Carbon dioxide emissions and petroleum consumption

Mayel Espino

University of San Diego

# Author Note

# Abstract

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*Keywords:* t

# Carbon dioxide emissions and petroleum consumption

Vehicle carbon dioxide emissions have a strong correlation with the petroleum consumption. There are many attributes that define a vehicle, but not all of them have the same influence on the emissions or the petroleum consumption, not directly. A specific vehicle configuration may be more popular and therefore will have a larger impact compared to other configurations. My focus for this particular study/model is to consider the attributes independently and not compare them as a configuration, or group of attributes.

The importance of a good data model in the age of information age is very clear and easy to appreciate, knowledge is a powerful tool to educate and persuade the general population, policy makers and industry leaders. For the model to be effective and useful, the model must be truthful, trustworthy, verifiable, and enlightening.

An effective model can be used by different parties to make different, and maybe contrary points but model does not take sides. Although the model does not take sides, it will clarify, quantify and lend more credibility to one point over the other.

# Method

## Sample

The data is comprised of a variety of metrics on attributes that define an automobile. We were provided a data sample obtained from FuelEconomy.gov web services, with over forty three thousand records. In the sample we have a mix of electric vehicles and internal combustion vehicles. For all vehicles the same variables are measured and recoded, there are two categories: key variables and control variables. Since we are most interested in the carbon dioxide emissions as it relates to annual petroleum consumption, these two are our key variables. There are some other variables that will be used to control and correct the model.

The variables in the sample which are the most interesting are :

* Key variables
  + primary fuel tailpipe carbon dioxide emissions in grams per mile
  + annual primary-fuel petroleum consumption in barrels
* Control variables
  + combined miles-per-gallon for the primary fuel type
  + vehicle manufacturer ?? same as make??
  + make. - Over a hundred makes, spanning the whole range from luxury to economy.
  + engine displacement in litters.
  + engine cylinders.- From two to sixteen.
  + combined luggage and passenger volume in cubic feet
  + vehicle type. – hatchback or passenger.
  + transmission type. – Manual or automatic
  + primary fuel type. – Electricity, diesel, natural gas; premium regular or midgrade gasoline.

Other data, such as year built, is included in the sample but will not be used for the model.

A characterization of the data is provided to give a sense of the tools and methods that can be applied to the model.

Some of the data is nominal and does not lend itself to meaningful descriptive statistics. For example make and model. Most of the data is either descriptive or continuous, and useful to build a model.

The following table provides descriptive statistics for the key variables.

**Table 1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Mean* | *Standard Deviation* | *skewness* | *kurtosis* | *Mode* |
| Carbon dioxide emissions | 462.747 | 124.772 | 0.418 | 2.073 | 493.722 |
| Petroleum consumption | 17.153 | 4.663 | 0.369 | 2.118 | 18.312 |

In both variables:

* The kurtosis is under 3.0, which means that the distribution has lighter tails than a normal distribution.
* The skewness greater than 1.0, which makes the distribution highly skewed.

The kurtosis, skewness as well as the outliers are easily accounted for when considering that: the sample includes data for electric vehicles and a wide range of engine sizes for the internal combustion

The following box plot, figure 1, further illustrates the distribution

**Figure 1**

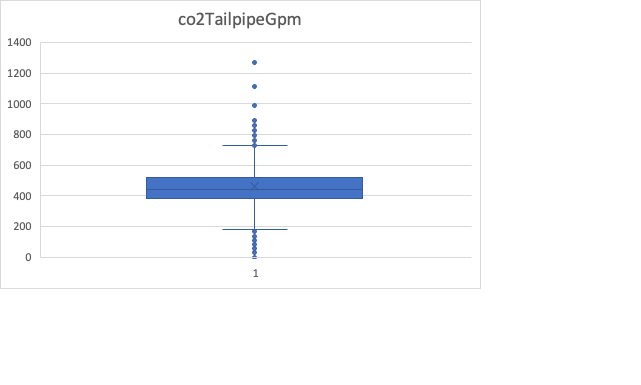
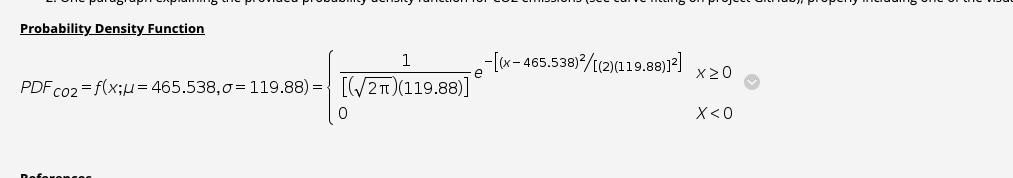


Figure 2



PDFco2 = f(x;µ = 465.538,