Retail Gasoline Price Impact of Compliance with the Renewable Fuel Standard

Whitepaper
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Key Findings

- A fact-based review of developments in the gasoline, ethanol and Renewable Identification Number (RIN) markets indicates that the Renewable Fuel Standard in general and RINs in particular have not been a demonstrable factor in the rise in retail gasoline prices that has occurred in early 2013.
- There is a distinct seasonal pattern to gasoline prices and crack spreads, slumping during the last quarter of the calendar year and then strengthening considerably through the first quarter of the following year. The increase in gasoline prices and crack spreads during the first quarter of 2013 has been generally consistent with increases experienced in 2011 and 2012, despite the fact that conventional ethanol RIN prices averaged $0.03 during the first quarter of 2011 and $0.02 during the first quarter of 2012.
- Considering both the ethanol price advantage versus gasoline and the direct cost of currently elevated RIN prices, there is actually a net benefit to consumers due to the usage of ethanol within the Renewable Fuel Standard:
  - The direct effect on retail gasoline prices associated with elevated RIN costs is only $0.004 per gallon in a "reference case" and a maximum $0.02 per gallon in a "high case." The costs and other assumptions in the high case make it, in some regards, a logical extreme.
  - However, focusing only on RIN prices provides only part of the picture of the impact of ethanol on gasoline prices paid by consumers. Thus far in 2013, ethanol prices have on average been $0.44 per gallon below wholesale gasoline prices, which translates to a gross benefit of $0.04 per gallon of finished motor gasoline supplied to consumers.
  - Considering both the ethanol price advantage and the direct cost of RIN prices, the net benefit to consumers from the usage of ethanol is $0.04 per gallon of gasoline in the reference case and $0.02 per gallon in the high case.

Introduction

A public debate has flared up regarding whether retail gasoline prices are being impacted by the recent run-up in the prices of RIN credits used to demonstrate compliance with the federal Renewable Fuel Standard. The standard, which requires an increasing amount of biofuels to be blended into the nation's fuel supply, was originally established by the Energy Policy Act of 2005 and was expanded by the Energy Independence and Security Act (EISA) of 2007 (and is now referred to as RFS2).

An opinion piece in *The Wall Street Journal* on March 11 stated that if the EPA were to suspend the RFS2 ethanol requirement, "…the price of gas would quickly fall by about five to 10 cents a gallon." Similar refrains have been heard from others in the media and the petroleum industry. Counter-arguments have been made by supporters of renewable fuels, who contend that claims of retail gasoline price impacts of up to 10 cents per gallon are significantly exaggerated.

Informa Economics, Inc. was commissioned by the Renewable Fuels Association (RFA) to provide a third-party assessment of the impact that RINs are having on retail gasoline prices.

The objective of this whitepaper is to examine the data and provide fact-based insights on this issue. Informa's analysis and the contents of this paper were developed independently.

Overview of the 2013 Situation

The 2012 drought resulted in a small crop and record-high prices for corn, the main feedstock for ethanol production in the U.S. Market prices for ethanol have not been sufficient to allow producers to offset higher production costs and maintain significantly positive margins on a sustained basis, and ethanol facilities have been idled. As a result, Informa projects that U.S. ethanol production will fall by nearly 550 million gallons in 2013, to a level of 12.8 billion gallons.

Grain-based ethanol consumption also is expected to be subdued at 12.5 bil. gal. in 2013, due to reduced production and the presence of the so-called blend wall, which reflects the historical constraint of the ethanol content in gasoline to 10%, except for gasoline used in flex-fuel vehicles. The Environmental Protection Agency (EPA) has issued waivers allowing blends of up to 15% (E15) in model year 2001 and newer light-duty vehicles, but sales of E15 are expected to remain small in 2013.

