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Implications of Renewable Fuel Standard Waivers and Exemptions on Biofuel and Agricultural Markets

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Summary

Annual Renewable Fuel Standard (RFS) requirements are subject to waivers and small-refinery exemptions that reduce the implemented volumes relative to legislated quantities. Without speculating what the "correct" level should be, we use economic models to assess how increases in certain parts of the mandated volumes affect biofuel, agricultural and related markets.

Relevant aspects of the RFS are summarized as follows.[1] The law sets out minimum use requirements for types of renewables. These targets are nested such that there are "gaps", one of which is most likely to be filled by corn starch ("conventional") ethanol. Legislation stated that this gap could be 15 billion gallons (b.g.) but the applied level has been lower through the issuance of waivers and small refinery exemptions. Biodiesel use beyond its own mandate can help meet the conventional gap or a similar gap for advanced biofuels that might otherwise be met with imported sugar-cane ethanol. Renewable Identification Numbers (RINs) are tradable compliance certificates whose price indicates how difficult it is to meet each mandate. There are additional complications, some of which are represented in the analysis but not discussed here.

Our analysis uses the FAPRI-MU stochastic model as of March 2019.[2] We compare two cases both of which start in 2020. Results for key indicators are summarized in terms of two averages, one for the first several years and the other for the last several years.

The base case sets the mandated volumes and implied gaps 8% below the levels implied in the legislation. The alternative case sets the gaps at the higher levels set in the legislation. Going from base to alternative, the conventional gap rises 1,200 million gallons (m.g.), from 13.8 b.g. to 15 b.g. The advanced gap is not constant in the underlying legislation, with a jump in 2022, so the increase averages 184 m.g. in the first part of the analysis and 203 m.g. in the latter part. (A table with year-by-year changes in mandated volumes is provided at the end of this note.)

Key assumptions and sensitivities

The blend wall at new price levels. The potential for greater use of fuels with more than 10% ethanol – beyond the "blend wall" – is uncertain. The price ranges implied in this analysis have not been sustained for any long period of time in the past, so we do not know how biofuel use would evolve in these conditions.

We anticipate the following chain of effects in this case. A higher RIN price drives down the retail prices of fuels that contain more ethanol relative to fuels that include less ethanol. Consumers respond to the change in relative prices and buy more ethanol, but demand is not very responsive. If demand is more responsive, then RIN prices would not rise as much.

We expect that such an increase in ethanol demand would not be smooth or quick. It can take time to build infrastructure to deliver fuels with a greater share of ethanol and for consumers to adopt these fuels. The rate of change might be different at different price levels, with energy equivalence representing a potentially important consideration.

Trade could be critical. If ethanol exports are more responsive to prices, for example, then export reductions would account for a greater share of the domestic ethanol use increase. In this case, domestic ethanol production would not increase as much and impacts on corn and soybean prices would be smaller than estimated here.

Other uncertainties. Some potential complications are ignored, including how exactly the mandates are set, the pace at which high-ethanol fuel distribution expands, the scope for substantial cellulosic biofuel increases, and other possible changes in market conditions or the policy setting.

Key biofuel market results

- The mandated volumes and gaps rise in the scenario. For example, the conventional gap is 1,200 million gallons (m.g.) higher.
- The RIN price associated with conventional ethanol rises $0.20 per gallon in the early years and $0.24 per gallon in the later years. The advanced and biodiesel RIN prices rise by about $0.30 per gallon (on a RIN basis).
- Domestic ethanol use rises by 430 m.g. a year in the early period and 619 m.g. per year in later period. The higher RIN prices are assumed to lower relative retail price of fuels with more ethanol, where most of the growth in use occurs.
- Higher RIN price encourages biodiesel use, which rises by about 200 m.g. per year.
- Wholesale ethanol price rises only $0.03-0.04 per gallon. Much of the conventional RIN price increase is used for infrastructure investment to distribute high-ethanol fuels or otherwise helps lower retail prices of these fuels.
- Reduced biofuel exports and more imports account for part of the increases in domestic use. The share is not large in these estimates, partly due to small wholesale price changes, but could prove to be larger.
- Most of the consumption increase is met with greater domestic production, given the trade responses. Ethanol production averages 384 m.g. higher in the early period and 556 m.g. in the later period as consumer ethanol use expands. Biodiesel production is about 200 m.g. higher.

