# Estimating Motor Fuel Demand in South Carolina

## FY 2022-23 and FY 2023-24

August 2022

State of South Carolina
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## INTRODUCTION

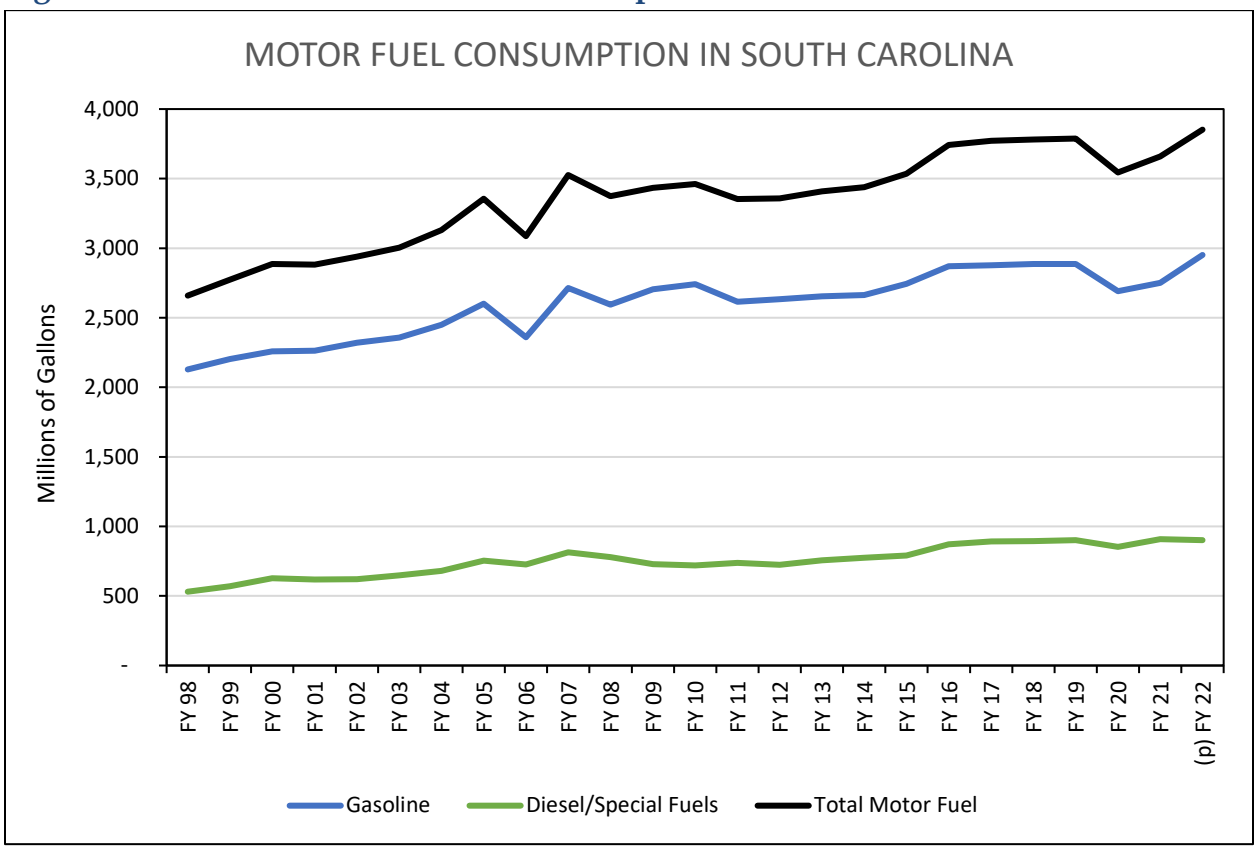
This report analyzes the history of South Carolina's motor fuel consumption and revenue and uses linear regression models to project the consumption levels and revenue for the next two fiscal years. The primary types of motor fuel used in South Carolina are gasoline and diesel fuel, although gasoline is consumed at a rate of over three times more than diesel in the state. For the purposes of this report, the term "gasoline" refers to both gasoline and gasohol, and the term "diesel" refers to diesel, biodiesel, and liquified petroleum gas.

