Technical Report

Coherency of Agricultural Feedstock and Petroleum Prices; An Analysis of Monthly Prices, January 1989 through November 2010*

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Introduction

This report provides a detailed summary of the work undertaken in partial fulfillment of a the coop agreement with OEPNU/OCE/USDA (Award No. 58-0111010-006). The objective of the coop agreement is to investigate the "coherency" of agricultural feedstock prices and petroleum product prices. Different feedstock alternatives have different drivers for price than do petroleum products. Thus, if the alternative drivers are sufficiently strong, there should be times during a period of years when the agricultural feedstock prices behave differently than petroleum product prices. For example, corn which is used to produce ethanol has more than 60 percent of its annual demand derived from being an input to livestock feed.

As a basis for this work, this report provides the ground work for three papers that have been developed to address the major objectives of the contract: Robert J. Meyers, et.al., "Long Run and Short Run Co-Movement in Petroleum Prices and Prices of Agricultural Feedstocks for Biofuel" and "Long and Short Run Movements between Prices of Petroleum Products and Agricultural Feedstocks for Biofuel: How do They Relate?" and Michael D. Helmar, et al., "Estimating Corn Stover and Switchgrass Pseudo Prices in the Absence of Established Markets". All three papers are in draft form and are available from the authors of this paper.

For purposed of this discussion, we mean by coherency that the agricultural feedstock prices closely track petroleum product prices and vice versa. The idea is to find the strength of the interrelationship between the *spot* prices for agricultural feedstocks and petroleum products. We will use traditional analysis involving graphics, simple calculations as well as time series analysis to develop the answers to the questions about coherency. To give the question a bit of additional structure, we define coherency in terms of three features of the petroleum product and agricultural feedstock prices:

- The extent to which the price series move together in both the short and long run,
- The degree to which shocks in one market (whether an agricultural feedstock or petroleum products) can be expected to spill over to another market(s), and
- The proportion of variation in one price that can be accounted for by variation in other, related prices.

These definitions will be given even grater structure within the various segments of the analysis being reported. That is, we will define more specifically what we are looking for in the examination of the coherency between agricultural feedstock and petroleum product prices.

The analysis utilizes monthly series of spot agricultural feedstock and petroleum product process (January 1989 through November 2010). These monthly prices are reported by federal agencies and generally available to those who want to access them. (They are also provided in the Appendices of this report.) We analyze a set of grains prices, oil seeds prices, and petroleum product prices. Wood or timber prices are available only quarterly and we use this time frame for these feedstocks. The grains and oil seeds prices are for agricultural commodities that either are or can be used to produce biofuel. The other prices are for agricultural commodities that are a bit more removed from biofuel production, but are at least being considered as feedstocks for biofuel. However, these prices present a more complicated set of issues for the analysis because of data availability.

Only wood prices (pulp wood) are reported from a well established market. Switchgrass and corn stover are not widely traded agricultural commodities. In the case of these two prices we had to construct a series of annual prices. In short, we took budgets for the two commodities and moved them forward and backward in time on the basis of the prices for elements in their cost structure. The elements used for moving the budgets forward and backward were available from federally reported sources, however. Thus, in the case of agricultural commodities which do not have established markets we developed a method to generate feedstock prices.

Several recent studies have investigated energy and agricultural price relationships utilizing econometric techniques (e.g., Park and Fortenbery 2007, Harri, Nalley and Hudson 2009, Tejeda, Goodwin 2009 and Frank and Garcia 2010 and those mentioned in the three papers for which this technical report was developed as background). These analyses use different commodities, sample periods, data frequencies and techniques but they all support the general proposition that the emergence of higher energy prices and increased biofuel production beginning around 2006 caused a much closer connection between petroleum product prices and agricultural feedstock prices than had been experienced prior to 2006. We take the results of these analyses further by introducing additional data on agricultural feedstock prices and expanded analytical techniques to examine the coherency between agricultural feedstock and petroleum product prices.

Why is it important to get the USDA, agricultural interests and other federal and private agencies concerned with fuel costs and production methods to understand the relationships between agricultural commodity or feedstock prices and petroleum product prices? First, from an agricultural sector viewpoint, prices are traditionally variable and there are USDA government programs to assist farmers in countering the vagrancies of the variability in prices for agricultural commodities and/or feedstocks. The costs of these government programs, which have been in place since the 1930s, currently depend on the coherency between agricultural feedstock prices and petroleum product prices.

For the farmers and others interested in agriculture there are producer prices, volumes of production and food prices that are to an extent determined by the relationship between agricultural feedstock and petroleum product prices. Since the demand for petroleum is rather large in terms of the economy, this relationship has the potential to become a major factor in the determination of agricultural commodity prices. The concern about this relationship surfaced in the 2006 to 2008 period and continues to be a factor since petroleum products are becoming more limited in supply with increased exposure to risk stemming from geo-political turmoil (see Tyner and Taheripour, Increased Agriculture and Energy Systems, Farm Foundation 2008).

For the energy markets there is a different but just as important set of concerns. The capacity to keep fuel prices stable has many important aspects for the general economy. Also, petroleum products are commodities that have a high impact on imports. Thus, there is an impact on the balance of payments of the USA. Finally, the military has an interest in developing a domestic supply of fuel for their equipment. It is not good for security purpose to have the military fleet dependent on foreign sources of energy. These and other questions make it important to have an understanding about the future course of petroleum product and agricultural feedstock prices.

Coherency

This section provides a more detailed explanation of the analysis that we will provide as background for the three papers mentioned above.. Recall that the definitions of 'coherency" are three fold:

- The extent to which the price series move together in both the short and long run,

- The degree to which shocks in one market (whether an agricultural feedstock or petroleum) can be expected to spill over to another market(s), and

- The proportion of variation in one price that can be accounted for by variation in other, related prices.

To discuss these concepts a bit further, we will take them one at a time and explain the relationships we are trying to uncover in the analysis. The degree of concurrent movement of the prices in the short term and in the long run can be determined either by time series analysis or by simply observing the related price series. We have time series of nearly 20 years of monthly or quarterly prices for the agricultural feedstock (grains, oil seeds and feedstocks that are not used regularly but could be used) and for petroleum products (West Texas sweet crude oil and related products). In the traditional analysis we will observe the series and discuss what is suggested by the trends and other aberrations that are revealed by simply observing the plots of the series.

In the time series analysis we will add structure to the question of "moving together" and get more definitive results. Essentially this is provided by making a simple assumption of a linear relationship between the series and using the related econometric techniques to discern the quantitative relationships between the sets of prices. As will be apparent, the simple linear relationship in the random variables could be used to develop short run and long run inferences about the relationship between prices by leading and lagging the prices specified in a linear relationship. This time series analysis as well has the potential to identify regimes (periods of different behavior) for the relationships between prices over the period of observation.

The degree to which shocks in one market transmit to another market can be observed by inspecting the time series and by adapting the time series analysis models to estimate short run impacts of the various observed shocks. In general, these estimates have to do with the number of periods that show an aberration in one market impacting the prices in another. For example, if a price shock occurs in one market and in the short term, the prices tend to come back to a relationship that typifies the long term trend, how l affects the prices in a related market, how long does it take for this disturbed equilibrium between the two prices to come back to a "normal" relationship?

The last coherency measure relates to variation in one series explained by the variation in another series. The time series analysis models impose a linear relationship between the price series and then evaluate the "explained variation" in one series by a second or a series of series. The idea of explained variation has a few more caveats since both or all of the variables are random variables, but is essentially the same as the interpretation from a simple regression. This explained variation concept can be looked at more simply by investigating the variance of the difference between or among two or more random variables, and seeing how much of the variation is explained by the covariance term.

With these hopefully more intuitive explanations of the differences between the time series and traditional approaches, we will go into more detail about the methods for defining coherency. But, it is stressed that both traditional and time series methods have things to offer in terms of understanding coherency, and the results should be taken together for answering the general question.

Traditional Analysis

For the traditional analysis the discussion will be brief. One reason is that this type of analysis is done every day by serious analysts. In fact, it is often the predecessor of more sophisticated analysis using time series methods. It is safe to say that most experienced analysts observe the data in plots before undertaking more complicated analysis. This is in fact, what we will do. Plot the series and observe any differences or similarities that are expected and/or unexpected. The series can be inspected for the appearance of lead and lag relationships as well by simply sliding the graphs of the collections of series forward and backward in relationship to each other.

The proportions of variance explained by one series compared to another can also be investigated. But, we will leave this to the time series analysis since it is simply a special case of the linear relationship imposed by the structure in the time series analysis approach. In short, all that is necessary is to set the constant term to zero in the simple time series analysis model applied and the result comes out naturally.

Conversions of Agricultural Feedstocks

As a last step in the preliminaries before investigating the traditional and time series analysis results for selected agricultural feedstocks and the petroleum product prices, we include a Table 1 which displays standard conversions of agricultural feedstock to ethanol and related products. With these data, it is possible to understand the amount of ethanol and related products that emerge form the use of the selected agricultural feedstocks in biofuel production. These conversion factors unused agricultural feedstocks have been surprisingly difficult to obtain, and were generated from the noted reference material and conversations with exerts in the biofuel field. They should be treated as rough approximations of the conversions that can be used to identify the outputs of the use of agricultural feedstocks in biofuel production. Differences in the conversion factors exist for different plants and methods of conversion, for example, chemical or heat treatment conversions.

Taking the first row of Table 1 as an example, note that a bushel of corn is 56 pounds. If used in biofuel production, this bushel of corn generates approximately 2.78 gallons of ethanol which at a weight of 6;6 pounds per gallon amounts to about 18.5 pounds of ethanol. The byproduct from ethanol production is DGS which are estimated at about 18 pounds. The remainder is waste and outputs that escape into the atmosphere as by product gasses.

Wheat is the second example of an agricultural feedstock that will be considered and also shown in Table 1. If used for biofuel the production from a 60 pound bushel is slightly less than for corn, 2.5 gallons per bushel or 16.5 pounds using the same available rates for the weight of ethanol per gallon. Wheat however has lower amounts of DGS per bushel, 38 percent by reference to published documents so the DGS output is 17.3 pounds. The remainder is gasses lost into the atmosphere and residuals.

The conversion factors for soybeans are provided in the third row of Table 1. Starting again with the weight per bushel of soybeans at 60 pounds, the oil content is approximately 18 percent, leaving soy meal the byproduct at about 48 pounds per bushel. The oil is converted into several products.. The major product is soy diesel at 86 percent of the 10.8 pounds or 9.3 pounds per bushel

For corn stover and switchgrass the conversion factors were reported as essentially the same. One ton produces 528 pounds of ethanol and 350 pounds of lignin, with the remainder residuals. We stress that these are but approximations. There are no full scale plants operational in the USA. For wood the results are even more approximations and nearly the same as for switchgrass and corn stover

Table 1, Conversion Calculations for Selected Feedstocks

Feedstock Unit Weight or Volume	Petroleum Product Output	By-Product Output	Residual	Reference
Corn per bushel 56 pounds	Ethanol 2.78 gallons per bushel (6.6 pounds per gallon) = 18.5 pounds.	DGS is the main by-product at about 18 pounds per bushel	Waste and residual	Conversations with Robert Brown, ISU

Wheat per bushel 60 pounds	Ethanol 2.5 gallons per bushel (6.6 lbs per gallon) = 16.5	DGS 38% of 17.3 pounds	Waste and residual	Conversations with Manitoba, Canadian Wheat Board
Soybeans per bushel 60 pounds	Bio diesel, 18 percent oil, equals pounds of bio-diesel 10.8 pounds per bushel.	Soy meal about 48 pounds per bushel	Waste and residual .	National Bio-Diesel Board update, April 26.2007
Corn Stover per ton	Ethanol 80 gallons at 6.6 pounds per gallon equals 528 pounds	Lignin 350 pounds	Waste and residual	ISU Extension Ag Decision Maker, File A1-70.
Switch Grass per tom	Ethanol 80 gallons at 6.6 pounds per gallon equals 528 pounds	Lignin 350 pounds	Waste and residual	Used same conversions as for corn Stover (several conversations with specialists)
Wood Soft/Hard per tom	Ethanol 70 – 90 gallons (take 80 as representative) at 6.6 pounds per gallon equals 528 pounds	Lignin and related products 350 pounds	Waste and residual	US Forrest Service Wisconsin Office

Price Series for Grains and Oil Seeds

The price series for grains (wheat and corn farm price per bushel) used in this analysis are plotted in Figures 1 and 2. The data used for the plots and documentation of the data sources are provided in Appendix Table 1. Observe that the wheat and corn prices are plotted in both nominal and in real terms. For deflation we use the USA producer price index for all commodities, 1982 =100. We selected the corn price because the other feed grains follow corn prices rather closely. The wheat price was selected because it is primarily a food grain and we intend to make some observations about the impact on food prices of the corn and wheat used for ethanol. Of course, wheat is an ethanol feedstock in other parts of the world, in particular, Western Europe. The relatively high rate of transmission of wheat prices between the USA and wheat-based ethanol-producing regions, especially in periods of high wheat prices, suggests that ethanol markets could impact domestic food grain markets.

Observing the series, note that wheat prices are normally higher than corn prices, but that the prices track each other rather closely. The shocks to the series appear to be during the years 1993 through 1996 and 2008 through 2009. Otherwise, the prices except for the differential closely track each other. Another interesting factor is that the wheat prices tend to lead the corn prices in the two periods in which there seems to be a different relationship between corn and wheat prices. To anticipate the results from the time series analysis, these price series, except for the periods noted, seem to move together over the years observed.

The variation in the two price series is rather closely related as well. Imagine that we took the sum or difference between the two price series, adjusting for a mean of zero, and asked what the variance of the sum (or difference) would be. The covariance term would be quite large and in fact dominate the individual variances of the two prices. In short, the proportion of the variance on one of the price series explained by the other would be quite large. We claim this from the observation of Figures 1 and 2, and will discuss it later when we display the time series results.

The monthly oil seeds prices in dollars per metric ton are plotted in Figures 3 and 5, in nominal and real prices, respectively. The data are as well in Appendix Table 1. The deflator for Table 5 is the same as for the grains. The prices plotted are for soybeans (Central Illinois price), soybeans (Rotterdam price), sunflower seed (U.S market price), rapeseed (Hamburg price), peanuts (Rotterdam price), and copra (Rotterdam price). These are the most widely traded oil seeds and the prices observed at the major marketing hubs. For additional detail and specifics about the sources of these data see Appendix Table 2.

For the monthly vegetable oils and fats, the plots are in prices per metric ton at major markets and are provided in Figures 4 and 6. The prices in Figure 4 are in nominal terms and the prices in Figure 6 are deflated using the same deflator as for the grains and oil seeds prices. The prices reported are for soybean oil (Decatur Illinois), cotton seed oil (US), peanut oil (Rotterdam), canola oil (Rotterdam), corn oil (US), Soybean oil (Rotterdam), palm oil (Malaysia), coconut oil (Rotterdam), and lard (Chicago). These prices are again the prices per metric ton at major markets.

We departed from reporting these prices at the farm level for the oilseeds and vegetable oils and fats because the metric was not the same—especially for oils. Reporting at the major markets and in metric tons in nominal and deflated terms seemed the best for comparison. Because of the high degree of price transmission between the farm and various markets for oilseeds and vegetable oils, use of representative market prices does not create significant distortions in the relationships between those prices.

Observing the monthly oil seed prices first, in both nominal and deflated terms, suggests that the prices track each other rather well. The major changes are for soybean prices in Decatur, Illinois during the early years, 1990 and 1994 and later in 2008. Soybean prices tend to be somewhat higher throughout the series but follow the same pattern. The copra (the meat of the coconut) prices are again following the same pattern but are lower throughout the series plotted. This difference is due to the oil content of the meat of the coconut relative to the oilseeds.

The measures of coherency in the oil seed prices are similar to the results for the grains. They follow the same pattern throughout the years, thus on the first criterion they seem to move together. Shocks to the series as well seem to be characterized by similar price movements up and down. In general, there are few instances in which the prices depart from the consistent pattern over the period of observation. The variances of the prices, except for differences in the intercept (level), are quite surprisingly are well explained by any one of the prices. Thus, the prices are every coherent for the period of observation.

For monthly prices for vegetable oil and fat there is also great harmony in the price movements in both the nominal and deflated prices (Figures 4 and 6). Base data are provided in Appendix Table 2. The exception is peanut oil which is consistently higher in price during the early years of the plotted series. The rest of the prices move together consistently, have variances that are well explained by any one of the prices and respond to shocks consistently during the period of examination.

One of the reasons for the coherency of grains and oil seeds and vegetable oils and fat price series is the direct incentives for farmers and users of these products. Farmers have at least partial substitution possibilities growing the different crops. Thus if one of the prices gets too far out of line there will be a production response that tends to bring the prices series together on the production side of the market. On the consumption side there is great substitutability for the oil seeds and for the vegetable oils and fats. This tends to make the prices move together rather closely. In short, there are forces on both sides of the market that tend to bring the price movements close together and provide for strong coherency.

Figure1, Monthly wheat and corn farm prices per bushel 1990 through October 2010

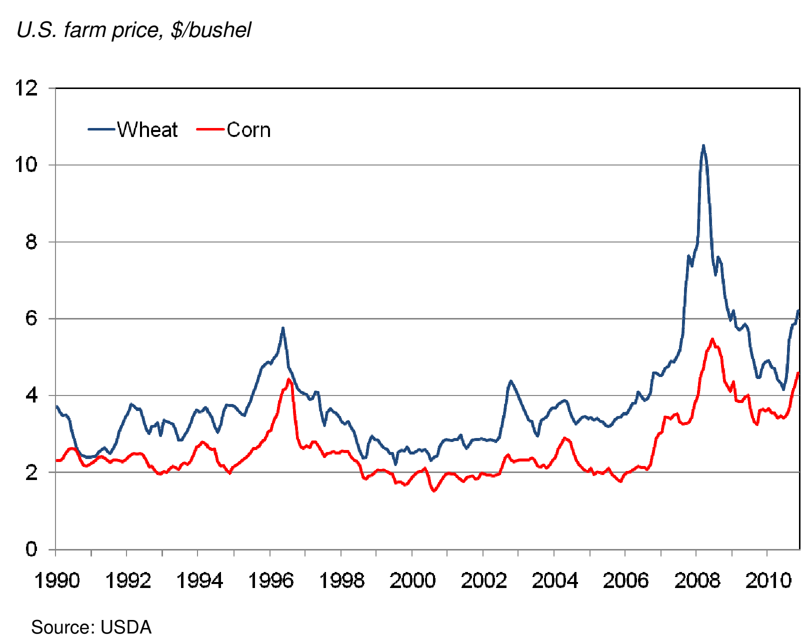


Figure 2, Monthly real U.S. farm prices for wheat and corn in dollars per bushel 1990 through October 2010, deflator U.S. producer price index for all commodities, 1982=100.

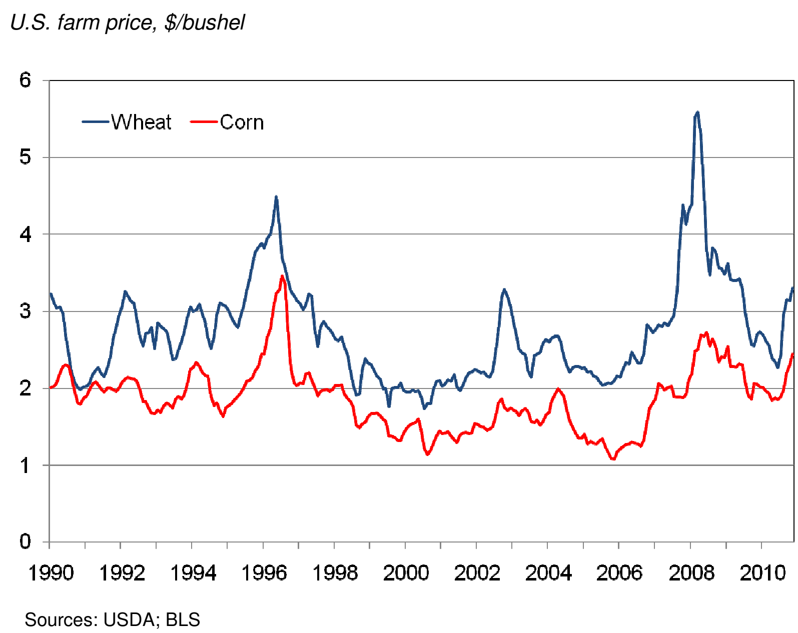


Figure 3, Monthly oil seeds prices in dollars per metric ton, 1990 through October 2010

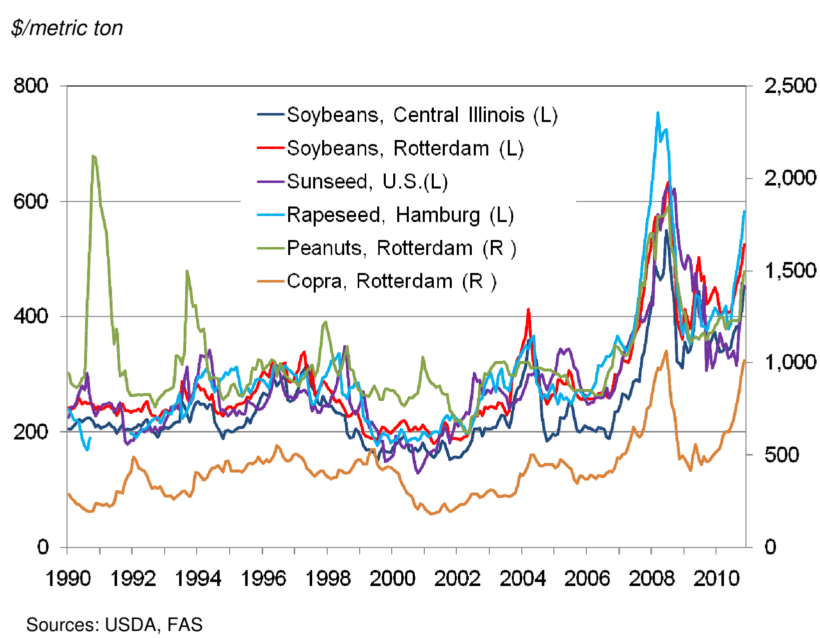
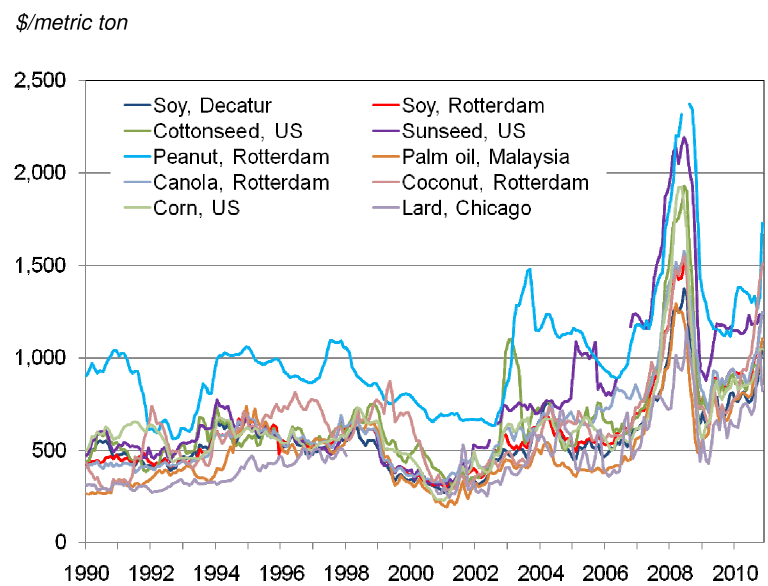
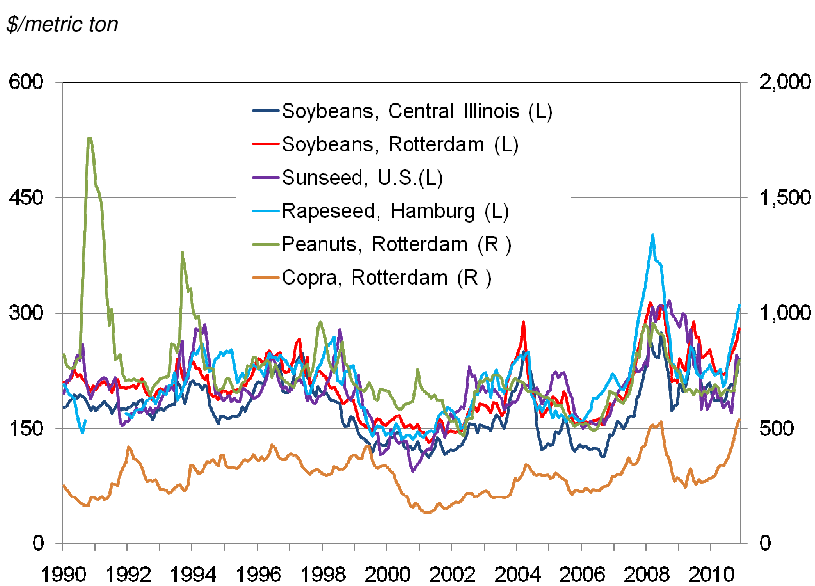


Figure 4, Monthly vegetable oil and fat prices in dollars per metric ton, 1990 through October 2010



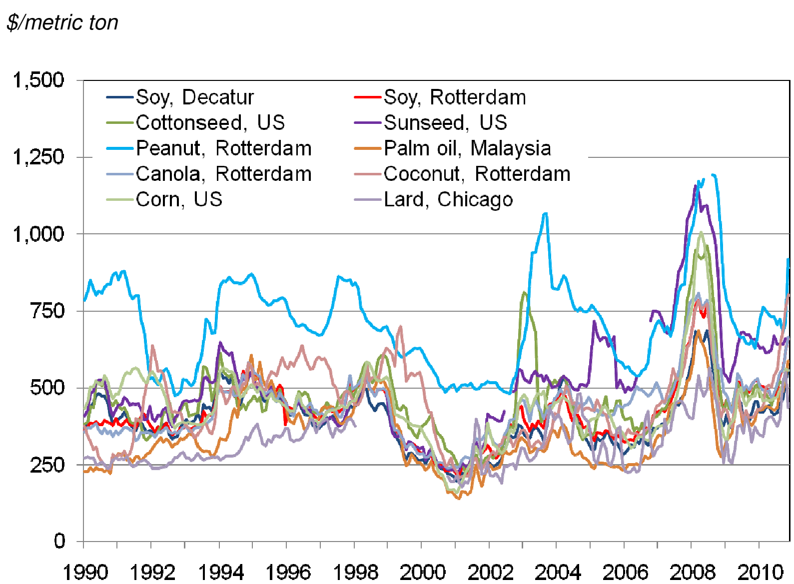
Sources: USDA, FAS & ERS

Figure 5, Real monthly oil seed prices in dollars per metric ton, 1990 through October 2010, deflator U.S. producer price index for all commodities, 1982=100.



