<u>Exhibit List</u>

Supplemental Comments by Growth Energy, Archer Daniels Midland, and Biotechnology Innovation Organization on EPA's Proposed Renewable Fuel Standard Program: Standards for 2018 and Biomass-Based Diesel Volume for 2019

Docket # EPA–HQ–OAR–2017-0091

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7	Bruce A. Babcock, Gabriel E. Lade & Sebastien Pouliot, *Impact on Merchant Refiners and Blenders of Changing the RFS Point of Obligation*, CARD Policy Brief 16-PB 20 (Dec. 2016)
8	Edgeworth Economics, *Economic Issues Associated with a Change of the RFS Point of Obligation* (Feb. 22, 2017)
9	Christopher R. Knittel, Ben S. Meiselman & James H. Stock, *The Pass-Through of RIN Prices to Wholesale and Retail Fuels Under the Renewable Fuel Standard: Analysis of Post-March 2015 Data* (Nov. 23, 2016)

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Exhibit 7

CARD Policy Briefs

Center for Agricultural and Rural Development
Iowa State University

CARD Policy Brief 16-PB 20
December 2016

Impact on Merchant Refiners and Blenders from Changing the RFS Point of Obligation

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Executive Summary

The Environmental Protection Agency has proposed to deny a request to move the point of obligation under the Renewable Fuel Standard (RFS) from oil refiners to fuel blenders. Supporters of the request argue that those refiners who do not have the fuel blending capabilities of large, integrated oil companies are in danger of going out of business due to their need to buy RINs (Renewable Identification Numbers) to show compliance with the RFS. We demonstrate that this claim is false and that moving the point of obligation would have no impact on refiner profits. The key point that is neglected in the arguments of those who want to move the point of obligation is that added refiner costs from complying with the RFS are passed on to blenders through higher gasoline prices. We show that high RIN prices, holding constant gasoline consumption levels, have no impact on profits of refiners, blenders, or integrated oil companies. Moving the point of obligation from refiners to blenders similarly will have no impact on profit levels other than moving administrative costs of showing compliance from refiners to blenders. High RIN prices that result from substitution of ethanol for gasoline impact refiner profits from a loss of market share to biofuel producers. This loss of profits from lost market share is consistent with the objective of the RFS to substitute biofuels for gasoline. Moving the point of obligation from refiners to blenders would have no impact on this loss.

Impact on Merchant Refiners and Blenders from Changing the RFS Point of Obligation

By Bruce A. Babcock, Gabriel E. Lade, and Sébastien Pouliot

The Environmental Protection Agency (EPA) has proposed to decline a request to change the obligated party under the Renewable Fuel Standard (RFS) biofuel blending requirements. Currently, producers and importers of gasoline and diesel are obligated parties and must demonstrate compliance by acquiring a sufficient number of blending credits called Renewable Identification Numbers (RINs).[1] The request of EPA was to move the point of obligation from refiners to blenders of biofuels. Supporters of the request argue that making blenders the obligated parties would increase the efficiency and fairness of the program. Opponents of the request argue that moving the point of obligation to blenders would increase program complexity and administrative costs without doing anything to further the goal of the RFS. Understanding the potential impact of moving the point of obligation requires a good understanding of how the current system works. To facilitate understanding, we limit our analysis of the RFS to the markets for ethanol and gasoline.[2]

To begin, it is useful to categorize current obligated parties into two groups: owners of refineries with downstream gasoline blending, distribution, and/or retailing assets and owners of refineries who do not own downstream assets. The former are familiar, branded vertically integrated oil companies such as Shell and BP. Because they both produce and blend fuel downstream, these 'integrated' oil companies acquire most of their RINs by purchasing ethanol that carry RINs at their blending facilities. The latter group are made up primarily of smaller refining companies, and are referred to as 'merchant' or 'independent' refiners. Merchant refiners do not blend fuel downstream and thus are unable to acquire RINs through blending, and must therefore buy RINs from other parties such as downstream fuel blenders, who are not obligated under the RFS, or integrated oil companies who generate more RINs than they need.

Investor Carl Icahn is among those who advocate moving the point of obligation. He is also a vocal opponent of the RFS and has a large financial stake in CVR Energy, a merchant refining business. He claims that the current system is unfair to merchant refiners because they have to buy RINs on the open market, as compared to those refineries who own blending operations. For example, Icahn wrote an opinion piece in the Wall Street Journal recently that concisely stated how he thinks the RFS currently works: [3]

> "Those blenders, often gas-station chains, earn windfall profits by generating RINs that the merchant refiners are

[1] Each gallon of biofuel produced by a qualifying plant carries with it a RIN that is separated when the biofuel is blended with gasoline or diesel. The RIN can either be sold on the RIN market or turned in to EPA to show compliance with the RFS.
[2] Limiting analysis to the blending of gasoline and ethanol greatly reduces the complexity involved in accounting for the interactions of RINs generated by biomass-based diesel and those generated by ethanol without unduly limiting understanding of the impacts of changing the point of obligation.
[3] Icahn, C. "If Oil Refiners Crash, So Will the Economy." *Wall Street Journal*, November 21, 2016.

> forced to buy to comply with the law. Big integrated oil firms are practically exempt: Most of them blend more fuel than they refine, meaning they end up with excess RINs to sell."

Mr. Icahn's view is that blenders benefit from the RFS, merchant refiners lose, and integrated companies break even. He believes that moving the point of obligation to blenders would take away their windfall profits and help merchant refiners.

In this policy brief, we start by analyzing the claims of Mr. Ichan (and others) regarding who wins and loses under the current RFS system. We do this by examining the financial situation of each of these players when RIN prices are high and when they are zero to clarify the gains and losses from RIN prices. We examine two scenarios regarding ethanol mandates. The first scenario is a mandate level that can be met if all consumers buy E10, which is a blend of 10% ethanol and 90% gasoline. Practically all U.S. gasoline today is E10. The second scenario is a mandate level that can only be met if enough motorists buy E85, which contains approximately 70% ethanol and 30% gasoline. Last, we discuss the implications of moving the point of obligation from refiners to downstream blenders under each of these two scenarios.

We have strived to make this analysis understandable to non-economists. The cost of doing this is a fairly detailed explanation of fundamental economic forces that affect market outcomes of all widely traded commodities. While much of what we write here may seem obvious to our colleagues, given the amount of misinformation that has made its way into the public debate about this issue, we decided that the costs were worth the benefits of increasing the chances that the future of the RFS will be based on sound economic analysis.

Impact of RIN Prices on Markets for Gasoline and Blended Fuel

To begin, consider a situation much like we have today with a high ethanol blending mandate and high RIN prices. For illustrative purposes, assume that the wholesale price of gasoline blendstock is $1.65 per gallon, the wholesale price of ethanol is $1.50 per gallon and the price of RINs is $1.00.[4]

To see the impact of high RIN prices, we start with the market for gasoline. By most accounts, the market for gasoline, particularly at the wholesale level, is competitive. There are many buyers and sellers, ensuring that fundamental supply and demand forces determine market prices. Currently, all producers and importers of gasoline are obligated under the RFS to acquire a certain number of RINs for each gallon of gasoline they produce or import. Thus, the per-gallon cost of acquiring the required number of RINs is equivalent to a per-gallon 'tax' on gasoline production. A per-unit production tax increases the cost of producing gasoline. This is depicted in Figure 1, where the supply

[4] These prices are representative of their levels in early December, 2016.

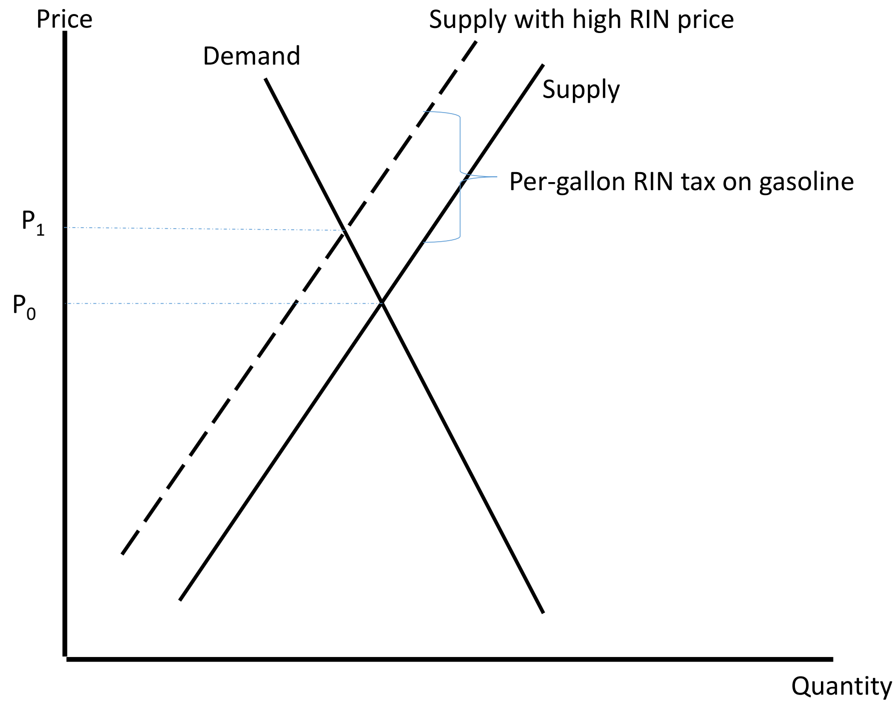

Figure 1. Impact of a high RIN price on supply curve of gasoline.

curve of gasoline shifts up vertically by the amount of the RIN tax. The vertical shift in the supply curve increases the market-clearing price for gasoline from P_0 to P_1.

In Mr. Icahn's view, merchant refiners are harmed by the RFS because they have to pay the tax by buying RINs. Proof of this is contained in the financial statements of merchant refiners that show a cost for RIN acquisition. However, this view ignores the impact of the RIN tax on the market price of gasoline. All producers and importers are subject to the RIN tax. Hence, the market-clearing price of gasoline with a high RIN price is higher than it would otherwise be. It is indeed true that the income statements of merchant refiners with a zero RIN price would show lower costs, but they would also show lower revenues because the market-clearing gasoline price would be lower. Therefore, the net impact of high RIN prices on the profits of merchant refiners is less than the cost of RINs. How much less depends on what portion of the RIN tax gets reflected in higher gasoline prices. To answer this question requires an exploration of the market for blended fuel.

We first examine the impact of RINs on blenders' profits from producing and selling 1,000 gallons of E10. First, consider what happens with an RFS ethanol blending obligation of exactly 10%, which corresponds to being able to meet the blending mandate with E10. Fuel blenders compete with other blenders for market share. Given sufficient competitive pressures, the market price for E10 will reflect blenders' cost of producing E10 plus enough profit to keep them in business. We assume that the profit level needed to keep them in business is the same whether RIN prices are high or low. Thus, we can safely set this profit level equal to zero without impacting our analysis.[5]

[5] The required profit margin to keep blenders in business will be reflected in margins between wholesale and retail blended fuel price, which empirical evidence shows is unaffected by high RIN prices.

Blenders who pay $1.50 for a gallon for 100 gallons of ethanol receive both 100 gallons of the physical product (ethanol) and 100 RINs. Thus, the total cost of producing 1,000 gallons of E10 is $1,635—$1,485 for 900 of gasoline (at $1.65 per gallon) plus $150 for 100 gallons of ethanol, which includes 100 RINs. With a $1.00 RIN price blenders' net cost of ethanol—the physical product—is only 50 cents per gallon. Competition between blenders will result in an E10 price that reflects the net cost of ethanol rather than the total cost. Therefore, the revenue generated from 1,000 gallons of E10 and 100 RINs is $1,635—$1,535 from the E10 and $1,000 from the RINs. Thus, the profit level above that needed to keep the blender in business (i.e., windfall profits) is zero. These calculations are shown on the left side of Box 1(a).

The RFS blending obligation implies that oil refiners must acquire one RIN for every nine gallons of gasoline they produce. With a RIN price of $1.00 this equates to a "RIN tax" on gasoline of 11.11 cents per gallon ($1.00 divided by 9). As shown on the right side of Box 1(a) refiners receive $1,485 for selling 900 gallons of gasoline and pay a total RIN tax of $100 on those sales ($0.1111*900).

Box 1(a): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, a 10% biofuel mandate, and no substitution of ethanol for gasoline.

Blender Costs:	**Merchant Refiner RIN Costs:**
Gasoline: $1,485	RIN purchases: $100
Ethanol: $150	Total: $100
Total: $1,635	
	Merchant Refiner Revenue:
Blender Revenue:	Gasoline sales: $1,485
E10 sales: $1,535	Total: $1,485
RIN sales: $100	
Total: $1,635	

Our conclusion that blenders do not obtain windfall profits when prices are high contradicts Mr. Icahn's claims. It is easy to reconcile our conclusion that blenders break even with Mr. Icahn's opinion that they make windfall profits from RINs if Mr. Ichan believes that windfall profit can be measured from RIN revenue reported on blenders' financial statements (equal to $100 for 1,000 gallons of E10 sales in the example above). However, just as RIN costs do not measure lost profits of merchant refiners, RIN revenues do not indicate windfall profits of blenders because blenders' costs of gasoline and ethanol must also be considered.

Now consider what would happen to blenders and merchant refiners if the RIN price falls to zero (see Box 1(b)). With a zero RIN price, the RIN tax drops from 11.11 cents per gallon to zero. As shown in Figure 1, a drop in the tax on gasoline will shift the gasoline supply curve down and the market price of gasoline will fall back to P0. If we assume that the RIN tax was fully reflected in the price of gasoline—a topic that we turn to next—the market price of gasoline falls from $1.65 per gallon to $1.539 per gallon. This drop in the price of gasoline means that the cost of producing E10 drops also. However, a zero RIN price now means that the cost of ethanol, the physical product, increases from 50 cents to $1.50 per gallon, increasing the cost of producing E10. The cost of producing E10 with a zero RIN price is now $1,385 for the 900 gallons of gasoline plus $150 per 100 gallons of ethanol, for a total cost of producing E10 of $1,535. RIN revenue with a zero RIN price is zero. This means that both costs and revenues for blenders equal $1,535 and the blender again breaks even.

It is easy to show that profits to merchant refiners are also unaffected by the drop in RIN prices. With a $1.00 RIN price, the cost of acquiring enough RINs to meet the obligation of producing 900 gallons of gasoline is $100. Revenue from producing the 900 gallons with a $100 RIN cost is $1,485. Thus, revenue minus RIN cost is $1,385. With a zero RIN price the cost of RINs is, by definition, zero. However, revenue from selling 900 gallons of gasoline is now $1,385. Thus, revenue minus RIN cost does not change, which means that the profit levels of merchant refiners are not impacted at all by higher RIN prices, despite the fact that their financial statements show a RIN cost when RIN prices are not zero.

Example 1(b): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $0 RINs, a 10% biofuel mandate, and no substitution of ethanol for gasoline.

Blender Costs:		**Merchant Refiner RIN Costs:**	
Gasoline:	$1,385	RIN purchases:	$0
Ethanol:	$150	Total:	$0
Total:	$1,535		
Blender Revenue:		**Merchant Refiner Revenue:**	
E10 sales:	$1,535	Gasoline sales:	$1,385
RIN sales:	$0	Total:	$1,385
Total:	$1,535		

The fact that profits of blenders and merchant refiners are not impacted at all in this somewhat simplified example clearly shows the fallacy of Mr. Icahn's logic. One must account for how RIN prices impact both costs and revenues of blenders and refiners before making conclusions about who is hurt or helped by high RIN prices. In the above example, neither blenders nor refiners are impacted at all by RIN prices because prices for the physical products adjust to reflect the RIN tax.

Note that the conclusions from the examples above would also hold for an integrated refiner. The balance sheet of an integrated refiner would also show a net impact of RIN of zero.

Impact of Substitution of Ethanol for Gasoline

Our conclusion that refiners are unaffected by high RIN prices depends on the assumption that the market price of gasoline increases by exactly the per-gallon RIN tax. If this is the case, then refiners pass on all of their costs of paying the tax to blenders who pass on their higher costs to consumers. Figure 1 shows that a high RIN price leads to a drop in gasoline consumption. If this is the case, part of the burden from the tax on gasoline is on refiners. This can be seen in Figure 1 with the difference $P_1 - P_0$ being smaller than the RIN tax on gasoline. The question then becomes, when does a high RIN price impact gasoline consumption?

There is no question that consumers buy more E10 when its price is lower. This is evidenced by the substantial increase in fuel use in the last few years with sharply lower fuel prices. Thus, the demand for E10 slopes downward. As discussed above, because high RIN prices increase the market price of gasoline, one effect of RIN prices is to increase the cost of producing E10. However, high RIN prices also lead to lower ethanol blending costs that offset the effects of higher gasoline prices. In a world where E10 is the only fuel, the net effect on the price of E10 of high RIN prices is zero: higher gasoline prices are offset by lower ethanol blending costs and the price of E10 remains constant. In this E10 world, profits of gasoline producers and blenders are unchanged by RIN prices.

EPA's 2017 ethanol mandates cannot be met only with E10. EPA has decided to set mandates that can be met with 15 billion gallons of corn ethanol. For 2017, total E10 consumption is projected to be 142 billion gallons, which implies ethanol-in-E10 consumption will be 14.2 billion gallons.6 E10 represents about 99% of all consumption of blended gasoline in the United States, such that total fuel consumption through various blends is about 143.4 billion gallons. If 15 billion gallons of ethanol are to be consumed in 2017, then about 800 million gallons of ethanol need to be consumed in either E85 or E15. To keep things reasonably simple, let's assume that all of this additional ethanol consumption will be consumed in E85. Research has shown that most consumers will not choose E85 unless its price is low enough to save them money on a cost per mile basis.[7] The mechanism through which the E85 price can be lowered is from an increase in the RIN price, because, as discussed above, a higher RIN price lowers the blending value of ethanol thereby lowering the cost of producing E85.

If consumption of E85 increases, consumption of E10 decreases. That is, E85 substitutes for E10. Fewer gallons of E10 implies fewer gallons of gasoline are consumed because E85 contains about 30% gasoline, whereas E10 contains 90% gasoline. Thus, as RIN prices rise to induce more consumption of E85, consumption of gasoline drops. A lower level of gasoline consumption with high RIN prices means that the market price for gasoline increases by less than the RIN tax, a situation that is depicted in Figure 1. This means that not all of the RIN tax is passed on to blenders in the form of higher gasoline prices. A portion of the tax is paid by refiners. Thus, when we move away from an E10 world into a world where E10 and gasoline consumption are reduced because of high RIN prices, then profits of refiners will be somewhat lower with high RIN prices than with zero RIN prices; how much lower can be easily calculated.

An increase in ethanol consumption of 800 million gallons above the level that can be consumed in E10 means that the equivalent amount of gasoline will not be consumed if total miles traveled remain unchanged. Accounting for the lower fuel economy of ethanol means that 536 million fewer gallons of gasoline will be consumed because EPA has pushed ethanol mandates from 14.2 to 15 billion gallons. This represents a decrease in gasoline consumption of 0.4% (0.536/129.2).

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[6] EPA's mandates for 2017 could be met with more than 15 billion gallons of ethanol if imported sugar cane ethanol is used to meet part of the advanced mandate. Mandates could also be met with less than 15 billion gallons of ethanol if biomass-based diesel consumption exceeds its own mandate. Consideration of these RFS complexities are not needed to analyze how changing the point of obligation impacts blenders and refiners.
[7] See Pouliot, S., and B.A. Babcock. "Feasibility of Meeting Increased Biofuel Mandates with E85." *Energy Policy* 101 (2017) 194–200.

With a 15 billion gallon mandate, the blending obligation is roughly 10.5% of total motor fuel, which translates into needing 105 RINs for every 900 gallons of gasoline.[8] With a RIN price of $1.00 this corresponds to a gasoline RIN tax of 11.68 cents per gallon. If the refiner could pass the entire RIN tax on to the wholesale price of gasoline, then it would sell gasoline at $1.6558 (1.539+0.1168). A drop in consumption of 0.4% with a supply elasticity of 0.5 implies a drop in the price of gasoline of -0.8% (-0.4%/0.5). The RIN tax is not entirely passed to the wholesale price of gasoline, such that from a $1.6557 wholesale gasoline, the price paid to refiner declines by 1.3 cents to $1.6425. This means that the refiners pay 1.3 cents of the 11.68-cent RIN tax. Blenders pay 10.35 cents.

Example 2(a): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, 10.5% biofuel mandate, and substitution of ethanol for gasoline.

Blender		Merchant Refiner	
Blender Costs:		**Merchant Refiner RIN Costs:**	
Gasoline:	$1,479	RIN purchases:	$105
Ethanol:	$150	Total:	$105
Total:	$1,629		
Blender Revenue:		**Merchant Refiner Revenue:**	
E10 sales:	$1,529	Gasoline sales:	$1,479
RIN sales:	$100	Total:	$1,479
Total:	$1,629		

Example 2(b): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $0.00 RINs, 10.5% biofuel mandate, and substitution of ethanol for gasoline.

Blender		Merchant Refiner	
Blender Costs:		**Merchant Refiner RIN Costs:**	
Gasoline:	$1,374	RIN purchases:	$0
Ethanol:	$150	Total:	$0
Total:	$1,624		
Blender Revenue:		**Merchant Refiner Revenue:**	
E10 sales:	$1,624	Gasoline sales:	$1,374
RIN sales:	$0.00	Total:	$1,374
Total:	$1,624		

The change in refiner profits due to the RIN tax from producing 900 gallons of gasoline can now be calculated, under the assumption that the blending obligation is maintained at 10.5%. With a $1.00 RIN price, revenue from the 900 gallons is $1,479, the cost of RINs to the refiner is $105, and total refiner revenue minus RIN cost is $1,374. With a $0 RIN, the price of wholesale gasoline is $1.527, making the revenue of the refiner from 900 gallons of gasoline $1,374. The cost of RINs is zero, such that the total refiner revenue minus the RIN cost is $1,374. Thus, with a $1.00 RIN price, the profit from 900 gallons of gasoline relative to revenue with a $0 RIN is the same. That is, a drop in the RIN price has no impact on refiner profit if the blending obligation is held constant. If the drop in the RIN price from $1.00 to zero is the result of a drop in the blending obligation from 10.5% to 10.0%, then the refiner saves 11.68 cents per gallon in RIN costs, whereas the gasoline price drops by only 10.38 cents per gallon. In this case, the drop in the RIN price increases refiner profits by 1.3 cents per gallon.

[8] Thus, the blending obligation is calculated as 15/(142/0.99) = 10.46%. Alternatively, this corresponds to an ethanol to gasoline ratio of 15/((142/0.99) - 15) = 11.68%. Thus, for 900 gallons of gasoline, the mandate requires 105 (900*11.68%) gallons of ethanol.

Multiplying this profit increase by 129 billion gallons of gasoline indicates that the profits of refiners would increase by approximately $1.68 billion, which represents 0.8% of their revenue generated from selling gasoline. This example shows that refiners are not harmed by having to pay for RINs but rather are harmed by the drop in consumption of gasoline that accompanies increased ethanol consumption.

Thus, in contrast to the earlier simplified example where refiners are not affected by RIN prices, when increased RIN prices result in a drop in gasoline consumption then profits of refiners will be somewhat lower. However, the amount by which refiners' profits drop is a small fraction of their total cost of acquiring RINs because blenders still pay a large share of the RIN tax, a cost that blenders pass on to consumers through the price of blended fuel.

The reason why a high mandate leads to high RIN prices is that a low ethanol blending value is needed to bring E85 prices down enough to induce consumers to buy enough E85 to meet expanded ethanol targets. With a $1.00 RIN price, a 50-cent ethanol blending value, and $1.6434 gasoline, the wholesale price of E85 will be $0.84 per gallon. If the wholesale-to-retail markup is 75 cents per gallon for both E10 and E85, the retail price of E85 will be about 30% lower than E10, which translates into an 11% savings in cost per mile. Our research has shown that when consumers get this kind of discount then many of them start to buy E85 instead of E10.

Our analysis of the impacts of high RIN prices differs sharply from those who advocate moving the point of obligation to blenders. Thus, it is no surprise that we conclude that moving the point of obligation would have little-to-no impact on the distribution of gains and losses from high RIN prices or on the overall effectiveness of the program. This conclusion also sets aside the issue of whether the administrative complexity of the RFS program would be increased by moving the point of obligation to blenders.

Impact of Changing the Point of Obligation

An EPA decision to move the point of obligation to blenders would force blenders to accumulate enough RINs to show compliance with the RFS. Presumably, the obligation would depend on the quantity of gasoline the blender sells domestically. To analyze the impact of this change we start as before with a blending obligation of 10%.

Impact in an E10 World

The RIN obligation from producing 1,000 gallons of E10 is 100 RINs. The blender acquires RINs by buying 100 gallon of ethanol and separating them when the ethanol is blended with 900 gallons of gasoline. Moving the point of obligation from the refiner to the blender means that the blender no longer sells the RINs to refiners, but rather keeps them and turns them into the EPA to show compliance with the RFS. Thus, there would be no need for a RIN market if 100% of gasoline-based fuels contained 10% ethanol because blenders would produce no other fuel.

Because the refiner no longer pays the RIN tax, the supply curve of gasoline is never affected by the RIN tax, as shown in Figure 1. In this E10 world, where there is no substitution of ethanol for gasoline, the quantity of gasoline consumed does not change, so the price of gasoline is $1.539 as in the case with a zero RIN price. Because the refiner no longer pays the RIN tax, the lower price of gasoline has no net impact on profits because the tax savings are just offset by the lower gasoline price.

Example 3: Blender Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, 10% biofuel mandate, and no substitution of ethanol for gasoline.

Blender Costs:	**Merchant Refiner RIN Costs:**
Gasoline: $1,374	RIN purchases: $0
Ethanol: $150	Total: $0
Total: $1,624	
	Merchant Refiner Revenue:
Blender Revenue:	Gasoline sales: $1,374
E10 sales: $1,624	Total: $1,374
RIN sales: $0.00	
Total: $1,624	

The lower gasoline price reduces blenders' costs of the gasoline that is used to produce E10. However, these cost savings are exactly offset by the need to acquire the RINs. With a $1.00 RIN price each gallon of gasoline purchased carries with it an obligation to pay an 11.11 cent tax. The RIN tax on blenders can be avoided by blending less gasoline, so the tax varies directly with the amount of gasoline purchased. Thus, the net cost per gallon of gasoline to the blender increases by 11.11 cents, making the net cost per gallon of gasoline used to make E10 equal to $1.65 per gallon. This is exactly the same cost per gallon the blender pays when the point of obligation is on the refiner. Thus, the cost per gallon of E10 remains unchanged, so the consumer price of E10 also remains constant.

Moving the point of obligation to blenders would change the income statement of refiners. They would no longer report RIN costs. However, this reported reduction in cost would not be offset by an increase in profit because of a lower gasoline price. Blenders' financial reports would no longer report RIN revenue; however, profits would not go down because the lower cost of gasoline would exactly offset the lower revenue. In this E10 world, changing the point of obligation from refiners to blenders would have no impact on profits of either.

Impact in the Beyond-E10 World

As discussed above, the simple E10 world does not account for the fact that high RIN prices are caused by blending targets that can be met only if consumers substitute ethanol for gasoline. The impact of moving the point of obligation considering this substitution is a bit more complicated. To analyze this more realistic situation we again use a blending obligation of 10.5%.

The RIN obligation from producing 1,000 gallons of E10 with a 10.5% blending rate is 105 RINs. The blender can acquire 100 RINs by buying the 100 gallons of ethanol needed to produce 1,000 gallons of E10 and then separating the RINs. The other 5 RINs can be obtained by either buying them in the RIN market or by buying more ethanol and selling it as E85. The cost to the blender of buying the 5 RINs in the RIN market is $5 with our $1.00

RIN price. Blenders will choose to buy ethanol and produce E85 if that costs less than buying the RINs.[9]

The per-RIN cost to the blender of generating RINs to meet the RFS obligation is given by the difference between the price of ethanol and its blending value or the market price of RINs, whichever is less. After arbitrage profits are eliminated the two costs will be the same. Thus, we can conclude that the blender must pay a RIN tax of 11.68 cents per gallon on each gallon of gasoline sold. This cost is either a cash cost of buying the RINs in the RIN market or an opportunity cost of not selling the 5 RINs and instead buying the ethanol and using it to produce E85. In either circumstance, the blending value of ethanol in E85 with a $1.00 RIN price is 50 cents.

We are now in a position to compare the impact on profits of merchant refiners and blenders if the RFS point of obligation were moved to blenders. First, note that as long as the blending obligation is 10.5% and the beyond-E10 portion of the EPA mandate is met with E85, then the quantity of E10 and E85 produced by blenders and purchased by consumers does not change with a change in the point of obligation. This means that consumers pay exactly the same price for E10 and E85 even with a change in the point of obligation. Because consumers pay the same price it must be the case that the cost to competitive blenders of producing both fuels remains the same.

