"Other" Petroleum Products Consumption Module
Short-Term Energy Outlook Model

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1. Overview

Most discussion of petroleum product consumption focuses on the five major petroleum products used: motor gasoline, jet fuel, distillate fuel, residual fuel, and liquefied petroleum gas. However, the third largest category of product consumption is "other" petroleum products, which represented about 11 percent of total petroleum product consumption in 2010.

The "other" petroleum product consumption module of the *Short-Term Energy Outlook* (*STEO*) model provides petroleum product consumption forecasts for the United States for 6 petroleum product categories (Table 1). The frequency of the *STEO* model is monthly and the model equations are used to produce monthly forecasts over a 13-to-24 month horizon (every January the *STEO* forecast is extended through December of the following year).

Table 1. Other petroleum products consumption (million barrels per day)

Product	2006	2007	2008	2009	2010
Asphalt and road oil	0.521	0.494	0.417	0.360	0.362
Petrochemical feedstocks	0.700	0.644	0.552	0.446	0.469
Petroleum coke	0.522	0.490	0.464	0.427	0.376
Still gas	0.709	0.697	0.670	0.664	0.670
Unfinished oils	0.033	0.031	-0.025	-0.037	0.022
Remaining miscellaneous products (1)	0.323	0.306	0.281	0.252	0.262
Total other petroleum products	2.808	2.663	2.359	2.112	2.161

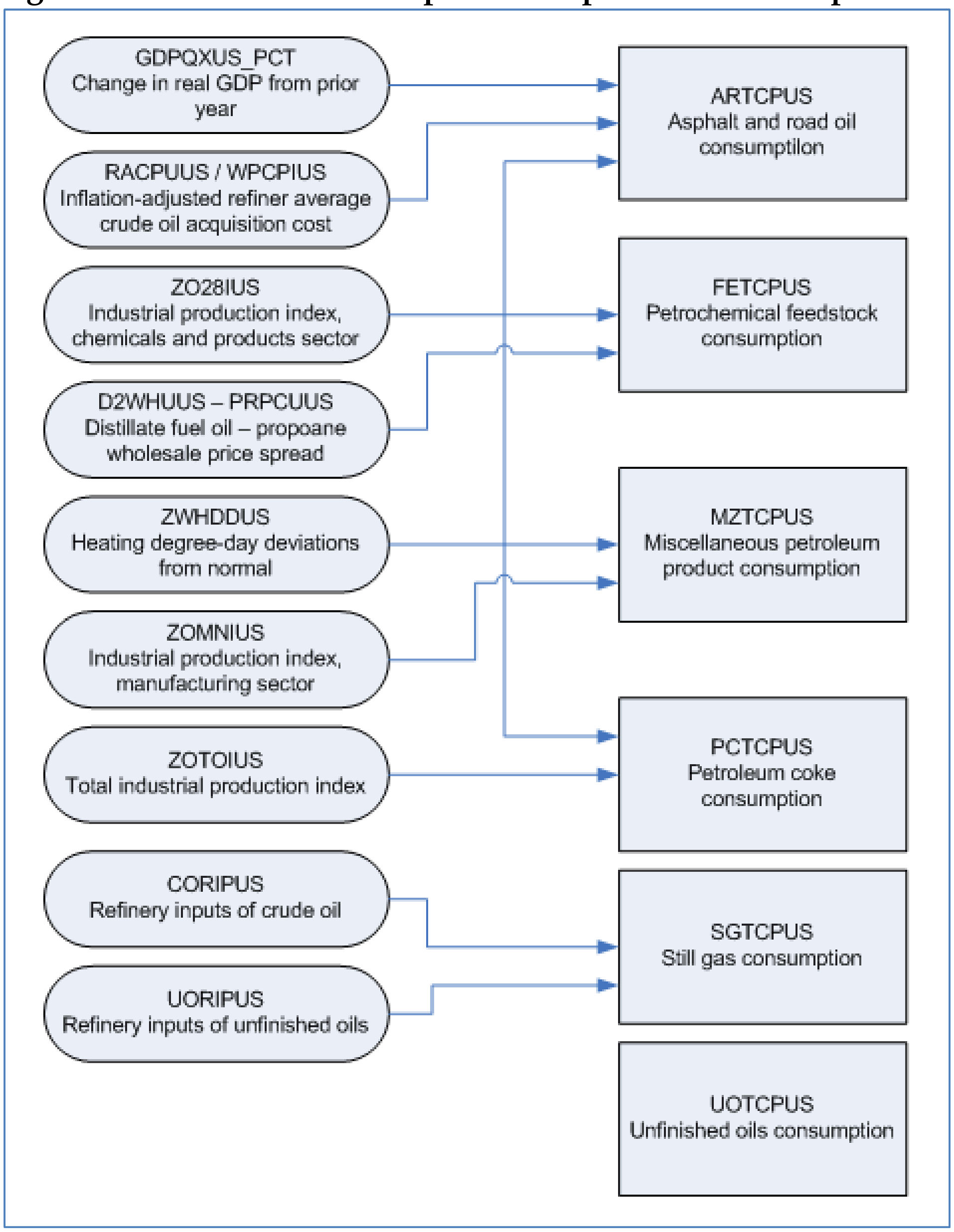
Note: (1) Remaining miscellaneous products includes finished aviation gasoline, kerosene, special naphthas, lubricating oils, waxes, and miscellaneous products.
Source: U.S. Energy Information Administration, *Petroleum Supply Monthly*.

The *STEO* model contains over 2,000 equations, of which about 450 are estimated regression equations. The regression equations are estimated and the forecast models are solved using EViews Econometric Software (Quantitative Micro Software, LLC).

The other petroleum products consumption module, which is documented in this report, contains 7 equations, of which 6 are estimated regression equations. Some input variables to the other petroleum products consumption module are exogenous, coming from other modules in the *STEO* model or forecasts produced by other organizations (e.g., weather forecasts from the National Oceanic and Atmospheric Administration).

Consumption of other petroleum products reflects a variety of end uses. Consumption may be estimated as a function of crude oil refinery inputs (still gas consumption), overall economic activity measured by real GDP (asphalt and road oil), or industrial production indices (Figure 1).

Figure 1. Flow chart of other petroleum products consumption.



2. Data sources

The monthly volume data used in the other petroleum products consumption module appear in the EIA *Petroleum Supply Monthly* (*PSM*). The *PSM* includes volume data from surveys of primary suppliers such as refineries, pipelines, and bulk terminals. The PSM reports "products supplied", which approximately represents consumption of petroleum products because it measures the disappearance of these products from primary sources. In general, product supplied of each product in any given period is computed as follows: refinery production, plus imports, minus stock build, minus refinery inputs, and minus exports.

The other petroleum products consumption module uses macroeconomic variables such as real gross domestic product (GDP), wholesale price index, and industrial production indices as explanatory variables in the generation of forecasts. The macroeconomic forecasts are generated by models developed by IHS Global Insight Inc. (GI). GI updates its national macroeconomic forecasts monthly using its model of the U.S. economy. EIA re-runs the GI model to produce macroeconomic forecasts that are consistent with the STEO energy price forecasts.

Historical data for heating degree-days are obtained from the National Oceanic and Atmospheric Administration (NOAA).[1] NOAA also publishes forecasts of population-weighted regional heating degree-days up to 14 months out. Where the STEO forecast horizon goes beyond the NOAA forecast period, “normal” values may be used. NOAA reports normal heating degree-days as the average of the 30-year period 1971-2000. However, the STEO model uses a corrected degree-day normal that adjusts for the warming trend that began around 1965 (*The Impact of Temperature Trends on Short-Term Energy Demand*).

3. Variable naming convention

Over 2,000 variables are used in the STEO model for estimation, simulation, and report writing. Most of these variables follow a similar naming convention. The

[1] Heating degree-days (HDD) is a measure of the relative coldness of a location, is calculated as the deviation of daily average temperature below 65 degrees; HDD = 0 if average temperature exceeds 65.

following table shows an example of this convention using total consumption of other petroleum products:

Characters	PS	TC	P	US
Positions	1 and 2	3 and 4	5	6 and 7
Identity	Type of energy	Energy activity or consumption end-use sector	Type of data	Geographic area or special equation factor

In this example, PSTCPUS is the identifying code for other petroleum products (PS) total consumption (TC) physical units (P) in the United States (US).