Sources: USDA, FAS; BLS

Figure 6, Real monthly vegetable oil and fat prices in dollars per metric ton, 1990 through October 2010, deflator U.S. producer price index for all commodities, 1982=100.



Sources: USDA, FAS & ERS; BLS

As a point of reference we have also developed sugar prices for the same period as the other price series analyzed in this section. At present these are not plotted but are available for analysis if needed. These price series are monthly as well and are reported in Appendix Table 4.

Price Series for Petroleum Products

The price series for crude oil and petroleum products are the next set of prices to investigate for coherency. These monthly prices for the period 1990 through October 2010 are plotted in Figures 7 and 8, in nominal and deflated terms, respectively. The base data for the deflation and other price indices are provided in Appendix Table 3. The deflator is the same as for grains, oil seeds and vegetable oils and fats, the U.S. producer price index for all commodities, 1982 = 100.

The prices plotted with the legend on the left hand side are for the distilled products, Gasoline, #2 diesel, heating oil, jet fuel, ethanol and biodiesel. All are U.S. prices per gallon and from the EIA. On the right hand legend is plotted the crude oil price (West Texas intermediate) in dollars per barrel. Note that a barrel of crude oil is equal to approximately 42 gallons. The biodiesel price has been available only in recent years and is plotted for the period available..

The plots in Figures 7 and 8 show a pattern quite similar to the grains, oil seeds and vegetable oils and fat series. The prices move quite closely together, suggesting coherency. The ethanol price is higher in the early years and lower in the years since the energy act put a limit on the ethanol production. Actually, the energy act put a minimum mandated level and likely artificially resulted in increased ethanol production. Also, the combination of the depth of the recession in 2008 and investments going south pushed up investment and speculation in commodities, particularly oil and metals as safer havens than financial credit instruments. While data indicate that non-commercial agriculture futures activity increased during this time period, it did not do so anywhere near as much as for non-renewable commodities. Again the prices suggest that one price would explain most of the variation in the other prices. Also from the coherency view point the set of prices tend to move together during different episodes or periods of major change in energy prices.

The prices tend to be higher in the later years, with the crude oil price increasing at a rate greater than the distillates, adjusted for the two way plot of the data. It is also clear that something different in the price series plotted in Figures 7 and 8 is going on with the prices during the past 3 years. Crude oil and bio-diesel are behaving very differently than gasoline, ethanol, biodiesel, and jet fuel. We have the reason for ethanol and fuel crude oil and bo-diesel reflect the slow economic condition in the nation. Again, speculation pushed oil prices up, but the recession was constraining the increases in distillate prices during this period. It was an odd time, with high oil prices at the same time that oil and distillate inventories were generally adequate and sometimes rising. Notice that ethanol follows gasoline pretty well, and #2 diesel reflects transportation demand during the recession. These differences show as well in the deflated series.

Figure 7, Monthly fuel and crude petroleum prices in nominal terms 1990 through October 2010.

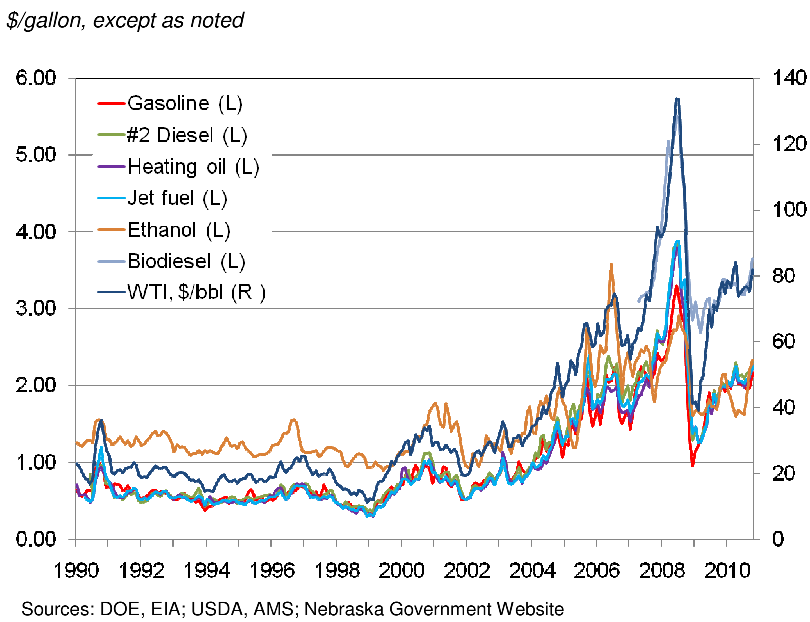
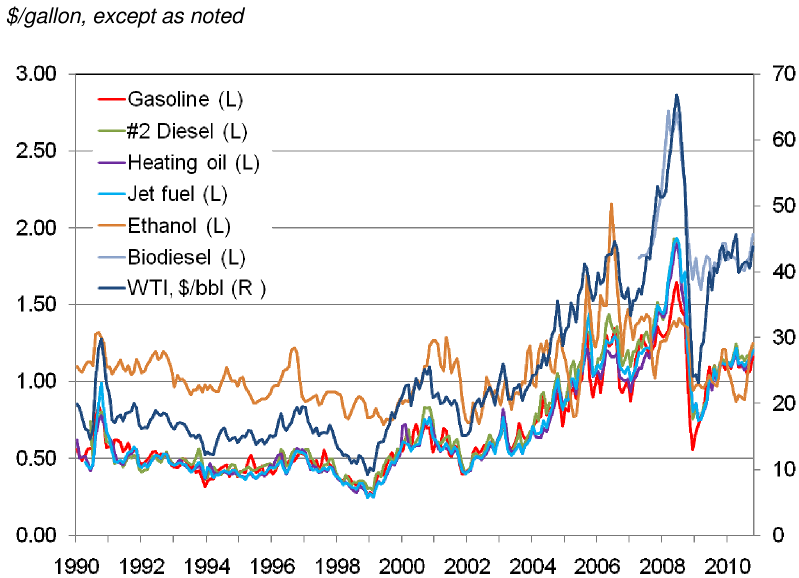


Figure 8, Monthly fuel and crude petroleum prices 1990 through October 2010, deflated by the U.S. Producer price index for all commodities 1982 = 100.



Sources: DOE, EIA; USDA, AMS; Nebraska Government Website; BLS

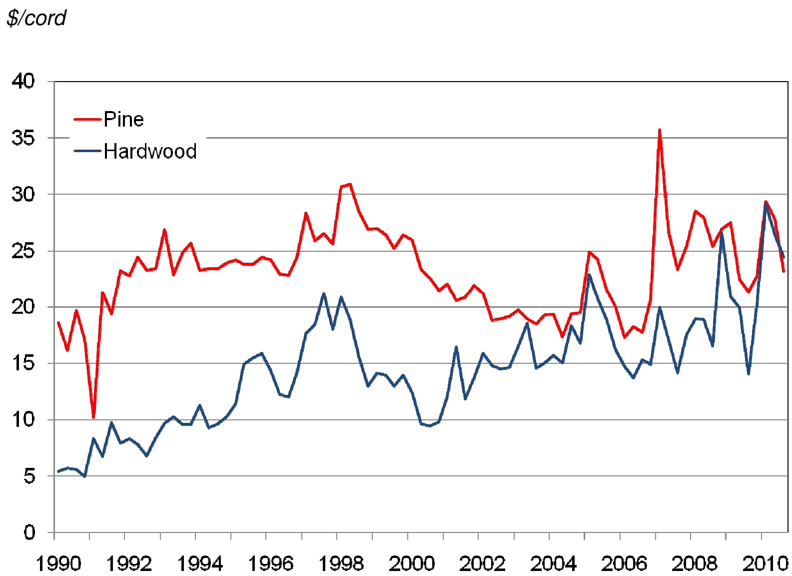
Prices Series of Feedstock Not Now Widely Used

The analysis also will investigate prices of agricultural feedstocks that are now not widely used for biofuels. We selected the feedstock to include switchgrass, corn stover and pulpwood. The pulpwood (hard and soft) prices have already been discussed to some extent. However, we will repeat the discussion in this section. The pulpwood prices are from the Louisiana market that reports the prices on a quarterly basis. Prices series used for the plots in this section for wood are located in Appendix Table 7. For corn stover and switchgrass the prices required construction from cost or budget data. These budgets are reported in Appendix Table 6. Here we used the budgets from several states and constructed the pseudo prices by moving the budget categories by the costs of inputs to the budget for which at least annual prices were available from secondary government sources.

Figures 9 and 10 contain the prices for pulpwood (hard and soft) for the period 1990 to October 2010. Observe that the prices of hard and soft pulpwood have come together over recent years. This is a result of drivers in the timber industry. Note as well that the price is in the neighborhood of $25.00 per cord. One cord amounts to 1/2 ton and the conversion to biofuel is 80 gallons per ton. Thus, the cost for biofuel from pulpwood is approximately $ $50 per gallon not including the investment to manufacture the biofuel.

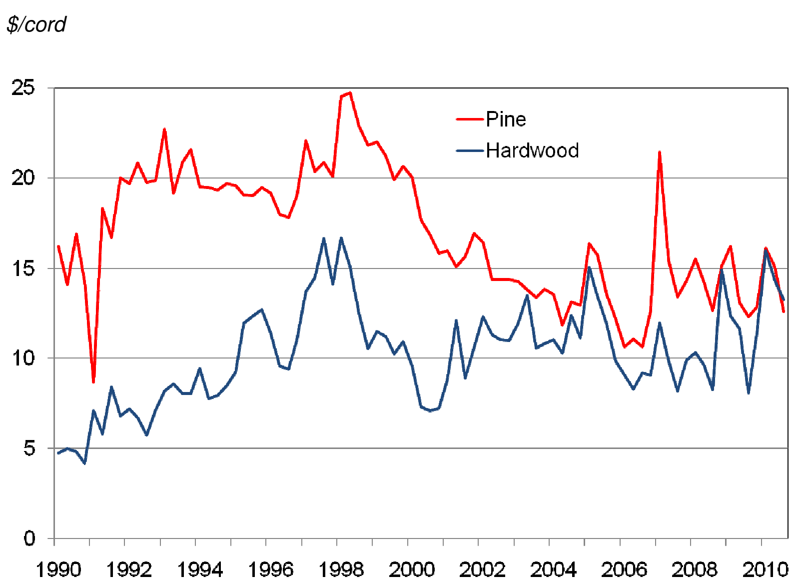
Switchgrass prices track in close relationship to petroleum prices. As well, the switchgrass and corn stover prices move in close relationship compared to the pulpwood prices. This is because the inputs to the budgets for corn stover and switchgrass are dominated by energy costs.

Figure 9, Monthly prices for hard and soft pulpwood (Louisiana), 1990 through October 2010.



Source: Louisiana Department of Agriculture and Energy

Figure 10, Monthly real prices for hard and soft pulpwood (Louisiana), 1990 through October 2010.



Source: Louisiana Department of Agriculture and Energy, BLS

Corn stover prices compared to crude oil prices are plotted in Figures 11 and 12, nominal and real, respectively. This is a commodity for which there is really no national or regional market. We constructed these prices from budgets made available from the University of Missouri, based on information from Purdue University. The figures include a delivered price and a field edge price. Note that the delivery of the corn stover is expensive relative to the field edge price. This difference is made up mostly of energy costs. The price is nearly the price of crude oil. Ethanol per ton of corn stover is abut 80 gallons.

Figure 11, Annual prices for corn stover (at field level and delivered) and crude oil prices, 1990 through) October 2010.

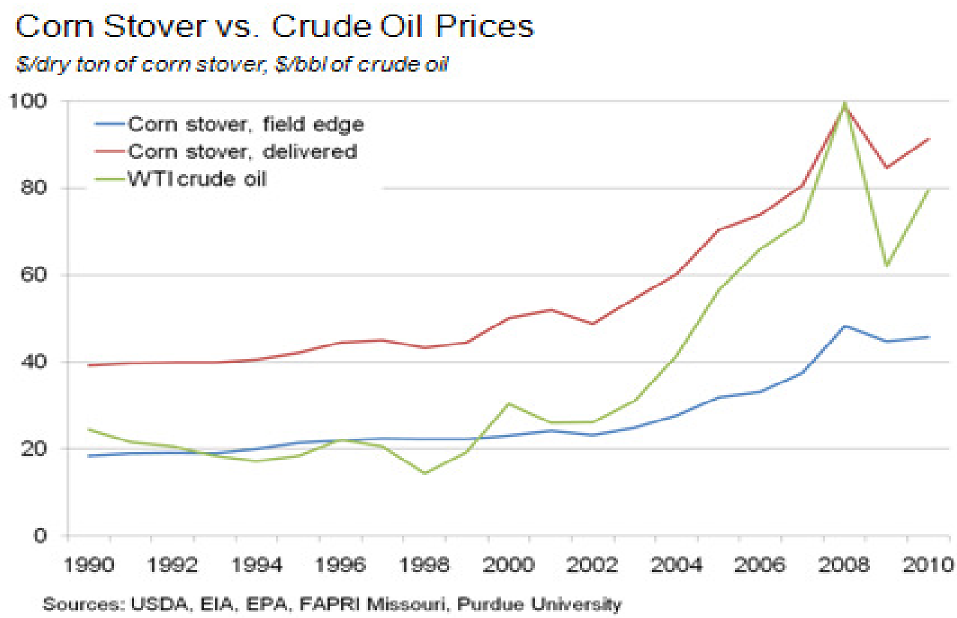
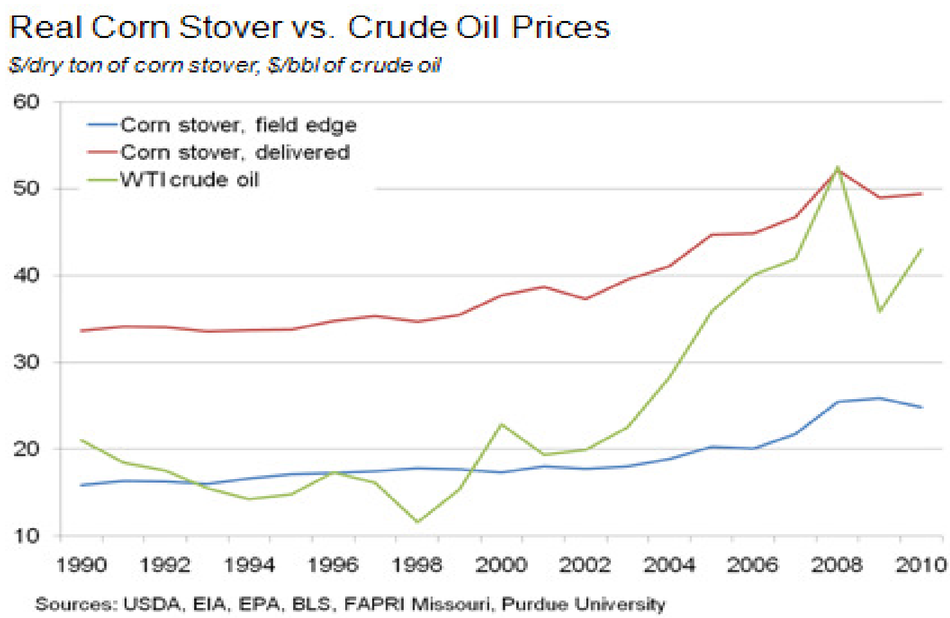


Figure 12, Real annual prices of corn stover (at Field level and delivered) and crude oil prices, 1990 through October 2010.



Switchgrass is the last of the not now widely used agricultural feedstocks. Again these prices (costs) were constructed from budgets. The budgets came from Indiana/Missouri, Tennessee, Iowa, North Carolina and Virginia. All budgets were for 2008 except Virginia which is based on 2007 data. The cost figures were developed by taking the component of the budget and adjusting them with the differences in the annual prices for each of the components (available from secondary data). The trends in prices are up over the period. Virginia has the highest price and Indiana/Missouri the lowest. At the end of the period the delivered costs are nearly at the level of the crude oil, plotted for reference. The ethanol content of switchgrass is about the same as corn stover, about 80 gallons per ton (Table 1).

Figure 13, Annual switchgrass prices (field edge) and crude oil prices. 1990 through 2010.

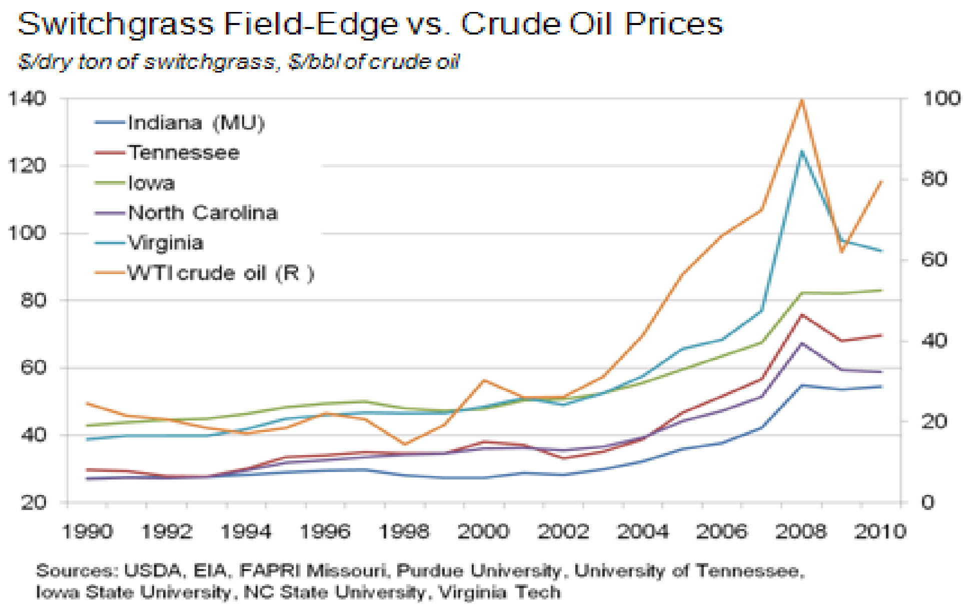
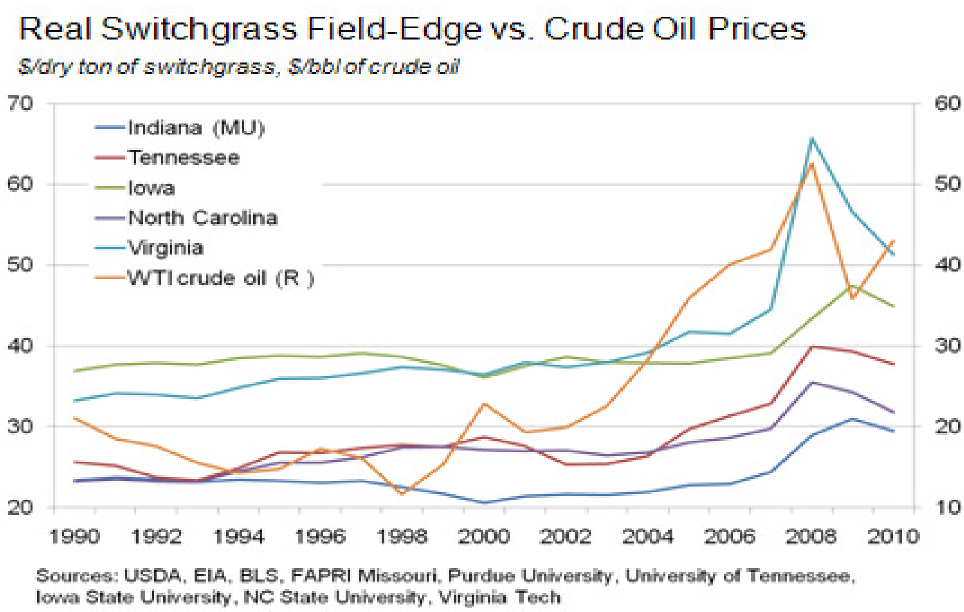


Figure 14, Real annual switchgrass (field edge) and crude oil prices, 1990 through 2010.



Graphic Analysis of Ratios of Energy and Agricultural Feedstock Prices

These ratios are rather revealing in that the first three graphics show the declining ratios of grains, oilseeds and vegetable oil, and fat prices relative to crude oil prices (Figures 15 through 18). The break point in the three graphs is in year 1999 to 2000. The reason is the increase in oil prices rather than a decrease in the prices of grains, oilseeds and vegetable oils, and fat. In fact, it almost appears that there are two price regimes in the 20 years of data plotted.

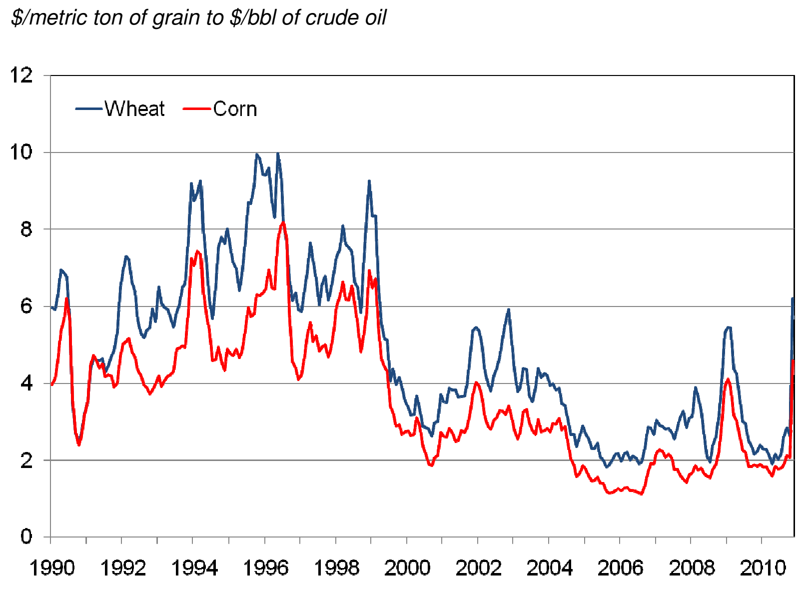
For wheat and corn the relative prices become closer to each other during the latter part of the time series, as shown in Figure 15. This is likely because in planted acreage adjustments at the farm level and in substitution on the consumption side The fact that the relative prices are closer together in the latter years is most likely due to substitutions on the consumption side where technology has made the products more substitutable. As well, the years of low prices for agricultural feedstocks followed several good years of production and yields.

Except for peanut oil the same trends in prices are apparent in the oil seed prices as for grains, as seen in Figure 16. The same relationships seem to hold between the oil seeds to crude oil relationship. Prices tend to follow a similar trend and there is a decided down turn in the relationship in about at the same periods as for grains. This is due to the increase in the price of oil relative to the agricultural feedstock commodities.

Figure 17 shows similar relationships for vegetable oil and fats as for grains and oilseeds. There is a smoother transition than for grains, but there is a definite relationship to the increase in the price of crude oil during the latter part of the period for which data were assembled. The lower trend in the relationship during the later years may be due to the broad substitutability of vegetable oils and fat within the consumption side of the market, and again unusually good yields..

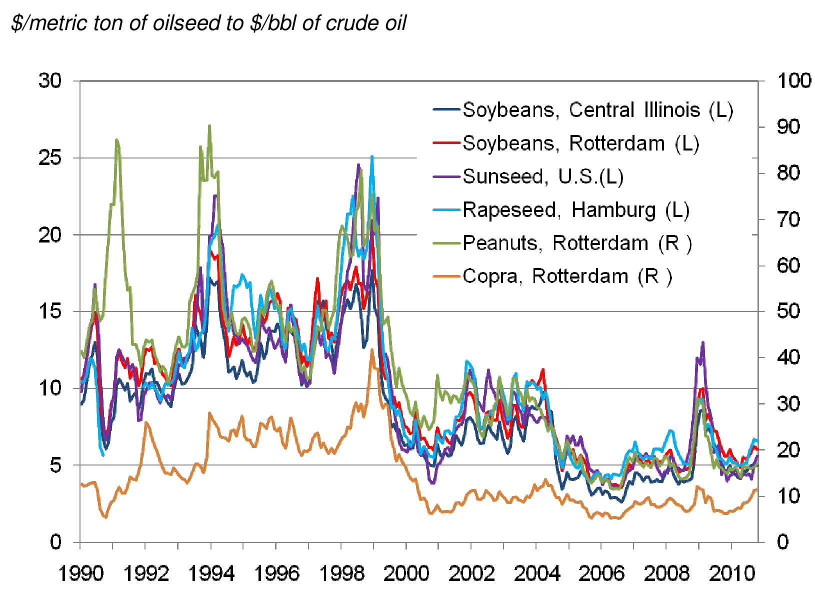
Figure 18 has the oil prices compared to the crude oil price. At different times there are different distillates driving the petroleum products market. For example, when the short in supply distillate is jet fuel, it has a higher relative price than gasoline. These subtle differences are shown by the Figure 18. One of the obvious trends is the reduction in gasoline prices related to the recession in the later years.

Figure 15, Monthly grain prices relative to crude oil prices expressed as ratios, 1990 through October 2010.



Source: USDA; EIA

Figure 16, Monthly oil seed prices relative to crude oil prices expressed as ratios, 1990 through October 2010.



Source: USDA, FAS; EIA

Figure 17, Monthly vegetable oil and fat prices relative to crude oil prices expressed as ratios, 1990 through October 2010.

