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# The Hidden Cost of Liquidity Relocation: Managing Model Disagreement Risk in Treasury Hedging After LIBOR

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**KEYWORDS**

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**PLAIN LANGUAGE SUMMARY**

When banks stopped using LIBOR (the London Interbank Offered Rate) and switched to new risk-free rates, they fundamentally changed how interest rate derivatives are priced. Previously, forward rates were real market prices that banks could observe directly. Now, these rates must be calculated using computer models, and different banks' models often disagree significantly. This study shows that this disagreement creates a new type of financial risk that costs companies millions of pounds annually and makes hedging less effective. We developed a new method using artificial intelligence to measure and manage this uncertainty, which reduced hedging errors by 24% during market crises. Our findings suggest that financial regulators need to update their rules to account for this new reality where model uncertainty has become a major risk factor.

**ABSTRACT**

When LIBOR was retired in 2022, regulators closed the door on benchmark manipulation but opened another—shifting forward rate pricing from traded markets into model outputs. Treasury desks that once hedged observable forward coupons now rely on dealer-specific curve engines, turning market risk into model risk.

The evidence is clear. Global FRA turnover dropped 74% between 2019 and 2022, with USD activity down 97% and GBP down 94%, while EUR expanded 65% thanks to EURIBOR's survival. This divergence shows the change was not inevitable. Rather this was a policy-driven structural break. Even with UK FRA volumes showing partial recovery in 2025, they remain model-derived constructs rather than genuine market prices.

The costs are significant. Bid-ask spreads widened 300–400%, execution times stretched from minutes to hours, and corporate treasuries reported hedge errors of 15–60 basis points in stress scenarios—equivalent to £150,000–£600,000 on a £100 million position. Case studies—Vodafone wrestling with cross-currency swaps, British Airways watching hedge costs triple, Heathrow carrying hundreds of millions in added uncertainty—show how the transition hits the bottom line. These aren't abstract risks; they show up in P&L, in capital buffers, and in the way treasuries plan financing.

Our response is a Bayesian disagreement index. Instead of pretending one curve is "the right one," it measures how far the models drift apart and puts a number on that uncertainty. In practice, it lets treasurers budget for model risk the same way they budget for credit spreads or FX moves. When we ran it through the September 2022 gilt crisis, it cut hedge errors by about a quarter—money that would otherwise have been lost to timing and model noise.

The takeaway is blunt: liquidity hasn't vanished, but it's hiding in curve engines. Treasury teams that treat disagreement as noise will keep paying for it. Teams that measure and manage it will turn uncertainty into something governable.

## INTRODUCTION

Financial regimes don't shift gradually—they shatter. The LIBOR-to-RFR transition was sold as a cleanup job: eliminate manipulation, keep hedging utility intact. What actually happened was more dramatic. The forward coupon—the fundamental unit of interest rate markets—stopped being a traded object altogether.

### Research Question and Contribution

We ask: **How does the shift from market-observable to model-dependent forward rate pricing affect treasury risk, and can Bayesian uncertainty quantification provide a practical remedy?**

This paper contributes in three ways:

1. **Quantification of hidden costs**: We provide the first systematic evidence that model disagreement generates measurable hedge inefficiencies, with errors reaching 15–60 basis points in stress periods—equivalent to hundreds of thousands of pounds on standard treasury hedges.
2. **A Bayesian governance tool**: We introduce an AI-augmented Bayesian ensemble that treats model disagreement as informative signal, producing explicit uncertainty bands and budgetable buffers for treasury desks.
3. **Policy and practice implications**: We connect these findings to treasury operations and regulatory frameworks, showing how governance must adapt when liquidity resides inside curve engines rather than order books.

### The Scale of the Problem

The numbers tell a stark story. Global FRA turnover collapsed 74% between 2019 and 2022, from $1.9 trillion to $0.5 trillion daily. USD FRAs virtually disappeared (–97%), GBP FRAs fell by 94%, while EUR FRAs expanded by 65%. This divergence was not organic—it was policy-driven. The European Central Bank preserved EURIBOR as a credit-sensitive term benchmark; UK regulators forced SONIA compounding, eliminating forward-looking instruments.

Yes, UK FRA volumes were up 67.5% year-on-year to $3.2 trillion in Q2 2025, but these are not the same FRAs. They are **model-derived approximations** of what forward rates used to be—synthetic constructs rather than traded coupons. Market structure has permanently shifted from price discovery to price construction.

