GATED RESEARCH / FUEL OIL & FEEDSTOCK FLOWS

Fuel Oil Inventory Pressure Research Framework

Structural relationships between observable HSFO inventory pressure and forward Singapore HSFO crack pricing behaviour.

22,572	-0.6155	~2 wks	2022-25
VALID SCENARIO CONFIGURATIONS	STRONGEST SPEARMAN	PRICING TRANSMISSION	WEEKLY OBSERVATION SET

HEADLINE FINDING

Across 2022-2025, sustained observable HSFO inventory build was inversely related to forward Singapore HSFO cracks roughly two weeks out. The strongest models clustered tightly rather than scattering, which is the core evidence the relationship is structural.

Research produced independently by Maven.
Framework reviewed and sample-verified by Maritime Data. Distributed via the Fuel Oil & Feedstock Flows programme.

MAVEN x MARITIME DATA

Maritime Data's role

What we did, and what this document is

This research was produced independently by Maven using its own physical cargo intelligence and pricing data. Maritime Data did not generate the findings.

OUR INVOLVEMENT

Maritime Data reviewed the research framework underpinning this analysis and independently verified a random sample of results against Maven's set of 22,572 valid scenario configurations. This is a methodological review, not an endorsement of the findings. The correlations remain the work and responsibility of the source data provider.

HOW TO READ IT

The study demonstrates a directional relationship between volume and price on the trades examined. It is not a forecast and not financial advice. If you are weighing a serious financial decision, we would encourage you to speak to us to learn more and run your own analysis.

Maven's own conclusion is framed the same way: this is evidence of a structural relationship, not a deterministic forecasting model. The limitations Maven sets out are reproduced in full later in this document.

Executive summary

The question, the scale of testing, and the result

The framework tests a single question: does observable physical fuel oil inventory pressure carry measurable information about future Singapore HSFO crack pricing? It is built as a repeatable research architecture rather than a one-off correlation, so the same relationship can be checked across thousands of plausible model specifications.

27,756	22,572	4.31m	200+
RESULTS GENERATED	VALID CONFIGS RETAINED	OBSERVATION ROWS	WEEKLY OBSERVATIONS

WHAT THE STRONGEST MODELS AGREED ON

- Direction was inverse: higher observable inventory pressure went with weaker future Singapore HSFO crack levels, lower pressure with stronger cracks.
- Persistence beat snapshots: four-to-six-week rolling and decayed inventory accumulation outperformed single-week readings by a wide margin.
- Signal type was the single most important design choice, ahead of geography or product selection.
- The strongest relationships emerged about two weeks forward, suggesting physical pressure takes time to transmit into benchmark pricing.

> Best observed configuration: Spearman -0.6155, Pearson -0.5212, on 202 weekly observations. Strong for a physical commodity framework built from observable cargo-level data.

Why physical intelligence matters

Starting from flows, not from price

Traditional fuel oil analysis starts from the price itself: cracks, timespreads, MOC activity, refinery margins, published inventory statistics, arbitrage economics. This framework starts from the physical cargo flows that help create those outcomes, and tests whether they contain information before it is fully reflected in benchmark pricing.

THE ECONOMIC LOGIC

1. Physical cargo arrivals shape observable inventory pressure.

v

2. Inventory pressure shapes regional supply availability.

v

3. Supply availability feeds blending, bunker supply, refinery optimisation and marginal balance.

v

4. Those physical conditions are reflected in Singapore HSFO crack pricing.

PHYSICAL DRIVERS TESTED

Cargo arrivals
Directly affect regional supply availability.

Stem status
Projected, active, confirmed or arrived - the operational maturity of a movement.

Product classification
Whether cargoes are directly relevant to HSFO pricing.

Destination region
Whether cargoes connect to the Singapore pricing ecosystem.

Arrival timing
Whether supply is prompt, deferred or already confirmed.

Inventory persistence
Whether supply pressure is isolated or sustained.

Methodology and dataset

How inventory pressure was built and tested

FIVE STEPS

1 Build physical inventory signals
Cargo-level observations grouped into weekly measures across product, geography, stem status, confidence, ETA window and signal type.

2 Align inventory with pricing
Signals aligned to forward Singapore HSFO crack targets - levels, changes and z-scores - across one-to-four-week lags.