Some examples of the identifiers used in this naming convention are:

Type of energy categories:

AR = asphalt and road oil
D2 = distillate fuel oil
FE = petrochemical feedstock
MZ = miscellaneous other petroleum products
PC = petroleum coke
PR = propane
PS = total other petroleum products
SG = still gas
UO = unfinished oils
ZO = industrial output
ZW = weather

Energy activity or consumption end-use sectors:

HD = heating degree-days
MN = manufacturing sector
PC = petrochemicals sector
TC = total consumption
28 = chemicals and products sector (SIC 28)

Type of data:

D = deviations from normal (e.g., heating degree days)
P = data in physical units (e.g., barrels or barrels per day)

Geographic identification or special equation factor:

US = United States

Regression equations generally include monthly dummy variables to capture the normal seasonality in the data series. For example, JAN equals 1 for every January in the time series and is equal to 0 in every other month.

Dummy variables for specific months may also be included in regression equations because the observed data may be outliers because of infrequent and unpredictable events such as hurricanes, survey error, or other factors. Generally, dummy variables are introduced when the absolute value of the estimated regression error is greater than 2 times the standard error of the regression (the standard error of the regression is a summary measure based on the estimated variance of the residuals). No attempt was made to identify the market or survey factors that may have contributed to the identified outliers.

Dummy variables for specific months are generally designated Dyymm, where yy = the last two digits of the year and mm = the number of the month (from "01" for January to "12" for December). Thus, a monthly dummy variable for March 2002 would be D0203 (i.e., D0203 = 1 if March 2002, = 0 otherwise).

Dummy variables for specific years are designated Dyy, where yy = the last two digits of the year. Thus a dummy variable for all months of 2002 would be D02 (i.e., D02= 1 if January through December 2002, 0 otherwise). A dummy variable might also be included in an equation to show a structural shift in the relationship between two time periods. Generally, these type of shifts are modeled using dummy variables designated DxxON, where xx = the last two digits of the years at the beginning of the latter shift period. For example, D03ON = 1 for January 2003 and all months after that date, = 0 for all months prior to 2003.

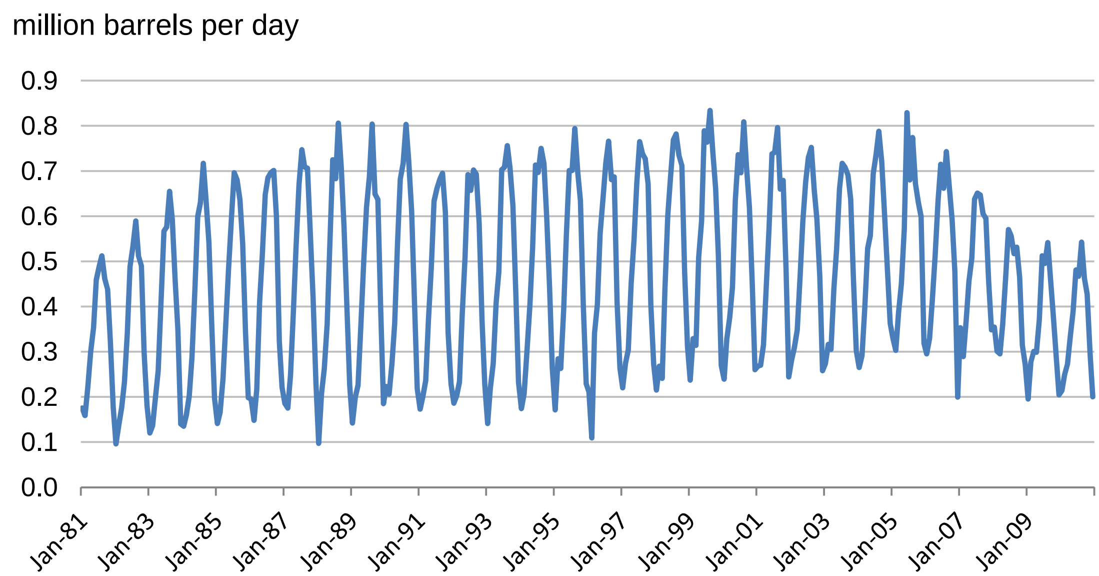
4. Other petroleum product consumption module equations

A. Asphalt and road oil

The heaviest fraction of many crude oils includes natural bitumens or asphaltenes, and is generally called asphalt. Asphalt and road oil consumption is highly seasonal but has been relatively stable until the last 5 years (Figure 2).

Since the 2005, asphalt and road oil consumption has been on a relatively steady decline, particularly during the peak summer months.

Figure 2. Asphalt and road oil consumption, January 1981 - December 2010



Source: EIA, *Petroleum Supply Monthly*, Table 3.

Asphalt and road oil consumption is a function of real GDP growth, the real price of crude oil, and heating degree-day deviations from normal per day (equation 1). A trend variable is included to capture the decline in consumption over the last few years, which may be due to growing State government budget constraints. Introducing a trend variable in place of a missing variable does introduce significant uncertainty into a forecast of asphalt and road oil consumption.

$$\begin{aligned}\text{ARTCPUS} = {} & \text{a0} + \text{a1} * \text{GDPQXUS\_PCT} \\ & + \text{a2} * \text{RACPUUS} / \text{WPCPIUS} \\ & + \text{a3} * \text{ZWHDDUS} / \text{ZSAJQUS} \\ & + \text{a4} * \text{@TREND(2005:12)*D06on} \\ & + \text{monthly dummy variables}\end{aligned} \quad (1)$$

where,

ARTCPUS = asphalt and road oil consumption, million barrels per day
GDPQXUS_PCT = change in real GDP from prior year, percent
RACPUUS = U.S. refiner average acquisition cost of crude oil, dollars per barrel

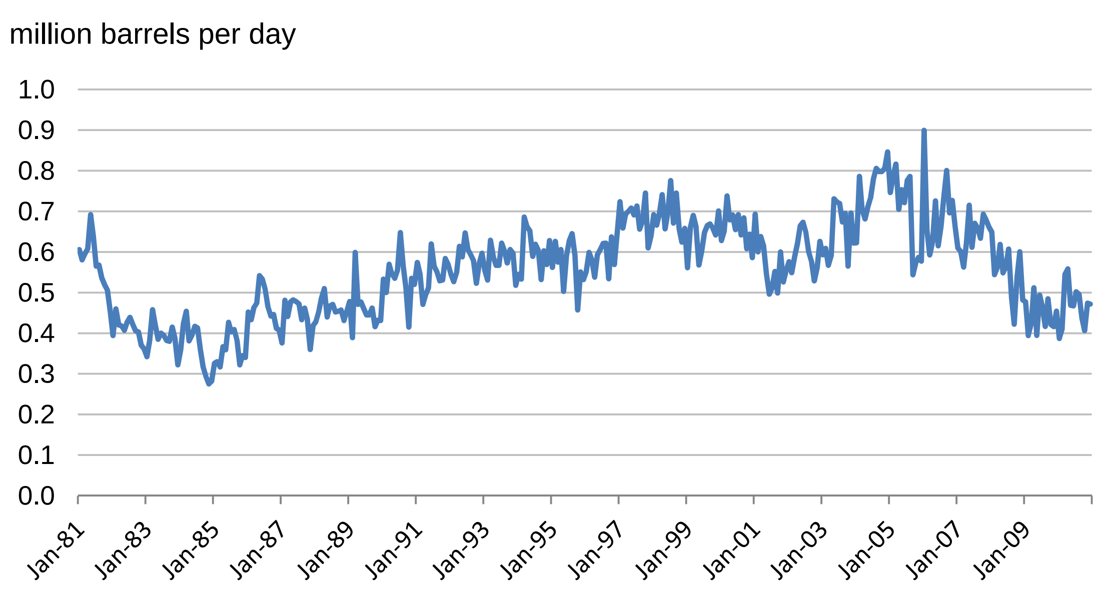
WPCPIUS = wholesale price index
ZWHDDUS = heating degree-day deviations from normal
ZSAJQUS = number of days in the month
@TREND(2005:12)*D06on = 1 on January 2006, increasing by 1 each month; 0 before January 2006.

B. Petrochemical feedstocks

Petrochemical feedstocks are used in the manufacture of chemicals, synthetic rubber, and a variety of plastics. In some petrochemical production processes, such as ethylene crackers, there are several alternatives to petrochemical feedstocks and it is possible to substitute feedstocks. Consequently, we expect the consumption of petrochemical feedstocks to be a function of both industrial output and relative prices.

