Renewable Identification Numbers (RINs) and refining profitability

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Renewable Identification Numbers (RINs) are credits used to certify compliance with the Renewable Fuel Standard which requires certain minimum volumes of renewable fuels to be blended into fuels sold in the United States. RINs are a controversial aspect of refining profitability. An especially hot question is whether RIN obligations selectively hurt small refiners, especially those who supply local inland markets which tend to be less economically efficient than coastal or global markets; and whether those small refiners can recapture RIN costs by passing them through in the form of higher product prices.

Published studies provide conclusive evidence that retail and large wholesale fuel markets are sufficiently competitive so that RIN expenses are recaptured in the form of higher refined product prices. That has not been proven true for small merchant refineries in inland markets; those refiners are considered vulnerable to being selectively hurt or ruined by RINs obligations.

Stock price data and earnings conference calls provide evidence on how RIN price changes affect profitability. Our study of this evidence shows much confusion on the topic, and especially on the passthrough and recapture question.

This article includes two equations useful for calculating break-even price increases for recapturing increased D6 RINs expense.

D6 RINs

D6 is a code that refers to a category of renewable fuels called conventional biofuel which is made by blending corn-based ethanol into gasoline. Several other codes and categories exist for other biofuels and production pathways.

In domestic manufacture, a D6 RIN is earned at the point of blending along the D6 pathway as shown in Figure 1.

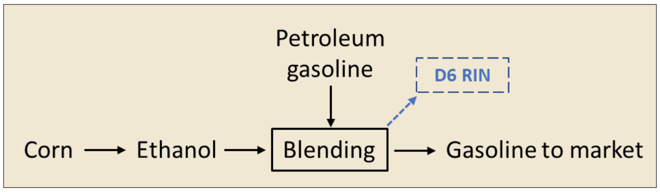

Figure 1 D6 manufacturing pathway

D6 RINs are acquired with the purchase of ethanol and retired by "obligated parties" to comply with their obligations as set by the Environmental Protection Agency (EPA). By rule, refiners who produce petroleum gasoline are obligated parties.

By the nature of their businesses, biofuel blenders tend to be long RINs and refiners tend to be short RINs.

RIN trading

A secondary market exists in which RINs are traded among market participants. This enables refiners to purchase RINs from blenders and retire them to meet their obligations.

D6 RIN price boil over in 2013

Figure 2 shows D6 RIN prices during 2012 and 2013. There are three data series corresponding to RINs created in 2011, 2012, and 2013. The most prominent dark blue series is for the D6 RINs created in 2013. The D6 RINs created in 2011 and 2012 are shown as faded blue lines.

In early 2013, the D6 RIN price skyrocketed 100-fold from its low, in one of the most extreme cases of panic buying in any commodity market in history. This RIN price boil over was caused by the fact that ethanol in E10 gasoline hit the 10% maximum, at which point the D6 RIN obligation could only be met by buying much more costly D4 biodiesel RINs. This is explained in reference 1.

In 2013, D6 RINs were being exchanged by

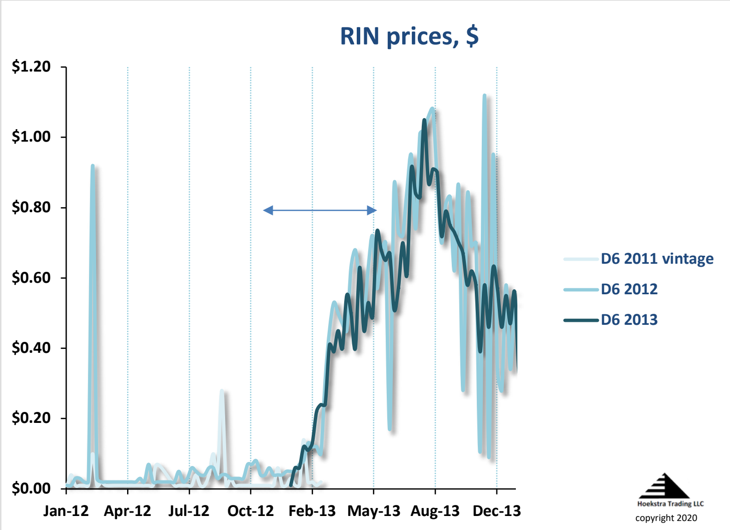

Figure 2 D6 RIN prices 2012-2013

many different market players including speculators and brokers in private transactions with fragmented information at inconsistent prices. The D6 RINs market was not very efficient at that time. When the price boiled over, refiners who were not blending finished gasoline started paying $billions/year to buy these RINs and retire them to cover their obligations. Where did all those $billions go?

