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High RIN Prices Signal Constraints to U.S. Ethanol Expansion

Paul C. Westcott, westcott@ers.usda.gov

Lihong L. McPhail, lmcphail@ers.usda.gov

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Introduction

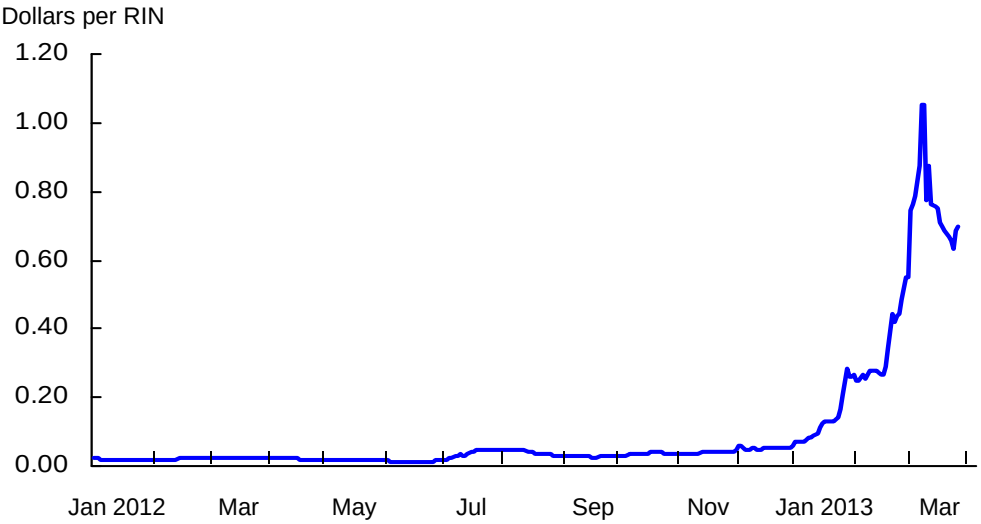
Renewable Identification Numbers (RINs) are codes assigned to batches of renewable fuel and are used in the administration of the federal Renewable Fuel Standard (RFS), an energy law that specifies minimum annual levels of biofuel consumption in the United States. Obligated parties under the RFS use RINs to report qualifying biofuel use to the U.S. Environmental Protection Agency (EPA) to demonstrate compliance with their annual RFS requirements.

After many years of relatively low prices for conventional ethanol RINs, those prices have recently risen sharply (fig. 1). As for any product, prices for RINs reflect underlying supply and demand factors. Thus, surging prices indicate an upcoming imbalance between the supply of RINs and the demand for RINs for RFS compliance. That imbalance reflects underlying conditions in the U.S. ethanol market, where RFS ethanol mandates now exceed ethanol use due to declining gasoline use and the effects of the E10 blend wall.

Nearly all retail gasoline sold in the United States currently is an E10 (10-percent ethanol) blend with gasoline. The limited ability to expand usage of higher ethanol blends (E15 and E85) creates an effective limit on the use of ethanol at near 10 percent of total gasoline consumption. Forecasts for gasoline consumption imply an E10 market that is substantially smaller than the portion of the RFS that can be met with corn-starch based ethanol, with the gap widening. This shortfall in meeting the conventional ethanol RFS will soon transmit to a shortfall in the availability of conventional RINs relative to the demand for RINs for RFS compliance, likely to occur in 2014 once carryover RINs are no longer sufficient to fill the gap. Thus, RIN prices have begun to reflect those shortfalls. Additional factors that may be affecting RIN prices include uncertainties regarding potential regulatory and legislative actions as well as uncertainties in this new and evolving RIN market with little history to guide market participants.

Figure 1

Conventional ethanol RIN prices have risen sharply in 2013



Source: Oil Price Information Service.
Note: 2012 prices are for RINs generated in 2012; 2013 prices are for RINs generated in 2013.