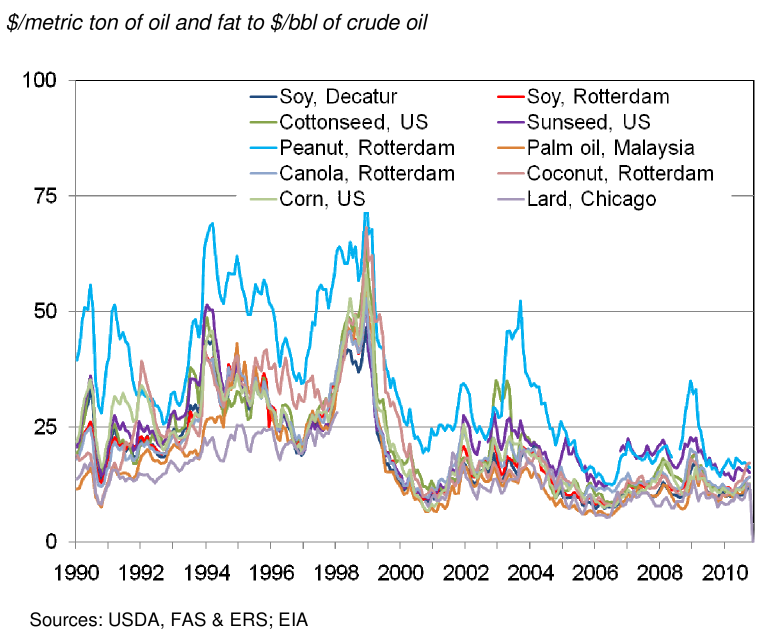
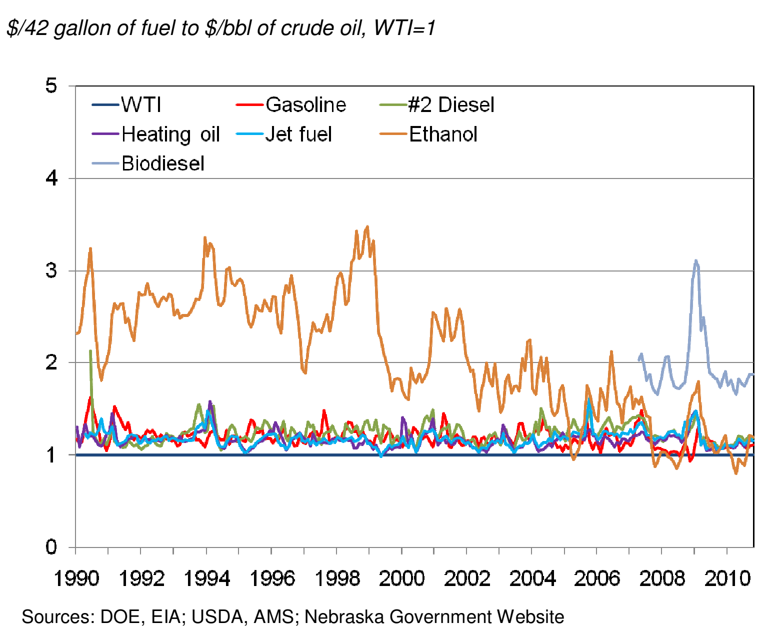


Figure 18, Monthly fuel prices relative to crude oil prices expressed as ratios, 1990 through October 2010.



Time Series Approach

The time series approach used for identifying the relations between petroleum products and agricultural feedstocks is somewhat different than the coherency structure developed above. It focuses on long and short run co-movements in petroleum products and agricultural feedstock prices. The reason is that coherency has special meaning in time series analysis, and we wish to differentiate our work from this other stream of analysis. The interpretations of the results in terms of the focus on co-movement in prices are however the same. On other aspect of this brief summary of the time series approach and the results of the empirical application is that we do not list the references for the methods here. They are completely listed on the paper (Robert L. Myers , et. al.) presenting the full analysis. With these qualifications we proceed to develop the methods and results.

To characterize the relationships among a set of *n* different petroleum product and agricultural feedstock prices, let $\mathbf{p}_t$ be an (*n*x1) vector of the logarithms of each commodity price. The first step in our approach is to decompose each (log) price into a "long-run equilibrium" or permanent component $\boldsymbol{\tau}_t$ and a "transitory" or cyclical component $\boldsymbol{\eta}_t$ so that:

(1) $$\mathbf{p}_t = \boldsymbol{\tau}_t + \boldsymbol{\eta}_t .$$

The permanent component is defined as $\boldsymbol{\tau}_t = \mathbf{p}_t + \lim_{s\to\infty}\sum_{k=1}^{s}\left[\Delta\hat{\mathbf{p}}_{t+k|t} - E(\Delta\mathbf{p}_t)\right]$ where $\Delta\hat{\mathbf{p}}_{t+k|t}$ is the *k*th step ahead best linear unbiased forecast of $\Delta\mathbf{p}_t$ conditional on information available at time *t* By definition, $\boldsymbol{\tau}_t$ is the expected long-run price vector conditional on information available at time *t*, corrected back to time *t* by subtracting any known trend or drift. For example, if a price p_{it} is mean stationary then its permanent component τ_{it} would just be the unconditional mean of the price and would not vary over time. Alternatively, if a price p_{it} is trend stationary with deterministic polynomial trend its associated permanent component would just be the time *t* trend value of the series. If p_{it} is nonstationary then τ_{it} is the expected long-run price conditional on information available at *t*, adjusted back to the current period by extracting any drift. In this case it can be shown that $\boldsymbol{\tau}_t$ follows a pure random walk (possibly with drift) and is therefore itself nonstationary. We refer to $\boldsymbol{\tau}_t$ as the "long-run equilibrium price" and, by definition, $\boldsymbol{\eta}_t$ is then stationary and represents transitory deviations from long-run equilibrium.

When $\boldsymbol{\tau}_t$ is nonstationary we need to allow for the possibility of cointegration. Suppose all prices are nonstationary and there are $r < n$ cointegration relationships among the *n* prices in the system. Then it is well known that the permanent component in (1) can be expressed in terms of a smaller number of $k = n - r$ "common trends" so that the long-run equilibrium prices can be written as $\boldsymbol{\tau}_t = \mathbf{A}\tilde{\boldsymbol{\tau}}_t$ where $\tilde{\boldsymbol{\tau}}_t$ is a (*k* x 1) vector of common trends (random walks) and $\mathbf{A}$ is an (*n* x *k*) loading matrix that has full column rank.

Similarly, it can be shown that the cyclical part of the series may also have common components. In particular, $\Delta\mathbf{p}_t$ is said to be "codependent" with common serial correlation features (hereafter just "codependent") if there are $c < n$ linear combinations of $\Delta\mathbf{p}_t$ that are innovations with respect to information available at time $t - 1$ (i.e., linear combinations of $\Delta\mathbf{p}_t$ that are not serially correlated). These linear combinations are called "cofeature vectors" and one implication of their existence is that the cyclical part can be written as $\boldsymbol{\eta}_t = \mathbf{B}\tilde{\boldsymbol{\eta}}_t$ where $\tilde{\boldsymbol{\eta}}_t$ is an (l x 1) vector of common cyclical components with $l = n - c$, and **B** is an (n x l) loading matrix for the common cycles that has full column rank.

Allowing for both cointegration and codependency the decomposition (1) can be expressed:

(2) $$\mathbf{p}_t = \mathbf{A}\tilde{\boldsymbol{\tau}}_t + \mathbf{B}\tilde{\boldsymbol{\eta}}_t.$$

If there is no cointegration or codependency then $\tilde{\boldsymbol{\tau}}_t$ and $\tilde{\boldsymbol{\eta}}_t$ will be of full dimension n.

Measures of Long-Run and Short-Run Co-Movement

To develop measures of long-run and short-run co-movement among prices we focus on the most common case of nonstationary prices. We measure the extent of long-run co-movement between two prices p_{it} and p_{jt} by the size of the correlation coefficient between the innovations in their permanent component, $Corr(\Delta\tau_{it}, \Delta\tau_{jt})$. If the long-run equilibrium values of the prices move closely together this correlation will be close to one, while if movements in the long-run equilibrium values are completely unrelated this correlation will be zero. The correlation between the innovations in the permanent components therefore has a natural interpretation as a measure of long-run co-movement between the prices.

Clearly, the number of common trends k and the size of the parameters in the loading matrix **A** will influence the extent of long-run co-movement between prices. For example, suppose that p_{it} and p_{jt} are both driven by a single common trend (i.e., they are cointegrated). Then the long-run equilibrium values of both prices would move together perfectly and $Corr(\Delta\tau_{it}, \Delta\tau_{jt}) = 1$. In this case the long-run equilibrium prices maintain a fixed relationship with one another and we will say there is perfect long-run co-movement between the prices. Alternatively, if the two prices are not driven by common trends (i.e., are not cointegrated) then $Corr(\Delta\tau_{it}, \Delta\tau_{jt}) < 1$ and the two prices will be unrelated in the long-run (long-run forecasts of any linear combination of the equilibrium prices will have infinite variance).

In the limiting case when the permanent components of the two prices are separate *uncorrelated* random walks then the long-run equilibrium values of the prices move completely independently and $Corr(\Delta\tau_{it}, \Delta\tau_{jt}) = 0$. Intermediate outcomes $0 < Corr(\Delta\tau_{it}, \Delta\tau_{jt}) < 1$ indicate long-run equilibrium values of prices move together because innovations in their permanent component are correlated, even though these prices would eventually move apart and be unrelated in the long run. In this case values of $Corr(\Delta\tau_{it}, \Delta\tau_{jt})$ close to one indicate strong co-movement in long-run equilibrium prices while values close to zero indicate weak co-movement.

We measure short-run co-movement between any two prices p_{it} and p_{jt} by the unconditional correlation between their transitory components $Corr(\eta_{it}, \eta_{jt})$. Because the transitory components are stationary this unconditional correlation is well-defined and provides a convenient summary measure of the extent to which prices co-move in the short run as they converge back towards their long-run equilibrium values. Just as the number of common trends *k* and the size of the parameters in the loading matrix **A** influence the extent of co-movement between long-run equilibrium prices, the number of common cycles *l* and the parameters of the loading matrix **B** influence the extent of co-movement between the transitory deviations. For example, suppose that Δp_{it} and Δp_{jt} are both driven by a single common cycle (i.e., they are codependent).

Then their transitory components would move perfectly together and $Corr(\eta_{it}, \eta_{jt}) = 1$. In this case we will say that there is perfect short-run co-movement between the prices. Alternatively, if the two prices are not codependent then each price is driven by separate cyclical components and $Corr(\eta_{it}, \eta_{jt}) < 1$. In the limiting case of no relationship between the transitory components then $Corr(\eta_{it}, \eta_{jt}) = 0$. In the intermediate case of $0 < Corr(\eta_{it}, \eta_{jt}) < 1$ values close to one indicate strong co-movement in adjustments towards long-run equilibrium while values close to zero indicate weak short-run co-movement. Together, the estimated correlation matrices of $\Delta\boldsymbol{\tau}_t$ and $\boldsymbol{\eta}_t$ provide detailed information on the ways in which the prices are related to one another in both the long-run and the short run.

Estimation and Testing

Estimation and testing for nonstationarity and cointegration are now standard and will not be outlined in detail here. However, estimation and testing for codependence is less common and so we provide a brief outline of these procedures.

Consider a vector error correction (VEC) model of the form:

$$\text{(3)} \qquad \Delta\mathbf{p}_t = \boldsymbol{\mu} + \boldsymbol{\alpha}\mathbf{z}_{t-1} + \sum_{i=1}^{q} \boldsymbol{\Gamma}_i \Delta\mathbf{p}_{t-i} + \boldsymbol{\varepsilon}_t$$

where $\mathbf{z}_t = \boldsymbol{\beta}'\mathbf{p}_t$ is the (*r* x 1) vector of equilibrium errors from the *r* cointegrating relationships and $\boldsymbol{\beta}$ contains the cointegrating vectors. To test for codependence consider the information set $\mathbf{w}_t = \{\mathbf{z}_{t-1}, \Delta\mathbf{p}_{t-1}, ..., \Delta\mathbf{p}_{t-q}\}$ and note that if a linear combination of $\Delta\mathbf{p}_t$ is an innovation with respect to the information set $\mathbf{w}_t$ (i.e., is a cofeature vector) then that combination should not be correlated with $\mathbf{w}_t$.

Therefore, to test for codependence compute a statistic based on the canonical correlations between $\Delta\mathbf{p}_t$ and $\mathbf{w}_t$ and evaluate how many of these canonical correlations are "sufficiently close" to zero. In particular, to test the null hypothesis that there are at least *c* codependency vectors (at most *l* common cycles), take the *c* smallest canonical correlations $\lambda_1, \lambda_2, ..., \lambda_c$ between $\Delta\mathbf{p}_t$ and $\mathbf{w}_t$ and compute the test statistic:

(4) $$C(q,c) = -(T-q-2)\sum_{i=1}^{c}\ln(1-\lambda_i^2)$$

which is distributed $\chi^2[c^2 + cn(q+1) + cr - cn]$. A series of such tests will indicate the number of cofeature vectors (i.e., the number of common cycles in the transitory components of the prices).

Once the number of cofeature vectors has been established, estimation of the (c x n) cofeature vector, denoted $\tilde{\boldsymbol{\beta}}$, can be undertaken in a variety of ways, including reduced rank regression. However, imposing the codependency restrictions on the error correction model (3) and estimating the resulting "pseudo-structural form" using maximum likelihood or any other simultaneous equations estimator. To find the appropriate pseudo-structural form, first note that $\tilde{\boldsymbol{\beta}}$ is not unique and so can be normalized to:

$$\tilde{\boldsymbol{\beta}} = \begin{bmatrix} \mathbf{I}_s \\ \tilde{\boldsymbol{\beta}}^*_{(n-s)\times s} \end{bmatrix}$$

for a set of unknown parameters $\tilde{\boldsymbol{\beta}}^*$. Then note that the codependency restrictions imply (up to a constant term) the following restrictions on the VEC model (3):

(5) $$\begin{bmatrix} \mathbf{I}_s & \tilde{\boldsymbol{\beta}}^{*\prime} \\ \mathbf{0}_{(n-s)\times s} & \mathbf{I}_{n-s} \end{bmatrix} \Delta\mathbf{p}_t = \begin{bmatrix} \mathbf{0}_{(s\times r)} \\ \boldsymbol{\alpha}^* \end{bmatrix} \mathbf{z}_{t-1} + \sum_{i=1}^{q} \begin{bmatrix} \mathbf{0}_{(s\times n)} \\ \boldsymbol{\Gamma}_i^* \end{bmatrix} \Delta\mathbf{p}_{t-i} + \boldsymbol{\varepsilon}_t$$

where the * differentiates parameters from their unrestricted counterparts. When codependency is found we estimate the parameters in (5) as a system using iterated three stage least squares.

Also notice that (5) imposes the following restrictions on the VEC model (3):

(6) $$\boldsymbol{\alpha} = \begin{bmatrix} \mathbf{I}_s & \tilde{\boldsymbol{\beta}}^{*\prime} \\ \mathbf{0}_{(n-s)\times s} & \mathbf{I}_{n-s} \end{bmatrix}^{-1} \begin{bmatrix} \mathbf{0}_{(s\times r)} \\ \boldsymbol{\alpha}^* \end{bmatrix} \text{ and } \boldsymbol{\Gamma}_i = \begin{bmatrix} \mathbf{I}_s & \tilde{\boldsymbol{\beta}}^{*\prime} \\ \mathbf{0}_{(n-s)\times s} & \mathbf{I}_{n-s} \end{bmatrix}^{-1} \begin{bmatrix} \mathbf{0}_{(s\times n)} \\ \boldsymbol{\Gamma}_i^* \end{bmatrix} \text{ for } i = 1, 2, \ldots q.$$

These restrictions will be useful for computing the permanent-transitory decomposition under codependency restrictions.

Computing the Decomposition

Once the parameters of the model have been estimated (either with or without cointegration and codependency restrictions as indicated by test results), decomposing each price into permanent and transitory components is straightforward. Following now standard procedures, the VEC decomposition can be computed as:

(7a) $$\boldsymbol{\tau}_t = (\mathbf{I}_n - \mathbf{P})[\boldsymbol{\Gamma}(1) - \boldsymbol{\alpha}\boldsymbol{\beta}']^{-1}\boldsymbol{\Gamma}(L)\mathbf{p}_t$$

(7b) $$\boldsymbol{\eta}_t = -(\mathbf{I}_n - \mathbf{P})[\boldsymbol{\Gamma}(1) - \boldsymbol{\alpha}\boldsymbol{\beta}']^{-1}\boldsymbol{\Psi}(L)\Delta\mathbf{p}_t + \mathbf{P}\mathbf{p}_t$$

where $\boldsymbol{\Gamma}(L) = \mathbf{I}_n - \boldsymbol{\Gamma}_1 L - \ldots - \boldsymbol{\Gamma}_q L^q$, $\boldsymbol{\Gamma}(1) = \mathbf{I}_n - \boldsymbol{\Gamma}_1 - \ldots - \boldsymbol{\Gamma}_q$, $\boldsymbol{\Psi}(L) = \boldsymbol{\Psi}_0 - \boldsymbol{\Psi}_1 L - \ldots - \boldsymbol{\Psi}_{q-1}L^{q-1}$ with $\boldsymbol{\Psi}_j = \sum_{i=j+1}^{q}\boldsymbol{\Gamma}_i$, and where $\mathbf{P} = [\boldsymbol{\Gamma}(1) - \boldsymbol{\alpha}\boldsymbol{\beta}']^{-1}\boldsymbol{\alpha}\{\boldsymbol{\beta}'[\boldsymbol{\Gamma}(1) - \boldsymbol{\alpha}\boldsymbol{\beta}']^{-1}\boldsymbol{\alpha}\}^{-1}\boldsymbol{\beta}'$.

These formulas already impose cointegration restrictions directly, so decompositions computed using (7) will satisfy all appropriate cointegration restrictions. If there is no cointegration ($r = 0$)

these formulas are still applicable if we set $\boldsymbol{\alpha\beta}'=\mathbf{0}$ and $\mathbf{P}=\mathbf{0}$. If short-run codependency behavior is found then the decomposition (7) is still applicable, except that values for $\boldsymbol{\alpha}$ and the $\boldsymbol{\Gamma}_i$ must satisfy the restrictions in (6) with $\tilde{\boldsymbol{\beta}}^*$, $\boldsymbol{\alpha}^*$, and $\boldsymbol{\Gamma}_i^*$ estimated using the pseudo structural form (5). Imposing these restrictions will ensure that the transitory component $\boldsymbol{\eta}_t$ computed from (7b) exhibits all of the behavior implied by the codependency restrictions.

Evaluating Potential Nonlinearities and Regime Shifts

It is possible that the co-movement of commodity prices involves nonlinearities that are not well captured by the linear cointegration and codependency models discussed so far. For example, it could be that the price relationships experienced a structural change due to the emergence of biofuels, or that when production of biofuel reaches certain threshold levels then the nature of the price relationships change. One way to allow for such nonlinearities is to allow model parameters to change over different ranges of values for underlying threshold variables, such as biofuel production levels, commodity stock levels, and time.

To allow for such regime changes, suppose the estimation equations for the multivariate price model take the general form $\Delta\mathbf{p}_t = \mathbf{f}(\mathbf{w}_t;\boldsymbol{\theta}) + \boldsymbol{\varepsilon}_t$ where $\mathbf{w}_t$ is as defined previously and $\boldsymbol{\theta}$ its associated parameter vector. Then we can define a multiple threshold model as:

(8) $$\Delta\mathbf{p}_t = \mathbf{f}(\mathbf{w}_t;\boldsymbol{\theta}_j) + \boldsymbol{\varepsilon}_t \qquad \mathbf{x}_t \in R_j(\boldsymbol{\delta})$$

where *j* indexes a set of multiple regimes defined by values of the exogenous threshold variable vector $\mathbf{x}_t$ lying in a set of nonintersecting and exhaustive sets $R_j(\boldsymbol{\delta})$ defined by the parameter vector $\boldsymbol{\delta}$.

A simple example would be a two-regime model based on the level of biofuel production:

(9a) $$\Delta\mathbf{p}_t = \mathbf{f}(\mathbf{w}_t;\boldsymbol{\theta}_1) + \boldsymbol{\varepsilon}_t \qquad x_t \le \delta$$

(9b) $$\Delta\mathbf{p}_t = \mathbf{f}(\mathbf{w}_t;\boldsymbol{\theta}_2) + \boldsymbol{\varepsilon}_t \qquad x_t > \delta$$

where x_t is biofuel production and δ is the critical biofuel production level above which the price process changes. In general, however, (8) allows for multiple regimes and multiple threshold variables and parameters. After identifying and estimating the separate models for each regime, the cointegration, codependency and permanent-transitory decomposition analyses can then be applied regime by regime to isolate the extent of long-run and short-run co-movement in different regimes.

Estimation conditional on a given value for $\boldsymbol{\delta}$ is straightforward and can be achieved by sub-sample regression. However, testing for the number and location of the thresholds is complicated by the problem of under-identified nuisance parameters under the null of no thresholds

An alternative bootstrap method for testing the null of no threshold (one regime) against a one threshold (two-regime) alternative. But although this same test has been applied to test for multiple regimes sequentially there is no distribution theory to support it.

An alternative procedure for identifying multiple regimes has however been developed. A multivariate version of their procedure would be to evaluate the BIC-like criterion function:

(10) $$Q_T(m) = \max_{\boldsymbol{\delta}} \left\{ \frac{2}{T} \left[L_T(\boldsymbol{\delta}) - L_T \right] - \frac{\ln(T)}{T} md \right\}$$

where L_T is the log-likelihood value for the single regime (no threshold) model, $L_T(\boldsymbol{\delta})$ is the full sample log-likelihood value for the multi-regime model with thresholds $\boldsymbol{\delta}$, d is the number of parameters to be estimated in the single regime model, and m is the number of threshold parameters. Multiplying T times the first component on the right hand side of (10) gives the conventional likelihood ratio (LR) statistic for testing the null of a single regime against the alternative of m threshold parameters.

Therefore this LR statistic forms the basis for model selection. But instead of using the conventional LR test (whose distribution in this context is unknown), model selection is based on inclusion of a penalty function that penalizes over-parameterization of thresholds relative to the sample size. This penalty function is analogous to the BIC criterion for choosing lag lengths. Threshold and regime selection is then based on:

(11) $$\hat{m} = \arg\max_{0 \le m \le M} Q_T(m)$$

where M is a maximum number of thresholds to be considered. Simulation evidence is available to suggest this criterion performs well in selecting the appropriate number of thresholds and regimes.

Co-Movement Among Related Sets of Commodity Prices

We first illustrate the approach by examining co-movement among three major agricultural prices—corn, wheat, and soybeans. Because these commodities are substitutes in production, and to some extent in consumption, we might expect their price movements to be strongly related, especially in the long run, and the results support this conclusion.

We test for unit roots and cointegration using Dickey-Fuller and related trace tests. Results provide strong support for the hypotheses that each of the log price series contain a unit root, and that the series are linked by two unique cointegrating vectors, which implies a single common trend drives all three prices. The two estimated cointegrating vectors (imposing conventional normalization restrictions and ignoring intercepts) are:

$$\underset{(0.073)}{c_t = 0.90 w_t} \quad \text{and} \quad \underset{(0.098)}{s_t = 0.91 w_t}$$

where c_t, s_t, and w_t are log corn, soybean, and wheat prices and asymptotic corrected standard errors are in parentheses. The restriction that each cointegrating parameter is 1 cannot be rejected and so these restrictions are imposed directly from here on. Because the prices are in logarithms, the cointegrating restrictions imply that the prices of corn, soybeans and wheat remain proportional to one another in the long-run (i.e., that long-run equilibrium prices of the three series grow or decline at the same rate).

The next step is to test for common cycles. Results for the canonical correlation tests and are strongly support the conclusion that there are no cofeature vectors (three unique cycles). Hence the conclusion is that the cyclical components of all three log prices have unique autocorrelation structures that do not share common features.

The implication of the combined cointegration and cofeature tests is that the three agricultural commodity prices have a permanent-transitory decomposition of the form:

$$\begin{bmatrix} c_t \\ s_t \\ w_t \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \tau_t + \begin{bmatrix} \eta_{ct} \\ \eta_{st} \\ \eta_{wt} \end{bmatrix}$$

where τ_t is the single common trend and the η_{it} are unique stationary components that do not share common serial correlation features. The permanent-transitory decomposition was computed using (7) and the permanent component of (log) corn prices (shown in the related paper). Corresponding graphs for soybeans and wheat (not shown) are similar and show that the majority of variation in agricultural commodity prices is due to (common) permanent movements in long-run equilibrium prices, with only a small amount of the variation due to transitory shocks.

As expected, $Corr(\Delta\tau_{it}, \Delta\tau_{jt}) = 1$ for all price pairs (perfect long-run co-movement between the prices). The unconditional sample correlation matrix for the transitory component is given by (ordered corn, soybeans, wheat):

$$Corr(\boldsymbol{\eta}_t) = \begin{bmatrix} 1 & & \\ 0.60 & 1 & \\ -0.0 & -0.65 & 1 \end{bmatrix}.$$

Therefore, adjustments back to long-run equilibrium after a transitory shock are positively correlated for corn and soybeans but negatively correlated for wheat and soybeans and not correlated at all for wheat and corn. This indicates there is relatively stronger short-run co-movement between corn and soybeans prices, but that the transitory wheat component behaves differently than the other prices. This is not unexpected because corn and soybean production are generally more easily substitutable with each other than with wheat, especially in the short run.

Overall, results indicate that corn, wheat, and soybean price movements are strongly related in the long run because their long-run equilibrium prices co-move perfectly keeping prices proportional in the long run. Short-run deviations away from equilibrium price levels also move together for corn and soybeans, but short run deviations for wheat behave differently and are not positively related to short-run deviations for corn and soybean prices.

A similar analysis applied to three petroleum prices (crude oil, gasoline, and jet fuel) found that all three prices are nonstationary with two cointegrating vectors (the three prices are driven by a single common trend). Hence, these petroleum prices also remain proportional in the long-run and $Corr(\Delta\tau_{it}, \Delta\tau_{jt}) = 1$ for all petroleum price pairs.

Using a 5% significance level the canonical correlation statistics suggest one cofactor vector, which implies two common serial correlation features drive all of the transitory movements in petroleum prices. The cofactor vector estimated using the pseudo-structural form (5) with iterated three stage least squares is (up to a constant term):

$$\Delta o_t = \underset{(0.168)}{-0.21}\Delta g_t + \underset{(0.123)}{0.78}\Delta j_t$$

which, given that the coefficient on gasoline price changes is statistically insignificant, suggests that transitory movements in crude oil prices are less volatile than transitory movements in jet fuel prices.

The implications of these findings can be investigated more fully by computing the decomposition (7) under cointegration and codependency restrictions (shown on the related paper). Corresponding graphs for gasoline and jet fuel (not shown) are similar and show that the majority of variation in petroleum prices is due to (common) permanent price movements, with only a small amount of the variation due to transitory shocks to long-run equilibrium.

Given that the transitory components of the three petroleum prices share two common serial correlation features, we might expect their transitory movements to co-move closely. This is indeed the case as indicated by the unconditional sample correlation matrix for the transitory components (ordered crude oil, gasoline, jet fuel):

$$Corr(\hat{\boldsymbol{\eta}}_t) = \begin{bmatrix} 1 & & \\ 0.81 & 1 & \\ 0.87 & 0.99 & 1 \end{bmatrix}.$$

Overall, results indicate that, as expected, crude oil, gasoline, and jet fuel price movements are strongly related in both the long and short run.

Co-movement Among Agricultural and Petroleum Prices

Having examined agricultural and petroleum prices separately as a baseline we now investigate co-movement among petroleum prices and the prices of agricultural feedstocks for biofuel. Because we have already investigated agricultural and petroleum prices separately, and because the underlying VEC models can become over-parameterized when a large number of prices are included, we only include a subset of the agricultural and petroleum prices in this analysis. In particular, we investigate the relationship between corn prices and crude oil prices.
However, we also include ethanol prices in the model because corn is currently the major ethanol feedstock in the U.S. and crude oil is the major feedstock for petroleum fuels worldwide. So it is possible that competing demands for ethanol and petroleum fuels may forge a link between crude oil and ethanol prices, which passes through to corn as a result of factor demand for corn in ethanol production.