Between 1986 and 2006, consumption of petrochemical feedstocks had been on a relatively steady upward trend, except for the recession of 2001 (March 2001 – November 2001). The decline during the recession of 2008 (December 2007 – June 2009) was significantly greater than the previous recession (Figure 3).

Figure 3. Petrochemical feedstock consumption, January 1981 - December 2010



Source: EIA, *Petroleum Supply Monthly*, Table 3.

Petrochemical feedstock consumption is estimated as a function of the industrial production index, chemicals and products sector (equation 2). A natural gas – crude oil price spread is included to capture substitution between natural gas liquids and refined crude oil products such as naphtha and gas oil as feedstocks in petrochemical processes. The crude oil price is converted to dollars per million Btu by dividing by its approximate heat content.

$$FETCPUS = a0 + a1 * ZO28IUS + a2 * (NGHHUUS - WTIPUUS / 5.8) + \text{monthly dummy variables} \quad (2)$$

where,

FETCPUS = petrochemical feedstock consumption, million barrels per day
ZO28IUS = industrial production index, chemicals and products sector
NGHHUUS = natural gas spot price at Henry Hub, Louisiana, dollars per million Btu
RACPUUS = refiner average acquisition cost of crude oil, dollars per barrel

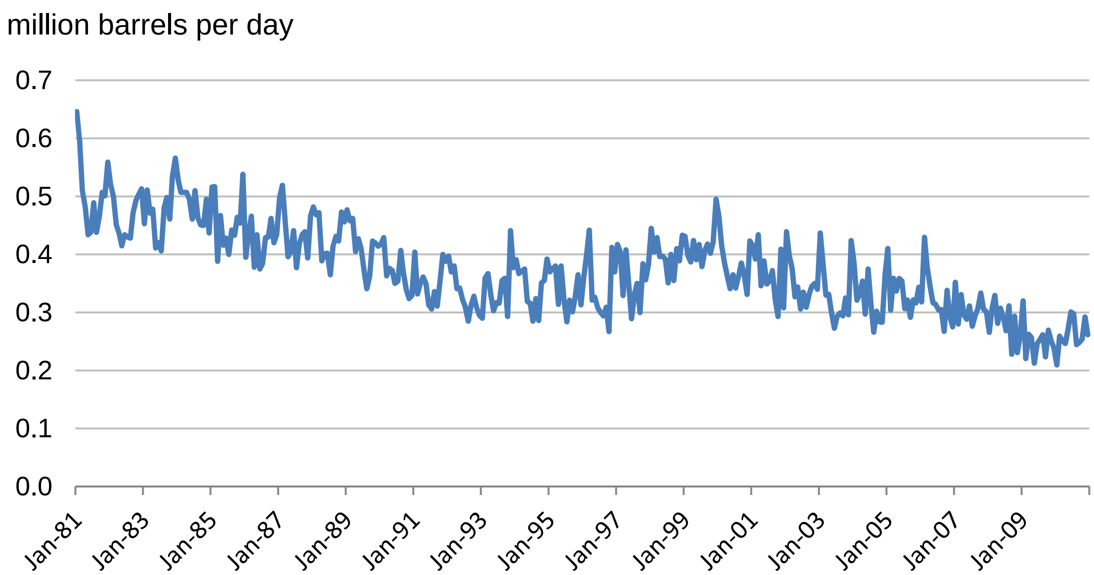
C. Miscellaneous other petroleum products

The remaining miscellaneous products, less than 15 percent of the total of other petroleum products consumption, are estimated as a sub-aggregate variable, MZTCPUS. The total volume of remaining miscellaneous products has been trending downwards since 2000 (Figure 4), with most of the decline occurring in kerosene and lubricants (Table 2).

Special naphthas represent all finished products within the naphtha boiling range that are used as paint thinners, cleaners, or solvents. The steady decline in demand for special naphthas may reflect increasingly stringent environmental regulations or a greater participation in the market from the petrochemical sector.

Kerosene is used primarily used in space heaters, cooking stoves, and water heaters. The steady decline in kerosene demand likely reflects fuel switching (e.g., to natural gas or bottled propane) and growing demand for kerosene-type jet fuel.

Figure 4. Remaining miscellaneous products consumption, January 1981 - December 2010



Source: EIA, *Petroleum Supply Monthly*, Table 3.

Table 2. Remaining miscellaneous products consumption (million barrels per day)

Product	2006	2007	2008	2009	2010
Aviation gasoline blend components	0.000	0.001	0.000	0.000	0.000
Lubricants	0.137	0.142	0.131	0.118	0.130
Special Naphthas	0.037	0.041	0.044	0.024	0.014
Kerosene	0.054	0.032	0.014	0.018	0.020
Finished Aviation Gasoline	0.018	0.017	0.015	0.014	0.015
Waxes	0.013	0.011	0.009	0.006	0.008
Miscellaneous Products	0.064	0.063	0.067	0.072	0.075
Total remaining miscellaneous products	0.323	0.306	0.281	0.252	0.262

Source: U.S. Energy Information Administration, *Petroleum Supply Monthly*, Table 3.

Total remaining miscellaneous products (MZTCPUS) is regressed against the industrial production index for the manufacturing sector (ZOMNIUS), a time trend variable, and monthly dummy variables (equation 3):

MZTCPUS = a0 + a1 * ZOMNIUS (3)
+ a2 * @TREND(2000:12)
+ monthly dummy variables

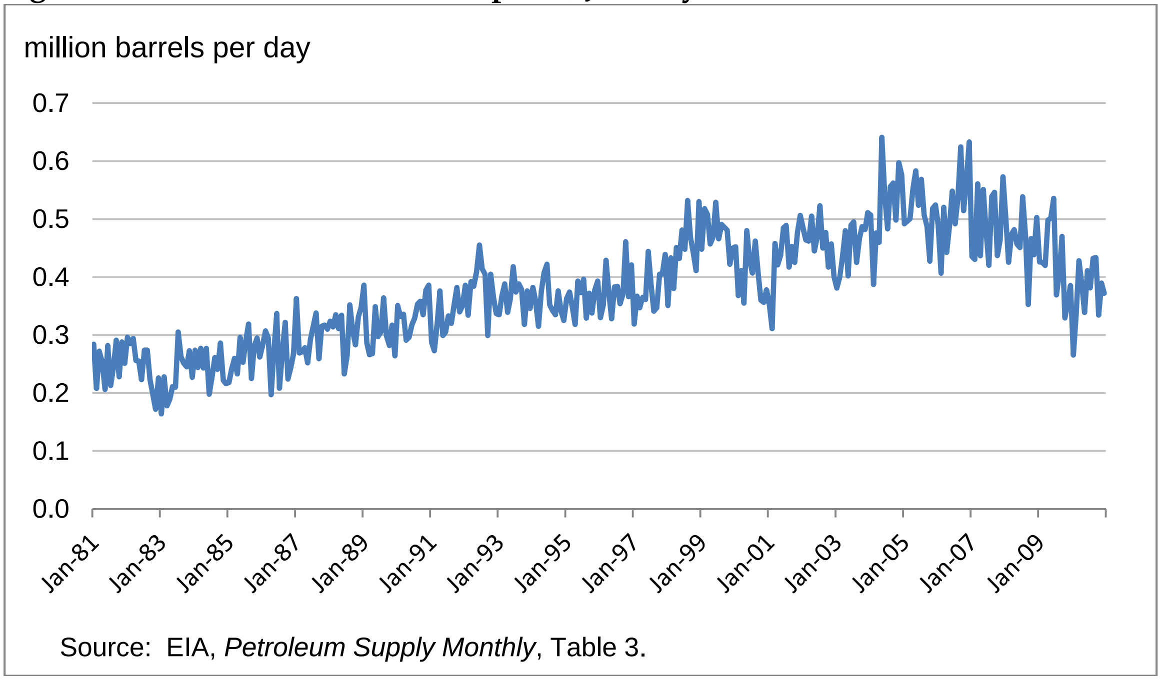
where,

MZTCPUS = miscellaneous other petroleum products consumption, million barrels per day
ZOMNIUS = Industrial production index, manufacturing sector
@TREND(2000:12) = 1 on January 2001, increasing by 1 each month.

