

For this question I did assumption that State (Dealer) is similar to that of Customer state.

Questions:

1. Define one or more metrics that can be used to measure the success of the program. Identify the 10 most successful states and the 10 least successful states based on your metric(s), and show the performance in these 20 states.

When can a Program be successful?

- Mileage Difference: Mileage difference between New Vehicle and Trade-in vehicle. This attribute is important in terms of understanding the amount of fuel saving. More the mileage difference it is better

Tableau variable: **Mileage_difference**

| | |
|----------|--|
| Name: | Mileage_difference |
| Formula: | [New Vehicle Car Mileage] - [Trade In Mileage] |

- Increase in revenue for automotive (MSRP-Incentive): This KPI helps in understanding the increase in the economy of US in terms of how much willing are the users ready to spend. More the revenue it is better

Tableau variable: **Revenue**

| | |
|----------|---------------------------------------|
| Name: | Revenue |
| Formula: | [new vehicle MSRP] - [Invoice Amount] |

- Number of increase in Shifting to Passenger Car: This though can be a subset of the previous KPI, but helps in understanding the movement of consumer to Passenger car. Since passenger cars are more efficient in terms of mileage, More the movement to Passenger car it is better.

| Trade In Vehicle Category | New Vehicle Category | | | |
|---------------------------|----------------------|--------|-------|---------|
| | 1 | 2 | 3 | P |
| 1 | 182,473 | 235 | 6 | 265,098 |
| 2 | 31,372 | 42,289 | 19 | 45,909 |
| 3 | 184 | 4,990 | 2,253 | 149 |
| P | 16,436 | 22 | | 85,803 |

Transfer of Old to New Passenger CarCategory

Other

Transfer to PassengerCar

Thus, we created a new variable called ***OthersToPassengerCarCategory*** that calculates the above highlighted text.

Name: OthersToPassengerCarCategory

Formula:

```

if [Trade In Vehicle Category] != 'P' then
  if [New Vehicle Category]== 'P' then 1 else 0 end
else
  0
end

```

Top 10 State KPI

After identifying these 3 KPI, I created a summary table of top 10 state associated with Mileage difference, Revenue and OthersToPassengerCarCategory. These top 10 are according to Mileage Difference. I found that all these KPI are very much correlated to Mileage difference and Top 10 of every KPI was having same states. So I merged them into one summarized view.

KPI_Top 10 State

| State | Mileage_difference | Revenue | OthersToPassengerCarCategory |
|-------|--------------------|--------------------|------------------------------|
| CA | 800,064 | \$1,384,466,129.00 | 36,173 |
| FL | 314,905 | \$596,587,448.00 | 15,785 |
| IL | 299,140 | \$627,856,327.00 | 15,010 |
| MI | 256,893 | \$574,974,771.00 | 13,568 |
| NJ | 219,168 | \$465,501,698.00 | 10,793 |
| NY | 328,448 | \$673,005,471.00 | 16,318 |
| OH | 288,519 | \$571,495,254.00 | 15,497 |
| PA | 291,306 | \$602,489,304.00 | 15,044 |
| TX | 380,140 | \$790,125,797.00 | 18,481 |
| VA | 224,187 | \$432,082,245.00 | 11,647 |

Mileage_difference, Revenue and OthersToPassengerCarCategory broken down by State. The view is filtered on State, which keeps 10 of 55 members.

Top 10 State KPI

I saw similar behavior like top 10 states, with all the KPI conforming to the rank of Mileage difference.

