

Motor Fuel and Special Fuel Trends

By

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Introduction

Each state and the District of Columbia report monthly motor fuel and special fuel taxable sales to the Federal Highway Administration (FHWA). Then, with about a 3-month time lag, the FHWA publishes a report summarizing the state provided information. These reports may be found on the FHWA Web site at http://www.fhwa.dot.gov/policyinformation/motorfuelhwy_trustfund.cfm.

The series published by the FHWA have changed over time. The monthly motor fuel series dates from January 1999 and the monthly special fuel series dates from January 2003. Each of these series consists of an aggregation of several grades of fuel. The motor fuel series aggregates regular gasoline, premium gasoline, and a number of ethanol fuel blends. The special fuel series includes primarily diesel fuel, but in addition a small amount of liquefied petroleum gas.

Some states, like Iowa, publish monthly data on taxable fuel sales with a shorter time lag and with additional detail on different fuel types, but the FHWA report is the only source of data for all states and the District of Columbia. The month designated in the FHWA reports represents the month during which the motor fuel taxes were remitted to the states. Generally, taxes are remitted the month following the distribution of fuels from terminals to retail locations.

Data Issues and Considerations

Data Variability

A review of the data reveals some unusual variability in terms of month-to-month changes in gallonage amounts and in terms of year-to-year absolute and percentage changes. Some of the variation is due to seasonal factors, which is discussed in the next section. Other sources of variability likely include late submissions of monthly reports and tax revenues by motor fuel vendors. This results in usually low gallonage amounts reported one month followed by offsetting usually high gallonage amounts reported the following month. For example, in January 2004 motor fuel gallons reported by New Mexico decreased by 28.18% compared to January 2003, but in February 2004 this drop was offset by a 29.85% year-over-year increase in reported gallons. Such reporting distortions should balance out over two or three months. Another possible source of variation is usual weather events, which can both affect fuel usage patterns and cause reporting delays.

Seasonal Variation

Given seasonal differences in weather, holidays, and vacations, as well as seasonal variations in different types of business activities, motor fuel and special fuel consumption may logically be expected to exhibit seasonal variation. Also, particularly because of differences in weather patterns around the country seasonal variations in motor fuel and special fuel consumption may be expected to differ by region.

The following table presents for the entire nation monthly shares of motor fuel and special fuel consumption averaged over all years for which data exists, the most recent five years, and the most recent year.

Table 1: U.S. Monthly Motor Fuel and Special Fuel Consumption Shares

Month	Motor Fuel			Special Fuel		
	All Years	5-Years	1-Year	All Years	5-Years	1-Year
January	7.83%	7.97%	7.91%	7.76%	7.85%	7.65%
February	7.61%	7.65%	7.66%	7.47%	7.55%	7.33%
March	8.24%	8.31%	8.32%	8.57%	8.70%	8.91%
April	8.28%	8.27%	8.16%	8.18%	8.13%	7.94%
May	8.64%	8.61%	8.56%	8.25%	8.33%	8.27%
June	8.55%	8.55%	8.62%	8.82%	8.90%	9.20%
July	8.72%	8.70%	8.58%	8.27%	8.20%	7.98%
August	8.76%	8.68%	8.64%	8.47%	8.45%	8.57%
September	8.29%	8.28%	8.54%	8.86%	8.81%	9.02%
October	8.42%	8.44%	8.38%	8.59%	8.48%	8.19%
November	8.21%	8.20%	8.26%	8.08%	8.02%	8.22%
December	8.45%	8.35%	8.38%	8.67%	8.58%	8.71%

Seasonal factors may also be expected to vary by region of the country. Table 2 presents regional monthly shares for motor fuel consumption and Table 3 presents regional monthly shares for special fuel consumption. The share factors presented in each table reflect averages over the five years from 2007 through 2011. The eight regions presented in each table are the same as defined by U.S. Bureau of Economic Analysis.

- New England (NE) – Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont
- Mideast (ME) – Delaware, District of Columbia, Maryland, New Jersey, New York, and Pennsylvania
- Great Lakes (GL) – Illinois, Indiana, Michigan, Ohio, and Wisconsin
- Plains (PL) – Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota
- Southeast (SE) – Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia
- Southwest (SW) – Arizona, New Mexico, Oklahoma, and Texas
- Rocky Mountain (RM) – Colorado, Idaho, Montana, Utah, and Wyoming
- Far West (FW) – Alaska, California, Hawaii, Nevada, Oregon, and Washington.

