



How Much Will the Cost of a RINs Bundle Decline if the Conventional Ethanol Gap Disappears?

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In a *farmdoc daily* article ([February 15, 2018](#)) last week, we showed how high D6 RINs prices can be directly traced to conventional ethanol mandates that exceed the E10 blend wall, creating a gap that has to be filled by biodiesel. When biodiesel takes on the role of the "marginal gallon" for filling the conventional ethanol mandate, this forces the price of a D6 ethanol RINs to equal the much higher price of a D4 biodiesel RINs. It was also demonstrated that a combination of the crash in crude oil prices and an improving economy increased the E10 blend wall and thereby reduced the conventional ethanol gap, to perhaps just a few hundred million gallons. This means it is possible that D6 RINs prices could fall back their pre-2013 level of just a few cents without making any changes to the RFS. The purpose of this article is estimate how much the total cost of a RINs bundle would drop if the conventional ethanol gap disappeared and the price of D6 RINs declined to just a few cents. The RINs bundle reflects the true weighted-average cost of the RINs that obligated parties under the RFS must turn in to the EPA to demonstrate compliance.

Analysis

To understand what is meant by the cost of a RINs "bundle" one has to understand how compliance with the RFS actually works. It does not work the way many people think it does. For example, the conventional ethanol mandate imposes an obligation on gallons of gasoline and also on gallons of diesel. Likewise, the biodiesel mandate imposes a mandate on gallons of both diesel and gasoline. In fact, every gallon of petroleum gasoline and diesel transportation fuel in the U.S. is subjected to exactly the same set of RFS mandate obligations.

A simple example will help illustrate. Assume annual gasoline consumption is 150 billion gallons, diesel consumption is 50 billion gallons, and the mandated volume of ethanol is 15 billion gallons and biodiesel is 2 billion gallons. These are the only two types of biofuels in this example. The ethanol mandate represents 7.5 percent of total gasoline and diesel consumption, whereas the biodiesel mandate represents 1 percent. The way the RFS works, each obligated therefore has to turn in 0.075 ethanol RINs for each gallon of gasoline and diesel they produce (or import) and 0.01 biodiesel RINs for each gallon of gasoline and diesel. Obligated parties can simply multiply 0.075 and 0.01 times the number of gallons of gasoline and diesel they produce to compute their total RINs obligation. Finally, assume that

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the cost of an ethanol RIN is \$0.50 per gallon and a biodiesel RIN is \$1 per gallon. The cost of a RINs “bundle” for obligated parties can then be computed as,

$$\text{Cost of RINs bundle} = 0.075 \times 0.50 + 0.01 \times 1 = \$0.0475.$$

In this example, obligated parties spend \$0.0475 per gallon of gasoline and diesel to comply with the ethanol and biodiesel mandates. The cost of the RINs bundle is a function of both the fractional RINs obligation per gallon and the price of the two types of RINs.

With this background, we can begin the process of estimating the actual cost of a RINs bundle under the RFS. The starting point is found in Panel A of Table 1. The first four columns present the four fractional mandates specified in the annual EPA rulemakings for the RFS between 2010 and 2018—total, advanced, cellulosic, and biodiesel (biomass-based diesel). Fractional in this case simply refers to the percentage mandates divided by 100. The fractional mandate for the conventional ethanol mandate is implied from the difference between the total and the advanced mandates. In percentage terms, the total, advanced, cellulosic, biodiesel, and conventional mandates for 2018 are 10.67, 2.37, 0.159, 1.74, and 8.3 percent, respectively.

Table 1. Fractional Mandates and Estimated RINs Requirements for Obligated Parties under the RFS, 2010-2018

