Modeling Cigarette Consumptio

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Background -- California Cigarette Excise Tax Allocations (Cents Per Pack)

• *General Fund*	*10 cents*
• *Breast Cancer Fund*	*2 cents*
• *Cigarette and Tobacco Products Surtax Fund (Proposition 99, passed in 1988)*	*25 cents*
• *California Children and Families First Trust Fund (Proposition 10, passed in 1998)*	*50 cents*
• *TOTAL*	*87 cents*

Background -- Proposition 10

- ***Proposition 10, passed in November 1998:***
  - ***$0.50 per pack increase in California cigarett tax, effective January 1, 1999.***
  - ***BOE required to determine the effect of the new tax on cigarette consumption.***
  - ***Purpose: To "backfill" revenue losses for existing programs funded by previously enacted cigarette taxes.***

Modeling Challenges

- *Another nearly concurrent external factor: Cigarette manufacturers' price increases resultin from the tobacco settlement announced late 199 a wholesale price increase of $0.45 / pack.*

- *Together, these two events increased retail cigarette prices by approximately 50%.*

- *Research task: Develop an econometric model t predict consumption without the Proposition 10 t increase of $0.50 / pack.*

Methodology -- Nonlinear Regression Model

- ***Background: previous regression estimation wor literature review.***
  - ***– Price Elasticities estimated in most studies ranged from -0.3 to -0.5.***
  - ***– Such a large percentage price/tax increase outside of historical experience.***

- ***Nonlinear Regression model***

- ***SAS Nonlinear (NLIN) procedure***

Model Structure -- Functional Form and Specification

- *Functional form: Multiplicative, annual percentag change*
- *Specification:*
  - *Expressed in packs per capita, real 1997 prices.*
  - *Dependent variable: (apparent consumption per capita , year t) / (apparent consumption p capita , year t-1).*
  - *Independent variables: All expressed in sam mathematical form as dependent variable (i.e annual percent changes).*

Mathematical Specification

- (cig2/pop2)/(cig1/pop1) =
- B_0 *
- (catax2/catax1)^B_1*
- (fedtax2/fedtax1)^B_2 *
- (retail price2/retail price1)^B_3*
- (wage2/wage1)^B_4*
- (CaEmployRt2/CaEmployRt1)^B_5 *
- (Pre-1966 indicator)^B_6
- + error term

Independent Variables

- ***Where:***
  - ***B-0 Constant (trend multiplier)***
  - ***B-1 CA excise tax per pack***
  - ***B-2 Federal excise tax per pack***
  - ***B-3 Product price per pack***
    (Retail price - CA tax - Federal tax)
  - ***B-4 CA wage and salary income per capita***
  - ***B-5 CA employment rate***
    (Inverse of unemployment rate)
  - ***B-6 Pre-1966 Surgeon General Report***
    dummy variable (Equals 1 after 1965)

Results -- Overall Model

- *All variables except product price significant at t*
  95% confidence level.
- *R-Squared = 0.63*
- *Autocorrelation coefficient = -0.36*

Results -- Coefficients

- ***B0 = 0.965 i.e. 3.5% per year decline, all othe conditions constant.***
- ***B1 = - 0.089***
- ***B2 = - 0.155***
- ***B3 = - 0.009***
- ***B4 = 0.503***
- ***B5 = - 1.125***
- ***B6 = 0.010***

Results -- Example of Interpretation of B1 Coefficient

- ***B1 - Suppose the CA excise tax increase by 10%:***
  - ***predicted % change = (1.10)*** $^{-0.08955}$
  - ***i.e. - 0.85 %***
  - ***i.e. An elasticity close to -0.1 for CA excise taxes (- 0.85 / 0.10 = - 0.085)***
- ***Other coefficients interpreted similarly***

Results -- Hypothetical Example of Interpretation of Assumed Changes

- ***Suppose: CA excise taxes, Federal excise taxes, and retail prices each increase 10 %, real wages & salaries increase 2%, and the employment rate increases 0.5%.***
- ***Given these conditions, the product of these ratios 0.946, i.e. A 5.4% decline in apparent cigarette consumption.***