## HISTORICAL MOTOR FUEL CONSUMPTION AND REVENUE

Motor fuel demand in South Carolina has generally increased over time. However, in 2020, consumption significantly decreased due to the effects of the COVID-19 pandemic. Reduced travel and restrictions significantly impacted demand, particularly for gasoline in late FY 2019-20. Motor fuel consumption has increased since then and, based on preliminary numbers, has now exceeded pre-pandemic levels as of FY 2021-22.

The following chart and table show the historical motor fuel gallons consumed in South Carolina since 1998.

**Figure 1. Historical SC Motor Fuel Consumption**




(p) - Preliminary

## Table 1. Summary of Historical Motor Fuel Gallons

| Fiscal Year | Gasoline (Billions of Gallons) | Diesel Fuel (Billions of Gallons) | Total Motor Fuel (Billions of Gallons) |
|---|---|---|---|
| 1997-98 | 2.128 | 0.531 | 2.659 |
| 1998-99 | 2.204 | 0.571 | 2.774 |
| 1999-00 | 2.259 | 0.628 | 2.887 |
| 2000-01 | 2.262 | 0.619 | 2.881 |
| 2001-02 | 2.321 | 0.620 | 2.940 |
| 2002-03 | 2.357 | 0.647 | 3.004 |
| 2003-04 | 2.449 | 0.681 | 3.131 |
| 2004-05 | 2.601 | 0.754 | 3.355 |
| 2005-06 | 2.360 | 0.726 | 3.086 |
| 2006-07 | 2.714 | 0.813 | 3.526 |
| 2007-08 | 2.594 | 0.779 | 3.374 |
| 2008-09 | 2.705 | 0.728 | 3.433 |
| 2009-10 | 2.742 | 0.720 | 3.462 |
| 2010-11 | 2.615 | 0.739 | 3.353 |
| 2011-12 | 2.634 | 0.723 | 3.357 |
| 2012-13 | 2.653 | 0.756 | 3.409 |
| 2013-14 | 2.662 | 0.775 | 3.438 |
| 2014-15 | 2.745 | 0.790 | 3.535 |
| 2015-16 | 2.870 | 0.872 | 3.742 |
| 2016-17 | 2.878 | 0.893 | 3.771 |
| 2017-18 | 2.886 | 0.895 | 3.781 |
| 2018-19 | 2.885 | 0.902 | 3.787 |
| 2019-20 | 2.691 | 0.853 | 3.544 |
| 2020-21 | 2.751 | 0.908 | 3.659 |
| 2021-22(p) | 2.951 | 0.901 | 3.852 |

