

## Price and expenditure measures of petroleum products: a comparison

*Price changes in petroleum products are closely correlated among the three price programs of the Bureau of Labor Statistics; changes in the BLS petroleum-product CPI also correlate with changes in consumer spending on those products, as measured by the Consumer Expenditure Survey*

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Political events in oil-producing countries, hurricanes in the Gulf of Mexico, and increasing global demand for petroleum products have all contributed to sharp increases in recent years in prices of crude oil and of petroleum products derived from crude oil. From January 2000 to July 2006, the average price for a gallon of unleaded regular gasoline in the United States increased 130.5 percent.<sup>1</sup> Personal consumption expenditures on gasoline rose from \$175.7 billion to \$287.3 billion from 2000 to 2005.<sup>2</sup> Rising prices and increasing expenditures are a concern for consumers, business leaders, and Federal policymakers. As a result, reliable information on the prices and costs of crude oil and petroleum products is more vital than ever in making decisions at all levels of the economy.

The Bureau of Labor Statistics (BLS, the Bureau) conducts price and consumer expenditure surveys that measure both changes in prices of, and expenditures for, petroleum products throughout the various levels of the economy. This article introduces the programs that carry out these surveys, describes the petroleum data compiled by those programs, explains the methodology underlying the various crude-oil and gasoline surveys, and provides historical comparisons of price data across the BLS programs.

### Price and expenditure programs

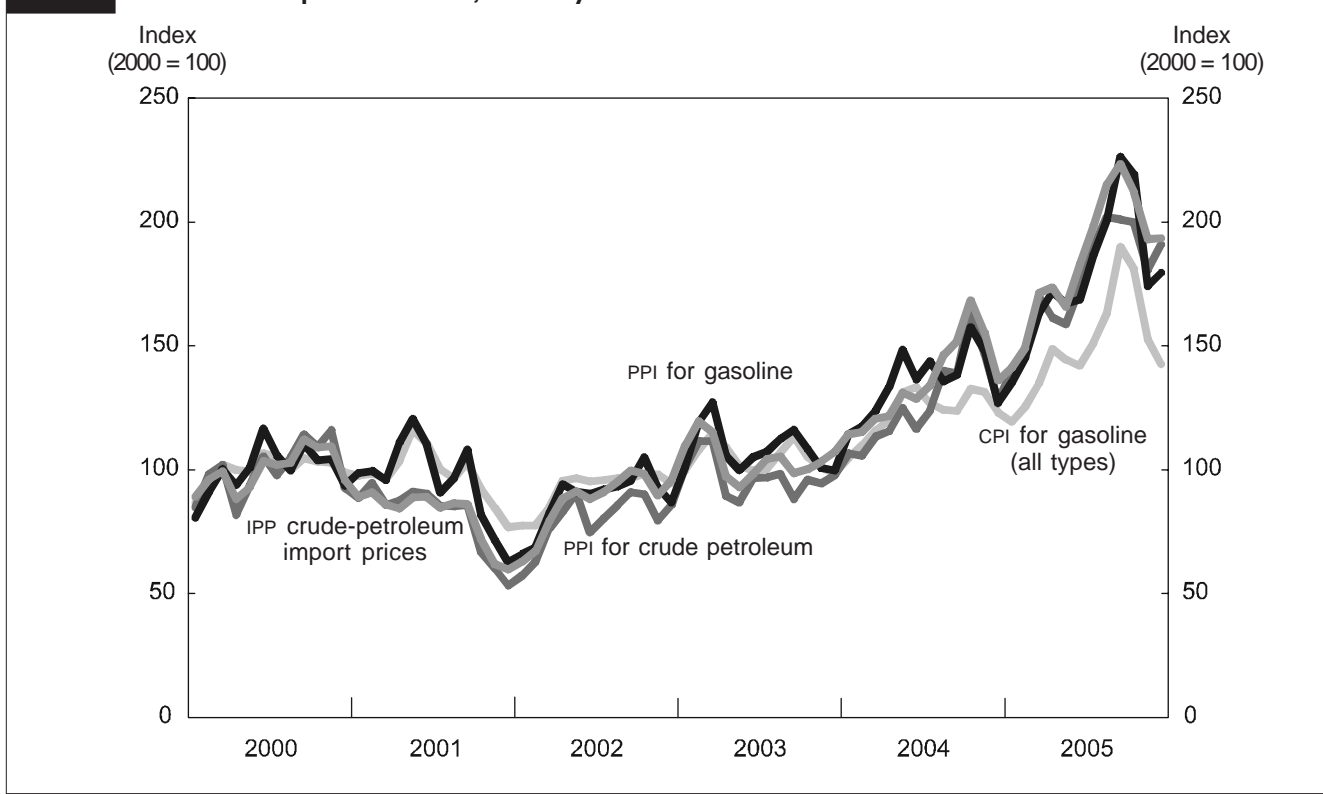
The Bureau conducts three price surveys and a survey of consumer expenditures: the Interna-

tional Price Program (IPP), which measures import and export prices; the Producer Price Index (PPI), which measures prices received by domestic producers; the Consumer Price Index (CPI), which measures consumer prices paid out of pocket; and the Consumer Expenditure Survey (CE), which measures out-of-pocket consumer expenditures. Chart 1 illustrates the high correlation among the three price indexes. (Two different PPI's are shown.) Each program has a different scope, measurement goal, and methodology for collecting and compiling data related to crude oil and petroleum products, and the differences among the programs must be understood in order to properly interpret and compare the movements among the respective indexes. A description of each program's measures of petroleum product prices and expenditures follows. The appendix presents an exhibit summarizing the program methodologies.