Results strongly support unit roots in both series. Unit root test results reported earlier for corn also support nonstationarity in corn prices. Tests for cointegration among the three prices (corn, crude oil and ethanol) were investigated (See related paper). The Johansen trace tests support one cointegrating vector and the Engle-Granger tests suggest that crude oil and ethanol prices are cointegrated but not corn and ethanol and not corn and crude oil. The estimated cointegrating relationship with normalization restrictions imposed is (up to a constant term):

$$e_t = \underset{(0.039)}{0.45} o_t$$

where e_t is the log ethanol price. Johansen's likelihood ratio test of the over-identifying restriction that corn price does not enter into the cointegrating relationship has a p-value of 0.473, indicating strong support for this hypothesis.

The estimated co-integrating parameter is not statistically significantly different from 0.5 so in the remainder of the analysis we impose this restriction. Because the relationship is in natural logarithms, a cointegration parameter of 0.5 indicates that a 1% increase in the long-run crude oil price is expected to coincide with only a 0.5% increase in the long-run ethanol price. Hence, there is a long-run equilibrium relationship between crude oil and ethanol prices but ethanol prices are expected to grow at only about half the rate of crude oil prices in the long-run, perhaps because ethanol is a renewable fuel that is expected to continue to grow in importance in the future while crude oil is non-renewable and in finite supply.

Tests for common serial correlation features among corn, ethanol, and crude oil prices were conducted, and the results strongly reject the presence of any cofeature vectors. Therefore the conclusion is that the transitory deviations from long-run equilibrium values among these three prices are not co-dependent and are therefore driven by three separate short-run cycles.

Together, the cointegration and codependency tests suggest a normalized common trend-common cycle representation of the form:

$$\begin{bmatrix} c_t \\ e_t \\ o_t \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} \tau_{1t} \\ \tau_{2t} \end{bmatrix} + \begin{bmatrix} \eta_{1t} \\ \eta_{2t} \\ \eta_{3t} \end{bmatrix} \quad (12)$$

which indicates the long-run equilibrium price of crude oil is expected to grow at twice the rate of the long-run equilibrium price of ethanol, and the long-run equilibrium price of corn is unrelated to the long-run equilibrium price of ethanol and crude oil. Transitory deviations from long-run equilibrium in each price are driven by separate short-run cycles, though these short-run cycles may be correlated.

The implications of these relationships can be investigated more fully by computing the decomposition (7) under the cointegration restriction. The permanent component of (log) ethanol prices is graphed along with actual (log) ethanol prices in Figure 6. The graph shows that the majority of variation in ethanol prices is due to (common with crude oil) permanent price movements, with only a small amount of the variation due to transitory shocks to long-run equilibrium prices. Graphs for the equilibrium prices for corn and crude oil (not shown) display a similar pattern.

Hence, ethanol and crude oil prices will co-move strongly in the long-run, although the long-run rate of growth of ethanol prices is expected to be half that of crude oil prices. Ethanol and crude oil prices have no long-run relationship with the corn price. Nevertheless, because the common trends in (12) may be correlated random walks, it is still possible that innovations in long-run equilibrium prices for corn are correlated with the innovations in long-run equilibrium prices for crude oil and ethanol.

We used the decomposition to compute the correlation matrix of these innovations and the results are (ordered corn, ethanol, crude oil):

$$Corr(\Delta\hat{\boldsymbol{\tau}}_t) = \begin{bmatrix} 1 & & \\ -0.16 & 1 & \\ -0.16 & 1 & 1 \end{bmatrix}.$$

The innovations in the long-run equilibrium values of ethanol and crude oil prices are perfectly correlated (as expected) while the correlation between innovations in long-run equilibrium corn and petroleum prices is small and negative. This indicates there is no positive co-movement in equilibrium prices for corn and either crude oil or ethanol.

Turning to transitory price movements we compute the unconditional correlation matrix of the transitory components as (again ordered corn, ethanol, crude oil):

$$Corr(\hat{\boldsymbol{\eta}}_t) = \begin{bmatrix} 1 & & \\ 0.51 & 1 & \\ -0.00 & 0.64 & 1 \end{bmatrix}.$$

We might expect considerable short-run co-movement in crude oil and ethanol prices. This is indeed the case with their transitory components having an unconditional correlation coefficient of 0.64. There is also short-run co-movement between corn and ethanol prices, and have an unconditional correlation coefficient of 0.51. Hence, even though corn and ethanol prices are not connected in the long-run, they display considerable short-run co-movement. Corn and crude oil prices display essentially no short-run co-movement (unconditional correlation coefficient of -0.00). So corn and crude oil prices share little co-movement in either the long run or the short run.

Overall, these results suggest that long-run equilibrium corn prices are driven by economic fundamentals that are not well connected to the economic fundamentals driving long-run equilibrium crude oil and ethanol prices. However, crude oil and ethanol prices are well-connected both in terms of long-run co-movement and co-movements of short-run transitory deviations from equilibrium. This suggests substitution/complementarity relationships between crude oil and ethanol forge a strong relationship between these prices but the economic fundamentals underlying long-run corn price determination appear quite separate from those for petroleum prices, presumably because corn has other uses besides biofuel, is subject to a supply response, and because there are other sources of biomass for ethanol production besides corn.

Nonlinearities and Regime Shifts

The model was tested for nonlinearities first using U.S. ethanol production as the threshold variable. The hypothesis is that when ethanol production gets high enough the biofuel demand for corn establishes a link between corn and ethanol/crude oil prices that might not have existed at lower ethanol production levels. However, estimation of the Gonzalo-Piterakis criterion (10) suggested no threshold effects from ethanol production (the full sample model provided the highest value for the criterion function).

Evidently, previous conclusions regarding corn price co-movements with ethanol and crude oil prices are not sensitive to ethanol production levels. We also investigated the possibility of different price co-movement regimes due to shifts in coarse grain stock levels. Again, however, the Gonzalo-Piterakis criterion suggested no thresholds so our previous results are also robust to changes in coarse grain stocks.

There is some evidence from previous studies that there may have been a structural change in corn-crude oil price relationships which occurred in part because of the rise in ethanol production in recent years but in part due to other factors such as regulatory changes and the world commodity price boom. To investigate this issue we allowed for nonlinearities in corn-ethanol-crude oil price relationships using time as the threshold variable.

This essentially amounts to testing for structural change using an endogenous switching point. In this case the evidence supports a single significant structural change point at March 1998. However, long-run co-movement between the price series was found to be identical before and after the structural change (ethanol and crude oil prices cointegrated with a cointegrating parameter of 0.5 but corn price not cointegrated with either ethanol or crude oil prices).

Furthermore, while short-run co-movement does change after the structural break, the short- run cyclical component of corn prices becomes *less* correlated with the short- run cyclical component of ethanol prices after the break (unconditional correlation coefficient of -0.01 versus 0.51 for the full sample). This would suggest that, contrary to the conventional wisdom, higher corn prices during recent years is primarily a commodity market phenomenon and has little to do per se with higher crude oil and ethanol prices.

Because some previous evidence suggests April 2006 as a structural change point for corn-crude oil price relationships, we also re-estimated our model using data after April 2006 only. However, results on long-run co-movement using this subsample were virtually identical with all earlier results. In particular, corn prices are not cointegrated with either ethanol or crude oil prices and, while ethanol and crude oil prices are cointegrated, ethanol prices are expected to grow at one half or less of the growth rate of oil prices.

This lack of cointegration between corn and ethanol/crude oil prices holds in our data irrespective of whether an exchange rate is included in the analysis. This is contrary to previous work which found cointegration between corn price, crude oil price, and the exchange rate using data from April 2006 through September 2008. Perhaps the different results here are due to the relatively short sample (30 observations) in their study.

These results do not necessarily imply that higher ethanol demand and prices have no influence on corn prices, or that regulations encouraging increased ethanol production have not influenced corn prices. But they do suggest that, in the long-run, ethanol prices are expected to be driven more by crude oil prices than corn prices, and that corn prices are expected to be driven more by supply and demand from traditional corn uses rather than by crude oil prices. Presumably, this is due to expected growth in other sources of biomass besides corn for ethanol production, and the fact that corn production can respond to changing relative prices and profitability. The implication is that concerns about long-run impacts of higher crude oil prices on agricultural commodity prices have been overblown.

Switchgrass, Corn Stover and Corn Compared for Ethanol and By-Product Value

The absence of well-established markets for corn stover and switchgrass makes estimating prices for those commodities difficult. Nevertheless, estimates are vital in producing credible cost structures when planning cellulosic ethanol plants. Several research institutions have produced estimated costs of production but those estimates vary widely and are single-year estimates. Nevertheless, their methodologies and base year estimates are useful in constructing cost and price series for biofuel feedstocks. Appendix Table 6 includes these budgets. Applying the USDA Prices Paid Indices for specific cost categories allows estimation of specific cost categories over time.

Energy costs are one of the most volatile of the cost categories. Extreme and rapid fluctuations in energy costs, particularly crude oil, can have a dramatic effect on corn stover and switchgrass prices. At the field level, harvesting costs are impacted by fuel costs. Even more so, delivered costs are heavily influenced by energy costs, particularly for transportation. This leaves farmers and processors alike exposed to significant risk.

Table 2. Value of ethanol and co-products, $/gallon

	2007	2008	2009	2010	2011	2007-11 average
Corn						
Ethanol	1.90	2.16	1.64	1.78	2.55	2.01
DDG	0.35	0.50	0.36	0.38	0.63	0.44
Total value	2.25	2.67	2.00	2.16	3.17	2.45
Input price	1.25	1.75	1.27	1.44	2.39	1.62
Value less price	1.00	0.92	0.73	0.72	0.78	0.83
Corn stover						
Ethanol	1.90	2.16	1.64	1.78	2.55	2.01
Lignin	0.12	0.15	0.13	0.14	0.20	0.15
Total value	2.02	2.31	1.77	1.92	2.75	2.01
Input price	1.10	1.30	1.21	1.27	1.35	1.25
Value less price	0.93	1.01	0.56	0.65	1.39	0.76
Switchgrass						
Ethanol	1.90	2.16	1.64	1.78	2.55	2.01
Lignin	0.12	0.15	0.13	0.14	0.20	0.15
Total value	2.02	2.31	1.77	1.92	2.75	2.01
Input price	1.38	1.60	1.50	1.54	1.62	1.53
Value less price	0.64	0.71	0.27	0.38	1.13	0.48

Sources: USDA Market News, various issues, EIA

Overall costs for switchgrass are higher than those for corn stover. Nutrient replacement and harvest operations are similar but establishment of the perennial switchgrass stand introduces long-term costs not present for corn stover. As well, there is the cost of land which is not considered for corn stover.

Net returns should also be included in the price estimate. Farmers will require some return for their efforts. Because corn stover is produced in conjunction with grain, net returns from the stover harvest are added to those from the grain harvest in the farmer's bottom line. But because there are no co-products from switchgrass production, that crop alone will be required to produce competitive levels of net returns to induce production. As a result, prices for switchgrass would likely be \$20 to \$30 per dry ton higher than for corn stover, a disadvantage for utilizing this feedstock. Furthermore, in the current era of high crop prices, which is expected to persist for several years, net returns are expected to be somewhat higher than in the 2007-2010 period, see Table 2. It is possible that the required premium of switchgrass prices over corn stover prices will increase in the medium term.

Beyond the feedstock costs, overall costs of cellulosic ethanol production are high compared to the output price. Costs will have to be reduced in coming years for adequate investment in cellulosic ethanol production to achieve the advanced biofuels portion of RFS2. While it is likely that both corn stover and switchgrass will be utilized as feedstocks, those plants using corn stover are expected to achieve lower costs on average.

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Appendix Tables

Appendix Table 1, Monthly grains and oil seed prices 1990 through 2010, nominal

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	$/bushel	$/bushel	$/bushel	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt
	Source: USDA	Source: USDA	Source: USDA	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, NASS, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS
1990	3.71	2.31	5.65	205	211	198	242	679	943	225	N/A	238	290
	3.56	2.32	5.56	205	205	195	240	N/A	886	243	N/A	231	269
	3.48	2.37	5.65	211	211	198	242	N/A	875	243	N/A	221	253
	3.49	2.51	5.82	215	220	206	247	N/A	868	251	N/A	220	236
	3.40	2.62	5.97	222	228	213	259	N/A	873	267	N/A	216	234
	3.08	2.63	5.88	217	217	209	249	N/A	915	280	N/A	189	216
	2.79	2.62	5.97	222	221	217	252	N/A	923	273	N/A	175	205
	2.58	2.51	6.00	224	226	221	250	584	1308	302	N/A	169	198
	2.46	2.32	5.99	224	227	225	250	708	1650	258	N/A	190	196
	2.43	2.19	5.88	219	227	225	247	750	2120	240	N/A	N/A	198
	2.39	2.16	5.78	209	216	212	239	884	2110	227	N/A	N/A	236
	2.40	2.22	5.72	212	215	204	244	961	2000	236	N/A	N/A	237
1991	2.42	2.27	5.71	206	210	197	239	875	1850	243	N/A	N/A	233
	2.42	2.32	5.65	209	208	204	241	N/A	1788	247	N/A	N/A	226
	2.53	2.39	5.76	211	210	198	244	N/A	1700	249	N/A	N/A	238
	2.60	2.42	5.77	215	217	203	245	N/A	1500	251	N/A	N/A	224
	2.65	2.38	5.67	210	216	207	241	N/A	1256	249	N/A	N/A	226

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	2.55	2.31	5.56	208	216	207	241	N/A	1103	234	N/A	N/A	245
	2.50	2.27	5.36	197	203	194	229	N/A	1180	240	N/A	N/A	303
	2.63	2.33	5.66	206	213	206	241	670	928	251	N/A	N/A	299
	2.80	2.33	5.64	213	215	221	248	690	937	227	N/A	N/A	296
Oct.	3.07	2.31	5.48	202	204	200	237	619	956	184	N/A	N/A	353
	3.25	2.29	5.48	205	210	196	237	538	854	179	N/A	N/A	385
	3.44	2.33	5.45	203	197	201	234	553	820	185	N/A	197	411
1992	3.54	2.40	5.54	206	206	208	236	N/A	823	185	N/A	195	488
	3.78	2.46	5.59	208	207	202	237	N/A	825	197	N/A	190	471
	3.72	2.49	5.67	213	213	211	240	N/A	830	197	N/A	196	429
	3.65	2.48	5.66	210	208	201	235	N/A	825	205	N/A	202	425
	3.64	2.49	5.87	218	215	210	247	N/A	827	200	N/A	205	413
	3.43	2.47	5.94	222	222	218	253	N/A	828	203	N/A	206	390
	3.15	2.33	5.59	208	215	208	237	N/A	830	211	N/A	214	352
	3.01	2.15	5.40	201	217	211	229	N/A	796	200	N/A	220	320
	3.20	2.16	5.36	198	216	219	227	690	759	209	N/A	224	328
Oct.	3.22	2.05	5.26	191	203	204	221	659	799	200	N/A	225	320
	3.29	1.98	5.36	201	201	200	229	622	816	208	N/A	215	329
	2.96	1.97	5.61	205	228	199	235	597	828	207	N/A	224	300
1993	3.37	2.03	5.58	208	211	207	239	650	846	220	N/A	236	278
	3.33	2.00	5.56	206	210	218	236	N/A	853	231	N/A	231	279
	3.30	2.10	5.65	210	214	211	238	N/A	860	243	N/A	231	277
	3.26	2.16	5.73	214	213	205	244	N/A	870	238	N/A	245	262
	3.11	2.14	5.81	217	219	211	246	N/A	1038	245	N/A	247	274
	2.84	2.09	5.90	217	215	211	245	N/A	1026	238	N/A	266	289

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	2.85	2.22	6.56	252	257	254	287	N/A	992	260	261	223	303
	2.96	2.25	6.56	244	250	245	274	N/A	1061	293	270	229	306
	3.10	2.21	6.21	230	238	235	260	703	1501	313	283	237	288
Oct.	3.25	2.28	6.01	218	222	216	249	657	1424	247	290	250	275
	3.47	2.45	6.32	238	237	232	267	622	1304	258	295	261	308
	3.63	2.67	6.64	250	244	239	276	600	1310	289	341	279	406
1994	3.58	2.70	6.72	253	247	242	282	794	1196	300	347	296	403
	3.60	2.79	6.71	247	241	234	273	N/A	1169	333	334	294	384
	3.70	2.74	6.73	249	244	236	274	N/A	1180	331	337	303	365
	3.56	2.65	6.57	241	232	228	261	N/A	988	328	338	311	377
	3.43	2.60	6.77	247	247	236	256	N/A	908	342	319	298	408
	3.21	2.61	6.72	246	250	242	265	N/A	919	315	304	279	430
	3.04	2.29	5.92	217	230	220	237	N/A	920	276	293	270	430
	3.25	2.16	5.58	206	219	225	232	N/A	916	271	293	279	443
	3.57	2.19	5.47	199	211	225	233	668	825	236	309	291	426
Oct.	3.76	2.06	5.30	189	203	217	227	635	800	238	308	294	409
	3.75	1.99	5.36	202	209	224	239	564	815	234	315	303	464
	3.74	2.13	5.41	203	209	212	243	560	825	227	313	299	469
1995	3.69	2.19	5.47	200	206	202	243	567	878	234	312	309	414
	3.61	2.23	5.40	201	208	200	238	N/A	885	238	300	307	412
	3.52	2.30	5.51	205	211	199	246	N/A	855	229	307	313	412
	3.48	2.36	5.55	207	212	198	249	N/A	823	236	290	289	413
	3.67	2.42	5.56	208	212	200	250	N/A	821	231	285	262	410
	3.84	2.51	5.68	212	219	210	252	N/A	841	231	303	271	425
	4.10	2.63	5.90	224	239	233	261	N/A	876	254	327	278	448

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	4.26	2.63	5.83	215	231	228	257	677	885	251	321	267	458
	4.53	2.69	5.98	226	244	243	266	672	970	249	327	275	450
Oct.	4.72	2.79	6.16	235	250	252	271	635	964	243	343	289	464
	4.81	2.87	6.40	247	259	261	282	650	1016	238	342	292	488
	4.88	3.07	6.76	260	272	269	296	624	1013	240	317	289	468
1996	4.83	3.09	6.78	267	278	277	305	657	958	243	315	289	456
	4.98	3.37	7.00	264	274	263	299	N/A	980	253	303	282	475
	5.07	3.51	7.00	262	273	260	295	N/A	990	262	289	275	461
	5.32	3.85	7.43	284	299	287	316	N/A	1015	276	300	296	479
	5.75	4.14	7.69	291	302	291	322	N/A	1010	300	318	317	503
	5.25	4.20	7.41	280	288	281	308	N/A	927	315	308	310	550
	4.73	4.43	7.62	287	293	284	312	N/A	993	300	306	311	534
	4.57	4.30	7.82	293	304	296	317	N/A	970	280	303	306	495
	4.37	3.56	7.79	301	312	308	319	611	929	265	304	315	475
Oct.	4.17	2.88	6.94	255	272	271	290	569	917	258	273	308	470
	4.10	2.66	6.90	253	261	262	286	551	904	262	260	306	471
	4.06	2.63	6.91	255	256	258	289	564	897	256	253	300	498
1997	4.02	2.69	7.13	266	264	262	301	631	893	260	251	297	506
	3.89	2.65	7.38	277	272	268	308	N/A	870	269	248	283	496
	3.93	2.79	7.97	301	304	300	332	N/A	908	269	269	296	489
	4.10	2.80	8.23	308	312	314	338	N/A	920	273	298	302	466
	4.08	2.69	8.40	316	307	315	298	N/A	953	267	302	297	428
	3.52	2.56	8.16	302	295	296	278	N/A	969	262	294	265	415
	3.23	2.42	7.52	277	291	284	308	N/A	987	236	252	247	399
	3.56	2.50	7.25	269	287	291	265	N/A	924	245	247	248	385

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	3.66	2.52	6.72	252	296	333	269	604	964	234	249	264	403
Oct.	3.58	2.54	6.49	246	296	N/A	278	615	1072	234	276	281	412
	3.54	2.51	6.86	262	276	262	288	551	1199	245	306	294	412
	3.44	2.52	6.72	252	254	253	284	677	1220	245	300	296	394
1998	3.32	2.56	6.69	244	243	246	274	677	1146	245	312	308	378
	3.27	2.55	6.57	245	243	242	270	N/A	1079	260	342	323	371
	3.33	2.55	6.40	238	235	231	257	N/A	993	267	358	323	378
	3.18	2.41	6.26	233	233	229	252	N/A	953	280	363	328	380
	3.06	2.34	6.26	233	230	228	255	N/A	930	304	324	336	420
	2.77	2.28	6.16	230	223	221	246	N/A	984	317	292	266	414
	2.56	2.19	6.14	229	223	218	238	N/A	1034	348	286	264	402
	2.38	1.89	5.43	198	209	206	226	N/A	1088	317	273	257	403
	2.39	1.84	5.25	190	210	209	228	591	967	251	277	277	409
Oct.	2.77	1.91	5.18	191	218	206	233	580	955	236	278	277	439
	2.95	1.93	5.39	205	224	206	236	474	890	231	300	286	465
	2.86	2.00	5.37	201	210	202	230	529	855	238	301	285	474
1999	2.84	2.06	5.32	191	193	189	216	562	845	251	280	268	471
	2.73	2.05	4.80	176	172	170	198	633	823	269	255	227	451
	2.65	2.06	4.61	169	167	164	192	N/A	820	236	243	217	451
	2.62	2.04	4.63	170	172	167	191	N/A	818	208	252	219	504
	2.49	1.99	4.50	166	167	164	189	N/A	845	217	241	198	530
	2.50	1.97	4.44	164	169	164	190	N/A	875	210	233	189	530
	2.22	1.74	4.19	150	163	159	185	N/A	840	202	235	176	449
	2.53	1.75	4.39	164	174	171	201	N/A	800	183	237	189	431
	2.58	1.75	4.57	172	183	180	209	567	800	184	232	197	421

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
Oct.	2.57	1.69	4.48	166	182	172	206	560	856	149	232	195	430
	2.66	1.70	4.45	165	173	163	201	527	856	151	227	194	436
	2.52	1.82	4.43	164	165	162	197	476	850	156	206	181	434
2000	2.51	1.91	4.62	174	177	176	203	N/A	850	160	216	185	420
	2.54	1.98	4.79	179	182	179	208	N/A	833	193	208	185	411
	2.59	2.03	4.91	183	188	182	212	N/A	818	188	209	193	399
	2.57	2.03	5.00	188	196	189	217	N/A	781	176	218	204	353
	2.59	2.11	5.19	193	197	197	220	N/A	766	172	210	196	324
	2.50	1.91	4.93	181	189	185	213	N/A	788	180	218	182	295
	2.32	1.64	4.53	168	178	178	202	N/A	810	178	218	186	284
	2.40	1.52	4.45	165	181	182	203	N/A	806	177	212	188	274
	2.43	1.61	4.59	172	186	189	209	611	825	140	189	190	222
Oct.	2.68	1.74	4.45	166	183	186	204	584	836	129	180	185	210
	2.82	1.86	4.55	171	186	189	205	509	913	134	194	189	237
	2.87	1.97	4.78	181	195	196	212	558	1030	142	208	200	228
2001	2.84	1.98	4.68	170	189	178	205	653	959	153	214	197	205
	2.83	1.96	4.46	163	176	164	200	N/A	913	163	207	191	193
	2.87	1.96	4.39	160	166	158	187	N/A	890	165	215	196	182
	2.86	1.89	4.22	155	158	152	180	N/A	880	169	222	200	183
	2.98	1.82	4.33	162	159	156	183	N/A	866	167	224	201	189
	2.74	1.76	4.46	168	169	165	191	N/A	875	193	227	197	196
	2.63	1.87	4.79	184	191	188	210	N/A	834	194	243	215	223
	2.74	1.90	4.85	180	193	186	216	531	830	209	246	224	235
	2.85	1.91	4.53	166	191	181	211	597	830	201	251	229	210
Oct.	2.87	1.84	4.09	152	177	173	187	503	743	181	257	221	195

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	2.87	1.85	4.16	156	178	172	189	465	720	200	308	231	202
	2.88	1.98	4.20	157	173	168	189	434	680	217	314	224	212
2002	2.87	1.97	4.22	156	161	158	188	302	686	210	299	221	221
	2.83	1.93	4.22	157	160	162	187	236	690	220	304	212	232
	2.87	1.94	4.38	165	164	163	191	N/A	630	225	290	210	232
	2.83	1.91	4.47	168	171	164	192	N/A	623	234	277	196	244
	2.81	1.93	4.64	175	181	175	202	N/A	615	231	293	199	263
	2.92	1.97	4.88	184	194	188	213	N/A	705	260	272	211	289
	3.21	2.13	5.35	205	202	199	229	N/A	715	302	274	222	289
	3.63	2.38	5.53	205	210	209	227	N/A	715	287	282	242	290
	4.21	2.47	5.39	206	220	216	236	392	875	289	274	256	270
Oct.	4.38	2.34	5.20	193	207	195	229	397	878	265	284	258	274
	4.25	2.28	5.46	206	216	196	243	397	943	265	302	282	290
	4.06	2.32	5.46	205	215	196	241	388	932	273	309	293	301
2003	3.89	2.33	5.51	205	209	204	244	421	968	267	303	302	311
	3.70	2.34	5.55	208	214	211	243	419	983	276	291	285	309
	3.55	2.33	5.59	208	213	212	241	496	1000	276	277	269	291
	3.37	2.34	5.82	219	216	217	251	406	1000	276	286	297	273
	3.33	2.38	6.07	230	221	226	250	432	1000	269	290	309	276
	3.08	2.34	6.09	227	226	232	240	390	1005	265	286	278	280
	2.95	2.17	5.82	214	248	244	230	N/A	984	260	271	276	279
	3.35	2.15	5.68	208	244	227	237	N/A	935	240	259	271	275
	3.39	2.20	6.06	226	291	257	289	N/A	930	251	276	295	283
Oct.	3.44	2.12	6.60	262	276	277	310	408	930	251	291	311	297
	3.61	2.20	7.05	275	286	294	327	406	973	256	306	323	335