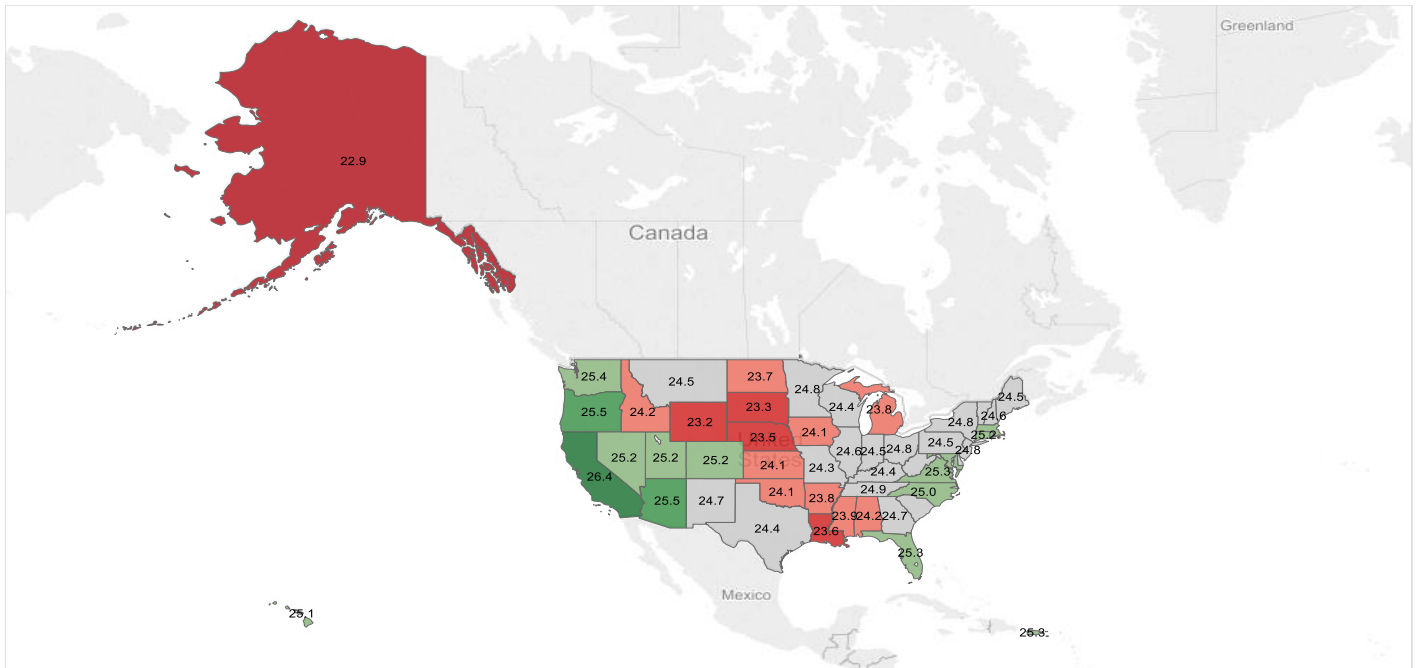
KPI_Bottom10State

| State | Mileage_difference | Revenue | OthersToPassengerCarCategory |
|-------|--------------------|-----------------|------------------------------|
| MP | 69 | \$121,577.00 | 3 |
| VI | 90 | \$256,259.00 | 2 |
| DC | 158 | \$366,922.00 | 6 |
| GU | 1,337 | \$3,041,235.00 | 56 |
| PR | 4,554 | \$8,616,192.00 | 183 |
| WY | 5,123 | \$11,939,847.00 | 207 |
| AK | 9,305 | \$22,507,498.00 | 403 |
| MT | 14,045 | \$28,067,894.00 | 633 |
| HI | 15,408 | \$29,974,279.00 | 683 |
| ND | 17,993 | \$41,568,359.00 | 970 |

Mileage_difference, Revenue and OthersToPassengerCarCategory broken down by State. The view is filtered on State, which keeps 10 of 55 members.

2. Did West Coast consumers purchase more fuel efficient cars than consumers in other regions?
Please support your answer with analysis and visualizations.
Here we take into account the average mileage of the new cars that are bought by the consumers.

Sheet 4



Map based on Longitude (generated) and Latitude (generated). Color shows average of New Vehicle Car Mileage. Details are shown for State.