Year	Total Mandate	Advanced Mandate	Cellulosic Mandate	Biodiesel Mandate	Implied Conventional				
					Ethanol Mandate	D3 RINs Obligation	D4 RINs Obligation	D5 RINs Obligation	D6 RINs Obligation
Panel A: Fractional									
2010	0.0801	0.0059	0.00060	0.0071	0.0742	0.00060	0.0071	0.0000	0.0742
2011	0.0801	0.0078	0.00003	0.0069	0.0723	0.00003	0.0069	0.0009	0.0723
2012	0.0923	0.0121	0.00006	0.0091	0.0802	0.00006	0.0091	0.0029	0.0802
2013	0.0963	0.0160	0.00008	0.0113	0.0803	0.00008	0.0113	0.0046	0.0803
2014	0.0919	0.0151	0.00019	0.0141	0.0768	0.00019	0.0141	0.0008	0.0768
2015	0.0952	0.0162	0.00069	0.0149	0.0790	0.00069	0.0149	0.0006	0.0790
2016	0.1010	0.0201	0.00128	0.0159	0.0809	0.00128	0.0159	0.0029	0.0809
2017	0.1070	0.0238	0.00173	0.0167	0.0832	0.00173	0.0167	0.0054	0.0832
2018	0.1067	0.0237	0.00159	0.0174	0.0830	0.00159	0.0174	0.0047	0.0830
Panel B: Per Million Gallons									
2010	80,100	5,900	600	7,100	74,200	600	7,100	0	74,200
2011	80,100	7,800	30	6,900	72,300	30	6,900	870	72,300
2012	92,300	12,100	60	9,100	80,200	60	9,100	2,940	80,200
2013	96,300	16,000	80	11,300	80,300	80	11,300	4,620	80,300
2014	91,900	15,100	190	14,100	76,800	190	14,100	810	76,800
2015	95,200	16,200	690	14,900	79,000	690	14,900	610	79,000
2016	101,000	20,100	1,280	15,900	80,900	1,280	15,900	2,920	80,900
2017	107,000	23,800	1,730	16,700	83,200	1,730	16,700	5,370	83,200
2018	106,700	23,700	1,590	17,400	83,000	1,590	17,400	4,710	83,000

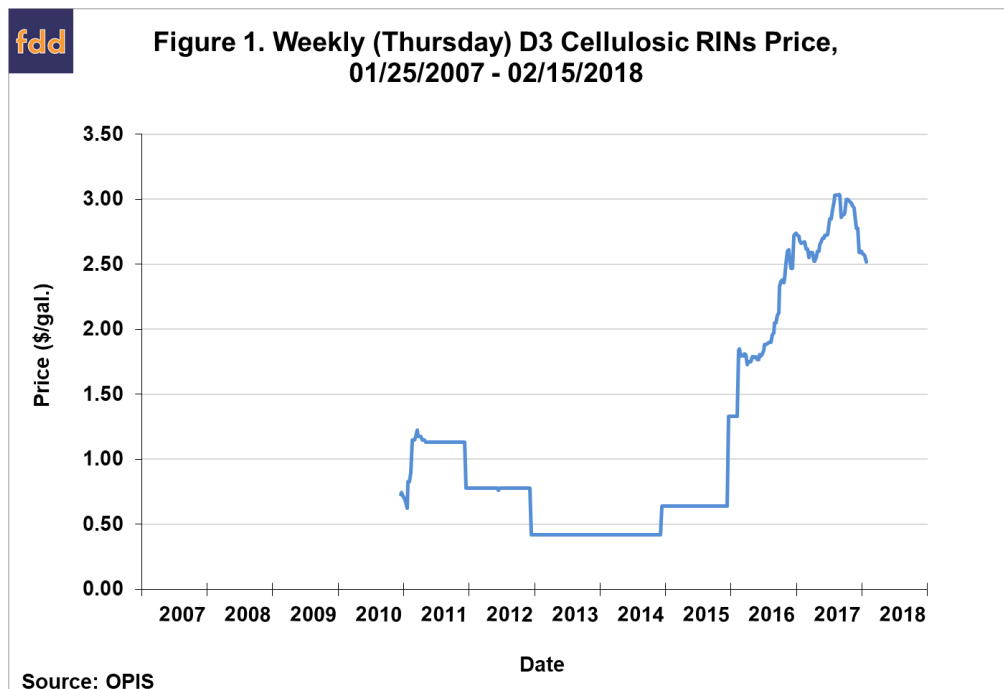
Notes: The mandated volumes in Panel B are computed by multiplying the corresponding figure in Panel A by 1,000,000.