D. Petroleum coke

Petroleum coke is a by-product of the upgrading of the heaviest petroleum fractions (e.g., residual fuel oil) to more valuable lighter products in crude oil refinery coking units. Petroleum coke is produced as either sponge coke, needle coke, or fluid coke, which vary primarily by particle size. About 65% of the coke produced in the United States is used as fuel. The remaining 35% is sponge coke that, when calcined, is sold as premium-grade coke used in the manufacture of aluminum anodes, furnace electrodes and liners, and shaped graphite products. Petroleum coke consumption had steadily increased as U.S. refiners increased their capability of upgrading heavy crude oil and increased their production of petroleum coke as a byproduct (Figure 5). Downturns in consumption occurred during the last two recessions of March 2001 – December 2001 and December 2007 – June 2009.

Figure 5. Petroleum coke consumption, January 1981 - December 2010



Domestic petroleum coke consumption is estimated in equation (4) as a function of industrial production, the ratio of the natural gas price to the coal price to electric utilities, and heating degree-day deviations from normal per day, and monthly dummy variables:

$$\begin{aligned} PCTCPUS = {} & a_0 + a_1 * ZOTOIUS \\ & + a_2 * NGEUDUS / CLEUDUS \\ & + a_3 * ZWHDDUS / ZSAJQUS \\ & + \text{monthly dummy variables} \end{aligned} \quad (4)$$

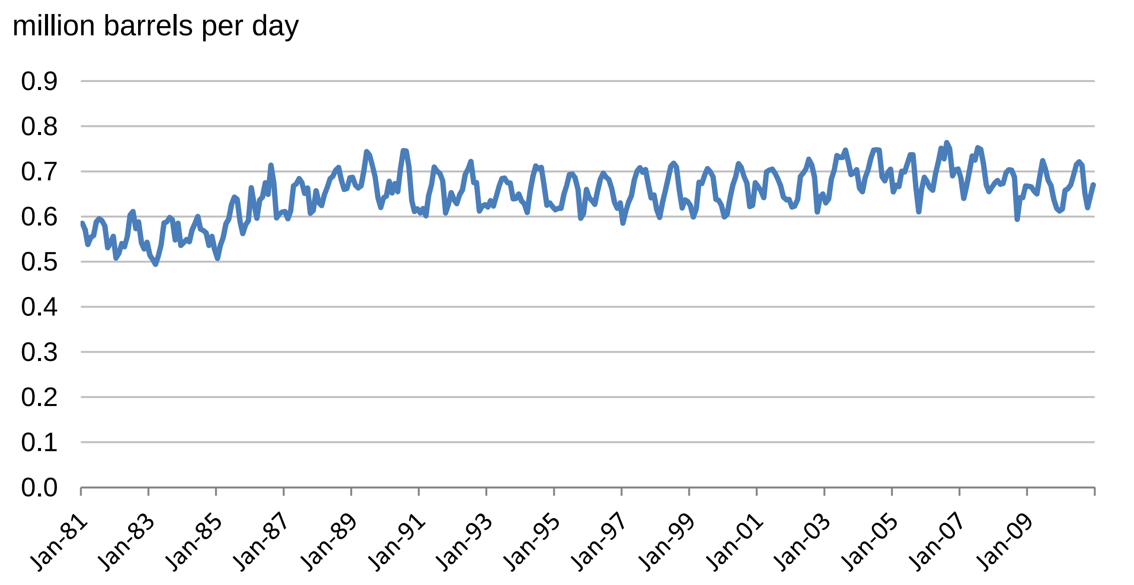
where,

PCTCPUS = current month petroleum coke consumption
CLEUDUS = average cost of coal to electric power sector, dollars per million
NGEUDUS = average cost of natural gas to electric power sector, dollars per million Btu
ZOTOIUS = total industrial production index
ZWHDDUS = heating degree-day deviations from normal
ZSAJQUS = number of days in the month
@TREND(2005:12)*D06on = 1 on January 2006, increasing by 1 each month; 0 before January 2006.

E. Still gas

Still gas (also known as refinery gas) is any form or mixture of gas produced in refineries by cracking, reforming, and other processes. Still gas is produced as a by-product in the upgrading of heavy petroleum fractions to more valuable lighter products and is consumed internally as refinery fuel. Still gas consumption has been relatively stable over the last 2 years (Figure 6).

Figure 6. Still gas consumption, January 1981 - December 2010



Source: EIA, Petroleum Supply Monthly, Table 3.

Since the supply of still gas creates its own demand, still gas consumption (SGTCPUS) is modeled in equation (5) as a function of refinery inputs of crude oil (CORIPUS) and unfinished oils (UORIPUS).

SGTCPUS = a0 + a1 * CORIPUS (5)
+ a2 * UORIPUS
+ monthly dummy variables

Where,

SGTCPUS = still gas consumption, million barrels per day
CORIPUS = refinery inputs of crude oil, million barrels per day
UORIPUS = refinery inputs of unfinished oils, million barrels per day

F. Unfinished oils

Unfinished oils include all oils requiring further processing, except those requiring only mechanical blending. Unfinished oils are produced by partial refining of crude oil and include naphthas and lighter oils, kerosene and light gas oils, heavy gas oils, and residuum. Table 3 summarizes the annual average volumes of unfinished oils consumption by type of oil.

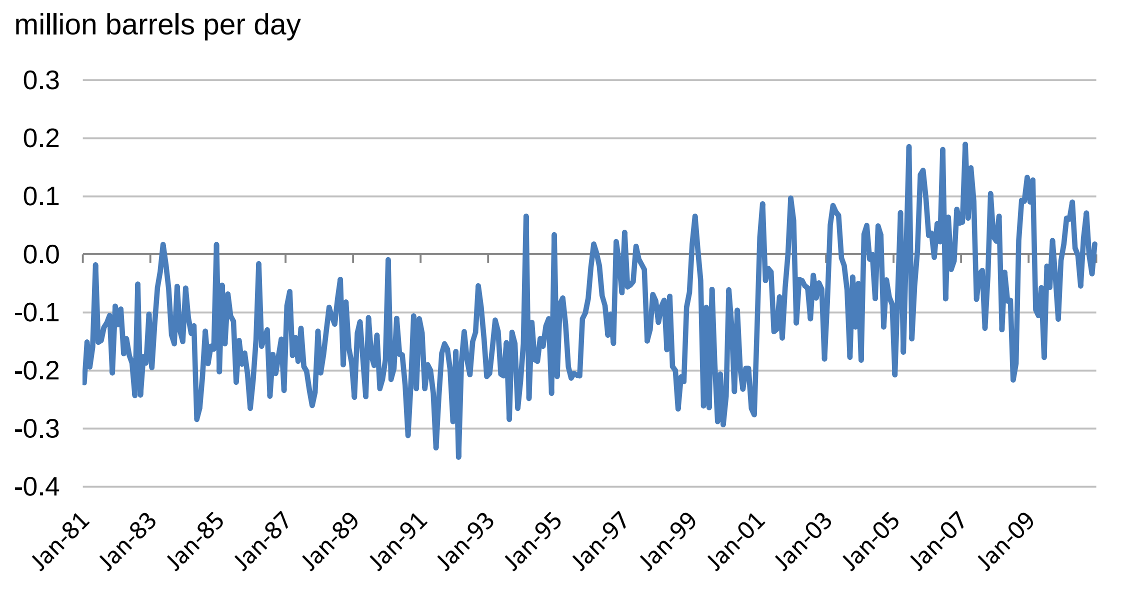
Table 3. Unfinished oils consumption (million barrels per day)

Product	**2006**	**2007**	**2008**	**2009**	**2010**
Naphtha and lighter oils	0.001	0.037	0.005	-0.026	0.031
Kerosene and light gas oils	0.056	0.034	-0.015	-0.040	-0.034
Heavy gas oils	-0.091	-0.100	-0.125	-0.102	-0.139
Residuum	0.068	0.060	0.110	0.130	0.163
Total unfinished oils	0.033	0.031	-0.025	-0.036	0.020

Note: Consumption calculated as imports – net refinery inputs – stock build (draw). Negative consumption number indicates reported refinery inputs and stock change exceeded imports.
Source: U.S. Energy Information Administration, *Petroleum Supply Monthly*, Tables 28, 37, and 55.