Table 2: Regional Monthly Motor Fuel Consumption Shares

Month	Regions							
	NE	ME	GL	PL	SE	SW	RM	FW
January	8.13%	8.18%	7.76%	7.80%	8.04%	7.96%	7.83%	7.95%
February	7.46%	7.39%	7.67%	7.31%	7.72%	7.82%	7.51%	7.87%
March	8.13%	8.25%	8.07%	8.13%	8.34%	8.54%	8.00%	8.53%
April	7.93%	8.10%	8.28%	8.08%	8.43%	8.39%	7.87%	8.31%
May	8.45%	8.75%	8.64%	8.63%	8.61%	8.57%	8.33%	8.60%
June	8.39%	8.42%	8.58%	8.77%	8.76%	8.33%	8.50%	8.39%
July	8.63%	8.68%	8.92%	8.87%	8.65%	8.43%	9.09%	8.67%
August	8.84%	8.50%	8.79%	8.92%	8.57%	8.61%	9.00%	8.73%
September	9.13%	8.30%	8.27%	8.35%	8.14%	8.14%	8.70%	8.26%
October	8.46%	8.56%	8.53%	8.57%	8.28%	8.42%	8.84%	8.39%
November	8.08%	8.37%	8.08%	8.19%	8.22%	8.44%	8.02%	7.98%
December	8.35%	8.50%	8.43%	8.39%	8.26%	8.35%	8.33%	8.31%

Table 3: Regional Monthly Special Fuel Consumption Shares

Month	Regions							
	NE	ME	GL	PL	SE	SW	RM	FW
January	7.30%	7.86%	7.80%	7.32%	8.20%	7.93%	7.75%	7.61%
February	7.70%	7.54%	7.50%	6.89%	7.79%	8.08%	6.93%	7.08%
March	8.76%	9.19%	8.83%	8.77%	8.66%	8.59%	7.92%	8.55%
April	7.75%	7.79%	7.99%	7.37%	8.62%	8.33%	7.87%	8.09%
May	8.38%	8.40%	8.11%	8.22%	8.45%	8.55%	8.27%	8.09%
June	8.86%	9.50%	8.93%	9.10%	8.89%	8.44%	8.65%	8.92%
July	7.84%	7.67%	8.26%	7.89%	8.11%	8.22%	9.14%	8.75%
August	8.46%	8.12%	8.31%	8.60%	8.40%	8.71%	8.75%	8.43%
September	9.40%	9.12%	8.99%	9.59%	8.49%	8.19%	8.86%	9.03%
October	7.90%	8.06%	8.62%	8.57%	8.33%	8.60%	9.33%	8.59%
November	8.13%	7.76%	7.81%	8.41%	8.12%	8.26%	8.41%	7.50%
December	9.53%	8.98%	8.83%	9.25%	7.93%	8.10%	8.12%	9.35%

As Table 2 shows the region that exhibits the highest degree of seasonal variation in motor fuel consumption is the New England region with a 1.67 percentage point spread between the month with the highest share of annual consumption (September at 9.13%) and the month with the lowest share of annual consumption (February at 7.46%). The Southwest region, on the other hand, exhibits the least seasonal variation in motor fuel consumption with only a 0.79 percentage point spread between its highest (August at 8.61%) and lowest (February at 7.82%) consumption months.

Similarly, for special fuel consumption Table 3 shows that the Plains region exhibits the greatest seasonal variation with a spread of 2.70 percentage points between its highest (September at 9.59%) and lowest (February at 6.89%) share months. The Southwest region again exhibits the smallest spread – 0.78 percentage point – between its highest (August at 8.71%) and lowest (January at 7.93%) consumption share months.

Most likely differences in weather and vacation travel times in the New England and the Southwest regions explain most of the difference between their respective seasonal motor fuel consumption patterns. For special fuel weather is again a dominant factor in explaining seasonal variations in consumption, but particularly for the Plains and Great Lakes regions agricultural harvests raise consumption during September.

Trend Analysis

The primary focus of this analysis is variations in motor fuel and special fuel consumption due to national and regional macroeconomic factors. Both motor fuel and special fuel consumption are sensitive to fluctuations in economic activity. Changes in the size of the workforce, shopping habits, and recreational and vacation activities in response to economic conditions influence personal travel and as a consequence motor fuel consumption. Since commercial motor freight carriers account for most of the consumption of special fuels changes in manufacturing, construction, agricultural, and retail activity strongly influence the demand for diesel and other special fuels.