RFS Background

The Energy Policy Act of 2005 originated the RFS program, which initially mandated 4.0 billion gallons of renewable fuel to be blended into gasoline in 2006, growing to 7.5 billion gallons in 2012. The scope of the RFS was expanded and extended in the Energy Independence and Security Act of 2007 (EISA). The new mandates include 18.15 billion gallons of renewable fuel use in U.S. transportation fuel in 2014, growing to 36 billion gallons in 2022. Within the overall RFS, specific sub-mandates are created for various categories of biofuel: advanced biofuel, cellulosic biofuel, and biomass-based diesel (biodiesel). The latter two categories are sub-components of advanced biofuel in the RFS. The sub-mandates are defined by eligible feedstock types and lifecycle greenhouse gas (GHG) emission reductions.

Biofuel that does not qualify for these specific sub-mandates can still count toward the overall RFS. The potential annual amounts of biofuel in this last category are not specified explicitly in EISA, but are derived as the residual from the total RFS and the advanced biofuel sub-mandate. This residual category is frequently referred to as the "non-advanced" mandate or the "conventional" mandate and has typically been met with corn-starch based ethanol.

RINs Track Renewable Fuel Use

The system for Renewable Identification Numbers (RINs) was developed by EPA to ensure compliance with the RFS mandates. A RIN is a 38-character numeric code corresponding to a volume of renewable fuel produced in or imported to the United States. RINs are generated by the producer or importer of the renewable fuel. RINs must remain with the renewable fuel as the renewable fuel moves through the distribution system and ownership changes. Once the renewable fuel is blended into a motor vehicle fuel, the RIN may be separated from the renewable fuel. Then the RIN may be used for compliance, sold, or held for future compliance (subject to limits on use of RINs across years, discussed later). Those alternative uses of RINs are intended to provide some flexibility to obligated parties in meeting the RFS. If the renewable fuel is subsequently exported, the corresponding RINs will not qualify for meeting the RFS.

Obligated parties include producers or importers of gasoline and diesel in the 48 contiguous states and Hawaii. Each year, obligated parties are required to report to EPA a sufficient number of RINs to indicate compliance with the RFS. These RINs can be obtained from the ethanol purchased and blended with gasoline or can be purchased from others who may have more RINs than needed to meet their obligation if the blends in their gasoline exceeded the national average required blend rate implied by the RFS. The annual compliance period runs from January 1 through December 31. Obligated parties must report sufficient RINs to EPA by the end of February of the following year to demonstrate compliance.

RINs are valid for compliance purposes for the calendar year in which they are generated or the following calendar year. If they are used in the following year, such use is subject to a rollover cap which specifies that no more than 20 percent of a year's obligations can be met with RINs from the previous year. Also, under certain conditions, an obligated party may carry a deficit from one calendar year into the next year as long as the deficit and that following year's full obligation are met in the next year. RINs expire if unused at the end of the year following their generation.

RINs are specific to the sub-mandates of the RFS. However, RINs associated with biofuels that have higher GHG emission reduction requirements may be used for other sub-mandates with the same or lower GHG emission reduction requirements. For example, cellulosic RINs (60 percent GHG emissions reduction requirement), biomass-based diesel RINs (50 percent GHG reduction), and sugar-based ethanol RINs (which qualify for the non-specific portion of the advanced RFS that has a 50 percent GHG reduction) may be used to meet the non-advanced, conventional RFS (20 percent GHG reduction).

Nonetheless, while there is technically the potential for such spillover usage of excess RINs from those advanced biofuel categories to meet the non-advanced, conventional RFS, this is unlikely to occur in any significant degree in the short run, given the limited availability of excess biofuel in those categories relative to their own mandates and the overall advanced mandate. Thus, the non-advanced mandate will continue to fall almost entirely on conventional ethanol, most of which is corn-based ethanol.

Changing Market Conditions Boost Conventional RIN Prices

Prices for conventional RINs reflect the supply of RINs, generated from domestically-produced ethanol, relative to the demand for those RINs, subject to the rules established for RIN usage to demonstrate compliance with the RFS.

In 2008 through 2011, the production and use of ethanol in the United States exceeded the implicit conventional ethanol (non-advanced biofuel) mandate. The supply of RINs exceeded the demand both for current year compliance as well as for carryover usage for the following year's compliance. Prices for conventional RINs averaged 3.2 cents in 2010 and 2.6 cents in 2011.

