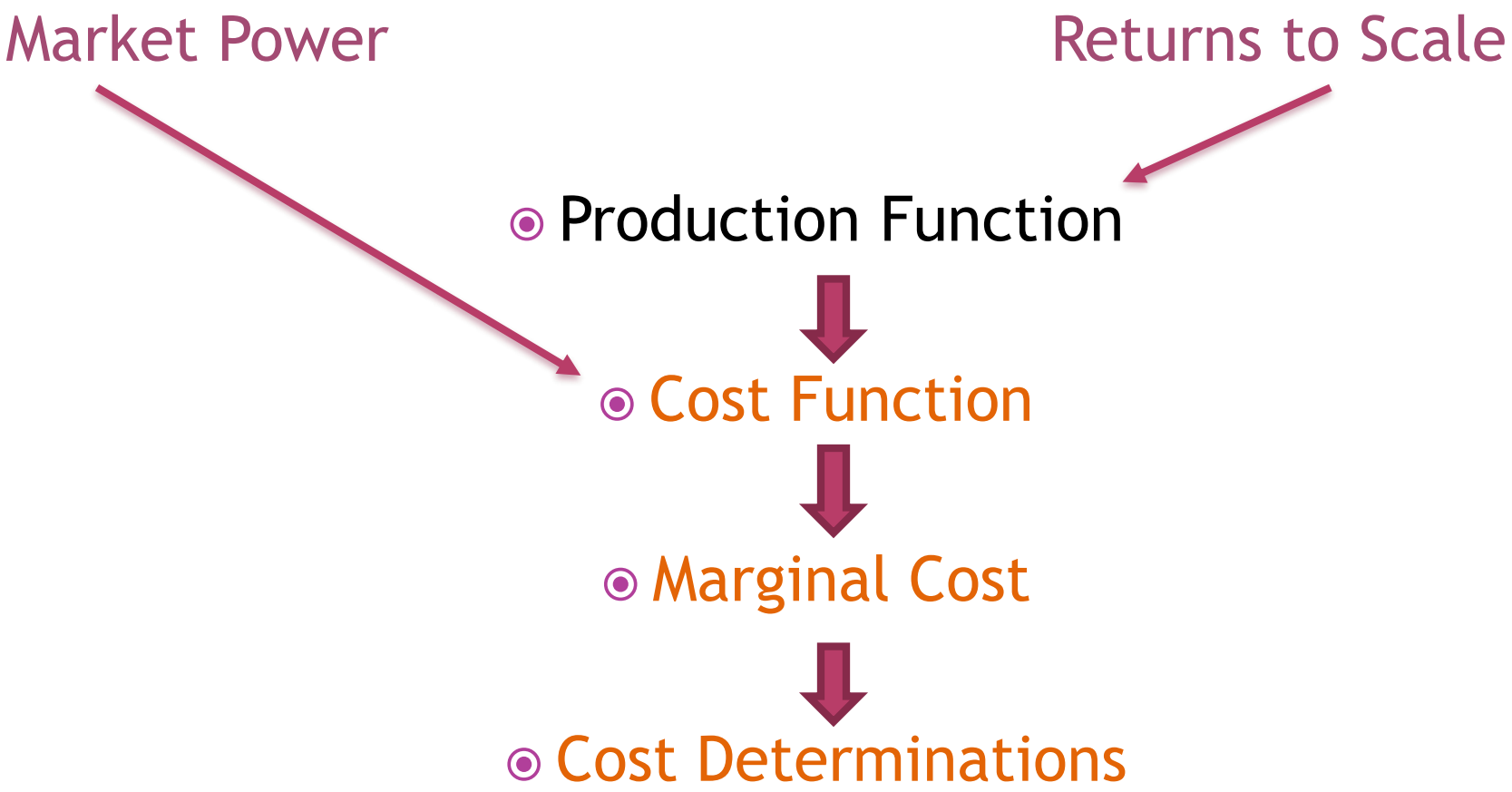
OUR FIXED REGULATED RATES : COST BASED RATES

- P = Variable Unit Cost + Contribution to fixed Cost
- Variable Unit Cost = Proxy of Marginal Costs
- Proxy of Ramsey Pricing:

  P = Marginal Cost x [1+ (System Marginal Costs / System Total Costs)]

