K-STATE RISK & PROFIT CONFERENCE | AUGUST 2026

Fertilizer and Diesel Prices: The Crude Story

Why the model I have used for a decade stopped working — and what replaced it

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In February 2025 my model said anhydrous should be $1,168 a ton. It was $751.

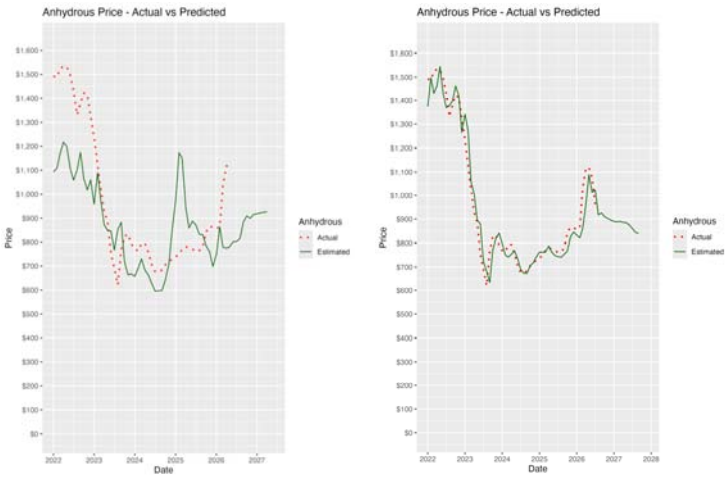
That is a $417 miss on the single biggest input line in a corn budget. This talk is about what I found when I went looking for the reason.

The model had been drifting for a while

-$417	+$267	$236	0.67
Feb 2025 over-predicted	Apr 2026 under-predicted	average error per ton	R-squared, and falling

Same model, opposite errors 14 months apart. That is not bad luck — that is a model whose drivers no longer describe the market.

Where it actually went



OLD MODEL
oil + corn + inflation expectations

NEW MODEL
European gas + corn + error correction

Retail prices: DTN national average. Model: K-State.

Actual vs predicted, 2022 to today

The old model: anhydrous = oil (6-month lag) + corn + inflation expectations.

It missed the entire spring 2026 run-up.

Anhydrous went from $865 in February to $1,118 in May. The model never saw it.

It also had prices far too high through 2025, when anhydrous was flat near $770.

Two suspects: the inflation term, and the energy price I was using.

1

Diesel

The good news first: crude still explains diesel. But how much diesel moves per dollar of crude has changed more than most people realise.

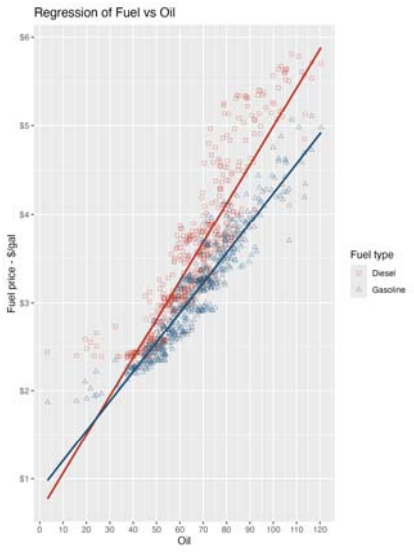
Where diesel sits today

Weekly EIA data, current week.

$5.26	$82	$3.38
U.S. retail highway diesel	WTI crude per barrel	retail diesel over crude, $/gal

Hold on to that third number. That gap is the widest in the EIA weekly record, which goes back to 1994 — and about $0.59 of it is federal and state fuel tax.

Crude still explains diesel



EIA weekly retail prices and WTI spot.

Retail fuel vs WTI, last 10 years

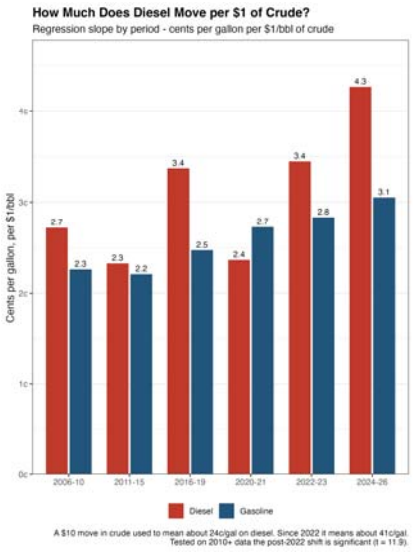
Ten years of weekly data. R-squared = 0.86 for diesel, 0.90 for gasoline.

That part of the story has not changed and is not controversial.

If you only know one number about your fuel bill, know the price of crude.

But 'explains' is not the same as 'explains by how much' — and that is where this got interesting.

But the pass-through has doubled



Rolling regressions on EIA weekly data. K-State analysis.

Cents of diesel per $1/bbl of crude

A $10 move in crude used to cost you about 24 cents a gallon.

Since 2022 it costs about 41 cents.