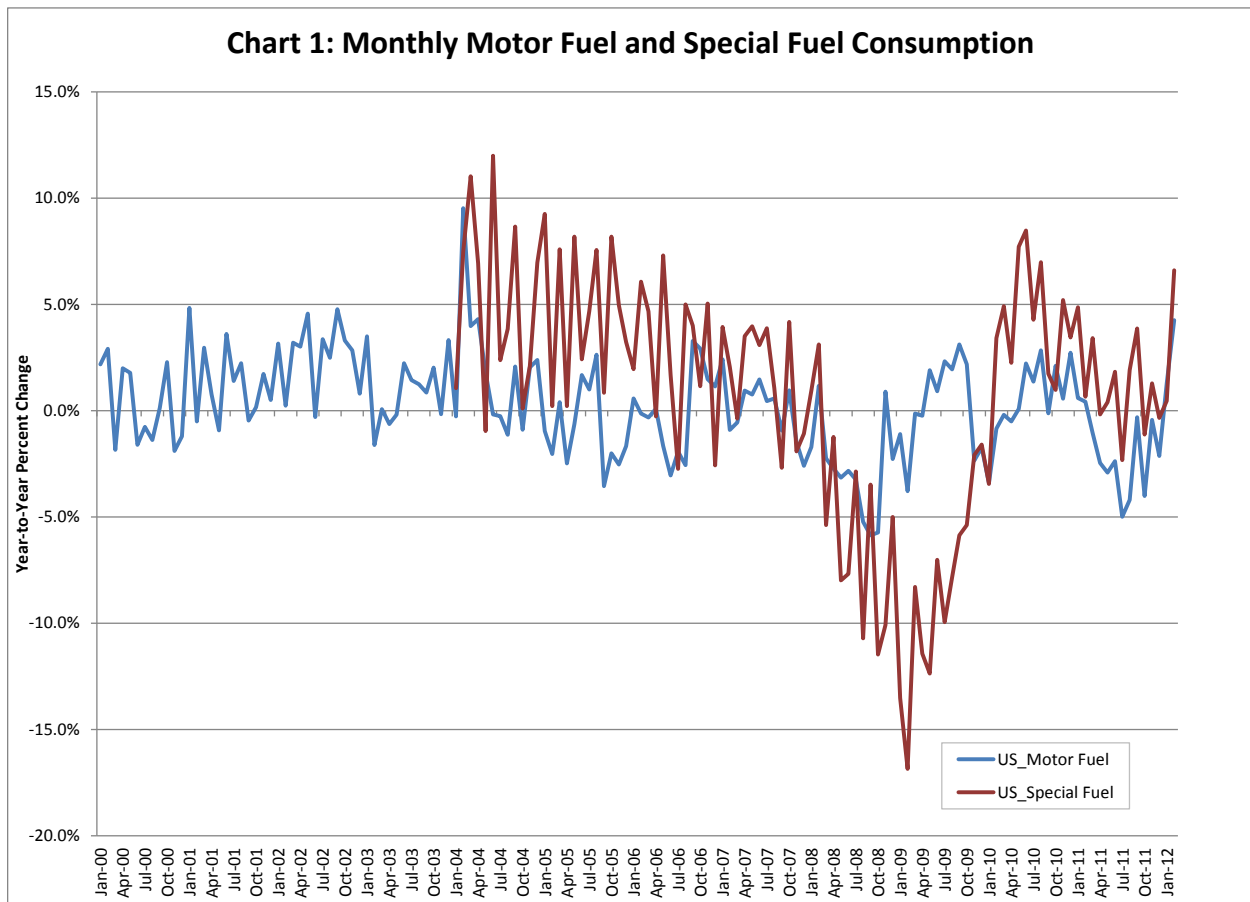
The consumption of transportation fuels also responds to variations in price. However, the most significant consumption responses to price occur over many years and are due to changes in motor vehicle technology, the availability of alternative fuels, shopping habits, and where people choose to live. Estimates of the short-term price elasticity of gasoline range between -0.10 and -0.20. Estimates of the short-term price elasticity of diesel fuel range between -0.05 and -0.15. Consequently, changes in motor fuel and special fuel consumption that are the focus of this analysis largely discount the influence of short-term price fluctuations on changes in consumption.

In addition, the analysis controls for the impact of seasonal variation in the demand for motor fuel and special fuel by making consumption comparisons on a same month year-to-year basis. The analysis tracks two measures of changes in consumption for each of the two fuel consumption series. The first measure consists of same month year-to-year percentage changes. Moving 3-month year-to-year percentage change series for the two fuel types are also tracked. The second measure consists of 1-month, 3-month, and 6-month diffusion indices, which reflect how widely disperses changes in consumption are spread throughout the country.

Year-to-Year Percent Change in Consumption

Even with the impact of seasonal variation minimized by computing changes in motor fuel and special fuel consumption on a year-to-year percentage basis, both series exhibit considerable volatility. The most likely cause of this volatility is irregularity in the filing and processing of reports submitted by fuel vendors to the states.

Chart 1 shows the amount of volatility in the motor fuel and the special fuel year-to-year percent change series. As indicated previously, the motor fuel data series starts in January 1999 and the special fuel data series starts in January 2003.



