E15 and E85 Expansion: What Can We Learn from Recent Data?

Summary:

We calculate breakeven RIN prices for E85 and E15 that cover a range of distribution costs. Although uncertainties exist, breakeven RIN prices that could induce E15 expansion at the margin might exceed those for E85 under some situations. Historical data indicate that E85 has sometimes expanded after periods of time when the RIN price might have covered additional distribution costs of E85, although there is no clear relationship and other factors doubtlessly also affect E85 and E15 use.

E85 expansion potential in the U.S. remains a critically important question, but as a decision to allow E15 sales year-round as soon as the 2019 summer driving season that begins on June 1st, the expansion potential for E15 also deserves careful attention. In this bulletin, we are revisiting the question of whether high-level ethanol fuel blends like E85 have the potential to be price-competitive, and similarly investigate the potential for E15 expansion, given recent fuel market conditions.

The more things change…

The upward trajectory of published renewable fuel obligations through 2019 under the Renewable Fuel Standard suggests an expansion beyond E10 might be required to fulfill those obligations though the actual obligations might be different as a result of small refinery waivers, court settlements, etc. Moreover, price conditions in both fuel and Renewable Identification Number (RIN) markets have changed dramatically in the previous couple of years. Crude oil, gasoline and ethanol prices, which turned lower in late-2015, remain fairly low while RIN prices that had been trending higher through 2017 fell steadily through 2018. This drop was due, in large part, to the abundance of RINs made available by the issuance of small refinery waivers, and prices have recovered only a little in recent weeks.

…the more they stay the same.

As before, we hypothesize that E85 and E15 expansion are more likely when their retail costs are favorable to other fuels, such as E10, on an energy basis. This implies there is some RIN price at which profit can be made from getting more ethanol to consumers in the form of these higher blend fuels. The exact level depends on costs of petroleum feedstock (RBOB, here), ethanol, and distribution costs (e.g. mixing and storage costs, pump and infrastructure investment, etc.). The RIN price that makes E85 and E15 equal to the price of a competing fuel, E10, could be large, but it is finite.

In our first comparison, we calculate a minimum conventional RIN price to allow profitable sales of E85 under certain assumptions (e.g. E85 contains 74% ethanol on average, and the E85 distribution margin including taxes is at least as high as the E10 margin). Figure 1 shows how the implied and actual conventional RIN prices have evolved from January 1, 2013 to January 23, 2019. The inferred RIN price that allows E85 to start to compete with E10 is calculated based on actual input fuel prices (RBOB gasoline and wholesale ethanol).

The costs of distribution to sell more E85 remain a key unknown: the lower band of the gray area in the figure reflects the assumption that the distribution costs are equal to E10 distribution costs (we assume $0.60

For more on this topic, see these FAPRI-MU publications:

Bulletin #01-15
Are RIN prices high enough for E85 expansion?

Bulletin #06-15
RIN price (mis)behavior?

Bulletin #09-15
How hard will EPAA push the accelerator on biofuel expansion?

Bulletin #04-16
RIN prices: Still (mis)behaving?

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per gallon) and the upper range of the gray area reflects the assumption that E85 distribution costs are 50% higher than E10 distribution costs (i.e. $0.90 per gallon). It seems likely that the distribution costs for selling a lot more E85 falls in between the two levels, so E85 expansion could still be unlikely if RINs are at the lower end of the range but is more likely if they are at the high end of the range. This uncertainty is represented by the shaded gradient.