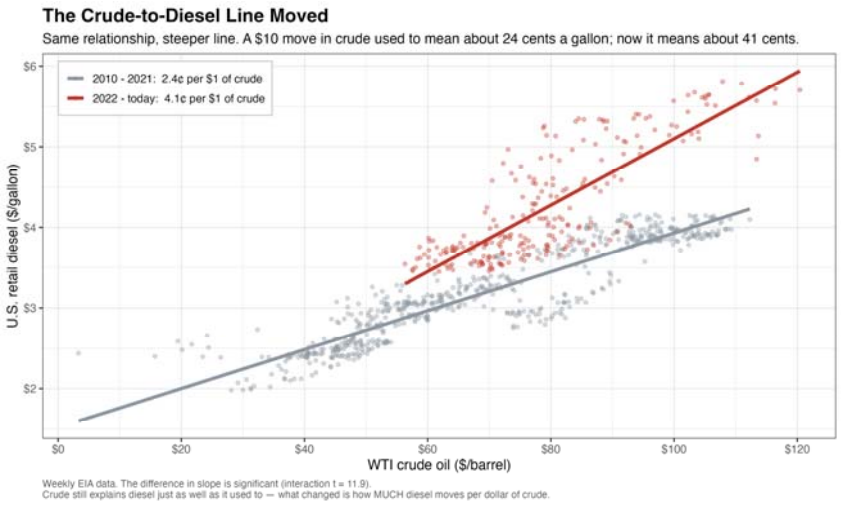
2011-15: 2.3 cents per gallon per dollar of crude. 2024-26: 4.3 cents.

Tested formally on 2010-onward data, the shift after 2022 is significant at t = 11.9. This is not a quirk of how I sliced the years.

Your exposure to an oil shock has nearly doubled while the headline relationship looked unchanged.

The line I used to draw, and the line now

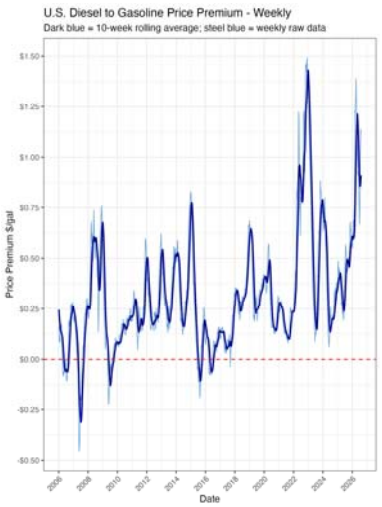
At $80 crude the old line says $3.45 a gallon. The new one says $4.28. That gap is 83 cents.

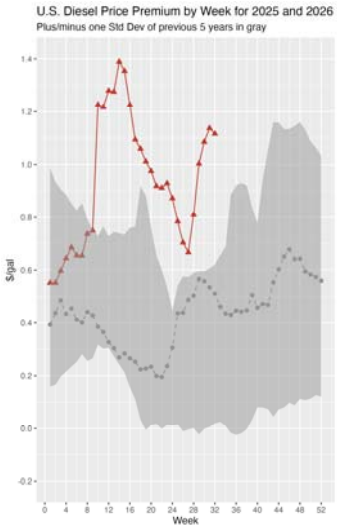


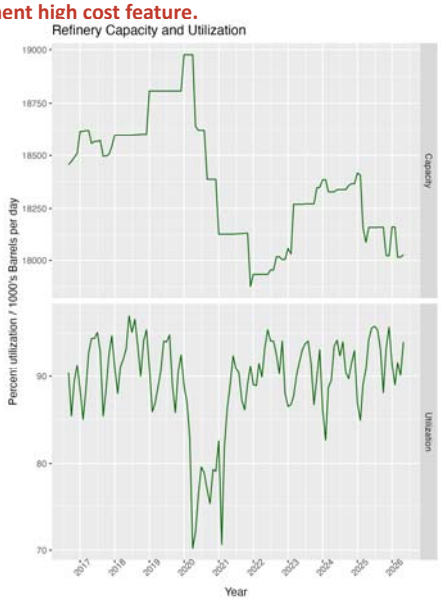
Weekly EIA data, 2010 to present. Slope difference significant at t = 11.9.

Why: refining, not crude, is the constraint

Diesel's premium over gasoline used to be a seasonal and small. Since 2022 it is a permanent high cost feature.

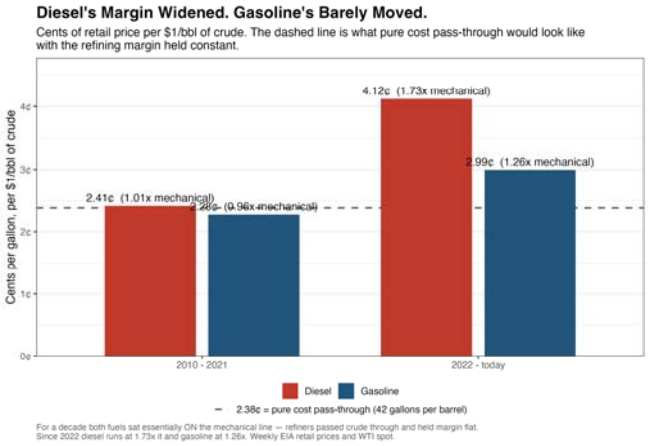






EIA weekly retail prices. 10-week rolling average in dark blue.

Why diesel and not gasoline?



Weekly EIA retail prices and WTI spot. 2.38¢ = 1/42 of a dollar, the mechanical rate if margin were held constant.