3 Calculate relationships
Both Pearson (linear) and Spearman (monotonic rank) correlations, since physical markets often behave non-linearly.

4 Rank configurations
Ranked on relationship strength, with observation count and consistency across related experiments as secondary checks.

5 Analyse factor-level structure
Assess which factor levels recur in the strongest models - repeatability matters more than a single winning result.

DATA INPUTS

The physical side was built from Maven Knowledge cargo-level fuel oil intelligence: observable movements, product classifications, stem status, confidence classifications, destination geography, ETA timing and reported volumes. The pricing side combined Singapore HSFO bunker prices with Brent to construct an HSFO crack series, isolating fuel-oil-specific dynamics from broader crude moves.

All observations were aligned to weekly Monday report dates across 2022-2025, matching Maven Knowledge's existing weekly reporting cycle, so the framework can be applied directly alongside it. A small number of weekly gaps were filled to preserve continuity.

Headline results

The strongest observed configuration

STRONGEST CONFIGURATION

Geography	**extended_bunker_supply_region**
Product	**hsfo_only**
Stem status	**active_stem_only**
Confidence	**confidence_clean**
ETA window	**0 to 4 weeks**
Signal type	**decayed_equal_6w_inventory**
Rolling window	**6 weeks**
Decay type	**equal**
Target	**crack_level**
Lag	**2 weeks forward**

RESULT

-0.6155
SPEARMAN (RANK)

-0.5212
PEARSON (LINEAR)

202
WEEKLY OBSERVATIONS

Higher observable HSFO inventory pressure was associated with weaker future Singapore HSFO crack levels.