Avg. New Vehicle Car ...
22.4 26.7

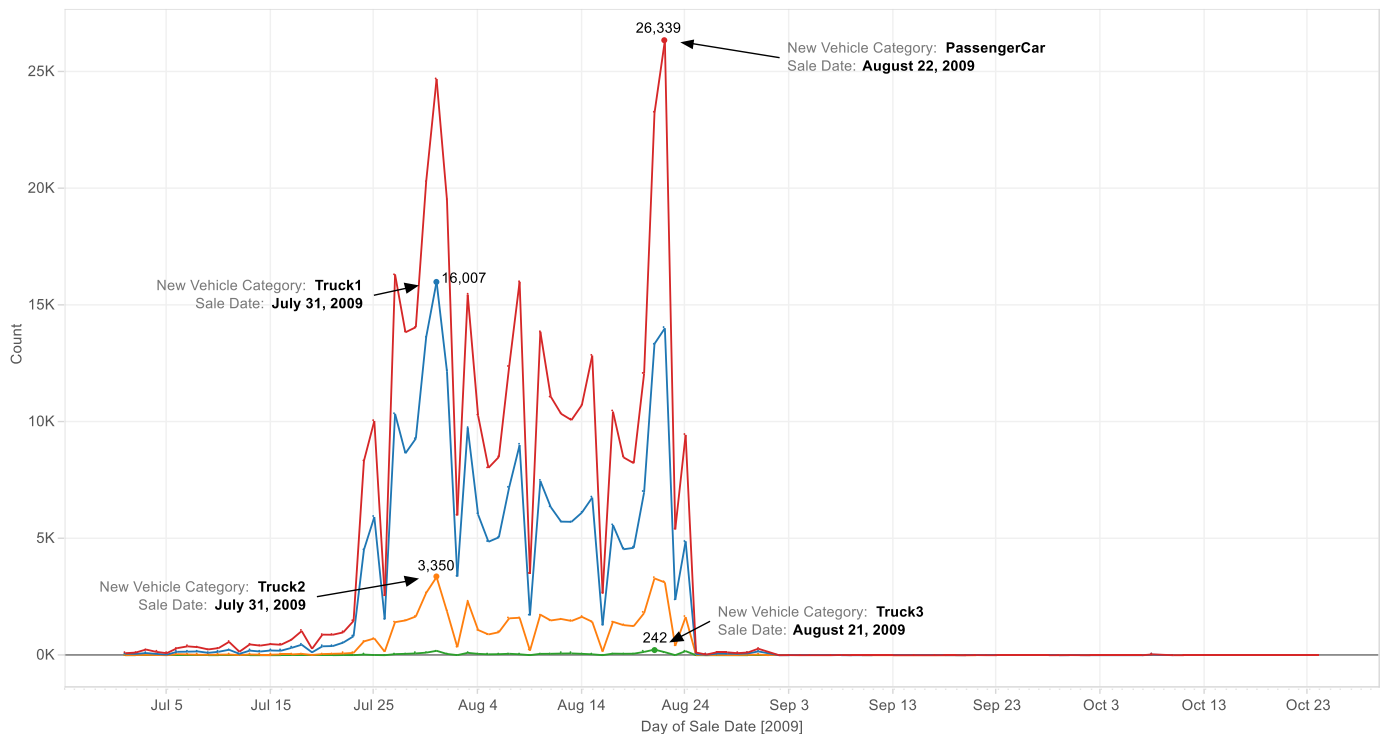
As we can see from the map where red indicates low and green indicates high average mileage, consumers in west coast states purchase more fuel efficient cars than consumers in other regions.

3. From the data, can you find any behavioral patterns that help us understand how consumers buy new vehicles? Can the tendencies you found (if any) be applied to the general population? Support your answer with models / visualizations / analyses, as appropriate.

To determine the customer behavior I tried to understand when did they perform trade-in operation.

Here from the below graph we can see that most trade-ins happened on July 31 and Aug 21 2009. Which is pretty strange as there were no holidays that that time and it was Friday and Saturday.