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	3.68	2.31	7.17	279	278	294	332	432	1000	256	324	331	400
2004	3.68	2.39	7.35	297	288	309	350	454	1000	267	341	341	388
	3.77	2.61	8.28	315	287	319	368	417	1000	282	366	349	415
	3.83	2.75	9.28	358	318	326	413	410	1000	300	347	343	450
	3.88	2.89	9.62	359	322	326	358	437	970	298	349	359	500
	3.82	2.87	9.56	346	295	298	316	454	970	302	340	366	498
	3.55	2.79	9.08	323	263	267	295	448	970	295	307	286	471
	3.37	2.51	8.46	291	243	246	279	384	970	293	298	277	445
	3.27	2.34	6.83	228	238	234	265	NA	968	300	291	256	440
	3.36	2.20	5.83	200	230	228	260	423	960	284	289	265	448
Oct.	3.43	2.14	5.56	184	219	217	249	448	960	273	288	257	447
	3.46	2.05	5.36	190	217	218	260	445	960	287	322	275	449
	3.40	2.04	5.45	196	219	223	265	403	954	298	340	282	449
2005	3.43	2.12	5.57	194	218	216	262	417	940	302	327	262	430
	3.36	1.95	5.42	196	211	204	290	410	940	333	318	249	440
	3.42	2.02	5.95	225	238	229	290	408	922	344	329	266	474
	3.35	2.00	6.03	223	233	224	283	397	930	335	328	256	460
	3.31	1.98	6.21	230	237	228	283	392	930	342	319	260	446
	3.23	2.03	6.58	251	252	244	306	388	880	344	293	254	433
	3.20	2.11	6.65	252	253	251	298	353	863	333	295	248	425
	3.24	1.95	6.15	228	245	242	274	373	850	313	299	261	371
	3.36	1.90	5.77	202	237	235	263	388	850	306	298	273	346
Oct.	3.43	1.82	5.67	200	234	231	257	386	850	282	284	272	384
	3.45	1.77	5.62	204	234	227	256	388	850	271	276	266	384
	3.53	1.92	5.78	211	233	238	264	390	850	256	274	260	372

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
2006	3.52	2.00	5.87	206	224	234	257	381	850	247	269	263	373
	3.66	2.02	5.67	206	231	235	257	410	850	251	266	267	393
	3.79	2.06	5.57	203	226	216	257	373	835	251	284	277	385
	3.81	2.11	5.52	201	217	212	258	384	820	262	299	286	372
	4.09	2.17	5.68	207	228	226	266	381	820	260	314	315	390
	3.98	2.14	5.62	206	224	227	267	375	824	258	306	314	387
	3.88	2.14	5.61	205	231	231	272	375	860	262	312	322	384
	3.91	2.09	5.23	191	227	226	262	375	920	276	312	330	404
	4.06	2.20	5.23	189	225	222	258	381	955	258	301	331	413
Oct.	4.59	2.55	5.52	208	238	242	273	379	980	267	295	337	411
	4.59	2.88	6.08	234	252	266	300	379	1,092	276	325	351	434
	4.52	3.01	6.18	235	256	268	297	388	1,085	300	340	366	486
2007	4.53	3.05	6.37	245	263	275	306	392	1,069	304	338	356	484
	4.71	3.44	6.87	266	283	297	325	392	1,044	328	339	349	503
	4.75	3.43	6.95	263	276	276	322	392	1,041	344	347	341	509
	4.89	3.39	6.88	257	267	262	320	403	1,045	351	369	344	553
	4.88	3.49	7.12	269	255	246	334	395	1,096	366	395	358	592
	5.03	3.53	7.51	287	290	281	361	399	1,123	375	417	371	653
	5.17	3.32	7.56	291	299	286	376	403	1,203	406	462	405	613
	5.64	3.26	7.72	287	319	304	385	397	1,322	403	542	439	595
	6.76	3.28	8.15	327	355	349	426	452	1,438	390	645	485	614
Oct.	7.65	3.29	8.36	340	385	372	450	472	1,415	392	693	521	658
	7.39	3.44	9.42	374	411	403	489	478	1,628	406	712	562	748
	7.71	3.77	10.00	407	421	437	515	470	1,700	423	711	597	765
2008	7.96	3.98	9.95	440	465	471	541	481	1,700	419	772	643	848

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	10.10	4.54	11.70	488	494	512	572	463	1,563	534	826	693	921
	10.50	4.70	11.40	473	473	514	575	456	1,795	578	922	754	972
	10.10	5.14	12.00	465	468	459	558	441	1,795	551	928	704	963
	8.87	5.27	12.10	476	473	461	575	450	1,795	606	749	719	1014
	7.62	5.47	13.10	550	550	528	622	443	1,823	622	767	725	1063
	7.15	5.25	13.30	521	567	551	634	465	1,850	624	763	682	946
	7.61	5.26	12.80	469	492	475	556	417	1,630	611	589	591	780
	7.43	5.01	10.80	419	464	446	509	465	1,564	622	511	532	724
Oct.	6.65	4.37	9.95	322	368	362	394	454	1,444	558	389	439	585
	6.29	4.26	9.39	318	361	354	378	443	1,355	520	337	409	479
	5.95	4.11	9.24	310	343	335	360	478	1,282	492	316	368	495
2009	6.20	4.36	9.97	356	388	383	413	525	1,270	483	344	388	479
	5.79	3.87	9.54	337	364	367	390	558	1,165	507	369	363	446
	5.71	3.85	9.12	344	356	347	379	560	1,108	498	350	352	416
	5.75	3.85	9.79	369	390	387	414	556	1,128	443	350	381	499
	5.85	3.96	10.70	419	439	432	465	545	1,140	476	413	437	559
	5.72	4.01	11.40	443	457	453	503	545	1,125	406	413	434	480
	5.17	3.60	10.80	393	452	429	463	516	1,152	390	370	384	448
	4.85	3.33	10.80	406	484	448	470	511	1,160	454	365	384	492
	4.48	3.25	9.75	359	430	408	421	518	1,120	306	348	375	466
Oct.	4.47	3.61	9.43	348	418	422	427	525	1,160	357	373	390	470
	4.79	3.65	9.53	364	391	439	440	481	1,160	311	406	402	493
	4.87	3.60	9.80	373	399	446	450	474	1,196	324	448	415	509
2010	4.90	3.66	9.79	351	379	391	437	454	1,213	346	434	408	524
	4.73	3.55	9.41	338	359	347	406	463	1,250	370	444	398	538

	PWHFM	PCOFM	PSBFM	PSBCIL	PSBBR	PSBAR	PSBROT	PPNUS	PPNROT	PSNUS	PSNROT	PRSHAM	PCPROT
	Wheat, US Farm	Corn, US Farm	Soybean US Farm	Soybean Central IL	Soybean BR	Soybean AR	Soybean Rott	Peanuts US	Peanuts Rott	Sunseed US	Sunseed Rott	Rapeseed Hamburg	Copra Rott
	4.70	3.55	9.39	341	357	353	408	454	1,240	348	463	407	608
	4.41	3.41	9.47	351	366	364	411	448	1,180	353	479	418	628
	4.33	3.48	9.41	342	359	359	407	454	1,214	328	485	378	624
	4.16	3.41	9.45	347	368	365	408	476	1,225	331	423	388	651
	4.50	3.49	9.79	370	406	399	429	474	1,225	340	443	443	689
	5.44	3.65	10.10	383	426	423	457	456	1,225	315	491	479	772
	5.83	4.08	9.98	381	456	436	470	441	1,225	381	534	505	847
Oct.	5.87	4.32	10.20	411	471	468	493	472	1,395	459	634	540	947
	6.21	4.59	11.20	452	486	492	526	496	1495	448	693	583	1013

Appendix Table 2, Monthly oil seed, veritable oil and fat prices nominal, 1990 through 2010

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	$/mt	Cents/lb
	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: UNCTAD, UNCTADstat	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, FAS	Source: USDA, ERS
1990	425	373	396	417	440	472	470	N/A	903	279	264	411	433	498	14.22
	447	409	425	428	445	490	501	N/A	933	271	262	425	393	520	14.40
	503	436	432	442	504	551	501	N/A	971	286	275	424	372	575	14.11
	515	423	436	440	499	557	497	N/A	938	267	263	432	343	574	14.15
	545	450	447	449	593	596	492	N/A	919	281	276	441	353	601	13.10
	552	442	443	435	594	601	476	N/A	931	272	270	417	317	587	13.07
	544	412	411	437	580	603	464	N/A	925	279	269	403	297	586	13.56
	552	427	430	460	607	609	472	N/A	963	291	268	430	294	629	13.29
	539	411	404	461	555	573	486	N/A	991	284	279	416	284	617	12.73
	498	405	410	468	547	520	502	N/A	1012	290	270	434	284	587	13.47
	464	406	416	456	533	491	499	N/A	1040	332	319	412	343	560	14.53
	475	406	414	476	546	510	512	N/A	1038	346	329	427	325	570	14.67
1991	475	437	437	455	524	530	493	N/A	1013	349	343	415	340	571	14.49
	478	420	416	445	504	525	467	N/A	1027	338	333	424	330	602	14.43
	490	423	412	453	507	546	464	N/A	1022	348	331	433	343	628	14.20
	474	431	421	460	488	535	466	N/A	986	319	308	432	323	639	14.59
	446	421	418	444	456	519	463	N/A	937	318	315	424	335	637	13.44
	433	416	422	440	448	523	477	N/A	919	311	304	422	369	653	13.00
	421	400	395	431	452	519	467	N/A	930	341	321	383	465	656	13.00
	446	408	404	457	463	522	461	N/A	929	338	322	391	459	651	13.71

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	451	437	415	472	441	502	490	N/A	841	323	306	414	455	628	13.86
Oct.	431	416	403	485	396	462	498	N/A	799	345	320	411	546	610	14.09
	414	413	411	466	384	463	487	N/A	718	362	331	416	595	601	13.84
	419	393	394	442	398	512	457	N/A	614	376	337	409	636	634	13.21
1992	414	396	411	429	405	464	438	N/A	619	383	352	403	738	639	12.53
	416	378	412	413	400	457	428	N/A	605	382	366	397	702	628	12.60
	435	402	401	434	418	478	463	N/A	595	396	381	415	644	599	12.63
	419	401	397	425	435	476	459	N/A	616	402	394	414	647	595	12.76
	444	396	400	439	493	505	453	N/A	651	390	380	428	638	574	12.97
	457	394	405	456	498	516	471	N/A	665	404	395	439	589	545	13.18
	415	377	383	429	539	467	460	N/A	644	382	386	423	528	494	13.65
	394	368	377	409	482	442	445	N/A	600	382	363	413	494	450	13.86
	403	390	379	421	464	477	452	N/A	562	391	377	423	501	438	14.71
Oct.	405	384	386	418	489	486	449	521	565	396	379	416	493	449	14.76
	442	421	380	437	506	517	450	564	575	413	397	430	496	455	15.35
	452	422	421	436	527	536	457	668	622	401	392	437	461	457	15.58
1993	468	421	441	444	531	542	467	683	621	410	403	444	444	457	14.64
	457	407	N/A	433	486	539	454	599	611	425	416	427	439	460	14.68
	463	419	373	438	490	544	456	573	602	408	414	426	427	457	14.25
	472	411	385	448	497	550	484	604	623	392	406	443	402	457	14.73
	498	409	367	448	500	548	503	661	685	371	374	445	418	457	15.60
	470	422	407	461	590	562	514	664	712	356	357	448	436	454	14.74
	532	438	437	505	678	633	552	699	773	362	351	460	460	456	14.43
	517	437	438	483	671	636	554	871	858	356	350	455	455	474	14.56
	521	452	449	489	634	617	558	874	845	352	349	466	424	491	14.67

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
Oct.	506	455	453	491	547	617	592	886	807	333	327	476	419	493	14.95
	561	493	496	536	588	622	625	955	808	357	343	527	464	515	14.83
	623	532	542	589	670	709	715	952	924	411	365	576	615	595	14.92
1994	659	569	575	602	731	773	697	1022	993	404	401	596	595	661	14.36
	636	530	554	577	661	743	622	1017	1011	387	398	577	573	675	14.79
	640	539	542	586	653	738	603	981	1013	395	396	584	539	671	15.12
	617	532	532	584	641	728	593	957	1030	434	425	581	560	661	15.11
	642	539	546	594	654	739	604	976	1020	488	486	597	599	663	15.23
	608	549	549	571	607	691	608	965	1014	508	521	571	608	656	15.33
	541	547	545	560	536	640	586	970	1017	494	490	574	579	606	15.71
	540	561	562	600	523	620	604	992	1018	575	586	613	596	568	16.36
	576	620	620	672	540	644	674	950	1018	614	607	660	622	575	17.49
Oct.	595	617	618	642	521	637	651	1014	1029	616	587	637	621	593	18.73
	657	679	677	706	548	648	696	1122	1048	707	686	707	706	608	18.21
	674	688	703	693	562	675	691	1186	1062	719	739	693	692	624	19.73
1995	638	671	680	674	582	645	672	1108	1054	655	647	674	622	618	20.64
	616	633	658	663	565	610	654	922	1025	661	655	670	636	600	21.41
	622	613	633	652	582	617	676	904	990	687	724	664	632	621	19.94
	578	584	589	610	529	593	649	909	981	625	660	614	619	609	18.16
	568	550	570	595	534	581	660	887	973	611	633	599	616	582	17.68
	588	522	580	611	590	601	717	860	965	631	629	611	668	587	18.98
	606	570	597	626	623	633	787	863	969	655	656	617	693	604	18.43
	580	585	585	616	597	606	749	915	980	616	625	587	686	581	19.46
	578	580	587	614	584	598	691	911	981	586	587	570	677	572	19.57
Oct.	584	594	593	638	620	606	714	937	990	615	602	606	718	574	19.39

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	564	589	578	623	593	579	700	918	995	607	586	590	750	563	19.79
	546	565	556	479	575	573	651	864	988	590	573	568	718	551	21.04
1996	520	535	526	554	539	543	614	821	959	535	509	544	711	541	21.04
	521	518	514	548	537	534	597	794	925	518	493	524	738	536	19.09
	520	504	499	538	535	535	567	807	911	519	486	519	723	537	18.77
	569	544	533	582	590	565	614	865	895	562	520	574	756	586	19.09
	584	556	555	591	627	582	618	944	897	552	535	596	778	617	19.20
	550	519	524	563	610	567	577	948	904	508	502	570	816	566	19.68
	531	490	485	549	623	542	578	948	902	476	465	555	775	561	20.66
	529	506	506	565	613	549	583	939	885	513	484	567	742	536	21.75
	527	527	522	569	576	549	588	899	879	545	524	580	721	532	23.17
Oct.	484	500	500	528	541	503	539	915	874	532	505	551	722	500	22.93
	481	504	503	517	535	496	523	864	868	550	505	550	760	506	20.75
	476	507	499	514	536	492	513	898	868	561	519	534	777	491	21.90
1997	495	512	510	534	556	499	520	959	874	567	560	542	768	516	22.87
	494	508	510	527	561	509	506	967	886	580	567	527	768	528	23.05
	513	508	511	541	577	500	532	987	896	559	550	541	737	537	23.05
	511	516	518	541	553	515	568	992	938	562	559	544	710	542	20.75
	522	522	521	541	555	511	607	1019	981	553	559	551	654	544	19.73
	506	521	524	550	551	492	576	1056	1047	533	517	542	637	547	21.40
	483	514	518	535	585	479	573	1060	1096	498	494	517	597	552	20.98
	486	518	527	544	598	485	536	1058	1093	504	486	517	567	563	20.66
	504	540	543	555	617	505	543	1042	1083	525	496	552	615	560	21.31
Oct.	536	590	591	611	628	540	628	1094	1083	547	517	624	627	556	22.81
	567	624	629	676	642	582	701	1124	1090	556	520	691	616	579	23.26

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	553	607	615	622	590	581	687	1130	1058	566	531	629	586	579	22.61
1998	553	581	627	625	610	568	667	1138	1055	621	564	631	558	574	21.40
	584	609	620	634	647	571	695	1124	1029	659	604	640	559	602	N/A
	597	633	639	652	672	584	760	1124	949	671	623	656	578	628	N/A
	619	627	632	662	716	628	789	1102	928	688	639	667	618	682	N/A
	623	634	634	671	730	685	855	1041	900	705	694	673	723	732	N/A
	569	603	595	629	662	626	815	1003	891	633	621	627	652	724	N/A
	549	582	580	612	648	NA	784	970	874	661	612	607	667	695	N/A
	529	589	591	592	664	NA	724	965	862	674	626	588	667	660	N/A
	554	611	613	615	733	NA	651	967	852	703	665	616	652	645	N/A
Oct.	556	599	589	614	749	N/A	653	1001	850	694	642	614	695	649	N/A
	556	588	590	614	753	N/A	692	992	862	681	650	616	752	654	N/A
	529	564	572	591	736	589	654	976	861	663	618	599	774	659	N/A
1999	504	515	519	546	699	516	594	970	835	632	600	554	763	643	N/A
	441	442	446	487	622	439	537	876	813	561	539	474	745	586	N/A
	430	404	406	444	579	421	498	766	776	497	463	444	700	507	N/A
	414	419	419	442	538	421	536	776	763	509	470	447	827	509	N/A
	394	404	406	428	535	439	551	772	751	475	446	430	874	506	N/A
	364	375	373	410	555	414	507	832	753	392	354	411	796	506	N/A
	337	352	352	392	545	377	508	860	766	319	311	385	656	494	N/A
	364	377	377	413	472	414	512	854	782	354	325	401	684	494	N/A
	370	385	386	414	469	414	482	836	797	388	365	407	704	487	N/A
Oct.	355	375	372	401	444	392	475	891	804	381	347	391	690	484	N/A
	345	367	362	391	434	395	452	904	807	370	332	370	703	484	N/A
	337	358	361	369	468	388	436	780	805	354	331	364	703	478	N/A

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
2000	345	356	368	371	485	395	429	728	789	348	318	368	654	459	N/A
	333	322	350	357	499	342	399	717	774	332	304	358	591	442	N/A
	357	332	336	362	522	382	419	697	756	349	319	363	552	425	N/A
	386	344	353	368	542	398	430	728	742	372	344	377	550	404	N/A
	369	306	313	340	506	373	389	799	727	324	307	354	481	367	N/A
	345	292	288	328	475	344	398	794	717	315	291	343	437	321	N/A
	324	296	292	340	464	324	396	786	681	312	281	346	400	299	N/A
	316	301	299	329	445	323	385	772	667	306	275	341	371	287	N/A
	314	286	287	312	408	329	342	769	656	288	260	328	332	261	N/A
Oct.	298	271	272	313	400	317	340	763	674	255	218	325	340	232	13.04
	295	284	282	316	393	314	379	783	684	257	226	326	367	229	12.06
	289	288	289	321	380	321	396	802	697	265	210	337	329	232	12.14
2001	276	273	281	306	358	318	386	821	688	254	200	338	319	226	13.57
	273	266	279	302	335	320	390	816	690	240	193	338	285	244	11.92
	306	298	287	329	342	347	430	791	693	254	223	363	289	263	11.07
	298	280	268	321	309	334	436	750	699	251	223	379	293	303	12.09
	298	266	272	295	320	336	431	728	695	234	207	375	295	327	11.84
	313	280	273	315	293	362	443	728	699	255	224	367	317	351	13.38
	364	349	348	409	370	408	495	728	668	330	287	425	358	381	18.05
	377	358	358	422	379	432	504	750	664	362	333	451	363	413	24.11
	340	331	330	382	348	393	503	750	665	310	275	442	322	381	22.00
Oct.	317	310	308	376	318	384	522	799	666	277	235	434	307	379	13.04
	336	344	344	388	351	422	620	816	668	323	290	452	330	403	13.18
	333	358	357	403	354	532	651	816	668	338	302	460	339	495	14.92
2002	327	362	365	389	361	522	606	772	665	338	322	449	362	453	12.69

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	312	323	323	358	350	518	578	617	665	330	302	418	376	405	12.50
	325	322	322	353	370	517	557	600	671	338	311	411	366	405	13.07
	338	340	340	370	374	514	552	595	656	349	317	409	411	390	12.42
	353	375	375	397	396	516	574	595	647	371	337	410	420	377	11.38
	390	417	417	438	429	556	595	661	641	411	392	451	446	388	14.64
	422	423	423	470	470	N/A	602	750	635	406	376	477	445	421	14.60
	454	473	473	503	492	N/A	610	776	635	425	376	520	443	479	15.00
	448	470	469	494	492	646	576	799	696	400	391	526	410	472	15.21
Oct.	457	471	470	517	592	657	595	N/A	718	408	394	536	434	495	14.39
	507	536	530	577	814	747	652	926	771	442	431	597	457	593	16.28
	498	549	529	585	1034	741	634	963	845	465	450	614	482	623	18.42
2003	474	495	490	535	1098	717	612	1009	889	458	449	623	494	646	18.61
	467	501	494	521	1100	719	595	1014	986	452	441	587	477	637	17.11
	475	497	485	508	1048	730	565	1036	1195	426	411	554	441	600	16.85
	494	487	485	524	983	743	578	1108	1284	412	401	600	421	607	16.72
	511	498	498	508	933	758	595	1163	1287	417	419	632	440	642	17.29
	505	508	501	543	633	742	615	1248	1352	430	415	611	455	665	18.90
	481	497	493	523	537	747	575	1284	1397	411	412	582	439	659	18.93
	450	460	460	512	562	720	543	1323	1468	395	406	552	421	676	20.08
	512	537	537	595	653	748	565	1338	1480	420	420	589	448	611	23.98
Oct.	604	577	558	624	726	722	615	1358	1293	485	473	616	487	595	27.50
	612	583	578	625	711	697	628	1394	1149	503	506	619	515	608	26.40
	651	594	559	638	733	705	660	1422	1148	510	503	646	583	633	25.18
2004	669	597	516	658	722	718	689	1433	1162	496	483	674	584	645	26.50
	729	642	523	689	754	749	731	1360	1194	535	526	702	642	665	25.83

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	764	632	644	691	770	770	712	1323	1236	550	544	685	685	674	23.77
	754	604	606	671	760	767	696	1323	1237	538	533	708	736	669	22.58
	720	561	561	632	718	768	684	1246	1209	513	500	741	716	669	21.31
	663	492	490	581	677	742	632	N/A	1150	440	429	670	658	625	22.50
	618	508	458	597	614	730	624	1235	1117	426	417	656	669	603	27.53
	573	514	514	610	558	729	632	1185	1111	432	421	669	627	565	32.06
	570	502	498	585	513	757	657	1213	1125	439	434	657	657	553	32.38
Oct.	512	480	475	558	501	767	701	1213	1127	431	413	669	642	509	27.95
	506	476	481	567	526	765	727	1213	1133	433	411	685	659	534	27.26
	480	482	492	553	525	782	724	1227	1131	423	394	707	654	588	26.50
2005	451	451	483	521	522	951	699	1235	1162	402	367	681	646	604	22.10
	456	443	442	497	537	1087	695	1213	1149	403	362	644	646	608	18.30
	520	494	496	546	621	1039	714	1102	1146	435	400	662	710	619	17.71
	509	485	489	547	657	1014	695	1102	1137	429	397	646	679	646	20.72
	515	462	478	538	675	1025	700	1174	1102	417	395	637	647	676	22.95
	545	455	454	559	730	1025	706	1157	1065	419	391	639	639	677	21.30
	561	457	455	561	653	995	708	1155	1050	417	391	633	606	662	18.08
	520	451	456	549	671	1023	682	1152	1023	407	386	646	550	636	17.75
	511	451	455	545	689	1084	683	1104	1002	421	396	675	559	612	20.97
Oct.	535	458	462	579	759	832	646	1,003	982	442	407	736	587	606	27.38
	496	439	439	560	752	861	598	1,003	960	444	396	723	582	597	27.76
	463	436	431	537	672	829	602	992	947	429	379	711	553	575	18.60
2006	477	428	424	532	653	799	591	937	930	424	388	733	569	556	17.16
	490	456	443	535	650	816	595	937	921	445	407	723	591	521	16.44
	512	474	480	539	656	799	606	937	902	440	408	742	575	498	16.82

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	507	489	472	540	596	827	659	937	899	439	413	796	578	511	18.00
	546	497	476	588	619	889	679	937	892	440	420	838	583	557	17.13
	534	478	465	601	601	NA	666	965	898	437	415	822	575	567	17.63
	570	500	491	630	644	NA	647	992	928	471	435	822	583	568	22.21
	547	509	505	629	588	NA	666	1,043	944	510	470	812	606	560	29.91
	519	518	518	602	598	NA	669	1,086	965	497	449	784	609	545	31.86
Oct.	547	544	517	615	605	1,167	666	1,161	1068	507	450	781	626	545	23.55
	609	629	609	675	666	1,235	722	1,157	1120	547	511	814	656	584	20.78
	610	629	645	699	677	1,242	730	1,102	1174	583	559	856	732	618	22.58
2007	617	620	655	697	683	1,225	719	1,086	1180	599	569	818	731	618	23.00
	638	605	607	714	721	1,202	709	1,020	1173	605	573	781	763	632	23.82
	656	605	606	718	728	1,174	713	1,063	1157	622	593	765	769	641	30.75
	685	645	623	761	758	1,162	755	1,160	1202	710	684	799	828	660	27.71
	725	637	611	788	832	1,178	831	1,226	1159	772	770	825	894	696	28.60
	750	745	743	833	882	1,263	916	1,379	1209	805	781	860	979	765	32.64
	788	780	768	885	936	1,433	999	1,535	1342	811	789	921	929	821	36.00
	769	810	881	908	929	1,517	1,114	1,543	1404	821	782	955	910	873	35.77
	813	829	738	959	1,026	1,554	1,279	1,609	1445	835	798	1051	930	961	36.00
Oct.	840	896	832	1,012	1,151	1,620	1,358	1,692	1463	881	848	1,195	1,010	1,157	35.09
	941	1,020	1,080	1,138	1,402	1,870	1,401	2,055	1691	952	935	1,273	1,131	1,242	33.78
	996	1,045	1,105	1,164	1,469	1,907	1,469	2,172	1777	950	948	1,386	1,153	1,311	32.66
2008	1,097	1,177	1,160	1,276	1,580	1,984	1,709	2,146	1861	1059	1053	1,428	1,285	1,404	33.01
	1,250	1,354	1,496	1,400	1,733	2,116	1,839	2,183	1958	1160	1192	1,434	1,382	1,651	38.33
	1,263	1,346	1,401	1,476	1,740	2,133	1,863	2,205	2203	1249	1291	1,519	1,471	1,842	46.00
	1,247	1,320	1,388	1,425	1,758	2,050	1,838	2,301	2200	1174	1247	1,469	1,443	1,920	43.04