In order to reduce the volatility of the motor fuel and the special fuel series 3-month centered moving averages have been computed for each. These series are presented in Chart 2. Year-to-year percent change series for total U.S. non-farm employment and for U.S. manufacturing employment are also presented in Chart 2. The two employment series provide perspective for the changes exhibited by the fuel consumption series over the most recent economic cycle.

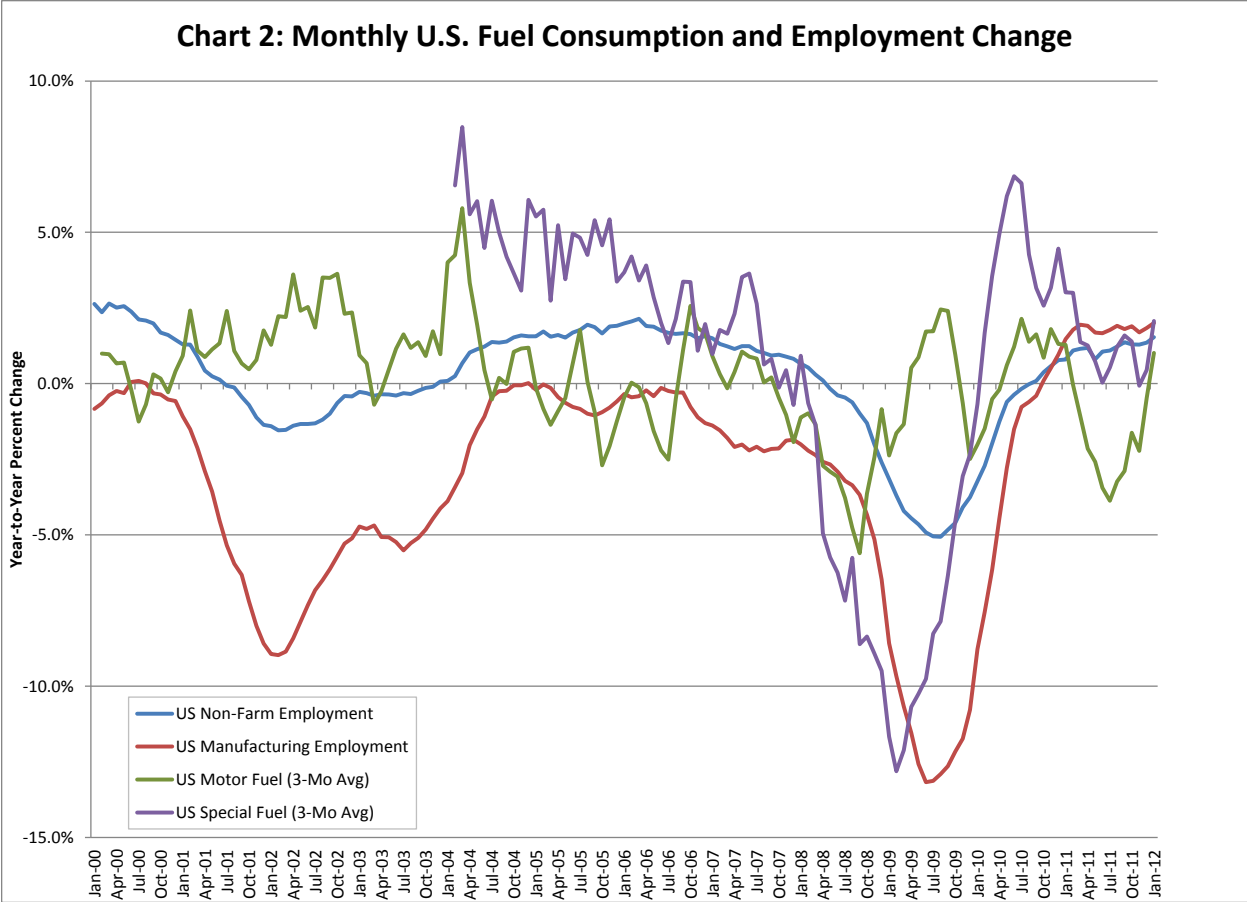


Chart 2 shows a strong similarity in the cyclical variation and magnitude of decline in the year-to-year rates of change for the special fuel and manufacturing employment series during the most recent recession. Although less obvious, there appears to be some correspondence between the year-to-year percent change in motor fuel consumption and total U.S. non-farm employment.

Table 4 summarizes the 1-month and moving 3-month year-to-year percentage changes in motor fuel consumption for the nation and the eight Bureau of Economic Analysis regions. Table 5 provides similar data for special fuel consumption. Each table covers the most recent twelve months.