Example 4: Blender Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, 10.5% biofuel mandate, and substitution of ethanol for gasoline.

Blender Costs:		**Merchant Refiner RIN Costs:**	
Gasoline:	$1,374	RIN purchases:	$0.00
RINs:	$1.05	Total:	$0.00
Ethanol:	$0.50		
Total:	$1,529		
Blender Revenue:		**Merchant Refiner Revenue:**	
E10 sales:	$1,529	Gasoline sales:	$1,374
Total:	$1,529	Total:	$1,374

No longer faced with the obligation to pay an 11.68 cent per gallon RIN tax, refiners' gasoline supply curve is not impacted by the RIN tax. Instead, it is the demand for gasoline by blenders that shifts down because they must pay a tax on the gasoline they purchase and because fewer gallons of gasoline are consumed with the higher ethanol mandate. The shift in demand yields the same quantity of gasoline as if the point of obligation was at the refiners. The market price of gasoline drops to $1.5266 per gallon. Thus, moving the point of obligation reduces the RIN tax obligation of refiners but it reduces the per-gallon gasoline price by an amount exactly equal to the RIN tax (i.e., 1.5266 = 1.6434 – 0.1168). Thus, refiners do not benefit from making blenders the obligated party. As discussed above, refiners would benefit if the move in the point of obligation were accompanied by a

[9] To generate a net of five RINs from producing E85 would require the blender to produce 7.48 gallons of E85 by buying 5.24 gallons of ethanol and 2.24 gallons of gasoline. More than five gallons of ethanol are needed because of the RIN obligation created by buying gasoline to make the E85.

drop in the blending obligation from 10.5% to 10%, but simply moving the point of obligation would have no impact on refiners' profits.[10]

With no change in the amount of ethanol that is needed to meet blending obligations, the RIN tax that would be paid by blenders is equal to 11.68 cents per gallon of gasoline. This increased cost is exactly equal to their per-gallon cost savings due to the lower market price they pay for gasoline. Thus, on the gasoline side, the cost of producing blended fuel does not change. On the ethanol side, the blending value of ethanol is determined by how high RIN prices need to be to induce enough E85 consumption to meet EPA targets. Given that these targets remain constant with a change in the point of obligation then RIN prices would not change, so the cost of ethanol plus the cost of RINs does not change by making blenders the obligated party. No change in the cost of producing blended fuel means that there is no net change in the cost of producing these fuels or in the profits of blenders.

Discussion & Conclusions

With competitive markets, changing the point of obligation from refiners to blenders has no impact on profits of either blenders or refiners. Because integrated oil companies are refiners and blenders who compete in both the market for gasoline and the market for blended fuel, their profits are similarly unaffected by who is obligated to acquire RINs. However, given the recent publicity surrounding the RFS, members of Congress, their staff and others who have influence over the direction of the RFS may start to believe repeated assertions that the RIN market is causing large financial damages to refiners. We show that these statements have no economic basis and argue that changing the obligated party under the policy would have no effect on the profitability of refiners or blenders.

However, our conclusions are dependent on the assumption that there exists sufficient competition in the markets for RINs and ethanol to keep blenders from colluding. Blenders who are not obligated under the RFS include major retailers of gasoline. In Iowa, such retailers include QuikTrip, Kum and Go, and Casey's. Holiday blends fuel and sells it in Minnesota. Costco is registered to blend fuel and sell RINs as is Circle K and 7-Eleven. According to an article by Blewitt and Mider, Mr. Ichan argues that these independent retailers and big integrated oil companies are colluding to drive the price of RINs higher. They quote Icahn:[11]

> Speculators and investment banks have partnered with gas-station retailers to gang up on refiners that are stuck buying the credits they can't produce, Icahn said. As a result, the RIN market has become "the mother of all short squeezes" for the independents.

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[10] Some administrative cost savings would accrue to refiners from moving the point of obligation, but the cost increase to blenders would likely be greater than the cost savings because there are more blenders than refiners.

[11] Laura Blewitt and Zachary Mider. "Icahn Calls on EPA to Fix 'Mother of All Short Squeezes'." Bloomberg Markets, August 15, 2016. https://www.bloomberg.com/news/articles/2016-08-15/carl-icahn-calls-on-epa-to-fix-mother-of-all-short-squeezes.

> "They are also making secret deals with the blenders to entice them not to sell to the refineries but rather to sell to them," Icahn said. "These speculators are 'hoarding' the RINs hoping to get much higher prices as the time nears when refineries are obligated to deliver RINs to the EPA."

Clearly our contention that fuel and RIN markets are competitive runs counter to this view. Economists are generally wary of explaining market prices by widespread collusion among companies. First, collusion is illegal, and if companies are caught entering into such agreements they could be subject to large fines and executives could go to jail. Second, it is not conceivable that disparate companies like Costco, Kum and Go, and Casey's have entered into agreements with BP and Holiday to control the market for RINs. Third, because the incentive to cheat on agreements to increase market prices is so high, it is almost impossible for illegal collusion to last, especially when there are many companies participating. It is extremely unlikely that collusion can be maintained in this market given the presence of a large number of buyers and sellers of ethanol and RINs, particularly over long periods. Fourth, if there were collusion in the RIN market, a clear sign would be that some RINs are left to expire. Collusion typically involves limiting supply so as to increase the price. However, the number of RINs generated is proportional to the number gallons of ethanol produced, which are all eventually sold at retail. Thus, collusion in the RIN market alone can only happen if the quantity of RINs is controlled so that some RINs are left to expire to limit their quantity. Otherwise, collusion in the RIN market would have to be tied to the ethanol market as well, which appears even more unlikely. Thus our assumption of competitive markets is much more plausible than assuming collusion is what determines RIN prices.

Some supporters of moving the point of obligation to refiners argue that blenders are closer in the fuel supply chain to consumers so they are better equipped to make sure that EPA blending targets are met. It is instructive to consider whether the argument is in fact true.

When merchant refiners are the obligated party they must buy RINs from blenders who acquire them from purchased ethanol to make blended fuel. The market price of RINs balances the supply of and demand for RINs. As in any commodity market, if a supplier can find a lower-cost way of producing a product, they will benefit because they can sell more of the product at lower cost but at the prevailing market price. In the market for RINs, blenders have an incentive to produce more RINs at a lower cost because they can sell the additional low-cost RINs at the prevailing RIN price and increase their profits.

Recall that RIN prices reflect the difference between the cost of producing ethanol and its value in blended fuel. At current blending mandates, its incremental value in blended fuel is its value in E85. Every blender has a direct financial incentive to increase the blending value in E85 by making it more widely available or through marketing efforts that convince consumers to buy it at a higher price. Those blenders who are successful can profit because they can sell the acquired RINs at a price that reflects a lower blending value than they achieved. It is this financial incentive that EPA is counting on to make sure that blending targets above E10 are achieved.

If the blenders were made the obligated party, they would compare the cost of buying RINs in the RIN market with their own costs of acquiring RINs through blending, which is the difference between the price of ethanol and their own blending value of ethanol. If the market price of RINs is lower than their cost of acquiring RINs through blending, they will choose to buy RINs. If their cost of acquiring RINs through blending is lower because of successful E85 marketing efforts, then they will choose to acquire RINs by producing and selling E85. Note that the financial incentive to blenders of expanding sales of E85 when they are the obligated party is exactly the same as their financial incentive when refiners are the obligated party. Because their financial incentives are identical, so too is the efficiency with which fueling infrastructure will be expanded to facilitate consumption of biofuels.

The primary reason why fueling infrastructure and consumption of ethanol has lagged expectations is uncertainty about the U.S. commitment to RFS blending targets, not the fact that refiners are further upstream in the fuel supply chain. Thus, if EPA is to continue to push forward with its goal of continuing to expand the biofuel blending mandates, it would be better served to send a stable investment signal to the fuels market rather than undertaking actions like moving the point of obligation.

Supplemental Comments by Growth Energy, Archer Daniels Midland, and Biotechnology Innovation Organization on EPA's Proposed Renewable Fuel Standard Program: Standards for 2018 and Biomass-Based Diesel Volume for 2019

Docket # EPA–HQ–OAR–2017-0091

Exhibit 8

ECONOMIC ISSUES ASSOCIATED WITH A CHANGE OF THE RFS POINT OF OBLIGATION

Edgeworth Economics

February 22, 2017

I. Introduction

Over the last two years, a number of companies and industry groups with interests in refining businesses have petitioned EPA to change the rules governing the RFS.[1] The petitioners have asked EPA to designate blenders or position holders as the entities obligated under the regulation, rather than refiners/importers as specified by the current rule.[2] The petitioners have offered a number of justifications for their requests, including various arguments based on economic theory or financial analysis. The primary economics-based arguments of the petitioners and their supporters can be summarized as follows:

- RIN costs represent a financial burden to merchant refiners and a windfall to blenders, and a change in the Point of Obligation would eliminate that discrepancy.[3]
- Shifting the Point of Obligation would improve incentives to invest in biofuel infrastructure and increase blending.[4]
- The current regulatory structure leads to various inefficiencies in the RIN market, which would be reduced by shifting the Point of Obligation.[5]
- Shifting the Point of Obligation would reduce fraud in RIN markets.[6]
- Shifting the Point of Obligation would not increase the regulatory burden due to any change in the number and/or sophistication of the obligated parties, and could reduce such burden.[7]

On November 10, 2016, EPA responded to the petitions with a proposed denial.[8] EPA addressed some of these assertions made by the petitioners in its proposal, but not all of them. Growth Energy has retained Edgeworth Economics to evaluate the economic arguments put forward by the petitioners as well as EPA's responses in the proposed denial, and to provide independent opinions regarding the economic issues raised by all the parties.[9] This report is provided as an adjunct to comments introduced into the public record by Growth Energy.

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[1] See, for example, Letter to EPA re: Petition for Rulemaking, submitted by Valero Energy Corporation, June 13, 2016 ("Valero Petition"); Letter to EPA re: Petition for Rulemaking, submitted by HollyFrontier, September 2, 2016 ("HollyFrontier Petition"); and Letter to EPA re: Petition for Rulemaking, submitted by American Fuel & Petrochemical Manufacturers, August 4, 2016 ("AFPM Petition").
[2] "Notice of Opportunity to Comment on Proposed Denial of Petitions for Rulemaking to Change the RFS Point of Obligation," *Federal Register*, v. 81, n. 225, November 22, 2016, pp. 83776-777. The various petitioners have proposed somewhat different definitions for the proposed obligated parties. In this report, we refer to those proposed to be obligated entities as "blenders."
[3] Valero Petition, pp. 13-18; HollyFrontier Petition, pp. 3-4 and AFPM Petition, pp. 12-16.
[4] Valero Petition, pp. 19-23; and HollyFrontier Petition, p. 4.
[5] Valero Petition, pp. 23-27; and AFPM Petition, p. 17.
[6] Valero Petition, pp. 23-27.
[7] Valero Petition, pp. 35-37; and AFPM Petition, pp. 17-18.
[8] EPA, "Proposed Denial of Petitions for Rulemaking to Change the RFS Point of Obligation," EPA-420-D-16-004, November 10, 2016 ("EPA Proposed Denial").
[9] Edgeworth Economics is an independent consultancy of professional economists, specializing in microeconomic and statistical analysis. The preparation of this report was directed by Jesse David, Ph.D. See https://edgewortheconomics.com/about-us.

II. RINs – Neither a Windfall nor an Out-of-Pocket Cost

A primary argument put forward by the petitioners for shifting the RFS Point of Obligation is that the current structure creates "disparities in RIN-access that highly prejudices merchant refiners" and "windfalls for others" (namely, non-integrated blenders).[10] Other parties, including some financial analysts as well as individuals with interests in merchant refineries, have made similar arguments. For example, in a November 2016 letter to OMB, Carl Icahn (majority owner of CVR Refining) stated that merchant refiners "incur a cost that the others do not have – the price of purchasing a RIN," while "blenders and 'Big Oil' players reap a windfall because they can blend without a compliance obligation."[11] Essentially, these parties argue that any company with a net position in RINs—whether it be a long position for a blender with relatively little refining or importing operations, or a short position for a refiner with relatively little presence at the rack—experiences a one-for-one impact from RIN trades on the company's bottom-line profitability. That is, RIN purchases represent a cost with no offsetting benefit, while RIN sales generate revenue with no offsetting cost. The petitioners argue that such a situation unfairly disadvantages merchant refiners, relative to integrated refiners, since merchant refiners generally purchase separated RINs to meet their RFS obligations, while integrated refiners purchase ethanol with RINs attached.

As this argument has been perhaps the leading reason for a change in the regulation put forth by the petitioners and their supporters, EPA addressed these claims directly and at length in its proposed denial. EPA concluded that RIN transactions do not represent windfall gains to non-integrated blenders and integrated refiners, nor do they represent discriminatory costs to merchant refiners. The Agency's responses are all on point, namely:

- Non-integrated blenders and integrated refiners *do* incur a cost to acquire RINs, notwithstanding the fact that the cost does not show up in their financial statements as a discrete line item. Rather, the cost of RIN acquisition for blenders is integrated in their cost to acquire ethanol—ethanol with RINs attached costs more than ethanol without RINs.[12] EPA also points out that integrated refiners experience a cost associated with RINs when they sell blended E10, as the wholesale price for E10 is less than the combined prices of the component fuels—petroleum blendstock plus ethanol.[13]
- Because prices of gasoline blendstocks sold at wholesale reflect RIN values, merchant refiners recoup their costs to acquire RINs when they sell their gasoline products.[14] This conclusion has been confirmed by EPA as well as independent researchers in academia. For example, economists at Iowa State University recently concluded that, conditional on the presence of competition in the markets for blendstocks, gasoline, and RINs (a caveat we address further, below), "moving the point of obligation would have little-to-no impact on the distribution of gains and losses from high RIN prices or on the overall effectiveness of the program."[15] In another recent paper, which Valero cites repeatedly for other purposes, a group of academics performed a

[10] Valero Petition, p. 13. See also, HollyFrontier Petition, p. 4; and AFPM Petition, p. 10.
[11] Letter from Carl Icahn to Shaun Donovan, Director of the Office of Management and Budget, November 3, 2016 ("November 2016 Icahn Letter"), p. 3. Of course, "'Big Oil' players"—i.e., vertically-integrated refiners with retail operations—*do* face a compliance obligation under the current RFS structure. Mr. Icahn's point appears to be completely misplaced with respect to these entities.
[12] EPA Proposed Denial, p. 17.
[13] EPA Proposed Denial, p. 18.
[14] EPA Proposed Denial, pp. 17-19.
[15] Bruce A. Babcock, Gabriel E. Lade, and Sébastien Pouliot, "Impact on Merchant Refiners and Blenders from Changing the RFS Point of Obligation," CARD Policy Brief 16-PB 20, December 2016, p. 9. See also, Dallas Burkholder, "A Preliminary Assessment of RIN Market Dynamics, RIN Prices, and Their Effects," EPA, May 14, 2015.

statistical analysis of fuels prices and concluded that "an obligated party with a net RIN obligation, such as a merchant refiner, is able to recoup their RIN costs on average through the prices they receive in the wholesale market."[16]

- The anecdotal evidence cited by the petitioners from financial filings of merchant refiners and retailers is flawed.[17] EPA addressed the fact that some publicly traded blenders report line items in their financials for RIN revenues, but nothing for RIN costs, while some merchant refiners show costs for RIN acquisition, but no specific reporting for offsetting revenues. EPA noted that the offsetting effects show up in other financial categories, and therefore the RIN acquisition costs (for merchant refiners) or RIN revenues (for non-integrated blenders) do not represent a net impact on bottom lines of those companies. In fact, public statements by executives at both types of companies contradict the petitioners' positions. For example, Valero cites a news article in its petition as support for a claim of "windfalls" and the "clear disparity among obligated parties"; yet, in that same article, an executive from Valero is quoted as saying that "much or all" of Valero's cost of RIN acquisition was "passed on to consumers."[18] Similarly, despite the fact that retailers such as Murphy USA have reported revenues associated with RIN sales as a distinct line item in their financial statements, they also have indicated that their bottom-line profitability has been consistent across years with both low and high RIN prices.[19]

Notably, although this argument about discriminatory impacts was one of the lead reasons cited by Valero in support of its petition, Valero's economists at the independent consulting firm, NERA, provide no support for it in their recent paper, submitted with Valero's petition.[20] In the section of NERA's report titled "Excess Burdens on Refiners that Do Not Blend," the authors devote two sentences to the topic, citing only "uncertainty of future RVOs and the price volatility of RINs," "transaction costs," and "portfolio management costs."[21] NERA makes no attempt to quantify such costs, and provides no analysis on the issue of RIN acquisition costs at all. This is in contrast to the estimates of tens or hundreds of millions of dollars in annual costs/windfalls purportedly identified by the petitioners.[22]

However, in a 2013 paper by NERA submitted to the EPA in support of an earlier petition by another merchant refiner (Monroe Energy), NERA did make claims that high RIN prices would adversely affect the profitability of merchant refiners.[23] According to NERA in that earlier paper, as of 2013, "merchant refiners

[16] Christopher R. Knittel, Ben S. Meiselman, and James H. Stock, "The Pass-Through of RIN Prices to Wholesale and Retail Fuels under the Renewable Fuel Standard," National Bureau of Economic Research working paper No. 21343, July 2015, p. 20. Valero cites Knittel, et al. (2015) at length in its petition to support its argument that "the RFS is not functioning properly." [Valero Petition, pp. 12, 18, and 19] However, the conclusions of this paper regarding a lack of full RIN pass-through to consumers relate only to retail markets for E85, which represents only a fraction of one percent of total fuel sales in the U.S. Knittel, et al. make clear that their findings for E10 do not support the petitioners' allegations.
[17] EPA Proposed Denial, pp. 18-20.
[18] Valero Petition, p. 14, citing Cezary Podkul, "The Tally Is in: Ethanol 'Blend Wall' Cost Refiners at Least $1.35 Billion," *Business News*, March 31, 2014.
[19] EPA Proposed Denial, p. 20, citing financial statements of Murphy USA, Inc. and Casey's General Stores, Inc.
[20] NERA Economic Consulting, "Effects of Moving the Compliance Obligation under RFS2 to Suppliers of Finished Products," prepared for Valero Corporation, July 27, 2015.
[21] NERA (2015), pp. 20-21. NERA does assert that the presence of a bid-ask spread and the requirement to pay commissions when trading in the market for RINs puts merchant refiners at a "strategic disadvantage" to integrated refiners (p. 33). Such costs represent impacts that would be at least an order of magnitude less significant than the costs cited by the petitioners. Moreover, shifting the Point of Obligation would not eliminate such costs—it would merely shift them to other parties.
[22] See, for example, Valero Petition, pp. 14-16; November 2016 Icahn Letter; and "The Winners and the Losers," available at CVR Energy website, http://fixtherfs.org/wp-content/uploads/2016/10/Winners-and-Losers-Absolute-RIN-Purchases-2.pdf.
[23] NERA Economic Consulting, "Analysis of RFS2 RIN Markets," prepared for Monroe Energy LLC, October 15, 2013.

are currently absorbing the higher cost of RINs and therefore are losing money"[24] and, as a result, "over time, some merchant refiners will have to exit the market."[25] In support of these claims, NERA cited financial metrics for various merchant refiners, including the "cash operating margin" for certain refineries and asserted that: "The average 8 ¼ cent reduction in the margin due to the RIN requirement in 2013 would more than wipe out this margin. It would more than wipe out the margin in many prior years as well."[26]

In its 2013 report, NERA calculated another financial metric—"net income per gallon of crude capacity"—for nine merchant refiners. This metric showed a range between 1 cent and 25 cents as of 2011/2012, a period when RIN prices were close to zero. Citing escalating RIN prices in mid-2013, NERA stated that "[p]aying the average RIN price in 2013 for every gasoline gallon produced will substantially impact the profitability and viability of refiners."[27] NERA concluded:

> The most likely outcome of continuing a regulatory system that systematically raises the cash operating costs of merchant refiners relative to Integrated Refiner/Blenders is that *the structure of the industry will change and merchant refiners could disappear*.[28]

Valero cites this prediction—now over three years old—in its petition, but none of the petitioners or their economists perform any analysis to check its validity. In fact, NERA's 2013 report offered a specific test for measuring the impact of RIN costs on merchant refiners: Over the last three years, as RIN prices escalated significantly above 2012 levels, did the profitability of merchant refiners decline and did any of those entities actually "disappear"? Table 1 shows the financial metric identified by NERA for the same group of merchant refiners analyzed in the 2013 report, with new data for 2013-2015. As seen here, none of these refiners "disappeared" after 2012, despite the dramatic increase in RIN prices. Moreover, while average profitability did fall somewhat in 2013 across the industry as a whole[29], in 2014 it increased back to essentially the same level as 2012 and in 2015 profitability continued to increase above 2012 levels. In fact, Valero, the largest refiner in the group, reported profitability in 2015 at a level more than two times that in 2012. Although this analysis cannot rule out any impact of the RFS on the profitability of merchant refiners, since many other factors also influence their businesses, it is clear that the supposedly devastating impacts predicted by the petitioners and their economists failed to materialize.

[24] NERA (2013), p. 36.
[25] NERA (2013), p. 41.
[26] NERA (2013), p. 43-44.
[27] NERA (2013), p. 43-44.
[28] NERA (2013), p. 45 (emphasis in original).
[29] In their public filings, merchant refiners reported factors such as decreasing spreads in the crude oil market and increasing refinery capacity as the reasons for this trend from 2012 to 2013. See, for example, HollyFrontier Corp., 2013 Form 10-K, p. 34; Phillips 66, 2013 Form 10-K, p. 31; and Marathon Petroleum Corp., 2013 Form 10-K, p. 44.

Table 1
Net Income per Barrel Crude Capacity for Merchant Refiners
2011-2015

Refiner	*Net Income per Barrel Crude Capacity (cents per gallon)* 2011	2012	2013	2014	2015
HollyFrontier	19.6	25.4	10.8	7.7	13.0
Marathon	13.1	18.5	8.0	9.6	11.8
Phillips 66	13.2	12.0	10.8	14.3	12.4
Western Refining	5.7	17.2	11.8	20.6	15.8
Tesoro	5.4	7.2	3.2	6.7	12.9
PBF Energy	2.9	0.0	0.5	4.5	3.6
Valero	5.2	4.9	6.3	9.9	12.1
Delek	7.4	12.7	5.5	11.6	0.7
Alon USA	1.2	2.1	0.7	1.2	1.6
Average (weighted by annual throughput)	9.5	10.5	7.5	10.4	11.5
	D6 RIN Price – Average of Daily Values (cents per gallon)				
	2.6	2.9	59.9	48.6	55.0

Sources: HollyFrontier Investor Presentation, August 2016, p. 27 (available at investor.hollyfrontier.com/events.cfm); company annual reports; and OPIS.

One might ask, why have the adverse impacts on merchant refiners predicted by Valero's economists failed to appear? There are two general explanations. First, as documented above, changes in RIN prices do not represent a one-for-one impacts on refiner profitability and may, in fact, have no impact at all, due to offsetting movements in fuel prices. Second, refiners may have mitigated any residual impact through adjustments to their supply chains and downstream sales arrangements. For example, expertise in blending can be acquired, and merchant refiners can purchase ethanol directly. If physical acquisitions are costly or difficult, contractual arrangements can be used. In the proposed denial, EPA properly identified all of these possibilities as potential compliance options for obligated parties under the existing regulatory structure.[30]

III. Incentives to Invest in Biofuel Infrastructure and Increase Blending

Another purported benefit that the petitioners have cited as justification for shifting the Point of Obligation is the potential to improve the incentives to blend ethanol and other biofuels.[31] The petitioners' position on this issue is relatively straightforward. They state that the current regulatory structure "discourages blending higher volumes of renewable fuel" because some of the parties that actually undertake blending are not themselves obligated and therefore have "little incentive to make the necessary level of investment" in blending infrastructure.[32] The petitioners also state that the current structure "subsidiz[es] exports" to the detriment of U.S. consumers.[33]

The RFS's mechanism for signaling an incentive to increase blending is the RIN price. This price provides a consistent incentive to generate new RINs, whether realized as revenue when a blender sells a

[30] EPA Proposed Denial, pp. 24-25.
[31] Valero Petition, pp. 12-13 and 18-23; and HollyFrontier Petition, p. 4.
[32] Valero Petition, p. 21; and NERA (2015), p. 32.
[33] Valero Petition, p. 27; and NERA (2015), p. 22.

separated RIN or as a cost when a refiner acquires a RIN to meet its obligation. Thus, the petitioners' argument in essence relies on a critical assumption: The generation of RINs and/or the transfer of RINs from RIN-generators to obligated parties (to the extent those parties are different) is not functioning in a competitive manner. For example, HollyFrontier states in its petition that "by limiting renewable fuel blending, rack sellers can increase RIN prices and maximize profit."[34] Similarly, Valero states that expanding blending infrastructure "would be contrary to the blenders' financial interest, as the more renewable fuel the blender purchases and blends, the more RINs will be created and those excess RINs will decrease the value of RINs."[35] The problem with this strategy for a blender, however, is the same problem facing a supplier in any market with multiple suppliers—it works only if other blenders follow the same strategy. If one blender stockpiles RINs or reduces blending in order to drive up the price of RINs, there would be an incentive for other blenders to increase their generation of RINs in response. Such a response could be avoided only by collusion among blenders. The petitioners, however, have provided no evidence of any such anticompetitive activity.

The petitioners also make the general, theoretical point that the distance in the supply-chain between blenders who separate RINs and obligated parties (refiners) attenuates the incentive presented by the RIN price. Valero's economists at NERA offer two versions of this argument. Their more simplistic version is a plain assertion that "blenders and retailers have little incentive to make the necessary level of investment because under RFS2 they do not have any obligation to blend fuels with higher concentrations of renewable fuels."[36] This assertion is false. Blenders and retailers have the same incentive to expand the use of renewable fuels as any other party in the supply-chain—the value of the generated RINs. Since RINs can be sold on an open market, realizing that value is not contingent on having a legal obligation under the regulation.[37] To the extent that the market price for RINs exceeds the cost of blending additional renewable fuel, that differential represents a potential source of profit for obligated and non-obligated blenders alike.

NERA's second argument is at least rooted in economic theory. NERA notes that, in general, it can be more effective to place the burden of a regulation on the parties located closest to the consumer decision point that drives the ultimate level of compliance. NERA states that the current policy is "blunt" due to the "separation between the party needing RINs and the party producing the RINs" and that shifting the point of obligation could "improve the efficiency of the regulation."[38] However, as demonstrated across a wide range of economic research on the theory and practice of environmental regulation, this effect will not be significant in a market with low elasticity of demand, such as gasoline, unless there exist other major frictions, such as high transactions costs or lack of competition.[39] As stated in a recent paper on greenhouse gas emissions trading: "As long as conditions are competitive and prices pass efficiently through the chain, the point of regulation does not affect the incentive or ability of any party to mitigate."[40]

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[34] HollyFrontier Petition, p. 4.
[35] Valero Petition, pp. 21-22, citing NERA (2015), pp. 18-19.
[36] NERA (2015), p. 32.
[37] As noted by EPA, the petitioners' argument here is in direct contradiction with their other argument that the current regulatory structure leads to "windfall" profits from RIN revenues for non-integrated blenders. If generating RINs as a non-obligated party resulted in "windfall" profits, that obviously would represent a significant incentive to expand blending of renewable fuels.
[38] NERA (2015), p. 33.
[39] See, for example, Gabriel E. Lade and James Bushnell, "Fuel Subsidy Pass-Through and Market Structure: Evidence from the Renewable Fuel Standard," Center for Agricultural and Rural Development, Iowa State University, Working Paper 16-WP 570, December 2016, p. 1.
[40] Suzi Kerr and Vicki Duscha, "Going to the Source: Using an Upstream Point of Regulation for Energy in a National Chinese Emissions Trading System," Motu Economic and Public Policy Research, Working Paper 14-09, September 2014. See also, for example, Carolyn Fischer, et al., "Using Emissions Trading to Regulate U.S. Greenhouse Gas Emissions: An Overview of Policy

In this case, as described above, economists have demonstrated that the markets for the components of gasoline, including petroleum blendstocks and ethanol, operate competitively and efficiently, with the value of RINs reflected in the wholesale prices of fuel components at all points in the supply chain. Moreover, as pointed out by EPA, export prices have adjusted such that refiners now earn higher prices on domestic supply, which offsets the difference in RFS obligations for exported volumes relative to domestically-consumed volumes.[41]

The case of E85 does represent somewhat of an anomaly in this respect, and the petitioners rely heavily on conditions in the retail marketplace for E85 to support their broader arguments. For example, Valero cites a paper published in June 2015 which found, in contrast to the market for E10, "a near absence of pass-through of RIN prices to retail E85 prices."[42] There are several problems, however, with relying on this finding as a basis for changing the Point of Obligation. First, as pointed out by EPA in the proposed denial, evidence indicates that *wholesale* markets for E85 are operating efficiently.[43] The problem of a lack of pass-through is confined to the *retail* marketplace, which would be unaffected by a change in the Point of Obligation. Specifically, to the extent that retail markets for E85 are failing to pass on RIN value to consumers, that is a consequence of the competitive conditions in the market for gasoline retailing, not the markets for RINs or fuel components. As EPA points out, the historic lack of competitive pricing for E85 at the retail level has been due to the fact that, even with full pass-through, RIN prices have been insufficient to bring E85 prices down to parity (energy adjusted) with E10.[44] As a result, the number of stations offering E85 has remained low, and consumers who have purchased the fuel generally are not price sensitive. These conditions are not conducive to competition at the retail level. They are, however, unrelated to the Point of Obligation, but rather are related to general RIN price levels and the uncertainty of future levels, due to the decisions of EPA and conditions in fuels markets. As noted by Babcock, et al. (2016), the solution to this problem is greater certainty on future renewable fuel volume obligations (RVOs), not a brand-new change in the regulatory structure.[45]

Valero's reliance on conditions in the retail market for E85 as a basis for changing the Point of Obligation is flawed for additional reasons. As pointed out by EPA, gasoline stations that have relationships with the obligated refiners are *less* likely to offer E85 for sale than independent stations or stations owned by non-obligated blenders.[46] This empirical finding contradicts the petitioners' claims that parties without an obligation under the RFS have no incentive to increase blending of renewable fuels and that shifting the Point of Obligation to blenders would increase E85 penetration.