*Measurement of traded-goods inflation: the IPP's import and export price indexes.* The IPP produces indexes for import and export goods and services. These indexes measure price changes on the basis of the actual transaction prices of specifically defined items and services coming into and leaving the country. Published IPP indexes for crude oil and refined petroleum products reflect three classification systems: the Harmonized Tariff System of the United States, the Bureau of Economic Analysis End Use classification system, and the North American Industry Classification System (NAICS.) These indexes are used, among other things, to deflate

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**Chart 1. Selected BLS price indexes, January 2000–December 2005**



various foreign trade statistics produced by the U.S. Census Bureau and the Bureau of Economic Analysis.

Although the IPP calculates indexes for all petroleum products, only some of these products meet the program's dollar-value-of-trade threshold for public release. The IPP publishes indexes solely for products with an annual dollar value of trade for exports of at least \$3.0 billion or a dollar value of trade for imports of at least \$3.0 billion. Because U.S. crude-oil exports no longer exceed \$3.0 billion per year, the IPP does not publish export indexes for crude oil. By contrast, crude-oil imports have a trade dollar value that greatly exceeds the IPP threshold. Indeed, on the basis of a dollar value of more than \$131 billion in 2004, imported crude oil accounts for 9.35 percent of the overall IPP import index, with all other imported petroleum products together accounting for 3.45 percent of the weight of the import index. Among the import and export price indexes the IPP produces for other petroleum products are indexes for gasoline and distillates.

Unlike most of the product indexes in the IPP, which reflect price data collected directly from importers and exporters, the import crude-oil index is based primarily on monthly transaction data obtained from the Department of Energy's Energy Information Administration (EIA) Form-856 survey.<sup>3</sup> This survey collects data on prices and quantities of virtually all crude oil

imported into the United States. Because of its broad scope, EIA-856 data are more comprehensive than data that can be obtained from a sample of importers. EIA-856 data also encompass transactions for the entire calendar month, so that, in contrast to price indexes for goods and services, for which the reference period is the first week of each month, the IPP crude-oil index is composed of transaction data received over the entire month.

One limitation of using the EIA-856 survey, however, is that most of the transaction data are not available from the Department of Energy in time for the first published estimate of the crude-oil import index. Instead, the complete set of EIA-856 data for a given month is available on a delayed basis. For example, most of the June 2006 prices were not available until July or August 2006. To correct for this limitation, the IPP employs two different estimation procedures to calculate its crude-oil import index: a procedure for calculating the preliminary and first revised index and a procedure for calculating two subsequent revisions of the index.

To calculate the preliminary and first revised index when the EIA-856 data are incomplete, the IPP uses a regression model based on the incomplete EIA-856 data to estimate the percent change in the price for crude oil. This regression model's estimates are much closer to the final estimate of the

monthly percent change in the crude-oil import index than are the estimates derived from merely aggregating the incomplete EIA-856 data.

The two subsequent revisions are calculated directly from the EIA-856 data with the use of a modified Laspeyres index formula based upon fixed item and index weights calculated each year by the IPP.<sup>4</sup> The weights are lagged 2 years. For example, in 2006, the weights were calculated from 2004 trade values. In January 2007, the IPP will start using 2005 weights. At the item level, the IPP calculates the weight for each type of imported crude oil, or “crude stream,” in the EIA-856 survey.<sup>5</sup> Each observation in the monthly index then represents a tanker load of a particular crude stream that arrives in the United States.

For each revision, a more complete set of EIA-856 data becomes available for use in the monthly index calculation. Therefore, for the two subsequent revisions, these data are simply aggregated by the IPP into the crude-oil import index. To achieve this aggregation, the IPP calculates the weighted average price for each crude stream by summing products of prices and quantities for all transactions for a crude stream and then dividing the result by the sum of the quantities. These weighted average prices are then combined into the overall index, which, as mentioned, is weighted by the annual trade value from 2 years earlier. As with all IPP indexes, the final crude-oil index number is released 3 months after the preliminary index is first published.

The IPP also uses EIA data to calculate a portion of its refined-petroleum import and export indexes. Although the IPP indexes include directly collected price data from importers and exporters for refined products such as jet fuel, naphthas, kerosene, and petroleum gases, prices and weights (at the lowest level) for imported and exported gasoline, diesel fuel, and heating oil are derived from EIA data. In 1999, the IPP stopped collecting prices for these refined products from petroleum importers and exporters because of their insufficient participation in the IPP survey and the existence of an alternative source of prices. The IPP uses the EIA publication *Petroleum Supply Annual* to update annual weights for the items that currently represent such products in the indexes.<sup>6</sup> This publication contains information on import and export volumes for gasoline, diesel fuel, and heating oil, by Petroleum Administration for Defense district.<sup>7</sup> Spot price data for the first 5 business days of each month are then obtained on a monthly basis from the EIA Web site for 16 Petroleum Administration for Defense products that enter into the calculation of the import and export indexes.<sup>8</sup> These products are import and export gasolines and diesel fuels from New York Harbor, the Gulf Coast, and Los Angeles and import and export heating oils from New York Harbor and the Gulf Coast. Unlike the PPI and the CPI, the IPP does not seasonally adjust its refined products indexes.

*Measurement of production inflation: the Producer Price Index.* The PPI publishes various monthly price indexes for crude oil and refined petroleum products, including gasoline, diesel fuel, and home heating oil. The indexes are based on prices collected directly from domestic producers and are calculated with the use of a modified Laspeyres index formula. The prices for crude oil are generally location-specific net transaction prices,<sup>9</sup> whereas the prices provided for refined petroleum products are primarily national averages of net transaction prices for the particular commodity. Crude-oil prices are received from domestic producers at various wells within the United States, including offshore operations. Prices for refined petroleum products are not received from a specific location, but rather are taken as national averages.