The market for RINs began to change in 2012 when the 2012 U.S. drought pushed corn prices sharply higher, leading to a decline in ethanol production and reduced use of conventional ethanol. As a result, the available supply of 2012 conventional RINs fell short of the corresponding 2012 conventional ethanol use mandate. However, there were sufficient supplies of carryover 2011 RINs available for 2012 RFS compliance and, consequently, 2012 RIN prices remained low, averaging 2.9 cents.

A widening gap between the implicit conventional ethanol mandate and expected U.S. ethanol use over the next 2 years is now shaping the RIN market and RIN prices. Although carryover 2012 RINs appear to be sufficient to supplement RINs generated in 2013 in order to meet the 2013 mandate, the situation looks to tighten next year. For 2014, the conventional RFS is likely to exceed the supply of 2014-generated RINs by more than the available carryover of 2013 RINs. This anticipated imbalance has driven up prices for 2013 conventional RINs as obligated parties attempt to build up their holdings of RINs to meet future compliance requirements.

This looming shortfall in RIN availability to meet the conventional RFS relates to several medium and longer term factors:

- *Stagnating U.S. gasoline use*: Annual gasoline use in the United States has been declining since its peak of 142 billion gallons in 2007. High gasoline prices, the 2008-09 economic slowdown, and improvement in fuel-use efficiency of automobiles underlie this declining trend. Use in 2012 was below 134 billion gallons, with no growth or declines projected by the U.S. Department of Energy for the next several years.

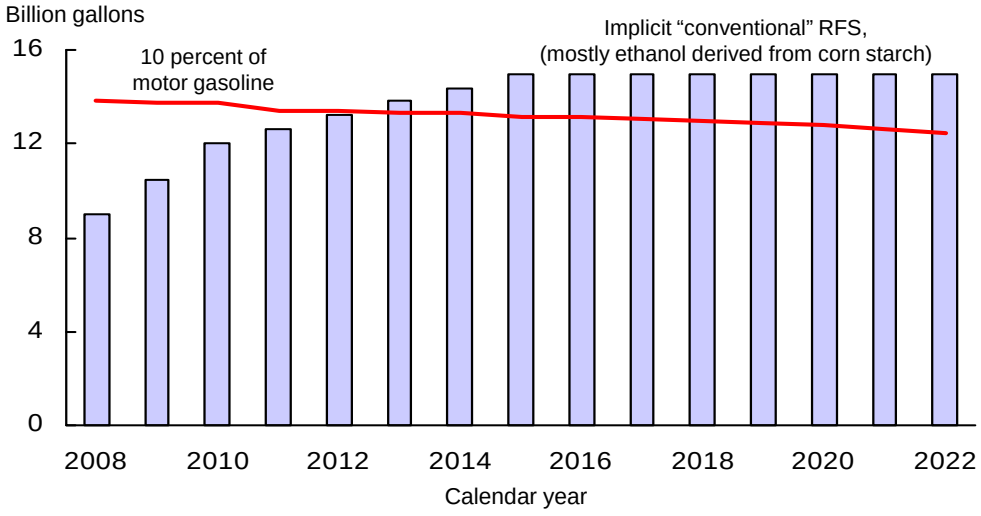
- *E10 blend wall to be hit*: Lower gasoline use is important for ethanol market developments and prospects because the gasoline market is where fuel ethanol is used. With lower gasoline use, the E10 "blend wall" occurs at a lower level than otherwise. The blend wall represents the maximum level of ethanol use in 10-percent blends with gasoline, the predominant blend in the United States. Full market penetration of 10-percent ethanol blends would be less than 13.4 billion gallons, short of the 13.8-billion-gallon conventional ethanol RFS for 2013, the 14.4-billion-gallon conventional mandate for 2014, and the 15-billion-gallon conventional mandate for 2015 (fig. 2).