Both fuels sat on the 2.38¢ line for a decade. Only one left it.

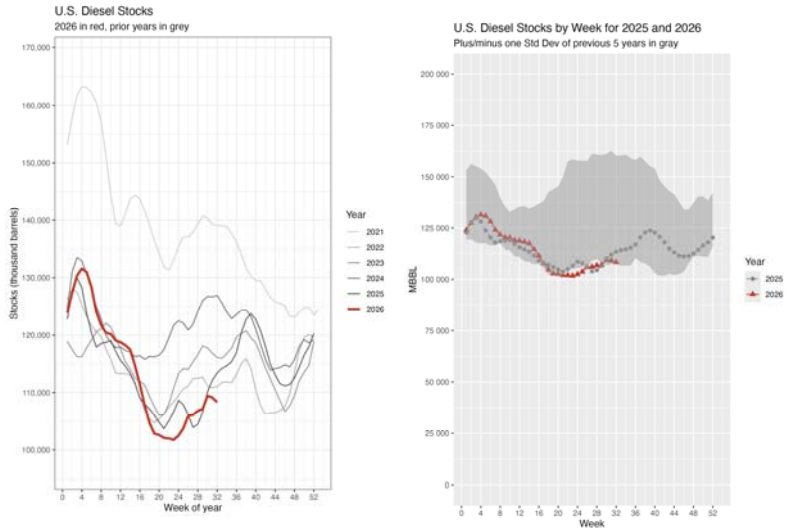
Demand elasticity. Gasoline is discretionary — people drive less when it gets expensive, which caps the margin. Freight, rail and ag cannot not run, so diesel margin expands without losing volume.

The Russia shock was distillate-specific. Russia was Europe's main diesel supplier. Gasoline trade is regional and the U.S. is a net exporter.

Shale crude yields the wrong product. Light tight oil makes proportionally more gasoline and less middle distillate, so booming U.S. crude added little diesel capacity.

Jet fuel competes for the same molecules. Jet and diesel come from the same cut, and air travel came back. Gasoline has no such competitor.

And stocks are not helping



EIA weekly stocks, 3-week rolling average.

U.S. diesel stocks by week

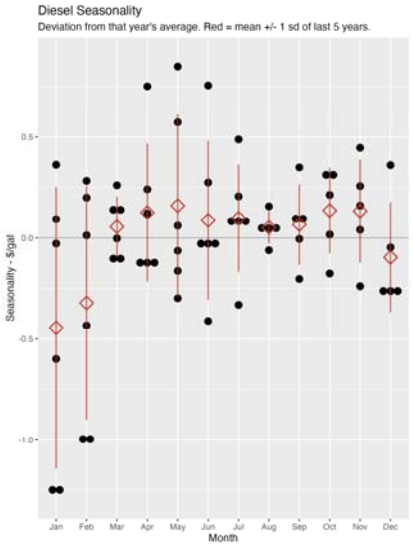
2026 is running at the bottom of the six-year range.

Thin inventories are why a small supply scare moves the pump price so fast.

Note the shape: stocks build through fall and draw down hard in winter.

A cold winter or a refinery outage on top of this is what turns a 20-cent move into a dollar.

When is diesel seasonally cheapest?



EIA monthly retail diesel, last 5 years.

Deviation from each year's average

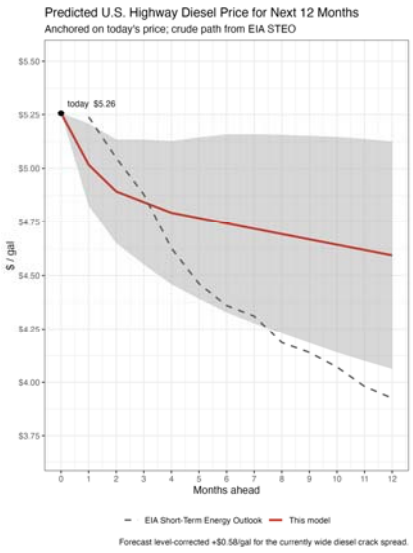
Diesel used to be cheapest in the back half of summer and early fall and most expensive in the winter as diesel competed with heating oil.

No longer true as winter is now lower cost for diesel. Construction and trucking are now the driving force for price

The red markers are the five-year mean plus and minus one standard deviation.

This is a modest effect next to a real supply shock, but it is free money on the margin if your storage lets you take it.

Diesel outlook: modestly lower



K-State model; crude path from EIA Short-Term Energy Outlook.

Next 12 months

Today $5.26. Twelve months out, about $4.59.

That comes almost entirely from the crude path — EIA has WTI easing from $82 toward $64.

The dashed line is EIA's own retail diesel forecast, shown as a check on mine.

I anchor the forecast on today's actual price and let the regression supply only the change. The raw model reads about 60 cents low right now because the crack spread is so wide.

The risk to this forecast is refining, not crude.

AND what happens with the Iran war

2

Fertilizer

This is where I was really wrong. The energy price that drives your fertilizer bill is not the one on the evening news.

Suspect #1: the inflation term

What I was using

University of Michigan inflation EXPECTATIONS.

A monthly consumer survey.

It carried the largest coefficient in my model: +$136 per ton for each percentage point.