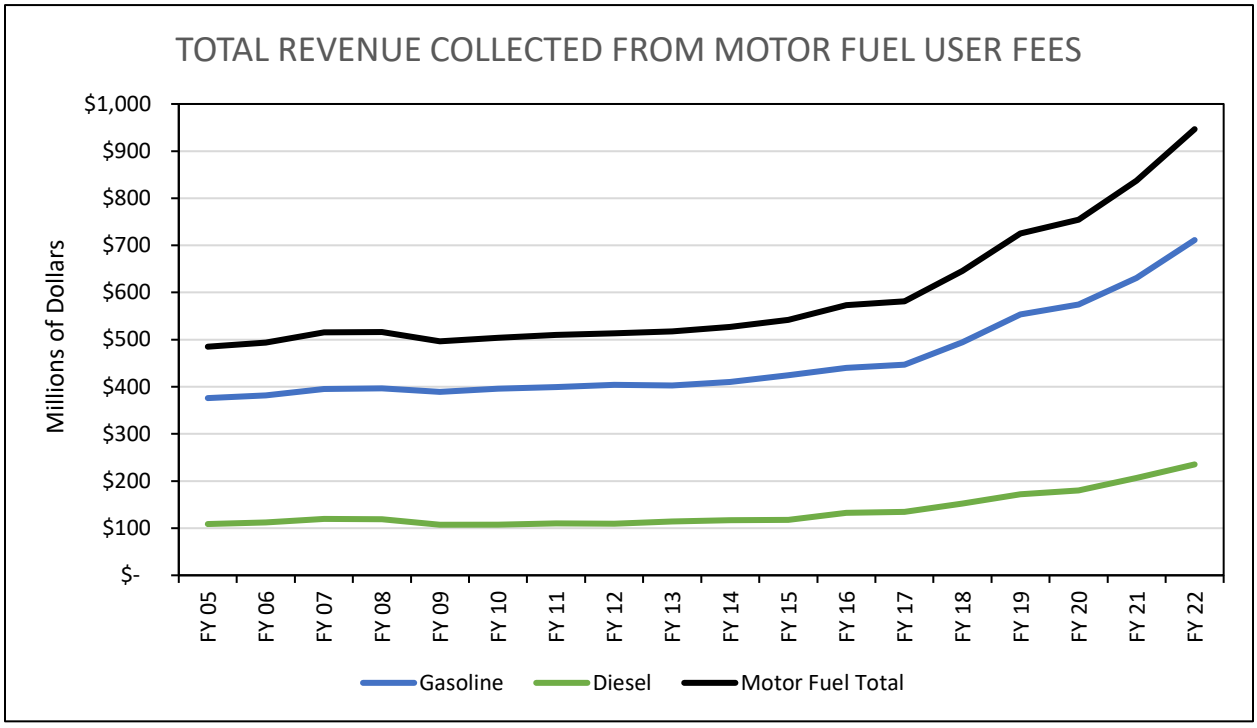
(p) – Preliminary

Due to changes in the fee over time, revenue is comprised of three main components in South Carolina:

- a 16 cents-per-gallon "base" fee,
- an additional fee component that increases by 2 cents each year from FY 2017-18 through FY 2022-23, and
- a 0.75 cents-per-gallon environmental and inspection fee.

The current total fee for FY 2022-23 is 28.75 cents per gallon. Further discussion on these components, the allocations of fee revenue, and the tax rate schedule can be found in the Appendix. Figure 2 depicts the revenue collected from motor fuel user fees without the 0.75 cents component.

**Figure 2. Total Revenue Collected from Motor Fuel User Fees**




## PROJECTIONS FOR FISCAL YEARS 2022-23 AND 2023-24

Projections for motor fuel consumption are based upon two models, one for gasoline and one for diesel fuel. Gasoline demand is predicted using the average price of gasoline, average per capita personal disposable income, Corporate Average Fuel Economy (CAFE) standard miles per gallon, and separate dummy variables for fiscal years 2019-20 and 2020-21 to account for the effects of the pandemic. Diesel demand is predicted using gross domestic product (GDP) and employment in the trade, transportation, and utilities sector.

Projections are separated into two categories: the original 16 cents base fee and the amount of the increased fee for the Infrastructure Maintenance Trust Fund (IMTF).

Based upon the models, we estimate motor fuel demand for gasoline and the corresponding revenue for FY 2022-23 and FY 2023-24 as follows:

**Table 2. Gasoline Demand and Revenue Projections**

| Fiscal Year | Gasoline Gallons (Billions) | Gasoline User Fee Revenue (16 Cents) (Millions) | Gasoline IMTF Revenue (Millions) | Gasoline Total Revenue (Millions) |
|---|---|---|---|---|
| 2022-23 | 2.815 | $450.5 | $337.8 | $788.3 |
| 2023-24 | 2.818 | $450.8 | $338.1 | $789.0 |