Before prices are collected, however, and in a manner similar to the IPP process for direct collection, a sample of establishments is randomly drawn, and each establishment selected is visited by a BLS representative, who attempts to persuade the establishment to participate in the PPI survey. If the establishment agrees to participate, a certain number of its products are selected to be priced for the survey. Any particular product that an establishment produces has a probability of selection proportional to the share of the establishment’s revenue from sales of the product. Once specific products are selected, establishments send monthly price updates on those products to the PPI. The updates reflect prices on the Tuesday of the week containing the 13th of the month.<sup>10</sup>

The PPI publishes three types of indexes from the pricing data that it collects: industry indexes, commodity indexes, and stage-of-processing indexes. All three are subject to revision for up to 4 months after their initial publication. Revisions account for late prices and corrections by respondents.

The PPI for an industry measures price changes received by domestic establishments for the industry’s output sold outside the industry. Industry indexes are structured according to NAICS. Currently, the PPI publishes indexes for the crude-petroleum and natural-gas extraction industries and for petroleum refineries. Within these industries, the PPI also publishes indexes for specific products manufactured by the industries. The product indexes are aggregated into industry indexes with the use of weights derived primarily from the Census Bureau’s industry-level (value-of-shipments) data. The PPI does not test industry indexes for seasonality or calculate any seasonally adjusted industry indexes.

PPI commodity indexes reflect price changes for specific commodities, regardless of the commodities’ industries of origin. Commodity indexes are classified according to a system unique to the PPI. Currently, the PPI publishes detailed commodity indexes for crude petroleum, as well as for refined petroleum products, including gasoline, diesel fuel, and home heating oil. In addition, an aggregate commodity index for all fuels and related products and power is published. As with industry-level PPI’s, weights for aggregating commodity-based

PPI's are derived from the Census Bureau's commodity-level (value-of-shipments) data. Commodity indexes are tested for seasonality, and if seasonal patterns are found, seasonally adjusted indexes are calculated. The commodity indexes for gasoline, home heating oil, and diesel fuel all show seasonal patterns, so seasonally adjusted indexes are produced for all three of these commodities.

Stage-of-processing indexes are built from commodity-based PPI's. Commodities are allocated to one or more stages of processing on the basis of the class of buyer and the amount of physical processing or assembling the commodity has undergone. The three main stage-of-processing categories are finished goods, intermediate goods, and crude goods. Energy goods are included in all three categories. Gasoline, diesel fuel, and home heating oil respectively account for 4.95 percent, 0.28 percent, and 0.96 percent of the stage-of-processing index for finished goods and 2.37 percent, 1.42 percent, and 0.49 percent of the index for intermediate goods.<sup>11</sup> Crude petroleum accounts for 16.77 percent of the crude-goods index.<sup>12</sup> In addition to the highest-level stage-of-processing indexes, indexes for crude, intermediate, and finished energy goods are produced by the PPI. Stage-of-processing indexes are available on both an unadjusted and a seasonally adjusted basis.

As indicated in the previous paragraph, the PPI for Gasoline is an important component of both the stage-of-processing index for finished goods and that for intermediate goods. The PPI for Gasoline is composed of three separate grades of octane: regular, mid-premium, and premium. Regular gasoline has an octane rating of 85 through 87, mid-premium 88 through 90, and premium greater than 90. Within each of these grades, there are summer and winter seasonal blends, the products of a two-phase program implemented by the Environmental Protection Agency (EPA) and aimed at reducing the volatility of summertime gasoline. The volatility in gasoline is measured as Reid vapor pressure (RVP).<sup>13</sup> The PPI collects prices for the lower RVP summer blend from April through August and the higher RVP winter blend from September through March. Then the gasoline indexes are quality adjusted to remove any changes in them that are due to shifts in seasonal blend.

While less important than gasoline to the stage-of-processing indexes, diesel fuel and home heating oil also are notable components of those indexes. Both diesel fuel and home heating oil are classified as light fuel oils and at one time were compatible. In 1993, however, the EPA mandated that all highway diesel fuel meet reduced sulfur content requirements. This new standard of 0.05 percent sulfur by weight, or 500 parts per million (PPM), was significantly lower than the previous maximum sulfur allowance. Then, in June 2006, the EPA implemented an even stricter standard of 15 PPM for diesel fuel.<sup>14</sup> The PPI's separation of diesel fuel and home heating oil, therefore, has become increasingly important.

*Measurement of consumer inflation: the Consumer Price Index (CPI).* As a measure of the average change of prices for consumer goods over time, the Consumer Price Index (CPI) is perhaps the most widely recognized BLS price program. While the IPP and PPI track the movement of both crude-oil prices and refined petroleum products prices, the CPI tracks only the price movement of refined petroleum products purchased by consumers. The CPI publishes a monthly motor fuel index that measures the average change in price over time of gasoline and other motor fuels.<sup>15</sup> The motor fuel index had a relative importance of 4.191 out of the U.S. city average of the CPI for All Urban Consumers (CPI-U) as of December 2005.<sup>16</sup> The gasoline (all types) index accounts for the majority of the motor fuel index's weight and reflects the prices of three grades of gasoline based on octane rating: unleaded regular, midgrade, and premium gasoline.<sup>17</sup> Other motor fuels, including diesel fuel and alternative motor fuels, account for a very small percentage of the weight in the overall CPI for Motor Fuel. Both the biennially updated weights and the relative importance values are derived from Consumer Expenditure Survey (CE) data.