More recent research has found that pass-through in even retail E85 markets may be improving, perhaps due to the more sustained, elevated levels of RIN prices during the last few years. A paper published in December 2016 by researchers at the University of California at Davis and Iowa State University concluded that "pass-through of the ethanol subsidy [i.e., RINs] is, on average, complete," although "full pass-through takes four to six weeks and that local market structure of gasoline stations influences both the speed and

Design and Implementation Issues," Resources for the Future, Discussion Paper 98-40, July 1998, p. 3; and Tim Hargrave, "US Carbon Emissions Trading: Description of an Upstream Approach," Center for Clean Air Policy, March 1998.

41 EPA Proposed Denial, pp. 21-22.

42 Valero Petition, p. 18, citing Knittel, et al. (2015), p. 20.

43 EPA Proposed Denial, pp. 30-31.

44 EPA Proposed Denial, p. 30. See also, Babcock, et al. (2016).

45 Babcock, et al. (2016), p. 14.

46 EPA Proposed Denial, pp. 34-36.

overall level of pass-through."[47] Thus, the problems with the retail markets for E85 appear to be dissipating.

IV. Purported Inefficiencies and "Speculation" in the RIN Market

The petitioners have identified various purported conditions in the trading market for RINs—such as high volatility, a lack of liquidity, a lack of market efficiency, and high transactions costs—as justification for shifting the Point of Obligation to blenders. For example, in its petition, Valero cites "high levels of speculation," "price volatility," and "artificially high values."[48] Valero's economists similarly cite "high volatility," a "thin market," and a "larger bid-ask spread" as problems with the market for RINs.[49] Other commenters have cited the simply the current level of RIN prices—compared to past levels—as evidence of market manipulation. For example, the CEO of CVR Refining recently asserted that "exempt parties" and "speculators" were "driv[ing] prices to confiscatory levels" and that the "market may be cornered."[50] None of the petitioners, however, provide any analysis or cite any data to support their allegations about conditions in the RIN market, nor do they offer any evidence to support their claim that shifting the Point of Obligation would improve those conditions.

In fact, there is little empirical evidence of any of these problems in the market for RINs, particularly D6 RINs which are the focus of the petitioners' arguments. Key characteristics of any trading market include *efficiency* (the degree and rapidity with which prices reflect new information) and *liquidity* (the extent to which a market allows large quantities of trades at stable prices).[51] These characteristics depend on factors such as the number of traders, the volume of trades, and any differences in information available to the various market participants. Evidence for RINs, however, shows that the marketplace is generally functioning well along these dimensions. For example, economists at Iowa State University recently published a paper in which they pointed out that collusion to restrict the availability of RINs would lead to a situation in which at least some of those RINs were left to expire; yet, that has not happened.[52] The authors also noted the difficulty in maintaining collusion to restrict supply in the face of potential punishment as well as cheating within the conspiracy. They concluded: "[O]ur assumption of competitive markets is much more plausible than assuming collusion is what determines RIN prices."[53]

Other recent research has confirmed the fact that movements in RIN prices reflect changes in the fundamental, underlying characteristics of fuels markets, combined with EPA's stance on the RVOs. For example, research by economists at the University of Illinois demonstrates that recent volatility in D6 RIN prices can be tied directly to conditions in the markets for soybeans and biodiesel:[54]

> The key takeaway point from this review of RINs prices is that if you want to understand the movement of ethanol RINs prices, which garner most of the headlines, then you have to first understand the movement of biodiesel RINs prices.

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[47] Lade and Bushnell (2016), Abstract.
[48] Valero Petition, p. 25-26.
[49] NERA (2015), p. 34.
[50] "CVR Refining Reports 2016 Second Quarter Results," CVR Refining press release, July 28, 2016.
[51] See, for example, Financial Sector Assessment: A Handbook, The World Bank and The International Monetary Fund, 2005, pp. 18-20, available at http://www.imf.org/external/pubs/ft/fsa/eng.
[52] Babcock, et al. (2016).
[53] Babcock, et al. (2016), p. 13.
[54] Scott Irwin, "What's Up with RINs Prices," *farmdoc daily*, v. 6, n. 188, October 5, 2016. See also, Scott Irwin, "Clues from the RINs Market about the EPA's RVO Proposals for 2014, 2015, and 2016," *farmdoc daily*, v. 5, n. 98, May 28, 2015.

and

> A review of the relevant data shows that the increase in RINs prices seen in 2016 is likely due to the looming expiration of the $1 per gallon biodiesel tax credit at the end of the year. Uncertainty about extension of the blenders credit increases the odds that blending losses will be larger in future years, which shows up as an increase in the time value of the RINs "option." This component of RINs prices in 2016 is either similar to or smaller than what was observed in previous years when the tax credit also was scheduled to expire. So, while one cannot say with certainty that the RINs market has not been manipulated, there is a logical economic explanation for the credit price increases seen this year.

Additional evidence for the efficiency and liquidity of the market for RINs can be found in trading information collected by brokers and data aggregators. Three examples of reports from these sources are attached as Appendix A. As shown in these reports (and confirmed in discussions with various market participants), bid-ask spreads—a typical measure of both the efficiency and liquidity of a trading market[55]—for RINs have been low. Published estimates are generally in the range of 0.5-2 cents, and estimates by market participants fall in the range of one-quarter to one-half a cent during most trading periods, with slight expansions during times of high volatility (for example, surrounding an EPA announcement regarding RVOs). These reports also show that intra-day trading ranges tend to remain very tight, with even large trades causing little movement in prices—additional indicators of an efficient and liquid market.

In general, to the extent that "speculation" does occur (i.e., participation in the RIN market by parties for purposes other than disposing of excess RINs or acquiring RINs for retirement), such practices are entirely legal and can be undertaken by any party, including the petitioners. The petitioners offer no evidence that such activity has caused RIN prices to get out of line from fundamentals for any extended period. Even more relevant to the present discussion, however, is the fact that the petitioners offer no evidence that shifting the Point of Obligation would affect any market inefficiencies due to trading practices or other reasons, to the extent that such problems do exist at all.

In its 2015 paper, NERA asserts that the market for RINs has become "increasingly thin," and that shifting the Point of Obligation would reduce the number of required transactions and "tighten the bid-ask spread."[56] NERA provides no data or even anecdotal evidence supporting any of these claims. In fact, a reduction in the number of a transactions in the marketplace, which Valero and NERA advocate for, would represent, by definition, a shift to a *less* liquid—i.e., "thinner"—market.[57] Reducing the number of transactions would be expected to reduce the extent of price discovery, leading to *higher* bid-ask spreads and a *greater* likelihood that a single entity or a group of colluding parties could manipulate the market.

V. Ability to Monitor Counterparties and Reduce Fraud

Petitioners have identified the potential for fraud in the market for RINs as a reason to shift the Point of Obligation to blenders.[58] In a recent report prepared for Valero and now available on a CVR Refining website, Doug Parker, former Director of EPA's Criminal Investigation Division, identified cases with "documented fraud loss" related to counterfeit RINs.[59] Mr. Parker asserts that these incidents occurred

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[55] See, for example, The World Bank and The International Monetary Fund (2005), pp. 19-20.
[56] NERA (2015), p. 34.
[57] The World Bank and The International Monetary Fund (2005), p. 20.
[58] Valero Petition, pp. 23-27.
[59] Doug Parker, "White Paper Addressing Fraud in the Renewable Fuels Market and Regulatory Approaches to Reducing this Risk in the Future," September 4, 2016, available at CVR Refining website, http://fixtherfs.org/supporting-information.

because the obligated parties "simply do not have the investigative expertise or the leverage to conduct such oversight based on where they sit in the production chain."[60]

These allegations, however, provide little support for the argument to shift the Point of Obligation, for a variety of reasons. First, the documented instances of fraud represent a tiny fraction of the total volume of RIN transactions. Mr. Parker cites a figure of $271 million in "documented fraud loss."[61] However, from 2010 through 2014, more than 200 billion RINs changed hands, as documented by EPA's EMTS system.[62] Mr. Parker's estimate represents less than one half of 1 percent of the value of those transactions.[63]

Equally as important, however, is that not a single one of these instances has related to D6 (conventional ethanol) RINs, which are the focus of the petitioners' arguments. Every one of the eight examples cited by Mr. Parker relate to biodiesel.[64] In its petition, Valero cites a single news article on the subject, which refers to one of those instances.[65] In contrast, the parties that participate in the market for conventional ethanol RINs are generally much better known to one another, since they are primarily large ethanol producers, retailers, oil refiners, and other established parties. Such parties have less incentive to engage in fraudulent behavior, since they repeatedly interact with one another in the market for RINs and have significant assets at stake if fraudulent behavior were to be detected and prosecuted.

Moreover, to the extent any such fraud exists, or even the potential for such fraud, the petitioners have provided no analysis to support the argument that shifting the Point of Obligation from refiners to blenders would reduce it. As noted above, Mr. Parker asserts that the refiners do not have "the investigative expertise or the leverage" to conduct oversight into their counterparties in the RIN market.[66] However, it is unclear that blenders, to the extent that they are different from the refiners, would have any greater resources or knowledge to perform such activities. To the contrary, non-integrated blenders are generally smaller and less sophisticated than the refiners, and therefore are likely to have *less* expertise and resources to dedicate to this issue. Moreover, to the extent that the current obligated parties have developed expertise to deal with counterparty risk, that expertise would be lost if the responsibility was shifted to a new set of entities, whatever their level of sophistication or the resources available to them.

In its petition, Valero notes that many parties who trade in the RIN markets are neither generators of RINs nor obligated parties; they include, for example, investment banks.[67] To date, however, none the parties that have been accused of actual fraud—as opposed to legal "speculation"—have been in this category; rather, they all have been producers (or purported producers) of biodiesel. Any policy that might reduce the participation of parties without a direct stake in the regulation would have had no impact on the actual cases of fraud documented to date.

As noted above, Valero also asserts in its petition that that shifting the Point of Obligation to blenders would reduce the number of transactions in the RIN market, since the entities creating the RINs often would be the obligated parties themselves. Valero asserts that this would reduce the potential for fraud and cause

[60] Parker (2016), p. 5.
[61] Parker (2016), p. 7.
[62] EPA EMTS website, https://www.epa.gov/fuels-registration-reporting-and-compliance-help/annual-rin-salesholdings-summary
[63] Based on total transactions each year multiplied by the average of daily RIN prices within the year. [EPA EMTS website, https://www.epa.gov/fuels-registration-reporting-and-compliance-help/annual-rin-salesholdings-summary; and OPIS]
[64] Parker (2016), pp. 8-10. All of the enforcement actions brought by EPA to date have related to biodiesel RINs. [EPA website, https://www.epa.gov/enforcement/civil-enforcement-renewable-fuel-standard-program#ngl]
[65] Valero Petition, pp. 25-26, citing Bryan Sims, "Biodiesel RIN fraud causes industry, obligated parties anxiety," *Biodiesel Magazine*, November 29, 2011.
[66] Parker (2016), p. 5.
[67] Valero Petition, pp. 24-25.

RIN prices to "stabilize."[68] Valero appears to be conflating the counterfeiting of RINs with the entirely legal activity of speculation in RIN markets by parties that may or may not have substantial interests in blending or refining operations. We address the questions about speculation, above. With regard to actual fraud, however, there is no evidence that reducing the number of transactions would reduce the incentive to generate fraudulent RINs. That incentive relates primarily to the value of RINs in relation to the penalties for being caught and prosecuted. As we discuss above, the value of RINs is determined in the marketplace based on fundamental features of fuels markets (supply and demand) interacting with the market participants' views regarding EPA's statements and promulgations related to the RVOs. Changing the Point of Obligation would have no impact on those factors. Moreover, as EPA notes in its proposed denial, shifting the Point of Obligation to blenders would make it more difficult for EPA to detect and prosecute non-compliance and fraud by obligated parties.[69] The petitioners' proposed changes in the RFS regulations therefore would, at best, have no impact on the generation of fraudulent RINs, and could make the situation worse.

VI. Regulatory Burden and the Number and Sophistication of Obligated Parties

Finally, the petitioners have asserted that shifting the compliance obligation from refiners/importers to blenders would reduce the overall regulatory burden of the RFS program in terms of the costs of record keeping and reporting to the EPA, or at least not increase that burden, due to a reduction in the number of obligated parties.[70] For example, Valero states:[71]

> No analysis has found that moving the Point of Obligation as Valero suggests would increase the number of obligated parties at all, and certainly not in any significant way. More likely, even with some new obligated parties and others dropping off, the total number of obligated parties would decrease.

and

> Thus, contrary to the 2010 expectation of ballooning numbers [of obligated parties], changing the Point of Obligation to the Rack Seller will not increase the administrative burden.

In support of these claims, Valero attached to its petition two estimates of the number of potential obligated parties under the proposed realignment, based on lists of entities that post prices at the rack and various other sources.[72] Valero identified approximately 100 to 200 entities that it believes would comprise the universe of obligated parties if the Point of Obligation was shifted to blending and noted that these figures were equal to or less than EPA's estimate of 200 current obligated parties.

In its proposed denial, EPA devoted a considerable portion of its analysis to addressing this issue, providing two primary responses.[73] First, EPA disputed Valero's analyses of potential obligated parties and noted that the original intention of the regulatory design—i.e., to minimize the number of obligated parties—remains valid.[74] As EPA stated in the 2010 Final Rule:[75]

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[68] Valero Petition, p. 26.
[69] EPA Proposed Denial, pp. 42-44.
[70] Valero Petition, pp. 35-37.
[71] Valero Petition, p. 36.
[72] Valero Petition, Attachments D and E.
[73] EPA Proposed Denial, pp. 22-24 and 37-42.
[74] EPA Proposed Denial, p. 38, citing the 2010 Final Rule (75 *Federal Register* 14669-904, March 26, 2010), at pp. 14721-722.
[75] 2010 Final Rule (75 *Federal Register* 14669-904, March 26, 2010), at p. 14722.

> When the RFS1 regulations were drafted, the obligations were placed on the relatively small number of refiners and importers rather than on the relatively large number of downstream blenders and terminals in order to minimize the number of regulated parties and keep the program simple.

EPA's own analysis found that the number of entities which take ownership of motor fuel at the point of blending could range from 350 to "over 1,000," according to one approach for identifying such entities, and "over 1,100" based on a second approach.[76] Our understanding of the tasks necessary for compliance is that some of the costs involved for obligated parties are "fixed"—for example, a requirement to hire a single, new regulatory officer. Thus, increasing the number of obligated parties would result in an increase in total costs borne by industry. Moreover, EPA pointed out that its own costs to monitor the regulation also would increase as the number of obligated parties increase, particularly if those new parties are not currently regulated by EPA.[77]

EPA's second response relates to differences between the types of entities that are currently obligated parties and those that would become obligated parties under the petitioners' proposal. EPA pointed out that current obligated parties include primarily large refiners, which have significant resources as well as expertise in regulatory compliance generally, whereas some blenders do not have those characteristics.[78] In addition, EPA noted that, to the extent that current obligated parties who would become non-obligated under the proposal have developed specific expertise to deal with RFS compliance, some of that expertise would be lost (and then duplicated by new obligated parties) if the Point of Obligation were shifted to blenders.[79] Thus, shifting the Point of Obligation would result in additional, unnecessary costs.

A further burden would be introduced if blenders were made the obligated parties due to the increase in the number of transaction points for obligated volumes. In the U.S., there are approximately 10 times as many petroleum product terminals as there are refiners.[80] Thus, a requirement to track fuel volumes purchased by blenders, as proposed by the petitioners, would represent a greater administrative burden than a requirement to track volumes produced by refiners.

VII. Conclusions

In summary, the petitioners have offered a variety of justifications to shift the RFS Point of Obligation from refiners/importers to blenders. In general, the petitioners' arguments that relate to the economic or financial circumstances of the affected parties have been presented without either empirical or theoretical support. A closer examination of those arguments reveals a variety of flaws, some of which already have been addressed by EPA in its proposed denial. Our primary conclusions regarding the petitioners' arguments are as follows:

1) *RIN values represent neither windfalls for blenders nor out-of-pocket costs for refiners*. Notwithstanding the fact that some companies report RIN expenses or RIN revenues as distinct line items in their financial statements, the overall impacts of RIN generation and sales (for non-integrated blenders) and RIN acquisitions (for merchant refiners) are largely or perhaps completely

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[76] EPA Proposed Denial, pp. 40-42.
[77] EPA Proposed Denial, pp. 37-39 and 43-44.
[78] EPA Proposed Denial, pp. 23, 39, and 43-44.
[79] EPA Proposed Denial, p. 23.
[80] The Association for Convenience & Fuel Retailing website, http://www.nacsonline.com/YourBusiness/FuelsReports/2015/StatisticsAndHistoricalContext/Pages/The-US-Petroleum-Industry-Statistics-Definitions.aspx.

offset by countervailing costs or revenues experienced by the companies in their transactions of component fuels. This conclusion has been supported by the findings of multiple academic researchers and is consistent with economic theory. Moreover, an analysis of the margins earned by merchant refiners since RIN prices began to escalate in 2013 demonstrates no adverse impact. The petitioners' argument therefore provides no justification for shifting the Point of Obligation.

2) *Shifting the Point of Obligation would have no impact on the incentives to invest in biofuel infrastructure or increase blending of renewable fuels*. RIN prices already provide a direct incentive for all parties in the supply-chain to promote renewable fuels. The only conditions that could impede this incentive would be anticompetitive activities or a malfunctioning RIN market. Although the petitioners offer various assertions about such conditions, they have provided no evidence to support those claims. The petitioners also cite circumstances in the retail market for E85 which could indicate a lack of pass-through of RIN value to the final consumer. Those conditions, however, relate primarily to the historic and current levels of the RVOs, as well as uncertainty regarding future levels, and would be unaffected by a shift in the Point of Obligation.

3) *RIN markets are, for the most part, operating efficiently and competitively; moreover, a change in the Point of Obligation would have no beneficial impact on those conditions*. The petitioners have made various allegations about RIN markets, including claims of either unilateral or collusive hoarding, high transactions costs, and excess volatility, among others. However, they provide no evidence to support any of their claims. In fact, research by academic economists as well as direct evidence from trading data indicate that RIN markets are functioning as designed, with prices changing in response to fundamentals and trading costs remaining relatively low. To the extent that the petitioners' proposal would reduce the total number of RIN transactions, any inefficiency or illiquidity in the market would only *increase*, not decrease as the petitioners claim.

4) *Changing the Point of Obligation would have no impact on fraud in RIN markets.* The only documented cases of actual fraud in the market for RINs relate to counterfeiting of biodiesel RINs. These instances have represented a relatively small cost compared to the overall value of RIN transactions, and have not affected the market for conventional ethanol RINs at all. To the extent that such fraud does exist, there is no reason to believe that blenders would have greater expertise or resources available to them to police such activities, relative to refiners. Moreover, changing the Point of Obligation would have no impact on the incentive to engage in RIN fraud.

5) *The petitioners' proposal would result in an increase in the number of obligated parties and an increase in the overall administrative burden of the RFS*. EPA's analyses have demonstrated that the current regulatory design is consistent with the original intent to minimize the number of obligated parties and the associated costs of administering the program. Shifting the Point of Obligation to blenders would not provide any improvement and likely would result in an increase in such costs. Moreover, such a shift would require new parties to develop expertise, essentially duplicating costs already expended by the current obligated parties.

Appendix A

Reports from RIN Brokers and Data Aggregators

PLATTS
McGRAW HILL FINANCIAL

BIOFUELSCAN

Volume 4 / Issue 216 / November 3, 2015

PLATTS KEY DAILY ETHANOL ASSESSMENTS

		Low-High	Midpoint	Change
United States (¢/gal) (PBF page 210)				
Ethanol Chicago (terminal)	AALRI00	155.20-155.30	155.25	-1.50
Ethanol swap Chicago (Dec)	ESCM001	152.45-152.55	152.50	-1.00
Brazil Cargo Assessments ($/cu m) (PBF page 220)				
Ethanol FOB Santos Cargo	AAWF000	529.95-530.05	530.00	+0.00
Northwest Europe (€/cu m) (PBF page 1210)				
Ethanol T2 FOB Rotterdam	AAYDT00	641.00-642.00	641.50	-4.00
Asia Pacific ($/cu m) (PBF page 2210)				
Bioethanol CIF Philippines	AAWAA00	527.00-529.00	528.00	-4.00

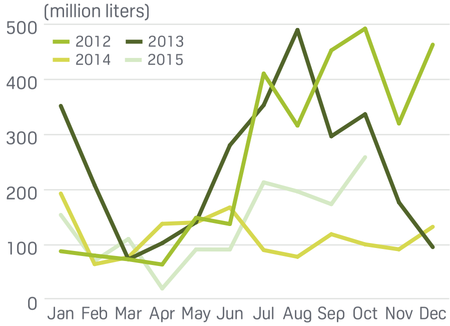
PLATTS KEY DAILY BIODIESEL ASSESSMENTS

		Low-High	Midpoint	Change
Northwest Europe ($/mt) (PBF page 1310)				
FAME 0 (RED) FOB ARA	AAWGI00	796.75-801.75	799.25	+24.75
RME (RED) FOB ARA	AAWGK00	908.75-913.75	911.25	+5.25
Northwest Europe premiums ($/mt) (PBF page 1313)				
FAME 0 (RED) FOB ARA	AAXNT00	328.50-333.50	331.00	+12.50
RME (RED) FOB ARA	AAXNU00	440.50-445.50	443.00	-7.00
United States (¢/gal) (PBF page 310)				
Biodiesel B100 SME Chicago	AAURR00	236.55-236.65	236.60	+6.00
Asia ($/mt) (PBF page 2310)				
Biodiesel FOB Southeast Asia	AAVSV00	599.90-600.10	600.00	-9.00

TUESDAY'S HIGHLIGHTS

- US biodiesel jumps on rising heating oil futures
- Ethanol Europe CEO urges NGOs to support biofuels
- Brazil spot ethanol export discussions muted on record domestic prices
- US Ethanol prices continue to fall despite rebounds in corn and gasoline futures

BRAZIL ETHANOL EXPORTS



Source: SECEX

Achieving volumes in RFS mandate would be difficult: CBO

Washington—Mandating the statutory biofuels volumes in the Renewable Fuel Standard will be difficult to achieve due to the blend wall and potentially cause US diesel prices to rise 25-45 cents/gal and E10 gasoline prices to rise 15-30 cents/gal, the Congressional Budget Office said in a report Tuesday. Repealing the RFS could cause diesel prices to fall 5 cents/gal, with a negligible impact on E10 prices, the CBO said. The findings, presented to two House of Representatives subcommittees, could give added ammunition to lawmakers seeking to repeal or reform the RFS. "Full compliance with the mandates in [the RFS statute] poses significant challenges," Terry Dinan, a senior adviser to the CBO, testified. If the statutory

(continued on page 10)

Argentina cuts biodiesel export taxes, lowers some prices

Buenos Aires—Argentina's Energy Secretariat said Tuesday it has cut biodiesel export taxes and reduced biodiesel prices for large producers, effective retroactively from September 1. On its website, the department said it reduced export taxes to 8.6% in September compared with 9.82% in August. It also reduced the price of biodiesel supplies paid by oil refiners for a 10% blend in diesel to Pesos 5.213/mt ($0.549) for output from large integrated producers. That down 0.25% from Pesos 5.226/mt in August. The price for output from non-integrated large producers was raised 0.34% to Pesos 6.161/mt from Pesos 6.14/mt over the same period. Prices for small and medium-sized producers were raised to Pesos 6.971-7.081/mt compared with Pesos 6.943-7.051/mt in August, the department said. The biodiesel industry has warned that high taxes and low prices are slowing production, as are a slower-than-expected increase in the blend in diesel beyond 10% and restrictions on exporting product to the EU. The Argentine Biofuels and

(continued on page 11)

CONTENTS

ETHANOL MARKET COMMENTARY

United States

Market analysis: (PBF page 299) US ethanol prices continued to fall Tuesday, despite rebounds in underlying CBOT corn and NYMEX RBOB gasoline futures. CBOT December corn futures rose 4 cents to $3.8050/bushel, while November RBOB gasoline futures rose 7.02 cents from Monday to $1.4455/gal. Chicago Argo was assessed at $1.5525/gal, down 1.5 cents from Monday. New York harbor any-November was assessed at $1.6625/gal, down 3.7 cents, while any-December fell to $1.6250/gal from Monday, down 1 cent. Rule 11 ethanol was assessed at $1.5750/gal for this-week delivery, down 2.5 cents. The Houston ethanol assessment fell 5.2 cents to $1.6250/gal. The California ethanol assessments fell to $1.7350/gal for prompt delivery, without receiving either a bid or offer during the Platts Market on Close assessment process. The RIN markets were largely up day on day, as ethanol RINs were assessed at 40.50 cents/RIN ,up 50 points from Monday; advanced RINs were assessed at 49 cents/RIN, down 4.5 cents from Monday; and biodiesel RINs were assessed at 57.5 cents/RIN, up 2 cents from Monday.

US Chicago and NYH ethanol assessment rationale: (PBF page 295) Chicago Argo ethanol was assessed at $1.5525/gal Tuesday. By the 3:15 pm EST (2015 GMT) assessment close, there were eight trades in the Chicago Argo ethanol Platts Market On Close assessment process for November 8-18 delivery. During the MOC process, Koch sold 20,000 barrels to ADM and Shell at $1.5525/gal. Koch then sold 10,000 barrels to Shell at $1.5525/gal. Next, Koch sold 15,000 barrels to Valero at $1.5525/gal. Trading activity concluded when CHS sold 5,000 barrels to Valero at $1.5525/gal. The window concluded with an outstanding bid at $1.55/gal from LDM and an outstanding offer of $1.5550/gal from Koch. New York Harbor ethanol for any-November was assessed at $1.6625/gal, while NYH any-December was assessed at $1.6250/gal. New York Harbor any-November was traded once at $1.6625/gal, when Shell purchased 25,000 barrels from Valero. The New York Harbor any-November window concluded with an outstanding bid of $1.65/gal from ADM and an outstanding offer of $1.6725/gal from Rolmpus. New York Harbor any-December concluded with an outstanding bid of $1.61/gal from Shell without an outstanding offer, but was heard at a bid/ask range of $1.62-$1.63/gal prior to the MOC process.

The above commentary applies to the following market data codes: AALRI00, AAMPF00.

RIN assessment rationale: (PBF page 195) Ethanol (D6) RINs for 2015 were assessed Tuesday at 40.5 cents/RIN, between the outstanding bid-ask range of 40-41 cents/RIN. Ethanol RINs for 2014 were assessed at 40.75 cents/RIN, moving in line with 2015 ethanol RINs. Ethanol RINs for 2016 were assessed at 40.75 cents/RIN, moving in line with 2015 ethanol RINs. Biodiesel (D4) for 2015 were assessed at 57.5 cents/RIN, the last traded level. Biodiesel RINs for 2014 were assessed at 56 cents/RIN, moving in line with 2015 biodiesel RINs. Biodiesel RINs for 2016 were assessed at 65 cents/RIN, moving in line with 2015 biodiesel RINs. Advanced (D5) RINs for 2015 were assessed at 49 cents/RIN, as they were last heard bid at a 4-cent discount to 2015 biodiesel RINs. Advanced RINs for 2014 were assessed at 44 cents/RIN, moving in line with 2015 advanced RINs. Advanced RINs for 2016 were assessed at 53.5 cents/RIN, as they were last heard bid at a 3.5-cent premium to 2015 advanced RINs.