- *Limited gains expected for higher ethanol blends*: While some ethanol use above the 10-percent blend can occur, infrastructural and other constraints limit growth in the E15 (15-percent ethanol blend) and E85 (85-percent ethanol blend) markets.

As a result of these gasoline and ethanol market factors, USDA's 2013 long-term projections as well as its short-term scenario presented at the February 2013 Agricultural Outlook Forum indicate a moderate increase in the amount of corn used to produce ethanol and by-products during the 2013/14 corn marketing year. Corn used for ethanol and by-products is expected to rise to 4.675 billion bushels from the drought-reduced level of 4.5 billion bushels projected for 2012/13.

Figure 2

E10 blend wall to constrain compliance with "conventional" Renewable Fuel Standard (RFS)



Sources: USDA-ERS calculations derived from U.S. Department of Energy, Energy Information Administration, *Annual Energy Outlook, 2013,* and the *Energy Independence and Security Act of 2007*.

RINs Intended to Provide Economic Incentives When Mandates Exceed Market Equilibrium

With the conventional mandate now exceeding the E10 blend wall quantity, the volume of ethanol produced and blended at the market equilibrium will not be sufficient to meet the mandate. The price of ethanol at this point (with no RINs) is not high enough to provide economic incentives for greater production nor is it low enough to encourage additional use. Thus, additional supplies and use beyond that market equilibrium volume require a higher price to ethanol producers and a lower price for ethanol users.

The difference between these two prices is equal to the per-unit value of RINs and represents the price gap between supply and demand at the mandated volume. RINs are intended to provide economic incentives to facilitate additional ethanol production and use when the RFS exceeds the market equilibrium. Blenders pay a higher price, including the RIN value, to ethanol producers. Once blended, a lower ethanol price is implicit in the price of the blended product and the RIN value represents the cost of compliance with the RFS mandate. How that compliance cost is split among blenders, refiners, and consumers depends on properties of supply and demand in the wholesale and retail motor-vehicle fuel markets.

Uncertainties Potentially Affecting Current RIN Prices

In addition to factors that might affect the demand for RINs for 2013 compliance, carryover provisions that allow 2013 RINs to be used for part of 2014's compliance mean that current demand and prices for 2013 RINs also reflect expectations for ethanol market prospects next year.

Typical factors that affect RIN prices are those that determine the supply and demand of ethanol. For example, prices for crude oil affect the ethanol market by changing the demand for biofuel and, potentially, the equilibrium quantities. Production costs affect the supply of ethanol, with prices for corn being the primary feedstock cost. Price expectations for crude oil and corn are thus important for shaping the ethanol market, with uncertainties regarding those factors influencing RIN prices.

Uncertainties in both the legislative and regulatory arenas also may be having a role in current RIN prices. First, there are uncertainties regarding how EPA will implement the RFS for 2014 and beyond. Second, there is uncertainty about how EPA might impose penalties for RFS compliance shortfalls if obligated parties are unable to meet their ethanol mandates or acquire sufficient RINs for their compliance requirements. Further, there is uncertainty regarding the potential for new legislation to modify the RFS to address current market constraints.

Finally, the market for RINs is relatively new. Some price effects may reflect uncertainty among participants in this evolving market regarding the operations of the market as well as the complexities of RIN market relationships to biofuel markets.

How these market factors and legislative and regulatory issues evolve will be important for shaping the ethanol market and for determining prices for RINs. But for now, as a consequence of these issues, there are uncertainties about future movements in conventional RIN prices, with both upside and downside risks.

References

McPhail, Lihong, Paul Westcott, and Heather Lutman. *The Renewable Identification Number System and U.S. Biofuel Mandates,* ERS Report No. BIO-03, November 2011, http://www.ers.usda.gov/publications/bio-bioenergy/bio-03.aspx

Westcott, Paul C. "Full Throttle U.S. Ethanol Expansion Faces Challenges Down the Road," *Amber Waves* (7)3, U.S. Department of Agriculture, Economic Research Service, September 2009, http://webarchives.cdlib.org/sw1vh5dg3r/http://ers.usda.gov/Amberwaves/September09/PDF/EthanolExpansion.pdf