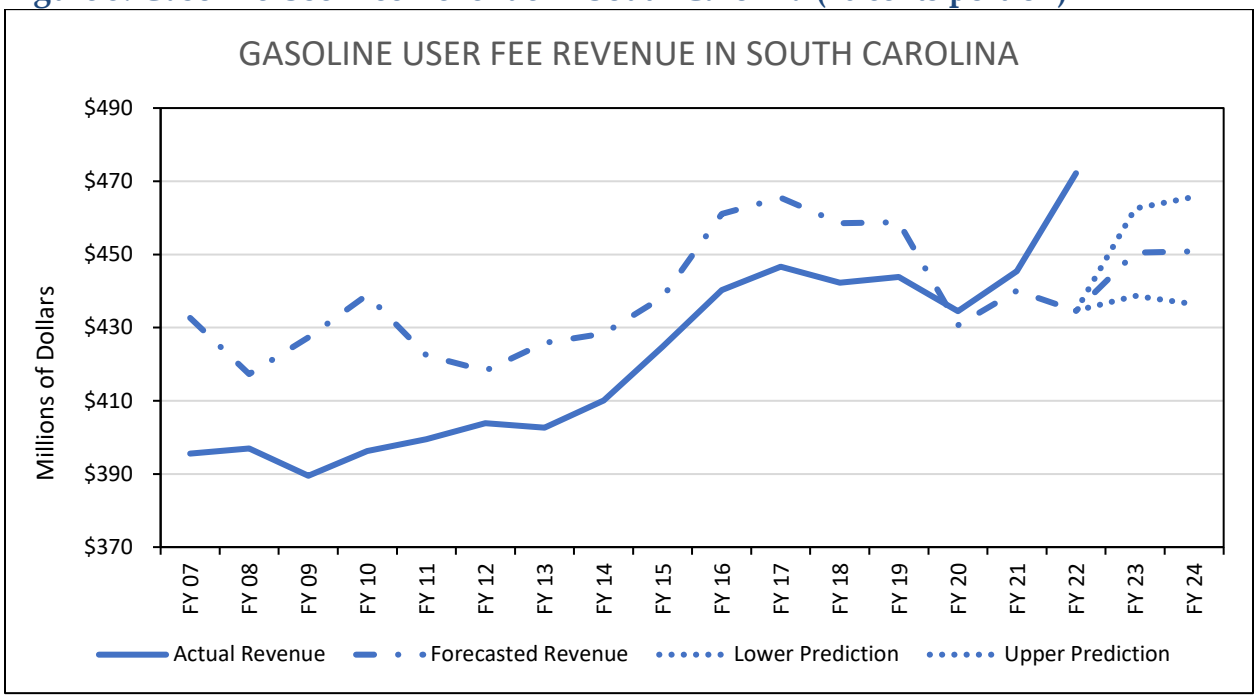
Projecting motor fuel consumption for FY 2022-23 and FY 2023-24 requires projections for most of the input variables for the two models. The accuracy of the forecasts of these variables affects the ability of the models to forecast motor fuel consumption. Gasoline consumption in FY 2021-22 was heavily impacted by significantly higher gasoline prices, as well as lower personal disposable income than in FY 2019-20 and FY 2020-21 due to the expiration of federal stimulus payments provided in those years. To account for the risk involved in forecasting motor fuel consumption based on forecasted input variables, we have provided forecast ranges for both gasoline and diesel consumption.

**Table 3. Gasoline Demand and Revenue Forecast Ranges**

| Fiscal Year | Gasoline Gallons (Billions) | Gasoline Fee Revenue (16 cents) Forecast Range (Millions) | Gasoline IMTF Fee Revenue Forecast Range (Millions) | Gasoline Total Fee Revenue Forecast Range (Millions) |
|---|---|---|---|---|
| 2022-23 | 2.742 – 2.891 | $438.7 – 462.6 | $329.0 – 346.9 | $767.7 – 809.5 |
| 2023-24 | 2.728 – 2.911 | $436.4 – 465.7 | $327.3 – 349.3 | $763.7 – 815.0 |

(95% Prediction Intervals)

**Figure 3. Gasoline User Fee Revenue in South Carolina (16 cents portion)**




The following table provides our projections of the 16 cents component of the fee for diesel fuel and for the additional fee attributable to the IMTF.