This level of consumption is well short of the effective RFS2 allocation to corn-based ethanol of 13.8 bil. gal. However, despite this shortfall, the blending of ethanol has not been maximized thus far in 2013. Whereas 95% of the gasoline supplied to the U.S. market in 2012 contained ethanol (reaching as high as 98.6% on a weekly basis), in January and February 2013 this share averaged only 93%, indicating that usage actually pulled back from the blend wall. As a result, the parties that are obligated to comply with RFS2 (mainly refiners and importers) will have to draw down their inventories by 1.3 billion RINs in 2013, relative to the 2.1 billion RINs estimated to have been carried over from 2012.

A substantial majority of RINs are obtained by obligated parties directly through ethanol purchases/blending or indirectly via contractual relationships with independent blenders. However, given the sizable draw-down in RINs expected in 2013, the market is anticipating that some obligated parties that do not have sufficient RINs banked or an extensive blending network will have to acquire RINs on the open market. On the other hand, obligated parties with excess RINs and especially independent blenders that are not obligated parties now have substantial market power.

As a result, RIN prices have increased in 2013 to levels that are multiples of any prices experienced previously. As reported by the Oil Price Information Service (OPIS), between January 2 and March 22, the average daily price for conventional ethanol RINs generated in 2013 was $0.37, reaching a daily high of $1.06 on March 11. By comparison, the average price for 2012 was $0.03. (One RIN represents one gallon of ethanol.[1])