- Challenge of Real Ramsey Pricing : Demand Functions

FUNDAMENTAL ASSUMPTIONS:



COST FUNCTION:

$$\frac{C^{\theta}-1}{\theta} = b\,\frac{y^{\lambda}-1}{\lambda} + \mathrm{F}$$

n-sample: $\{C_t, y_t\}_{t=1}^{n}$

Statistical Inference : $\theta^*, \lambda^*, b^*, F^*$

MARGINAL COSTS AND AVERAGE COSTS :

$$M.C = \underbrace{\frac{\partial C}{\partial y}\frac{y}{C}}_{\substack{Cost \\ Elasticity}} \times \underbrace{\frac{C}{y}}_{\substack{Average \\ Cost}}$$

VARIABLE UNIT COSTS AND MARGINAL COSTS:

$$M.C = \underbrace{\frac{\partial C}{\partial y}\frac{y}{C}}_{\substack{Cost \\ Elasticity}} \times \underbrace{\frac{C}{y}}_{\substack{Average \\ Cost}}$$

$$\frac{C^{\theta}-1}{\theta} = b\frac{y^{\lambda}-1}{\lambda} + F + \varepsilon$$

$\frac{\partial C}{\partial y}$ is unknown !

$\frac{\partial C}{\partial y}\frac{y}{C}$ is approximated by a "VARIABILITY" FACTOR (Regression Analysis)

VARIABLE PORTION OF COSTS: REGRESSION ANALYSIS

- Cost function: $\frac{C^{\theta}-1}{\theta} = b\frac{Y^{\lambda}-1}{\lambda} + F$
- Estimation of θ, λ and F: Non Linear Analysis (MLE)
- Intercept= $I = \left[\theta\left(b\frac{0^{\lambda}-1}{\lambda} + F\right) + 1\right]^{\frac{1}{\theta}}$
- Fixed Portion of Costs: $\frac{I}{C}$
- Variable Portion of Costs: $1 - \frac{I}{C}$

IN PRACTICE…

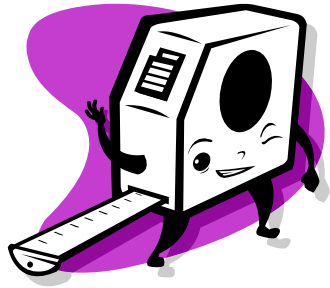
- Several Cost Categories
- Total Cost = Sum of cost functions
- Several outputs: C = C(Y1, Y2,w)
- Some outputs(cost drivers) are expenses ($) not physical metrics

THE UNIFORM CLASSIFICATION OF ACCOUNTS AND COST ACCOUNTS

Cost Categories	UCA Accounts	Cost Accounts
Equipment Investment	12	7
Equipment Maintenance	41	15
Equipment Depreciation	12	7
Infrastructure Investment	31	15
Infrastructure Maintenance	37	15
Infrastructure Depreciation	30	15
Train Operations	16	3
Yard and Terminal Operations	16	8
Other Rail Operations	34	11
Planning and Supervision	4	4
General Railway Administration	41	7
Total	**274**	**107**

OPERATING STATISTICS

- Gross Ton-Miles
- Net Ton-Miles
- Car-Miles
- Train Miles
- Train Hours
- Diesel Unit Miles
- Train Switching Miles
- Yard Switching Minutes
- Carloads
- Tons



REGULATED RATES IN PRACTICE:

- Focus on a particular part of the network

- We don't use all cost categories (i), only relevant ones (j)

- $MC = \sum_{j \in i} MC_j \times y_j$

- $P^* = MC \times \underbrace{(1+\beta)}_{\substack{Fixed\ Cost\ Factor \\ (system\ level)}}$

COST DETERMINATION…SIMPLE CASE

- Winnipeg ➔ Thunder Bay
- A grain shipper and a railway do not agree on the rate per car

- Trackage (Distance): 419 Miles
- Each month: 1200 Cars and 120,000 Tons moved for that shipper
- System Marginal Cost for track maintenance: $0.5/(Ton x Miles 000)
- System Ramsey Factor: 25%

- Regulated rate per car: [1.25 x (0.5/1000) x (419x120,000)] / 1200
  = $26 per Car to cover track maintenance

QUESTIONS ?