**Table 4. Diesel Fuel Demand and Revenue Projections**

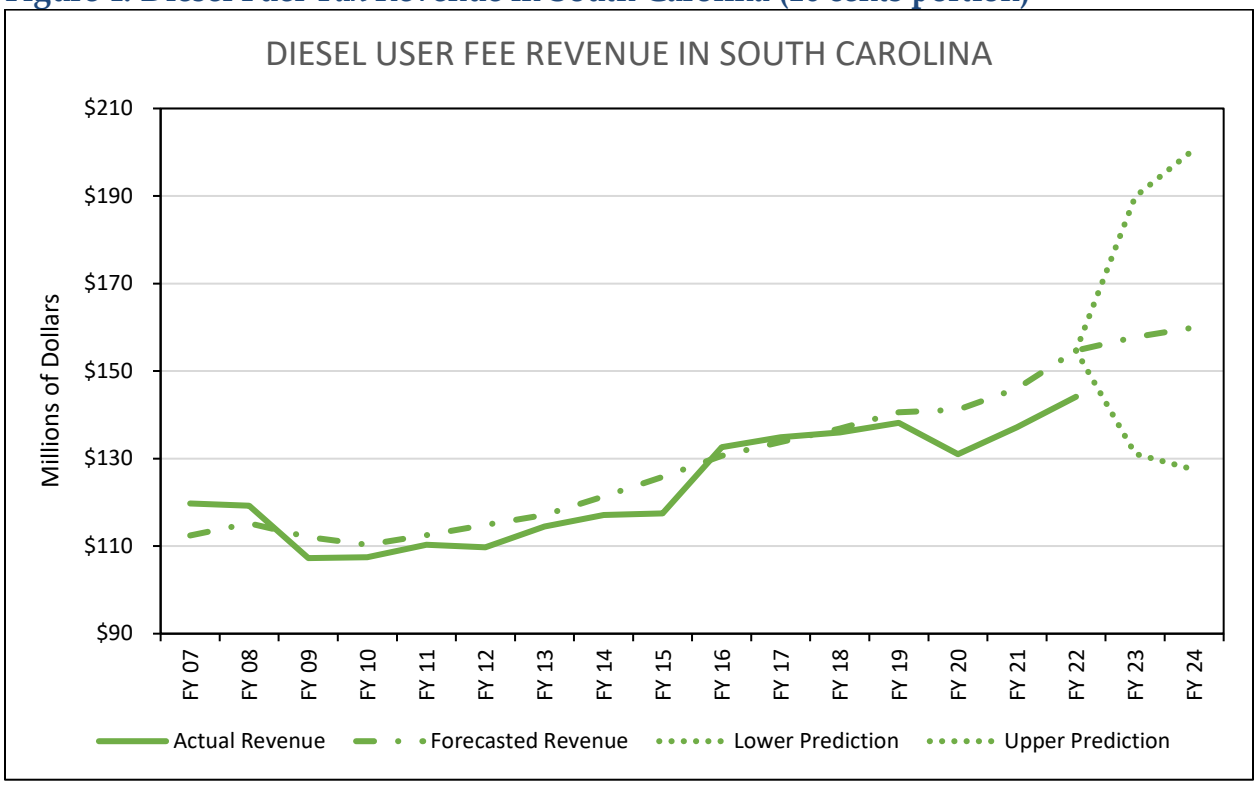
| Fiscal Year | Diesel Fuel (Billions) | Diesel User Fee Revenue (16 cents) (Millions) | Diesel IMTF Revenue (Millions) | Diesel Total Fee Revenue (Millions) |
|---|---|---|---|---|
| 2022-23 | 0.986 | $157.8 | $118.3 | $276.1 |
| 2023-24 | 1.000 | $160.0 | $120.0 | $279.9 |

**Table 5. Diesel Demand and Revenue Forecast Ranges**

| Fiscal Year | Diesel Fuel Gallons (Billions) | Diesel Fee Revenue Forecast Range (16 cents) (Millions) | Diesel IMTF Fee Revenue Forecast Range (Millions) | Diesel Total Fee Revenue Forecast Range (Millions) |
|---|---|---|---|---|
| 2022-23 | 0.819 – 1.187 | $131.1 – 189.9 | $98.3 – 142.4 | $229.4 – 332.3 |
| 2023-24 | 0.797 – 1.254 | $127.5 – 200.7 | $95.6 – 150.5 | $223.1 – 351.2 |

(95% Prediction Intervals)