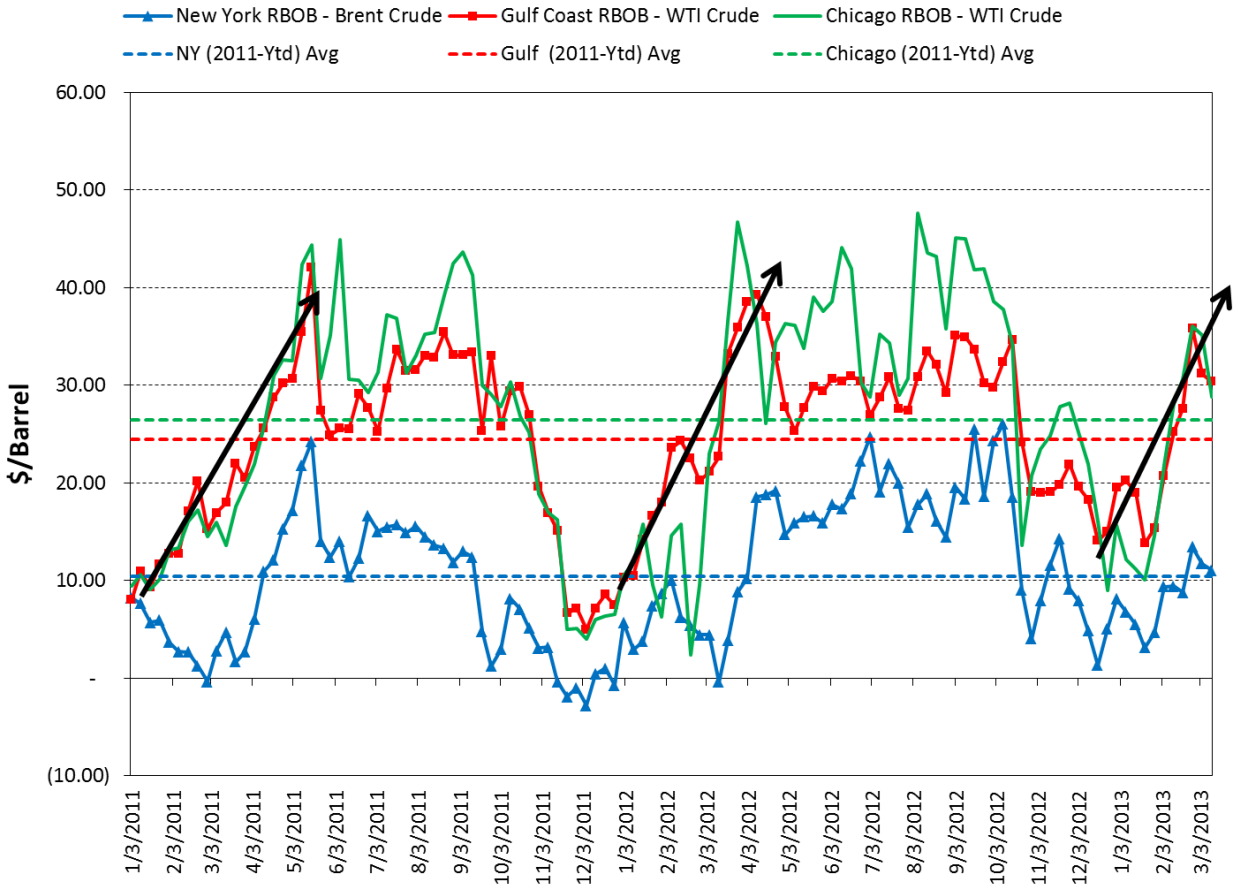
Fuel Market Analysis

There is a distinct seasonal pattern to gasoline prices and crack spreads (i.e., the margins refiners earn by processing crude oil into gasoline) – a pattern that has direct implications for the current debate about the impact of RIN prices on retail gasoline prices. **Gasoline prices**

[1] This analysis focuses on conventional corn-based ethanol RINs, referred to as D6 RINs due to the "D-code" embedded in the 38 digits that comprise a RIN.

and crack spreads slump during the last quarter of the calendar year, particularly November and December, and then strengthen considerably through the first quarter of the year and remain strong through the summertime driving season. This pattern is reflected in Exhibit 1, which shows gasoline crack spreads since the start of 2011, a period encompassing the recovery of the economy and petroleum prices from the Great Recession that began in December 2007.

Exhibit 1: Gasoline Crack Spreads for Chicago, New York and the Gulf Coast



Sources: OPIS (Gasoline Prices), DOE-EIA (Crude Oil Prices), Informa Economics (Calculations)
Notes: RBOB is a standard grade of unleaded gasoline for ethanol blending in areas where reformulated gasoline is sold. Gulf Coast and Chicago crack spreads are based on prices of West Texas Intermediate (WTI) crude oil at Cushing, Oklahoma, the reference grade and pricing point for U.S.-produced crude oil. However, refiners on the East Coast have less access to increasing production of crude oil from U.S. shale formations; accordingly, the New York crack spread is based on prices of Brent crude oil, which is very highly correlated with the overall U.S. refiner acquisition cost of imported crude oil.

The increase in gasoline prices and crack spreads during the first quarter of 2013 has been generally consistent with increases experienced in 2011 and 2012, despite the fact that conventional ethanol RIN prices averaged $0.03 during the first quarter of 2011 and $0.02 during the first quarter of 2012. Notably, the RFS2 in general and RIN market conditions in particular were not cited as causal factors behind the gasoline price increases during those years. Additionally, the absolute levels of crack spreads in early 2013 have been consistent with crack spreads experienced in 2011 and 2012.

While these calculations involve gasoline prices at the wholesale level, spreads between retail and wholesale gasoline prices did not show any uptrend in January and February. In fact, there has been no discernible trend upward or downward in the retail-to-wholesale spread during the period analyzed since the start of 2011. This implies that changes in prices at the retail level have been driven by market dynamics at the wholesale level.

In fact, the Department of Energy's (DOE) Energy Information Administration (EIA) did not even mention renewable fuels or RINs in an article titled "Gasoline prices have risen since the start of the year" in the February 21 edition of its publication *This Week in Petroleum*.[2] It did, however, cite several factors specific to the petroleum market and the refining industry:

- "The average U.S. retail price for regular motor gasoline has risen 45 cents per gallon since the start of the year, reaching $3.75 per gallon on February 18. Between January 1 and February 19, the price of Brent crude, the waterborne light sweet crude grade that drives the wholesale price of gasoline sold in most U.S. regions, rose about $6 per barrel, or about 15 cents per gallon. A simple calculation, which modestly understates the role of higher crude prices to the extent that crude price increases during December 2012 were still not fully passed through in retail gasoline prices at the start of 2013, suggests that about two-thirds of the rise in gasoline prices since the start of the year reflects higher gasoline crack margins."
- "…[T]his article focuses on some of the major factors behind the increase in gasoline crack spreads. Among these are: planned and unplanned refinery maintenance; the low starting level for gasoline crack spreads going into 2013; preparation for seasonal fuel specification changes; and developments in global product demand that have affected domestic refinery utilization rates, maintenance needs, and product balances. … Many refineries schedule maintenance early in the year when gasoline demand is seasonally low."
- "The market's reaction to this string of U.S. refinery outages may have been exacerbated by the late-January announcement that Hess Corporation planned to close its 70,000-bbl/d Port Reading refinery at the end of February. … It should also be noted that Gulf Coast crack spreads have been bolstered by the increases in RBOB prices attributable to the switch to summer-grade gasoline. On the West Coast, refinery maintenance has been particularly heavy."

Calculated Impact on Retail Gasoline Prices

In addition to the analysis above, some straightforward calculations can be used to show that the ongoing impact of elevated RIN prices on retail gasoline prices is not as high as cited in some media reports. In addition to the ethanol consumption forecast discussed above, the following are key assumptions to the calculations:

- The year-to-date average daily price of a conventional ethanol RIN has been $0.37; this is used as the assumed RIN price in a "reference case" calculation of the impact on gasoline prices. The average price for a conventional ethanol RINs from March 1-22 has been $0.79 – by far a monthly record – and accordingly this is used in a "high case" calculation. It should be noted that prices in the high case are far above any experienced in the history of RIN trading, and that an average daily price above $0.79 has occurred only four times

[2] http://www.eia.gov/oog/info/twip/twiparch/2013/130221/twipprint.html

during the 14 business days of the month and only once since feverish buying caused prices to spike to their all-time high of $1.06 on March 11. (The average price on March 22 was $0.67.)

- Not all of the 13.8 bil. RINs required for RFS2 compliance in 2013 need to be purchased on the open market at elevated prices, which is a key reason why the RIN price impact will be less than claimed in some media reports. A sizable portion of RINs are obtained by obligated parties directly through ethanol purchases/blending or indirectly via contractual relationships with independent blenders. Based on market research and conversations with industry participants, Informa estimates that 70-85% of the RINs attached to ethanol used in the supply chain are directly "separated" or indirectly transferred to obligated parties. Given this situation, it is likely that obligated parties hold a large majority of the excess RIN inventories that existed at the end of 2012 and can be applied to the 2013 obligation (amassed at a time when open-market RIN prices were far lower than in 2013).

- Accordingly, in the high case it is assumed that only 70% of ethanol RINs are "separated" by or otherwise conveyed to obligated parties (the remaining 30% would have to be purchased on the open market) and that only 70% of banked RINs are held by obligated parties, while in the reference case it is assumed that these shares are higher, at 85%. Given that it is likely that by the end of the year obligated parties had amassed an even higher share of the excess RIN inventories that existed at the end of 2012, it is assumed in the high case that obligated parties held 77.5% of the 2012 yearend inventories (the midpoint of 70% and 85%). The premise that only a moderate share of RINs needed for compliance have to be purchased on the open market is supported by statements by representatives of the petroleum industry:
  - In a March 12, 2013 security analyst meeting, Chevron Corporation Executive Vice President of Downstream & Chemicals, Mike Wirth, stated, "Specifically to Chevron's position, … we tend to have more marketing sales and therefore more blending of fuels that we sell than we do refining production. So we're in natural long position on RINs … So we can satisfy our compliance obligation and still have some excess that we can sell into the market."
  - Based on communications with the American Fuel and Petrochemical Manufacturers, a March 16 CNBC report stated, "Some companies have a surplus [of RINs]. But those without them have rushed into a market that is thinly traded, driving the spike in prices."[3]

- It is assumed that all of the costs and benefits associated with ethanol usage and RIN purchases are passed along through the supply chain to consumers. While this is assumed, in reality it is likely that a significant share of the costs and benefits are absorbed by participants in the supply chain, lessening the impact on consumers.