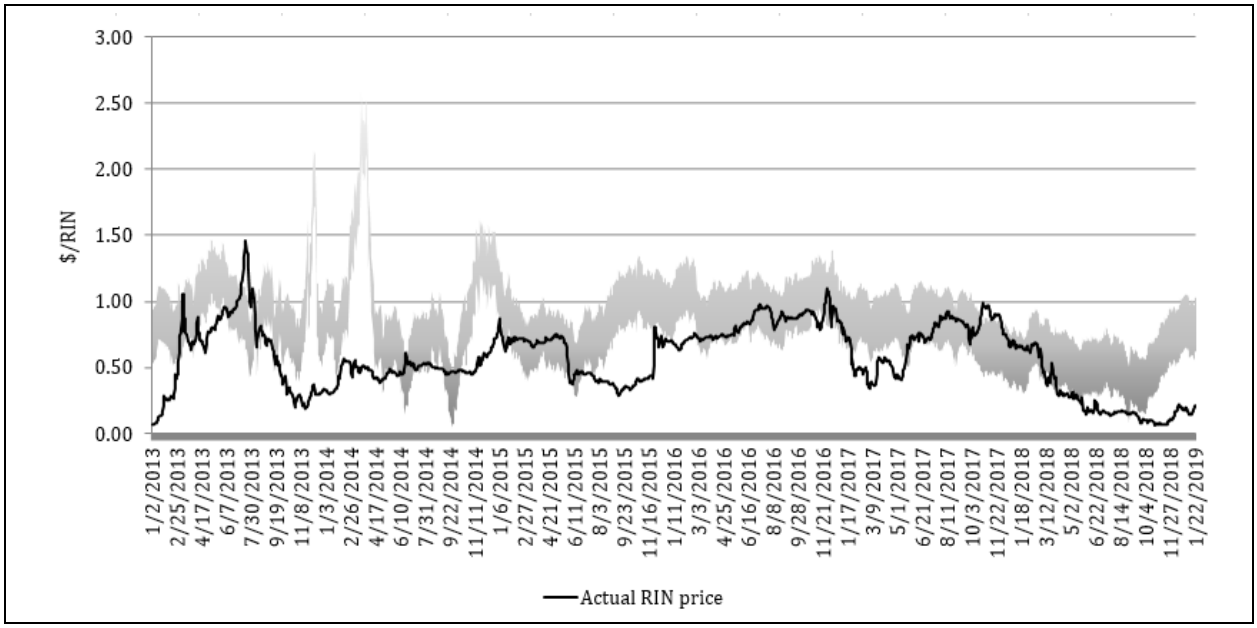

Figure 1.Breakeven RIN prices for E85 competitiveness.
Sources: Oil Price Information Service (OPIS); Energy Information Administration (EIA); authors' calculations

Figure 1 shows that, prior to 2015, the implied RIN price typically was higher than the observed price, suggesting that E85 sales probably were not profitable during these times. There were exceptions, particularly in 2013, when E85 sales could have attracted industry and consumer interest. In the first half of 2015, declining ethanol prices and rising RIN prices resulted in the actual and implied prices converging despite the fall in petroleum prices. The sudden drop in RIN prices, which coincided with the release of the proposed requirements for 2014-2016, led to potentially less competitive E85 prices. RIN prices recovered in 2016 and remained near the lower bound of the implied price for most of that year. Early 2017 was marked by a drop in RIN prices that recovered over the course of the year before steadily declining throughout 2018. In the latter half of 2017, observed RIN prices were high enough to potentially lead to E85 expansion though the incentive disappeared in early 2018 as RIN prices collapsed from policy uncertainty and small refinery waivers. Based on observed RIN prices, there has been little incentive to offer E85 in the time since then.

Figure 2 is a similar graph geared towards E15 expansion. As in Figure 1, the gray band represents our uncertainty regarding the distribution costs of E15. The lower bound reflects the assumption that the distribution costs are equal to E10, and the upper bound reflects the assumption that E15 distribution costs are 50% higher (again, $0.60 and $0.90 per gallon, respectively). There are two very distinct differences between Figures 1 and 2. First, it would seem that observed RIN prices have been, until quite recently, more than adequate to induce E15 expansion at our assumed lower threshold. Of course, there are other factors including Reid Vapor Pressure (RVP) restrictions, consumer acceptance, etc. that might have kept a lid on expansion even in the presence of favorable RIN prices.