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	1,285	1,322	1,240	1,436	1,824	2,147	1,962	2,310	2318	1208	1250	1,510	1,502	1,924	42.27
	1,376	1,382	1,243	1,537	1,930	2,194	2,045	2,359	n/a	1213	1199	1,577	1,551	1,815	44.93
	1,335	1,326	1,273	1,511	1,897	2,150	1,692	2,425	n/a	1128	1115	1,540	1,436	1,690	52.82
	1,120	1,110	877	1,322	1,599	2,015	1,319	2,425	2372	885	879	1,355	1,193	1,323	46.50
	1,016	987	712	1,226	1,377	1,929	1,176	2,425	2341	771	743	1,238	1,110	1,074	41.73
Oct	783	769	773	928	1,024	1,640	950	2,138	2,110	545	564	1053	856	766	37.07
	696	698	697	824	824	1,190	835	1,984	1771	488	489	991	719	685	26.40
	646	627	623	738	725	937	759	1,879	1436	503	511	836	740	593	20.00
2009	709	700	683	789	787	917	817	1,744	1343	562	566	817	734	555	25.36
	638	665	659	748	732	882	805	1,653	1293	572	577	760	673	640	20.31
	622	655	652	727	719	937	757	1,378	1214	598	595	709	625	653	19.49
	722	762	759	801	824	992	843	1,295	1187	702	716	807	747	690	23.36
	795	847	842	892	880	1,085	941	1,248	1157	801	799	933	843	821	29.00
	786	832	827	896	854	1,185	907	1,257	1154	726	732	920	747	872	30.06
	685	751	748	837	806	1,177	804	1,338	1149	640	647	846	686	800	27.63
	743	814	808	886	863	1,179	820	1,367	1131	723	719	887	747	777	32.20
	683	759	818	846	803	1,174	809	1,190	1120	674	675	857	701	812	29.73
Oct.	731	802	825	897	836	1,151	846	1,129	1148	680	663	896	706	829	25.75
	807	853	831	931	897	1,168	921	1,146	1116	725	703	928	729	840	30.07
	812	857	816	935	913	1,146	986	1,151	1192	792	766	944	768	882	28.75
2010	769	845	852	923	860	1,146	969	1,301	1316	793	774	916	784	889	28.60
	765	840	790	914	863	1,146	948	1,312	1380	798	778	893	798	828	28.25
	802	820	793	915	879	1,130	949	1,295	1380	832	809	897	921	846	32.95
	818	817	809	903	854	1,138	924	1,402	1360	830	811	909	940	849	33.95
	781	820	790	865	824	1,157	910	1,491	1353	811	798	864	932	849	34.24

	PSOUS	PSOBR	PSOAR	PSOROT	PCTOUS	PSNOUS	PSNORT	PPNOUS	PPNROT	PPAOROT	PPARMY	PCNOROT	PCCOROT	PCOOUS	PLRDCHI
	Soyoil, Decatur	Soyoil, BR	Soyoil, AR	Soyoil, Rott	Cottonseed Oil, US	Sunseed Oil, US	Sunseed Oil, Rott	Peanut Oil, US	Peanut Oil, Rott	Palm Oil, Rott	Palm Oil, Malaysia	Canola Oil, Rott	Coconut Oil, Rott	Corn Oil, US	Lard, Chicago
	760	808	773	859	882	1,229	889	1,494	1342	798	787	880	993	858	32.98
	773	856	827	907	936	1,182	937	1,495	1300	807	801	946	1,031	866	31.42
	828	915	899	1,002	963	1,185	1,074	1,508	1334	905	915	1,013	1,170	914	33.33
	864	940	941	1042	948	1,190	1,114	1517	1,262	912	906	1037	1275	945	43.59
Oct	970	1,040	1,039	1,157	1,041	1,235	1,284	1,574	1,331	987	997	1,156	1,412	1047	46.64
	1050	1130	1141	1247	N/A	N/A	1441	N/A	1728	1109	1107	1249	1512	1046	37.32

Appendix Table 3, Energy monthly prices nominal, 1990 through October 2010

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	$/bbl	$/gal	$/gal	$/gal	$/gal	$/gal	$/gal
	Source: EIA	Source: EIA	Source: EIA	Source: EIA	Source: EIA	Source: Nebraska Government Website	Source: USDA, AMS
1990	22.86	0.639	N/A	0.711	N/A	1.26	
	22.11	0.593	N/A	0.575	N/A	1.23	
	20.39	0.556	N/A	0.580	N/A	1.21	
	18.43	0.600	N/A	0.585	0.540	1.26	
	18.20	0.643	N/A	0.539	0.515	1.29	
	16.70	0.646	0.847	0.481	0.494	1.29	
	18.45	0.653	0.550	0.531	0.535	1.26	
	27.31	0.897	0.765	0.753	0.791	1.52	
	33.51	0.997	0.893	0.888	1.012	1.56	
	36.04	0.957	0.968	0.942	1.196	1.55	
	32.33	0.879	0.908	0.873	0.971	1.50	
	27.28	0.679	0.722	0.796	0.803	1.30	
1991	25.23	0.688	0.717	0.750	0.741	1.30	
	20.48	0.659	0.643	0.706	0.637	1.23	
	19.90	0.723	0.541	0.618	0.558	1.25	
	20.83	0.720	0.561	0.562	0.552	1.28	
	21.23	0.701	0.564	0.550	0.569	1.33	
	20.19	0.635	0.521	0.535	0.547	1.27	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	21.40	0.652	0.556	0.577	0.586	1.24	
	21.69	0.697	0.599	0.605	0.623	1.28	
	21.89	0.621	0.585	0.615	0.635	1.21	
October	23.23	0.645	0.608	0.665	0.671	1.24	
	22.46	0.649	0.598	0.643	0.645	1.33	
	19.50	0.555	0.504	0.524	0.522	1.28	
1992	18.79	0.530	0.475	0.516	0.509	1.22	
	19.01	0.553	0.495	0.532	0.543	1.24	
	18.92	0.571	0.498	0.525	0.514	1.29	
	20.23	0.598	0.563	0.562	0.543	1.32	
	20.98	0.634	0.600	0.576	0.579	1.37	
	22.38	0.645	0.600	0.612	0.615	1.41	
	21.78	0.600	0.573	0.603	0.611	1.35	
	21.34	0.621	0.557	0.582	0.590	1.36	
	21.88	0.618	0.602	0.618	0.623	1.41	
October	21.69	0.605	0.637	0.626	0.621	1.38	
	20.34	0.582	0.584	0.566	0.561	1.33	
	19.41	0.533	0.558	0.550	0.544	1.26	
1993	19.03	0.527	0.536	0.530	0.534	1.14	
	20.09	0.523	0.556	0.559	0.553	1.23	
	20.32	0.540	0.583	0.581	0.558	1.20	
	20.25	0.594	0.598	0.555	0.551	1.21	
	19.95	0.594	0.587	0.545	0.553	1.19	
	19.09	0.548	0.567	0.525	0.526	1.14	
	17.89	0.519	0.547	0.498	0.494	1.09	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	18.01	0.532	0.553	0.508	0.501	1.12	
	17.50	0.486	0.602	0.520	0.535	1.12	
October	18.15	0.503	0.668	0.539	0.568	1.16	
	16.61	0.444	0.551	0.502	0.533	1.11	
	14.51	0.376	0.429	0.435	0.446	1.16	
1994	15.03	0.422	0.454	0.499	0.528	1.13	
	14.78	0.436	0.513	0.557	0.501	1.16	
	14.68	0.441	0.535	0.492	0.451	1.13	
	16.42	0.490	0.511	0.479	0.469	1.12	
	17.89	0.505	0.478	0.479	0.472	1.12	
	19.06	0.528	0.478	0.492	0.493	1.19	
	19.65	0.545	0.510	0.499	0.509	1.25	
	18.38	0.555	0.504	0.495	0.498	1.32	
	17.45	0.464	0.532	0.477	0.490	1.26	
October	17.72	0.510	0.560	0.482	0.509	1.21	
	18.07	0.520	0.550	0.494	0.513	1.22	
	17.16	0.468	0.471	0.483	0.487	1.18	
1995	18.04	0.511	0.500	0.479	0.472	1.25	
	18.57	0.511	0.521	0.476	0.467	1.27	
	18.54	0.504	0.531	0.458	0.449	1.19	
	19.90	0.610	0.554	0.494	0.500	1.16	
	19.74	0.648	0.537	0.501	0.511	1.12	
	18.45	0.596	0.527	0.476	0.478	1.08	
	17.33	0.511	0.535	0.465	0.467	1.08	
	18.02	0.533	0.550	0.491	0.496	1.10	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	18.23	0.561	0.557	0.501	0.513	1.11	
October	17.43	0.487	0.571	0.487	0.502	1.11	
	17.99	0.505	0.579	0.517	0.524	1.12	
	19.03	0.534	0.586	0.576	0.553	1.16	
1996	18.85	0.506	0.571	0.555	0.550	1.22	
	19.09	0.533	0.548	0.614	0.557	1.23	
	21.33	0.585	0.600	0.656	0.586	1.23	
	23.50	0.691	0.713	0.676	0.617	1.30	
	21.17	0.649	0.687	0.576	0.557	1.37	
	20.42	0.580	0.574	0.514	0.516	1.38	
	21.30	0.616	0.582	0.555	0.556	1.40	
	21.90	0.609	0.676	0.603	0.615	1.54	
	23.97	0.624	0.717	0.677	0.682	1.56	
October	24.88	0.655	0.708	0.723	0.703	1.51	
	23.71	0.691	0.683	0.701	0.696	1.30	
	25.23	0.687	0.703	0.722	0.693	1.16	
1997	25.13	0.674	0.722	0.698	0.680	1.13	
	22.18	0.624	0.718	0.611	0.619	1.13	
	20.97	0.613	0.651	0.547	0.557	1.13	
	19.70	0.587	0.620	0.577	0.541	1.14	
	20.82	0.621	0.562	0.563	0.549	1.16	
	19.26	0.551	0.545	0.522	0.523	1.08	
	19.66	0.587	0.524	0.530	0.536	1.09	
	19.95	0.705	0.584	0.540	0.559	1.15	
	19.80	0.623	0.590	0.532	0.541	1.19	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
October	21.33	0.584	0.634	0.572	0.571	1.19	
	20.19	0.557	0.635	0.564	0.549	1.19	
	18.33	0.518	0.546	0.511	0.496	1.18	
1998	16.72	0.478	0.479	0.466	0.476	1.16	
	16.06	0.449	0.451	0.443	0.449	1.14	
	15.12	0.447	0.420	0.421	0.413	1.04	
	15.35	0.470	0.489	0.430	0.426	0.96	
	14.91	0.482	0.459	0.411	0.416	0.95	
	13.72	0.439	0.406	0.378	0.389	1.01	
	14.17	0.423	0.430	0.362	0.386	1.06	
	13.47	0.403	0.423	0.345	0.372	1.10	
	15.03	0.429	0.439	0.403	0.420	1.12	
October	14.46	0.435	0.438	0.385	0.420	1.10	
	13.00	0.372	0.421	0.359	0.371	1.06	
	11.35	0.307	0.372	0.313	0.304	0.94	
1999	12.51	0.343	0.381	0.335	0.334	0.94	
	12.01	0.317	0.362	0.304	0.309	0.95	
	14.68	0.423	0.482	0.388	0.378	1.01	
	17.31	0.501	0.505	0.431	0.430	0.96	
	17.72	0.492	0.478	0.423	0.415	0.95	
	17.92	0.489	0.564	0.433	0.440	0.90	
	20.10	0.583	0.616	0.500	0.512	0.95	
	21.28	0.639	0.650	0.548	0.564	0.95	
	23.80	0.688	0.615	0.602	0.614	0.96	
October	22.69	0.627	0.635	0.584	0.595	0.98	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	25.00	0.696	0.720	0.648	0.661	1.09	
	26.10	0.703	0.715	0.671	0.701	1.13	
2000	27.26	0.705	0.776	0.915	0.781	1.10	
	29.37	0.816	0.803	0.937	0.780	1.14	
	29.84	0.889	0.901	0.773	0.771	1.14	
	25.72	0.729	0.740	0.749	0.719	1.19	
	28.79	0.888	0.754	0.760	0.762	1.25	
	31.82	0.963	0.820	0.782	0.785	1.35	
	29.70	0.859	0.855	0.781	0.796	1.33	
	31.26	0.872	0.951	0.893	0.900	1.33	
	33.88	0.961	1.119	0.988	1.017	1.48	
October	33.11	0.948	1.119	0.977	0.982	1.49	
	34.42	0.944	1.122	1.032	1.028	1.66	
	28.44	0.737	1.009	0.943	0.863	1.72	
2001	29.59	0.829	0.840	0.845	0.870	1.77	
	29.61	0.826	0.836	0.785	0.815	1.70	
	27.24	0.785	0.810	0.741	0.748	1.51	
	27.49	0.947	0.846	0.782	0.770	1.46	
	28.63	0.927	0.874	0.772	0.821	1.76	
	27.60	0.720	0.875	0.756	0.767	1.63	
	26.42	0.683	0.739	0.698	0.711	1.41	
	27.37	0.776	0.812	0.734	0.764	1.49	
	26.20	0.761	0.832	0.731	0.738	1.53	
October	22.17	0.598	0.694	0.628	0.622	1.36	
	19.64	0.517	0.591	0.548	0.543	1.14	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	19.39	0.517	0.520	0.524	0.515	0.97	
2002	19.71	0.544	0.536	0.536	0.533	0.94	
	20.72	0.553	0.570	0.541	0.551	0.94	
	24.53	0.698	0.683	0.636	0.630	1.12	
	26.18	0.744	0.697	0.667	0.669	1.05	
	27.04	0.703	0.668	0.666	0.666	0.95	
	25.52	0.717	0.679	0.646	0.653	1.03	
	26.97	0.766	0.694	0.679	0.691	1.16	
	28.39	0.769	0.785	0.701	0.722	1.35	
	29.66	0.778	0.864	0.773	0.800	1.28	
October	28.84	0.826	0.827	0.768	0.790	1.20	
	26.35	0.766	0.777	0.720	0.708	1.25	
	29.46	0.808	0.823	0.821	0.811	1.21	
2003	32.95	0.879	0.871	0.905	0.887	1.15	
	35.83	0.996	1.043	1.129	1.055	1.30	
	33.51	0.955	1.019	0.988	0.893	1.44	
	28.17	0.799	0.788	0.796	0.743	1.25	
	28.11	0.760	0.738	0.741	0.714	1.12	
	30.66	0.808	0.788	0.759	0.748	1.27	
	30.75	0.873	0.847	0.786	0.780	1.28	
	31.57	1.007	0.942	0.816	0.823	1.27	
	28.31	0.903	0.784	0.736	0.738	1.38	
October	30.34	0.875	0.838	0.820	0.820	1.38	
	31.11	0.882	0.884	0.835	0.831	1.65	
	32.13	0.885	0.940	0.891	0.876	1.72	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
2004	34.31	0.998	0.963	0.984	0.998	1.40	
	34.68	1.047	1.124	0.913	0.933	1.37	
	36.74	1.091	1.068	0.909	0.947	1.69	
	36.75	1.119	1.315	0.922	0.973	1.80	
	40.28	1.344	1.359	1.018	1.092	1.73	
	38.03	1.153	1.166	0.994	1.032	1.86	
	40.78	1.225	1.267	1.090	1.145	1.68	
	44.90	1.206	1.263	1.167	1.227	1.58	
	45.94	1.261	1.423	1.257	1.362	1.56	
October	53.28	1.377	1.580	1.485	1.520	1.87	
	48.47	1.267	1.428	1.384	1.347	1.97	
	43.15	1.068	1.242	1.275	1.223	1.80	
2005	46.84	1.241	1.285	1.316	1.334	1.72	
	48.15	1.224	1.482	1.343	1.334	1.56	
	54.19	1.439	1.673	1.556	1.562	1.31	
	52.98	1.480	1.752	1.523	1.573	1.20	
	49.83	1.371	1.567	1.413	1.471	1.20	
	56.35	1.509	1.693	1.612	1.654	1.42	
	59.00	1.591	1.788	1.640	1.665	1.78	
	64.99	1.937	2.051	1.804	1.874	2.07	
	65.59	2.133	2.155	1.963	2.232	2.74	
October	62.26	1.709	2.183	1.891	2.398	2.47	
	58.32	1.470	1.736	1.689	1.698	2.09	
	59.41	1.600	1.707	1.707	1.727	1.99	
2006	65.49	1.735	1.889	1.751	1.816	2.13	

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	61.63	1.499	1.852	1.639	1.754	2.52	
	62.69	1.765	1.975	1.777	1.875	2.42	
	69.44	2.135	2.258	1.978	2.074	2.45	
	70.84	2.042	2.380	1.972	2.070	3.04	
	70.95	2.065	2.263	1.925	2.081	3.58	
	74.41	2.237	2.187	1.935	2.154	3.14	
	73.04	2.038	2.277	1.984	2.133	2.72	
	63.80	1.583	1.975	1.699	1.810	2.33	
October	58.89	1.506	1.785	1.648	1.739	1.89	
	59.08	1.588	1.885	1.648	1.733	2.25	
	61.96	1.670	1.993	1.684	1.810	2.43	
2007	54.51	1.432	1.804	1.528	1.654	2.26	
	59.28	1.640	1.986	1.693	1.740	2.12	
	60.44	1.938	2.028	1.742	1.846	2.31	
	63.98	2.105	2.176	1.864	2.036	2.37	3.09
	63.45	2.245	2.114	1.884	2.044	2.46	3.16
	67.49	2.186	2.245	1.991	2.099	2.43	3.17
	74.12	2.137	2.313	2.072	2.137	2.51	3.20
	72.36	2.004	2.159	1.984	2.092	2.43	3.22
	79.91	2.102	2.261	2.179	2.265	1.93	3.29
October	85.80	2.169	2.486	2.282	2.372	1.79	3.44
	94.77	2.424	2.709	2.586	2.673	2.08	3.74
	91.69	2.330	2.570	2.574	2.601	2.24	3.92
2008	92.97	2.334	2.535	2.558	2.605	2.29	4.28
	95.39	2.381	2.717	2.644	2.728	2.31	4.68

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	105.45	2.504	3.128	3.066	3.124	2.46	5.18
	112.58	2.762	3.370	3.226	3.365	2.59	4.98
	125.40	3.098	3.793	3.615	3.738	2.73	5.22
	133.88	3.292	3.842	3.801	3.878	2.72	5.51
	133.37	3.148	3.802	3.759	3.886	2.90	5.47
	116.67	2.897	3.180	3.169	3.271	2.75	4.88
	104.11	2.805	2.946	2.911	3.375	2.68	4.43
October	76.61	1.920	2.226	2.239	2.315	2.51	3.65
	57.31	1.283	1.750	1.843	1.880	2.10	3.19
	41.12	0.956	1.292	1.402	1.375	1.61	2.84
2009	41.71	1.146	1.431	1.465	1.469	1.67	3.09
	39.09	1.216	1.285	1.279	1.259	1.67	2.82
	47.94	1.288	1.270	1.277	1.268	1.62	2.68
	49.65	1.379	1.407	1.357	1.369	1.62	2.94
	59.03	1.689	1.509	1.473	1.488	1.70	3.10
	69.64	1.906	1.812	1.747	1.805	1.81	3.13
	64.15	1.750	1.700	1.628	1.712	1.72	2.86
	71.05	1.930	1.928	1.865	1.885	1.72	3.11
	69.41	1.779	1.807	1.728	1.749	1.69	3.02
October	75.72	1.924	1.966	1.929	1.942	1.94	3.12
	77.99	1.983	2.027	1.981	1.986	2.14	3.37
	74.47	1.919	1.996	1.968	1.979	2.15	3.38
2010	78.33	2.040	2.034	2.046	2.052	1.95	3.27
	76.39	1.963	2.014	1.978	1.989	1.83	3.29
	81.20	2.140	2.134	2.083	2.108	1.70	3.31

	PWTI	PGASNYH	PDS2LA	PHOLNYH	PJTAGLF	PETHOMA	PBIOIOWA
	WTI	NYH Gasoline	LA #2 Diesel	NYH Heating Oil	US Gulf Jet A	Omaha Ethanol Rack	Biodiesel Price, Iowa
	84.29	2.227	2.293	2.204	2.243	1.60	3.32
	73.74	2.019	2.121	2.040	2.063	1.68	3.21
	75.34	2.014	2.134	2.032	2.058	1.64	3.17
	76.32	1.995	2.094	1.979	2.019	1.62	3.18
	76.60	1.943	2.151	2.016	2.083	1.86	3.30
	75.24	1.969	2.170	2.090	2.114	2.18	3.35
October	81.89	2.164	2.318	2.242	2.248	2.33	3.66
						2.47	3.90
							4.25

Appendix Table 4, Sugar prices in the US, nominal monthly 1990 through October 2010

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	Cents/lb	Cents/lb
	Source: NYBOT	Source: NYBOT
1990	14.38	23.11
	14.63	22.93
	15.39	23.58
	15.24	23.81
	14.62	23.58
	12.99	23.33
	11.92	23.42
	10.92	23.27
	11.00	23.23
	9.77	23.29
	10.00	23.15
	9.72	22.47
1991	8.88	21.86
	8.57	21.42
	9.22	21.46
	8.55	21.23
	7.88	21.29
	9.37	21.42
	10.26	21.25
	9.45	21.83
	9.39	22.06

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
October	9.10	21.76
	8.79	21.75
	9.03	21.5
1992	8.43	21.38
	8.06	21.56
	8.22	21.36
	9.53	21.38
	9.62	21.04
	10.52	20.92
	10.30	21.1
	9.78	21.34
	9.28	21.55
October	8.66	21.61
	8.54	21.39
	8.15	21.11
1993	8.27	20.76
	8.61	21.16
	10.75	21.56
	11.30	21.76
	11.87	21.36
	10.35	21.42
	9.60	21.89
	9.30	21.85
	9.52	21.97
October	10.27	21.8
	10.10	21.87

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	10.47	22
1994	10.29	22
	10.80	21.95
	11.71	21.95
	11.10	22.08
	11.79	22.18
	12.04	22.44
	11.73	22.72
	12.05	21.84
	12.62	21.78
October	12.75	21.58
	13.88	21.57
	14.76	22.35
1995	14.87	22.65
	14.43	22.69
	14.58	22.46
	13.63	22.76
	13.49	23.1
	13.99	23.09
	13.46	24.47
	13.75	23.18
	12.72	23.21
October	11.94	22.67
	11.96	22.6
	12.40	22.63
1996	12.57	22.39

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	12.97	22.68
	13.07	22.57
	12.43	22.71
	11.94	22.62
	12.54	22.48
	12.83	21.8
	12.33	22.51
	11.87	22.38
October	11.65	22.37
	11.29	22.12
	11.38	22.14
1997	11.13	21.88
	11.06	22.07
	11.17	21.81
	11.50	21.79
	11.54	21.7
	12.02	21.62
	12.13	22.04
	12.54	22.21
	12.65	22.3
October	12.86	22.27
	13.19	21.9
	12.90	21.93
1998	11.71	21.85
	11.06	21.79
	10.66	21.74

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	10.27	22.14
	10.17	22.31
	9.33	22.42
	9.70	22.66
	9.50	22.19
	8.21	21.92
October	8.24	21.67
	8.73	21.83
	8.59	22.19
1999	8.40	22.41
	7.05	22.38
	6.11	22.55
	5.44	22.57
	5.83	22.65
	6.67	22.61
	6.11	22.61
	6.39	21.24
	6.98	20.1
October	6.90	19.5
	6.54	17.45
	6.00	17.87
2000	5.64	17.7
	5.51	17.24
	5.54	18.46
	6.48	19.43
	7.33	19.12

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	8.72	19.31
	10.18	17.64
	11.14	18.12
	10.35	18.97
October	10.96	21.15
	10.02	21.39
	10.23	20.56
2001	10.63	20.81
	10.26	21.18
	9.64	21.4
	9.27	21.51
	9.96	21.19
	9.80	21.04
	9.48	20.64
	8.77	21.1
	8.60	20.87
October	7.15	20.9
	7.80	21.19
	8.02	21.43
2002	7.96	21.03
	6.81	20.69
	7.27	19.92
	7.12	19.73
	7.33	19.52
	7.07	19.93
	8.02	20.86

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	7.86	20.91
	8.54	21.65
October	8.84	21.94
	8.87	22.22
	8.81	22.03
2003	8.56	21.62
	9.14	21.91
	8.50	22.14
	7.92	21.87
	7.41	21.8
	6.85	21.62
	7.18	21.32
	7.30	21.26
	6.70	21.34
October	6.74	20.92
	6.83	20.91
	6.95	20.37
2004	6.42	20.54
	7.01	20.57
	8.23	20.86
	8.21	20.88
	8.08	20.69
	8.41	20.03
	9.19	20.14
	8.99	20.1
	9.10	20.47

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
October	9.84	20.31
	9.65	20.4
	10.19	20.55
2005	10.33	20.57
	10.51	20.36
	10.57	20.54
	10.19	21.21
	10.23	21.96
	10.45	21.89
	10.89	21.94
	11.09	20.49
	11.59	21.1
October	12.40	21.71
	12.86	21.83
	15.09	21.74
2006	17.27	23.61
	18.93	24.05
	18.01	23.1
	18.21	23.56
	17.83	23.48
	16.19	23.32
	16.61	22.44
	13.58	21.38
	12.42	21.27
October	12.09	20.22
	12.38	19.66

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	12.47	19.59
2007	11.85	20.03
	11.63	20.59
	11.44	20.85
	10.85	20.91
	10.78	21.27
	11.05	21.33
	12.18	22.72
	11.66	21.8
	11.61	21.42
October	11.86	20.56
	11.83	20.25
	12.47	20.12
2008	13.75	20.24
	15.16	20.21
	14.60	20.65
	13.68	20.54
	12.23	20.83
	13.29	21.8
	14.90	23.76
	15.58	23.15
	14.74	23.1
October	12.99	21.46
	12.87	19.83
	12.31	20
2009	13.09	20.15

	PSGRCAR	PSGRUS
	Raw Sugar, FOB Cariabbean	Raw Sugar, Fees Paid, NY
	13.90	19.83
	13.83	19.75
	14.43	21.58
	16.89	21.64
	16.94	22.47
	18.57	23.02
	22.37	26.18
	23.11	28.91
October	23.22	30.48
	22.96	31.86
	25.28	33.3
2010	28.94	39.36
	27.29	40.13
	21.36	35.11
	19.87	30.86
	19.59	30.89
	21.24	32.73
	23.42	33.66
	25.09	34.24
	31.19	38.17
October	34.80	39.3
	35.44	38.84