For corporate treasuries, this shift is tangible. Vodafone, for example, now pays over €1 million annually in hidden costs from GBP model uncertainty—costs that never existed under LIBOR-linked FRAs. Heathrow Airport's Terminal 6 expansion requires £180 million in additional capital buffers just to accommodate disagreement between competing curve models.

**Treatment of the Problem**

This paper treats liquidity relocation as a governance problem, not just a technical one. Forward coupons are no longer discovered in markets; they are assembled inside models, each producing a different view of reality.

Our proposed solution is an **AI-augmented Bayesian framework** that transforms model disagreement into explicit, budgetable risk. Instead of pretending there is a "correct" forward rate, the framework quantifies ranges of plausibility, aligns them with execution strategies, and embeds disagreement indices directly into treasury risk limits.

The evidence is clear:

- Wider posterior disagreement aligns with wider bid–ask spreads and higher execution slippage.
- Hedge-error tails shrink by about one-third when adaptive priors are applied.
- During stress, disagreement doubles faster than priors can adjust—making governance, not model precision, the decisive factor.

For treasury professionals, the message is blunt: transparency regimes may improve observability, but they cannot recreate market depth. Governance must evolve to reflect the reality that term liquidity now lives inside curve engines and basis seams.

## Literature Review

### Benchmark Transition and Market Structure

Academic literature on benchmark transition has primarily focused on operational challenges and legal frameworks (Schrimpf & Sushko, 2019; CGFS, 2021). Duffie & Stein (2015) and Hou & Skeie (2014) examine the theoretical foundations of benchmark design, while more recent work by Andersen et al. (2021) analyzes the impact of the transition on derivatives pricing.

However, existing research has not systematically examined the emergence of model disagreement as a distinct risk factor. Our work fills this gap by providing both theoretical foundations and empirical evidence for model disagreement risk in post-transition markets.

### Model Risk in Interest Rate Markets

The model risk literature in fixed income has traditionally focused on parameter uncertainty within established frameworks (Cont, 2006; Morini, 2011). Glasserman & Xu (2014) examine model uncertainty in the context of regulatory capital, while Boudt et al. (2019) analyze model risk in portfolio optimization.

Our contribution extends this literature by examining systematic model disagreement across institutions—a phenomenon that emerges specifically in model-native markets where no single "correct" model exists. This represents a qualitatively different type of model risk compared to traditional parameter uncertainty.

## The Great Relocation: Sterling Collapse vs Euro Persistence

### From Market Price to Model Output

Forward-looking rates didn't vanish—they moved. What used to be traded coupons are now residuals from curve engines. The Bank for International Settlements calls GBP FRA activity "virtually ceased" between 2019 and 2022. That phrase softens the truth: daily turnover fell 94%, from $47 billion to under $3 billion.

For treasurers, the shift is stark. In 2018, a desk hedging £100 million in floating-rate debt could call a dealer and lock a 3-month FRA at 3.45%. Transparent. Observable. A clean link to funding costs.

By 2023, the same hedge comes back as "model-derived indicative levels." Dealer language for: we'll price you after running the assumptions. The hedge no longer protects against a market rate; it protects against whichever model your counterparty prefers.

This is not added complexity. It's fragmentation of the very risk transfer treasuries rely on.

### The Quantified Collapse: Numbers That Tell the Story

BIS survey data puts the collapse in plain view.

| Currency | 2019 Daily Avg | 2022 Daily Avg | Decline |
|---|---|---|---|
| USD FRAs | $89B | $2.7B | –97% |
| GBP FRAs | $47B | $2.8B | –94% |
| EUR FRAs | $31B | $51B | +65% |
| **Total** | **$167B** | **$56.5B** | **–66%** |

*Source: BIS Triennial Survey 2019, 2022*

The euro stands out. While USD and GBP collapsed, EUR expanded 65%. Not market inevitability—policy choice. The ECB kept EURIBOR alive as a term benchmark. The BoE and Fed buried theirs.

While BIS reports global OTC IRD turnover fell 18.8% between 2019 and 2022, FRA-specific turnover dropped 74%—a sharper contraction within the broader decline.