Focusing first on the 1-month year-to-year percentage changes, nationally motor fuel consumption decreased from March through December 2011. However, during the two most recent months for which data is available consumption growth has turned positive, by 1.28% during January 2012 and by 4.26% during February 2012. Also, during January six of the eight regions experienced positive growth in motor fuel consumption and during February all eight regions experienced positive growth. The region with the strongest growth during February was the Southeast at 7.21% followed by the Southwest at 5.94%. The weakest growth was in New England at 0.61%. However, averaged over the most recent three months the Plains region experienced the highest rate of growth in motor fuel consumption at 3.69%.

Table 4: Motor Fuel Consumption Year-to-Year Percent Change

Month	Regions – 1-Month Year-to-Year Percent Change								
	US	NE	ME	GL	PL	SE	SW	RM	FW
March	-1.05%	-1.20%	-0.61%	-0.61%	-1.98%	-1.42%	-1.33%	4.85%	-1.60%
April	-2.46%	-2.83%	-10.10%	-4.62%	-2.90%	1.43%	-0.02%	-0.18%	-3.12%
May	-2.91%	-3.91%	-4.64%	-2.68%	-0.85%	-3.51%	-0.06%	-3.48%	-3.53%
June	-2.38%	-1.52%	-3.66%	-2.67%	-2.36%	-2.04%	-1.47%	-4.55%	-2.16%
July	-5.00%	-4.09%	-18.21%	-2.07%	-3.86%	-4.73%	2.45%	-6.47%	-2.75%
August	-4.20%	-0.56%	-12.66%	-2.11%	-1.14%	-6.23%	-4.32%	13.50%	-1.47%
September	-0.30%	-2.52%	-1.74%	-1.98%	0.08%	2.41%	-0.25%	-2.35%	-1.27%
October	-4.01%	-1.88%	-8.61%	-0.72%	-2.29%	-5.44%	-3.10%	-7.03%	-1.89%
November	-0.43%	-1.95%	1.44%	-1.93%	-2.53%	0.73%	0.06%	0.14%	-1.84%
December	-2.13%	-3.17%	-2.23%	-3.75%	0.10%	-2.82%	-0.75%	-3.76%	-0.75%
January	1.28%	0.14%	4.99%	2.32%	6.27%	0.70%	-1.46%	1.81%	-1.83%
February	4.26%	5.73%	1.20%	3.26%	5.15%	7.21%	5.94%	3.34%	0.61%

Month	Regions – 3-Month Year-to-Year Percent Change								
	US	NE	ME	GL	PL	SE	SW	RM	FW
February	-0.04%	-0.13%	2.64%	-0.02%	0.19%	-1.80%	-0.85%	3.58%	0.73%
March	-1.07%	-1.20%	-1.20%	-2.16%	-1.37%	-0.55%	-1.25%	2.82%	-1.38%
April	-2.15%	-2.67%	-5.11%	-2.65%	-1.89%	-1.21%	-0.47%	0.28%	-2.75%
May	-2.59%	-2.76%	-6.08%	-3.29%	-2.02%	-1.43%	-0.51%	-2.82%	-2.94%
June	-3.44%	-3.19%	-9.04%	-2.47%	-2.38%	-3.42%	0.28%	-4.91%	-2.82%
July	-3.87%	-2.07%	-11.70%	-2.28%	-2.45%	-4.32%	-1.21%	0.34%	-2.12%
August	-3.24%	-2.39%	-11.17%	-2.05%	-1.68%	-3.02%	-0.81%	1.02%	-1.84%
September	-2.89%	-1.63%	-7.79%	-1.61%	-1.12%	-3.25%	-2.61%	0.92%	-1.55%
October	-1.62%	-2.21%	-3.11%	-1.53%	-1.58%	-0.87%	-1.10%	-3.22%	-1.67%
November	-2.22%	-2.34%	-3.26%	-2.15%	-1.57%	-2.57%	-1.26%	-3.70%	-1.49%
December	-0.47%	-1.70%	1.36%	-1.27%	1.14%	-0.51%	-0.69%	-0.69%	-1.46%
January	1.02%	0.70%	1.28%	0.42%	3.69%	1.49%	1.16%	0.29%	-0.66%