Added years ago because it improved fit.

What went wrong

Spring 2025: the survey spiked to 6.5% on tariff fears.

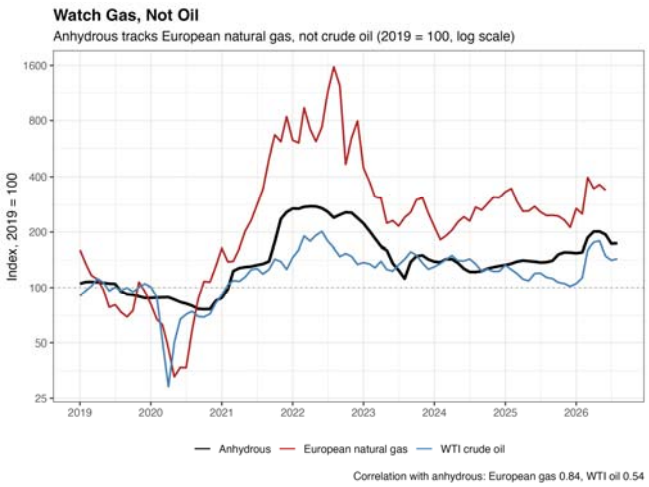
Actual CPI at the time was 2.3%.

At $136 a point, that one variable pushed my anhydrous forecast up by roughly $400 a ton.

Anhydrous did not move. It sat at $780.

A consumer sentiment survey is not a fertilizer cost driver. That variable is gone.

Suspect #2: I had the wrong energy price



FRED (PNGASEUUSDM), EIA. K-State analysis.

Indexed to 2019 = 100, log scale

Anhydrous tracks European natural gas, not crude oil.

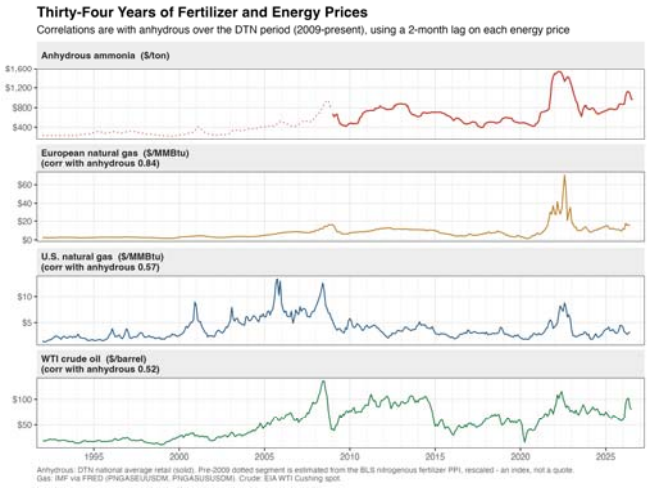
Correlation with anhydrous: European gas 0.84, WTI crude 0.54.

Ammonia is made from natural gas — roughly 33 MMBtu per ton. Oil was only ever a stand-in for the energy complex.

That stand-in worked until about 2021. Then global gas came apart from oil and the substitution stopped working.

Once European gas is in the model, oil adds nothing at all.

Thirty-four years says the same thing



Pre-2009 anhydrous is estimated from the BLS nitrogenous fertilizer PPI, rescaled — shown dotted.

1992 to today, in native units

Over the full record, European gas tracks anhydrous at 0.86. U.S. gas manages 0.30.

Look at the two gas panels. U.S. gas is spiky but goes nowhere — it has never once been above $14.

European gas went to $70 in 2022. That is the shock that took anhydrous to $1,500.

Crude correlates 0.80 over the full period but only 0.52 since 2009.

That is the whole argument in one number: oil used to be a fine stand-in, and it stopped being one.

"But we produce our own natural gas"

U.S. Henry Hub — about $3

What an American ammonia plant PAYS for gas.

Cheap, plentiful, and stable.

Correlation with anhydrous over the full sample: 0.56.

In 2009-14 it was actually NEGATIVE — the shale boom pushed gas down while fertilizer rose.

Tells you how profitable the manufacturer is.

European gas — about $15

What the world's marginal ammonia producer pays.

Five times the U.S. price for the same molecule.

Correlation with anhydrous: 0.84.

Ammonia is globally traded — the clearing price is set by the highest-cost producer who still has to run.

Tells you what YOU pay.

A U.S. plant buys gas at $3 and sells ammonia at the world price. That spread is producer margin, not a discount that reaches your farm.

March 2026 settled the argument

When the strait closed, the two gas markets went in opposite directions.

+58%

European gas
in one month

FELL

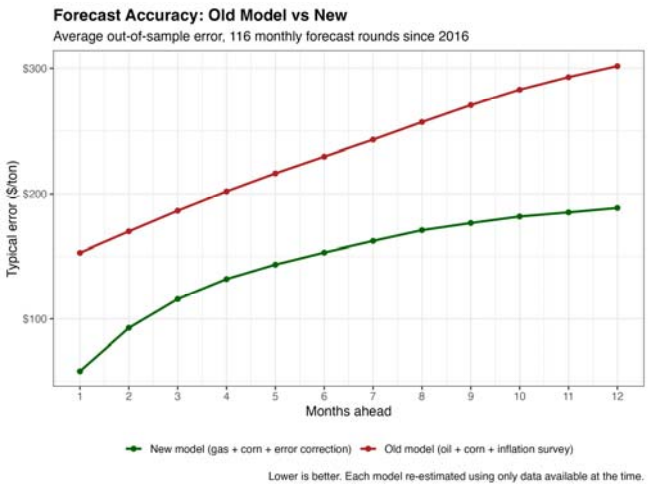
U.S. Henry Hub
over the same month

+$253

anhydrous,
Feb to May

If U.S. gas set your fertilizer price, anhydrous would have gone DOWN that month. It went to $1,118.