Biofuels (annual averages changes)

Calendar year	2020 to 2023	2024 to 2028
Applied standard	(Million gallons)	
Overall	1580	1600
Advanced biofuels	380	400
Cellulosic biofuel	0	0
Biomass-based diesel	196	197
Gaps: Conventional	1200	1200
Advanced	184	203
Ethanol supply and use		
Production	384	556
Imports	4	3
Domestic disappearance	430	619
In 10% and lower blends	72	19
In higher level blends	358	600
Exports	-45	-63
Bio-mass based diesel supply and use		
Production	189	212
Net imports	11	1
Domestic disappearance	198	213
Biofuel prices	(Dollars per gallon)	
Conventional rack, Omaha	0.03	0.04
Biodiesel, rack	0.11	0.05
RIN values		
Conventional ethanol	0.20	0.24
Advanced ethanol	0.30	0.30
Biodiesel per RIN gallon	0.30	0.30
Biodiesel per phyiscal gallon	0.45	0.44

Crops (annual averages changes)

September-August year	20/21 to 23/24	24/25 to 28/29
Area	(Million acres)	
Corn planted area	0.4	0.5
Soybean planted area	-0.1	-0.2
Supply	(Million bushels	
Corn production	68	99
Soybean production	-7	-11
Prices, program provisions	(Dollars per bushel)	
Corn farm price	0.06	0.06
Soybean farm price	0.08	0.07

Key crop market results

- Corn farm price rises $0.06 per bushel and soybeans by $0.07-0.08 per bushel on average.
- Corn area is about half a million acres higher.
- Although soybean oil demand for biodiesel increases, area is reallocated from soybeans to corn given the relative sizes of impacts and the implications for soybean meal markets and price.

Policy assumptions

The policy assumption used here is a stylized representation of an increase in mandates from current practices. Such a change could come about in multiple ways. The base case has mandated volumes and gaps 8% below those implied by legislation and these are increased to the full amounts implied by legislation in the alternative case (see table below for initial levels and changes). The biomass-based diesel mandate is given a set volume in the legislation after 2012, so subsequent implemented volumes guide the choice used here.

Renewable Fuel Standard assumptions

Calendar year	2020	2021	2022	2023	2024	2025	2026	2027	2028
Baseline					(Million RIN-gallons)				
Overall	19500	19500	19994	19995	19996	19997	19998	19999	20000
Advanced biofuels	4500	4500	4996	4996	4997	4998	4999	5000	5001
Cellulosic biofuel	0	0	0	0	0	0	0	0	0
Biomass-based diesel	2430	2430	2462	2463	2463	2464	2465	2465	2466
Gaps: Conventional	15000	15000	14998	14998	14998	14999	14999	14999	14999
Advanced	2070	2070	2534	2534	2534	2534	2534	2534	2535
Changes in scenario					(Million RIN-gallons)				
Overall	1560	1560	1600	1600	1600	1600	1600	1600	1600
Advanced biofuels	360	360	400	400	400	400	400	400	400
Cellulosic biofuel	0	0	0	0	0	0	0	0	0
Biomass-based diesel	194	194	197	197	197	197	197	197	197
Gaps: Conventional	1200	1200	1200	1200	1200	1200	1200	1200	1200
Advanced	166	166	203	203	203	203	203	203	203

[1] The mandates and gaps are discussed in greater detail elsewhere (e.g. Thompson, Meyer, and Westhoff, "The New Markets for Renewable Identification Numbers" *Applied Economic Perspectives and Policy* 2010.)
[2] The FAPRI-MU website (www.fapri.missouri.edu) provides information about the baseline and model.