Appendix 5, Price Indices Used and Not Used in the Analysis

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	1982-84 =100	1982-84 =100	1982-84 =100	1982-84 =100	1982=100	1982=100	Mar 73=100	Currency: Per USD	Currency: Per USD
	Source: BLS	Source: BLS	Source: BLS	Source: BLS	Source: BLS	Source: BLS	Source: FRB	Source: FRB	Source: FRB
1990	127.5	127.4	111.2	110.8	114.9	79.8	92.41		144.98
	128.0	128.0	110.7	110.2	114.4	77.0	92.45		145.69
	128.6	128.7	110.7	109.9	114.2	74.6	94.31		153.31
	128.9	128.9	110.5	109.4	114.1	73.4	94.31		158.46
	129.1	129.2	110.2	109.9	114.6	74.1	93.02		154.04
	129.9	129.9	110.7	112.2	114.3	72.8	93.01		153.70
	130.5	130.4	109.9	111.3	114.5	72.7	90.47		149.04
	131.6	131.6	111.5	112.7	116.5	82.4	88.18		147.46
	132.5	132.7	112.7	114.0	118.4	91.3	87.02		138.44
	133.4	133.5	113.7	113.4	120.8	101.0	84.42		129.59
	133.7	133.8	114.1	112.9	120.1	97.4	83.77		129.22
	134.2	133.8	113.4	112.7	118.7	90.5	85.10		133.89
1991	134.7	134.6	115.0	114.8	119.0	90.1	85.01		133.70
	134.8	134.8	115.1	114.7	117.2	83.0	83.77		130.54
	134.8	135.0	114.9	114.1	116.2	78.5	88.18		137.39
	135.1	135.2	114.2	113.1	116.0	78.1	89.87		137.11
	135.6	135.6	114.7	114.2	116.5	80.2	90.48		138.22
	136.0	136.0	114.4	115.8	116.4	80.3	92.29		139.75
	136.2	136.2	115.0	116.4	116.1	80.1	92.09		137.83
	136.6	136.6	115.0	116.2	116.2	81.3	90.91		136.82

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	137.0	137.2	115.5	116.8	116.1	81.4	89.15		134.30
Oct.	137.2	137.4	116.0	115.7	116.4	81.3	88.26		130.77
	137.8	137.8	116.5	115.3	116.4	81.2	86.70		129.63
	138.2	137.9	116.8	116.0	115.9	79.1	85.51		128.04
1992	138.3	138.1	116.5	116.2	115.6	76.3	85.61		125.46
	138.6	138.6	116.4	115.9	116.0	76.8	87.37		127.70
	139.1	139.3	116.4	115.8	116.1	75.8	89.61		132.86
	139.4	139.5	117.0	115.8	116.3	77.1	89.25		133.54
	139.7	139.7	117.3	116.8	117.2	79.7	88.16		130.77
	140.1	140.2	117.5	119.0	118.0	83.2	86.22		126.84
	140.5	140.5	118.0	119.4	117.9	83.3	84.20		125.88
	140.8	140.9	118.1	119.4	117.7	82.8	83.41		126.23
	141.1	141.3	118.5	119.8	118.0	84.4	84.11		122.60
Oct.	141.7	141.8	118.7	118.5	118.1	83.2	86.22		121.17
	142.1	142.0	119.6	118.3	117.8	82.1	89.93		123.88
	142.3	141.9	119.6	118.7	117.6	79.7	90.19		124.04
1993	142.8	142.6	119.6	119.2	118.0	79.4	91.50		124.99
	143.1	143.1	118.9	118.4	118.4	79.2	91.49		120.76
	143.3	143.6	120.3	119.5	118.7	79.7	90.44		117.02
	143.8	144.0	120.7	119.6	119.3	80.3	88.26		112.41
	144.2	144.2	121.1	120.5	119.7	81.9	87.93		110.34
	144.3	144.4	121.4	122.9	119.5	83.2	88.46		107.41
	144.5	144.4	121.7	123.2	119.2	81.0	89.92		107.69
	144.8	144.8	122.1	123.3	118.7	80.2	89.50		103.77
	145.0	145.1	122.5	123.9	118.7	80.9	88.97		105.57
Oct.	145.6	145.7	122.6	122.4	119.1	81.2	89.89		107.02

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	146.0	145.8	122.4	121.2	119.0	78.3	90.99		107.88
	146.3	145.8	122.5	121.7	118.6	74.7	91.66		109.91
1994	146.3	146.2	122.2	121.6	119.1	75.4	92.01		111.44
	146.7	146.7	123.1	122.4	119.3	75.4	91.09		106.30
	147.1	147.2	123.4	122.4	119.7	76.0	90.55		105.10
	147.2	147.4	122.9	121.6	119.7	76.4	90.54		103.48
	147.5	147.5	122.8	122.2	119.9	77.2	89.75		103.75
	147.9	148.0	122.8	124.2	120.5	79.5	88.92		102.53
	148.4	148.4	122.8	124.3	120.7	80.6	86.87		98.45
	149.0	149.0	123.0	124.3	121.2	82.0	87.18		99.94
	149.3	149.4	122.7	124.2	121.0	79.9	85.96		98.77
Oct.	149.4	149.5	122.5	122.4	120.9	77.4	85.05		98.35
	149.8	149.7	122.7	121.8	121.5	77.5	85.71		98.04
	150.1	149.7	122.7	122.0	121.9	76.6	87.43		100.18
1995	150.5	150.3	123.5	122.9	122.9	76.8	87.07	0.85	99.77
	150.9	150.9	123.3	122.6	123.5	76.8	86.17	0.84	98.24
	151.2	151.4	123.3	122.3	123.9	76.8	83.06	0.89	90.52
	151.8	151.9	123.4	122.1	124.6	78.5	80.34	0.91	83.69
	152.1	152.2	123.1	122.5	124.9	80.0	80.86	0.90	85.11
	152.4	152.5	123.4	125.0	125.3	81.0	80.79	0.91	84.64
	152.6	152.5	123.5	125.1	125.3	79.2	80.89	0.93	87.40
	152.9	152.9	124.1	125.7	125.1	78.3	83.50	0.94	94.74
	153.1	153.2	123.4	124.9	125.2	78.3	85.00	0.95	100.55
Oct.	153.5	153.7	124.1	123.9	125.3	76.8	84.14	0.96	100.84
	153.7	153.6	124.0	123.1	125.4	75.9	84.52	0.96	101.94
	153.9	153.5	124.4	123.7	125.7	77.9	85.25	0.97	101.85

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
1996	154.7	154.4	125.3	124.7	126.3	80.6	86.45	0.97	105.75
	155.0	154.9	125.7	125.0	126.2	80.9	86.64	0.98	105.79
	155.5	155.7	126.1	125.2	126.4	82.0	86.57	0.99	105.94
	156.1	156.3	126.7	125.4	127.4	86.2	87.10	0.99	107.20
	156.4	156.6	127.4	126.7	128.1	86.6	87.51	1.00	106.34
	156.7	156.7	126.8	128.4	128.0	85.2	87.75	1.00	108.96
	157.0	157.0	127.5	129.0	128.0	85.9	87.35	1.01	109.19
	157.2	157.3	128.0	129.4	128.3	86.8	86.84	1.01	107.87
	157.7	157.8	128.3	129.8	128.2	87.1	87.52	1.02	109.93
Oct.	158.2	158.3	128.8	128.7	128.0	86.8	87.82	1.03	112.41
	158.7	158.6	129.4	128.4	128.2	88.5	86.93	1.03	112.30
	159.1	158.6	130.2	129.4	129.1	93.3	88.44	1.04	113.98
1997	159.4	159.1	131.4	130.8	129.7	96.1	90.04	1.04	117.91
	159.7	159.6	131.4	131.0	128.5	90.3	92.70	1.05	122.96
	159.8	160.0	130.6	129.9	127.3	83.4	93.49	1.06	122.77
	159.9	160.2	130.2	128.9	127.0	82.2	94.61	1.06	125.64
	159.9	160.1	129.7	129.0	127.4	83.4	93.00	1.07	119.19
	160.2	160.3	130.5	131.9	127.2	84.5	92.47	1.07	114.29
	160.4	160.5	130.6	132.1	126.9	83.9	93.50	1.08	115.38
	160.8	160.8	130.1	131.4	127.2	84.9	95.47	1.09	117.93
	161.2	161.2	130.8	132.1	127.5	86.5	95.06	1.09	120.89
Oct.	161.5	161.6	131.0	130.8	127.8	87.2	94.43	1.10	121.06
	161.7	161.5	131.8	131.1	127.9	87.3	95.01	1.11	125.38
	161.8	161.3	130.5	130.0	126.8	83.0	97.26	1.11	129.73
1998	162.0	161.6	129.9	128.8	125.4	78.6	98.49	1.12	129.55
	162.0	161.9	128.6	127.4	125.0	76.6	97.55	1.13	125.85

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	162.0	162.2	128.9	127.1	124.7	74.6	97.93	1.13	129.08
	162.2	162.5	129.2	127.0	124.9	75.8	98.40	1.14	131.75
	162.6	162.8	129.3	127.9	125.1	77.0	98.77	1.15	134.90
	162.8	163.0	128.9	131.2	124.8	76.4	100.47	1.15	140.33
	163.2	163.2	128.7	131.3	124.9	77.2	101.10	1.16	140.79
	163.4	163.4	128.4	130.6	124.2	74.8	102.65	1.17	144.68
	163.5	163.6	127.5	130.0	123.8	74.3	98.63	1.18	134.48
Oct.	163.9	164.0	127.3	127.1	124.0	74.2	95.33	1.19	121.05
	164.1	164.0	127.5	126.5	123.6	73.2	96.20	1.19	120.29
	164.4	163.9	127.4	126.6	122.8	70.4	95.41	1.21	117.07
1999	164.7	164.3	127.3	126.2	122.9	70.1	94.64	1.51	113.29
	164.7	164.5	127.7	126.0	122.3	68.6	96.07	1.93	116.67
	164.8	165.0	127.7	125.9	122.6	70.0	98.04	1.91	119.47
	165.9	166.2	127.8	125.7	123.6	75.5	98.16	1.70	119.77
	166.0	166.2	127.8	126.5	124.7	78.9	98.17	1.69	122.00
	166.0	166.2	127.9	130.2	125.2	80.1	99.06	1.77	120.72
	166.7	166.7	128.4	131.1	125.7	82.8	99.34	1.80	119.33
	167.1	167.1	129.0	131.4	126.9	86.5	97.32	1.89	113.23
	167.8	167.9	130.2	132.7	128.0	90.2	95.97	1.90	106.88
Oct.	168.1	168.2	130.6	130.3	127.7	86.6	94.94	1.97	105.97
	168.4	168.3	130.9	130.0	128.3	89.4	95.95	1.93	104.65
	168.8	168.3	130.4	129.6	127.8	87.0	96.37	1.84	102.58
2000	169.3	168.8	131.1	129.9	128.3	88.4	96.23	1.81	105.30
	170.0	169.8	134.5	132.9	129.8	93.1	98.44	1.78	109.39
	171.0	171.2	133.6	131.8	130.8	96.1	98.82	1.74	106.31
	170.9	171.3	133.7	131.7	130.7	93.7	99.52	1.77	105.63

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	171.2	171.5	133.8	132.4	131.6	96.6	102.65	1.83	108.32
	172.2	172.4	136.6	138.9	133.8	107.4	100.04	1.81	106.13
	172.7	172.8	138.6	141.3	133.7	107.1	100.99	1.80	108.21
	172.7	172.8	138.5	140.9	132.9	105.1	102.54	1.81	108.08
	173.6	173.7	141.4	143.8	134.7	112.7	104.26	1.84	106.84
Oct.	173.9	174.0	143.5	143.1	135.4	113.7	105.87	1.88	108.44
	174.2	174.1	143.4	142.7	135.0	112.0	106.76	1.95	109.01
	174.6	174.0	146.2	145.3	136.2	116.5	104.82	1.96	112.21
2001	175.6	175.1	154.4	153.8	140.0	131.8	103.68	1.96	116.67
	176.0	175.8	154.0	152.3	137.4	119.6	105.00	2.01	116.23
	176.1	176.2	152.7	150.8	135.9	111.3	107.50	2.10	121.51
	176.4	176.9	151.9	149.7	136.4	113.3	108.65	2.19	123.77
	177.3	177.7	153.0	151.3	136.8	114.5	108.71	2.29	121.77
	177.7	178.0	153.0	155.7	135.5	109.2	109.73	2.38	122.35
	177.4	177.5	151.4	154.8	133.4	100.7	109.80	2.47	124.50
	177.4	177.5	149.7	152.7	133.4	101.0	107.35	2.51	121.37
	178.1	178.3	147.8	150.6	133.3	100.7	106.91	2.68	118.61
Oct.	177.6	177.7	145.0	144.6	130.3	89.2	107.85	2.74	121.45
	177.5	177.4	144.7	143.5	129.8	89.1	109.20	2.55	122.41
	177.4	176.7	143.6	142.2	128.1	82.6	109.70	2.36	127.59
2002	177.7	177.1	142.9	141.5	128.5	84.0	111.41	2.38	132.68
	178.0	177.8	142.6	140.0	128.4	82.5	112.19	2.42	133.64
	178.5	178.8	143.1	140.2	129.8	87.4	111.16	2.35	131.06
	179.3	179.8	143.3	140.3	130.8	93.7	110.35	2.32	130.77
	179.5	179.8	143.4	141.5	130.8	93.4	107.34	2.48	126.38
	179.6	179.9	142.7	146.2	130.9	92.9	104.51	2.71	123.29

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	180.0	180.1	142.8	146.8	131.2	93.5	101.95	2.94	117.90
	180.5	180.7	143.0	146.8	131.5	94.5	103.40	3.11	118.99
	180.8	181.0	143.5	147.2	132.3	97.5	103.62	3.35	121.08
Oct.	181.2	181.3	144.6	144.4	133.2	99.7	104.09	3.80	123.91
	181.5	181.3	145.1	143.6	133.1	99.5	102.63	3.59	121.61
	181.8	180.9	146.2	144.2	132.9	99.4	101.65	3.63	121.89
2003	182.6	181.7	147.2	146.1	135.3	106.5	98.94	3.44	118.81
	183.6	183.1	150.2	148.3	137.6	114.9	97.87	3.60	119.34
	183.9	184.2	156.9	154.5	141.2	129.6	97.17	3.46	118.69
	183.2	183.8	155.6	153.1	136.8	110.0	96.82	3.11	119.90
	182.9	183.5	155.4	153.7	136.7	108.5	92.30	2.95	117.37
	183.1	183.7	155.4	159.1	138.0	114.3	91.21	2.89	118.33
	183.7	183.9	155.4	159.4	137.7	114.0	93.08	2.88	118.70
	184.5	184.6	155.7	159.2	138.0	113.7	94.23	3.01	118.66
	185.1	185.2	156.6	159.6	138.5	113.0	92.43	2.92	114.80
Oct.	184.9	185.0	155.7	155.0	139.3	110.7	88.94	2.86	109.50
	185.0	184.5	155.1	152.9	138.9	108.6	88.62	2.92	109.18
	185.5	184.3	155.7	153.6	139.5	111.0	86.36	2.93	107.74
2004	186.3	185.2	157.4	156.3	141.4	118.9	84.52	2.85	106.27
	186.7	186.2	158.8	156.9	142.1	118.0	85.10	2.93	106.71
	187.1	187.4	157.6	155.2	143.1	117.5	86.61	2.91	108.52
	187.4	188.0	158.1	155.6	144.8	120.4	87.59	2.91	107.66
	188.2	189.1	159.2	158.1	146.8	126.0	89.15	3.10	112.20
	188.9	189.7	161.6	165.5	147.2	127.8	87.71	3.13	109.43
	189.1	189.4	162.6	166.6	147.4	129.4	86.57	3.04	109.49
	189.2	189.5	164.0	167.7	148.0	130.7	86.81	3.00	110.23

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	189.8	189.9	163.7	166.7	147.7	127.7	86.32	2.89	110.09
Oct.	190.8	190.9	164.0	162.8	150.0	134.6	84.36	2.85	108.78
	191.7	191.0	167.9	165.6	151.4	139.7	81.13	2.79	104.70
	191.7	190.3	167.9	165.7	150.2	132.7	80.24	2.72	103.81
2005	191.6	190.7	167.3	166.9	150.9	132.3	81.18	2.69	103.34
	192.4	191.8	168.7	166.4	151.6	134.2	81.95	2.60	104.94
	193.1	193.3	169.6	166.7	153.7	140.9	81.00	2.71	105.25
	193.7	194.6	172.4	169.6	155.0	146.5	82.35	2.58	107.19
	193.6	194.4	173.3	171.7	154.3	143.7	83.47	2.46	106.60
	193.7	194.5	173.3	177.4	154.3	146.0	85.03	2.41	108.75
	194.9	195.4	175.6	180.1	156.3	154.8	85.78	2.37	111.95
	196.1	196.4	178.1	181.8	157.6	160.7	84.26	2.36	110.61
	198.8	198.8	186.0	188.9	162.2	177.6	83.85	2.29	111.24
Oct.	199.1	199.2	194.1	192.8	166.2	190.7	85.13	2.25	114.87
	198.1	197.6	196.5	194.6	163.7	177.4	86.56	2.21	118.45
	198.1	196.8	193.4	191.6	163.0	172.1	85.79	2.28	118.46
2006	199.2	198.3	199.0	198.7	164.3	175.6	84.41	2.27	115.48
	199.4	198.7	197.4	194.6	161.8	163.5	85.19	2.16	117.86
	199.7	199.8	195.7	192.3	162.2	163.8	85.15	2.15	117.28
	200.6	201.5	194.2	190.8	164.3	170.5	84.02	2.13	117.07
	201.4	202.5	193.9	192.0	165.8	172.9	80.75	2.17	111.73
	201.9	202.9	192.7	197.6	166.1	171.5	81.64	2.25	114.63
	202.9	203.5	193.1	198.5	166.8	173.4	82.06	2.19	115.77
	203.7	203.9	194.5	199.0	167.9	176.6	81.29	2.16	115.92
	202.9	202.9	196.0	199.6	165.4	163.8	81.72	2.17	117.21
Oct.	201.8	201.8	191.4	190.1	162.2	148.5	82.48	2.15	118.61

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
	202.0	201.5	193.1	190.6	164.6	158.4	81.59	2.16	117.32
	203.1	201.8	195.0	192.6	165.6	161.8	80.97	2.15	117.32
2007	203.4	202.4	195.2	194.4	164.0	152.4	82.45	2.14	120.45
	204.3	203.5	197.7	194.9	166.8	160.2	82.15	2.09	120.50
	205.3	205.4	200.0	196.4	169.3	167.9	81.30	2.09	117.26
	206.0	206.7	199.9	196.4	171.4	174.7	79.94	2.03	118.93
	206.9	207.9	200.5	198.6	173.3	181.3	79.29	1.98	120.77
	207.2	208.4	201.1	206.2	173.8	182.4	79.04	1.93	122.69
	207.7	208.3	200.6	206.1	175.1	186.7	77.60	1.88	121.41
	207.7	207.9	199.7	204.3	172.4	176.3	77.63	1.96	116.73
	208.5	208.5	200.6	204.3	173.5	178.9	76.03	1.90	115.04
Oct.	209.1	208.9	202.2	200.8	174.7	180.9	74.05	1.80	115.87
	210.7	210.2	204.7	202.2	179.0	196.9	72.31	1.77	111.07
	211.4	210.0	205.5	203.0	178.6	192.6	73.78	1.79	112.45
2008	212.2	211.1	205.9	204.8	181.0	195.9	73.13	1.77	107.82
	212.7	211.7	208.7	205.8	182.7	199.5	72.65	1.73	107.03
	213.5	213.5	213.0	209.2	187.9	217.1	70.34	1.71	100.76
	214.1	214.8	217.2	213.3	190.9	224.7	70.42	1.69	102.68
	215.3	216.6	222.0	219.9	196.6	243.2	70.73	1.66	104.36
	217.3	218.8	225.9	231.4	200.5	254.8	71.37	1.62	106.92
	219.1	220.0	232.9	239.0	205.5	268.7	70.84	1.59	106.85
	218.8	219.1	230.6	235.7	199.0	237.9	74.06	1.61	109.36
	218.8	218.8	224.5	228.5	196.9	230.2	75.58	1.80	106.57
Oct.	216.8	216.6	222.8	221.2	186.4	194.5	80.64	2.18	99.97
	212.9	212.4	219.1	216.3	176.8	162.6	83.04	2.27	96.97
	211.3	210.2	218.0	215.2	170.9	145.7	80.90	2.40	91.28

	CPIALLUSS	CPIALLUSN	CPIFUUSS	CPIFUUSN	PPIALLUS	PPIFUUS	TWMCINUS	RXBZ	RXJP
	CPI, all items, SA	CPI, all items, NSA	CPI, fuels & utilities, SA	CPI, fuels & utilities, NSA	PPI, all commodities, NSA	PPI, fuels & related products & power, NSA	Nominal Major Currencies Dollar Trade-Weighted Index	BRAZIL -- SPOT EXCHANGE RATE, REAIS/US$	JAPAN -- SPOT EXCHANGE RATE, YEA/US$
2009	212.0	211.1	216.5	215.2	171.2	148.5	81.27	2.31	90.12
	212.9	212.2	216.6	213.5	169.3	143.6	83.40	2.32	92.92
	212.6	212.7	214.5	210.5	168.1	140.2	84.01	2.32	97.86
	212.8	213.2	211.2	207.2	169.1	144.8	82.47	2.20	98.92
	213.1	213.9	208.5	206.4	170.8	152.2	79.07	2.07	96.64
	214.6	215.7	207.0	212.7	174.1	165.0	77.18	1.96	96.61
	214.8	215.4	206.8	213.0	172.5	160.7	76.62	1.93	94.37
	215.6	215.8	207.5	212.7	175.0	169.6	75.35	1.85	94.90
	215.9	216.0	207.4	211.6	174.1	164.9	74.07	1.82	91.27
Oct.	216.4	216.2	209.3	207.9	175.2	166.8	72.83	1.74	90.37
	216.9	216.3	211.9	209.0	177.4	174.7	72.43	1.73	89.27
	217.2	215.9	211.7	208.8	178.1	173.2	73.27	1.75	89.95
2010	217.6	216.7	212.8	211.4	181.9	185.6	73.81	1.78	91.10
	217.6	216.7	213.8	210.8	181.0	178.9	75.49	1.84	90.14
	217.7	217.6	216.2	212.3	183.3	183.4	75.18	1.79	90.72
	217.6	218.0	215.7	211.7	184.4	184.4	75.35	1.76	93.45
	217.2	218.2	214.9	212.8	184.8	184.6	78.44	1.81	91.97
	216.9	218.0	212.2	217.8	183.5	184.1	79.00	1.80	90.81
	217.6	218.0	213.5	219.6	184.1	186.3	76.74	1.77	87.50
	218.2	218.3	214.4	219.6	184.5	186.6	75.93	1.76	85.37
	218.4	218.4	213.5	217.7	185.1	184.9	74.99	1.72	84.36
Oct.	218.9	218.7	214.4	213.0	186.8	188.7	72.33	1.68	81.73
	219.1	218.8	213.9	211.0	188.0	189.8	72.84	1.71	82.52
							73.81	1.70	83.34

Appendix Tables 6, Construction of Switchgrass and Corn Stover Budgets

Appendix Table 6.1 Switchgrass Cost Summary

	Missouri (Indiana)		**Tennessee**		**Iowa State**		**NC State**		**Virginia**	
Base year	2008		2008		2008		2008		2007	
Yield, tons	4.8		3.9		4.0		6.0		4.0	
	Acre	Ton	Acre	Ton	Acre	Ton	Acre	Ton	Acre	Ton
Establishment costs										
Nutrients	71.66	15.09	92.00	23.59	83.30	20.83	207.10	34.52	46.70	11.68
Herbicides	27.85	5.86	40.68	10.43	7.74	1.94	6.50	1.08		
Seed	66.95	14.09			45.00	9.47	90.00	15.00	82.50	20.63
Machinery	5.63	1.18	25.46	6.53	28.55	7.14	20.63	3.44	35.23	8.81
Fuel									11.59	2.90
Labor			6.63	1.70			16.05	2.68	22.08	5.52
Twine							0.90	0.15		
Land					80.00	20.00				
Fixed costs, interest, depreciation	2.73	0.57	14.79	3.79			42.24	7.04	27.16	6.79
Total establishment costs	**174.81**	**36.80**	**179.56**	**46.04**	**244.59**	**59.37**	**383.43**	**63.90**	**225.26**	**56.31**

Switchgrass Cost Summary, continued

Production costs	**Missouri (Indiana)**		**Tennessee**		**Iowa State**		**NC State**		**Virginia**	
	Acre	Ton	Acre	Ton	Acre	Ton	Acre	Ton	Acre	Ton
Nutrient replacement	71.01	14.95	137.60	35.28	54.85	13.71	133.20	22.20	158.30	39.57
Herbicides					7.74	1.94				
Machinery	30.53	6.43	73.07	18.74	142.46	35.62	73.33	12.22	48.24	12.06
Fuel									12.95	3.24
Baling twine							4.50	0.75	7.00	1.75
Labor			24.77	6.35			46.58	7.76	32.16	8.04
Land					80.00	20.00				
Fixed costs, interest, depreciation	14.02	2.95	34.21	8.77	3.41	0.85	107.76	17.96	26.49	6.62
Total replacement production costs	**115.57**	**24.33**	**269.65**	**69.14**	**288.46**	**72.12**	**365.36**	**60.89**	**285.14**	**71.28**
Prorated reseeding					6.18	1.55				
Prorated establishment					34.26	8.57				
Field-edge costs	**131.46**	**27.68**	**285.97**	**73.33**	**328.90**	**82.23**	**403.70**	**67.28**	**307.66**	**76.92**
Transportation and storage										
Haul – SS		17.91		17.91		6.10		17.91		17.91
Storage		8.89		8.89		16.67		8.89		8.89
Haul to Ethanol Plant		16.38		16.38		8.65		16.38		16.38
Field to Plant – Total		**43.18**		**43.18**		**31.42**		**43.18**		**43.18**
Minimum delivered switchgrass price		**70.86**		**116.51**		**113.65**		**110.46**		**120.10**

Appendix Table 6.2 Missouri (Indiana, EPA) Switchgrass Costs

Base year	2008
Yield, ton/acre	4.75

Establishment costs

	Units/acre	Price	Price units	Total	Total/ton
Nutrients					
MAP (P2O5), lbs	30	1440.00	ton	21.60	4.55
Potash (K2O), lbs	37	940.00	ton	17.39	3.66
Lime,ton	2	13.76	ton	27.52	5.79
Custom application	1	4.40	acre	4.40	0.93
Custom application fuel	1	0.75	acre	0.75	0.16
Subtotal				**71.66**	**15.09**
Herbicides					
Atrazine, qt	1.25	12.20	gal	3.81	0.80
2,4 D, pts	1.25	15.90	gal	2.48	0.52
Glyphosate, qt	2	28.90	gal	14.45	3.04
Chemical Applicator Purchase	1	1.95	acre	1.95	0.41
Chemical Applicator Fuel	1	0.80	acre	0.80	0.17
Chemical Applicator Labor	1	4.35	acre	4.35	0.92
Subtotal				**27.85**	**5.86**
Seed					
Seed	4	13.3	lb	53.20	11.20
Drill	1	12	acre	12.00	2.53
Fuel	1	1.75	acre	1.75	0.37
Subtotal				**66.95**	**14.09**