BLS data collectors collect monthly price information from a sample of national retail outlets drawn from the Telephone Point-of-Purchase Survey conducted by the Census Bureau for the Bureau of Labor Statistics. The CPI outlet sample for all grades of gasoline currently consists of approximately 630 outlets. Each such outlet selected for gasoline pricing is assigned a price quote for each grade of gasoline, as well as for diesel and alternative fuels. The current CPI sample has 1,892 price quotes for gasoline products and 238 quotes for other motor fuels. Price information is collected for each category of product, provided that the product is available for sale when the BLS data collector visits the outlet. Unleaded regular, midgrade, and premium grades are available for sampling nearly every month, although diesel fuel sometimes is not available. Alternative motor fuels, such as E85 and propane, are rarely available. The prices collected are per-gallon unit prices and include excise, sales, and other taxes paid by consumers. Prices are collected continuously throughout the month and are reviewed for accuracy by CPI analysts in the BLS national office. Unlike the PPI, the CPI does not make adjustments for changes in the formulation of vehicle or motor fuels stemming from air-pollution mandates.<sup>18</sup>

Once prices are collected and analyzed for the reference month, the CPI basic indexes for motor fuels are calculated with a geometric mean formula, aggregated across items and geographic areas with a modified Laspeyres index formula, and published along with national, regional, and selected city average prices for motor fuels. Because price data for the survey are directly collected by the Bureau, no late or lagged prices are included in the CPI. Therefore, revisions to published data are rare, in contrast to the situation with the IPP and PPI programs,

which revise their indexes 3 and 4 months, respectively, after their initial publication.

*Measurement of consumer spending: the Consumer Expenditure Surveys (CE).* The Consumer Expenditure Surveys (CE) program is composed of two separate surveys: a quarterly Interview survey and a weekly self-administered Diary survey. Each of these components has a unique sample and methodology. As the primary source of published data on petroleum-related products, the Interview survey is the only one discussed any further in this article.

The CE Interview survey is administered through home visits by representatives of the Census Bureau and is processed and published by the Bureau of Labor Statistics. A national probability sample of households designed to represent the total U.S. civilian noninstitutional population is drawn from the decennial census address file, supplemented with new-housing permits. Each sample unit is interviewed every 3 months over five calendar quarters and is then dropped from the survey and replaced with a new sample unit. In 2004, approximately 7,500 consumer units were interviewed each quarter.<sup>19</sup>

All CE data are collected and published at the consumer unit level. Just as the prices collected by the CPI include all sales and excise taxes, so, too, do the expenditure amounts collected by the CE. These expenditure amounts may be for items purchased by the consumer unit for personal consumption or as gifts to others. Business-related expenses and expenses for which the consumer unit is reimbursed are not included.

The CE publishes tabulated information on average annual expenditures, characteristics, and income, integrated from the Interview and Diary surveys, by a variety of demographic characteristics, such as region of residence, income level, and age. Published data are weighted to the U.S. population and are aggregated to meet statistical reliability criteria. Standard errors are computed by the balanced repeated replication method of variance estimation and are available to the public.<sup>20</sup> Data are published annually, subject to a 1-year lag due to collection and processing schedules.

The CE Interview survey collects information on expenditures for gasoline, diesel fuel, and fuel oil for home heating use. For this article, only the aggregated data for the CE published item “gasoline and motor oil” are used, in order to ensure the integrity of the data and allow for meaningful comparison with the gasoline figures produced by the CPI.<sup>21</sup>

In the CE Interview survey questionnaire, respondents are asked for information about their average monthly expense for gasoline and other fuels used in the operation of automobiles, trucks, and other vehicles. Subsequent questions attempt to determine how much of that expense goes for diesel fuel and how much is counted as a business expense. Then the nonbusiness expenditure amounts of the monthly esti-

mates, with appropriate sales taxes applied, are annualized for publication.

The following tabulation, published by the CE, shows the average amount spent annually by a consumer unit on gasoline and motor oil, as well as the consumer unit’s share of transportation expenses, from 2000 to 2004:

Expenditure category	2000	2001	2002	2003	2004
Transportation .....	\$7,417	\$7,633	\$7,459	\$7,781	\$7,801
Gasoline and motor oil .....	1,291	1,279	1,235	1,333	1,598
Share of transportation (percent) .....	17.4	16.8	15.9	17.1	20.5

As the figures demonstrate, mean expenditures varied rather substantially in all three categories from one year to the next over the 2000–04 period.

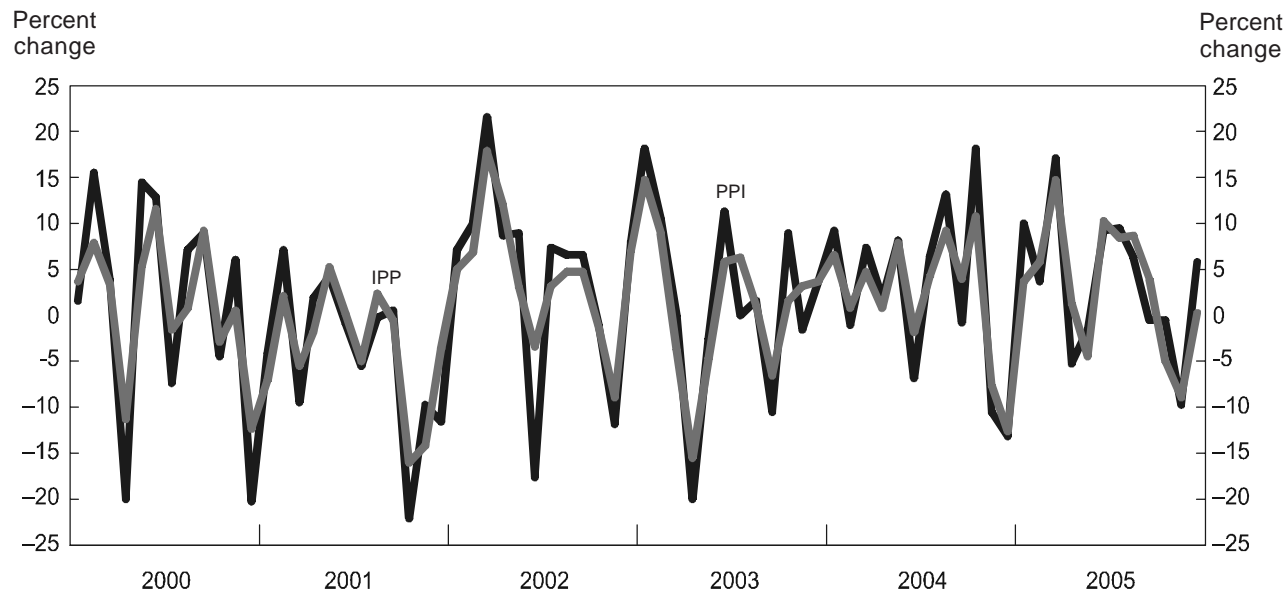
Spending on gasoline and motor oil is a component of overall transportation expenditures in the CE. As the preceding tabulation shows, like mean expenditures, the proportion of transportation spending allocated to gasoline and motor oil has varied. In 2004, approximately \$1 out of every \$5 spent on transportation was used to purchase gasoline and motor oil. (This expenditure category also accounted for approximately 3.7 percent of *total* annual spending.)