The replacement model



Rolling-origin backtest. K-State analysis.

Average forecast error, 116 monthly rounds since 2016

Anhydrous = European gas (2-month lag) + corn + seasonality.

Plus an error-correction term: prices close only about half the gap to fundamental value in nine months. They do not snap.

Out-of-sample error falls from $236 a ton to $152.

One month ahead it is better still: $58 versus $153.

Every model here is re-estimated using only the data that existed at the time. No hindsight.

Anhydrous Ammonia Price Model

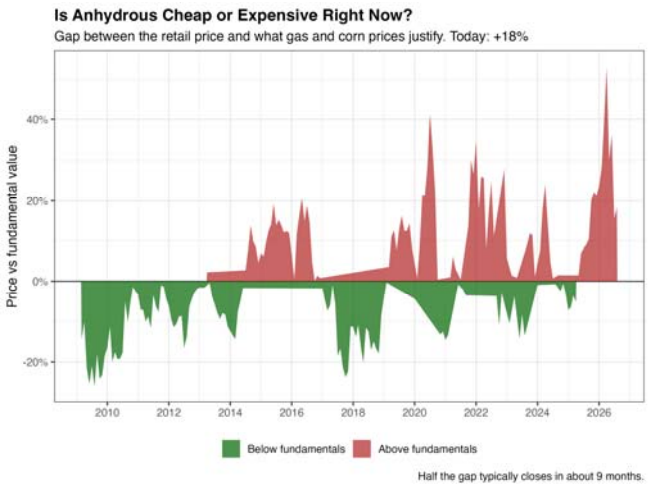
Log-log OLS with error correction | Adj R^2 = 0.790 | out-of-sample RMSE = $152/ton

Term	Coefficient	Std. Error	t	P-value
Intercept	5.170	0.131	39.539	<0.001
European natural gas (lag 2 mo), log	0.341	0.045	7.553	<0.001
Corn price, log	0.393	0.089	4.415	<0.001
Seasonal sin(1)	0.007	0.019	0.397	0.691
Seasonal cos(1)	−0.011	0.021	−0.525	0.6
Seasonal sin(2)	−0.008	0.010	−0.752	0.453
Seasonal cos(2)	0.004	0.009	0.484	0.629

Elasticities: +10% European gas -> +3.3% anhydrous; +10% corn -> +3.8% anhydrous. Half-life of adjustment 9.2 months.

Sources: DTN retail fertilizer, FRED (PNGASEUUSDM), EIA STEO, CME corn futures. Newey-West standard errors.

Is anhydrous cheap or expensive right now?



K-State long-run model.

Retail price vs fundamental value

Today's $964 is about 18% above what gas and corn prices justify.

Green is below fundamental value, red is above.

This gap is normal and it is not a trading signal on its own — but it does decay. Half of it typically closes in about nine months.

The 2021-22 spike and this year's are the two largest in the series.

Which raises the obvious question: what put it there?

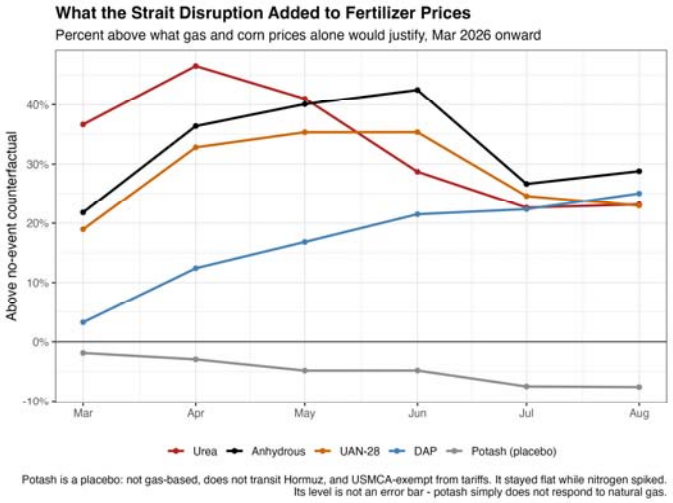
3

What the Strait Did

The February disruption gave us something economists almost never get: a clean natural experiment on the nitrogen market.

Measuring the disruption — with a control

Urea peaked 46% above where gas and corn alone say it should be. Potash barely moved.



K-State event study. Model estimated on pre-event data only.

Urea took it first and hardest

Urea

Peaked +46.5% in April.

Already +36.6% in March, the first month.

It is the globally traded molecule that actually moves through the strait.

Iran, Qatar and Saudi Arabia are major urea exporters.

Repriced violently, then normalised as trade rerouted.

