DESIGNING WATER RATES FOR LOS ANGELES

By way of background, one should note that when the marginal cost is very different from the average cost, MC pricing becomes somewhat problematical

FOR LADWP (as of 1992)

Local surface/ground water	**< $100/AF**
Owens Valley, Mono Lake	**$100/AF**
MWD imported water	**$250/AF**
Water market water	**$225-325/AF**
Conservation	**$350-475/AF**
Reclaimed sewage	**$600-800/AF**
Desalination	**$1500/AF**

The sharp variation in marginal cost poses two questions:

1) Which is the marginal source whose cost is to serve as a benchmark for price?

For LA, we used the cost of reclaimed sewage.

2) Which uses or users are to be charged this cost?

Our answer in LA: Identify the types of water use that we believe are most likely to be responsive to financial incentives.

Our goal was to influence behavior.

To influence behavior, one needs to design incentives

(a) that people will notice, and

(b) that they feel they can respond to.

Previous increasing block rate structures in California

- involved many small price increments

- last increment occurred well below median

The new LA rates involve two sharply differentiated rates, creating an incentive that is intended to be highly visible, with the switch point from lower to higher rate located at a level -- above median use-- aimed at influencing the price-responsive component of demand.

The upper block rate is set equal to estimate of long-run marginal cost, differentiated by summer and rest of year.

The lower block rate is set approximately equal to current average cost.

The differential between the two rates works out a bit less than 100% in winter and somewhat more than 100% in summer.

1993 (original rates)

TABLE 3: NORMAL YEAR WATER RATES ADOPTED BY LA CITY COUNCIL

	PRICE IN LOW BLOCK ($/CCF)	SWITCH POINT	PRICE IN HIGH BLOCK ($/CCF) WINTER	SUMMER
RESIDENTIAL				
Single-Family	$1.14	WINTER: 575 gallons/day SUMMER: 725 gallons/day	$2.33	$2.98
Multi-Family	$1.14	125% of winter use	NA	$2.98
NON-RESIDENTIAL	$1.21	125% of winter use	NA	$2.98

The 1993 rates had a single switch point; 600 gallons per account per day in winter, and 750 gallons per account per day in summer — about 200% of the median use per account.

These were somewhat higher than I had recommended (500 and 600 gallons/account/day).

My idea was to set the switch point so that

(A) it differentiated "reasonable" use from "more than reasonable" use

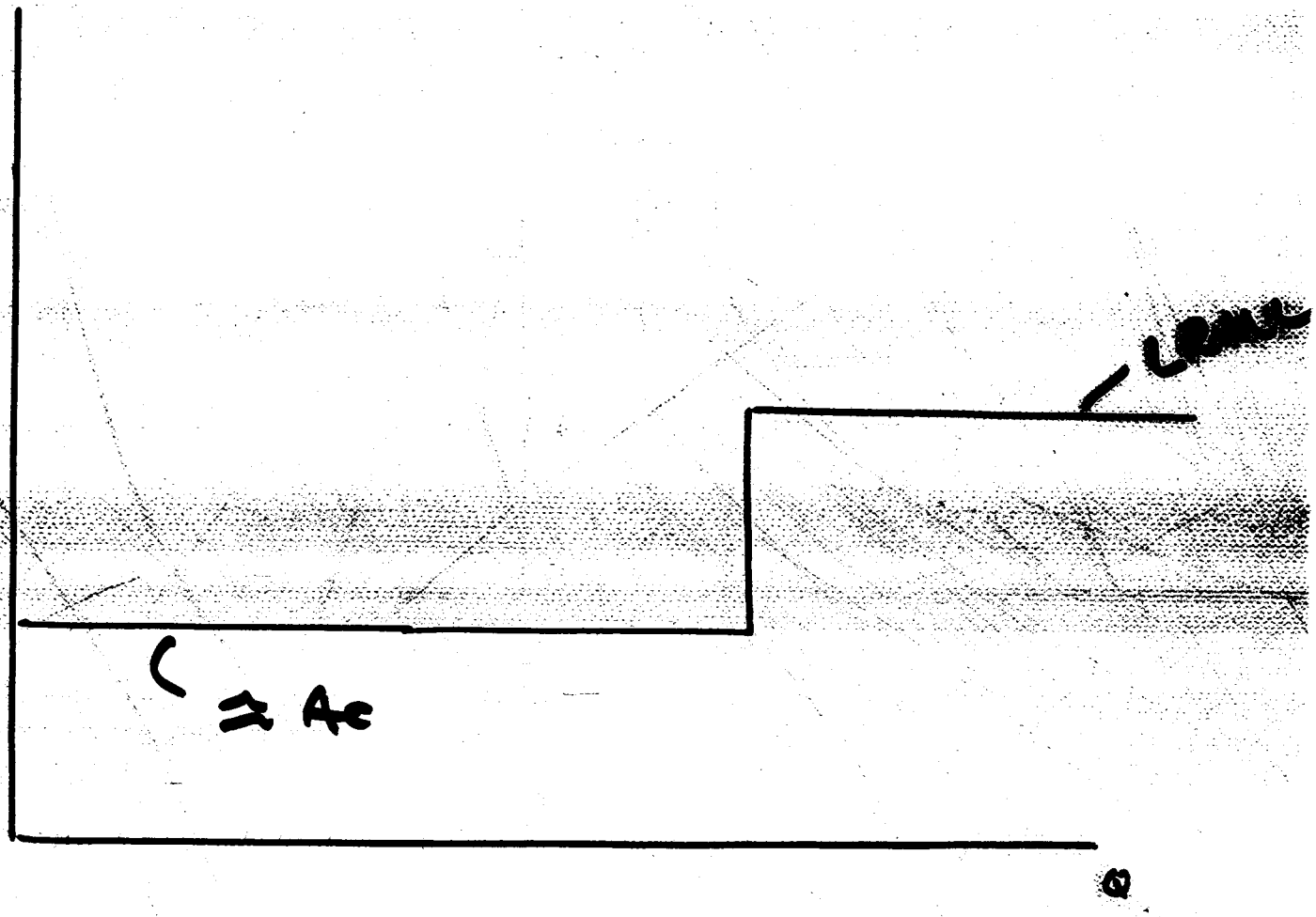
(B) it differentiated indoor plus modest outdoor use (presumed to be less elastic) from extensive outdoor use (presumed to be more elastic)