We normally expect that unfinished oil consumption should equal zero. Over the last 30 years, however, unfinished oils consumption has generally been negative (Figure 7). Unfinished oils that are delivered to end users should be classified as refined products such as petrochemical feedstocks or residual fuel oil. However, unfinished oils can be misclassified by respondents to EIA's surveys. For example, one refiner may sell residual fuel oil to another refiner for use as a feedstock. If the first refiner classifies the product as residual fuel oil and the second refiner classifies it as unfinished oil residuum then residual fuel oil consumption may be overstated and unfinished oil consumption understated (and possibly negative).

Figure 7. Unfinished oils consumption, January 1981 – December 2010



Source: EIA, Petroleum Supply Monthly, Table 3.

Unfinished oils consumption is estimated in regression equation (6) as a function of prior month consumption and monthly dummy variables:

$$UOTCPUS = a0 + a1 * UOTCPUS(-1) + \text{monthly dummy variables} \quad (6)$$

where,

UOTCPUS = current month consumption
UOTCPUS(-1) = prior month consumption unfinished oils

5. Forecast evaluations

In order to evaluate the reliability of the forecasts, we generated out-of-sample forecasts and calculated forecast errors. Each equation was estimated through December 2008. Dynamic forecasts were then generated for the period January 2009 through December 2010 using each regression equation (see Figures 8 – 13). The forecasts are then compared with actual outcomes.

Dynamic forecasts of each equation are forecasts generated using the actual values of the exogenous variables on the right-hand side of the regression equations (e.g., weather and the number of households), but simulated values of the lagged dependent variable. Consequently, the calculated forecast error is not the same as a calculated regression error, which uses the actual value of the lagged dependent variable.

Table 4 reports the differences between the out-of-sample dynamic forecast and actual consumption for each regression equation for the years 2009 and 2010. A forecast for total other petroleum products is calculated as the sum of the 6 individual product forecasts. The out-of-sample forecast of total other petroleum products consumption for 2009 was about 3.4 percent higher than actual consumption, while the forecast for 2010 was about 2.4 percent higher than actual consumption. The primary sources of forecast error in 2009 were petrochemical feedstocks and unfinished oils consumption. The primary source of error in the 2010 forecast was petroleum coke consumption.

Table 4. Actual versus out-of-sample consumption forecasts, annual averages (million barrels per day)

	2009		2010	
Equation	**Actual**	**Forecast**	**Actual**	**Forecast**
ARTCPUS	0.360	0.375	0.362	0.402
FETCPUS	0.446	0.488	0.469	0.465
MZTCPUS	0.252	0.239	0.262	0.238
PCTCPUS	0.427	0.431	0.376	0.450
SGTCPUS	0.664	0.655	0.670	0.670
UOTCPUS	- 0.037	- 0.004	0.022	- 0.009
Total	2.112	2.184	2.161	2.217

Source: EIA, Short-Term Energy Outlook model.

The differences between the monthly out-of-sample forecasts and actual values are shown in Figures 8 through 13 for the 6 regression equations

Figure 8. ARTCPUS, Asphalt and road oil consumption out-of-sample forecast versus actual, January 2009 – December 2010

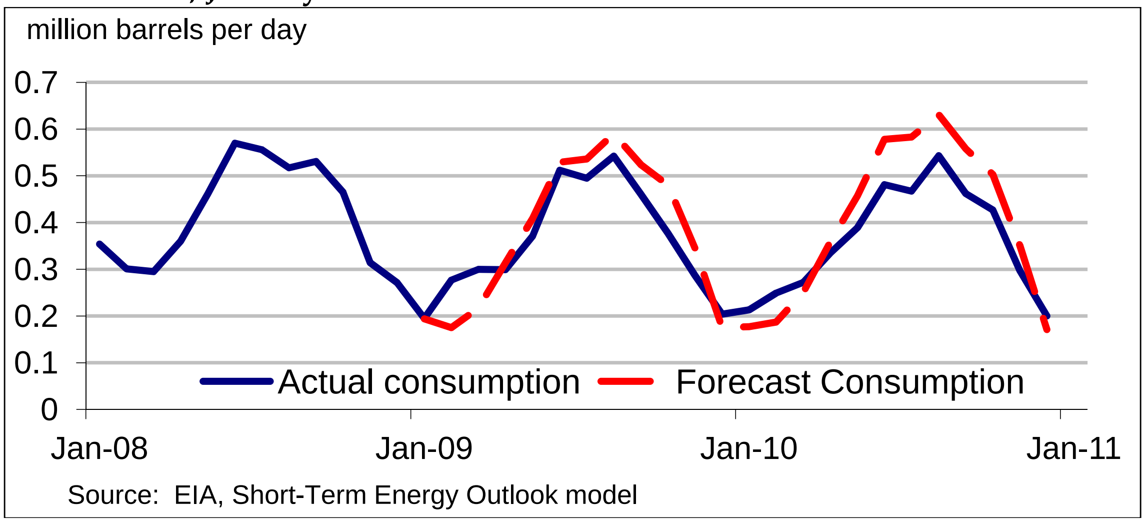


Figure 9. FETCPUS, Petrochemical feedstock consumption out-of-sample forecast versus actual, January 2009 – December 2010

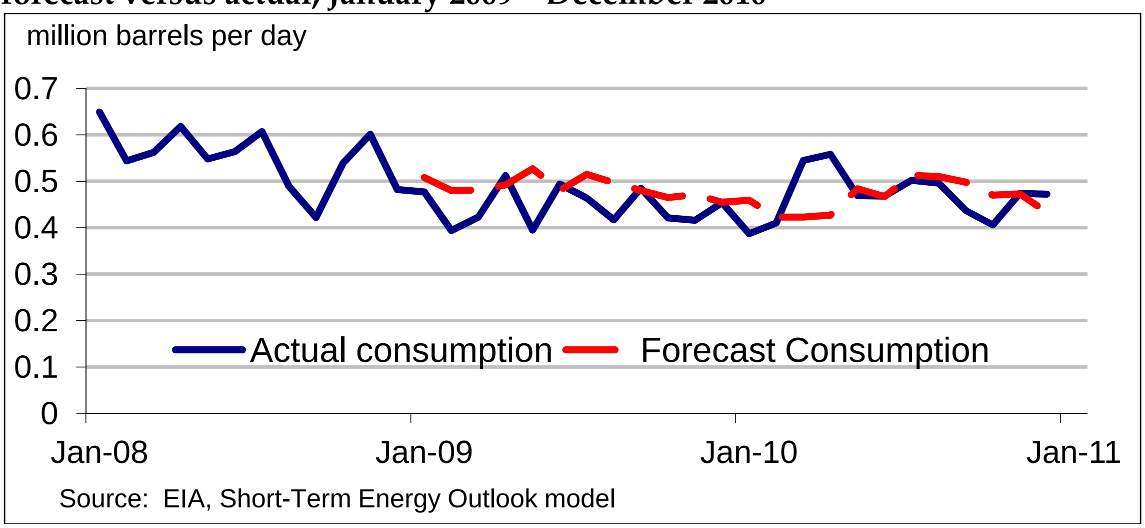
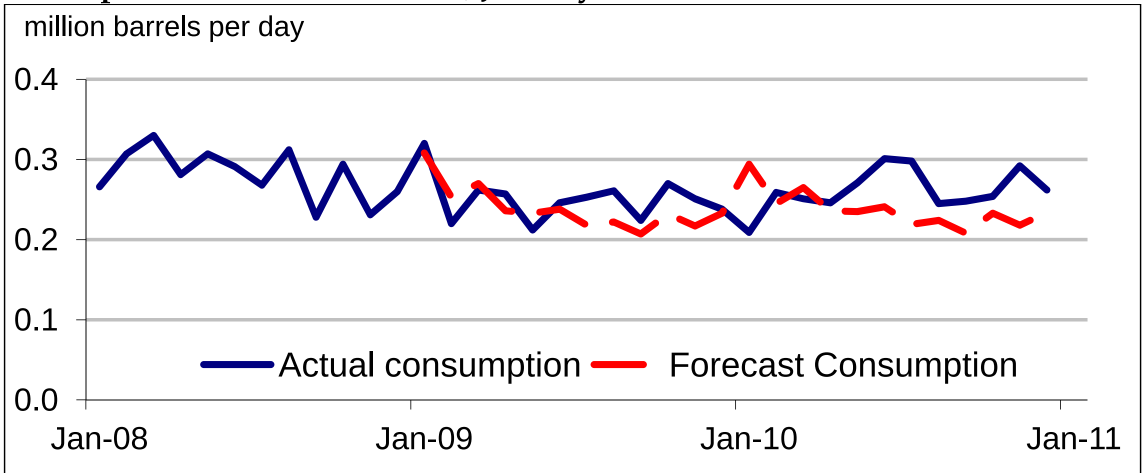
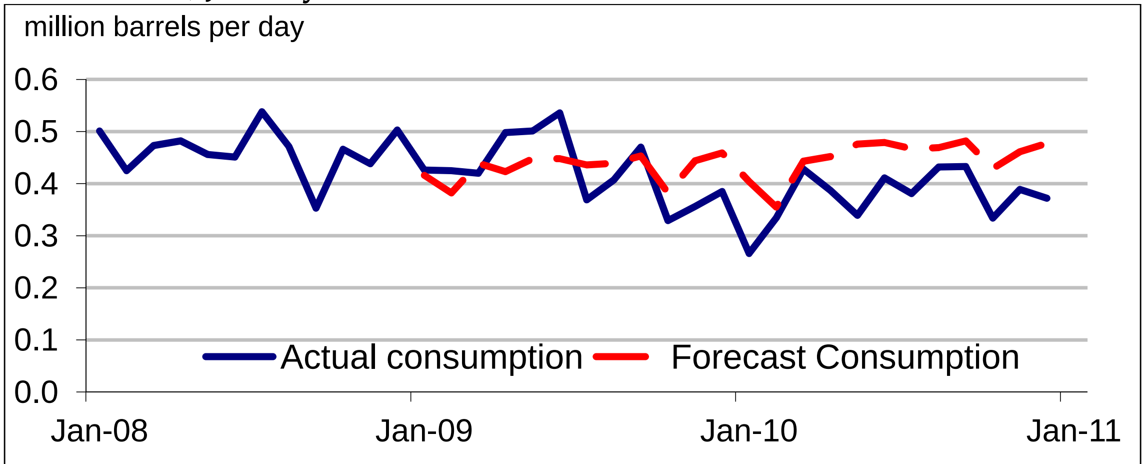