Anhydrous

Peaked +42.5%, but not until June.

Only +21.8% in March — about half of urea's move.

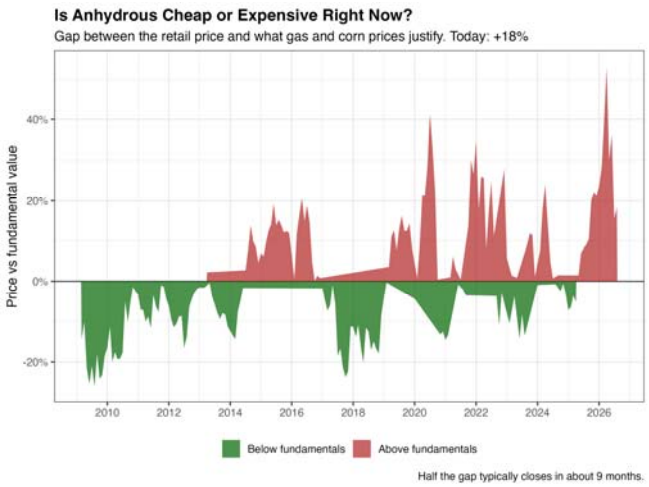
Pressurised, harder to ship, more regionally produced.

U.S. retail anhydrous is sticky in both directions.

Lagged on the way up and is lagging on the way down.

They crossed over in June. Today anhydrous carries the larger leftover premium: +29% vs +23%.

The part that worries me



K-State long-run model.

What I would flag if I were budgeting off this

The premium is decaying more slowly than it should.

My model says gaps close at about 7% a month. On that schedule urea's 46% premium should be near zero by now.

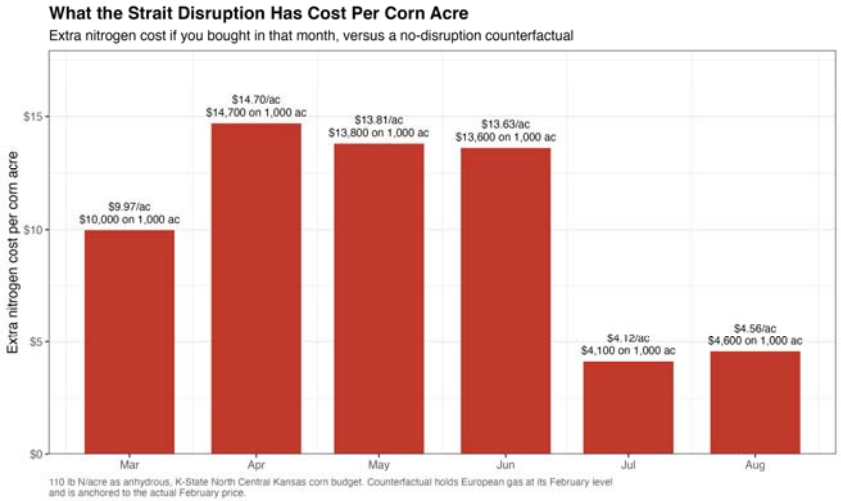
It flattened out around 23% instead.

Either the strait is still not functioning normally, or the market has repriced to a permanently higher level.

Practical consequence: my own forecast probably unwinds this premium too fast. Plan for the upper half of the range, not the middle.

What it has actually cost you

Not a scenario — this is the bill that already came due, month by month.



110 lb N/acre as anhydrous, K-State North Central Kansas corn budget. Counterfactual holds European gas at its February level.

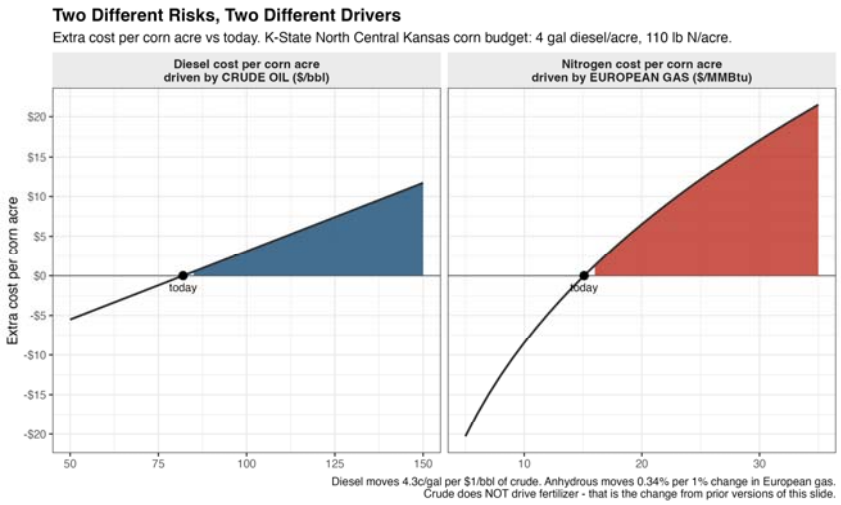
4

What It Means for Your Budget

Two energy prices, two different risks, and one of them is not the one you have been watching.

Two different risks, two different drivers

Your diesel bill tracks crude. Your fertilizer bill tracks European gas. Hedging one does nothing for the other.



Per corn acre. K-State North Central Kansas corn budget: 4 gal diesel/acre, 110 lb N/acre.

