Computer Program to Evaluate Possible Commingling Effects Bases on Various Input Assumptions.

When ethanol gasoline and non-ethanol gasoline are mixed, the Reid vapor pressure (RVP) of the mixture exceeds the weighted average of the RVP's of the constituent gasolines. The increment of vapor pressure above the weighted average is referred to as the "RVP boost", or more formally as the "commingling effect".

Prof. David Rocke of U. C. Davis, a consultant to the ARB, has performed a probabilistic simulation of consumer gasoline-purchasing to estimate the magnitude of the commingling effect and how it is influenced by several parameters of gasoline-purchasing. He wrote the attached FORTRAN program to perform this simulation. The simulation accounts for the following parameters describing gasoline-purchasing: (1) the market share of ethanol gasoline, (2) the probability distribution of consumers' propensity to purchase ethanol gasoline, (3) consumers' loyalty to a brand of gasoline (the gasolines of each brand are assumed to be all ethanol gasolines, or all non-ethanol gasolines), (4) the amount of gasoline in the tank at the time of refueling, (5) the probability that the refueling fills the tank when refueling, and (6) the percentage of capacity to which the tank is filled if it is not filled up.

The random distributions of all these parameters of gasoline-purchasing among California motorists are simulated by randomly sampling from the beta family of probability distributions, which have values between 0 and 1. Distributions in the beta family, which can have a great variety of shapes, are specified by non-negative parameters α and β. The beta family of distributions is discussed in practically all undergraduate-level mathematical statistics and engineering statistics texts, for example in Mood and Graybill, Introduction to the Theory of Statistics. Specifically, parameters (1), (2), and (3) are simulated by randomly sampling from a single beta distribution of consumers' propensity to purchase ethanol gasoline. The market share of ethanol gasoline is the expected value $\alpha/(\alpha+\beta)$ of the distribution, and consumers' brand loyalty is represented by the sum $\alpha+\beta$ of the distribution's parameters.