Figure 10. MZTCPUS, Remaining miscellaneous products consumption out-of-sample forecast versus actual, January 2009– December 2010



Source: EIA, Short-Term Energy Outlook model

Figure 11. PCTCPUS, Petroleum coke consumption out-of-sample forecast versus actual, January 2009 – December 2010



Source: EIA, Short-Term Energy Outlook model

Figure 12. SGTCPUS, Still gas consumption out-of-sample forecast versus actual, January 2009 – December 2010

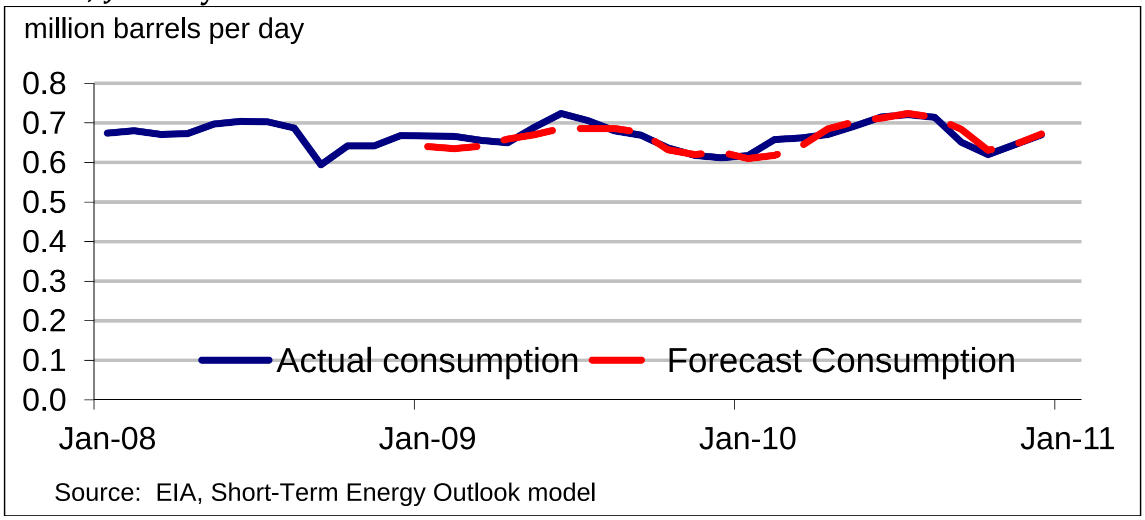


Figure 13. UOTCPUS, Unfinished oils consumption out-of-sample forecast versus actual, January 2009 – December 2010

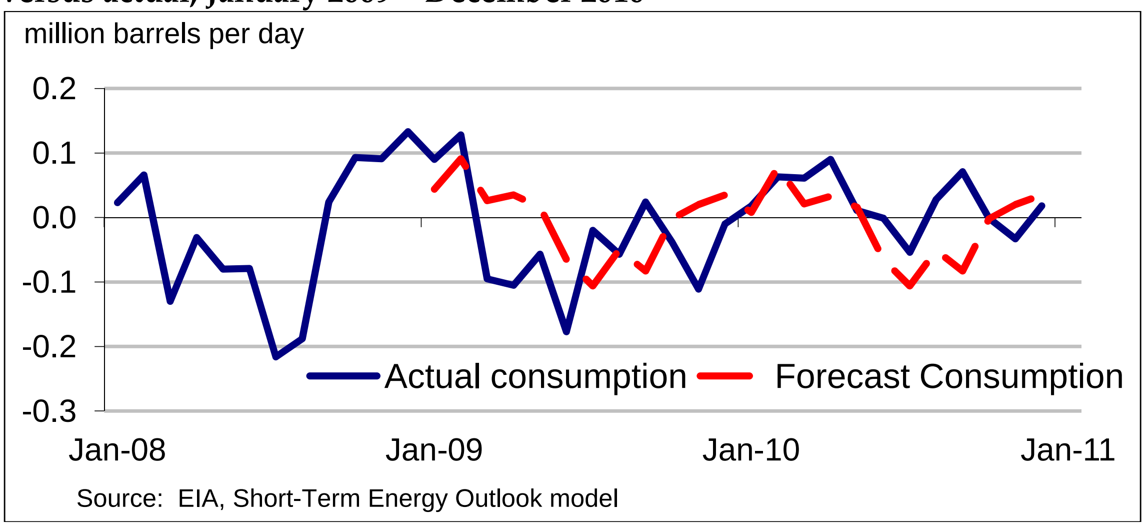


Table reports summary forecast error statistics for each regression equation. The root mean squared error and the mean absolute error depend on the scale of the dependent variable. These are generally used as relative measures to compare forecasts for the same series using different models; the smaller the error, the better the forecasting ability of that model.

The mean absolute percentage error (MAPE) and the Theil inequality coefficient are invariant to scale. The smaller the values the better the model fit. The Theil inequality coefficient always lies between zero and one, where zero indicates a perfect fit. The Theil inequality coefficient is broken out into bias, variance, and covariance proportions, which sum to 1. The bias proportion indicates how far the mean of the forecast is from the mean of the actual series, signaling systematic error. The variance proportion indicates how far the variation of the forecast is from the variation of the actual series. This will be high if the actual data fluctuates significantly but the forecast fails to track these variations from the mean. The covariance proportion measures the remaining unsystematic forecasting errors. For a “good” forecast, the bias and variance proportions should be small, with most of the forecast error concentrated in the covariance proportion.

The bias proportions are relatively low for each of the 6 forecasted series in Table 5. The highest bias proportion occurred in the petroleum coke forecast, which can be seen in the forecast of 2010 consumption rising above actual in Figure 11. The variance proportions are also relatively low with the exception of asphalt and road oil, which is a result of the very strong seasonality in that consumption (Figure 8).

