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# **UNEMPLOYMENT RATE AND PRICE OF GASOLINE PREDICT THE FUEL ECONOMY OF PURCHASED NEW VEHICLES**

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16. Abstract  This study examined the relationship between two economic indicators—the unemployment rate and the price of gasoline—and the fuel economy of purchased new vehicles. A regression analysis was performed on U.S. monthly data from October 2007 through February 2011. The main finding is that the fuel economy of purchased new vehicles can be well predicted from the unemployment rate and the price of gasoline.					
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## **Introduction**

In two previous studies (Sivak and Schoettle, 2009a; 2009b), we found that the fuel economy of purchased new vehicles in the U.S. was well predicted by two economic indicators—the unemployment rate and the price of gasoline. These previous analyses were performed on the monthly data from October 2007 through April 2009 and through June 2009, respectively. In this study, we are extending this analysis through February 2011.

## **Method**

We examined the relationship between the unemployment rate and the price of gasoline on one hand, and the fuel economy of purchased new vehicles on the other hand. A regression analysis was performed on monthly data from October 2007 (the conventional starting month of the 2008 model year) through February 2011.

The dependent variable in the regression analysis was the average sales-weighted fuel economy of purchased light-duty vehicles (cars, SUVs, vans, and pickup trucks). This average was calculated from the monthly sales of individual models (Automotive News, 2011) and the EPA “combined” fuel-economy ratings for the respective models (Environmental Protection Agency, 2011). All vehicles purchased from October 2007 through September 2008 were assumed to be model year 2008. Analogous assumptions were made for vehicles purchased from October 2008 through February 2011. The fuel-economy information was available for 99.9% of vehicles purchased.

For cases in which the EPA fuel economy guide contained multiple fuel economy values for a vehicle model, the average of these values was used (without regard to sales figures for each specific engine or vehicle-model variant). Additionally, when a vehicle model was sold during a particular model year but it is not listed in that year’s EPA fuel economy guide, the fuel economy value(s) from the most recently available year were

used. Finally, for very low sales volume manufacturers (e.g., Ferrari, Rolls-Royce, etc.), the vehicle models within that manufacturer were aggregated and one average fuel economy value was calculated. Analogously, the sales figures for such manufacturers and models were also aggregated each month.

The independent variables were the unemployment rate (Bureau of Labor Statistics, 2011) and the average price of regular gasoline (Energy Information Administration, 2011).

## Results

Figure 1 shows, by month, the average fuel economy of purchased new vehicles (top panel), and the unemployment rate and the price of regular gasoline (bottom panel). At the beginning of the period examined (October 2007), the average fuel economy was 20.1 mpg. The average fuel economy then improved rapidly, to 21.7 mpg by May 2008, but dropped to 20.7 by November 2008. The average fuel economy then improved gradually through August 2009, but leveled off thereafter through the end of 2010. The average fuel economy for the last month examined (February 2011) was 22.6, a gain of 2.5 mpg from October 2007.

The regression model:

$$\text{fuel economy} = 16.58 + (0.39 \times \text{unemployment rate}) + (0.62 \times \text{price of gasoline})$$

was highly significant,  $F(2, 38) = 95.4$ ,  $p < .001$ . Both the unemployment rate and the price of gasoline had significant effects on the average fuel economy of the purchased vehicles in the expected (positive) direction ( $t = 13.8$  and  $6.2$ , respectively). These two variables accounted for 83% of the variance in the average fuel economy. The good fit of the model to the actual fuel economy is illustrated in the top panel of Figure 1, which includes both the model predictions and the actual values. The model accounts very well for the general trends in the average fuel economy, including the rapid rise during the summer of 2008.