US ETHANOL PRICE ASSESSMENTS

		Low-High	Midpoint	Change
United States (¢/gal) (PBF page 210)				
Ethanol Chicago (terminal)	AALRI00	155.20-155.30	155.25	-1.50
Ethanol Chicago (Rule 11)	AAVWD00	157.45-157.55	157.50	-2.50
Ethanol swap Chicago (Dec)	ESCM001	152.45-152.55	152.50	-1.00
Ethanol swap Chicago (Jan)	ESCM002	150.45-150.55	150.50	-1.60
Ethanol NYH Barge (Nov)	AAMPF00	166.20-166.30	166.25	-3.70
Ethanol NYH Barge (Dec)	AAUEG00	162.45-162.55	162.50	-1.00
Ethanol Houston 5-15 Tank	AATGJ00	162.45-162.55	162.50	-5.20
Southern California Rail Car Assessments (¢/gal) (PBF page 210)				
Ethanol prompt 7-14	AAMNK00	173.45-173.55	173.50	-1.00
Ethanol forward 15-30	AAMNN00	171.45-171.55	171.50	-1.00
Northern California Rail Car Assessments (¢/gal) (PBF page 210)				
Ethanol Prompt 7-14	AAMFT00	173.45-173.55	173.50	-1.00
Ethanol Forward 15-30	AAMFZ00	171.45-171.55	171.50	-1.00

US DRIED DISTILLER GRAINS PRICE ASSESSMENTS ($/st) (PBF page 501)

		Low-High	Midpoint	Change
CIF New Orleans barge	AADDG00	157.95-158.05	158.00	0.00
FOB Chicago truck	ACDDG00	140.45-140.55	140.50	+1.00

The above commentary applies to the following market data codes: RINCY01, RINCY02, BDRCY01, BDRCY02, ABRCY01 and ABRCY02.

DDG market analysis: (PBF page 504) The US DDGS market was dead on arrival Tuesday as trading dropped off. "This is the least I've ever seen DDGS trade," one Midwest source said. That assessment was confirmed by another source: "No one seems to care much out in the marketplace today." The market has been dismal in terms of activity for the last several days. Some sources have argued that mild fall weather has stalled domestic demand as beef herds remain in the pastures and out of feedlots. Other sources have argued that forward concerns from possible Chinese customers are stymieing the market. Either way, everyone agrees that nothing is happening in the market now. Looking ahead, the US Energy Information Administration will release its weekly ethanol production and stock estimates on Wednesday. In competing products, corn rallied on Tuesday, as front-month CBOT corn futures settled 4 cents higher as $3.8050/bushel. Soybean meal, however, finished 90 cents lower, with front-month CBOT futures settling at $301.30/st.

DDG assessment rationale: (PBF page 504) Chicago FOB DDGS were assessed at $140.50/st with an additional $15 charge for containerizing after being heard bid at $137/st and offered at $144/st. New Orleans CIF DDGS for October were assessed at $158/st as they were last heard bid at $156/st and last heard offered at $160/st at the market close.

The above commentary applies to the following market data codes: AADDG00 and ACDDG00.

US ethanol bids/offers/trades: (PBF page 209)

- MOC bids: Chicago: Ethanol: LDM bids $1.55/gal,Nov 8-18, ITT Argo, 5Kb; Chicago: Ethanol: ADM bids $1.57/gal,Nov 8-18, R11, 145Kb; Houston: Ethanol: Shell bids $1.61/gal,Nov 8-18, Houston, 10Kb; New York: Ethanol: ADM bid $1.65/gal, any-Nov, NYH, 25Kb; New York: Ethanol: Shell bids $1.61/gal, any-Nov, NYH, 25Kb.

RENEWABLE IDENTIFICATION NUMBER (RIN)

(¢/RIN)	Rolling code	Calendar code	Low-High	Midpoint	Change
Ethanol (D6) (PBF page 201)					
RIN Calendar-Year 2014	RINCY01	RD62014	40.70-40.80	40.75	+0.50
RIN Calendar-Year 2015	RINCY02	RD62015	40.45-40.55	40.50	+0.50
RIN Calendar-Year 2016	RINCY03	RD62016	40.70-40.80	40.75	+0.50
Biodiesel (D4) (PBF page 301)					
RIN Calendar-Year 2014	BDRCY01	RD42014	55.95-56.05	56.00	+2.00
RIN Calendar-Year 2015	BDRCY02	RD42015	57.45-57.55	57.50	+2.00
RIN Calendar-Year 2016	BDRCY03	RD42016	64.95-65.05	65.00	+1.00
Advanced biofuel (D5) (PBF page 201)					
RIN Calendar-Year 2014	ABRCY01	RD52014	43.95-44.05	44.00	-4.50
RIN Calendar-Year 2015	ABRCY02	RD52015	48.95-49.05	49.00	-4.50
RIN Calendar-Year 2016	ABRCY03	RD52016	53.45-53.55	53.50	-1.50
Cellulosic biofuel (D3) (PBF page 201)					
RIN Calendar-Year 2014	CBRCY01	RD32014	48.95-49.05	49.00	+0.00
RIN Calendar-Year 2015	CBRCY02	RD32015	63.95-64.05	64.00	+0.00

The calendar codes indicate the traditional full calendar year codes for Platts RINs assessments, while the supplementary rolling codes are unique to the specific calendar-year RINs.

PLATTS US RENEWABLE VOLUME OBLIGATION – CALCULATED VALUES (PBF page 302)

		¢/gal		%/gal			
			Change	Biodiesel	Ethanol	Advanced Biofuel	Cellulosic
2014 RVO (Jan 1, 2014 – Jan 31, 2015)	RVOY014	4.1575	+0.0413	1.1300	8.1200	0.4860	0.0040
2015 RVO (Jan 1, 2014 – Jan 31, 2016)	RVOY015	4.1791	+0.0414	1.1300	8.1200	0.4860	0.0040
2016 RVO (Jul 1, 2015 – Jan 31, 2016)	RVOY016	4.3060	+0.0446	1.1300	8.1200	0.4860	NA

RVOs are Renewable Volume Obligation values. RVO is the aggregate cost of the Renewable Identification Number percentages per gallon of transportation fuel for biodiesel, ethanol, advanced biofuel, and cellulosic ethanol as mandated by US Environmental Protection Agency in Renewable Fuel Standard Program (RFS2). Platts calculates these RVO values factoring the value of biodiesel, ethanol, advanced biofuel and cellulosic biofuel RIN credits as assessed by Platts for the respective RVO years; RINs are assessed as cents/RIN.

ETHANOL PRICES AT KEY RACK LOCATIONS (¢/gal)

	Chippewa Falls		Des Moines		Grand Forks		Kansas City		Minneapolis		Omaha		Sioux Falls	
Cenex	DE312FX	167.31	DE059FX	162.86	DE175FX	172.76							DE256FX	198.99
Dale Pet					DE175AT	169.00								
Fl Hills			DE059IF	175.00	DE175IF	173.00	DE099IF	170.00	DE141IF	185.00	DE185IF	169.00	DE256IF	164.00
MinnIowa			DE059CW	164.00					DE141CW	185.00	DE185CW	163.00	DE256CW	161.00
Sapp Bros											DE185EA	162.90		
Western			DE059FN	169.00	DE175FN	175.00	DE099FN	169.00	DE141FN	168.00	DE185FN	171.00	DE256FN	166.00

Prices effective as of 12:01 am EST 03NOV15, provided by DTN.

- MOC offers: Chicago: Ethanol: Koch offers $1.5550/gal,Nov 8-18, ITT Argo, 10Kb; Houston: Ethanol: Vitol offers $1.64/gal,Nov 8-18, Houston, 10Kb; New York: Ethanol: Rolympus offers $1.6725/gal, any-Nov, NYH, 25Kb.
- MOC trades reported: Koch-ADM, $1.5525/gal, Chicago Argo,Nov 8-18, 10Kb; Koch-Shell, $1.5525/gal, Chicago Argo,Nov 8-18, 10Kb; Koch-Shell, $1.5525/gal, Chicago Argo,Nov 8-18, 5Kb; Koch-Shell, $1.5525/gal, Chicago Argo,Nov 8-18, 5Kb; Koch-Valero, $1.5525/gal, Chicago Argo,Nov 8-18, 5Kb; Koch-Valero, $1.5525/gal, Chicago Argo,Nov 8-18, 5Kb; Koch-Valero, $1.5525/gal, Chicago Argo,Nov 8-18, 5Kb; CHS-Valero, $1.5525/gal, Chicago Argo,Nov 8-18, 5Kb; Shell-Valero, $1.6625/gal, New York Harbor, any-Nov, 25Kb. Other trades reported: None.

US ethanol exclusions: (PBF page 209)
- No data was excluded from the assessment.

The above price indications apply to the following market data codes: AALRI00, AAMPF00.

US RIN bids/offers/trades: (PBF page 206)
- MOC bids: None.
- MOC offers: None.
- MOC trades reported: None. Other trades reported: None.

US RIN exclusions: (PBF page 206)
- No data was excluded from the assessment.

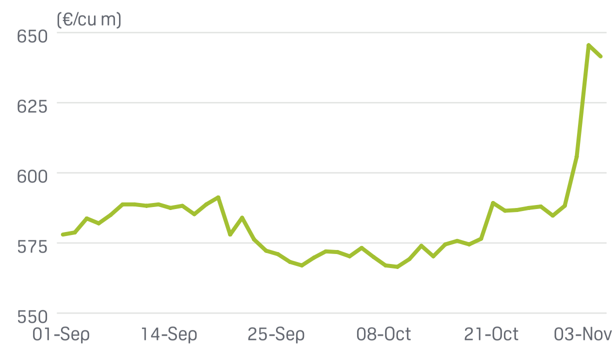
The above price indications apply to the following market data codes: RINCY01, RINCY02, BDRCY01, BDRCY02, ABRCY01, ABRCY02.

BRAZIL ETHANOL PRICE ASSESSMENTS

		Low-High	Midpoint	Change
Brazil Cargo Assessments (PBF page 220)				
Ethanol FOB Santos Cargo (¢/gal)	AATAE00	208.15-208.25	208.20	+7.60
Ethanol FOB Santos Cargo ($/cu m)	AAWFO00	529.95-530.05	530.00	+0.00
Ethanol FOB Santos Cargo (Real/cu m)	AAWFP00	2073.25-2073.35	2073.30	+28.10
Hydrous ANP (PBF page 223)				
Domestic Ex-mill Ribeirao with taxes (Real/cu m)	AAXNQ00	1945.00-1955.00	1950.00	+80.00
FOB Santos/Paranagua ($/cu m)	AAXNR00	487.50-492.50	490.00	+20.00
Anhydrous ANP (PBF page 223)				
Domestic Ex-mill Ribeirao with taxes (Real/cu m)	AAXNN00	1895.00-1905.00	1900.00	+20.00
Grade B (PBF page 223)				
FOB Santos/Paranagua ($/cu m)	AAXNS00	497.50-502.50	500.00	+20.00
Daily Prices (PBF page 226)				
Spot Ex-mill Ribeirao Hydrous expressed as Raw Sugar equivalent (basis 96 degrees pol) (¢/lb)	AAXOA00	13.94-13.96	13.95	+0.80
Spot FOB Anhydrous direct to FOB NY (inc. D5 value) ($/gal)	AAXNO00	1.83-1.85	1.84	+0.12
Spot FOB Anhydrous direct to FOB NY (inc. D5 value) ($/cu m)	AAXNP00	483.44-488.72	486.08	+31.70

RIN D6 ETHANOL 2014

ETHANOL T2 FOB ROTTERDAM



Brazil (PBF page 289)

COMMENTARY: Domestic hydrous ethanol prices in Center-South Brazil surged Tuesday, following the country's long weekend that kept the market closed Monday. The Platts hydrous assessment increased Real 80/cu m to Real 1,950/cu m on an ex-mill Ribeirao Preto basis, in line with the last deals heard Tuesday. The price is an all-time high. Despite the surge, market participants saw good volumes trading at this level. Rains forecasted for the whole week translated into higher offers on Tuesday, sources said. "Producers are very bullish," a broker said. On exports, discussions remained quiet due to strength in domestic prices. "Everything is at standstill for spot shipments. Everyone is focused on the domestic market," a trader said. "There are no spot offers -- rains are hampering the harvest," a broker said. Only an offer for Grade B for the next crop, 2016-17, was heard at $420/cu m on an FOB Santos/Paranagua basis. Despite weeks of quiet spot discussions, Brazilian ethanol exports in October reached a 2015 record of 259.1 million liters, up 49% from

PFL MARKETS DAILY

Desk: 239-390-2885 **July 24, 2014**

CBOT ETHANOL				RBOB				CRUDE				NYH ULSD Futures			
Month	Settle	Prev	Chg	Month	Settle	Prev	Chg	Month	Settle	Prev	Chg	Month	Settle	Prev	Chg
Aug 14	2.1070	2.109	(0.002)	Aug 14	2.8368	2.8601	(0.0233)	Sep 14	102.07	103.12	(1.05)	Aug 14	2.8709	2.8754	(0.0045)
Sep 14	2.0120	2.015	0.004	Sep 14	2.8130	2.8388	(0.0258)	Oct 14	100.72	101.65	(0.93)	Sep 14	2.8792	2.8857	(0.0065)
Oct 14	1.9210	1.927	(0.002)	Oct 14	2.6711	2.6917	(0.0206)	Nov 14	99.86	100.73	(0.87)	Oct 14	2.8902	2.8970	(0.0068)
Nov 14	1.8400	1.848	(0.003)	Nov 14	2.6432	2.6624	(0.0192)	Dec 14	99.12	99.95	(0.83)	Nov 14	2.9013	2.9086	(0.0073)
Dec 14	1.7650	1.773	(0.008)	Dec 14	2.6256	2.6440	(0.0184)	Jan 15	98.47	99.24	(0.77)	Dec 14	2.9117	2.9198	(0.0081)
Jan 15	1.7220	1.726	(0.004)	Jan 15	2.6204	2.6382	(0.0178)	Feb 15	97.85	98.57	(0.72)	Jan 15	2.9195	2.9281	(0.0086)

CORN				SOYBEANS				WHEAT				NATGAS			
Month	Settle	Prev	Chg	Month	Settle	Prev	Chg	Month	Settle	Prev	Chg	Month	Settle	Prev	Chg
Sep 14	361.50	362.50	(1.00)	Aug 14	1207.50	1201.00	6.50	Sep 14	528.75	530.75	(2.00)	Aug 14	3.847	3.762	0.085
Dec 14	369.50	370.75	(1.25)	Sep 14	1111.50	1101.75	9.75	Dec 14	550.25	554.50	(4.25)	Sep 14	3.850	3.776	0.074
Mar 15	381.25	382.50	(1.25)	Nov 14	1084.75	1076.50	8.25	Mar 15	572.75	577.75	(5.00)	Oct 14	3.859	3.787	0.072
May 15	389.50	390.25	(0.75)	Jan 15	1091.50	1083.75	7.75	May 15	588.25	593.75	(5.50)	Nov 14	3.906	3.839	0.067
Jul 15	397.00	397.50	(0.50)	Mar 15	1097.50	1090.75	6.75	Jul 15	600.50	607.00	(6.50)	Dec 14	3.985	3.921	0.064
Sep 15	404.00	405.00	(1.00)	May 15	1103.50	1097.00	6.50	Sep 15	613.00	619.50	(6.50)	Jan 15	4.054	3.995	0.059

Ethanol Crush Spread Pricing (per Bu.)

Aug 14	2.4953	Q1 14	1.454
Sep 14	2.2198	Q2 14	1.122
Oct 14	1.9559	Q3 14	0.998
Nov 14	1.6410	Q4 14	0.902
Dec 14	1.4235	Q1 15	0.832

Nationwide Ethanol Indicative Pricing

Location	Bid	Ask
Argo ITT	2.140	2.155
NYH Barge	2.240	2.260
Gulf Coast	2.160	2.200
NorCal	2.220	2.260

Equities shook off a 20% drop in new home sales in June from the original May print, but WTI futures sold-off leading a decline in petroleum markets. RBOB futures closed lower for a third consecutive day and September traded down to two and half month lows. Soybeans added to yesterday's gains and touched a one week high after weekly export sales came in at 2.5 million tonnes, most of which was for the 14/15 marketing year. Corn, however, could not get any traction and finished down, settling near its four year lows set on Tuesday. Ethanol futures posted small losses with the biggest decline, of 0.8 cents, coming in the November and December contracts. Physical markets were little changed as Argo traded $2.145 and August New York Harbor barges were indicated $2.25 late. D4 RINs were well bid this morning and looked set to breakout, but the rally fizzled in afternoon trade and the market went out around 55.5 cents, after trading up to 56 earlier. LCFS credits held steady in upper 20's as buyers balked at paying $30.

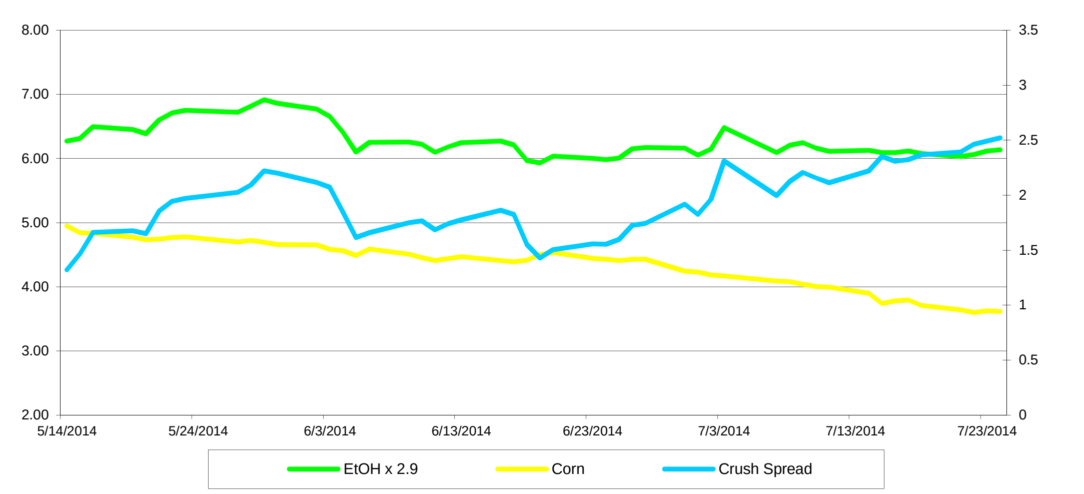
DOE Storage (mbbl)

Periods	Crude	Gasoline	Distillate
This Week	371.1	217.9	125.9
Last Week	375.0	214.5	124.3
Last Year	364.2	222.7	126.5
Difference	-4.0	3.4	1.6

F/X

USD Index	80.80
Brazilian Real	2.218
Canadian Dollar	1.0727
Euro	1.3462
Japanese Yen	101.49

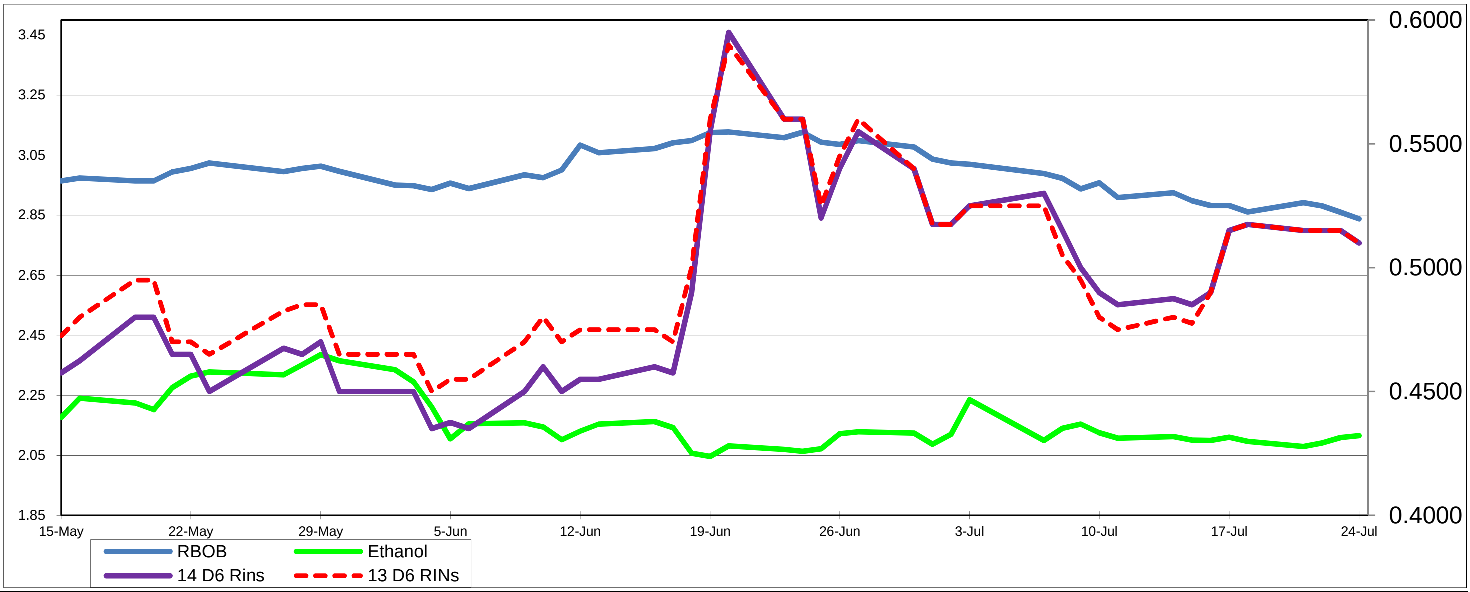
Front Month Ethanol Crush Spread



NEAR MARKET SUMMARY

Energy	
WTI (Cash)	101.96
Brent	107.16
NYMEX Crude	102.07
B100 SME Chicago	3.57
B100 SME Gulf Co.	3.57
B100 FAME Chicago	3.43
B100 FAME Gulf Co.	3.50
Ag Products	
White Grease (cnt/lb)	38.00
Yellow Grease (cnt/lb)	32.00
Tallow (cnt/lb)	40.00
Soybean Oil (cnt/lb)	36.24
Soybean Meal ($/ton)	395.30
Canola (CAD/tonne)	440.70
Sugar (cnt/lb)	17.05
DDGS-Chicago(wkly)	150.00
Market Indices	
CRB Index	298.19
DJ Industrials	17083.80
NASDAQ	4472.11
S&P 500	1987.98
Gold	1294.80

RBOB/Ethanol/RINs



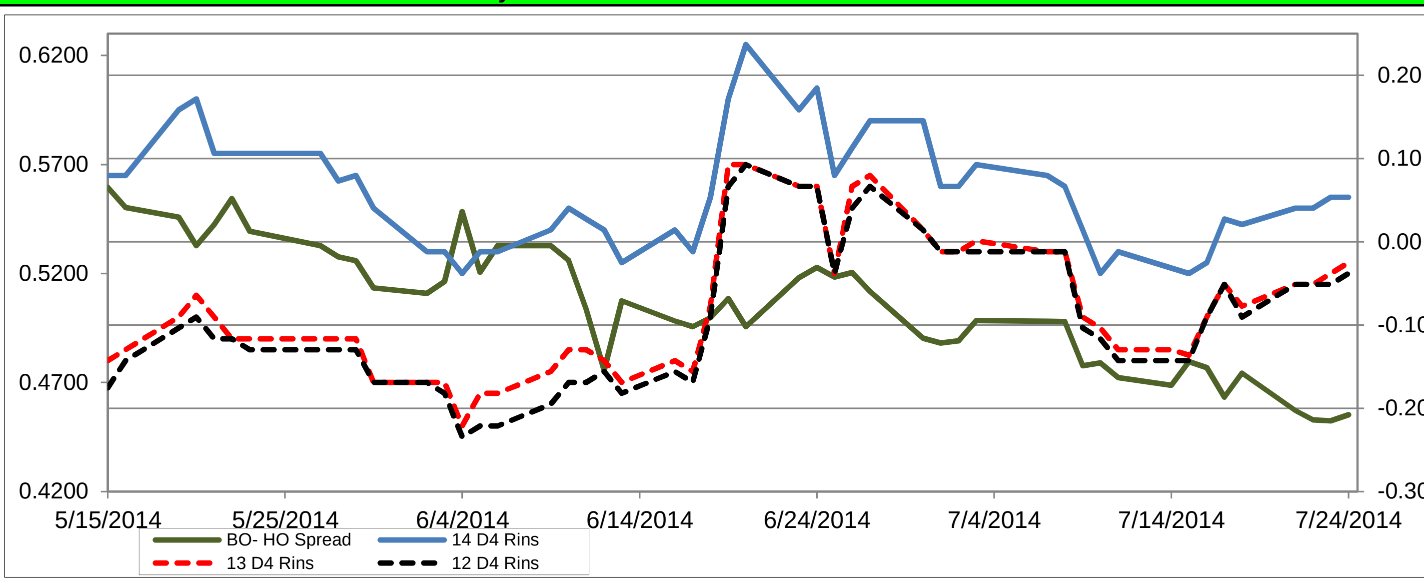
2012 - 2014 RIN Pricing in cents/RIN & LCFS in dollars/credit							
Year	Type	Bid	Ask	Year	Type	Bid	Ask
2012	D4	52.00	53.00	2012	D6	51.00	515.00
2013	D4	52.50	53.00	2013	D6	51.00	51.50
2014	D4	55.00	56.00	2014	D6	51.00	51.50
2012	D5	51.50	52.00	2013	D3*	-	42.00
2013	D5	51.50	52.00				
2014	D5	52.00	54.00	2014 Prompt Dlvd	LCFS	$28.00	$30.00

D4 = Biomass Based Diesel RIN D5 = Sugarcane Based Advanced Fuel RIN D6 = Corn Ethanol Based RIN

D3* = Cellulosic Waiver fixed by EPA LCFS Credits (1 Credit = 1 MT of CO2)

	RBOB	CBOT Ethanol	Diff	CU Ethanol Swaps		Nationwide Etoh Pricing		
Month(s)	Settle	Settle	Implied	Month(s)	Settle	Location	Bid	Ask
Aug 14	2.8368	2.1070	(0.7298)	Aug 14	2.0550	Chicago Rule 11	2.110	2.130
Sep 14	2.8130	2.0120	(0.8010)	Sep 14	1.9583	FOB NE BN	2.000	2.020
Oct 14	2.6711	1.9210	(0.7501)	Oct 14	1.8733	FOB NE UP	2.020	2.040
Nov 14	2.6432	1.8400	(0.8032)	Nov 14	1.8000	Tampa	2.260	2.280
Dec 14	2.6256	1.7650	(0.8606)	Dec 14	1.7542	Pacifc Northwest	2.240	2.280

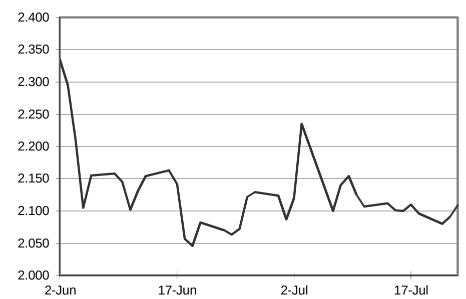
Soybean Oil-NYH ULSD Futures/Biodiesel RINs



PFL BIOFUEL MARKETS DAILY COMMENTARY

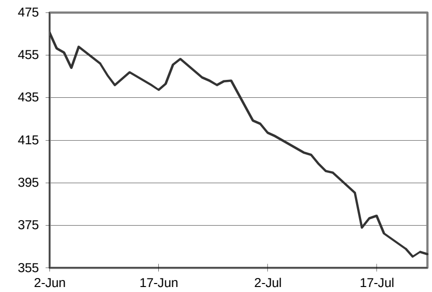
July 24, 2014

ETHANOL CHART



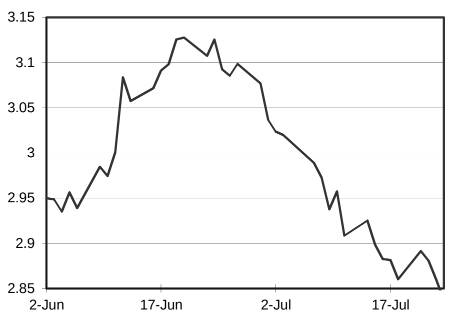
R3	2.266
R2	2.218
R1	2.172
S1	2.046
S2	2.007
S3	1.969
5DMA	2.098
20DMA	2.118
50DMA	2.164

CORN



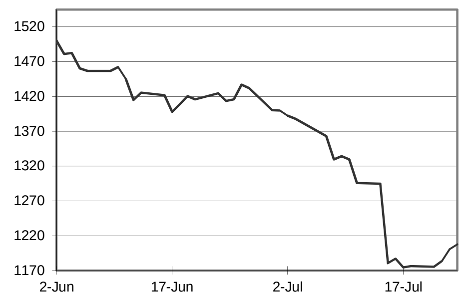
R3	380.5
R2	375.0
R1	368.9
S1	354.4
S2	348.3
S3	343.0
5DMA	363.9
20DMA	396.6
50DMA	434.4