Table 5. Regional consumption out-of-sample simulation error statistics

	UOTCPUS	**FETCPUS**	**PCTCPUS**
Root Mean Squared Error	0.077	0.062	0.072
Mean Absolute Error	0.062	0.047	0.063
Mean Absolute Percentage Error	320	10.5	16.7
Theil Inequality Coefficient	0.601	0.066	0.084
Bias Proportion	0.000	0.096	0.294
Variance Proportion	0.047	0.083	0.155
Covariance Proportion	0.953	0.822	0.551
	ARTCPUS	**SGTCPUS**	**MZTCPUS**
Root Mean Squared Error	0.065	0.018	0.038
Mean Absolute Error	0.057	0.014	0.031
Mean Absolute Percentage Error	16.0	2.11	12.2
Theil Inequality Coefficient	0.082	0.014	0.077
Bias Proportion	0.165	0.064	0.221
Variance Proportion	0.516	0.000	0.003
Covariance Proportion	0.319	0.936	0.775

Notes: Forecast period = January 2008 – December 2009

Appendix A. Variable definitions, units, and sources

Table A1. Variable definitions, units, and sources

			Sources	
Variable Name	**Units**	**Definition**	**History**	**Forecast**
ABTCPUS	MMBD	Aviation gasoline blending components product supplied (consumption)	PSM	STEO
APR	Integer	= 1 if April, 0 otherwise	--	--
ARTCPUS	MMBD	Asphalt and road oil product supplied (consumption)	PSM	STEO
AUG	Integer	= 1 if August, 0 otherwise	--	--
CORIPUS	MMBD	Crude oil refinery inputs	PSM	STEO
Dyy	Integer	= 1 if year (yy), 0 otherwise	--	--
Dyymm	Integer	= 1 if month (mm) and year (yy), 0 otherwise	--	--
DyyON	Integer	= 1 if year (yy) or later, 0 otherwise	--	--
D2WHUUS	CPG	Distillate fuel oil wholesale price	PMM	STEO
DEC	Integer	= 1 if December, 0 otherwise	--	--
FEB	Integer	= 1 if February, 0 otherwise	--	--
FETCPUS	MMBD	Petrochemical feedstocks product supplied (consumption)	PSM	STEO
GDPQXUS_PCT	Percent	Change in U.S. real GDP from prior year	GI	STEO
JAN	Integer	= 1 if January, 0 otherwise	--	--
JUL	Integer	= 1 if July, 0 otherwise	--	--
JUN	Integer	= 1 if June, 0 otherwise	--	--
MAR	Integer	= 1 if March, 0 otherwise	--	--
MAY	Integer	= 1 if May, 0 otherwise	--	--
MZTCPUS	MMBD	Miscellaneous products product supplied (consumption)	PSM	STEO
NOV	Integer	= 1 if November, 0 otherwise	--	--
OCT	Integer	= 1 if October, 0 otherwise	--	--
PCTCPUS	MMBD	Petroleum coke product supplied (consumption)	PSM	STEO
PRPCUUS	CPG	Propane wholesale price	PMM	STEO
PSTCPUS	MMBD	Total other petroleum products product supplied (consumption)	PSM	STEO
RACPUUS	DPB	U.S. refiner average crude oil acquisition cost	PMM	STEO
SEP	Integer	= 1 if September, 0 otherwise	--	--
SGTCPUS	MMBD	Still gas product supplied (consumption)	PSM	STEO
UORIPUS	MMBD	Unfinished oils refinery inputs	PSM	STEO
WPCPIUS	Index	Wholesale price index	GI	GI
ZO28IUS	Index	Industrial production index, chemicals and products sector	GI	GI
ZOMNIUS	Index	Industrial production index, manufacturing	GI	GI
ZOTOIUS	Index	Industrial production index, all sectors	GI	GI
ZSAJQUS	Integer	Number of days in a month	--	--
ZWHDDUS	HDD	U.S. Heating degree-days, deviation from normal	NOAA	NOAA

Table A2. Units key

CPG	Cents per gallon
DPB	Dollars per barrel
HDD	Heating degree-days
Index	Index value
Integer	Number = 0 or 1
MMBD	Million barrels per day

Table A3. Sources key

BLS	Bureau of Labor Statistics
GI	IHS-Global Insight
NOAA	National Oceanic and Atmospheric Organization
PMM	EIA Petroleum Marketing Monthly
PSM	EIA Petroleum Supply Monthly
STEO	Short-term Energy Outlook Model

Appendix B. EViews model program file

```
'-------------------------------------------------------------------------------------------------------------------
'----- Crude Oil and Other Liquids consumption
'-------------------------------------------------------------------------------------------------------------------

:EQ_UOTCPUS
@ADD UOTCPUS  UOTCPUS_A

:EQ_FETCPUS
@ADD FETCPUS  FETCPUS_A

:EQ_PCTCPUS
@ADD PCTCPUS  PCTCPUS_A

:EQ_SGTCPUS
@ADD SGTCPUS  SGTCPUS_A

:EQ_ARTCPUS
@ADD ARTCPUS  ARTCPUS_A

:EQ_MZTCPUS
@ADD MZTCPUS  MZTCPUS_A

'-------------------------------------------------------------------------------------------------------------------
'----- Calculate a sub aggregate
'-------------------------------------------------------------------------------------------------------------------

@IDENTITY PSTCPUS  = FETCPUS  + SGTCPUS  + ARTCPUS  + PCTCPUS  + MZTCPUS
```

Appendix C. Regression results

C1. ARTCPUS, Asphalt and road oil consumption, million barrels per day

Dependent Variable: ARTCPUS
Method: Least Squares
Date: 04/25/11 Time: 15:32
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.152337	0.026316	5.788778	0.0000
GDPQXUS_PCT	0.004909	0.001992	2.464088	0.0155
RACPUUS/WPCPIUS	0.000393	0.000407	0.966523	0.3362
ZWHDDUS/ZSAJQUS	0.000979	0.002258	0.433616	0.6655
@TREND(2005:12)*D06ON	-0.001830	0.000367	-4.985107	0.0000
D0506	0.133596	0.037108	3.600165	0.0005
D0511	0.110295	0.037219	2.963414	0.0038
D0612	-0.102407	0.038332	-2.671563	0.0089
D0701	0.118694	0.037596	3.157082	0.0021
D0808	-0.105829	0.038279	-2.764695	0.0068
D0812	0.114201	0.038674	2.952931	0.0040
D0902	0.110019	0.039080	2.815270	0.0059
FEB	0.007684	0.017027	0.451258	0.6528
MAR	0.061893	0.016179	3.825384	0.0002
APR	0.132010	0.016712	7.898966	0.0000
MAY	0.182059	0.019425	9.372221	0.0000
JUN	0.262516	0.024060	10.91102	0.0000
JUL	0.209397	0.031683	6.609056	0.0000
AUG	0.261391	0.031820	8.214787	0.0000
SEP	0.168264	0.033879	4.966597	0.0000
OCT	0.147267	0.029730	4.953529	0.0000
NOV	0.033880	0.027209	1.245167	0.2161
DEC	-0.061620	0.021078	-2.923349	0.0043
ARTCPUS(-1)	0.443401	0.073629	6.022075	0.0000

R-squared	0.965443	Mean dependent var	0.476347
Adjusted R-squared	0.957164	S.D. dependent var	0.169226
S.E. of regression	0.035025	Akaike info criterion	-3.688681
Sum squared resid	0.117765	Schwarz criterion	-3.131182
Log likelihood	245.3208	Hannan-Quinn criter.	-3.462278
F-statistic	116.6105	Durbin-Watson stat	1.734857
Prob(F-statistic)	0.000000		

C2. FETCPUS, Petrochemical feedstock consumption, million barrels per day

Dependent Variable: FETCPUS
Method: Least Squares
Date: 04/25/11 Time: 15:54
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.168628	0.086985	-1.938580	0.0553
ZO28IUS	0.004816	0.001249	3.855404	0.0002
NGHHUUS-(WTIPUUS/5.8)	0.008465	0.001993	4.247266	0.0000
D0402	0.205145	0.060223	3.406428	0.0009
D0509	-0.218534	0.060971	-3.584248	0.0005
D0601	0.307875	0.060453	5.092841	0.0000
FEB	-0.030864	0.026922	-1.146426	0.2543
MAR	0.021568	0.026254	0.821493	0.4133
APR	0.034659	0.026277	1.318987	0.1901
MAY	0.038681	0.026367	1.467024	0.1454
JUN	0.019377	0.026530	0.730390	0.4668
JUL	0.059745	0.026639	2.242767	0.0271
AUG	0.033130	0.026951	1.229297	0.2218
SEP	0.029425	0.027517	1.069312	0.2875
OCT	0.013322	0.026350	0.505591	0.6142
NOV	0.040606	0.026325	1.542477	0.1261
DEC	0.005965	0.026238	0.227354	0.8206
FETCPUS(-1)	0.582420	0.071204	8.179599	0.0000