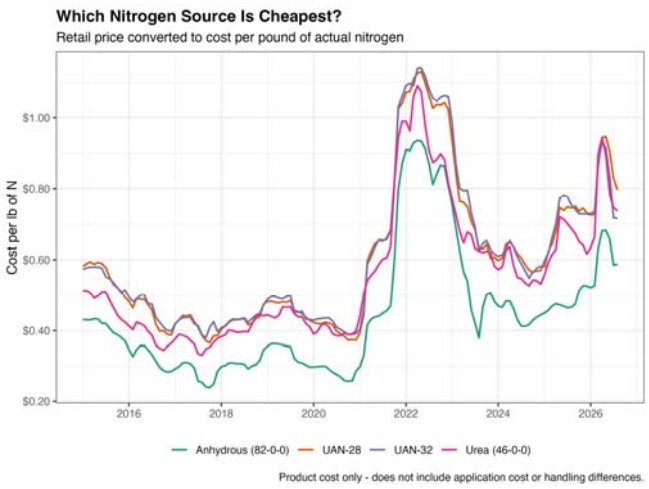
What a shock costs per corn acre

North Central Kansas corn budget: 4 gal diesel and 110 lb N per acre.

$1.72	$6.63	$15.68
if crude rises $10/bbl	if European gas rises $5/MMBtu	if both move (+$20 crude, +$10 gas)

On 1,000 corn acres that is $1,720, $6,627 and $15,679. A $5 move in a European gas price you have never quoted costs you almost four times what a $10 move in crude does.

Which nitrogen source is cheapest?



DTN national average retail. 82-0-0, 46-0-0, 32%, 28%.

Retail price converted to cost per lb of N

Anhydrous is still the cheapest nitrogen per pound, and it is not close.

Converting every product to cost per pound of actual N is the only fair comparison.

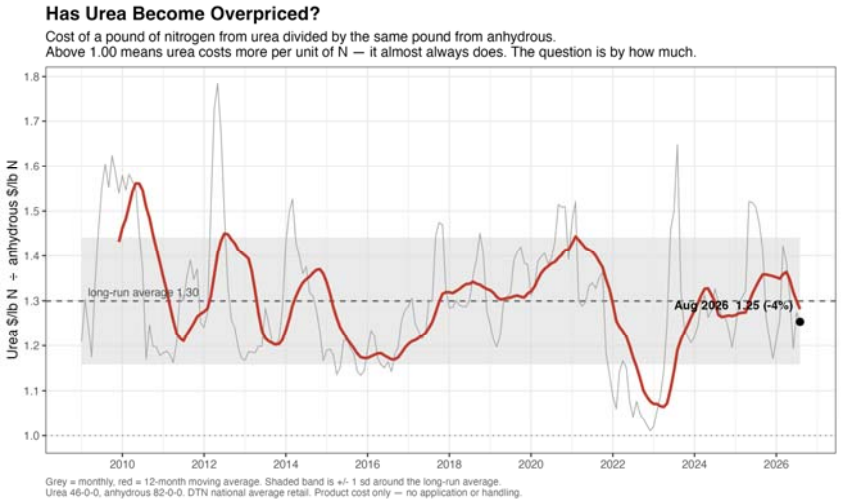
The spread between anhydrous and urea widened sharply during the disruption and has not fully closed.

This is product cost only — it does not price application, handling, or the agronomic differences.

If you can run anhydrous, the arithmetic currently favors it.

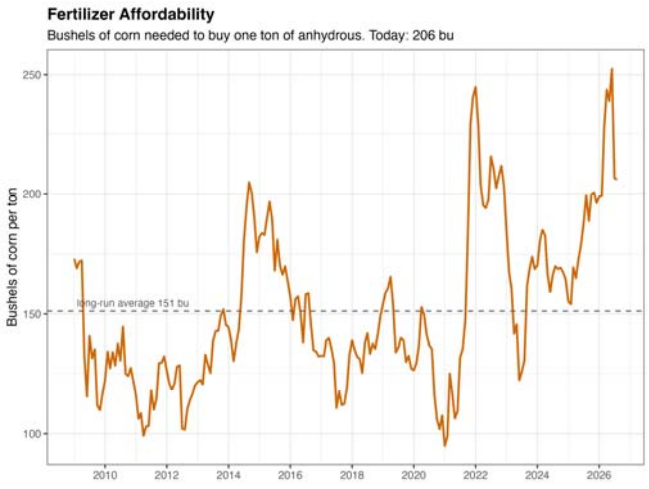
Has urea become overpriced?

It was in March, at 1.42. It is not now — at 1.25 it sits slightly BELOW its long-run average.



Urea 46-0-0 and anhydrous 82-0-0, DTN national average retail, converted to cost per pound of actual nitrogen.

Affordability: how many bushels does a ton cost?



DTN retail anhydrous; CME corn futures.

