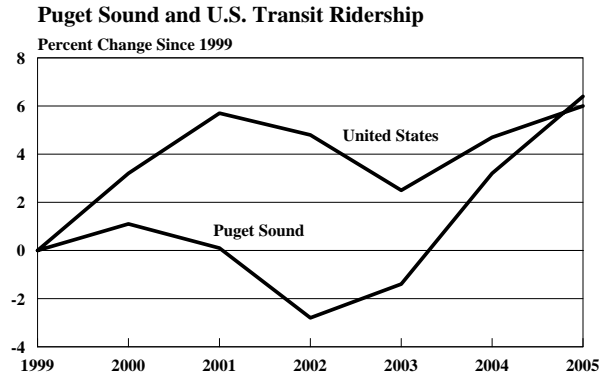


**PUGET SOUND TRANSIT RIDERSHIP**  
**An Econometric Analysis**

Puget Sound Regional Council, which is responsible for regional transportation and landuse planning, recently published data on transit ridership. Despite losses during the recession, regional and national transit ridership increased about 6 percent between 1999 and 2005.



What caused the overall growth in Puget Sound transit ridership during the period? And what does it imply for the future? King County Metro bus riders constitute a large share of transit ridership in the region. Therefore, the King County Metro bus ridership forecasting model should help answer these questions.

As shown on page 3, the bus ridership forecasting model can be approximated by the following expression:

$$\Delta\text{BUSRIDE} = 0.42\Delta\text{KN} - 0.11\Delta(\text{FARE}/\text{CPI}) + 0.10\Delta(\text{PGAS}/\text{CPI})$$

where  $\Delta\text{BUSRIDE}$  is the percent change in bus ridership over the period,  $\Delta\text{KN}$  is the percent change in King County employment,  $\Delta\text{FARE}/\text{CPI}$  is the percent change in real fares, and  $\Delta\text{PGAS}/\text{CPI}$  is the percent change in real gas prices.

**Puget Sound Transit Ridership and Related Variables**

	1999	2005	Percent Change
Transit rides (mils.)	127.9	136.1	6.4
Employment (thous.)	1,685.0	1,719.6	2.1
Bus fare* (cents/ride)	76.9	85.0	10.5
Gas price (\$/gal.)	1.30	2.36	81.5
Consumer price index (82-84=100)	172.8	200.1	15.8
Real bus fare (bus fare/consumer price index)	44.5	42.5	-4.5
Real gas price (gas price/consumer price index)	0.75	1.18	57.3

\*King County Metro average bus fare.

Using this equation with Puget Sound data, the model would have predicted a 7.1 percent increase in regional transit ridership between 1999 and 2005:

$$\begin{aligned}\Delta\text{RIDERSHIP} &= 0.42\Delta\text{PN} - 0.11\Delta(\text{FARE}/\text{CPI}) + 0.10\Delta(\text{PGAS}/\text{CPI}) \\ &= 0.42(2.1) - 0.11(-4.5) + 0.10(57.3) \\ &= 0.9 + 0.5 + 5.7 \\ &= 7.1\end{aligned}$$

Given that the predicted increase in transit ridership over the six-year period is very close to the actual gain (6.4 percent), it is reasonable to conclude that the model is doing a good job of explaining the demand for public transportation.

As the above results show, ridership increased because of a gain in regional employment, a decrease in real fares, and an increase in real gasoline prices. But the biggest contributor to growth of ridership—accounting for four-fifths of the total gain—was gasoline prices, which climbed from \$1.30 per gallon to \$2.36.

Between 2003 and 2005, transit ridership grew at a 2.7 percent annual rate. Will it continue to rise at that pace? Not likely. Puget Sound employment is expected to expand at a 2.6 percent rate over the next two years. If real fares and real gasoline prices hold the line, which seems like a good bet, transit ridership will increase at a 1.1 [=0.42(2.6)-0.11(0.0)+0.10(0.0)] percent rate.

Dick Conway  
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## KING COUNTY METRO BUS RIDERSHIP FORECASTING MODEL

VARIABLE LIST

BUSRIDE      BUS RIDES PER MONTH (mils.)

KN            KING COUNTY EMPLOYMENT (thous.)

CPI           SEATTLE CONSUMER PRICE INDEX, ALL URBAN (1982-84=100)

PGAS          SEATTLE GASOLINE PRICE (\$ per gal.)

FARE          BUS FARE (cents)

DUMUN        SERIES LINKING DUMMY

DUMCT        COMMUNITY TRANSIT DUMMY

DUMRFA       RIDE FREE AREA DUMMY

DUMUPASS     UPASS DUMMY

DUMCOUNT1   RIDE COUNT DUMMY 1

DUMCOUNT2   RIDE COUNT DUMMY 2

DUMST        SOUND TRANSIT DUMMY

DUMt          DUMMY (1 for time t, 0 otherwise)

PDL          POLYNOMIAL DISTRIBUTED LAG (in this case over four quarters)

MA            MOVING-AVERAGE TERM

MODEL

## BUS RIDES

VARIABLE	COEFFICIENT	t-VALUE
LBUSRIDE		
CONSTANT	-2.11417	-3.0
PDL(LKN,4,2,3)	0.07227*	6.3
LFARE(-1)	-0.11458	-2.4
LPGAS	0.09843	6.5
DUMUN	1.56534	161.7
DUMCT	-0.05149	-4.0
DUMRFA	0.06852	7.1
DUMUPASS	0.03565	3.9
DUMCOUNT1	0.03605	4.4
DUMCOUNT2	0.06976	5.8
DUMST	-0.06150	-6.3
MA(1)	0.74038	10.2

\*Estimated elasticity over four quarters is 0.42160

SAMPLE 1980.2-2005.2  
 $R^2=1.000$ , SEE=0.011, DW=1.881

LBUSRIDE=log(BUSRIDE)  
 LKN=log(KN)  
 LFARE=log(FARE/CPI)  
 LPGAS=log(PGAS/CPI)

Other dummy variables not shown.

The variables in the regression equation are expressed in log form. Thus, the regression coefficients are estimated elasticities. Accordingly, the regression equation can be approximated by

$$\Delta \text{BUSRIDE} = 0.42\Delta \text{KN} - 0.11\Delta (\text{FARE}/\text{CPI}) + 0.10\Delta (\text{PGAS}/\text{CPI})$$

where each term is expressed as a percent change (e.g.,  $\Delta \text{BUSRIDE}$  is the percent change in bus rides).

Note that the regression coefficient for DUMUPASS indicates that the University of Washington UPASS program raised total Metro bus ridership by approximately 3.6 percent.