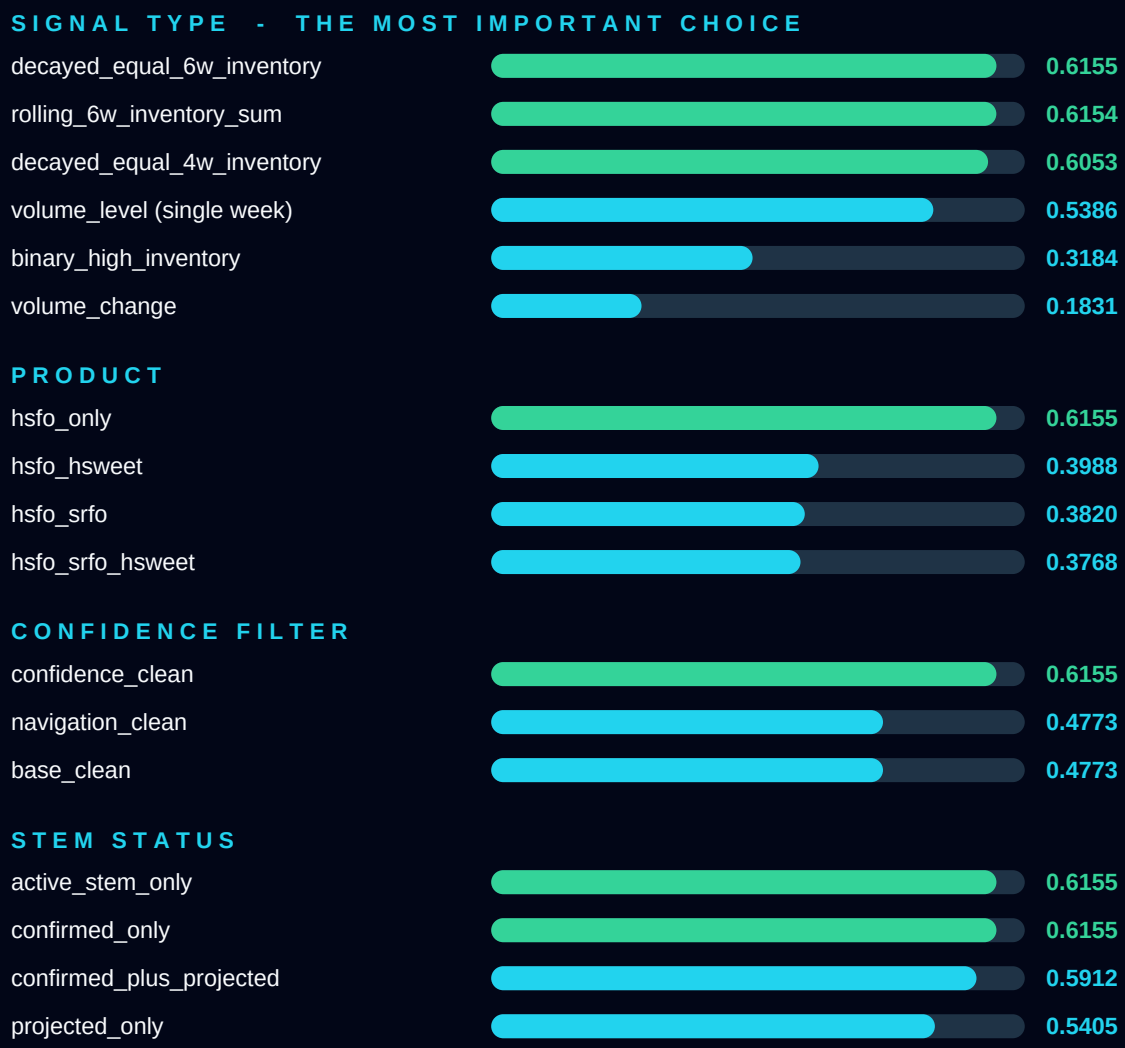
WHY THE CRACKS, NOT THE OUTRIGHT PRICE

Using the HSFO crack rather than the outright price isolates fuel-oil-specific supply and demand from broad moves in crude. The relationship was strongest against future crack levels, not week-on-week changes, which supports reading inventory pressure as a market-state variable rather than a short-term directional trigger.

Factor results

Which design choices carried the signal (1 of 2)

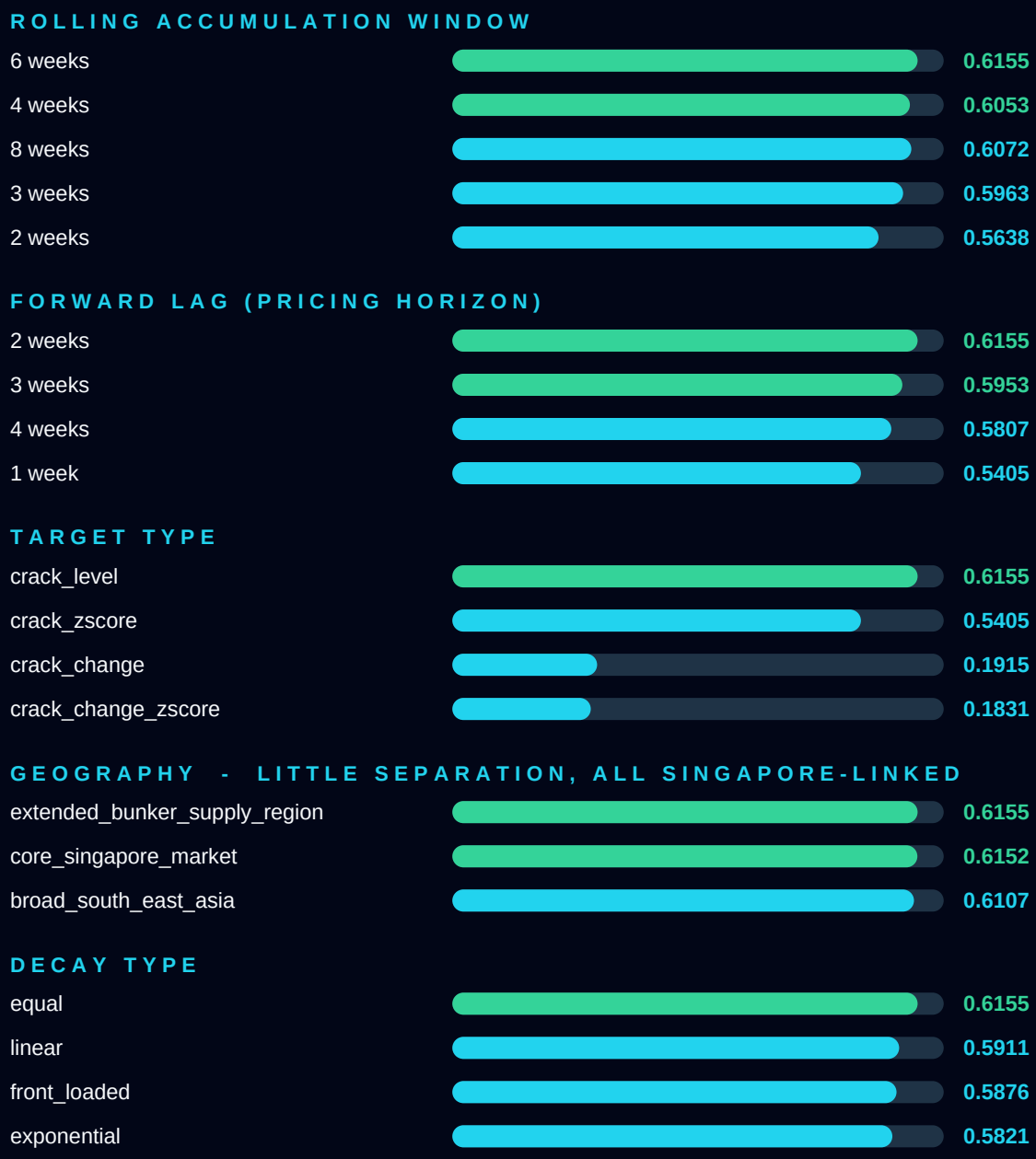
Bars show best observed absolute Spearman by factor level. Green marks the level that dominated the strongest 100 models.