R-squared	0.787344	Mean dependent var	0.608259
Adjusted R-squared	0.751901	S.D. dependent var	0.114505
S.E. of regression	0.057034	Akaike info criterion	-2.752845
Sum squared resid	0.331798	Schwarz criterion	-2.334721
Log likelihood	183.1707	Hannan-Quinn criter.	-2.583043
F-statistic	22.21453	Durbin-Watson stat	2.025050
Prob(F-statistic)	0.000000		

C3. MZTCPUS, Remaining miscellaneous products consumption, million barrels per day

Dependent Variable: MZTCPUS
Method: Least Squares
Date: 04/25/11 Time: 16:04
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.247032	0.045808	5.392761	0.0000
ZOMNIUS	0.001627	0.000474	3.429754	0.0009
@TREND(2000:12)	-0.000846	0.000114	-7.424980	0.0000
D0111	0.079968	0.028987	2.758718	0.0069
D0306	-0.064963	0.028336	-2.292584	0.0240
D0312	0.100367	0.028320	3.544072	0.0006
D0602	0.109987	0.028404	3.872293	0.0002
D0801	-0.097805	0.028696	-3.408337	0.0009
D1001	-0.102467	0.028850	-3.551700	0.0006
FEB	-0.058170	0.013153	-4.422480	0.0000
MAR	-0.035352	0.012644	-2.795925	0.0062
APR	-0.061470	0.012673	-4.850442	0.0000
MAY	-0.062044	0.012720	-4.877842	0.0000
JUN	-0.050699	0.013045	-3.886492	0.0002
JUL	-0.068492	0.012716	-5.386458	0.0000
AUG	-0.068451	0.012827	-5.336353	0.0000
SEP	-0.084331	0.012844	-6.565910	0.0000
OCT	-0.057842	0.013113	-4.410968	0.0000
NOV	-0.070092	0.013084	-5.356901	0.0000
DEC	-0.062092	0.013092	-4.742723	0.0000
MZTCPUS(-1)	0.082080	0.081323	1.009303	0.3153

R-squared	0.771237	Mean dependent var	0.312974
Adjusted R-squared	0.725023	S.D. dependent var	0.050700
S.E. of regression	0.026586	Akaike info criterion	-4.259208
Sum squared resid	0.069977	Schwarz criterion	-3.771397
Log likelihood	276.5525	Hannan-Quinn criter.	-4.061105
F-statistic	16.68814	Durbin-Watson stat	1.980993
Prob(F-statistic)	0.000000		

C4. PCTCPUS, Petroleum coke consumption, million barrels per day

Dependent Variable: PCTCPUS
Method: Least Squares
Date: 04/25/11 Time: 16:16
Sample: 2000M01 2010M12
Included observations: 132

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.017987	0.105031	-0.171259	0.8643
ZOTOIUS	0.002160	0.001301	1.660490	0.0996
ZWHDDUS/ZSAJQUS	-0.006652	0.002785	-2.388574	0.0186
NGEUDUS/CLEUDUS	0.004750	0.004454	1.066417	0.2885
D0105	-0.017847	0.052431	-0.340386	0.7342
D0405	0.157316	0.052416	3.001290	0.0033
D0609	0.106498	0.052652	2.022677	0.0455
D0809	-0.134218	0.052012	-2.580519	0.0112
D0810	0.114726	0.052874	2.169820	0.0322
FEB	0.006302	0.021697	0.290468	0.7720
MAR	0.079333	0.022180	3.576831	0.0005
APR	0.034516	0.021199	1.628150	0.1063
MAY	0.057932	0.022530	2.571379	0.0115
JUN	0.062166	0.021129	2.942238	0.0040
JUL	0.044620	0.021223	2.102383	0.0378
AUG	0.056087	0.021315	2.631400	0.0097
SEP	0.061433	0.022355	2.748016	0.0070
OCT	-0.008484	0.021633	-0.392167	0.6957
NOV	0.057751	0.021842	2.644097	0.0094
DEC	0.075660	0.021410	3.533873	0.0006
PCTCPUS(-1)	0.462512	0.078438	5.896554	0.0000

R-squared	0.569724	Mean dependent var	0.461306
Adjusted R-squared	0.492197	S.D. dependent var	0.069148
S.E. of regression	0.049275	Akaike info criterion	-3.037879
Sum squared resid	0.269514	Schwarz criterion	-2.579251
Log likelihood	221.5000	Hannan-Quinn criter.	-2.851513
F-statistic	7.348702	Durbin-Watson stat	2.223658
Prob(F-statistic)	0.000000		

C5. SGTCPUS, Still gas consumption, million barrels per day

Dependent Variable: SGTCPUS
Method: Least Squares
Date: 04/25/11 Time: 16:28
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.073584	0.043133	-1.706004	0.0911
CORIPUS	0.036034	0.003173	11.35748	0.0000
UORIPUS	0.018331	0.008015	2.286924	0.0243
D01	-0.014207	0.004282	-3.317746	0.0013
D02	-0.010021	0.004132	-2.425170	0.0171
D0501	-0.039719	0.013498	-2.942494	0.0040
D0505	-0.036692	0.013412	-2.735701	0.0074
D1002	0.035541	0.013586	2.615993	0.0103
FEB	0.001119	0.005996	0.186668	0.8523
MAR	0.007723	0.005887	1.311928	0.1925
APR	0.008192	0.006396	1.280820	0.2032
MAY	0.012868	0.006850	1.878395	0.0632
JUN	0.011150	0.006982	1.596897	0.1134
JUL	0.011703	0.007219	1.621044	0.1082
AUG	0.013331	0.006886	1.935869	0.0557
SEP	-0.002405	0.006683	-0.359824	0.7197
OCT	-0.014232	0.005905	-2.410152	0.0178
NOV	-0.009011	0.006395	-1.409013	0.1619
DEC	-0.003766	0.006591	-0.571393	0.5690
SGTCPUS(-1)	0.300027	0.060004	5.000080	0.0000

R-squared	0.903893	Mean dependent var	0.683460
Adjusted R-squared	0.885633	S.D. dependent var	0.037387
S.E. of regression	0.012644	Akaike info criterion	-5.752299
Sum squared resid	0.015986	Schwarz criterion	-5.287717
Log likelihood	365.1380	Hannan-Quinn criter.	-5.563630
F-statistic	49.50044	Durbin-Watson stat	1.605296
Prob(F-statistic)	0.000000		

C6. UOTCPUS, Unfinished oils consumption, million barrels per day

Dependent Variable: UOTCPUS
Method: Least Squares
Date: 04/25/11 Time: 16:34
Sample: 2001M01 2010M12
Included observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003540	0.022859	0.154872	0.8772
D0202	-0.213088	0.072548	-2.937180	0.0041
D0212	-0.186881	0.072466	-2.578886	0.0114
D0501	-0.180372	0.072602	-2.484384	0.0146
D0504	-0.213126	0.072526	-2.938639	0.0041
D0506	0.254695	0.072745	3.501222	0.0007
D0606	0.246559	0.072762	3.388570	0.0010
FEB	0.070876	0.032398	2.187683	0.0310
MAR	-0.019272	0.031674	-0.608444	0.5443
APR	0.015769	0.032336	0.487659	0.6268
MAY	-0.004813	0.031509	-0.152759	0.8789
JUN	-0.077182	0.033330	-2.315725	0.0226
JUL	-0.070518	0.031580	-2.233004	0.0278
AUG	-0.013675	0.032081	-0.426281	0.6708
SEP	-0.045086	0.031661	-1.423990	0.1575
OCT	0.011267	0.031822	0.354072	0.7240
NOV	-0.000162	0.031514	-0.005139	0.9959
DEC	0.024726	0.032326	0.764880	0.4461
UOTCPUS(-1)	0.356410	0.075623	4.713005	0.0000

R-squared	0.495698	Mean dependent var	-0.012963
Adjusted R-squared	0.405822	S.D. dependent var	0.088958
S.E. of regression	0.068571	Akaike info criterion	-2.377596
Sum squared resid	0.474901	Schwarz criterion	-1.936243
Log likelihood	161.6558	Hannan-Quinn criter.	-2.198361
F-statistic	5.515371	Durbin-Watson stat	1.764103
Prob(F-statistic)	0.000000		