## Price program comparison

The IPP, PPI, and CPI measure price changes for petroleum products over time, whereas the CE measures changes in consumer expenditures on gasoline. In the case of the price surveys, methodological differences among BLS programs can result in varying measures of price change for similar petroleum products. To determine how significantly these methodological differences affect index movements, this section compares price changes for comparable petroleum products across BLS price programs. Similarities between index movements are analyzed both visually and through basic statistical analyses, including correlations and means tests. Also compared is the relationship between the CPI for Gasoline and CE mean expenditures on gasoline, because expenditures on gasoline are likely to change as the price of gasoline changes.

*Comparison of IPP crude-oil index and PPI for Crude Petroleum.* The IPP measures monthly changes in the price for crude petroleum imports to the United States. Prices used in calculating the IPP index for crude petroleum are for multiple days throughout the reference month. In contrast, the PPI measures monthly changes in price for domestically produced crude petroleum. Prices used in calculating the PPI typically reflect the Tuesday of the week containing the 13th of the reference month. Chart 2 shows 1-month percent changes in

**Chart 2. One-month percent changes in the PPI for Crude Petroleum and the IPP index for Crude Petroleum, January 2000–December 2005**



the IPP index and the PPI for Crude Petroleum from January 2000 through December 2005. The sample means for IPP and PPI crude petroleum were 1.4 percent and 1.6 percent, respectively, and the sample standard deviations were 7.3 percent and 9.8 percent. These summary statistics indicate that the PPI tended to be slightly more volatile than the IPP index from 2000 through 2005.

A visual examination of chart 2 indicates that, in spite of methodological differences in the calculation of the index between the IPP and the PPI, movements in the two crude-petroleum indexes have been similar. In the vast majority of cases, the 1-month percent changes in the indexes are in the same direction and similar in magnitude. In some cases, the magnitude of the change in the PPI appears to be slightly higher than that in the IPP index. This finding is in line with the summary statistics, which show the PPI to have a slightly higher mean and standard deviation than the IPP index. To examine more rigorously the difference between the means of the two indexes for crude petroleum, a paired t-test was conducted. The test's null hypothesis was that the means of the two series are equal. The test failed to reject the null hypothesis at the  $\alpha = .05$  significance level, indicating that the means are not significantly different from each other.

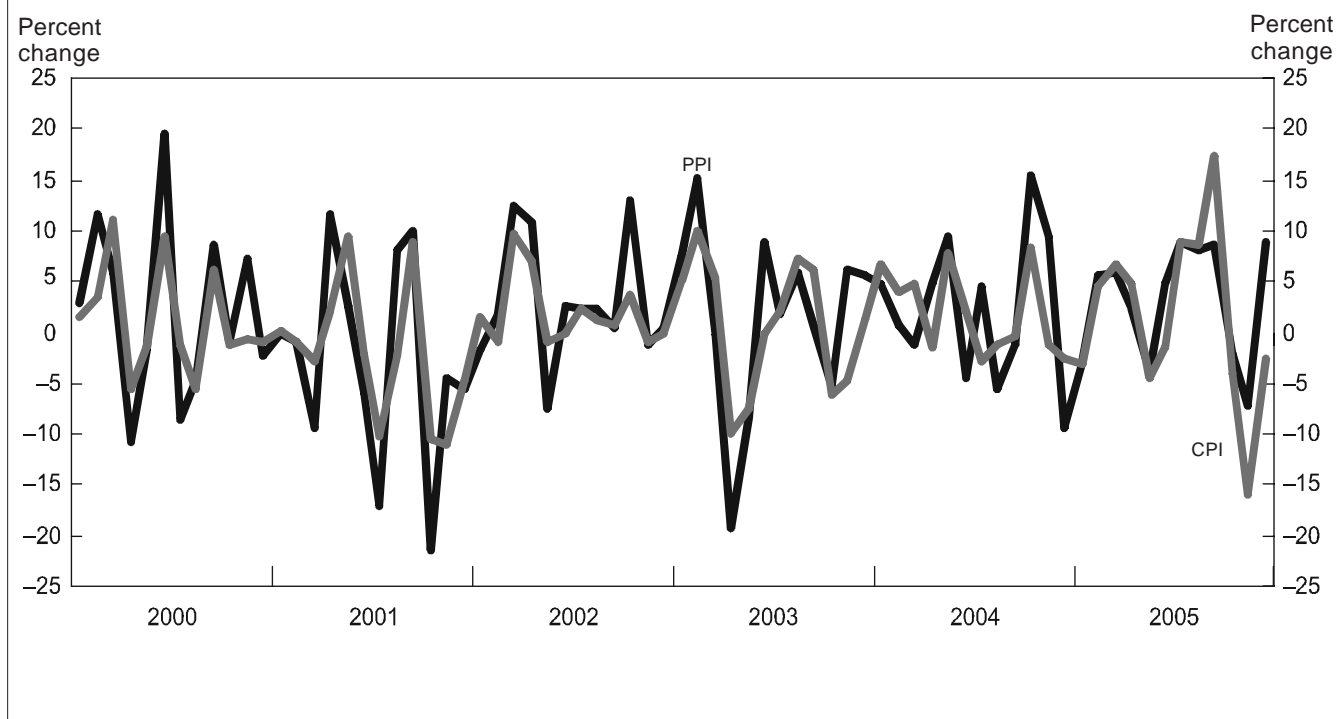
Finally, the correlation between the PPI for Crude Petroleum and the IPP crude-petroleum index is 0.91, indicating a strong