RBOB



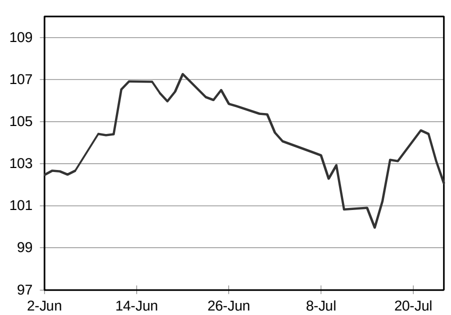
R3	3.0179
R2	2.9550
R1	2.9245
S1	2.7542
S2	2.7017
S3	2.6512
5DMA	2.8659
20DMA	2.9512
50DMA	2.9913

SOYBEANS



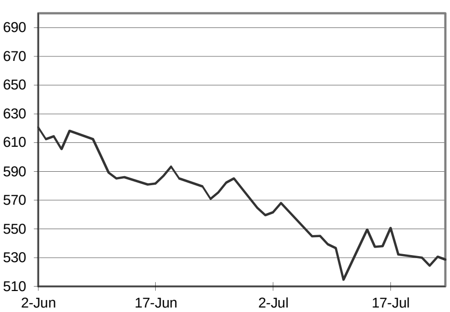
R3	1273.7
R2	1250.0
R1	1232.1
S1	1183.8
S2	1167.8
S3	1141.3
5DMA	1189.0
20DMA	1294.3
50DMA	1393.9

CRUDE



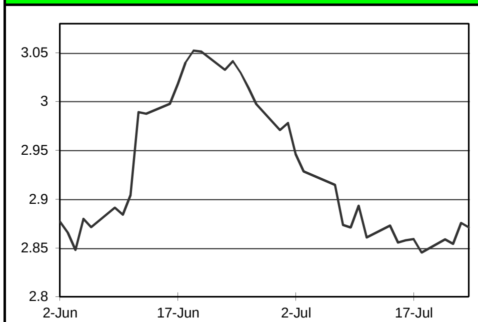
R3	113.41
R2	108.59
R1	105.23
S1	99.10
S2	96.29
S3	92.79
5DMA	103.47
20DMA	103.32
50DMA	103.88

WHEAT



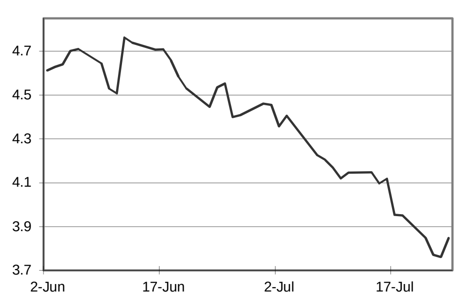
R3	571.0
R2	562.5
R1	550.8
S1	508.4
S2	498.8
S3	752.2
5DMA	529.3
20DMA	546.3
50DMA	590.4

NYH ULSD Futures



R3	3.0364
R2	2.9521
R1	2.9072
S1	2.8355
S2	2.8009
S3	2.7303
5DMA	2.8609
20DMA	2.8999
50DMA	2.9310

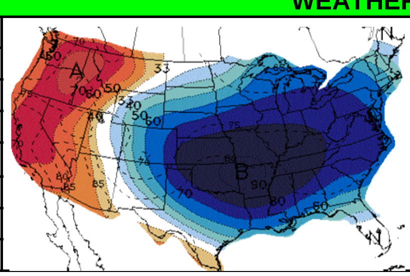
NATURAL GAS



R3	4.182
R2	4.049
R1	3.926
S1	3.772
S2	3.664
S3	3.607
5DMA	3.836
20DMA	4.143
50DMA	4.396

WEATHER

City	H/L
Chicago	75/57
New York	80/67
Houston	96/76
Los Angeles	90/69
Washington D.C.	82/67
St. Louis	82/65
Naples, Florida	90/73



Except for some lingering showers along the immediate coast, Thursday will be noticeably cooler and drier behind the cold front across much of the region. A pleasant late July surface high pressure brings a dry Thursday across the Great Lakes and Ohio Valley region. Scattered thunderstorms will develop today along a cold front from Virginia to the Gulf Coast and Florida Peninsula. Less coverage of rain today with only isolated to scattered thunderstorms expected in eastern Montana and eastern Wyoming and scattered showers in northern Washington.

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Argus *Americas Biofuels*

Incorporating Argus US Ethanol

Issue 16-184 | Friday 23 September 2016

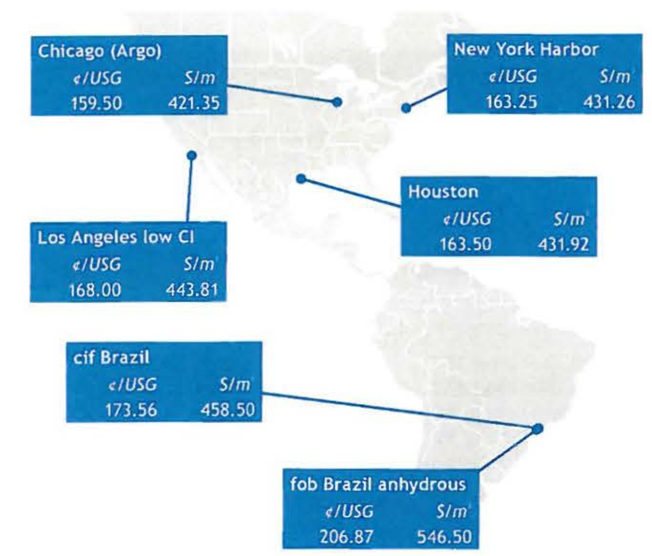
OVERVIEW

- US ethanol prices continued to find upward momentum Friday despite weaker CBOT corn and RBOB gasoline futures as traders eyed robust export demand and tumbling inventories and production.

- The RINs market was mostly higher Friday as the D4/D6 spread climbed to just off a ten-month high.

- US biodiesel premiums gained Friday as D4 RIN prices ticked upward, but outright prices fell as the Nymex plunged nearly 4.75¢.

Americas ethanol prices



Contents

PRICE SUMMARY

Ethanol	¢/USG	±	$/m³	±
Chicago (Argo)	159.50	+1.13	421.35	+2.99
New York Harbor	163.25	+1.00	431.26	+2.64
fob Brazil anhydrous	206.87	0.00	546.50	0.00
Los Angeles low CI	168.00	-3.00	443.81	-7.93
Cbot ethanol	154.60	+1.10	408.41	+2.91

RINs	Timing	Price	±	Less 2015 (¢/RIN)
Renewable fuel (ethanol)	2016	87.00	-0.13	-0.50
Biomass-based diesel	2016	98.50	+0.25	-1.75
Advanced biofuel	2016	97.50	+0.25	-1.50
RVO *¢/USG*	2016	9.15	-0.01	+0.57

Biodiesel	Price	±
SME New York Harbor B100 *¢/USG*	320.98	-4.44
SME Houston fob B100 *¢/USG*	311.48	-4.44
SME Chicago fob B100 *¢/USG*	327.98	-4.44
SME fob Paranagua *$/t*	815.00	+4.00
SME fob Argentina upriver *$/t*	727.21	-9.92
Cbot soybean oil *¢/lb*	33.31	-0.65

Biofuel spreads	Spread	±
Ethanol crush spread *$/bushel*	+0.96	+0.03
Heating oil/soybean oil spread *¢/USG*	-1.09	0.00
Houston less Chicago ethanol *¢/USG*	+4.00	0.00
New York Harbor less Chicago ethanol *¢/USG*	+3.75	-0.13
Los Angeles less Chicago ethanol *¢/USG*	+8.50	-4.13
Los Angeles less Nebraska ethanol *¢/USG*	+25.00	-3.00
Rule 11 less Nebraska ethanol *¢/USG*	+12.50	-0.50

Key California carbon prices	Vintage	Price	±
Credits *$/t*			
California carbon allowances (CCA)	2016	12.96	0.00
Low-carbon fuel standard (LCFS)	2016	95.00	-0.50
Price per gallon *¢/USG*			
CCA price for regular Carbob	2016	10.43	0.00
LCFS price for regular Carbob	2016	3.35	-0.02

ETHANOL

US

US ethanol prices continued to find upward momentum Friday despite weaker CBOT corn and RBOB gasoline futures as traders eyed robust export demand and tumbling inventories and production.

CBOT corn futures were slightly lower after China's Ministry of Commerce announced a 33.8pc anti-dumping duty on all US distiller's dried grains effective immediately.

Ethanol export activity continues to underpin the market as a 15,000m3 shipment is scheduled to depart from Saint Rose, Louisiana for Brazil in the second half of September. A 10,000t shipment is scheduled to depart from the US west coast for China sometime in September, while an 8,000t shipment is scheduled to depart from the US Gulf coast for Korea between 2-12 October.

At Kinder Morgan's Argo ethanol hub, prompt barrels reached a near three-month high after a deal was done at 159¢/USG, while a deal was heard done early at 160¢/USG. September any availabilities remained flat to the prompt barrels as a market was seen between 159¢ and 160¢/USG.

ANNOUNCEMENT

Argus completes and extends annual Iosco assurance review

Argus has completed its fourth external assurance review of its price benchmarks, extending the scope of the process to cover petrochemicals and fertilizers for the first time, as well as again covering crude, products, biofuels, thermal coal, coking coal, natural gas and biomass benchmarks. The review was carried out by professional services firm PwC. Annual independent, external reviews of oil benchmarks are required by international regulatory group Iosco's Principles for Oil Price Reporting Agencies, and Iosco encourages extension of the reviews to non-oil benchmarks. For more information and to download the review visit our website:
http://www.argusmedia.com/About-Argus/How-We-Work

Ethanol deals done

Market	Timing	Price ¢/USG	Volume '000 bl
Chicago Argo	28 Sep-8 Oct	159.00	5
New York Harbor	Any Sep	164.00	25

Ethanol

	Low	High	±
Chicago			
Argo prompt ¢/USG	159.00	160.00	+1.13
Weighted average		159.00	
Argo any Sep ¢/USG	159.00	160.00	+1.13
Rule 11 prompt ¢/USG	154.00	157.00	-0.50
New York			
Any Sep ¢/USG	162.50	164.00	+1.00
US Gulf coast/south			
Houston ¢/USG	163.00	164.00	+1.13
Tampa ¢/USG	177.00	178.00	+1.13
Atlanta ¢/USG	170.00	171.00	+1.13
Dallas ¢/USG	161.00	162.00	+1.13
Nebraska			
Union Pacific ¢/USG	141.50	144.50	0.00
Burlington Northern ¢/USG	141.50	144.50	0.00
US west coast			
Los Angeles low CI ¢/USG	167.00	169.00	-3.00
Brazil			
fob anhydrous $/m³	470.00	623.00	0.00
fob anhydrous BRL/m³	1,517.91	2,012.04	+12.62
fob hydrous $/m³	455.00	582.00	0.00
fob hydrous BRL/m³	1,469.47	1,879.63	+11.98
cif anhydrous $/m³	431.00	486.00	+0.50
cif anhydrous BRL/m³	1,391.96	1,569.59	+12.20
fob Santos industrial grade* $/m³	460.00	585.00	+12.50
fob Santos industrial grade* BRL/m³	1,485.62	1,889.32	-26.54
Asia			
cfr Asia South Korea B grade $/m³	610.00	620.00	-25.00

**assessment is as of 23 Sep*

Ethanol forward curves ¢/USG

	Chicago, low-high	New York, low-high
Sep	159.00-160.00	162.50-164.00
Oct	150.25-151.25	161.50-162.50
Nov	143.50-144.50	153.50-154.50
Dec	139.50-140.50	149.00-150.00

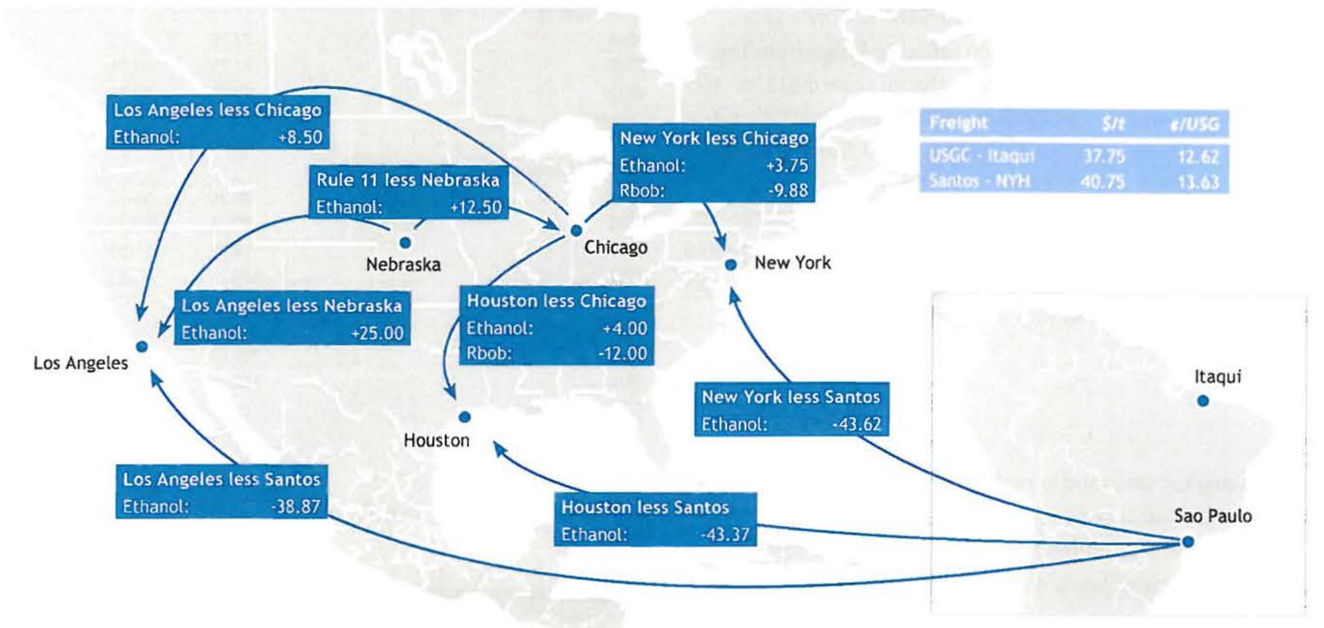
Related markets ¢/USG

	Low	High	±
Spot			
New York Rbob barge 83.7	138.19	138.44	-3.99
New York Cbob barge 83.7	138.44	138.94	-3.62
Houston Rbob Colonial 83.7	135.69	136.69	-2.99
Houston Cbob Colonial 85	135.44	136.69	-3.62
Los Angeles Carbob 84 month	155.07	156.07	-2.61
Mont Belvieu natural gasoline	96.50	101.00	-1.44
Settlement			
Nymex Rbob settlement, Oct		137.69	-2.49
Nymex Rbob crack spread, Nov $/bl		+12.46	+0.87

Current month-to-date averages, Sep

	Averages
Chicago (Argo) prompt ¢/USG	152.96
New York Harbor prompt ¢/USG	157.33
Los Angeles low CI ¢/USG	166.31
fob Brazil anhydrous $/m³	537.28
cif Brazil anhydrous $/m³	446.47

ARGUS MARKET MAP: ETHANOL ¢/USG



New York Harbor values remained at a ten-week high after September barges were traded at 164¢/USG, while a heard traded went through early at 162.5¢/USG. The October barges lost a quarter-cent after being discussed between 161.5¢ and 162.5¢/USG without trade.

Chicago Rule 11 railcars shipping next week were discussed between 154¢ and 157¢/USG, but transactions were not reported.

Fob Nebraska Union Pacific railcars shipping this week were unchanged after a trade was heard done at 143¢/USG.

Arizona railcars shipping this week were heard traded at 162¢ and 163¢/USG.

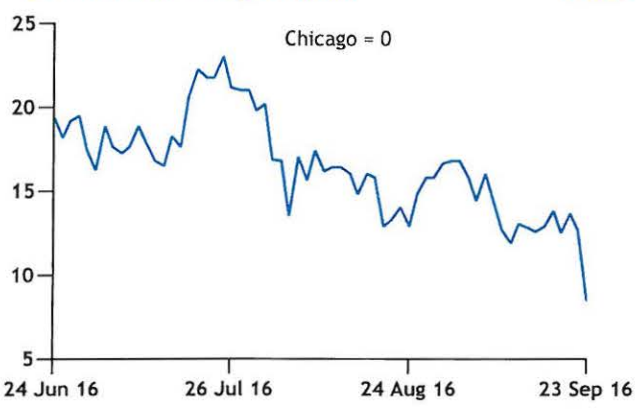
At the west coast, NorCal cars shipping this week were heard traded at 168¢/USG, down 3¢ on the day.

Brazil

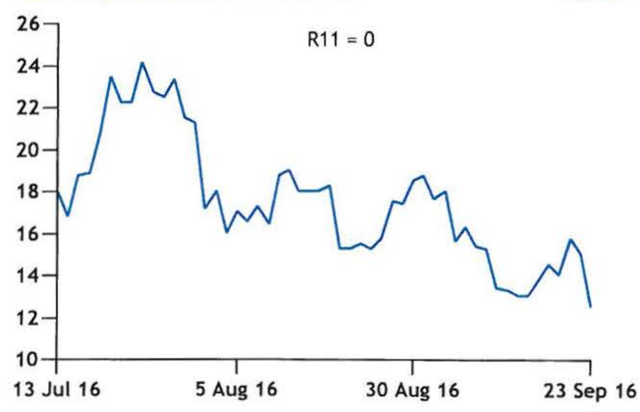
The Brazilian ethanol market ended the week on a quiet note Friday as both delivered and domestic prices stabilized.

Selling levels for cif Brazil deliveries ticked \$1/m³ to \$486/m³ in thin commerce as firm buying interest failed to materialize.

LA ethanol vs Chicago ethanol ¢/USG



Los Angeles ethanol vs Rule 11 ¢/USG



Discourse was also limited on the export front as high domestic valuations worked against waterborne economics. Anhydrous fuel ethanol hovered in the $470-623/m³ range, while the hydrous fuel specification failed to bulge from the $455-582/m³ levels. Korean B grade ethanol gained $13/m³ to $460-585/m³ in weekly comparison as stouter domestic valuations and a stronger Brazilian currency lifted the industrial grade specification over the course of the week.

In Sao Paulo, ex-mill truckloads of hydrous fuel ethanol with 12pc ICMS tax stabilized in the R1,950-1,960/m³ range in a fairly illiquid session Friday as weak demand and limited supply kept a lid on commerce in Ribeirao Preto.

RINS

The RINs market was mostly higher Friday as the D4/D6 spread climbed to just off a ten-month high.

The 2016 vintage D4 biomass-based diesel RINs rose by a quarter-cent as deals were done at 98.5¢/RIN, widening the B16/E16 spread by more than a quarter-cent to 11.5¢/RIN.

Current year D6 ethanol credits were slightly lower as commerce was done between 86.75¢ and 87.25¢, while the E16/E17 spread was talked at +0.25¢/+0.4¢ without trade. The 2015 vintage D6 credits edged higher after credits exchanged hands at 87.5¢/RIN

The 2016 vintage D3 cellulosic RINs shed two cents as commerce was done for QAP credits at 203¢/RIN. The 2014 vintage

RINs deals done

Market	Timing	Price ¢/RIN	Volume '000 RINs
Biodiesel	2016	98.50	500
	2016	98.50	250
	2016	98.50	675
Cellulosic	2016	203.00	100
Ethanol	2015	87.50	3000
	2016	86.75	500
	2016	86.75	500
	2016	86.75	350
	2016	87.00	500
	2016	87.00	500
	2016	87.00	1000
	2016	87.25	1000
	2016	87.25	500
	2016	87.25	2000
	2016	87.25	3000
	2016	87.25	500
	2016	87.25	2000

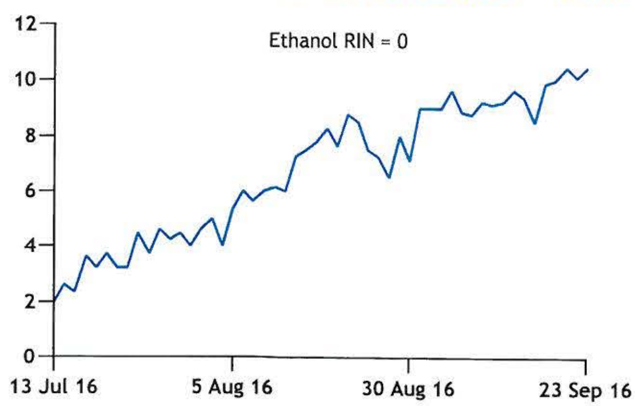
RINs ¢/RIN

	Low	High	±
Renewable fuel (ethanol)			
2014	87.25	87.75	+0.13
2015	87.25	87.75	+0.13
2016	86.75	87.25	-0.13
Weighted average		87.15	
2017	86.50	86.85	-0.20
Biomass-based diesel			
2014	98.25	98.75	+0.25
2015	99.75	100.75	+0.25
2016	98.25	98.75	+0.25
2017	100.25	102.25	+0.25
Cellulosic biofuel			
2014	123.00	125.00	-2.50
2015	159.00	161.00	0.00
2016	202.00	204.00	-2.00
Advanced biofuel			
2014	98.25	98.75	+0.25
2015	98.75	99.25	+0.25
2016	97.25	97.75	+0.25
Renewable Volume Obligation (RVO) ¢/USG			
2015		8.58	+0.02
2016		9.15	-0.01

RIN spreads ¢/RIN

	Today	±	Prior day	5-day avg
Category spreads, 2015				
Biodiesel D4-ethanol D6	12.75	+0.13	12.62	12.65
Biodiesel D4-advanced biofuel D5	1.25	0.00	1.25	1.25
Advanced biofuel D5-ethanol D6	11.50	+0.13	11.38	11.40
Category spreads, 2016				
Biodiesel D4-ethanol D6	11.50	+0.38	11.12	11.20
Biodiesel D4-advanced biofuel D5	1.00	0.00	1.00	1.00
Advanced biofuel D5-ethanol D6	10.50	+0.38	10.12	10.20
Vintage spreads, 2015-2016				
Biodiesel D4	1.75	0.00	1.75	1.75
Advanced biofuel D5	1.50	0.00	1.50	1.50
Ethanol D6	0.50	+0.25	0.25	0.30

Advanced RINs vs ethanol RINs (current year) ¢/RIN



Supplemental Comments by Growth Energy, Archer Daniels Midland, and Biotechnology Innovation Organization on EPA's Proposed Renewable Fuel Standard Program: Standards for 2018 and Biomass-Based Diesel Volume for 2019

Docket # EPA–HQ–OAR–2017-0091

Exhibit 9

The Pass-Through of RIN Prices to Wholesale and Retail Fuels under the Renewable Fuel Standard: Analysis of Post-March 2015 Data

November 23, 2016

Christopher R. Knittel, MIT
Ben S. Meiselman, University of Michigan
James H. Stock, Harvard University

Summary

Knittel, Meiselman, and Stock (2015) (KMS)[1] examine the pass-through of RIN prices under the RFS to three categories of fuels: bulk wholesale petroleum fuels, bulk wholesale biofuels, and retail gasoline blends. The KMS period of analysis is January 1, 2013 – March 9, 2015. This note extends the analysis of bulk wholesale petroleum fuel prices in KMS to data through Nov. 14, 2016.

KMS compare wholesale prices of two similar fuels, one of which is regulated under the RFS and one of which is not. The regulated fuel must retire a bundle of RINs when it is sold into the fuel supply. Because the two fuels have different RIN obligations, the difference (spread) between their prices should respond to a change in RIN prices. Using daily prices of fuels and RINs, KMS regress the obligated/non-obligated fuel price spread on the price of the RIN obligation to estimate the fraction of the RIN price that is passed through to the price of the obligated fuel (the "pass-through coefficient"). They also estimate a dynamic system involving the spread and the RIN prices (a vector autoregression) to estimate the dynamic response of fuel prices to a change in the RIN price. The reason for using the spread between two chemically and/or geographically similar fuels, rather than just the price of the obligated fuel, is to control

[1] Knittel, C., B. Meiselman, and J.H. Stock, "The Pass-Through of RIN Prices to Wholesale and Retail Fuels under the Renewable Fuel Standard," NBER Working Paper 21343, July 2015. That paper was revised in July 2016 and again in November 2016, both times in response to comments by referees and editors. The references to KMS in this note all refer to the November 2016 revision. The July 2016 revision substantially shortened the July 2015 version including dropping and renumbering tables and figures; there was no change in the data and no change in conclusions, however there was one methodological change. In all versions, the base specifications include eight seasonal variables (sines and cosines at first four harmonics). In the July 2015 version, KMS reported sensitivity results in which the regressions were estimated dropping the seasonal variables. In the July 2016 version, KMS instead reported sensitivity results using seasonally adjusted data, where the seasonals were estimated using pre-2013 data. The November 2016 version updates the data used in the previous versions to the data set used here, but still restricted to the same sample as the original paper (Jan. 1, 2013 – March 9, 2016). This update filled in a few missing observations on RIN prices, and extended backwards the pre-2013 Rotterdam diesel and BOB series for use in estimating the seasonals for constructing seasonally adjusted spreads; this data update resulted in some second- and third-decimal changes in the results but no change in conclusions.

for non-RFS factors that affect the price of the obligated fuel, thereby reducing the risk of omitted variable bias and increasing precision.

Their main finding for bulk petroleum fuels is that RIN prices were passed through one-for-one in the prices of bulk petroleum fuels, specifically, they estimate a pooled levels pass-through coefficient of 1.00 (SE = 0.11).

This note uses the six spreads in KMS, extended using the same data sources. Three of these are diesel spreads: Gulf diesel – Gulf jet fuel, New York Harbor diesel – Rotterdam diesel, and Gulf diesel – Rotterdam diesel. Three are gasoline spreads: New York Harbor RBOB (prompt month future) – Rotterdam EBOB, New York Harbor RBOB (prompt month future) – Brent (spot), and Los Angeles RBOB (spot) – Brent (spot). In addition, in this note we augment the gasoline spreads by New York Harbor CBOB (spot) – Rotterdam EBOB. This provides a spot-spot comparison of NYH CBOB to EBOB, which complements the NYH RBOB future – EBOB comparison.

Our main findings are:

1. For the four spreads between refined products in KMS – that is, all the spreads in KMS except NYH RBOB-Brent and LA RBOB-Brent – and also for the additional refined product spread NYH CBOB-EBOB newly analyzed here, the findings of KMS hold in the extended sample. These findings are illustrated in the following figures, which show the refined product spread (in green); the predicted value of the spread (orange) from the benchmark estimated levels model from KMS (Table 2, regression 1); and the predicted value of the spread that modifies the orange line to impose a unit pass-through coefficient (blue). The benchmark KMS levels model (orange) regresses the spread against the RIN price over the KMS sample period. Results are shown for the Gulf diesel-Gulf jet spread and the NYH RBOB-EBOB spread. The red line denotes the end of the KMS sample, and subsequent dates denote the out-of-sample period. For the RBOB-EBOB spread, the fit is visually as good out of sample as in-sample, an observation supported by statistical tests. For the Gulf diesel-Gulf jet spread, there is a period during the summer of 2015 in which a gap of approximately $0.05 opens up for several months during the diesel glut of the summer of 2015, an unusual period in which wholesale diesel prices fell substantially below wholesale gasoline prices.[2] After those summer months in 2015 the spread returns to its predicted value.[3]

[2] Contemporaneous sources attributed the low diesel prices to excess supply of middle distillates as refineries increased production to meet strong gasoline demand, to gasoline supply pressures because of refinery outages earlier in 2015, and to recent expansion of middle distillate refining capacity (Wall Street Journal, July 22, 2015; EIA August 2015 STEO, July 22, 2015 EIA *This Week in Petroleum*).

[3] The gap in the summer of 2015 also appears if the model is estimated using seasonally adjusted data as discussed below. In contrast, the gap in September-November 2016 evident in the left panel of Figure A is not present using seasonally adjusted data, which suggests that this later gap is associated with the seasonal adjustment method in the benchmark model.