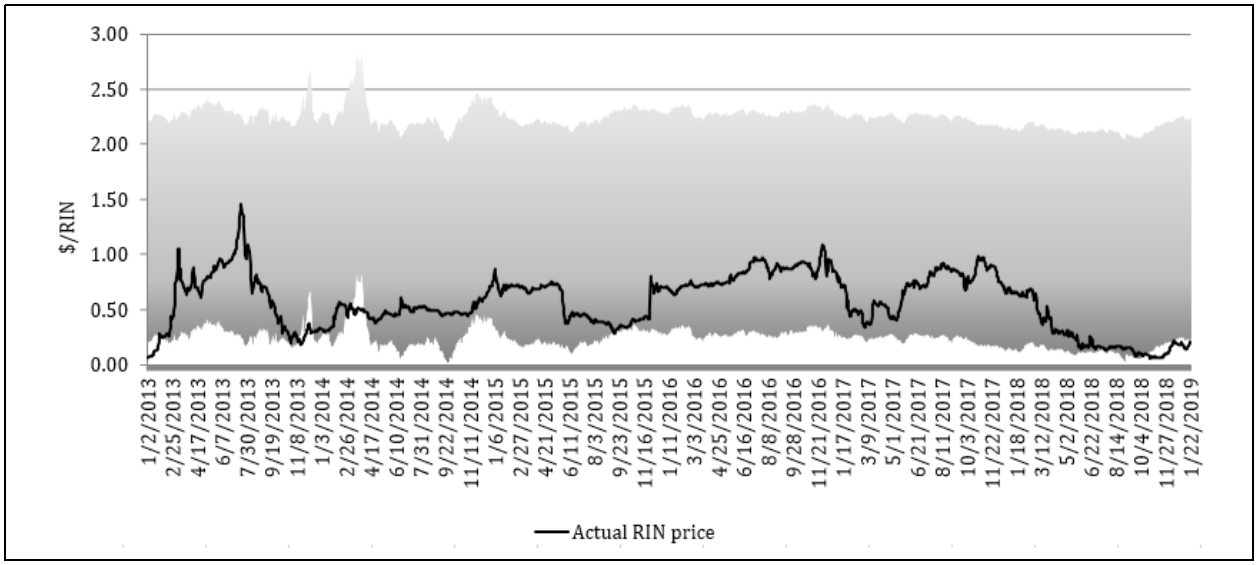

Figure 2. Breakeven RIN prices for E15 competitiveness.
Sources: OPIS; EIA; authors' calculations

The second difference is in regard to the width of the gray brand. It is not an axis scaling issue between Figures 1 and 2. Rather, it is a reflection of the hurdle faced by E15 if its distribution costs are indeed closer to $0.90 per gallon. As before, there are reasons to believe the actual distribution costs for E15 might be closer to the middle of this range (and perhaps even closer to the E10 level than E85), and this uncertainty is reflected in the shaded gradient in Figure 2. Relative to a gallon E85, which allows 0.85 RINs to become available for compliance (RINs are not separated until the corresponding ethanol has been blended for domestic use), a gallon of E15 only allows 0.15 RINs to become available. If obligated parties were to meet their requirements through E15 blending, it would take a much higher RIN price for them to overcome a $0.90 per gallon distribution cost compared to E85. Another way to look at it is that if E15 distribution costs were indeed that high, rising RIN prices might incentivize E85 expansion before E15 expansion, all else equal. In that scenario an RVP waiver, that allows E15 sales year-round, might not yield much E15 expansion if RIN prices are quite low.