With most government programs, failure to comply causes fines that go into government coffers. But with RINs, failure to comply causes payments to other market participants, meaning there are losers and winners in the market.

RINs and refining stocks in 2013

The increased D6 RIN price hurt refiners' profitability and stock prices in 2013 as indicated by the red data series in Figure 3. Our study of earnings conference call transcripts for this period shows that refining companies were blindsided and hurt badly by the RIN price boil over.

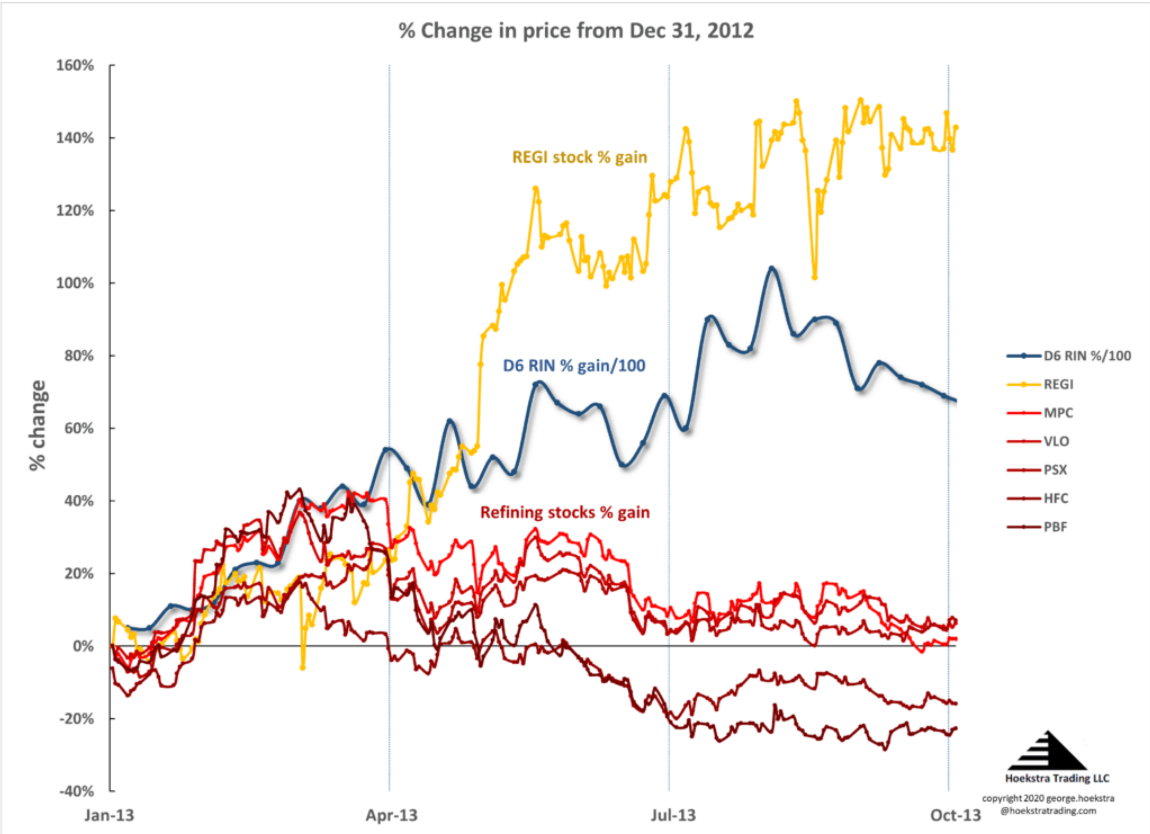

Figure 3 Refining company stocks (red), REGI stock (yellow) and D6 RIN (blue) prices in 2013

The boil over was foreseen and publicised by other knowledgeable RIN market participants. Well-informed and forward looking refiners could have taken steps to prepare for it and mitigate its negative impacts on profitability, but that did not happen.

RINs and Renewable Energy Group (REGI) in 2013

A RIN winner from 2013 was Renewable Energy Group (REGI), a biofuels producer whose stock price (gold) soared while refining companies' sank (see Figure 3).

Figure 4 Casey's General Stores stock (green), PBF Energy stock (red), and D6 prices in 2013

The (blue) % gain in D6 RIN price is divided by 100 here to fit it on the same chart with percentage stock returns.