**Figure 4. Diesel Fuel Tax Revenue in South Carolina (16 cents portion)**



### Table 6. Motor Fuel User Fee Revenue History and Estimates

| Fiscal Year | Fee Per Gallon | Gasoline | | Diesel Revenue | | Total Motor Fuel Revenue | |
|---|---|---|---|---|---|---|---|
| | Cents | Dollars | % Change | Dollars | % Change | Dollars | % Change |
| 2005-06 | 16 | $381,919,998 | 1.58% | $112,053,378 | 2.75% | $493,973,375 | 1.84% |
| 2006-07 | 16 | $395,517,686 | 3.56% | $119,766,794 | 6.88% | $515,284,480 | 4.31% |
| 2007-08 | 16 | $396,925,441 | 0.36% | $119,240,991 | (0.44%) | $516,166,432 | 0.17% |
| 2008-09 | 16 | $389,497,510 | (1.87%) | $107,267,436 | (10.04%) | $496,764,946 | (3.76%) |
| 2009-10 | 16 | $396,262,582 | 1.74% | $107,442,882 | 0.16% | $503,705,464 | 1.40% |
| 2010-11 | 16 | $399,487,621 | 0.81% | $110,325,004 | 2.68% | $509,812,625 | 1.21% |
| 2011-12 | 16 | $403,834,314 | 1.09% | $109,744,365 | (0.53%) | $513,578,679 | 0.74% |
| 2012-13 | 16 | $402,667,179 | (0.29%) | $114,511,278 | 4.34% | $517,178,457 | 0.70% |
| 2013-14 | 16 | $410,108,790 | 1.85% | $117,137,065 | 2.29% | $527,245,855 | 1.95% |
| 2014-15 | 16 | $424,754,788 | 3.57% | $117,457,502 | 0.27% | $542,212,290 | 2.84% |
| 2015-16 | 16 | $440,218,179 | 3.64% | $132,645,553 | 12.93% | $572,863,733 | 5.65% |
| 2016-17 | 16 | $446,608,833 | 1.45% | $134,870,908 | 1.68% | $581,479,741 | 1.50% |
| 2017-18 | 18 | $494,128,760 | 10.64% | $151,935,565 | 12.65% | $646,064,325 | 11.11% |
| 2018-19 | 20 | $553,345,125 | 11.98% | $172,225,934 | 13.35% | $725,571,058 | 12.31% |
| 2019-20 | 22 | $574,486,486 | 3.82% | $180,172,095 | 4.61% | $754,658,582 | 4.01% |
| 2020-21 | 24 | $630,855,710 | 9.81% | $206,466,083 | 14.59% | $837,321,793 | 10.95% |
| 2021-22 | 26 | $711,303,119 | 12.75% | $235,278,106 | 13.95% | $946,581,224 | 13.05% |
| 2022-23e | 28 | $788,302,003 | 10.83% | $276,128,391 | 17.36% | $1,064,430,394 | 12.45% |
| 2023-24e | 28 | $788,965,271 | 0.08% | $279,914,904 | 1.37% | $1,068,880,175 | 0.42% |

e-Estimates

Note: Revenues in Table 6 do not include the 0.75 cents per gallon environmental and inspection fees.

# APPENDIX

## I. SOUTH CAROLINA MOTOR FUEL TAX RATES

The following table gives an overview of how the motor fuel tax rate has changed since it was first enacted. The rate increased to 28 cents on July 1, 2022, the last year of the increases enacted in 2017.

### Table A1. South Carolina Motor Fuel Tax Rate Schedule

| Year | Tax | Legislative Enactment |
|---|---|---|
| 1922 | 2 cents | Act 494 of 1922 |
| 1923 | 3 cents | Act 146 of 1923 |
| 1925 | 5 cents | Act 34 of 1925 |
| 1929 | 6 cents | Act 102 of 1929 |
| 1958 | 7 cents | Act 855 of 1958 |
| 1972 | 8 cents | Act 1575 of 1972 |
| 1977 | 9 cents | Act 141 of 1977 |
| 1979 | 10 cents | Act 197 of 1979 |
| 1980 | 11 cents | Act 506 of 1980 |
| 1981 | 13 cents | Act 177 of 1981 |
| 1987 | 15 cents | Act 197 of 1987 |
| 1995 | 16 cents | Act 136 of 1995 |
| 2017 | 18 cents | Act 40 of 2017 |
| 2018 | 20 cents | Act 40 of 2017 |
| 2019 | 22 cents | Act 40 of 2017 |
| 2020 | 24 cents | Act 40 of 2017 |
| 2021 | 26 cents | Act 40 of 2017 |
| 2022 | 28 cents | Act 40 of 2017 |

## II. SOUTH CAROLINA MOTOR FUEL FEE DISTRIBUTION

Funds collected from the motor fuel user fee are distributed among various agencies and funds. Act 40 of 2017 set a yearly increase of the fee through FY 2022-23 and restructured the way the fee revenue is allocated. Table A2 shows a breakdown of the current distributions.