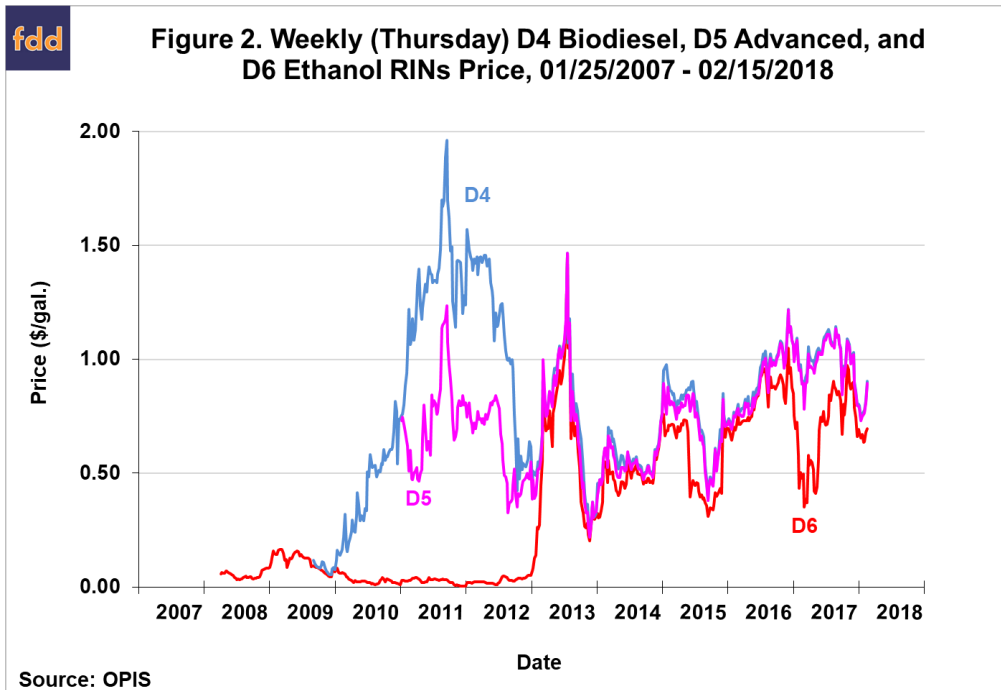
Due to the nesting provisions of the RFS, the fractional mandates are not exactly the same thing as RINs obligations. In the example above these were one and the same. The assumptions we use for the analysis are that:

1. D3 cellulosic RINs are only used to meet the cellulosic mandate,
2. D4 biodiesel RINs are only used to meet the biodiesel mandate,
3. D5 advanced RINs are only used to meet the difference between the advanced mandate and the sum of the cellulosic and biodiesel mandates (cellulosic and biodiesel are advanced biofuels),
4. D6 ethanol RINs can only be used to meet the conventional ethanol mandate.

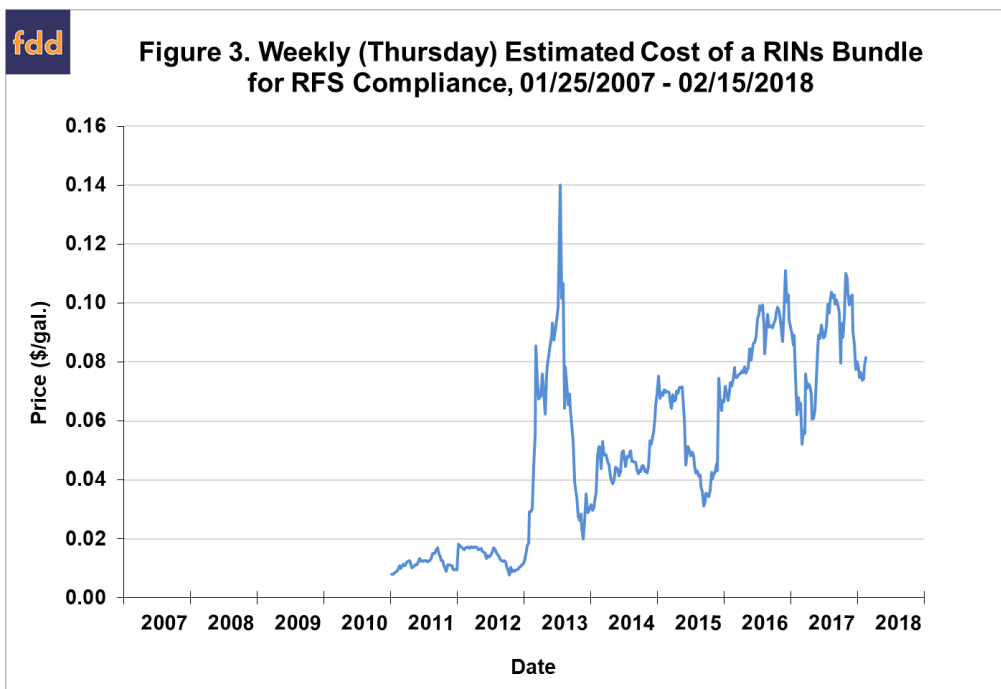
These assumptions are used to compute the RINs obligations found in the last four columns of Panel A in Table 1. For example, this results in fractional obligations for 2018 of 0.00159, 0.0174, 0.0047, and 0.0830 for D3, D4, D5, and D6 RINs, respectively, for each gallon of gasoline and diesel produced in the U.S. One can also look down the columns to see the growth in a particular obligation over time. As one example, the D4 biodiesel RINs obligation increased from 0.0071 in 2010 to 0.0174 in 2018. The D6 obligation increased from 0.0742 to 0.0830 over the same time period. Panel B in Table 1 converts the fractional mandates and RINs obligations to volumes assuming gasoline and diesel production of one million gallons. This helps to highlight the dominance of the D6 ethanol RINs obligation in the total obligation and why the price of D6 RINs is the focus of so much attention in the political controversies surrounding the RFS.