- Consumption of finished motor gasoline will be 133.4 billion gallons in 2013, based on the "Short-Term Energy Outlook" published by the Department of Energy's Energy Information Administration.

Based on these assumptions, the direct effect on retail gasoline prices associated with RIN costs would be only $0.004 per gallon in the reference case and would be a maximum $0.02 per gallon in the high case. Still assuming full pass-through of costs to consumers but otherwise

[3] CNBC, "Ethanol Surplus May Lift Gas Prices." http://www.cnbc.com/id/100560109

varying the assumptions described above would result in direct effects of between $0.004 and $0.02 per gallon (see Exhibit 2).

Exhibit 2: Calculated 2013 Ethanol/RIN Impact on Retail Gasoline Prices

Cost Associated with Open Market Purchases of RINs		**High Case**	**Reference Case**	
Est. Conventional Ethanol (D6) RIN Inventory at End of 2012	bil.	2.1	2.1	
% Held by Obligated Parties	%	77.5%	85%	*(a)*
D6 RIN Inventory Held by Obligated Parties at End of 2012	bil.	1.6	1.8	
2013 Conventional Ethanol Consumption	bil. gal.	12.5	12.5	
% of 2013 RINs Separated by or Indirectly Controlled by by Obligated Parties	%	70%	85%	*(a)*
RINs Controlled Obligated Parties Through 2013 Ethanol Consumption	bil.	8.8	10.6	
Total D6 RINs Held or Controlled by Obligated Parties in 2013	**bil.**	**10.4**	**12.4**	
2013 RFS Allocation for Conventional Ethanol	bil. gal.	13.8	13.8	
RINs to Be Purchased on Open Market in 2013 by Obligated Parties	**bil.**	**3.4**	**1.4**	
Open Market Price per RIN (High Case Is Record High 3/13 Monthly Avg.)	$/RIN	$ 0.79	$ 0.37	*(b)*
Aggregate Cost of Open Market RIN Purchases by Obligated Parties	**bil. $**	**$ (2.72)**	**$ (0.53)**	
Finished Motor Gasoline Consumption	bil. gal.	133.4	133.4	*(c)*
Per-Gallon Cost of Open Market RIN Purchases by Obligated Parties	**$/gal**	**(0.02)**	**(0.004)**	
Assumed % of Wholesale Cost or Benefit Passed through to Retail	%	100%	100%	
Per-Gallon Cost Impact on Retail Gasoline Price	**$/gal**	**(0.02)**	**(0.004)**	
Benefit from Usage of Physical Ethanol Versus Gasoline				
Year-to-Date Avg. Ethanol Price	$/gal	2.37	2.37	*(d)*
Year-to-Date Avg. RBOB Unleaded Gasoline Price	$/gal	2.81	2.81	*(d)*
Year-to-Date Avg. Ethanol Price Advantage	$/gal	0.44	0.44	
2013 Conventional Ethanol Consumption	bil. gal.	12.5	12.5	
Aggregate Benefit from Usage of Physical Ethanol Versus Gasoline	**bil. $**	**$ 5.52**	**$ 5.52**	
Finished Motor Gasoline Consumption	bil. gal.	133.4	133.4	*(c)*
Per-Gallon Benefit from Usage of Physical Ethanol Versus Gasoline	**$/gal**	**0.04**	**0.04**	
Assumed % of Wholesale Cost or Benefit Passed through to Retail	%	100%	100%	
Per-Gallon Retail Gasoline Price Benefit	**$/gal**	**0.04**	**0.04**	
Net Impact on Retail Price of Gasoline				
Aggregate Net Benefit (Cost) Assoc. w/ Ethanol Use = Ethanol Savings - RIN Cost	bil. $	$ 2.80	$ 4.99	
Finished Motor Gasoline Consumption	bil. gal.	133.4	133.4	*(c)*
Per-Gallon Net Benefit of Ethanol Use	$/gal	0.02	0.04	
Assumed % of Wholesale Cost or Benefit Passed through to Retail	%	100%	100%	
Per-Gallon Retail Gasoline Price Benefit (Cost) from Usage of Ethanol	**$/gal**	**0.02**	**0.04**	