An example based on available historical data

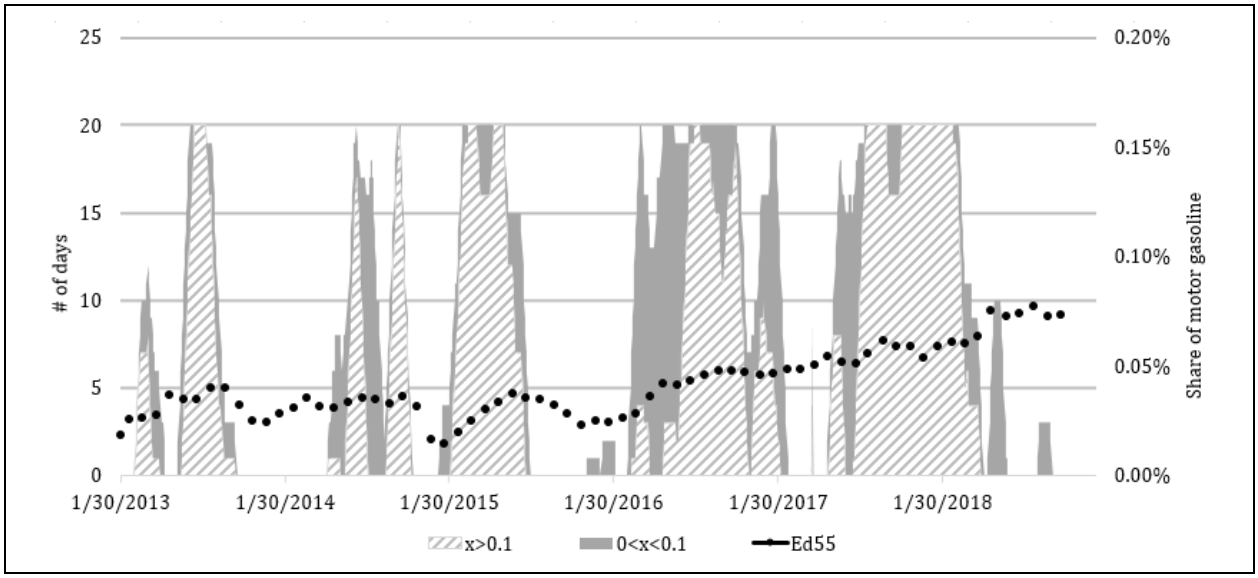

Figure 3. US E85 sales relative to breakeven periods.
Sources: EIA; authors' calculations

Figure 3 illustrates the relationship between our calculated breakeven RIN prices and E85 expansion over time. The dots represent the monthly share of motor gasoline use that is supplied in ethanol blends above 55% over time (these public data from EIA are an approximation for nationwide E85 use, but they are not perfect). The shaded and striped areas represent the number of the previous 20 days in which the breakeven RIN price at the lower threshold (i.e. $0.60 per gallon) was exceeded by a certain margin. The solid areas represent days in which the margin was exceeded by between $0.00 and $0.10 per gallon and the striped regions represent days in which the margin was exceeded by more than $0.10 per gallon. Intuitively, we would expect E85 expansion to occur in or shortly after periods of prolonged profitability (e.g. shaded or striped regions are positive) and more so when striped regions are more pronounced than shaded regions (e.g. indicative of greater profitability). Until 2015, the pattern we see in the share of motor fuel use fits our intuition. E85 expansion seems to occur when profitability signals are strongest and declines occur when those signals fade. After 2015, we see a shift in behavior in which the expansion occurs as before, but there is less of a decline when the price incentives seem to go away. This suggests there are other factors at work in the market. For example, blender pump incentives have led to increased access to E85 for consumers. Perhaps because of some consumers' individual preferences or simply habit formation, we might expect rising E85 use when market conditions are favorable and less of a decline when market conditions are less than favorable. In either case, it is important to remember that the response we see could be muted somewhat due to infrastructure availability, the substitution of biodiesel to meet broader RFS requirements rather than blending more ethanol, and the that these data are approximate.