Table 5: Special Fuel Consumption Year-to-Year Percent Change

Month	Regions – 1-Month Year-to-Year Percent Change								
	US	NE	ME	GL	PL	SE	SW	RM	FW
March	3.41%	2.20%	14.39%	6.84%	-4.05%	-0.62%	4.05%	20.60%	-2.05%
April	-0.18%	0.38%	-9.66%	-1.91%	-0.94%	1.09%	4.92%	0.09%	1.47%
May	0.40%	-4.95%	-1.72%	-0.47%	5.92%	-1.67%	5.26%	-6.95%	1.68%
June	1.83%	-0.41%	0.93%	4.16%	3.67%	-1.21%	8.83%	0.26%	-2.36%
July	-2.33%	2.85%	-0.64%	-3.91%	-4.02%	-6.97%	7.11%	-2.85%	-2.86%
August	1.91%	-1.20%	-6.51%	5.00%	4.75%	-0.19%	2.07%	12.60%	4.77%
September	3.87%	-1.85%	-2.39%	3.08%	2.23%	3.26%	9.46%	13.37%	4.18%
October	-1.12%	4.26%	0.56%	-4.48%	0.70%	-7.17%	9.72%	-3.07%	0.56%
November	1.29%	-1.24%	4.12%	1.81%	-0.83%	2.80%	5.10%	-4.84%	-5.63%
December	-0.34%	-1.03%	-1.85%	-0.44%	2.89%	-3.57%	6.75%	-5.94%	-1.40%
January	0.46%	-0.64%	1.95%	3.64%	0.21%	-2.94%	5.10%	1.74%	-3.62%
February	6.61%	-2.47%	-2.49%	3.53%	5.65%	11.47%	7.99%	16.69%	5.12%

Month	Regions – 3-Month Year-to-Year Percent Change								
	US	NE	ME	GL	PL	SE	SW	RM	FW
February	3.00%	7.09%	9.10%	5.02%	2.45%	-1.15%	3.79%	14.42%	-1.37%
March	1.38%	1.16%	2.22%	2.22%	0.36%	-1.12%	4.69%	10.21%	-1.62%
April	1.26%	-0.80%	1.38%	1.67%	0.06%	-0.41%	4.75%	3.47%	0.28%
May	0.73%	-1.64%	-3.24%	0.80%	3.01%	-0.62%	6.34%	-2.29%	0.13%
June	0.03%	-0.87%	-0.40%	0.04%	1.92%	-3.21%	7.05%	-3.15%	-1.29%
July	0.53%	0.33%	-1.98%	1.76%	1.68%	-2.72%	5.91%	2.74%	-0.27%
August	1.21%	-0.19%	-3.27%	1.34%	1.20%	-1.27%	6.09%	7.24%	2.00%
September	1.59%	0.29%	-2.80%	1.17%	2.57%	-1.39%	6.87%	7.25%	3.18%
October	1.39%	0.29%	0.60%	0.10%	0.75%	-0.46%	8.00%	1.77%	-0.08%
November	-0.07%	0.61%	0.79%	-1.10%	0.98%	-2.75%	7.08%	-4.57%	-2.05%
December	0.45%	-0.97%	1.23%	1.53%	0.86%	-1.24%	5.66%	-3.17%	-3.40%
January	2.07%	-1.34%	-0.82%	2.05%	2.89%	1.34%	6.64%	3.58%	-0.19%

The consumption of special fuels decreased four of the past 12 months and increased eight of the past 12 months. The strongest increase came during the most recent month for which data is available (February 2012) at 6.61%. Only the Southwest region experienced growth in special fuel consumption each of the past 12 months. During February 2012 this region experienced special fuel consumption growth of 7.99%. Two other regions – the Southeast at 11.47% and the Rocky Mountain at 16.69% -- experienced higher rates of special fuel consumption growth during February. The New England and Mideast regions experienced decreases in special fuel consumption during February.

Diffusion Indices

1-month, 3-month, and 6-month diffusion indices have been computed for motor fuel and special fuel. These indices since the beginnings of the respective fuel consumption series are illustrated in Charts 3 and 4.

These diffusion indices measure the degree to which year-to-year gains in fuel consumption are dispersed throughout the country. The computation of the 1-month diffusion index consists of three steps. First, the monthly year-to-year percent change in fuel consumption is computed for each state and the District of Columbia. Second, values of 1, 0.5, and 0 are assigned to each state for each month depending on whether the year-to-year percent change is greater than or equal to 0.05 percent, less than 0.05 percent but greater than or equal to -0.05 percent, or less than -0.05 percent, respectively. Third, the index weights are summed over all states, divided by 51 and then multiplied by 100. The same method is used to compute the 3-month diffusion index, except the year-to-year percent changes in fuel consumption are computed on the basis of 3-month moving sums of fuel consumption. The 6-month diffusion index computes the year-to-year percent changes on the basis of 6-month moving sums of fuel consumption.

The values of the three motor fuel and the three special fuel diffusion indices for the most recent twelve months (March 2011 – February 2012) are presented in Table 6. In February 2012 the 1-month, 3-month, and 6-month diffusion indices for motor fuel equaled 80.4, 63.7, and 29.4, respectively. These values indicate that motor fuel consumption appears to be coming out of a slump that lasted through all of 2010. From January 2011 to July 2011 the 1-month index dropped from 58.8 to 11.8. By December the 1-month index had only risen back to 18.6, but in January 2012 the index took a large jump to 60.8. Annual motor fuel consumption totals for 2011 confirm this downturn. During 2011 annual motor fuel consumption decreased in every region of the country ranging from a 4.68% decrease in the Mideast region to a 0.58% decrease in the Rocky Mountain region. Only eight states experienced increases in motor fuel consumption during the year. These states were Hawaii (12.29%), North Dakota (5.73%), New Mexico (3.82%), Utah (3.72%), West Virginia (1.90%), South Dakota (1.02%), Iowa (0.45%), and Louisiana (0.13%).