2013 earnings conference call transcripts confirm the contrast between the gold and red stock price patterns is largely explained by RIN cash transfers from refiners to REGI. RINs are a fundamental component of REGI's profitability. Their understanding of RIN economics enabled them to anticipate risks and manage them proactively to the benefit of their business and shareholders.

RINS and Casey's General Stores (CASY) in 2013

Another beneficiary was Casey's General Stores (CASY). Casey's is a chain of fuel and convenience stores in the midwest and southern USA whose stock price (Figure 4, green) rose 40% in 2013 and resembles a mirror image of PBF.

In 2008, Casey's developed an internal RIN accounting and processing system that interfaced seamlessly with EPA's system. That capability had been running smoothly for years, even though RINs weren't generating much profit at the time.

When the D6 RIN price suddenly popped up in 2013, a new revenue opportunity popped up on Casey's computer screens and Casey was ready to exploit it. With capability to manage their RINs business, Casey executives immediately began directing sales incentive programs to regions where they generated RINs to maximise gasoline market share in those regions, generating more RINs and extra profit margin at the expense of less RIN-savvy players. Rins revenue delivered a 30% increase in Casey's net income that year which contributed to a 40% increase in share price as shown on their green stock chart.

These two examples show how some well-prepared companies benefited by anticipating the coming change and being ready to act when it hit.

The passthrough and recapture of RIN costs

A 2015 article by Dallas Burkholder of EPA[2] provided empirical evidence that refiners' higher RIN expense was being recaptured in the form of higher prices for the petroleum gasoline they sold to blenders. This petroleum gasoline is called "bob" which is an acronym for blendstocks for oxygenate blending. Recovery of RIN cost via increased bob price lessens the hit to refining profitability.

The Burkholder article and subsequent publications explain how prices are expected to adjust across the fuels value chain when RIN prices change, assuming perfect competition at all levels. They provide convincing evidence the perfect

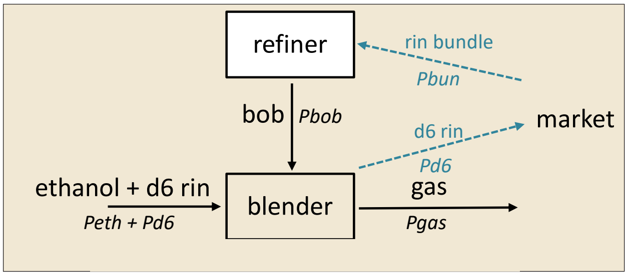

Figure 5 Flow of fuel components and RINs

competition theory holds for large coastal and global fuel markets. The Burkholder article steps through a calculation of the theory's implications for RIN price passthrough to bob and E10 prices for one particular case.

Rins passthrough is a $30 billion/year question. EPA argues refiners recapture most of that in higher bob prices, while refiners blame RINs for low margin capture rates and refinery shutdowns, and financial analysts survey the damage and scratch their heads.

For example, in a first quarter 2021 earnings conference call, the topic came up four times in questions from financial analysts. The analysts pressed for some clarity; but the answers didn't clarify much.[3]

To my knowledge, no EPA or other publication provides convincing evidence the perfect competition assumption holds for US inland markets. This is important because small refiners and their communities could be ruined by RIN liabilities.

I have also not found a general formulation of the passthrough theory that provides an easy and accurate way to calculate the implied sensitivity of bob and E10 prices to D6 RIN price changes for a general case, as was calculated for a particular case in the Burkholder paper.

Two equations for bob and E10/RIN price sensitivities

Below are two equations for the price sensitivities of petroleum gasoline (bob) and E10 gasoline (gas) to a change in D6 RIN price, assuming the prices are set in perfectly competitive markets:

$$\partial Pbob/\partial Pd6 = D6obl + D4obl\,\partial Pd4/\partial Pd6 + D5obl\,\partial Pd5/\partial Pd6$$

$$\partial Pgas/\partial Pd6 = Veth\,\partial Peth/\partial Pd6 + Vbob\,\partial Pbob/\partial Pd6$$

In English, the equations say that, when the D6 RIN price changes:

1. The bob price change is the D6 RIN obligation fraction plus the weighted sum of the D4 and D5 RIN obligation fractions; the weighting factors are the sensitivities of the D4 and D5 RIN prices to a D6 RIN price change.
2. The gas price change is the weighted sum of the fractions of ethanol and bob in the blended gas; the weighting factors are the sensitivities of the ethanol and bob prices to a D6 RIN price change.