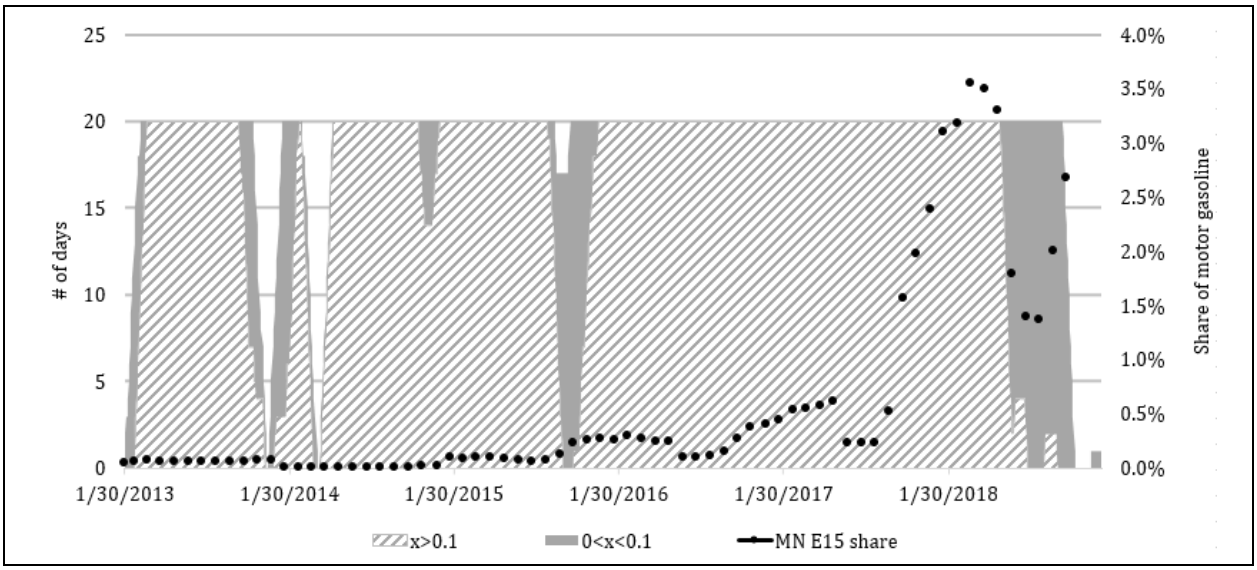

Figure 4.Minnesota E15 sales relative to breakeven periods.
Sources. Minnesota Department of Commerce; EIA; authors' calculations.

Figure 4 illustrates the corresponding relationship for E15 using publically available data from Minnesota. The dots represent the share of motor gasoline use in Minnesota that can be attributed to E15 blends and the shaded and striped areas represent the strength and persistence of our profitability indicator. In this case, we see a distinct seasonal component each year (e.g. increases in the winter months and declines in the summer months) despite persistently strong profitability indicators. This likely is the result of the RVP restrictions that prohibit E15 sales during the summer in most locations within the U.S.

Key lessons from this assessment are as follows. First, observed RIN prices have been in ranges that could induce E85 use in the past, and cursory examination of the data suggests that this effect might have materialized. There are other factors, like subsidies for pumps that can distribute E85, that we do not consider. For E15, the costs of distribution are a critical factor because of the limited generation of RINs from greater E15 use. This distribution cost is unknown: the range we test here might seem reasonable at the low end – namely,

the same as E10 – but we do not know the plausible upper value of this range, let alone the true value. Then again, even halving the range of E15 distribution costs would still imply that the RIN price required to bring E15 retail price to energy equivalence with E10 would be greater than the RIN price necessary to put E85 on a level with E10. There are other considerations to fuel purchases, like consumer willingness to pay and octane level, and the biofuel mandate is associated with any number of complicating factors, such as the potential for biodiesel expansion instead of greater ethanol use. Still, these results put great importance on efforts to understand the size and drivers of E15 distribution costs.

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