Q3_CustBehavior_Date



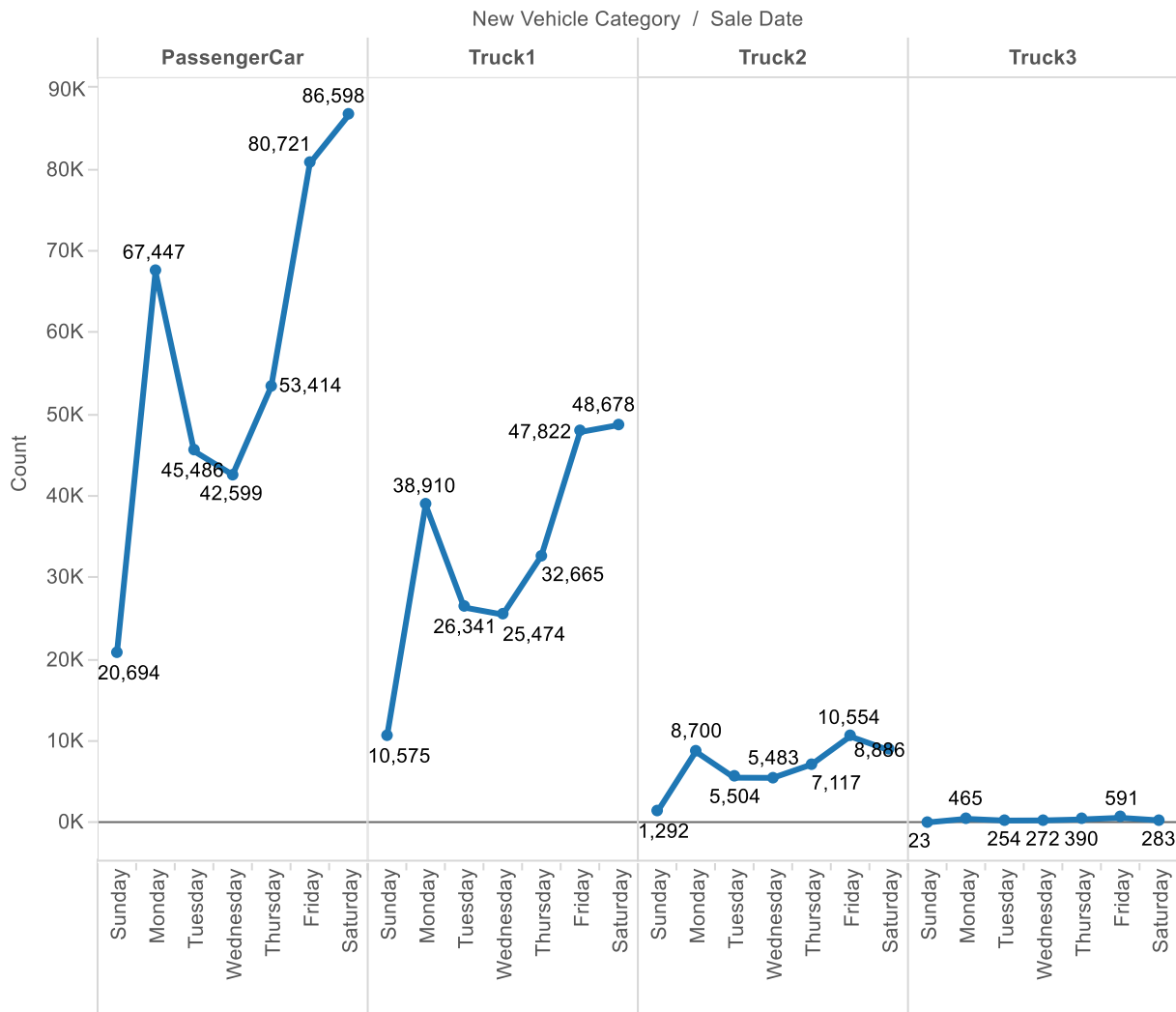
The trend of sum of Count for Sale Date Day. Color shows details about New Vehicle Category.