These equations can be used to calculate the equilibrium change in refiner and blender product prices that will offset a change in D6 RIN price for any set of input values.

Derivation

In Figure 5, the flow of fuel components and RINs is shown with the *P* variables representing prices:

Pbob = price of petroleum gasoline blend stock, $/gal bob
Peth = price of ethanol without attached RIN, $/gal ethanol
Pgas = price of blended gasoline, $/gal gasoline
Pbun = price of the RFS RIN bundle, $/gal petroleum fuel
Pd6 = price of d6 RIN, $/gal ethanol

Calculating the refiner's cost recapture

For each gallon of bob sold, the refiner is obligated to retire a bundle of D6, D4, and D5 RINs. He buys this bundle for the weighted sum of the prices of the three RINs. The weighting factors (*D6obl, D4obl, D5obl*) are set by EPA, and the RIN prices (*Pd6, Pd4, Pd5*) are set by the markets:

$$Pbun = D6oblPd6 + D4oblPd4 + D5oblPd5.$$

The refiner's profit (PREF) in $/gal of bob, is:

$$PREF = Pbob - D6oblPd6 - D4oblPd4 - D5oblPd5 - CREF$$

where CREF is the refiner's production cost in $/gal bob.

To calculate the bob price increase required to recapture an increase in D6 RIN cost, the refiner differentiates this equation with respect to Pd6:

$$\partial PREF/\partial Pd6 = \partial Pbob/\partial Pd6 - D6obl - D4obl\,\partial Pd4/\partial Pd6 - D5obl\,\partial Pd5/\partial Pd6$$

and sets this derivative equal to zero, giving equation 1:

1) $\partial Pbob/\partial Pd6 = D6obl + D4obl\, \partial Pd4/\partial Pd6 + D5obl\, \partial Pd5/\partial Pd6$

Example

Using the data in the example case given in Table 1 and Figures 9 and 10 of the Burkholder article:

$D6obl = .0812$
$D4obl = .0113$
$D5obl = .0049$
$\partial Pd4/\partial Pd6 = 0.418$
$\partial Pd5/\partial Pd6 = 0.836$

The break-even RIN price increase is calculated by equation 1 to be 9%:

$$\partial Pbob/\partial Pd6 = .0812 + .0113(.418) + .0049(.836) = 0.09$$

In the Burkholder example, the corresponding value is calculated to be \$0.05/\$ 0.55 = 0.09 which agrees with equation 1.

Calculating the blender's cost recapture

A similar derivation from the blender's profit equation gives the sensitivity of blended gas price to D6 RIN price increase:

2) $\partial Pgas/\partial Pd6 = Veth\, \partial Peth/\partial Pd6 + Vbob\, \partial Pbob/\partial Pd6$

Applying this equation to the Burkholder example gives a calculated E10 price sensitivity of minus 1.9% which agrees with Burkholder's answer.

RIN passthrough spreadsheet

Our RIN pricing model spreadsheet, included with purchase of Hoekstra Research Report 10, contains a worksheet that calculates these sensitivities and passthrough prices for any set of input values. It is a useful tool for those involved in RIN and product pricing strategy.

Conclusions

Published studies show conclusively that retail and large wholesale fuel markets are sufficiently competitive such that, in those markets, RIN expenses are recaptured in the form of higher product prices.

We found no convincing evidence the same is true for small merchant refineries in inland markets; those refiners are vulnerable to being selectively hurt or ruined by RIN obligations.
The equations:

$$\partial Pbob/\partial Pd6 = D6obl + D4obl\, \partial Pd4/\partial Pd6 + D5obl\, \partial Pd5/\partial Pd6$$

$$\partial Pgas/\partial Pd6 = Veth\, \partial Peth/\partial Pd6 + Vbob\, \partial Pbob/\partial Pd6$$

are useful for calculating break-even passthrough prices for bobs and E10 fuels.

References

1. RINs and Sulfur Credit Pricing and Economics, by George Hoekstra, in digitalrefining.com, Nov 2020
2. A Preliminary Assessment of RIN Market Dynamics, RIN Prices, and Their Effects, by Dallas Burkholder, Office of Transportation and Air Quality, US EPA, May 2015
3. A $billion question: do refiners recapture RIN expense?, by George Hoekstra, June 24, 2021

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