relationship between them. Therefore, regardless of the aforementioned methodological differences, the visual examination of chart 2, the means test, and correlation analysis all indicate that the two crude-petroleum indexes have behaved similarly over time. This parallel behavior is likely explained by the nature of the crude-oil market. Crude oil is traded openly in global commodity markets; hence, prices for domestic and imported crude petroleum should tend to converge, lest there be unrealized opportunities for arbitrage.

*Comparison of PPI for Gasoline and CPI for Gasoline.* The PPI measures monthly price changes in gasoline from the perspective of the seller. In contrast, the CPI measures price change from the purchaser's perspective. Sellers' and purchasers' prices may differ due to government subsidies, sales and excise taxes, and distribution and marketing costs. Chart 3 presents the 1-month percent changes in the seasonally adjusted PPI for Gasoline and CPI for Gasoline from 2000 through 2005. Over the sample period, the mean and standard deviation for the PPI for Gasoline were 1.6 percent and 8.0 percent, respectively, whereas the mean and standard deviation for the CPI for Gasoline were 0.9 percent and 6.0 percent, respectively.

A visual examination of chart 3 indicates that price movements for gasoline, as measured by the PPI and CPI, were similar from 2000 through 2005, although changes in the PPI appear to have

**Chart 3. One-month percent changes in the PPI for Gasoline and the CPI for Gasoline, January 2000–December 2005**



been more volatile and often greater in magnitude than changes in the CPI. The relatively greater volatility of the PPI for Gasoline, compared with the CPI for Gasoline, is in part due to the two programs' different treatment of consumer taxes: the CPI includes them, and the PPI does not. Hence, an identical change in the price of gasoline would have a larger effect on the PPI than the CPI.<sup>22</sup> An equality-of-means test, however, shows that, the means are not significantly different from each other at the  $\alpha = .05$  level of significance. The correlation coefficient between the two series is 0.72, also showing a relatively strong relationship between PPI and CPI gasoline. Thus, the visual examination of chart 3, the means test, and correlation analysis all suggest a substantial relationship between the CPI for Gasoline and the PPI for Gasoline in spite of methodological differences.

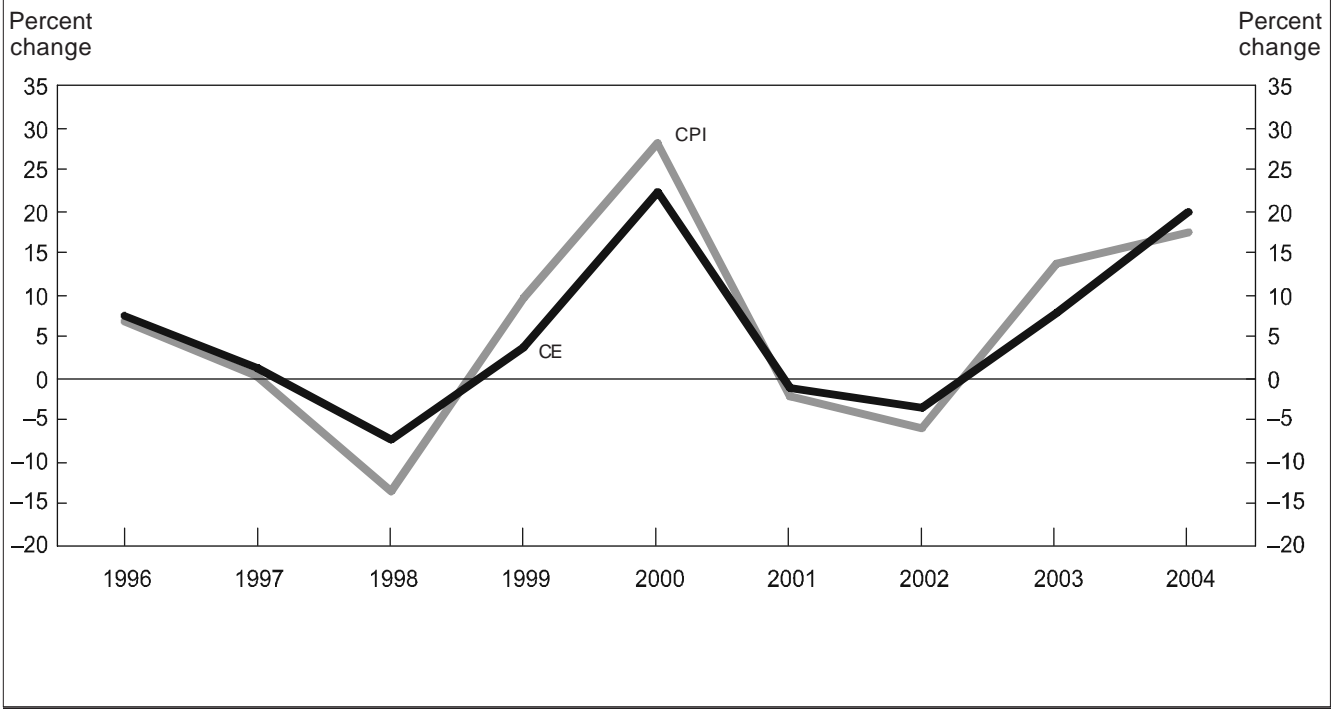
The relationship between the PPI for Gasoline and the CPI for Gasoline, however, does not appear to be as strong as that between the IPP index for crude petroleum and the PPI for Crude Petroleum. The correlation coefficient for PPI and CPI gasoline is lower than that for IPP and PPI crude petroleum. In addition, the difference between the means of PPI and CPI gasoline is greater than the difference between the means of IPP and PPI petroleum. These findings suggest that the methodological differences between BLS programs measuring gasoline prices may be greater than those between BLS programs measuring crude-petroleum

prices, especially because crude petroleum is, on average, more volatile than gasoline.