New Vehicle Category

- PassengerCar
- Truck1
- Truck2
- Truck3

After digging at this level, I went deeper to understand day wise how is the trade-In. I was pretty shocked to see that trade-in happened lowest on Sunday compared to other days. And this was consistent throughout all Car category.

Q3_CustBehavior_Day

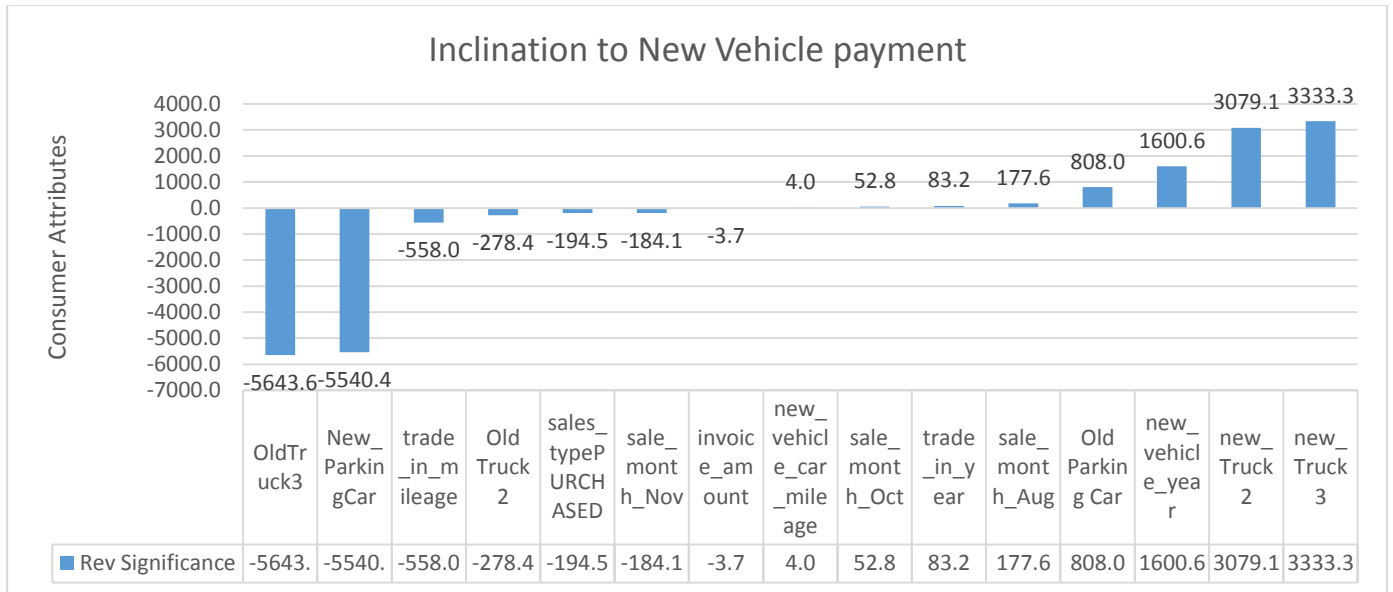


The trend of sum of Count for Sale Date Weekday broken down by New Vehicle Category.

Also to understand more in terms of significance of attributes with respect to new vehicle payment, I did a regression of NewVehicleMSRP with respect to following attributes:
 sales_type, invoice_amount, trade_in_vehicle_category, trade_in_year, trade_in_mileage, new_vehicle_category, new_vehicle_year, new_vehicle_car_mileage, sale_month,

I found that customer are more prone to spend when they had an older car. Also, latest the trade-in vehicle year will result in buying new expensive vehicle.

Also, if a customer had OldTruck they are less prone to buy expensive new car. Buying New Parking car is cheaper than new Trucks



4. The program was declared “wildly successful” by the government. Is there sufficient data from NHTSA to support that conclusion? If not, what additional data will you need in order to determine if the government was right? Explain why this additional data is needed and what you would use it for. (You are not expected to actually go and find that extra data.) If you don’t need additional data, was the government right -- and why?