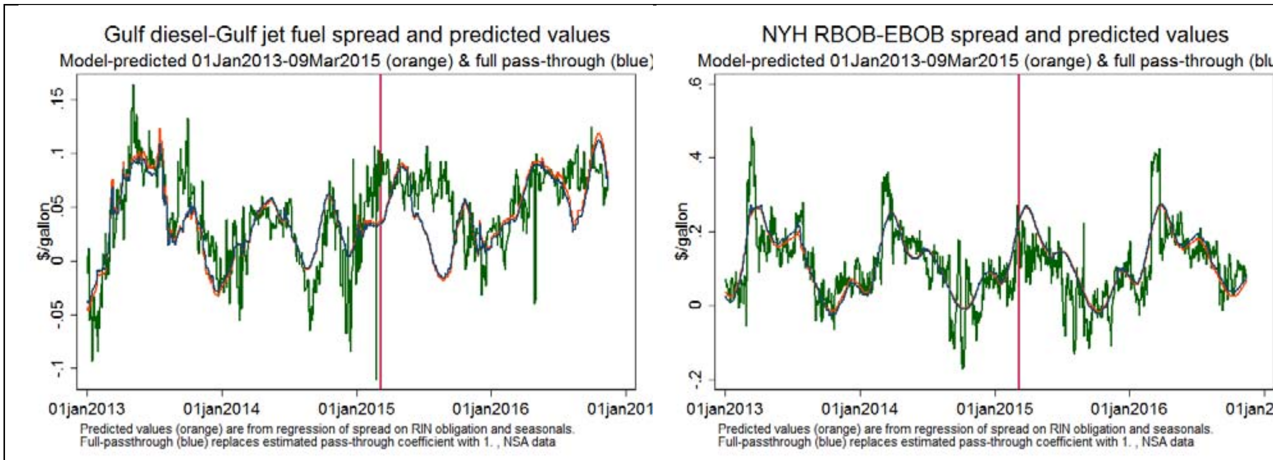


Figure A. Spread between obligated and nonobligated fuels: actual values (green), predicted values based on the KMS benchmark levels model estimated on the KMS sample (orange), and predicted values based on complete pass-through (blue). The vertical line separates the KMS sample and the out-of-sample period.

When these five refined product spreads are pooled together (using the pooling method in KMS), imposing the restriction that the pass-through coefficient is the same and using the benchmark levels regression from KMS (KMS, Table 3, regression 1), the pass-through coefficient is estimated to be 1.03 (SE=0.11) in the KMS sample. When this pooled regression is re-estimated using the full sample, the estimate is 1.12 (SE = 0.09).

2. For the five refined product spreads, the estimated RIN pass-through dynamics of KMS also hold up in the full sample and point to complete pass-through. The following chart presents the dynamic effect of a change in the RIN obligation on the spread, estimated in a pooled VAR using all five refined product spreads using the method of KMS Table 4. The left panel is estimated on the KMS sample, and the right panel is estimated on the full data set. In both the KMS sample and the full sample, approximately half the RIN price is passed through on the same day. Using the KMS sample and seasonally adjusted data, the pass-through coefficient after 10 days is .99 (SE = .28), and after 15 days is 1.01 (SE = .30). The dynamics estimated using the full sample are slightly slower, but not statistically different than, the KMS sample estimates: in the full sample, the 10-day pass-through coefficient is .91 (SE = .21) and the 15-day pass-through is .97 (SE = .22). The full-sample estimates are more precise than the KMS sample estimates.

Estimated Jan. 1, 2013 – March 9, 2015	Estimated Jan. 1, 2013 – Nov. 14, 2016

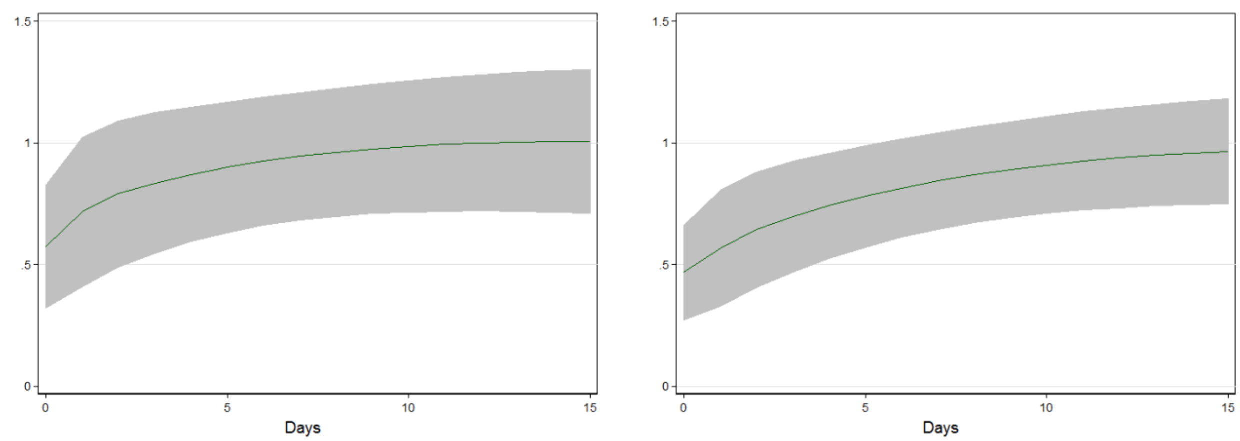


Figure B. Dynamic response of price spread between obligated and nonobligated fuels to a change in the price of the RIN obligation: pooled VAR for the five refined product spreads). Estimated using seasonally adjusted data.

3. Results from estimating pass-through using only the out-of-sample data are sensitive to how seasonals are handled. Because the spreads have seasonal swings, and because RIN price movements are mainly at the monthly or lower frequencies, it is important to control for normal seasonal variation in the spreads to reduce the risk of omitted variable bias. KMS do so in two ways: including seasonal variables (sines and cosines) in the regression, and using seasonally adjusted data, where the spread seasonal adjustment is done using data before the RFS had a material influence on spreads (pre-2013). The main results in KMS were robust to using either method, but for the shorter out-of-sample period here, the two different approaches give different results.

   The figure below shows the pass-through dynamics estimated using the pooled VAR for the five refined product spreads. The left panel includes seasonals in the VAR (the method of Figure B), the right panel uses seasonally adjusted data (the alternative method used in KMS). The upper panel shows results for the March 10, 2015 – Nov. 14, 2016 out-of-sample period. Although the two methods give very similar results in the KMS and full extended samples, the results differ when applied to just the out-of-sample period. The results when seasonally adjusted data are used are similar to those in the KMS and full sample with 15-day pass-through being within a standard error of 1, although with large standard errors because of the short out-of-sample period. The results when seasonals are included are quite different, and the differences are even more pronounced when the sample is shortened to end in May 31, 2016 (lower panel). The reason the results differ is that, when seasonals are included, the seasonals are being estimated with just over one year of data. Because RIN prices mainly move at relatively low frequencies – monthly swings, with typically small daily changes – including seasonals in the regression with just over one year of data confounds seasonal movements with RIN price movements when using only 19 months of data. Using seasonally adjusted data avoids this problem by estimating the spread seasonals on pre-sample data. Thus, for estimates based on the out-of-sample period only, the preferred specification is to include seasonals (although this distinction does not matter for the longer KMS and full extended samples, where both methods give the similar results).

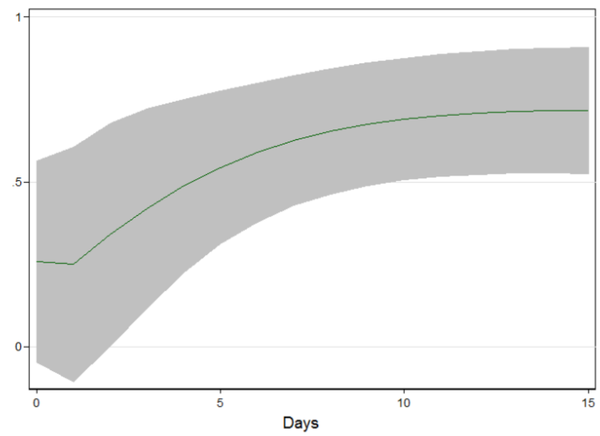
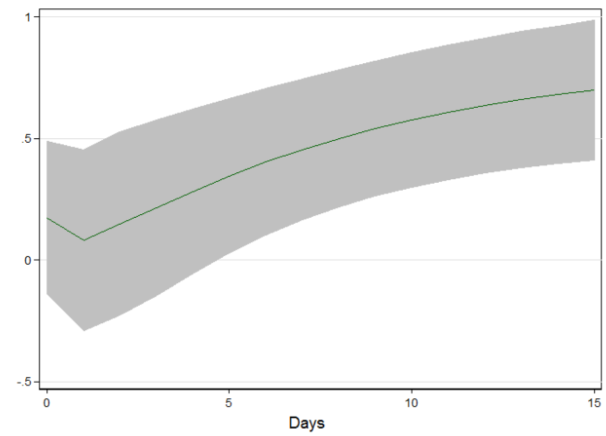
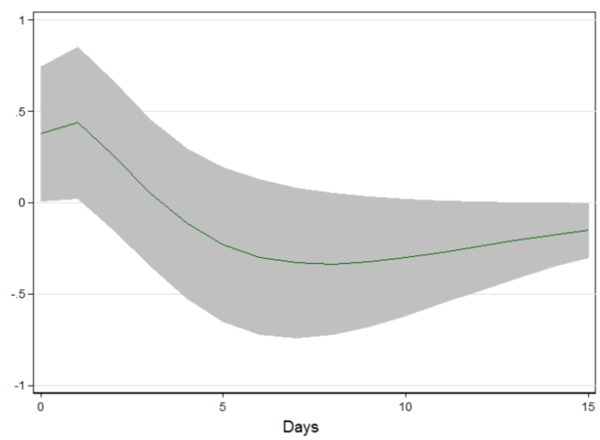
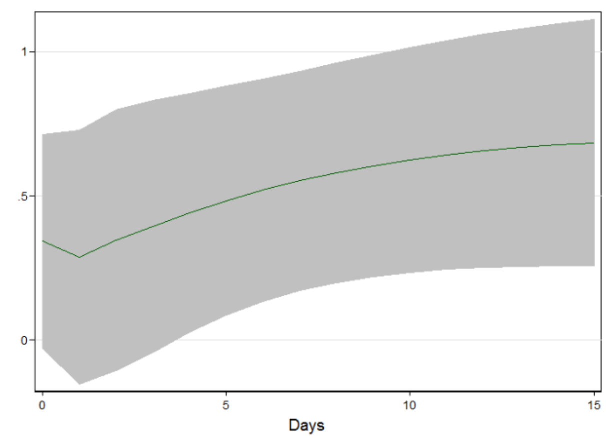
	With seasonals in regression	Seasonally adjusted data
Estimated 3/10/15-11/14/16		
Estimated 3/10/15-5/31/16		

Figure C. Effect of seasonal adjustment method and sample length on estimation of the dynamic response of spreads to RIN prices for the five refined product spreads in the out-of-sample period.

4. There were large and persistent departures of spreads involving Brent from normal seasonal patterns during 2015. Those large departures were related to supply disruptions and expanding gasoline demand because of low prices, not the RFS. The high crack spreads occurred when RIN prices were low; by the time they returned to normal, RIN prices had risen (see Figures D and E). Although the crack spreads returned to the model predicted values, the crack spread widened again towards the end of the sample. Because of these large swings in the crack spread due to non-RFS features of the oil and refined product markets, during the out-of-sample period Brent ceased to be a useful control fuel and instead introduced additional confounding factors.

It is important to keep in mind that the goal of this regression analysis is not to describe all the movements in the spreads, rather, it is to estimate the effect of a change in RIN prices on the price of an obligated fuel. The other non-RIN factors that move the spreads comprise the regression error term. In the out-of-sample period for the Brent spreads, those other factors (e.g, supply disruptions) were negatively correlated with RIN prices. Because those other factors are omitted from the regression but are correlated with RIN prices, the pass-through coefficient estimated during the out-of-sample period is subject to omitted variable bias and in fact estimates a nonsensical pass-through that is large and negative. This omitted variable bias undercuts the usefulness of Brent as a control fuel for estimating the pass-through coefficient in the out-of-sample period.

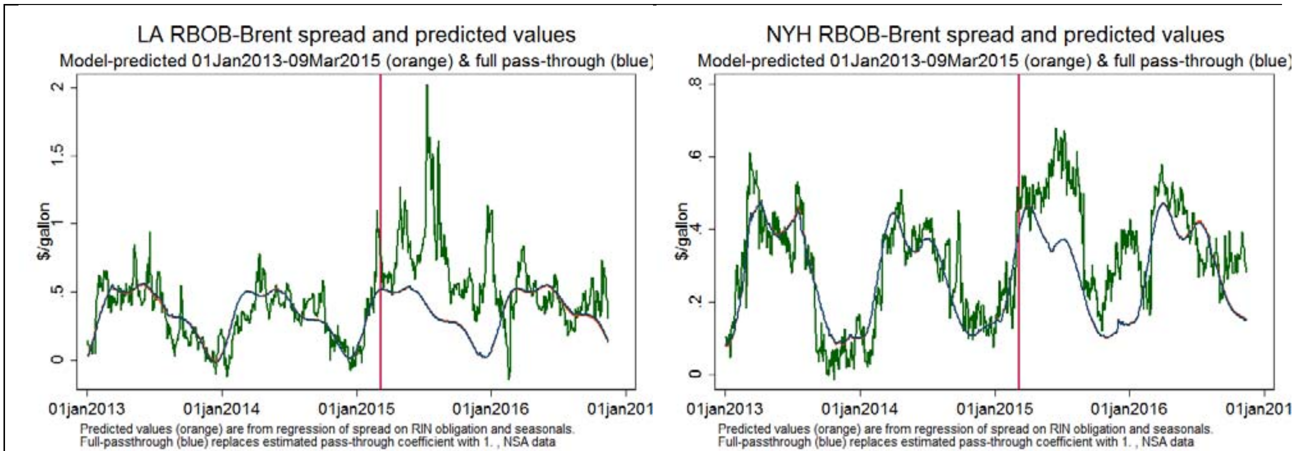


Figure D. Spread between obligated and nonobligated fuels: actual values (green), predicted values based on the KMS benchmark levels model estimated over the KMS sample (orange), and predicted values based on complete pass-through (blue). The vertical line separates the KMS sample and the out-of-sample period.

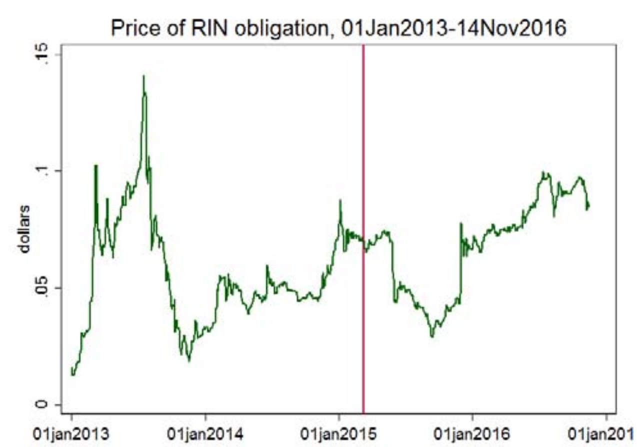


Figure E. Price of RIN obligation, Jan. 1, 2013 – Nov. 14, 2016

Data and methods

Data. The data were updated from the same source as in KMS; see the Data Appendix to this note. A seventh spread, newly added in this analysis, is the NYH CBOB spot – Rotterdam EBOB spread. Because the NYH RBOB is a prompt-month futures price while the Rotterdam EBOB is a spot price, adding this seventh spread creates a spot-spot comparison.

Each of the spreads is the price difference (in dollars per gallon) of an obligated petroleum fuel and a non-obligated fuel. Thus each spread has the same RIN obligation per gallon of fuel. The RIN obligation is the value, based on that day's RIN prices, of the bundle of RINs that an obligated party must retire with EPA per gallon of obligated fuel. The price of this RIN depends on the fractional RIN requirement for that year under the RFS.[4] The original KMS RIN price data set had some missing RIN observations, for which RIN prices were imputed using prior day data. For this analysis and for the concurrently updated KMS paper (see footnote 1), the missing values in the KMS data set have been filled in using OPIS data.

For convenience, henceforth we refer to the original KMS sample period of Jan. 1, 2013 – March 9, 2015 as the KMS sample, and the period March 10, 2015 – Nov. 14, 2016 as the out of sample (OOS) period. The full sample is the combined KMS and OOS periods, Jan. 1, 2013 – Nov. 14, 2016. The pre-sample period is the later of Jan. 1, 2005 or the first date at which a given series is available, through Dec. 31, 2012

Methods. We briefly summarize the two methods of KMS, highlighting two issues that are important for this extension, cointegration and the use of seasonals.

Let $S_t^{ij} \equiv P_t^i - P_t^j$ denote the spread between the price of an obligated fuel *i* and a non-obligated fuel *j*, and let R_t^{ij} denote the net RIN obligation on the spread.

The first set of methods are levels regressions of the form,

$$S_t^{ij} = \alpha_{ij} + \theta_{ij} R_t^{ij} + [\gamma' Seaonals] + u_t^{ij}, \qquad (1)$$

see KMS equation (1). The (levels) pass-through coefficient is θ_{ij}, and full pass-through corresponds to $\theta_{ij} = 1$. This coefficient represents a long-run effect of RIN prices on the spread and this method does not estimate the dynamics of RIN price adjustment.

The second method estimates the dynamics of RIN price adjustment using a vector autoregression (VAR). Let $Y_t = (R_t^{ij}, S_t^{ij})$. The VARs are specified in levels of Y_t and have the form:

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[4]In 2016, for each gallon of petroleum fuel imported or refined and sold into the domestic surface transportation market, the importer or refiner (obligated party) must turn in a total of 0.101 RINs, of which 0.0159 must be D4 (biomass-based diesel) and 0.0201 must be D4 or D5 (advanced), so up to 0.0809 can be D6 (conventional). Because the EPA delayed issuing the 2014 and 2015 rules, from Jan. 1, 2014 through the EPA proposed rule issued May 29, 2015, we use the 2013 fractional obligations. For May 29, 2015 – Dec. 31, 2015, we use the 2015 proposed fractional obligations. For 2016, we use the 2016 fractional obligations, which were finalized in November 2015.

$$Y_t = \Psi_0 + \sum_{k=1}^{p} \Psi_k Y_{t-k} + [\Gamma Seasonals_t] + \eta_t \ , \tag{2}$$

where the coefficient matrix Ψ_k is a matrix of autoregressive coefficients on the k^{th} lag of Y. The coefficients in the matrices $\{\Psi_k\}$ and Γ are unrestricted.

Two methodological points, noted in KMS, turn out to be relevant in analyzing the extended data set.

First, the levels regression in equation (1) is valid either if the spread and the RIN obligation are jointly stationary (no unit root), or if they both have a unit root and are cointegrated. If, however, both the spread and RIN obligation have a unit root but they are not cointegrated, then the error term in equation (1) has a unit root and the levels regression is invalid in the sense of giving neither a consistent estimator of θ_{ij} nor a valid standard error. In contrast, the VAR in equation (2) is valid in all three cases (both stationary, both unit roots and cointegrated, both unit roots but not cointegrated) because it includes lags.

Second, many of the spreads have strong seasonal patterns, so it is important to handle that seasonality to avoid potential omitted variable bias. KMS provide two methods. The first is to include seasonal variables in the regression, specifically sines and cosines at the first 4 harmonic frequencies (a total of 8 seasonal variables). The second is to seasonally adjust the spreads, but not the RIN prices, using pre-sample data (pre-2013); see KMS equation (5) and the surrounding discussion. The logic of this second procedure is the standard logic of seasonal adjustment: the spreads typically have seasonal patterns, but because those seasonal patterns are driven by seasonal shifts in fuel demand they should not change substantially from one year to the next. Estimating the seasonals on pre-2013 data avoids confusing seasonals and RIN-driven movements. There is no reason that RIN prices should have seasonals[5] so in this second procedure, RIN prices are not seasonally adjusted.

Empirical results

We first explain the figures and tables of results before turning to a substantive discussion.

Figures 1-7 present charts for each of the 7 spreads. We explain figure 1 in detail for the Gulf diesel-Gulf jet fuel spread; figures 2-6 have the same format for the other six spreads. The upper left panel presents the time series plot of the spread (green) over the full sample, with the vertical line denoting the boundary between the KMS sample and the OOS sample. The orange line is the predicted value from regression (1), estimated over the KMS sample, using seasonally unadjusted data and including seasonals in the regression (this is model 1 in Table 2 of KMS). Values of the orange line in the OOS period are the out-of-sample predicted values of the spread,

[5] RINs are electronic and bankable and can be retired with the EPA at any point through the true-up period, typically February following the obligation year. As a result, they are not subject to storage costs or any of the demand, supply, and physical factors that drive seasonal fuel price fluctuations.

given RIN prices, computed using the coefficients estimated using the KMS sample. The blue line is the predicted value with full pass-through (the estimated pass-through coefficient in the orange line is set to 1).

The upper right panel presents the same set of results, except that the spreads are seasonally adjusted so the levels regression omits the seasonal variables (this is model 4 in Table 2 of KMS). The orange line is the predicted value estimated using the KMS sample and the blue line is full pass-through.

The middle left panel is a scatterplot of the change in the spread versus the change in the price of the RIN obligation, both expressed as changes in the weekly average. The green dots are from the KMS sample, the blue triangles are from the OOS sample, and the green and blue lines are the regression lines for the KMS and OOS samples respectively. The black line is the 45º line that represents complete pass-through. This scatterplot updates KMS Figure 6 (working paper version).

The final three panels are impulse response functions from the VAR in equation (2), estimated using the seasonally adjusted data. The middle-right panel is for the KMS sample, the bottom-left panel is for the OOS sample, and the bottom-right panel is for the full sample. The grey areas denote ± one standard error bands.

Figures 8-10 present impulse response functions for pooled VARs, in which the same dynamics are imposed for multiple spreads (see KMS for the details). Figure 8 presents results for VARs that pool the three diesel spreads. Figure 9 presents results for VARs that pool the same six wholesale spreads analyzed by KMS. Figure 10 presents results for VARs that pool five refined product spreads (the four refined product spreads analyzed by KMS and also the NYH CBOB spot-EBOB spread). The two Brent spreads that were analyzed by KMS are not included in the pooled VARs in Figure 10. In figures 8-10, impulse response functions in the left column are for VARs that include seasonal variables, and impulse response functions in the right column are for VARs estimated on seasonally adjusted spreads. The top row is for the KMS sample, the middle row is for the OOS sample, and the bottom row is for the full sample.

Table 1 presents the levels regressions results. The first panel presents results for the KMS sample and corresponds to Table 2 in KMS (regressions 1, 2, and 4). The second panel presents results for the OOS sample, and the third panel presents results for the full sample. For the full sample, Table 1 also reports results of the *t*-test for a break in the coefficients between the two samples.

Table 2 presents pooled levels regression results for various combinations of spreads: diesel, the original KMS gasoline spreads, the original KMS pooled diesel and gasoline spreads, and in the final column, the five refined product spreads (original KMS four and also CBOB-EBOB). Regressions 1, 2, and 4 in Table 2 extends the same regressions in KMS Table 3 to the new estimation samples.

Table 3 presents the impulse response functions from the pooled VARs for the diesel spreads and the five refined product spreads, for the two methods of handling seasonals and for the KMS and full sample. The first two columns of the first panel are the first two columns of KMS, Table 4.

Discussion

Broadly speaking, the results for the five spreads between refined product prices are similar to each other, the results for the two RBOB-Brent spreads are similar to each other, and the results for these two groups differ. We begin by discussing the five refined product spreads.

1. For the five refined product spreads, the pooled models estimated on the KMS sample are stable out of sample, both in the levels specifications and in the dynamics estimated by the VARs. Dynamic pass-through estimates from the pooled VARs estimated using seasonally adjusted data are quantitatively and qualitatively similar in the KMS sample, the OOS sample, and in the full sample. Using the KMS sample and seasonally adjusted data, the pass-through coefficient after 10 days is .99 (SE = .28), and after 15 days is 1.01 (SE = .30). The dynamics estimated using the full sample are slightly slower, but not statistically different than, the KMS sample estimates: in the full sample, the 10-day pass-through coefficient is .91 (SE = .21) and the 15-day pass-through is .97 (SE = .22). Using the seasonal adjustment method in KMS (that is, including seasonals in the VAR), the 10-day pass-through coefficients for the five pooled refined product spreads are 1.25 (SE = .26) for the KMS sample and .96 (SE = .18) for the full sample. Static and dynamic pass-through estimates for individual spreads differ between the KMS sample and the OOS sample but with no particular pattern across the five refined product spreads, with estimates for some spreads indicating greater pass-through and for others indicating less, frequently with large standard errors in the OOS period. Overall, the results for these five refined product spreads are consistent with complete pass-through.

    a. The amount of information in the OOS period is more limited than in the KMS period, both because the number of observations is fewer and because the variation in RIN prices is less during the OOS period than during the KMS period. This is most readily seen by inspecting the scatterplots in Figures 1-7, in which the spread of green dots is substantially larger than the spread of the blue triangles. In the scatterplots, the correlations in the OOS period seem to be driven by a few large outliers, which suggests caution interpreting results for the OOS period.

    b. The fact that the OOS period is only 19 months creates a challenge for handling seasonal variation using only the OOS sample. Regressions that include seasonals in the model estimated on the OOS sample are effectively estimating seasonal patterns based just over a single observation (~1½ years). Consequently, including seasonal terms in the regression absorb fluctuations at the monthly level, whether or not those actually are seasonals. A preferable approach to handling seasonals in such a short sample is to use prior data to estimate the seasonals, then estimate regressions using the seasonally adjusted data. Comparing results across the two approaches – including seasonals in the model, or using seasonally adjusted data – shows that they yield similar results in the longer KMS sample and in the full sample, but can yield sharply different results in the short OOS sample. Because the method of using seasonally adjusted data is better suited for the OOS sample, we focus here on results using seasonally adjusted data.

c. The upper panel of Figures 1-4 and 7 indicates generally stable performance of the in-sample fit during the OOS period. Qualitatively, the RIN-predicted value (KMS sample estimated and full pass-through) tracks a smooth mean of these noisy spreads, both in the model with seasonals and using seasonally adjusted data. However, tests for a break in the pass-through coefficient are mixed, with two rejecting stability at the 5% level, one at the 10% level, and two not rejecting. We discuss two of these spreads that reject, the Gulf diesel-Gulf jet spread and the NYH CBOB-EBOB spread, below.

d. The results of the levels regressions for the five refined product spreads are consistent with complete pass-through. Of the 15 pass-through coefficients (five refined product spreads estimated over the KMS, OOS, and full sample) estimated using seasonally adjusted data, only three reject complete pass-through at the 10% significance level (Gulf diesel-Rotterdam diesel in the KMS sample, and Gulf diesel-Gulf jet and NYH CBOB-EBOB in the OOS sample). Two of these rejections are in the direction of less-than complete pass-through, while one is in the direction of more-than-complete pass-through. This said, the standard errors in the OOS sample are quite large for some of the spreads, consistent with point 1a about there being limited information in the OOS period.

e. Two of the refined product spreads exhibit large but transitory departures from their RIN-predicted value during the OOS period. The Gulf diesel-Gulf jet spread remained high during the summer of 2015, in contrast to its estimated seasonal pattern As a result, the estimated pass-through coefficient for this spread is attenuated in the OOS period (high spread but low RIN obligation for the first part of the OOS period). This period coincides with the "diesel glut" of the summer of 2016, in which there was a relative oversupply of diesel and undersupply of gasoline (see footnote 2). Re-estimating the pass-through coefficient for the Gulf diesel-Gulf jet spread from September 1, 2015 – Nov. 14, 2016, i.e. after the "diesel glut" subsided, results in a pass-through coefficient of .88 (SE = .20) using seasonally adjusted data, compared to .49 in the OOS sample. For the CBOB-EBOB spread, the aberrant period is in the spring of 2016, where the RIN price is high but the spread is even higher, even after seasonal adjustment. Mechanically, this results in a large pass-through coefficient for the CBOB-EBOB spread (high RIN prices, even higher spread) during the OOS period. These periods of departure account for the rejection for these two series of the test for coefficient stability. From a theoretical perspective, price spreads are determined by multiple factors including inventory developments, supply chain disruptions, and refinery decisions, and RIN prices are only one of these multiple factors. In these regressions, those factors are relegated to the error term, and because they are persistent (lasting several months, a substantial fraction of the OOS sample) they can pose problems for the levels regressions with RIN prices in the short sample. In the longer samples (KMS and full), these departures are a smaller fraction of the sample so they pose less of a risk of omitted variable bias.

f. The pooled levels regressions (Table 2, final column) for the diesel spreads, and for the five refined product spreads, are consistent with the findings for the individual spreads levels regressions. Of the pooled estimates using all five spreads, among the 9 estimates, the only ones that reject at the 5% level are those in which seasonals are included in the model and the regression is estimated in the subsample. As discussed before this is an inappropriate method for handling seasonals in a short sample. When seasonally adjusted data are used in the KMS sample for the five refined product spreads, the pass-through coefficient is 0.81 (SE = 0.15). In the full sample, all estimates are within a standard deviation of one, regardless of the seasonal adjustment method. The KMS abstract refers to a pooled pass-through coefficient of 1.00 (SE = 0.11). Using the full sample and the same method, for the five refined product spreads, the estimate is 1.12 (SE = 0.09). Using seasonally adjusted data, it is 1.00 (SE = 0.14).

g. The IRFs for the VAR estimated using the pooled diesel spreads, estimated on seasonally adjusted data, are similar (within one standard error) in the KMS sample and in the OOS period (Figure 8, right column). For the five pooled refined product spreads, the IRFs are again similar in the KMS and OOS periods using seasonally adjusted data (Figure 10, right column). For the pooled three diesel spreads and the pooled five refined product spreads, the IRFs using seasonally adjusted data and the IRFs using seasonals in the VAR are similar in both the KMS and OOS samples. For the pooled diesel spreads and the pooled refined product spreads, the dynamic estimates using the full sample point to complete pass-through. Using the full sample improves the precision of the estimates relative to using just the KMS sample.