Source: Informa Economics, except as noted
(a) Based on conversations with industry participants, it is estimated that 70%-85% of RINs are obtained by obligated parties directly through ethanol purchases/blending or indirectly via contractual relationships with independent blenders. The share of RIN inventories held by obligated parties is likely higher.
(b) Max ytd. daily avg. for a 2013 RIN. Source: OPIS.
(c) Department of Energy - Energy Information Administration, "Short-Term Energy Outlook"
(d) Ytd. weekly avg. Chicago ethanol spot price and Chicago RBOB unleaded spot price. Source: OPIS.

However, focusing only on RIN prices provides only part of the picture of the impact of ethanol on gasoline prices paid by consumers. In particular, ethanol prices have usually been substantially below gasoline prices at the wholesale level in recent years. Thus far in 2013, ethanol prices in Chicago have averaged $2.37 per gallon, while gasoline prices have averaged $2.81 per gallon in Chicago (wholesale prices in Chicago were utilized since it is the central pricing point for ethanol and since the regulatory conditions for gasoline are not as varied as on the East and West Coasts). This 44 cent-per-gallon discount translates to a gross benefit of

$0.04 per gallon of finished motor gasoline supplied to consumers. This does not take into account either the indirect benefit that ethanol has on gasoline prices by effectively lowering demand for clear gasoline (a benefit especially in past years when refineries were running close to capacity) or the enhanced octane value of ethanol over gasoline, given that ethanol has an octane rating of 113 whereas premium gasoline is 93 octane and regular unleaded gasoline is 87 octane (allowing a higher price to be charged for premium gasoline or a lower-cost sub-octane blendstock to be used in producing regular gasoline).

Considering both the ethanol price advantage and the direct cost of currently elevated RIN prices, there is actually a net benefit to consumers of $0.04 per gallon in the reference case and $0.02 per gallon in the high case associated with the usage of ethanol within RFS2. Still, it should be noted that costs in the high case are in some regards a logical extreme, based on record-high RIN prices, conservative assumptions about the share of RINs that are directly separated or otherwise controlled by obligated parties and the assumption that 100% of costs are passed through to the consumer.

A Final Note: Ethanol Prices versus RIN Prices

The relative prices of ethanol and RINs also might reflect the modest share of RINs not controlled by obligated parties and the associated thin nature of the open market for which record-high RIN prices have recently been reported. The weekly average price of a conventional ethanol RIN generated in 2013 has increased by $0.76 since the start of the year (see Exhibit 3). On the other hand, the Chicago spot price of ethanol has increased by a far more modest $0.19 per gallon; moreover, given that corn prices have increased by $0.30 per bushel since the start of the year and one bushel of corn yield approximately 2.8 gallons of ethanol, $0.11 per gallon of the ethanol price move can be "explained" by the increase in production costs.