*Comparison of CPI average gasoline prices and CE mean expenditures on gasoline and motor oil.* CPI price data and CE expenditure data on gasoline are expected to be related, because the average amount spent by consumers on gasoline is likely to be affected by gasoline prices. Chart 4 displays over-the-year percent changes in the CPI average price for gasoline and average yearly expenditures on gasoline from 1995 through 2004.<sup>23</sup> Over the sample period, the mean and standard deviation of the annual change in the CPI average price for gasoline were 6.0 percent and 12.8 percent, respectively, whereas the mean and standard deviation of the annual change in CE average expenditures on gasoline and motor oil were, respectively, 5.7 percent and 10.0 percent.

A visual examination of chart 4 indicates a strong relationship between the CPI for Gasoline and the CE average expenditures on gasoline and motor oil. The correlation coefficient between the two series is 0.96, also demonstrating a strong relationship. This correlation shows the relative inelasticity of consumers' response to changes in the price of gasoline. In general, chart 4 indicates that expenditures fall less than prices during periods of declining prices and rise more slowly than prices during periods of increasing prices.

**Chart 4. Percent changes in the annual averages of the CPI for Gasoline and in CE expenditures for gasoline and motor oil, 1996–2004**



THE BLS PRICE PROGRAMS—THE IPP, THE PPI, AND THE CPI—provide information on the changes in prices of various petroleum products. In addition, the CE provides information on consumer spending on petroleum products. Price changes for these products generally show a close correlation among the

price programs, and CPI changes also correlate closely with consumer expenditure changes for such products. However, data users should consider the differences in scope, measurement, and survey methods among the four programs in comparing changes across them. □

## Notes

<sup>1</sup> Bureau of Labor Statistics, Consumer Price Index, average price data, on the Internet at the BLS Website, [www.bls.gov/cpi/home.htm](http://www.bls.gov/cpi/home.htm).

<sup>2</sup> National Income and Product Accounts, Table 2.3.5, “Personal Consumption Expenditures by Major Type of Product” (U.S. Department of Commerce, Bureau of Economic Analysis), on the Internet at [www.bea.gov/bea/dn/nipaweb](http://www.bea.gov/bea/dn/nipaweb).

<sup>3</sup> As of October 2006, a decision is pending about whether this program will continue to be funded. For further information on the program’s methodology, contact Ara Khatchadourian at [khatchadourian.ara@bls.gov](mailto:khatchadourian.ara@bls.gov).

<sup>4</sup> A pure Laspeyres index has fixed weights that reflect the base period. The three BLS price indexes detailed in this article are described as modified Laspeyres indexes because the Bureau regularly updates the weights used in each index when new data are available.

<sup>5</sup> For a list of crude streams by country, see Appendix A of the “EIA-856 Monthly Foreign Crude Oil Acquisition Report Instructions,” on the Internet at [www.eia.doe.gov/pub/oil\\_gas/petroleum/survey\\_forms/eia856ip4.pdf](http://www.eia.doe.gov/pub/oil_gas/petroleum/survey_forms/eia856ip4.pdf).

<sup>6</sup> See *Petroleum Supply Annual 2005*, vol. 1 (Energy Information Administration, Oct. 23, 2006), on the Internet at [www.eia.doe.gov/oil\\_gas/petroleum/data\\_publications/petroleum\\_supply\\_annual/psa\\_volume1/psa\\_volume1.html](http://www.eia.doe.gov/oil_gas/petroleum/data_publications/petroleum_supply_annual/psa_volume1/psa_volume1.html).

<sup>7</sup> These districts were created by the Federal Government during the Second World War. Their original purpose was to administer oil allocations. The EIA continues to use these regions for data collection purposes. For an example of such information pertaining to one particular district, see “U.S. Refining Crude Oil Distillation Capacity, Valero and Huntway PAD District Detail,” on the Internet at [www.eia.doe.gov/emeu/finance/mergers/vhpad.html](http://www.eia.doe.gov/emeu/finance/mergers/vhpad.html).

<sup>8</sup> The EIA defines a spot price as the price for a one-time open-market transaction for the immediate delivery of a specific quantity of a product at a specific location where the commodity is purchased “on the spot” at current market rates.

<sup>9</sup> The net transaction price (the price after deductions for discounts or other allowances have been made) for a given crude-oil item reflects either the price of the item on the PPI pricing date or a monthly aver-



age of net transactions for the item. For comparability, the timing of the price for a given item will remain unchanged. Thus, an item will *not* be priced on the pricing date one month and then as a monthly average the next month.

<sup>10</sup> Although the PPI is aimed at collecting prices for the pricing day, if respondents are unable to provide such prices, the PPI will accept either prices that reflect a day close to the pricing day or average prices for a period that contains the pricing day.

<sup>11</sup> The figures listed are the December 2005 relative importances of component series in the PPI by stage of processing. Note that regular, mid-premium, and premium grades of gasoline account for 3.55 percent, 0.53 percent, and 0.87 percent, respectively, of the relative importance to the Finished Goods Index.