2. In contrast to the five refined fuel spreads, the two BOB-Brent spreads exhibit large and persistent departures from the RIN-predicted value. In brief, supply developments unrelated to the RFS, such as the Exxon-Torrance refinery fire, produced high crack spreads in the spring through fall of 2015, when RIN prices were relatively low, and the spreads returned to normal later in the sample, when RIN prices were relatively high. As a result, in the out-of-sample period, the levels regressions spuriously estimate negative pass-through coefficients.

    a. The central idea of using spreads between obligated and non-obligated fuels is that the non-obligated fuel serves as a "control" for common factors that influence the price of the two fuels. The closer the two fuels are chemically and geographically, the better the control. On *a-priori* grounds, the most compelling comparisons are Gulf diesel to Gulf jet, and NYH RBOB (or CBOB) to Rotterdam EBOB. In contrast, comparing refined product prices to Brent introduces the additional determinants of the crack spread including crude and refined inventories and changes in refiner operations. As noted in KMS, the crack spreads are much noisier than the refined product spreads, making the econometric exercise of finding the RIN price signal more difficult. Thus, on *a-priori* grounds, Brent is a less reliable control fuel than a comparable refined product.

    b. It further appears that developments in the crude and refined product market in 2015 undercut the statistical utility of Brent as a control fuel. The LA RBOB – Brent spread fluctuated in the range of zero to fifty cents during the KMS period but rose to around one dollar during the spring through fall of 2015. This persistently high price of LA RBOB, relative to crude, was associated with particularly high gasoline prices in California, relative to the rest of the country, and these high prices attracted a great deal of public attention. These high prices have been variously attributed to the February 18, 2015, fire at Exxon's Torrance refinery, to the expansion of California's cap and trade program to gasoline on January 1, 2015, to supply restrictions stemming from the limited number of refineries that produce CARBOB, and to other factors.[6] High LA RBOB prices during the spring-fall of 2015 in the presence of low RIN prices, followed by normal LA RBOB prices by the end of the sample when RIN prices had risen, produce a negative correlation that results in a large negative estimated pass-

[6] See Borenstein (2015) at https://energyathaas.wordpress.com/2015/09/28/why-are-californias-gasoline-prices-so-high/.

through coefficient. This large negative pass-through coefficient can be attributed to omitted variable bias, where the omitted variables are the supply-side disturbances that widened the California BOB-Brent spread. The persistent, supply-side factors that affected California gasoline markets confound the relationship between spreads and RIN prices, rendering unreliable the econometric analysis of the LA RBOB-Brent spread. In principle, this omitted variable bias could be addressed by including additional regressors that control for the supply disruptions and other factors leading to the high crack spread. However, needing to look for such factors underscores that Brent is not a useful control fuel during the out-of-sample period.

c. The NYH RBOB-Brent spread also exhibits persistent departures from the RIN-predicted value during this period. EIA attributed the historically high crack spreads in the spring of 2015 to expanding demand in the face of low oil prices, among other factors.[7]

d. The dynamic pass-through estimates using the six pooled spreads in KMS are statistically close to each other in both the KMS sample and the full sample (Figure 9) using both seasonal adjustment methods, and these four estimates are consistent with complete pass-through after ten days (0.89, SE = 0.25 with seasonals in the regression, 0.87, SE = 0.26 for seasonally adjusted data, both for the full sample). That said, the foregoing discussion of the persistent departures of the crack spreads in 2015 lead us to prefer the pooled estimates in Figure 10 based on the five refined product spreads, omitting the two crack spreads because of the supply-side omitted variables discussed above.

[7] See http://www.eia.gov/forecasts/steo/uncertainty/pdf/may15_uncertainty.pdf and https://www.eia.gov/forecasts/steo/archives/feb16.pdf.

Data Appendix

Prices of D4, D5, and D6 RINs are from the following hierarchy: Progressive Fuels Limited[8] when available (through 30Nov2014); if missing, then from OPIS (through 14Nov2016). The July 2015 version of KMS had some missing RIN prices during the KMS period, here and in the contemporaneous revision of KMS we have used OPIS data to fill in those missing RIN prices.

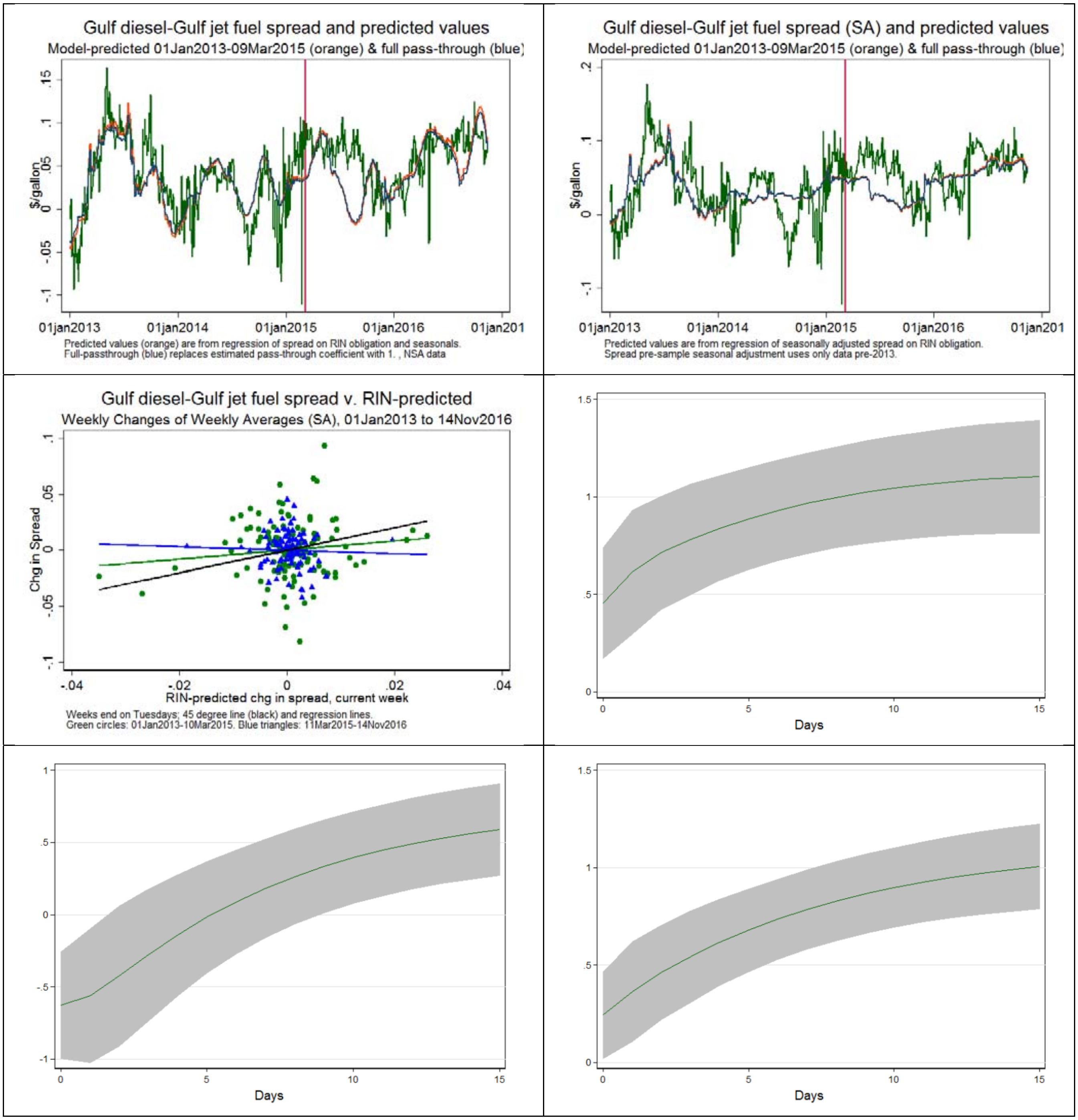
Domestic wholesale prices were obtained from the Energy Information Administration:[9] New York Mercantile Exchange prompt-month futures prices for reformulated blendstock for oxygenated blending (RBOB) New York Harbor, and spot prices for Brent oil, RBOB Los Angeles, CBOB New York Harbor, Ultra-low sulfur No. 2 diesel New York Harbor and U.S. Gulf Coast, and Kerosene-type jet fuel U.S. Gulf Coast.

Two wholesale European prices are used: the price of Rotterdam barge German diesel (10ppm sulfur), and the price of European blendstock for oxygenated blending (EBOB) free on board Rotterdam (both quoted in dollars per ton, converted to dollars per gallon). We use Argus data 03Jan2012-10Mar2015, before and after that Rotterdam diesel and Rotterdam EBOB prices are from Bloomberg. During the period that the Argus data are available, the standard deviations of the difference between the Bloomberg and Argus series are very small: $.0056 for Euro diesel and $.0067 for EBOB.

The data are for U.S. business days, typically close of business local time. For this analysis and in KMS, business days are defined to be days for which the NYMEX prices from EIA are non-missing.

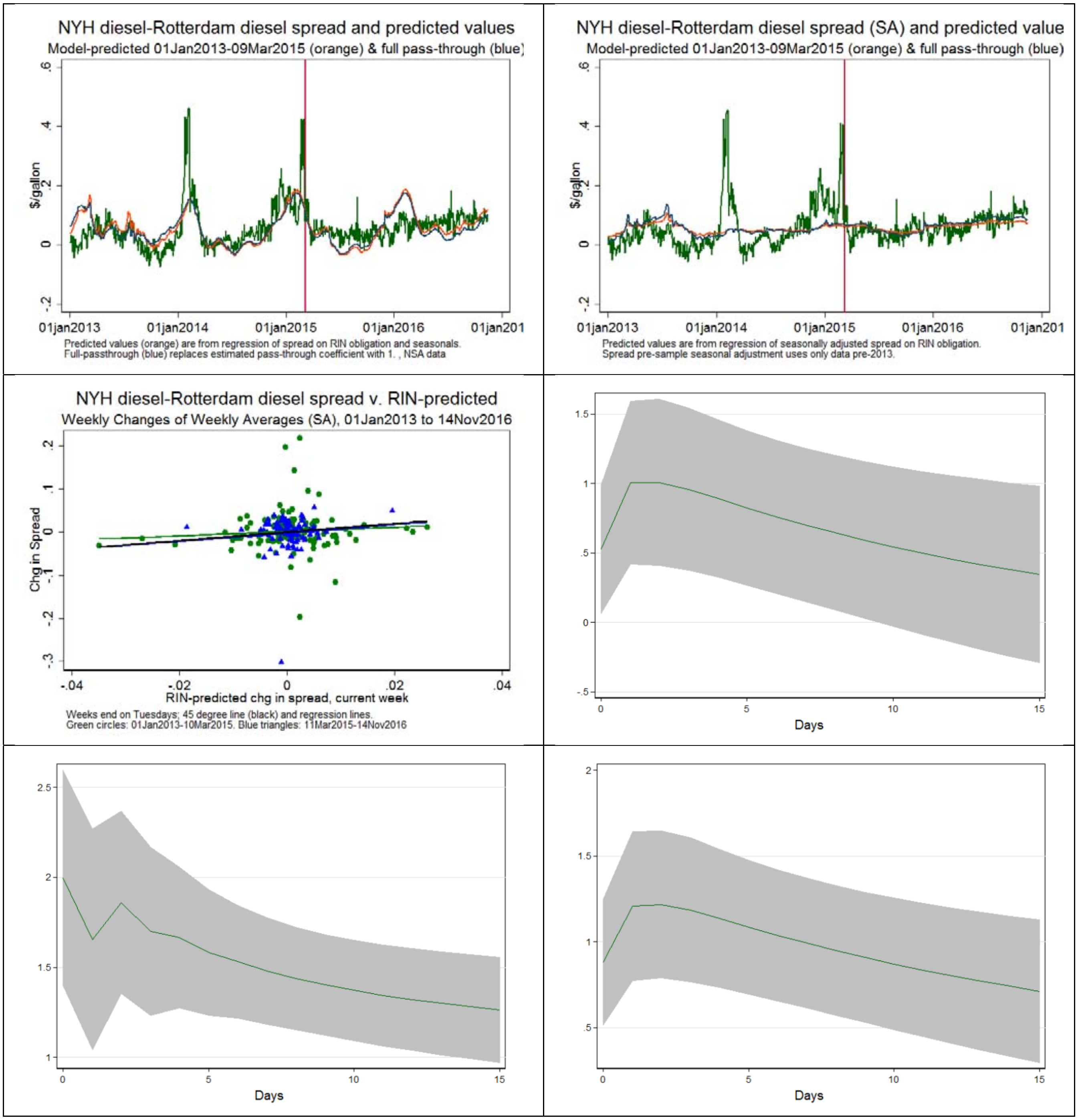
[8] RIN price data from Progressive Fuels Limited are proprietary. Progressive Fuels Limited can be reached online at www.progressivefuelslimited.com and by phone at 239-390-2885. These RIN prices are traded prices and do not necessarily reflect prices embedded long-term contracts for RINs.

[9] Spot prices were downloaded from http://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm, and futures prices were downloaded from http://www.eia.gov/dnav/pet/pet_pri_fut_s1_d.htm.



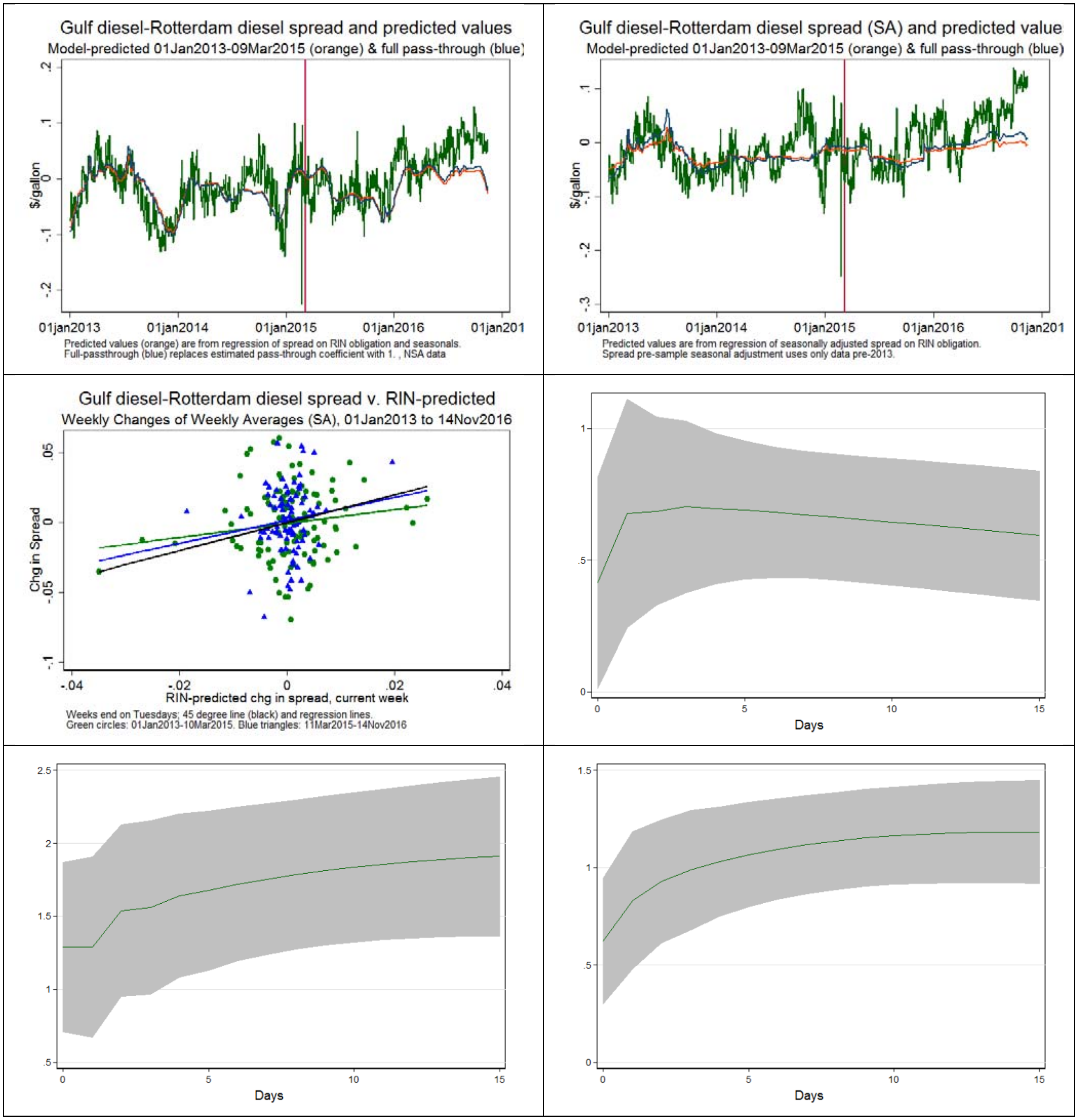
Notes: upper panels present spreads (green), KMS-sample predicted values (orange), and predicted under full pass through (blue), for seasonally unadjusted data/seasonals in model (left) and seasonally adjusted data (right). Middle left is scatterplot of weekly changes in spread on weekly changes in RIN obligation. Remaining panels are VAR impulse response presenting dynamic response of a change in the RIN obligation price on the spread, estimated using seasonally-adjusted data, in the KMS sample (middle-right), OOS (bottom-left), and full sample (bottom right).

Figure 1. Results for Gulf diesel – Gulf jet



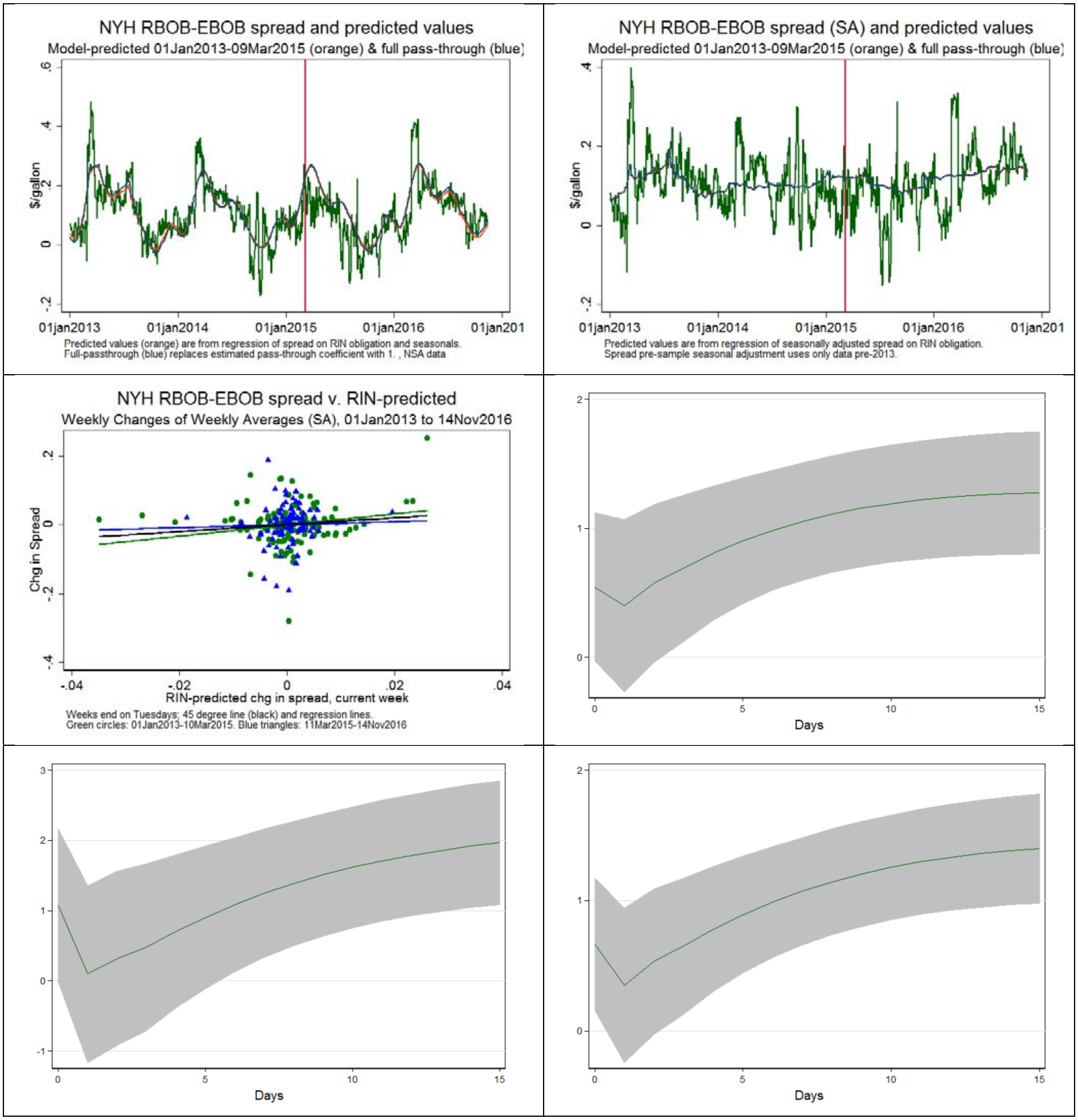
Notes: upper panels present spreads (green), KMS-sample predicted values (orange), and predicted under full pass through (blue), for seasonally unadjusted data/seasonals in model (left) and seasonally adjusted data (right). Middle left is scatterplot of weekly changes in spread on weekly changes in RIN obligation. Remaining panels are VAR impulse response presenting dynamic response of a change in the RIN obligation price on the spread, estimated using seasonally-adjusted data, in the KMS sample (middle-right), OOS (bottom-left), and full sample (bottom right).

Figure 2. Results for NYH diesel – Rotterdam diesel



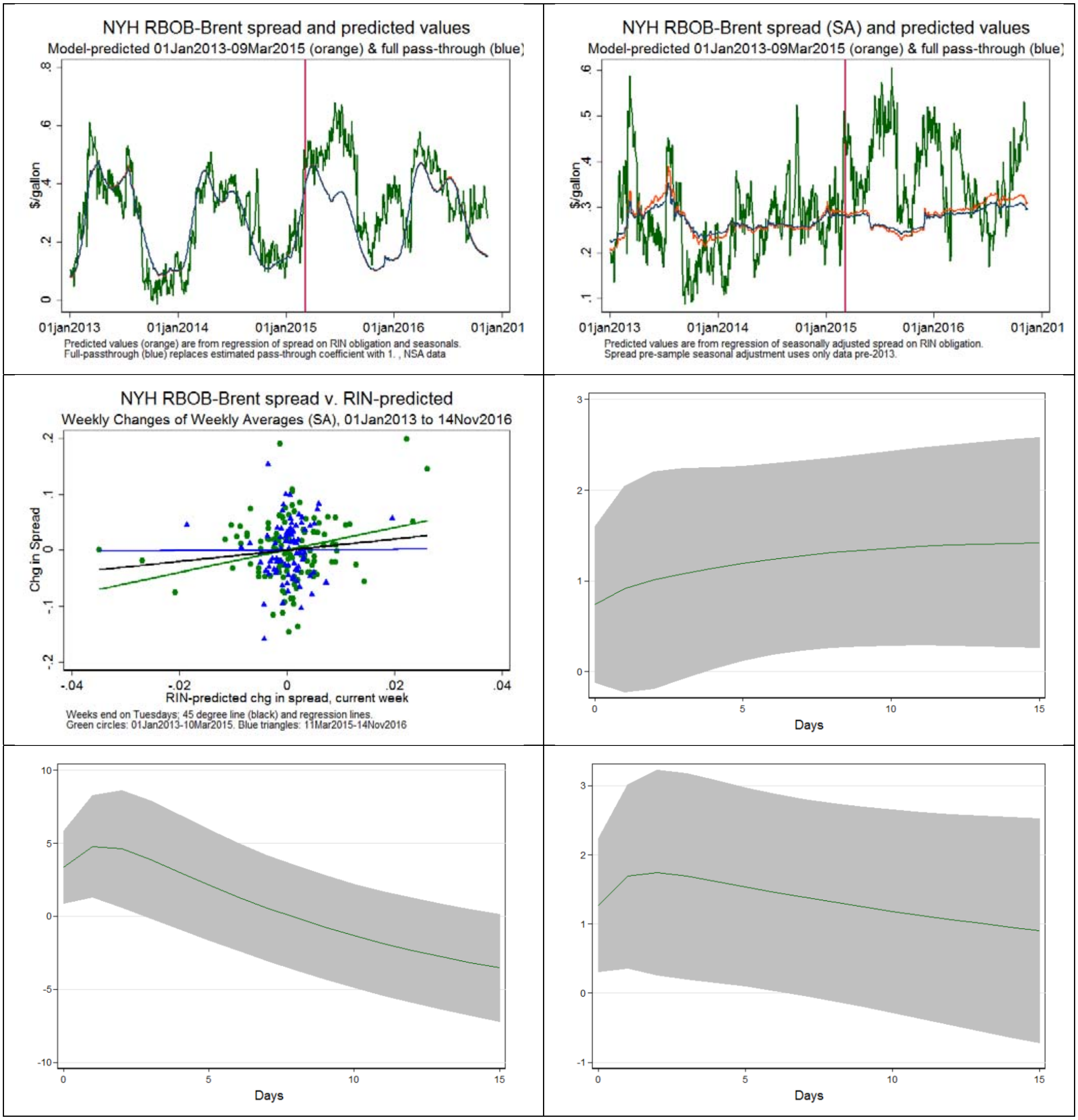
Notes: upper panels present spreads (green), KMS-sample predicted values (orange), and predicted under full pass through (blue), for seasonally unadjusted data/seasonals in model (left) and seasonally adjusted data (right). Middle left is scatterplot of weekly changes in spread on weekly changes in RIN obligation. Remaining panels are VAR impulse response presenting dynamic response of a change in the RIN obligation price on the spread, estimated using seasonally-adjusted data, in the KMS sample (middle-right), OOS (bottom-left), and full sample (bottom right).

Figure 3. Results for Gulf diesel – Rotterdam diesel



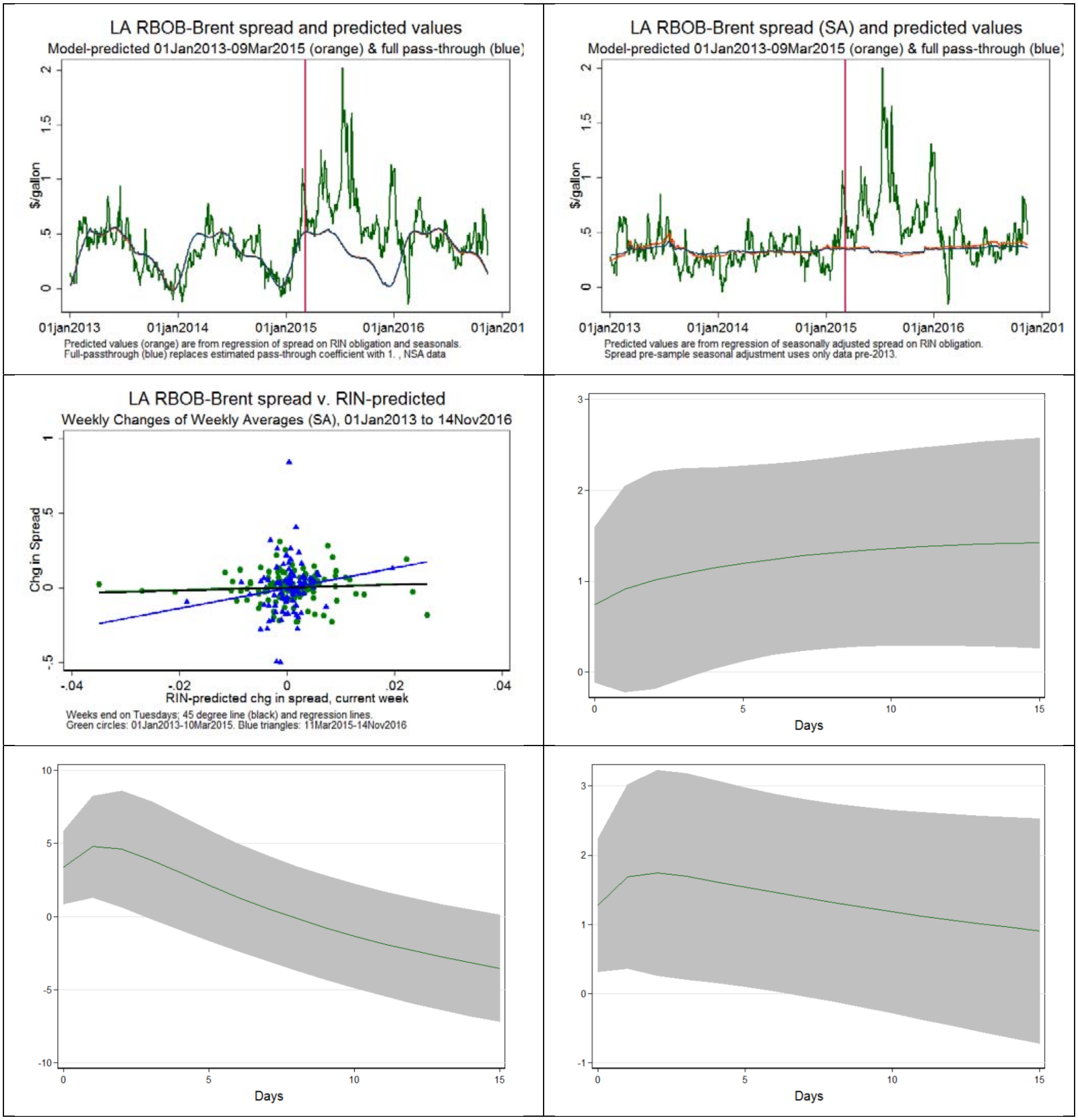
Notes: upper panels present spreads (green), KMS-sample predicted values (orange), and predicted under full pass through (blue), for seasonally unadjusted data/seasonals in model (left) and seasonally adjusted data (right). Middle left is scatterplot of weekly changes in spread on weekly changes in RIN obligation. Remaining panels are VAR impulse response presenting dynamic response of a change in the RIN obligation price on the spread, estimated using seasonally-adjusted data, in the KMS sample (middle-right), OOS (bottom-left), and full sample (bottom right).