For special fuel in February 2012 the 1-month, 3-month, and 6-month diffusion indices had values of 72.5, 54.9, and 49.0, respectively. Although the values of the diffusion indices for special fuel also show a consumption slowdown during 2011, this was not as severe as for motor fuel. Only the Southeast and Far West regions experienced decreases in special fuel consumption during the year.

Chart 3: Motor Fuel Consumption Change Diffusion Indices

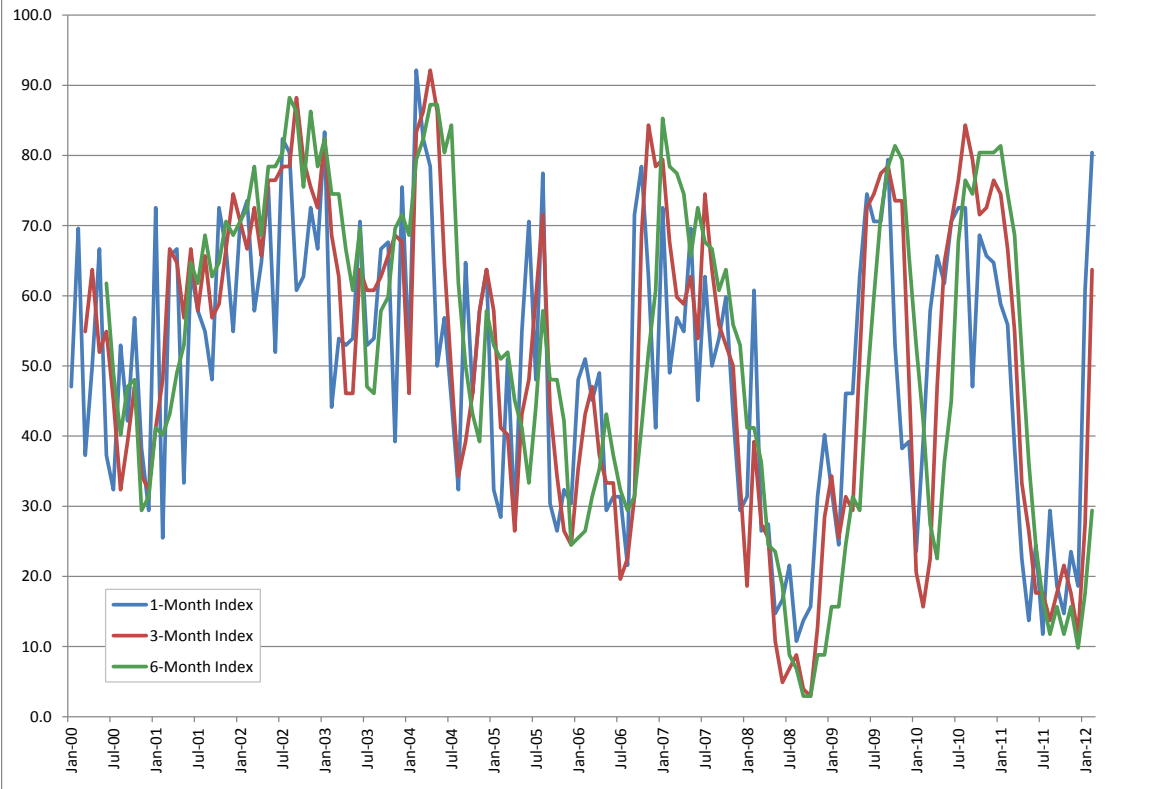


Chart 4: Special Fuel Consumption Change Diffusion Indices

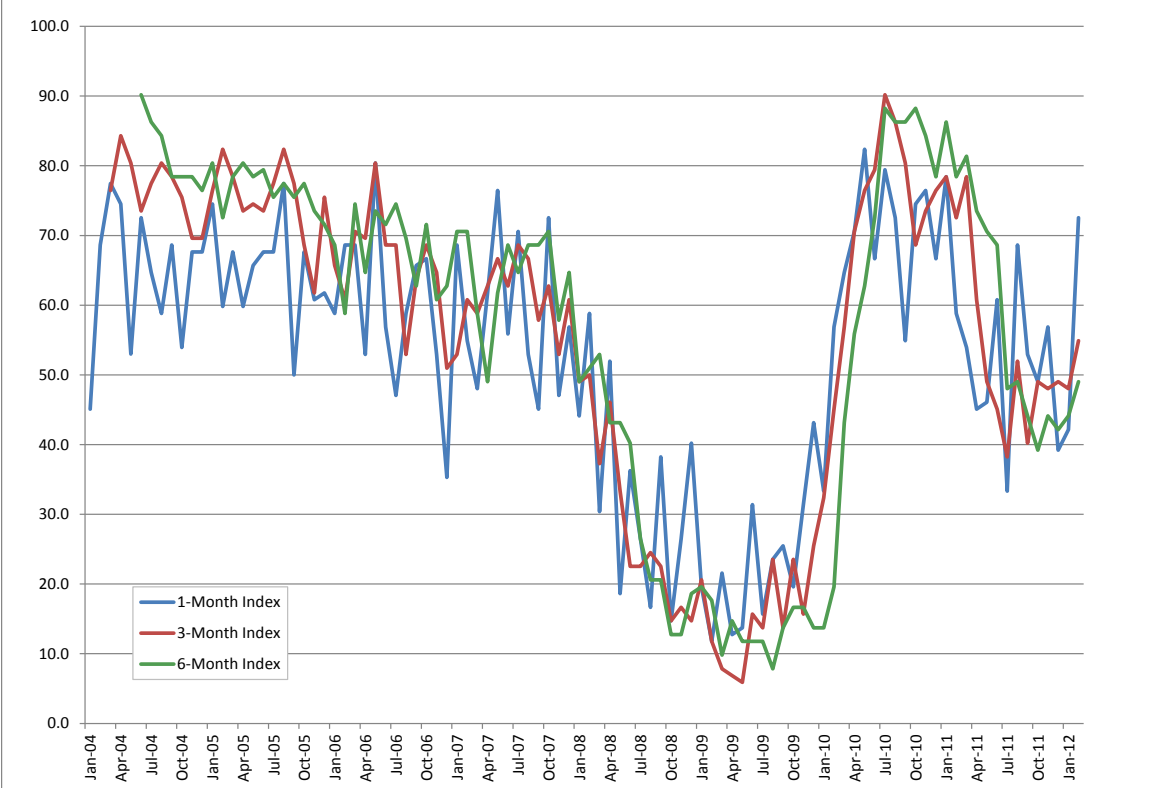


Table 6: Motor Fuel and Special Fuel Diffusion Indices, March 2011 – February 2012

Month	Motor Fuel			Special Fuel		
	1-Month	3-Month	6-Month	1-Month	3-Month	6-Month
March	38.235	54.902	68.627	53.922	78.431	81.373
April	22.549	33.333	51.961	45.098	60.784	73.529
May	13.725	26.471	36.275	46.078	49.020	70.588
June	24.510	17.647	24.510	60.784	45.098	68.627
July	11.765	17.647	16.667	33.333	38.235	48.039
August	29.412	13.725	11.765	68.627	51.961	49.020
September	18.627	17.647	15.686	52.941	40.196	44.118
October	14.706	21.569	11.765	49.020	49.020	39.216
November	23.529	17.647	15.686	56.863	48.039	44.118
December	18.627	11.765	9.804	39.216	49.020	42.157
January	60.784	27.451	17.647	42.157	48.039	44.118
February	80.392	63.725	29.412	72.549	54.902	49.020

Observations

- Motor fuel consumption has exhibited a pronounced recovery since the beginning of 2012. Nationally, year-to-year consumption increased by 1.28% during January and by 4.26% during February. This was after declining every month during 2011.