The revised rates adopted in 1995 have 15 *different* switch points according to climate (3 zones) and lot size (5 size classes); the switch point for each cell was intended to cover indoor and some modest outdoor use within the first block; it was also designed to be ~ 125% of median use within that cell.

(Revised Rates)

Table 13 1994 BRC Recommended Temperature and Lot Size Breakpoints

Lot Size (sq. ft.)	Summer Average Daily High	Number of Billing Units Charged at Low Initial Block Rate	
		Winter	Summer
<7,500	<75°	13	16
	75–85°	13	17
	>85°	13	17
7,500–10,999	<75°	16	23
	75–85°	16	25
	>85°	16	26
11,000–17,499	<75°	23	36
	75–85°	24	39
	>85°	24	40
>17,499	<75°	29	45
	75–85°	30	48
	>85°	30	49
1993 Rate Design Breakpoint			
all lots	all temperatures	22	28


C ≥ Ac
Q

CONTINGENCY PRICING FOR DROUGHT

The LA rate structure specifically allowed for a modification during periods of drought.

During a 5%, 10%, 15%, 20% OR 25% shortage, the switch point for transition from the low to the high block would be reduced by the corresponding percent.

And, the upper block rate would be increased from the normal, non-drought rate (the estimated LRMC of water) to an estimate of what would be the market-equilibrating price when demand was rationed by that percent.

PRELIMINARY RESEARCH FINDINGS

Study of the AWWARF Residential End Use data by Sheila Cavanagh Olmstead (School of the Environment, Yale University), Rob Stavins (Kennedy School of Government, Harvard University) and myself.

Provides data on daily water use in 1997 by 1082 households in 11 cities for 2 weeks in the summer and 2 weeks in the winter.

The households are served by 16 water utilities, and they involve 26 different price structures:

- **8 are uniform (flat-rate)**
- **8 are 2-tier, increasing block rate**
- **10 are 4-tier, increasing block rate**

The marginal price ranges from $0 to $4.96 per 1000 gallons.

ECONOMETRIC ANALYSIS

GLS with no allowance for endogeneity of price

Instrumental variables

Discrete/continuous choice model with 2 errors estimated by maximum likelihood

PRELIMINARY FINDING:

HOUSEHOLDS FACING A UNIFORM RATE STRUCTURE EXHIBIT A MUCH *LOWER* PRICE ELASTICITY THAN HOUSEHOLDS FACING AN INCREASING BLOCK RATE, EXVERYTHING ELSE BEING THE SAME.

POSSIBLE EXPLANATION :

The increasing block rate makes water rates more salient and encourages some households to pay more attention to their water use.

In effect, the adoption of an increasing block rate may cause a shift in the demand function, not just a movement along the given, pre-existing demand function.

DISCRETE/CONTINUOUS CHOICE MODELS

THE DISCRETE CHOICE IS WHICH BLOCK TO BE IN

THE CONTINUOUS CHOICE IS WHERE TO BE WITHIN THAT BLOCK

CONSEQUENTLY EXPECTED DEMAND IS COMPOSED OF SEVERAL TERMS:

$$E\{\text{Demand}\} = E\{\text{Demand} \mid \text{in block 1}\} * Pr\{\text{In Block 1}\}$$

$$+ E\{\text{Demand} \mid \text{in block 2}\} * Pr\{\text{in block 2}\} \ldots$$

THERE IS A PRICE ELASTICITY OF CONDITIONAL DEMAND AND A PRICE ELASTICITY OF BLOCK SELECTION.

IT IS AN OPEN QUESTION WHICH IS THE MORE IMPORTANT IN PRACTICE

So far we have focused on how a consumer with given preferences responds to a rate structure.

But a change in rate structure could cause a change in consumer "preferences" — by making the price of water more salient to consumers + encouraging them to pay more careful attention to their water use, perhaps rethink it.

Table 6. Price and Income Elasticity Estimates by Type of Price Structure

Category of Price Structure	Price Elasticity Estimate	Income Elasticity Estimate
All sample households	-0.3319	0.1273
Uniform price households	-0.1937	0.0175
Two- & four-block households	-0.6007	0.1962