Bushels of corn per ton of anhydrous

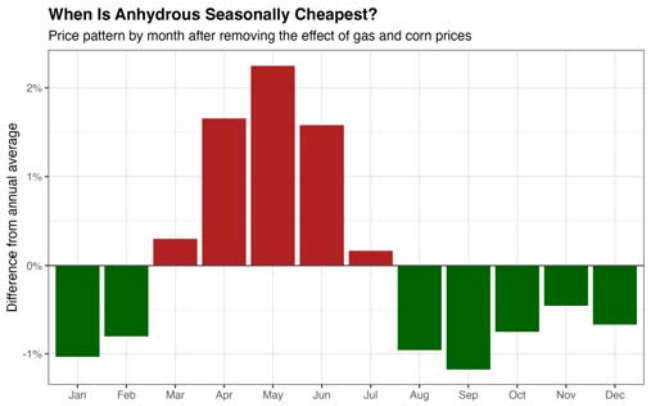
Anhydrous priced in bushels of corn strips out the dollar entirely.

This is the number that decides whether the fertilizer bill actually hurts.

Fertilizer can rise and still be affordable if corn rises with it. That is not what is happening now.

Compare today against the long-run average line before you decide the market is unusual.

When should you buy?



K-State model, harmonic seasonal terms.

Pure seasonal pattern, drivers held constant

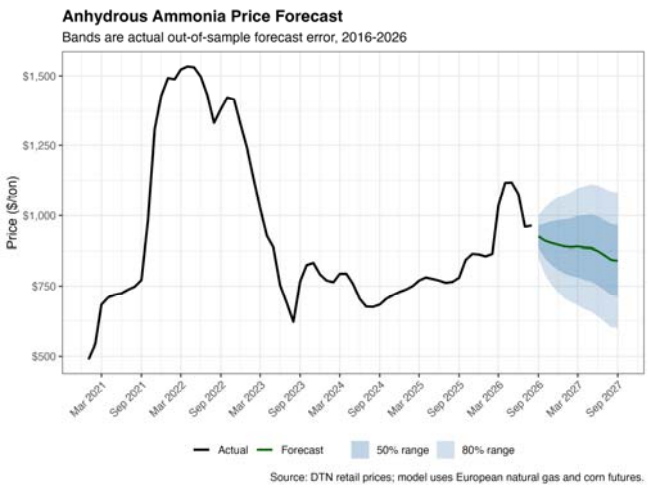
There is a modest spring premium — roughly 2%, or about $20 a ton.

Late summer and early fall are seasonally the softest window.

That is AFTER controlling for gas and corn. The raw seasonal swing looks bigger, but most of it is the drivers being seasonal themselves.

Do not let a $20 seasonal edge talk you out of acting on a $250 supply move.

The outlook



K-State model. Bands from rolling-origin backtest, 2016-2026.

Next 12 months

Anhydrous eases from $964 toward roughly $900 by year end and $844 a year out.

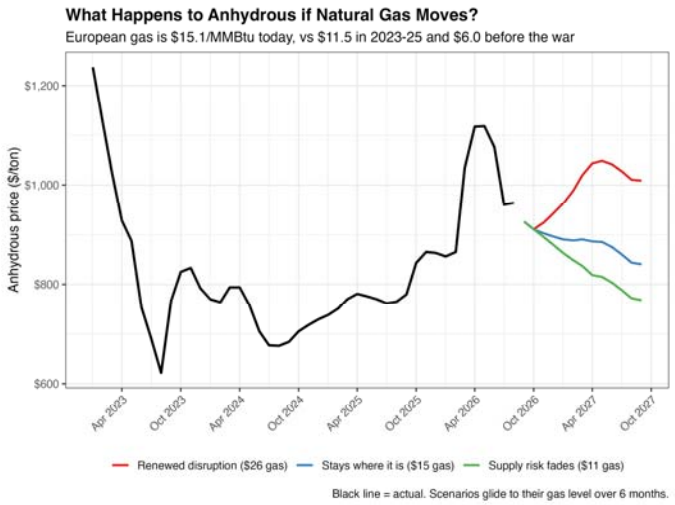
The bands are actual out-of-sample forecast error, not a theoretical confidence interval.

That is a wide band, and it should be. This model misses by about $150 a ton on average at a one-year horizon.

Given the premium is decaying slowly, I would weight the upper half of that band.

What if gas moves?

The whole fertilizer outlook rests on one number: European natural gas.



Scenarios glide to the stated gas level over six months.

5

What to Watch

Four things that will tell you where your input bill is going before your retailer does.

What to watch — and what to ignore

1. **Watch European gas (TTF), not just WTI**
   Quoted daily, and it leads your anhydrous price by about two months.

2. **Watch the diesel crack spread, not just crude**
   Refining is the binding constraint. A $10 crude move now costs 41 cents a gallon, not 24.

3. **Watch international urea as the early warning**
   It repriced a full two months before anhydrous did this spring.

4. **Ignore Henry Hub for fertilizer purposes**
   Cheap U.S. gas is the manufacturer's margin, not your discount.

Two of those four are prices nobody in this room quotes daily. That is exactly why they are worth watching.

The three numbers to leave with

$964

anhydrous today,
18% above fundamentals

$5.26

diesel today,
easing toward $4.59

2x

your exposure to
an oil shock vs 2015

The relationships did not disappear. They changed size and they changed driver — and both changes moved against you.

Questions

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Substack: substack.com/@agricultural · X: @ibendahl @AGfinancing

Farm Finance Show on YouTube: @little_pond_farm · AgManager.info