Equipment

Flail, variable costs

Repairs and maintenance	0.061	33.67	hour	2.05	0.43
Fuel and lubrication	0.061	23.82	hour	1.45	0.31
Labor	0.061	31.82	hour	1.94	0.41
Operating interest	0.061	2.91	hour	0.18	0.04
Subtotal				**5.63**	**1.18**
Flail, fixed costs					
Depreciation and interest	0.061	39.98	hour	2.44	0.51
Overhead	0.061	4.76	hour	0.29	0.06
Subtotal				**2.73**	**0.57**
Total establishment costs				**174.81**	**36.80**

Production costs

	Units/ton	Price	Price units	Total	Total/ton
Nutrient replacement					
Nitrogen	7	1060.00	ton	17.62	3.71
MAP (P2O5), lbs	3.6	1440.00	ton	12.31	2.59
Potash (K2O), lbs	18.4	940.00	ton	41.08	8.65
Subtotal				**71.01**	**14.95**
Equipment					
Flail, variable costs					
Repairs and maintenance	0.061	33.67	hour	2.05	0.43
Fuel and lubrication	0.061	23.82	hour	1.45	0.31
Labor	0.061	31.82	hour	1.94	0.41
Operating interest	0.061	2.91	hour	0.18	0.04
Subtotal				**5.63**	**1.18**
Flail, fixed costs	0.061		hour		
Depreciation and interest	0.061	39.98	hour	2.44	0.51
Overhead	0.061	4.76	hour	0.29	0.06
Subtotal				**2.73**	**0.57**
Flail, total				**8.35**	**1.76**
Rake, variable costs					
Repairs and maintenance	0.142	9.69	hour	1.38	0.29
Fuel and lubrication	0.142	13.81	hour	1.96	0.41
Labor	0.142	19.91	hour	2.83	0.60
Operating interest	0.142	1.03	hour	0.15	0.03
Subtotal				**6.31**	**1.33**
Rake, fixed costs					

Depreciation and interest	0.142	11.93	hour	1.69	0.36
Overhead	0.142	1.73	hour	0.25	0.05
Subtotal				**1.94**	**0.41**
Rake, total				**8.25**	**1.74**
Baling, variable costs					
Repairs and maintenance	0.103	65.09	hour	6.70	1.41
Fuel and lubrication	0.103	44.71	hour	4.61	0.97
Labor	0.103	26.57	hour	2.74	0.58
Operating interest	0.103	4.09	hour	0.42	0.09
Subtotal				**14.47**	**3.05**
Baling, fixed costs					
Depreciation and interest	0.103	62.67	hour	6.46	1.36
Overhead	0.103	7.09	hour	0.73	0.15
Subtotal				**7.19**	**1.51**
Baling, total				**21.65**	**4.56**

Self-propelled bale wagon, variable costs					
Repairs and maintenance	0.087	12.96	hour	1.13	0.24
Fuel and lubrication	0.087	17.39	hour	1.51	0.32
Labor	0.087	15.91	hour	1.38	0.29
Operating interest	0.087	1.21	hour	0.11	0.02
Subtotal				**4.13**	**0.87**
Self-propelled bale wagon, fixed costs					
Depreciation and interest	0.087	20.7	hour	1.80	0.38
Overhead	0.087	4.23	hour	0.37	0.08
Subtotal				**2.17**	**0.46**
Self-propelled bale wagon, total				**6.30**	**1.33**
Machinery and equipment total				**44.56**	**9.38**
Labor					
Total replacement production costs				**115.57**	**24.33**
Switchgrass field-edge costs				**131.46**	**27.68**
Field-edge to plant costs					
	Units/ton	Price	Price units		Total/ton
Haul to Storage	1	17.91	$/ton		17.91
Storage	1	8.89	$/ton		8.89
Haul to Ethanol Plant	1	16.38	$/ton		16.38

Field to Plant – Total	**43.18**
Minimum delivered switchgrass price	**70.86**

Appendix Table 6.3 Tennessee Switchgrass Costs

Base year	2008				
Yield, ton/acre	3.9				
Establishment costs					
	Units/acre	Price	Price units	Total	Total/ton
Nutrients					
MAP (P2O5), lbs	40	1600.00	ton	32.00	8.21
Potash (K2O), lbs	80	1500.00	ton	60.00	15.38
Subtotal				**92.00**	**23.59**
Herbicides					
Grass herbicide	2	8.00	per acre	16.00	4.10
Broadleaf herbicide	2	2.50	pint	5.00	1.28
Glyphosate, qt	2.5	7.87	qt	19.68	5.04
Subtotal				**40.68**	**10.43**
Equipment					
Machinery & equipment, variable costs					
Repairs and maintenance	1	8.07	acre	8.07	2.07
Fuel and lubrication	1	11.31	acre	11.31	2.90
Operating capital, 6 mos.	152.05	8%	acre	6.08	1.56

Subtotal				**25.46**	**6.53**
Machinery & equipment, fixed costs					
Depreciation and interest	1	14.79	acre	14.79	3.79
Subtotal				**14.79**	**3.79**
Labor	0.68	9.75	hour	**6.63**	**1.70**
Total establishment costs				**179.56**	**46.04**

Production costs

	Units/ton	Price	Price units	Total	Total/ton
Nutrient replacement					
Nitrogen	60	1520.00	ton	45.60	11.69
MAP (P2O5), lbs	40	1600.00	ton	32.00	8.21
Potash (K2O), lbs	80	1500.00	ton	60.00	15.38
Subtotal				**137.60**	**35.28**
Equipment					
Tractor, variable costs					
Repairs and maintenance	1	16.47	acre	16.47	4.22
Fuel and lubrication	1	42.56	acre	42.56	10.91
Subtotal				**59.03**	**15.14**
Tractor, fixed costs					
Depreciation and interest	1	16.69	acre	16.69	4.28
Subtotal					
				16.69	**4.28**
Tractor, total				**75.72**	**19.42**
Sprayer, variable costs					
Repairs and maintenance	1	0.11	acre	**0.11**	**0.03**
Sprayer, fixed costs					
Depreciation and interest	1	0.16	acre	**0.16**	**0.04**

Sprayer, total				**0.27**	**0.07**
Mower, variable costs					
Repairs and maintenance	1	1.27	acre	**1.27**	**0.33**
Mower, fixed costs					
Depreciation and interest	1	0.86	acre	**0.86**	**0.22**
Mower, total				**2.13**	**0.55**
Rake, variable costs					
Repairs and maintenance	1	0.12	acre	**0.12**	**0.03**

Rake, fixed costs					
Depreciation and interest	1	0.23	acre	**0.23**	**0.06**
Rake, total				**0.35**	**0.09**
Baler, variable costs					
Repairs and maintenance	1	10.35	acre	**10.35**	**2.65**
Baler, fixed costs					
Depreciation and interest	1	10.96	acre	**10.96**	**2.81**
Baler, total				**21.31**	**5.46**
Loader, variable costs					
Repairs and maintenance	1	2.19	acre	**2.19**	**0.56**
Loader, fixed costs					
Depreciation and interest	1	5.31	acre	**5.31**	**1.36**
Loader, total				**7.50**	**1.92**
Machinery and equipment total				**107.28**	**27.51**
Labor	2.54	9.75	hour	**24.77**	**6.35**
Total replacement production costs				**269.65**	**69.14**

Switchgrass field-edge costs				**285.97**	**73.33**
Field-edge to plant costs					
	Units/ton	Price	Price units		Total/ton
Haul to Storage	1	17.91	$/ton		17.91
Storage	1	8.89	$/ton		8.89
Haul to Ethanol Plant	1	16.38	$/ton		16.38
Field to Plant – Total					**43.18**
Minimum delivered switchgrass price					**116.51**

Appendix Table 6.4 Iowa Switchgrass Costs

Base year	2008
Yield, ton/acre	4

Establishment costs

	Units/acre	Price	Price units	Total	Total/ton
Nutrients					
P	30	0.37	lb	11.10	2.78
K	40	0.23	lb	9.20	2.30
Lime,ton	3	21.00	ton	63.00	15.75
Subtotal				**83.30**	**20.83**
Herbicides					
Pursuit +	0.02	53.00	gal	1.24	0.31
MSO	2	1.75	pint	3.50	0.88
2,4 D	0.19	16.00	gal	3.00	0.75
Subtotal				**7.74**	**1.94**
Seed	6	7.5	lb	**45.00**	**9.47**
Equipment					
Disk	1	9.45	acre	9.45	2.36
Harrow	1	6.25	acre	6.25	1.56

Airflow spreader	1	7.7	acre	7.70	1.93
Spraying	1	5.15	acre	5.15	1.29
Subtotal				**28.55**	**7.14**
Land	1	80	acre	**80.00**	**20.00**
Total establishment costs				**244.59**	**59.37**

Production costs

	Units/ton	Price	Price units	Total	Total/ton
Nutrients					
N	100	0.31	lb	31.00	7.75
P	1.94	0.37	lb	2.87	0.72
K	22.8	0.23	lb	20.98	5.24
Subtotal				**54.85**	**13.71**
Herbicides					
Pursuit +	0.02	53.00	gal	1.24	0.31
MSO	2	1.75	pint	3.50	0.88
2,4 D	0.19	16.00	gal	3.00	0.75
Subtotal				**7.74**	**1.94**
Equipment					
Preharvest machinery operations					
Liquid N application	1	4.80	acre	4.80	1.20
Bulk fertilizer spreader	1	3.20	acre	3.20	0.80
Sprayer	1	5.15	acre	5.15	1.29
Subtotal				**13.15**	**3.29**
Harvest machinery operations					
Mow/conditioning	1	10.75	acre	10.75	2.69

Rake	1	5.30	acre	5.30	1.33
Baling	8.42	10.70	bale	90.11	22.53
Staging	8.42	2.75	bale	23.16	5.79
Subtotal				**129.31**	**32.33**
Interest on operating expenses	75.74	0.09	acre	**3.41**	**0.85**
Land	1	80	acre	**80.00**	**20.00**

Machinery and equipment total				**142.46**	**35.62**
Labor					
Total replacement production costs				**288.46**	**72.12**
Prorated establishment costs				**34.26**	**8.57**
Prorated reseeding costs				**6.18**	**1.55**
Switchgrass field-edge costs				**328.90**	**82.23**

Field-edge to plant costs

	Units/ton	Price	Price units	Total/ton
Haul to Storage	1	6.1	$/ton	6.10
Storage	1	16.67	$/ton	16.67
Haul to Ethanol Plant	1	8.65	$/ton	8.65
Field to Plant – Total				**31.42**
Minimum delivered switchgrass price				**113.65**

Appendix Table 6.5 North Carolina Switchgrass Costs

Base year	2008
Yield, ton/acre	6

Establishment costs

	Units/acre	Price	Price units	Total	Total/ton
Nutrients					
10-20-20	4.33	30.70	cwt	132.93	22.16
30% N solution	1.33	19.75	cwt	26.27	4.38
Lime	1	38.00	ton	38.00	6.33
Custom spreading	5.66	1.75	cwt	9.91	1.65
Subtotal				**207.10**	**34.52**
Herbicides	1	6.50	acre	**6.50**	**1.08**
Baling Twine	0.06	15.00	ball	**0.90**	**0.15**
Seed	6	15	lb	**90.00**	**15.00**
Machinery, fuel, maintenance, repairs	1	20.63	acre	**20.63**	**3.44**
Interest on operating capital	142.16	0.075	acre	**10.66**	**1.78**

Depreciation, taxes, insurance	1	31.58	acre	**31.58**	**5.26**
Labor	1	16.05	acre	**16.05**	**2.68**
Total establishment costs				**383.43**	**63.90**

Production costs

	Units/ton	Price	Price units	Total	Total/ton
Nutrients					
10-10-10	4	22.50	cwt	90.00	15.00
30% N solution	1.33	19.75	cwt	26.27	4.38
Lime	0.2	38.00	ton	7.60	1.27
Custom spreading	5.33	1.75	cwt	9.33	1.55
Subtotal				**133.20**	**22.20**
Baling twine	0.3	15.00	roll	**4.50**	**0.75**
Equipment operating costs					
Machinery, fuel, maintenance, repairs	1	73.33	acre	**73.33**	**12.22**
Interest on operating capital	106.61	0.075	acre	**8.00**	**1.33**
Depreciation, taxes, insurance					
Machinery, fuel, maintenance, repairs	1	73.87	acre	**73.87**	**12.31**
Pasture establishment depreciation and interest	1	25.89	acre	**25.89**	**4.32**
Labor	1	46.58	acre	**46.58**	**7.76**
Total replacement production costs				**365.36**	**60.89**

Switchgrass field-edge costs				**403.70**	**67.28**
Field-edge to plant costs					
	Units/ton	Price	Price units		Total/ton
Haul to Storage	1	17.91	$/ton		17.91
Storage	1	8.89	$/ton		8.89
Haul to Ethanol Plant	1	16.38	$/ton		16.38
Field to Plant – Total					**43.18**
Minimum delivered switchgrass price					**110.46**

Appendix Table 6.6 Virginia Switchgrass Costs

Base year	2007
Yield, ton/acre	4

Establishment costs

	Units/acre	Price	Price units	Total	Total/ton
Nutrients					
Phosphate	40	0.32	lbs	12.80	3.20
Potash	40	0.26	lbs	10.40	2.60
Lime	0.5	32.50	tons	16.25	4.06
Fertilizer application	1	7.25	acre	7.25	1.81
Subtotal				**46.70**	**11.68**
Seed	10	8.25	lb	**82.50**	**20.63**
Equipment costs					
Machinery, fixed	1	23.54	acre	23.54	5.89
Repairs	1	11.69	acre	11.69	2.92
Subtotal				**35.23**	**8.81**
Fuel, oil, lube	4.93	2.35	gal	**11.59**	**2.90**
Production interest	174.56	0.07	dollars	**12.22**	**3.05**
General overhead	186.77	0.08	dollars	**14.94**	**3.74**
Labor	1.84	12	hours	**22.08**	**5.52**

Total establishment costs	**225.26**	**56.31**

Production costs

	Units/ton	Price	Price units	Total	Total/ton
Nutrients					
Nitrogen	160	0.38	lbs	60.80	15.20
Phosphate	60	0.32	lbs	19.20	4.80
Potash	232	0.26	lbs	60.32	15.08
Lime	0.33	32.5	ton	10.73	2.68
Chemical application	1	7.25	acre	7.25	1.81
Subtotal				**158.30**	**39.57**
Baling twine	4	1.75	per ton	**7.00**	**1.75**
Equipment costs					
Machinery, fixed	1	36.46	acre	36.46	9.12
Repairs	1	11.78	acre	11.78	2.95
Subtotal				**48.24**	**12.06**
Fuel, oil, lube	5.51	2.35	gal	**12.95**	**3.24**
Production interest	93.91	0.07	dollars	**6.57**	**1.64**
General overhead	249.01	0.08	dollars	**19.92**	**4.98**
Labor	2.68	12	hours	**32.16**	**8.04**

Total replacement production costs	**285.14**	**71.28**
Switchgrass field-edge costs	**307.66**	**76.92**

Field-edge to plant costs

	Units/ton	Price	Price units	Total/ton
Haul to Storage	1	17.91	$/ton	17.91
Storage	1	8.89	$/ton	8.89
Haul to Ethanol Plant	1	16.38	$/ton	16.38
Field to Plant – Total				**43.18**
Minimum delivered switchgrass price				**120.10**

Appendix Table 6.7 Missouri (Indiana, EPA) Corn Stover Costs

Base year	2008				
Yield, ton/acre	2.0				

Production costs

	Units/acre	Price	Price units	Total	Total/ton
Nutrient replacement					
Nitrogen	7	1060.00	ton	7.42	3.71
MAP (P2O5), lbs	3.6	1440.00	ton	5.18	2.59
Potash (K2O), lbs	18.4	940.00	ton	17.30	8.65
Subtotal				**29.90**	**14.95**
Equipment					
Flail, variable costs					
Repairs and maintenance	0.061	33.67	hour	2.06	1.03
Fuel and lubrication	0.061	23.82	hour	1.46	0.73
Labor	0.061	31.82	hour	1.95	0.97
Operating interest	0.061	2.91	hour	0.18	0.09
Subtotal				**5.64**	**2.82**
Flail, fixed costs					
Depreciation and interest	0.061	39.98	hour	2.45	1.22
Overhead	0.061	4.76	hour	0.29	0.15

Subtotal				**2.74**	**1.37**
Flail, total				**8.38**	**4.19**
Rake, variable costs					
Repairs and maintenance	0.151	9.69	hour	1.46	0.73
Fuel and lubrication	0.151	13.81	hour	2.08	1.04
Labor	0.151	19.91	hour	3.00	1.50
Operating interest	0.151	1.03	hour	0.16	0.08
Subtotal				**6.70**	**3.35**

Rake, fixed costs					
Depreciation and interest	0.151	11.93	hour	1.80	0.90
Overhead	0.151	1.73	hour	0.26	0.13
Subtotal				**2.06**	**1.03**
Rake, total				**8.76**	**4.38**
Baling, variable costs					
Repairs and maintenance	0.103	65.09	hour	6.71	3.36
Fuel and lubrication	0.103	44.71	hour	4.61	2.30
Labor	0.103	26.57	hour	2.74	1.37
Operating interest	0.103	4.09	hour	0.42	0.21
Subtotal				**14.48**	**7.24**
Baling, fixed costs					
Depreciation and interest	0.103	62.67	hour	6.46	3.23
Overhead	0.103	7.09	hour	0.73	0.37
Subtotal				**7.19**	**3.60**
Baling, total				**21.67**	**10.84**
Self-propelled bale wagon, variable costs					
Repairs and maintenance	0.087	12.96	hour	1.13	0.56
Fuel and lubrication	0.087	17.39	hour	1.51	0.76
Labor	0.087	15.91	hour	1.38	0.69

Operating interest	0.087	1.21	hour	0.11	0.05
Subtotal				**4.13**	**2.06**
Self-propelled bale wagon, fixed costs					
Depreciation and interest	0.087	20.7	hour	1.80	0.90
Overhead	0.087	4.23	hour	0.37	0.18
Subtotal				**2.17**	**1.08**
Self-propelled bale wagon, total				**6.30**	**3.15**
Machinery and equipment total				**45.10**	**22.55**
Total replacement production costs				**75.00**	**37.50**
Stover field-edge costs				**75.00**	**37.50**

Field-edge to plant costs

	Units/ton	Price	Price units		Total/ton
Haul to Storage	1	17.91	$/ton		17.91
Storage	1	8.89	$/ton		8.89
Haul to Ethanol Plant	1	16.38	$/ton		16.38
Field to Plant – Total $/t					**43.18**

Minimum delivered stover price **80.68**

Appendix Table7, Quarterly hard and soft wood prices for Louisiana; oil and price index numbers

		Pine pulpwood prices, Louisiana $/cord Source: LA Dept. of Agriculture & energy	Hardwood pulpwood prices, Louisiana $/cord Source: LA Dept. of Agriculture & energy	$/bbl Source: EIA	all commodities, NSA 1982=100 Source: BLS	Real		Ratio with WTI	
		PPWDLA	HPWDLA	PWTI	PPIALLUS	PPWDLA	HPWDLA	PPWDLA	HPWDLA
1990	Q1	18.58	5.43	21.79	114.50	16.23	4.74	0.85	0.25
	Q2	16.14	5.73	17.78	114.33	14.12	5.01	0.91	0.32
	Q3	19.68	5.63	26.42	116.47	16.90	4.83	0.74	0.21
	Q4	17.13	5	31.88	119.87	14.29	4.17	0.54	0.16
1991	Q1	10.2	8.34	21.87	117.47	8.68	7.10	0.47	0.38
	Q2	21.31	6.75	20.75	116.30	18.32	5.80	1.03	0.33
	Q3	19.41	9.74	21.66	116.13	16.71	8.39	0.90	0.45
	Q4	23.27	7.91	21.73	116.23	20.02	6.81	1.07	0.36
1992	Q1	22.82	8.34	18.91	115.90	19.69	7.20	1.21	0.44
	Q2	24.43	7.83	21.20	117.17	20.85	6.68	1.15	0.37
	Q3	23.3	6.78	21.67	117.87	19.77	5.75	1.08	0.31
	Q4	23.43	8.39	20.48	117.83	19.88	7.12	1.14	0.41
1993	Q1	26.89	9.7	19.81	118.37	22.72	8.19	1.36	0.49
	Q2	22.89	10.25	19.76	119.50	19.15	8.58	1.16	0.52
	Q3	24.83	9.57	17.80	118.87	20.89	8.05	1.39	0.54
	Q4	25.67	9.57	16.42	118.90	21.59	8.05	1.56	0.58

1994	Q1	23.29	11.27	14.83	119.37	19.51	9.44	1.57	0.76
	Q2	23.4	9.31	17.79	120.03	19.49	7.76	1.32	0.52
	Q3	23.42	9.61	18.49	120.97	19.36	7.94	1.27	0.52
	Q4	23.93	10.28	17.65	121.43	19.71	8.47	1.36	0.58
1995	Q1	24.19	11.39	18.38	123.43	19.60	9.23	1.32	0.62
	Q2	23.83	14.92	19.36	124.93	19.07	11.94	1.23	0.77
	Q3	23.81	15.46	17.86	125.20	19.02	12.35	1.33	0.87
	Q4	24.45	15.9	18.15	125.47	19.49	12.67	1.35	0.88
1996	Q1	24.2	14.37	19.76	126.30	19.16	11.38	1.22	0.73
	Q2	22.99	12.24	21.70	127.83	17.98	9.57	1.06	0.56
	Q3	22.86	12.02	22.39	128.17	17.84	9.38	1.02	0.54
	Q4	24.44	14.15	24.61	128.43	19.03	11.02	0.99	0.58
1997	Q1	28.35	17.61	22.76	128.50	22.06	13.70	1.25	0.77
	Q2	25.9	18.44	19.93	127.20	20.36	14.50	1.30	0.93
	Q3	26.55	21.2	19.80	127.20	20.87	16.67	1.34	1.07
	Q4	25.62	18.01	19.95	127.50	20.09	14.13	1.28	0.90
1998	Q1	30.66	20.86	15.97	125.03	24.52	16.68	1.92	1.31
	Q2	30.91	18.87	14.66	124.93	24.74	15.10	2.11	1.29
	Q3	28.45	15.52	14.22	124.30	22.89	12.49	2.00	1.09
	Q4	26.95	12.98	12.94	123.47	21.83	10.51	2.08	1.00
1999	Q1	27	14.09	13.07	122.60	22.02	11.49	2.07	1.08
	Q2	26.43	13.93	17.65	124.50	21.23	11.19	1.50	0.79
	Q3	25.25	13.01	21.73	126.87	19.90	10.25	1.16	0.60
	Q4	26.42	13.95	24.60	127.93	20.65	10.90	1.07	0.57
2000	Q1	25.98	12.4	28.82	129.63	20.04	9.57	0.90	0.43
	Q2	23.34	9.62	28.78	132.03	17.68	7.29	0.81	0.33
	Q3	22.55	9.46	31.61	133.77	16.86	7.07	0.71	0.30
	Q4	21.46	9.78	31.99	135.53	15.83	7.22	0.67	0.31
2001	Q1	22.04	12.1	28.81	137.77	16.00	8.78	0.76	0.42
	Q2	20.56	16.47	27.91	136.23	15.09	12.09	0.74	0.59

	Q3	20.89	11.85	26.66	133.37	15.66	8.89	0.78	0.44
	Q4	21.94	13.72	20.40	129.40	16.96	10.60	1.08	0.67
2002	Q1	21.2	15.87	21.65	128.90	16.45	12.31	0.98	0.73
	Q2	18.8	14.78	26.25	130.83	14.37	11.30	0.72	0.56
	Q3	18.93	14.5	28.34	131.67	14.38	11.01	0.67	0.51
	Q4	19.16	14.61	28.22	133.07	14.40	10.98	0.68	0.52
2003	Q1	19.72	16.49	34.10	138.03	14.29	11.95	0.58	0.48
	Q2	18.94	18.54	28.98	137.17	13.81	13.52	0.65	0.64
	Q3	18.48	14.56	30.21	138.07	13.38	10.55	0.61	0.48
	Q4	19.27	15.04	31.19	139.23	13.84	10.80	0.62	0.48
2004	Q1	19.31	15.68	35.24	142.20	13.58	11.03	0.55	0.44
	Q2	17.33	15.01	38.35	146.27	11.85	10.26	0.45	0.39
	Q3	19.38	18.29	43.87	147.70	13.12	12.38	0.44	0.42
	Q4	19.49	16.77	48.30	150.53	12.95	11.14	0.40	0.35
2005	Q1	24.89	22.91	49.73	152.07	16.37	15.07	0.50	0.46
	Q2	24.29	20.76	53.05	154.53	15.72	13.43	0.46	0.39
	Q3	21.52	18.9	63.19	158.70	13.56	11.91	0.34	0.30
	Q4	20.02	16.2	60.00	164.30	12.19	9.86	0.33	0.27
2006	Q1	17.3	14.75	63.27	162.77	10.63	9.06	0.27	0.23
	Q2	18.26	13.73	70.41	165.40	11.04	8.30	0.26	0.20
	Q3	17.73	15.29	70.42	166.70	10.64	9.17	0.25	0.22
	Q4	20.72	14.91	59.98	164.13	12.62	9.08	0.35	0.25
2007	Q1	35.72	19.93	58.08	166.70	21.43	11.96	0.62	0.34
	Q2	26.73	17.05	64.97	172.83	15.47	9.86	0.41	0.26
	Q3	23.35	14.19	75.46	173.67	13.45	8.17	0.31	0.19
	Q4	25.4	17.53	90.75	177.43	14.32	9.88	0.28	0.19
2008	Q1	28.52	18.94	97.94	183.87	15.51	10.30	0.29	0.19
	Q2	27.97	18.9	123.95	196.00	14.27	9.64	0.23	0.15
	Q3	25.38	16.57	118.05	200.47	12.66	8.27	0.21	0.14
	Q4	26.91	26.58	58.35	178.03	15.12	14.93	0.46	0.46

2009	Q1	27.49	20.91	42.91	169.53	16.22	12.33	0.64	0.49
	Q2	22.43	19.92	59.44	171.33	13.09	11.63	0.38	0.34
	Q3	21.35	14.07	68.20	173.87	12.28	8.09	0.31	0.21
	Q4	22.71	20.15	76.06	176.90	12.84	11.39	0.30	0.26
2010	Q1	29.37	29.09	78.64	182.07	16.13	15.98	0.37	0.37
	Q2	27.83	26.45	77.79	184.23	15.11	14.36	0.36	0.34
	Q3	23.21	24.43	76.05	184.57	12.58	13.24	0.31	0.32
	Q4								