## Table A2. Motor Fuel User Fee Distribution as of July 1, 2022

| Gasoline Revenue Distribution | Code of Laws Section |
|---|---|
| $18 million of the first 3¢ to the State Non-Federal Aid Highway Fund | §12-28-2910 |
| 13¢ component | - |
| 0.13¢ (1% of 13¢) to DNR | §12-28-2730 (A) |
| 12.87¢ | - |
| 2.66¢ to "C" Funds | §12-28-2740 (A) |
| 10.11¢ to DOT | §12-28-2720 |
| 0.25¢ of this amount to Mass Transit | §12-28-2725 |
| 12¢ component[1] | - |
| 1.33¢ to "C" Funds[2] | §12-28-2740 (A) |
| 10.67¢ to Infrastructure Maintenance Trust Fund[3] | §12-28-310 (D) |
| Remaining 3¢ to the State Highway Fund | §12-28-2750 |

| Diesel Revenue Distribution | Code of Laws Section |
|---|---|
| 12¢ to Infrastructure Maintenance Trust Fund[1] | §12-28-310 (D) |
| Remaining 16¢ to the State Highway Fund | §12-28-2750 |

| **Total Motor Fuel User Fee[3]: 28¢** | **§12-28-310 (Act 40 of 2017)** |
|---|---|
| **Total Environmental and Inspection Fee: 0.75¢** | **§12-28-2355** |
| 0.25¢ Inspection Fee to DOT State Non-Federal Aid Highway Fund | §12-28-2355 (C) (Act 40 of 2017) |
| 0.50¢ Environmental Impact Fee to DHEC | §12-28-2355 (B) |

1 – Motor fuel user fee increases by 2¢ per year for six years beginning July 1, 2017, for a total increase of 12¢ by July 1, 2022.

2 - Pursuant to Proviso 86.1 of the FY 2022-23 Appropriations Act, the increase in "C" Funds is taken from the 2¢ increase per year of the gasoline user fee.

3 - Pursuant to Proviso 86.1 of the FY 2022-23 Appropriations Act, the Motor Fuel User Fee increase pursuant to §12-28-310 on gasoline is reduced by the increase in the allocation to "C" Funds. (See footnote 1)

## III. MODELS AND STATISTICS

### GASOLINE

The general equation for the demand for gasoline may be written as

$$\ln \boldsymbol{G_t} = \boldsymbol{f}(\ln \boldsymbol{P_t}, \ln \boldsymbol{Yd_t}, \boldsymbol{lagMPG_t}, \boldsymbol{D1_t}, \boldsymbol{D2_t}),$$

where

$\boldsymbol{G_t}$ is the amount of per capita gasoline consumption in gallons at fiscal year t,
$\boldsymbol{P_t}$ is the average price of gasoline at fiscal year t,
$\boldsymbol{Prop_t}$ is the proportion of gasoline demand to total fuel demand at fiscal year t,
$\boldsymbol{lagMPG_t}$ is the Corporate Average Fuel Economy standard miles per gallon at fiscal year t,
$\boldsymbol{D1_t}$ is a dummy variable for FY 2019-20,
$\boldsymbol{D2_t}$ is a dummy variable for FY 2020-21.