The next step is to multiply the RINs obligations by RINs prices, like in the example above, to determine the weighted-average cost of a RINs bundle. The weekly RINs prices we will use in the calculations are shown in Figures 1 and 2. For each week, the RINs prices are multiplied by the RINs obligations shown in Table 1. Note that the RINs obligations only change once a year while the RINs prices can and do change weekly. The weighted average-cost of a RINs bundle from January 6, 2011 through February 15, 2018 is presented in Figure 3. The cost series starts in January 2011 because some of the RINs price data does not begin until around this time. It should be recognized that the cost of RINs bundles presented in Figure 3 are only estimates. The actual costs depend on the vintage of RINs actually used for compliance and the types of RINs used for compliance in higher nested categories (D4 for D6 compliance). Nonetheless, the estimates in Figure 1 should be a reasonable benchmark for the cost of RINs bundles over time.





The shock factor of the dramatic run up in the cost of RINs in 2013 is readily seen in Figure 3. In December 2012, the cost of a RINs bundle was right around one cent per gallon. Seven months later the cost of a bundle peaked at 14 cents per gallon. This is an enormous increase in the cost of RINs obligations, and since the cost must be applied to every gallon of gasoline and diesel produced in the U.S. (or imported), it is not surprising that it was so controversial. The cost did crash in the second half of 2013, reaching as low as 2 cents per gallon. Since late 2013, the cost of a RINs bundle has steadily trended upward, with two major dips in 2015 and 2017. The cost has bounced between 8 cents and 11 cents per gallon since May 2017, with the cost currently just over 8 cents per gallon.



We can now consider the question posed at the beginning of this article. That is, what happens to the cost of a RINs bundle if the conventional ethanol gap disappears and the price of D6 RINs returns to the pre-2013 level of just a few cents (Figure 2). We use as a baseline the cost of a RINs bundle for the latest weekly observation (February 15, 2018):

Cost of RINs bundle = $0.00159 \times 2.52 + 0.0174 \times 0.91 + 0.0047 \times 0.90 + 0.0830 \times 0.70 = \0.0817 .

The order of the terms in the computation are D3, D4, D5 and D6. We now compute the cost of the RINs bundle assuming the D6 RINs price falls back to its pre-2013 average of 5 cents per gallon:

Cost of RINs bundle = $0.00159 \times 2.52 + 0.0174 \times 0.91 + 0.0047 \times 0.90 + 0.0830 \times 0.05 = \0.0281 .

The drop in the cost of the RINs bundle would be over 5 cents per gallon, or about a two-thirds reduction. By any standard this would be a very large reduction in the cost of a RINs bundle. However, the projected cost of 3 cents per gallon would still be triple that of the pre-2013 level of around 1 cent per gallon. The reason is the increasing advanced mandate obligations for D3, D4, and D5 RINs. These RINs by definition must have a price that is equal to or greater than D6 RINs and their weight in the RINs bundle computation has increased over time.

Implications

Compliance for the RFS biofuels mandates does not work exactly the way most people think. The mandates for different types of biofuels apply to both gasoline and diesel production, which means that the true measure of RINs compliance cost is a weighted-average of fractional RINs obligations and the price of RINs. We estimate the cost of a RINs bundle on a weekly basis over January 2011 through February 2018. This is an estimate of the weighted-average cost of RINs obligations that must be applied to every gallon of gasoline and diesel produced in the U.S. (or imported). After spiking dramatically in 2013, the cost of a RINs bundle has steadily trended upward, with the cost bouncing between 8 cents and 11 cents per gallon the last couple of years. We next considered what might happen to the cost of a RINs bundle if the conventional ethanol gap disappears and the price of D6 RINs returns to the pre-2013 level of a few cents per gallon. The drop in the cost of the RINs bundle is estimated to be over 5 cents per gallon, or about a two-thirds reduction. However, the projected cost of 3 cents per gallon would still be triple that of the pre-2013 level of around 1 cent per gallon, due to increasing advanced mandate obligations for D3, D4, and D5 RINs. So, even if the conventional ethanol gap disappears and the price of D6 ethanol RINs returns to the low levels seen previous to 2013, the cost of a RINs bundle will not fall as much.

References

Irwin, S. "[Fixing the RFS is Getting Easier and Easier.](#)" *farmdoc daily* (8):26, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 15, 2018.