- On a 3-month year-to-year basis the Plains region has exhibited the strongest growth in recent months. The percentage increase over the most recent three months in the Plains region was 3.69%. Except for the Far West, all the other regions of the country exhibited motor fuel consumption growth over the three most recent months for which data is available.
- Although even the moving 3-month percent change motor fuel series exhibits considerable volatility, it's direction of change does appear to provide a leading indication by as much as 10 months to changes in total U.S. non-farm employment.
- In February 2012 the 1-month diffusion index for motor fuel reached 80.4.
- The moving 3-month year-to-year percent change special fuel series shows a close correspondence to movements in U.S. manufacturing employment. During the most recent recession this special fuel series bottomed out in February 2009 four months prior to U.S. manufacturing employment reaching its point of greatest decline in June 2009.
- In February 2012 the national year-to-year growth rate for special fuel increased to 6.61% from 0.46% in January. The national 3-month centered year-to-year growth rate for January, which covers the months from December 2011 through February 2012, equaled 2.07%. Of the eight regions the Southwest had the highest 3-month year-to-year growth rate for January at 6.64%. Three regions had negative 3-month year-to-year growth rates. They are New England (-1.34%), Mideast (-0.82%), and Far West (-0.19%).
- In February, the 1-month special fuel diffusion index increased to 72.5 from 42.2 in January.