<sup>12</sup> The figure is the December 2005 relative importance of the crude-goods series in the PPI by stage of processing.

<sup>13</sup> RVP is the standard measure of the volatility of gasoline. The higher the RVP, the more volatile the fuel is and the easier it evaporates. The first RVP reduction phase began in June 1989, while the second phase began in May 1992 and lasted throughout 1994. In December 1994, the EPA enacted Phase 1 of the reformulated gasoline provisions of the Clean Air Act of 1990. The provisions required reductions in automobile emissions of ozone-forming volatile organic compounds during the summer, high-ozone season, and of toxic air pollutants and nitrogen oxides during the entire year, in certain areas of the United States. Phase 2 of the program, which required additional reductions in volatile organic compounds and nitrogen oxides (NO<sub>x</sub>) during the summer months, began on January 1, 2000.

<sup>14</sup> This requirement was accounted for in the PPI through a quality adjustment of the diesel fuel index that same June.

<sup>15</sup> The CPI also publishes indexes for home fuel oil and other home fuels; this article, however, focuses on motor fuels alone.

<sup>16</sup> CPI relative importance tables are found on the Internet at [www.bls.gov/cpi/cpi\\_riar.htm](http://www.bls.gov/cpi/cpi_riar.htm).

<sup>17</sup> High-altitude areas of the country have ranges of gasoline ratings that may be different from the ranges just given.

<sup>18</sup> See “The Treatment of Mandated Pollution Control Measures in the CPI,” on the Internet at [www.bls.gov/cpi/cpitreat.pdf](http://www.bls.gov/cpi/cpitreat.pdf), for more information about the BLS policy not to make quality adjustments to the prices of vehicle and motor fuels in the CPI.

<sup>19</sup> A consumer unit is defined as (1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who use their income to make joint expenditure decisions. Financial independence is determined by the three major expense categories: housing, food, and other living expenses. To be considered financially independent, the respondent must pay, at least in part, expenses for at least two of the three categories. For example, a household occupied by two unrelated roommates is considered to contain two separate consumer units if each roommate pays his or her own expenses.

<sup>20</sup> More detailed information on estimation methodology is found in the *BLS Handbook of Methods*; see Chapter 16, “Consumer Expenditures and Income.”

<sup>21</sup> Note that in 2004 the unpublished average annual expenditure for gasoline constituted approximately 92 percent of the published category.

<sup>22</sup> As a hypothetical example, assume that the producer price of a gallon of gasoline increases \$.50, from \$2.00 to \$2.50. This rise in price would produce a 25-percent increase in the PPI. However, the CPI price would include a consumer tax (for this example, assume \$.20 per gallon). For the given \$.50 increase in the producer price of a gallon of gasoline, the consumer price would then increase from \$2.20 to \$2.70, causing the CPI to rise only 22.7 percent. This simplified example illustrates one explanation as to why the CPI for Gasoline tends to be less volatile than the PPI for Gasoline.

<sup>23</sup> The CPI average price for gasoline for a specific year is the mean of the CPI average gasoline prices for each month of that year.

## APPENDIX exhibit A-1. Summary of program methodologies

Category	International Price Program (IPP)	Producer Price Index (PPI)	Consumer Price Index (CPI)	Consumer expenditure Survey (CE)
Program objective	Measure changes in import and export prices.	Measure changes in producer selling prices.	Measure changes in consumer prices.	Measure average consumer expenditures.
Product coverage	Crude oil and refined petroleum products	Crude oil and refined petroleum products	Refined petroleum products	Refined petroleum products
Classification system(s)	Samples are based on the Harmonized System (HS). Indexes are published on the basis of HS, Bureau of Economic Analysis (BEA) End Use, and North American Industry Classification System (NAICS) classification systems.	Industry-based indexes are classified according to the North American Industry Classification System (NAICS). Commodity-based indexes are classified according to an internal BLS system.	Internal BLS system	Internal BLS system
Data collection timeframe	Entire month for crude oil. First week of the month for refined petroleum products: gasoline, diesel oil, and heating oil. Directly collected spot and contract prices for the reference month for other types of petroleum products, such as naphtha, jet fuel, kerosene, and petroleum gases).	Tuesday of the week containing the 13th of the month. However, if respondents are unable to provide prices for that day, the PPI will accept prices that reflect a day close to the pricing day or average prices for a period that contains the pricing day.	Throughout the entire month	Quarterly
Source of data	Prices for crude oil and refined petroleum products are provided by the Energy Information Agency of the Department of Energy.	Domestic producers submit prices voluntarily.	Collected by Bureau of Labor Statistics at retail outlets across the Nation.	Household interviews on a quarterly basis for five consecutive quarters.
Type of data	Crude oil: net transaction prices for virtually all crude oil imported into the United States. Refined petroleum products: spot prices for gasoline, diesel oil, and heating oil from the first week of the month are combined with directly collected prices for other types of petroleum products, such as naphtha, jet fuel, kerosene, and petroleum gases, to calculate indexes for refined petroleum products. The locations of the gasoline, diesel oil, and heating oil spot prices are New York Harbor, the U.S. Gulf Coast, and Los Angeles.	Crude-oil prices typically are manufacturer selling prices on the pricing date, but in some cases may be average prices for the entire calendar month. Refined-petroleum prices are manufacturers' national average prices for the pricing date.	Directly collected retail prices	Average annual expenditures and expenditure shares
Quality adjust petroleum products for environmental mandates	No	Yes	No	No
Frequency of publication	Monthly	Monthly	Monthly	Annually
Revision policy	Final index number is published 3 months after the preliminary index number.	Final index number is published 4 months after the preliminary index number.	Indexes are final upon publication.	Survey estimates are final upon publication.
Seasonally adjusted data	No	Yes	Yes	No