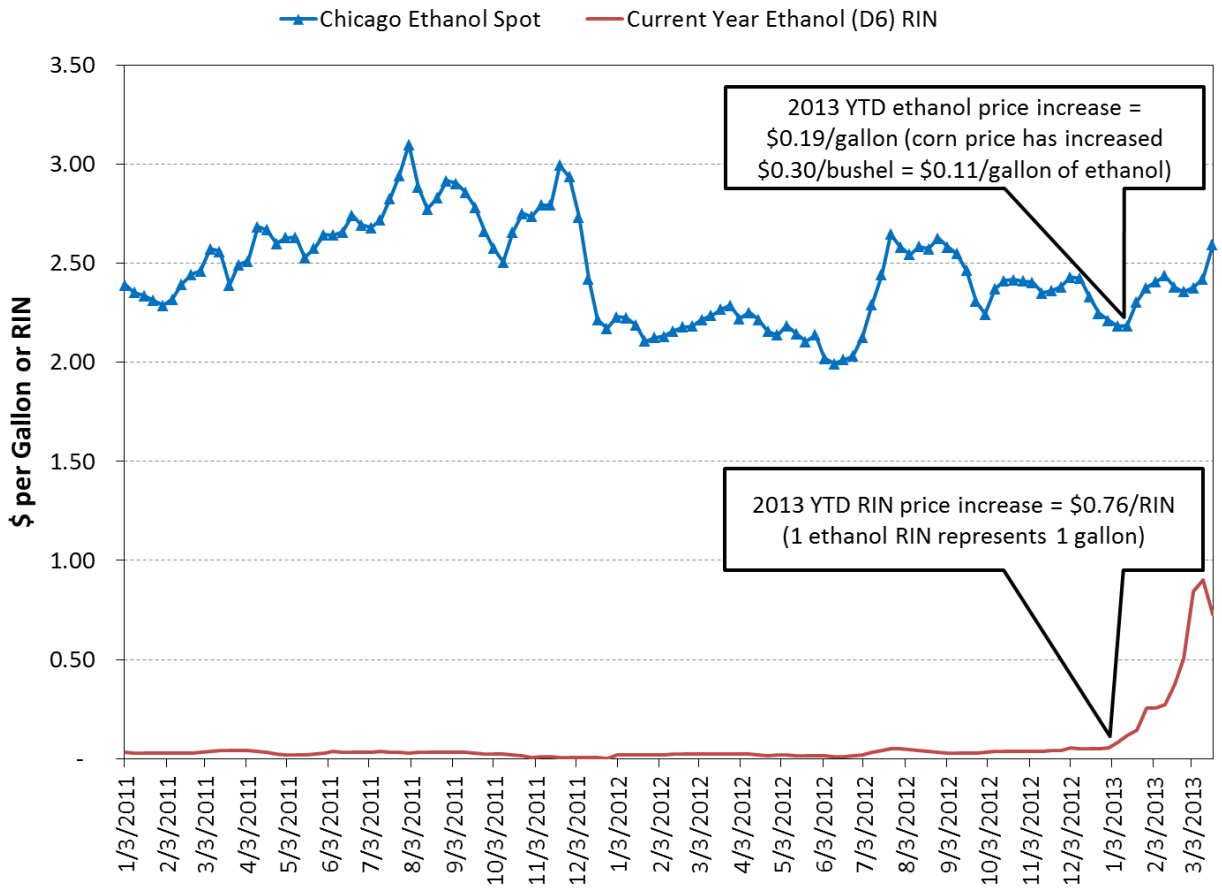
Each gallon of ethanol for which prices are reported still has a RIN attached, so if the "true" value of a RIN were equivalent to the reported market price in early 2013, it would be expected that this also would be reflected in the ethanol price. However, the price of a gallon of ethanol – the volume of which likely has been far higher than the number of RINs traded – has not increased nearly as much as the reported price of a RIN.

It is recognized that with the effective RFS2 allocation to conventional ethanol in 2013 higher than both the blend wall and the likely volume of production, a separated RIN (i.e., not attached to a physical gallon of ethanol) is worth more than an attached one. However, it is questionable whether the increase in the RIN price should be more than three times the increase in the ethanol price.

Conclusion

A fact-based review of developments in the gasoline, ethanol and RIN markets indicates that the Renewable Fuel Standard in general and RINs in particular have not been a demonstrable factor in the rise in retail gasoline prices that has occurred in early 2013.

Exhibit 3: Ethanol and RIN Price History



Source: OPIS