Factor results

Which design choices carried the signal (2 of 2)

Bars show best observed absolute Spearman by factor level. Green marks the level that dominated the strongest 100 models.



Repeatability

Why this is not a single lucky correlation

The strongest result matters less than the fact that the strongest models agreed with each other. Across the top 100 configurations, several design choices appeared in every single one. That level of concentration, across independent dimensions at once, is the core evidence the relationship is structural rather than an isolated statistical outlier.

SHARE OF THE STRONGEST 100 MODELS

The strongest models were not scattered across the experimental universe. They clustered on high-confidence HSFO-only cargoes, prompt-to-forward arrivals, active or confirmed stems, rolling or equal-decayed accumulation, and future crack levels two-to-three weeks out.

Limitations and how to use it

Maven's own framing, reproduced

LIMITATIONS

- The research is intentionally correlation-based. Correlation does not prove causation.
- It measures observable cargo-level inventory pressure, not complete tank inventory.
- Some physical flows may be missed, misclassified, delayed, rerouted, blended or commercially reallocated.
- The pricing relationship may change across market regimes.
- The research period may include structural conditions that do not repeat exactly.
- Some configurations were intentionally broad or exploratory and were not expected to perform strongly.

WHERE IT IS USEFUL

The framework is not a standalone trading signal. Its value is structural: it helps interpret whether observable supply conditions are consistent with stronger or weaker forward pricing. Maven identifies relevance for commodity hedge funds, fuel oil trading desks, bunker market participants, refinery optimisation teams, market analysts and risk teams.

> Not a forecast and not financial advice. If you are weighing a serious financial decision, speak to us to learn more and run your own analysis. Maritime Data's review covered the framework and a random sample of results, not an endorsement of the findings.

The research universe

The twelve factors tested

Each result comes from a unique combination of experimental factors controlling which cargoes are included, how inventory pressure is measured and which pricing outcome is evaluated. The full level-by-level factor catalogue is available on request.

Confidence	Cargo confidence and data-cleaning rules	3	LEVELS
Geography	Destination market coverage	3	LEVELS
Product	Product inclusion rules	4	LEVELS
Stem status	Cargo status inclusion rules	5	LEVELS
ETA window	Arrival timing scope	2	LEVELS
Weighting set	Inventory pressure construction	5	LEVELS
Signal type	Inventory signal transformation	21	LEVELS
Target type	Pricing outcome category	4	LEVELS
Target feature	Exact pricing target	16	LEVELS
Lag weeks	Forward pricing horizon	4	LEVELS
Rolling window	Rolling accumulation period	5	LEVELS
Decay type	Weighting of historical observations	4	LEVELS

NEXT STEP

Run it against your own positions

We can walk you through the framework, share the full factor catalogue and detailed findings on request, and help you test the relationship against the trades and horizons that matter to you.

BOOK A CALL

Rory Proud - Co-Founder, Maritime Data

meetings-eu1.hubspot.com/rory-proud

rory@maritimedata.ai