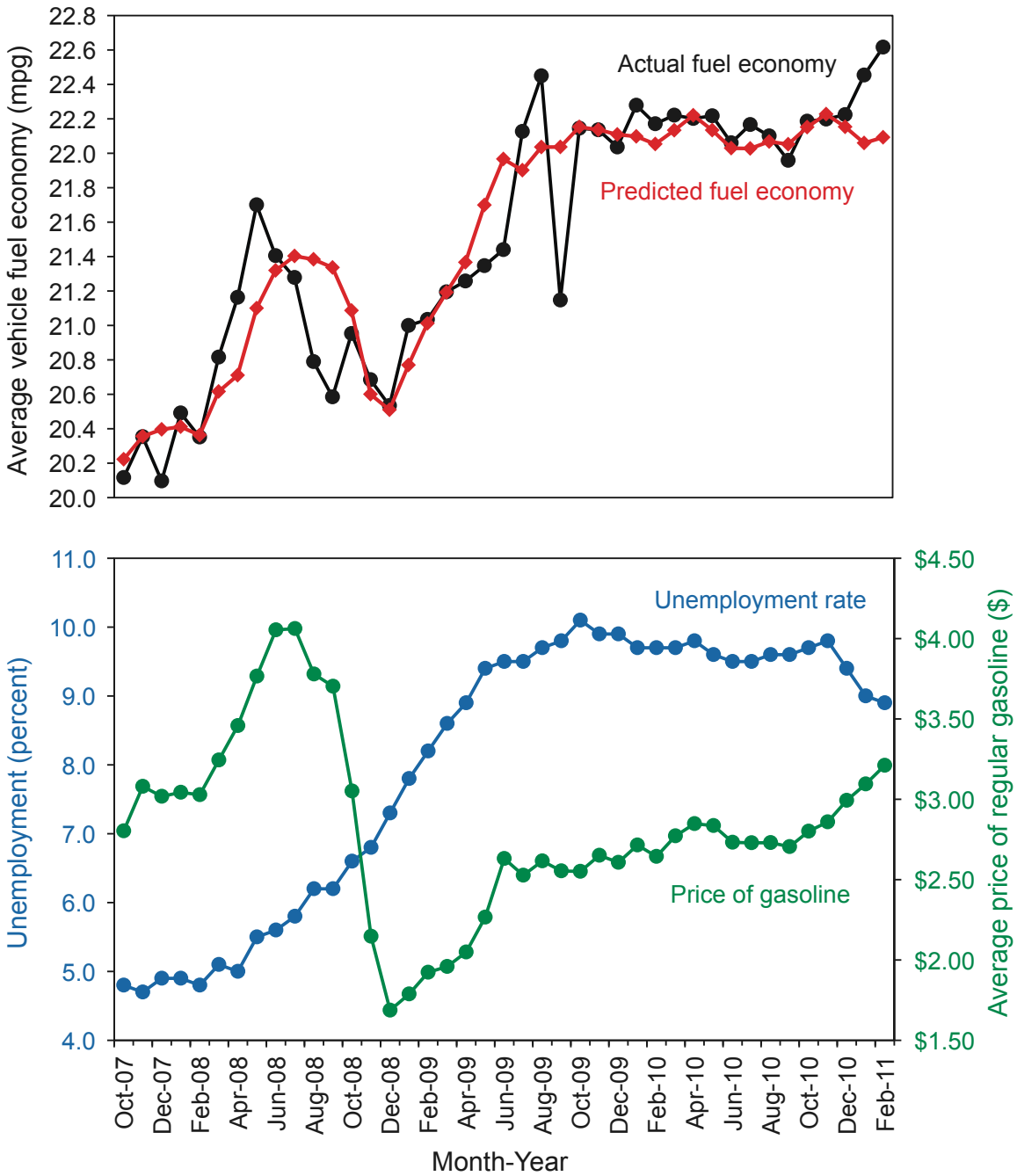


Figure 1. Average fuel economy of purchased new vehicles, both actual and predicted (top panel), and the unemployment rate and the price of regular gasoline (bottom panel).



## **Discussion**

### **Comparison with previous studies**

The present findings are consistent with those in our two previous studies on the relationship between the unemployment rate and the price of gasoline, and the average fuel economy of purchased new vehicles (Sivak and Schoettle, 2009a; 2009b). The predictive power of the two economic indexes tended to increase with the length of the period examined: The variance accounted for was 83% for the 41 months covered in the present study, compared to 58% for the 21 months in Sivak and Schoettle (2009b) and 53% for the 19 months in Sivak and Schoettle (2009a). (All three studies used October 2007 as the starting month of the analysis.)

### **Cash-for-Clunkers program**

The model's under-predictions for July and August 2009 are likely the consequence of the vehicle-scrappage program from July 27 through August 24, 2009, which provided financial incentives to purchase fuel-efficient vehicles (Sivak and Schoettle, 2009b). Analogously, the model's over-prediction for September 2009 is likely the consequence of the expiration of the program in August 2009, with the program likely pulling some of the purchases of fuel-efficient vehicles that would have otherwise been made in September 2009 into July and August 2009.

## **Conclusion**

The results provide support for the hypothesis that decisions of U.S. buyers concerning the fuel economy of purchased new vehicles are strongly influenced by both the unemployment rate and the price of gasoline.

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