After running the model using fiscal year data from the years 1978-2021, the following model was produced:

$$\ln G_t = 14.69 - 0.20 \ln P_t - 0.83 \ln Yd_t + 0.02\ lagMPG - 0.08D1 - 0.03D2. .$$

**Table A3. Gasoline Demand Model Statistics and Fit**

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.989 |
| R Square | 0.978 |
| Adjusted R Square | 0.966 |
| Standard Error | 0.0083 |
| Observations | 15 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 5 | 0.027 | 0.005 | 79.846 | 3.532E-07 |
| Residual | 9 | 0.001 | 6.883E-05 | | |
| Total | 14 | 0.028 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 14.693 | 1.593 | 9.222 | 6.991E-06 | 11.089 | 18.297 |
| ln(price) | -0.196 | 0.018 | -10.636 | 2.136E-06 | -0.237 | -0.154 |
| ln(pcPDI) | -0.829 | 0.165 | -5.027 | 0.001 | -1.202 | -0.456 |
| CAFÉ Standards | 0.015 | 0.004 | 3.756 | 0.005 | 0.006 | 0.025 |
| Dummy1 | -0.079 | 0.010 | -7.670 | 3.094E-05 | -0.103 | -0.056 |
| Dummy2 | -0.033 | 0.012 | -2.835 | 0.020 | -0.059 | -0.007 |

## DIESEL

The general equation for the demand for diesel fuel may be written as

$$\ln D_t = f(\ln SCGDP_t, \ln TTU_t),$$

**where**

$D_t$ is the amount of diesel fuel consumption in gallons at quarter t,
$SCGDP_t$ is the level of gross domestic product in South Carolina at quarter t, and
$TTU_t$ is the level of employment in the trade, transportation, and utilities sector in South Carolina at quarter t.

After running the model using quarterly data from the Quarter 1 of 1997 to Quarter 4 of 2021, the following model was produced:

$$\ln D_t = 10.58 + 0.45 \ln SCGDP_t + 0.43 \ln TTU_t .$$

### Table A4. Diesel Demand Model Statistics and Fit

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.919 |
| R Square | 0.844 |
| Adjusted R Square | 0.841 |
| Standard Error | 0.0660 |
| Observations | 100 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 2 | 2.282 | 1.141 | 262.031 | 7.79E-40 |
| Residual | 97 | 0.422 | 0.004 | | |
| Total | 99 | 2.705 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 10.580 | 1.022 | 10.354 | 2.31E-17 | 8.552 | 12.608 |
| ln(gdp) | 0.455 | 0.041 | 10.9651 | 1.12E-18 | 0.372 | 0.537 |
| ln(employment) | 0.427 | 0.199 | 2.143 | 0.03463 | 0.031 | 0.822 |

## IV. DATA SOURCES

Motor Fuel Gallons Sold in SC: SC Department of Revenue

Motor Fuel Revenue: SC Department of Transportation

Population Estimates:

https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html
https://www.census.gov/data/tables/time-series/demo/popest/intercensal-2000-2010-state.html
https://www.census.gov/programs-surveys/popest/technical-documentation/research/evaluation-estimates/2020-evaluation-estimates/2010s-counties-total.html

Average Gasoline Prices: State Energy Data System of the US Energy Information Administration and US EIA's PADD1C data

https://www.eia.gov/state/seds/seds-data-complete.php?sid=US
https://www.eia.gov/dnav/pet/pet_pri_gnd_dcus_r1z_w.htm

Per Capita Personal Disposable Income: US Bureau of Economic Analysis, Table SAGDP2

https://apps.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=3#reqid=70&step=1&isuri=1&acrdn=3

Corporate Average Fuel Economy (CAFE) Standards:

https://one.nhtsa.gov/cafe_pic/CAFE_PIC_fleet_LIVE.html

Employment in Trade, Transportation, and Utilities:

https://fred.stlouisfed.org/series/SCTRAD

SC GDP:

https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1&acrdn=1

1997-2004: SAGDP2 Table; 2005-2020: SQGDP2 Table

Gasoline Price Forecasts:

https://wellsfargo.bluematrix.com/docs/html/88d2eafa-3a64-4cca-b013-4093132d9c99.html
https://www.eia.gov/outlooks/steo/pdf/steo_full.pdf
Table 2

Personal Income Forecasts:
SC Revenue and Fiscal Affairs Office, Fiscal Analysis Division

CAFE Standards Forecasts:
https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy

GDP Forecasts:
https://www.federalreserve.gov/monetarypolicy/fomcprojtable20220316.htm

Population Forecasts:
SC Revenue and Fiscal Affairs Office, Health and Demographics Division

*We would like to acknowledge Jade Dunbar and Robert Martin, who developed the initial demand models, which served as the basis for these updated models.*