Figure 4. Results for NYH RBOB futures – Rotterdam EBOB



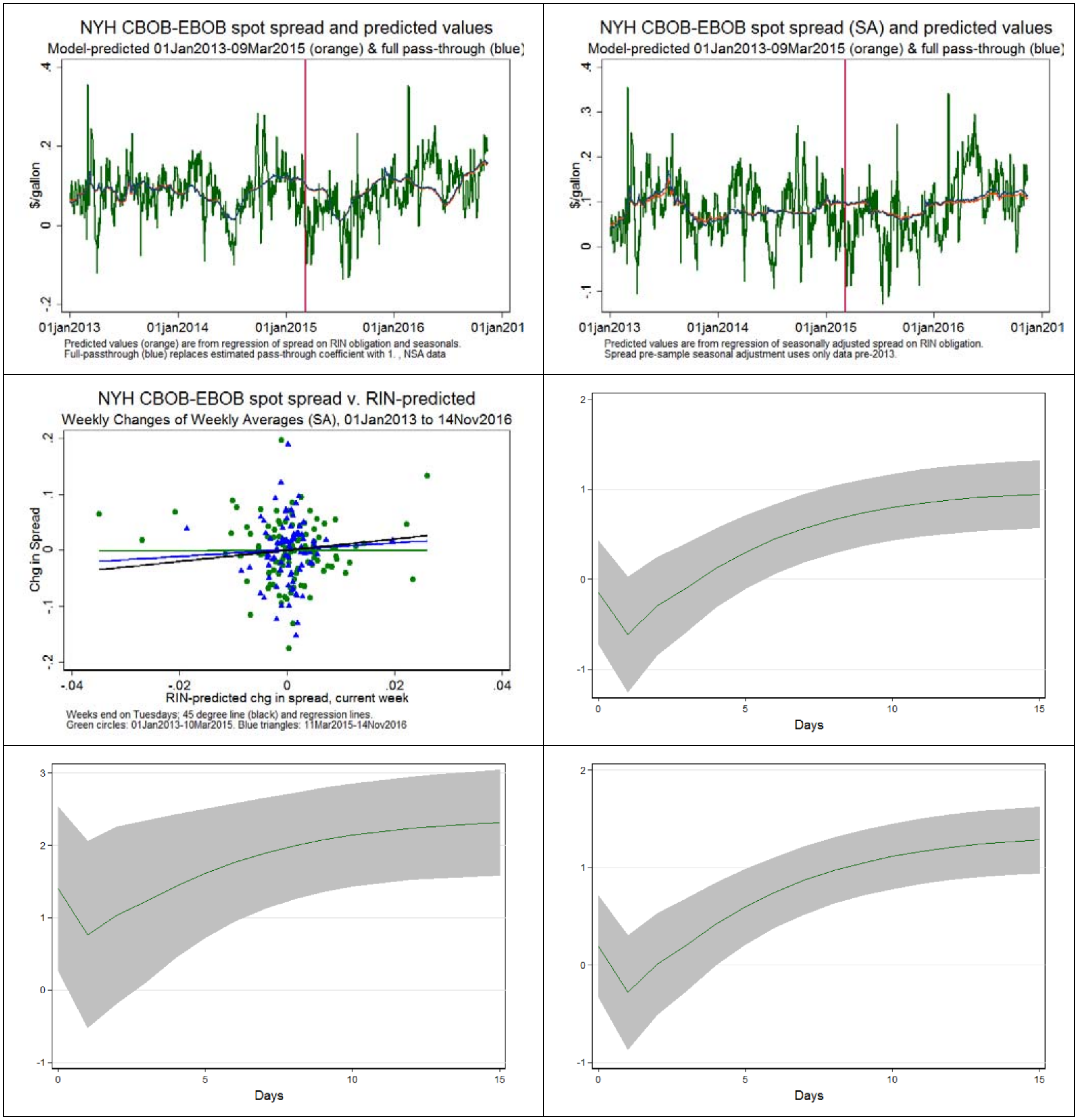
Notes: upper panels present spreads (green), KMS-sample predicted values (orange), and predicted under full pass through (blue), for seasonally unadjusted data/seasonals in model (left) and seasonally adjusted data (right). Middle left is scatterplot of weekly changes in spread on weekly changes in RIN obligation. Remaining panels are VAR impulse response presenting dynamic response of a change in the RIN obligation price on the spread, estimated using seasonally-adjusted data, in the KMS sample (middle-right), OOS (bottom-left), and full sample (bottom right).

Figure 5. Results for NYH RBOB futures – Brent



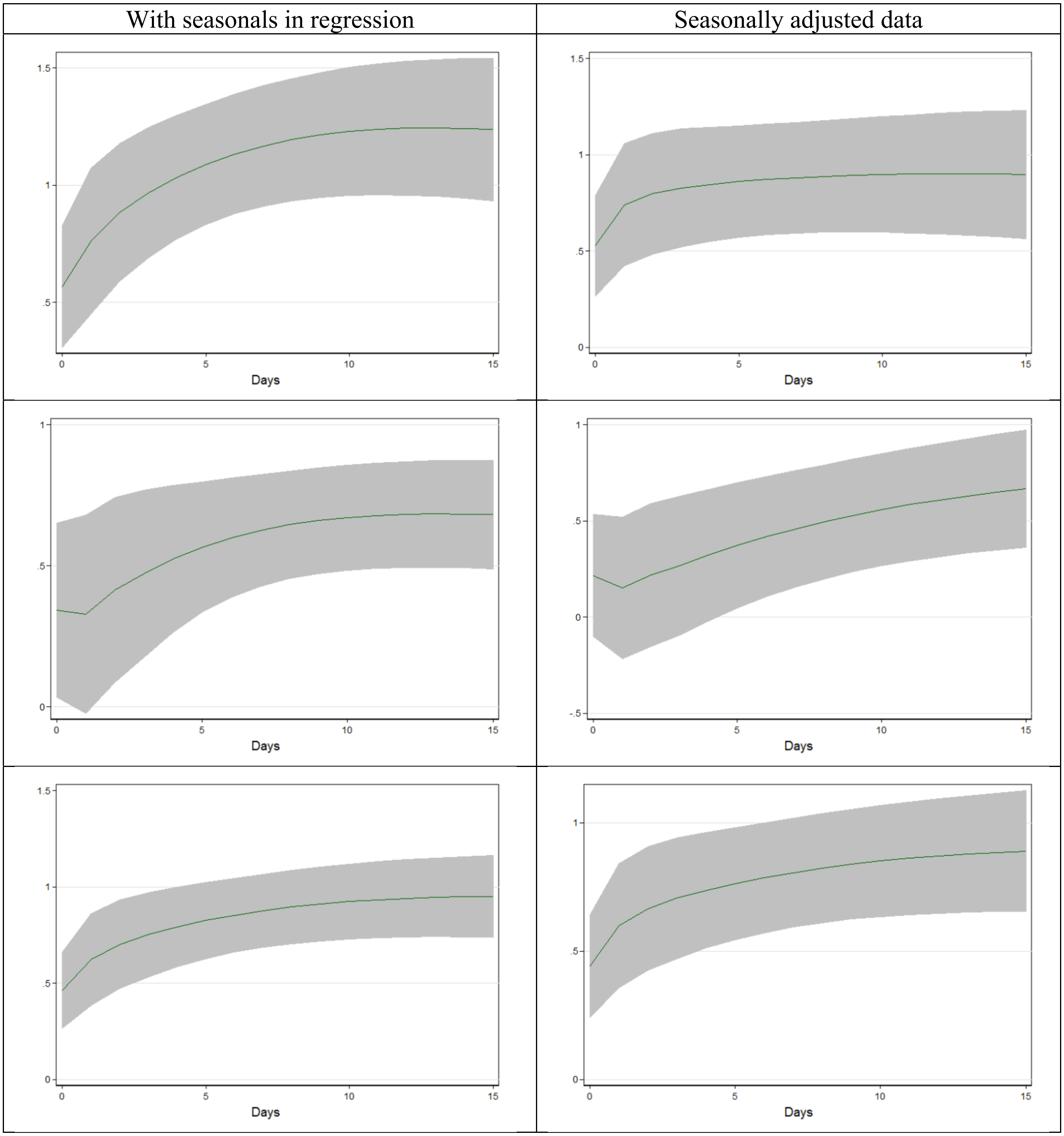
Notes: upper panels present spreads (green), KMS-sample predicted values (orange), and predicted under full pass through (blue), for seasonally unadjusted data/seasonals in model (left) and seasonally adjusted data (right). Middle left is scatterplot of weekly changes in spread on weekly changes in RIN obligation. Remaining panels are VAR impulse response presenting dynamic response of a change in the RIN obligation price on the spread, estimated using seasonally-adjusted data, in the KMS sample (middle-right), OOS (bottom-left), and full sample (bottom right).

Figure 6. Results for LA RBOB spot – Brent



Notes: upper panels present spreads (green), KMS-sample predicted values (orange), and predicted under full pass through (blue), for seasonally unadjusted data/seasonals in model (left) and seasonally adjusted data (right). Middle left is scatterplot of weekly changes in spread on weekly changes in RIN obligation. Remaining panels are VAR impulse response presenting dynamic response of a change in the RIN obligation price on the spread, estimated using seasonally-adjusted data, in the KMS sample (middle-right), OOS (bottom-left), and full sample (bottom right).

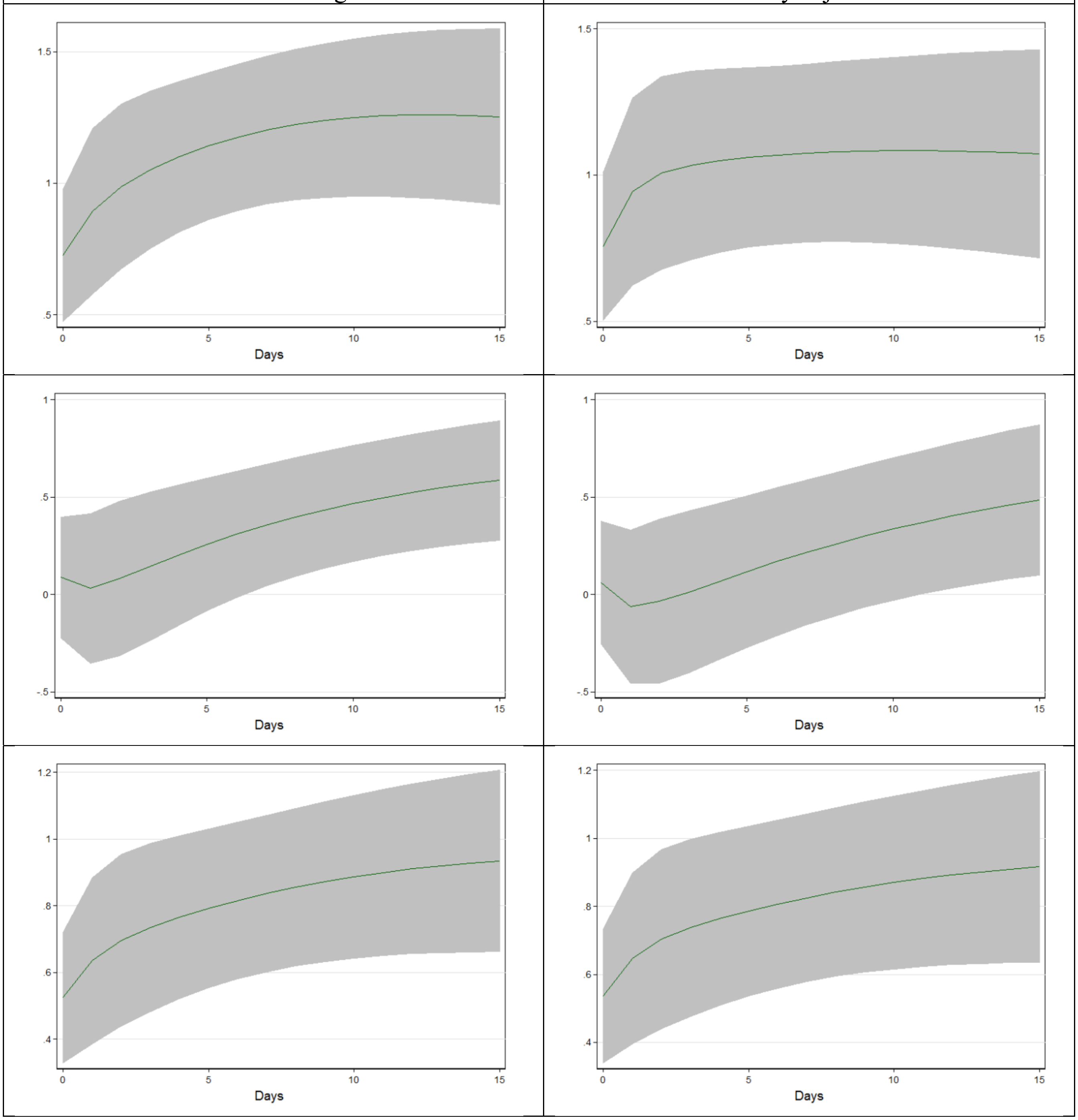
Figure 7. Results for NYH CBOB spot – Rotterdam EBOB



Notes: Left: with seasonals in VAR (left panel) Right: Seasonally-adjusted data
Top: KMS sample; Middle: post-09March2015. Bottom: full sample. *Note that the vertical scales vary across panels*.

Figure 8. Pooled impulse response functions: Diesel spreads

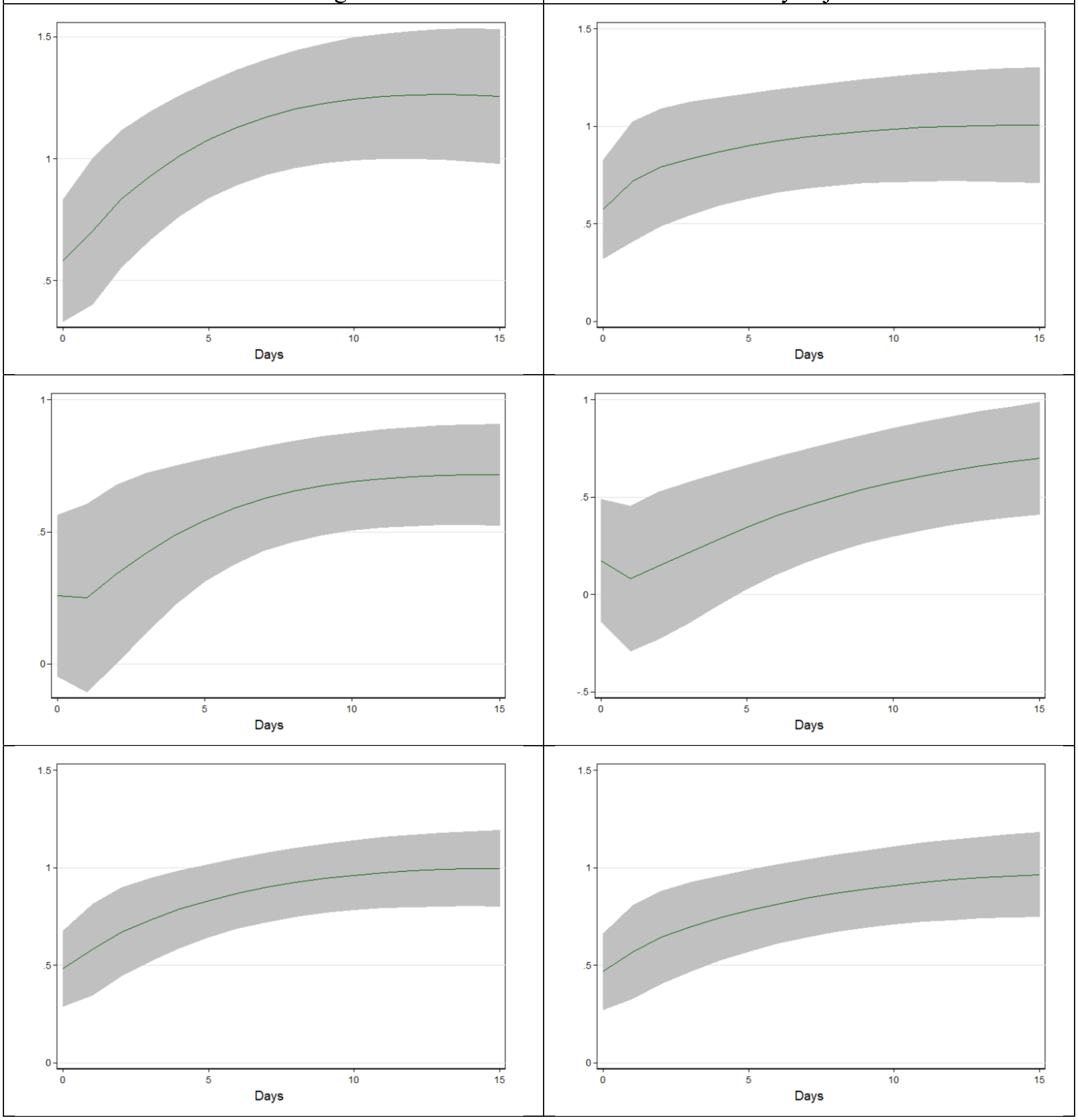
With seasonals in regression	Seasonally adjusted data



Notes: Left: with seasonals in VAR (left panel) Right: Seasonally-adjusted data
Top: KMS sample; Middle: post-09March2015. Bottom: full sample. *Note that the vertical scales vary across panels*.

Figure 9. Pooled impulse response functions: Diesel spreads + KMS original BOB spreads

With seasonals in regression	Seasonally adjusted data



Notes: Left: with seasonals in VAR (left panel) Right: Seasonally-adjusted data

Top: KMS sample; Middle: post-09March2015. Bottom: full sample. *Note that the vertical scales vary across panels*.

Figure 10. Pooled impulse response functions: Diesel spreads, NYH RBOB futures – EBOB, and NYH CBOB spot - EBOB

Table 1. Extended Sample: Estimated pass-through coefficients from levels fuel spread regressions (wholesale petroleum fuels only)

Regression coefficients (standard errors):	Original KMS wholesale petroleum fuel spreads						Additional
	Gulf diesel–Gulf jet fuel	NYH diesel–Rott. diesel	Gulf diesel–Rott. diesel	NYH RBOB Fut –EBOB	NYH RBOB Fut –Brent	LA RBOB Spot –Brent	NYH CBOB Spot –EBOB
01Jan2013-10Mar2015							
(1a) OLS, seasonals	1.159	1.565	0.818	0.682	1.086	0.711	0.903
	(0.154)	(0.424)	(0.142)	(0.332)	(0.310)	(0.701)	(0.278)
(2a) DOLS, seasonals	1.199	1.650	0.836	0.579	1.031	0.744	0.984
	(0.156)	(0.454)	(0.159)	(0.311)	(0.326)	(0.725)	(0.318)
(4a) OLS, SA data	1.059	0.628	0.603^^	0.952	1.436	1.906	0.799
	(0.225)	(0.469)	(0.185)	(0.353)	(0.477)	(0.749)	(0.181)
11Mar2015-14Nov2016							
(1b) OLS, seasonals	0.446^^^	1.045	1.834^^^	1.939^^^	-1.219^^	-7.007^^^	1.763^^
	(0.145)	(0.051)	(0.088)	(0.229)	(1.021)	(2.442)	(0.301)
(2b) DOLS, seasonals	0.466^^^	1.030	1.848^^^	2.018^^^	-1.225^^	-7.351^^^	1.748^^
	(0.149)	(0.052)	(0.093)	(0.253)	(1.030)	(2.460)	(0.312)
(4b) OLS, SA data	0.488^^	0.947	1.628	1.733	-1.282^^	-7.039^^^	1.750^
	(0.231)	(0.223)	(0.421)	(0.565)	(1.059)	(2.839)	(0.404)
01Jan2013-14Nov2016							
(1c) OLS, seasonals	0.800	1.158	1.408^^	1.152	0.951	-0.705	1.096
	(0.156)	(0.277)	(0.193)	(0.259)	(0.702)	(1.895)	(0.210)
(2c) DOLS, seasonals	0.828	1.179	1.428^^	1.145	0.887	-0.949	1.131
	(0.169)	(0.297)	(0.195)	(0.266)	(0.745)	(2.009)	(0.226)
(4c) OLS, SA data	0.943	0.731	1.117	1.129	1.102	0.305	1.075
	(0.152)	(0.310)	(0.268)	(0.280)	(0.574)	(1.322)	(0.203)
t-test for break (SA data)	-1.774*	0.610	2.238**	1.173	-2.347**	-3.054***	2.159**
Engle-Granger ADF test for cointegration	-4.232***	-4.526***	-4.592***	-5.646***	-3.054*	-3.983***	-7.019***

Notes: Regressions 1, 2, and 4 are regressions 1, 2, and 4 in KMS, Table 2. The *t*-tests in the final block test the hypothesis that the coefficients on the net RIN obligation are the same before and after 10Mar2015, maintaining constancy of the other coefficients in the regression. The final row reports the Engle-Granger Augmented Dickey-Fuller test for cointegration, computed over the full sample (rejection indicates cointegration). SA data are full-sample (through final series availability date) seasonally adjusted. Reported regression coefficients are significantly different from 1 at the ^10% ^^5% ^^^1% significance level. *t*-statistics reject the null at the ***1%, **5%, *10% significance level. See the notes to Table 2 of KMS.

Table 2. Pooled levels regressions for wholesale spreads

Regression coefficients (SEs):	Diesel	Gasoline	Diesel and Gasoline	Five Refined Product Spread
01Jan2013-09Mar2015				
(1) OLS, seasonals	1.181	0.826	1.003	1.026
	(0.154)	(0.268)	(0.114)	(0.109)
(2) DOLS, seasonals	1.228	0.785	1.007	1.049
	(0.164)	(0.283)	(0.121)	(0.113)
(4) OLS, seasonally adjusted data	0.764	1.431	1.098	0.808
	(0.211)	(0.305)	(0.158)	(0.149)
10Mar2015-14Nov2016				
(1) OLS, seasonals	1.108^^	-2.096^^	-0.494^^	1.406^^
	(0.055)	(1.074)	(0.554)	(0.088)
(2) DOLS, seasonals	1.115^	-2.186^^	-0.536^^	1.422^^
	(0.059)	(1.061)	(0.549)	(0.095)
(4) OLS, seasonally adjusted data	1.021	-2.196^^	-0.588^^	1.309
	(0.190)	(1.135)	(0.565)	(0.229)
01Jan2013-14Nov2016				
(1) OLS, seasonals	1.122	0.466	0.794	1.123
	(0.144)	(0.799)	(0.433)	(0.093)
(2) DOLS, seasonals	1.145	0.361	0.753	1.142
	(0.150)	(0.844)	(0.456)	(0.095)
(4) OLS, seasonally adjusted data	0.930	0.845	0.888	0.999
	(0.178)	(0.585)	(0.314)	(0.140)

Notes: This table extends regressions 1, 2, and 4 in KMS table 3 to the two new sample periods. All regressions are of the form of the spread in levels against its net RIN obligation in levels, with additional regressors. The diesel regressions pool three diesel spreads, the gasoline regressions pool three gasoline spreads, and the diesel and gasoline regressions pool all six spreads. The coefficient on the levels is constrained to be the same for the pooled spreads, but the other coefficients are allowed to differ across spreads. Standard errors are Newey-West with 30 lags and allow both for own- and cross-serial correlation in the errors. Reported regression coefficients are significantly different from 1 at the ^10%, ^^5%, and ^^^1% significance level. See the notes to Table 1.

Table 3. Pooled VARs: Cumulative structural impulse response functions, wholesale spreads

(a) Diesel spreads

	KMS data set (Jan. 1, 2013-March 9, 2015)				Full data set (Jan. 1, 2013-Nov. 14, 2016)			
	seasonals in VAR		seasonally adjusted data		seasonals in VAR		seasonally adjusted data	
Lag								
0	0.567	(0.266)	0.527^	(0.270)	0.464	(0.204)	0.441^^^	(0.206)
1	0.762	(0.319)	0.741	(0.328)	0.623	(0.244)	0.600	(0.248)
2	0.882	*(0.302)*	0.798	(0.324)	0.702	(0.236)	0.666	(0.247)
3	0.967	*(0.286)*	0.828	(0.316)	0.753	(0.225)	0.706	(0.241)
4	1.034	(0.271)	0.846	(0.305)	0.793	(0.212)	0.737	(0.232)
5	1.089	(0.263)	0.861	(0.298)	0.826	(0.203)	0.763	(0.225)
6	1.133	(0.261)	0.872	(0.295)	0.853	(0.198)	0.786	(0.220)
7	1.167	(0.264)	0.881	(0.295)	0.876	(0.195)	0.806	(0.218)
8	1.194	(0.268)	0.888	(0.298)	0.896	(0.195)	0.823	(0.218)
9	1.214	(0.274)	0.894	(0.303)	0.911	(0.197)	0.838	(0.219)
10	1.228	(0.280)	0.898	(0.309)	0.924	(0.199)	0.851	(0.222)

(a) Five refined product spreads

	KMS data set (Jan. 1, 2013-March 9, 2015)				Full data set (Jan. 1, 2013-Nov. 14, 2016)			
	seasonals in VAR		seasonally adjusted data		seasonals in VAR		seasonally adjusted data	
Lag								
0	0.583	(0.255)	0.574^	(0.259)	0.484	(0.198)	0.468^^^	(0.200)
1	0.702	(0.307)	0.717	(0.315)	0.581	(0.240)	0.566^	(0.244)
2	0.834	(0.288)	0.791	(0.309)	0.671	(0.232)	0.644	(0.243)
3	0.931	(0.269)	0.836	(0.298)	0.734	(0.217)	0.696	(0.234)
4	1.012	(0.253)	0.871	(0.284)	0.787	(0.202)	0.741	(0.222)
5	1.077	(0.244)	0.900	(0.275)	0.831	(0.191)	0.780	(0.213)
6	1.130	(0.241)	0.924	(0.270)	0.869	(0.184)	0.814	(0.207)
7	1.171	(0.243)	0.945	(0.269)	0.899	(0.181)	0.843	(0.204)
8	1.204	(0.246)	0.962	(0.270)	0.925	(0.180)	0.869	(0.203)
9	1.228	(0.251)	0.975	(0.273)	0.946	(0.181)	0.891	(0.203)
10	1.245	(0.257)	0.986	(0.277)	0.962	(0.183)	0.910	(0.205)

Notes: Entries are impulse responses, with standard errors in parentheses. VARs for all indicated spreads are constrained to have the same coefficients, including the same impact coefficient. All VARs have 2 daily lags and are estimated in levels. All spreads have the same net RIN obligation. The impulse response functions are identified by ordering the RIN obligation ordered first in a Cholesky factorization. Coefficients are statistically different from 1 at the ^10% ^^5% ^^^1% level.