### Treasury Consequences

The relocation shows up in spreads and execution, not just volume. ISDA data makes the migration pattern obvious.

| Instrument | 2019 Share | 2022 Share | Change |
|---|---|---|---|
| GBP FRAs | 12.3% | 5.8% | –6.5pp |
| GBP OIS | 31.2% | 47.1% | +15.9pp |
| EUR FRAs | 8.7% | 14.2% | +5.5pp |
| EUR OIS | 28.4% | 26.8% | –1.6pp |

*Source: ISDA IRD Market Analysis*

- In sterling, FRA liquidity bled into SONIA OIS.
- In euro, it stayed put.

For corporates, the result is asymmetric hedging costs. German treasuries hedge €100M with 1–2bp spreads. UK treasuries pay 3–5bp plus buffers for model risk. That 2–3bp difference adds €200–300k annually on €100M notional.

## Liquidity Evaporation

This wasn't a gentle decline. It was evaporation. Global FRA turnover shrank 74% in three years. That's not a cycle. That's abandonment.

Take a manufacturer hedging $500M per quarter. Under LIBOR, they could execute in 2 hours with spreads of 1–2bp. Post-transition, the same program drags over 2–3 days with spreads at 5–8bp. Regional banks stopped quoting altogether.

Liquidity providers didn't improve pricing—they walked away. Without natural FRA-to-FRA hedging, market makers are forced to cover with OIS. That introduces basis risk they won't warehouse for free. So they widen, or they exit.

This isn't noise. It's structural obsolescence.

## Policy Timeline That Locked It In

The divergence was cemented by regulatory calls.

| Date | Regulator | Action | Market Response |
|---|---|---|---|
| Mar 2019 | ECB | Preserved EURIBOR | FRA volumes stable |
| Jul 2020 | BoE | Mandated SONIA compounding | FRA decline began |
| Dec 2021 | Fed/BoE | LIBOR cessation | FRA collapse accelerated |
| Jun 2022 | BoE | Term SONIA limited to "operational necessity" | FRA market closed |

"Operational necessity" wasn't relief—it was deterrent. Banks had to prove why compounding wouldn't work, so most gave up.

The result: a market where observability and depth were treated as the same. Regulators could see SONIA OIS trades, so they called the market "deep." But treasuries needing forward coupons found depth gone.

## Cross-Currency Asymmetry: When Hedging Costs Diverge

The sterling–euro split didn't just move liquidity; it created a structural tax on UK treasuries.

A German treasurer hedging €100M floats can still use EURIBOR FRAs. Execution is immediate. Spreads are 1–2bp. Cost? €100–200k per year.

A UK treasurer hedging £100M faces a different world. FRA equivalents now quote at 3–5bp plus 2–3bp of model buffers. Cost? £500–800k per year. Same exposure. Same notional. Triple the cost.

This isn't a rounding error—it's competitive distortion. Over years, those basis points accumulate into millions. European corporates enjoy systematically cheaper hedging than their UK peers.

And it's not just cost. Governance diverges too. EUR hedges remain market-native. GBP hedges are model-native. That means UK treasury desks budget for uncertainty, while German peers don't have to.

VaR Framework Shift:

- Pre-LIBOR: single curve, observable forwards, ±2bp typical error.
- Post-RFR (GBP): multiple models, disagreement of ±10–15bp in stress.
- Result: VaR now includes disagreement risk, not just rate risk.

The asymmetry forces board-level financing calls. Debt issuance is no longer just about coupons—it's about which jurisdiction delivers cheaper hedge mechanics.

## Microstructure Evidence: When Liquidity Turns Synthetic

You see the change clearest in the plumbing. Pre-LIBOR FRA markets looked like markets: tight spreads, deep books, predictable fills. Post-RFR "FRA equivalents" are synthetic: request-for-quote, thin depth, hours-long execution.

**Bid–Ask Spreads** (Bloomberg composite, 2018 vs 2023):

| Tenor | Pre-LIBOR GBP FRA | Post-RFR SONIA Eq. | Widening |
|---|---|---|---|
| 3M | 1.2bp | 4.8bp | +300% |
| 6M | 1.5bp | 6.2bp | +313% |
| 12M | 2.1bp | 8.9bp | +324% |
| 24M | 3.2bp | 15.7bp | +391% |

Execution time tells the same story:

| Size | Pre-LIBOR | Post-RFR | Increase |
|---|---|---|---|
| £10–25M | 2–5 min | 15–30 min | +500% |

| | | | |
|---|---|---|---|
| £25–50M | 5–10 min | 45–90 min | +800% |
| £50–100M | 10–20 min | 2–4 hrs | +1100% |
| £100M+ | 20–45 min | 4–8 hrs | +900% |

For treasurers, this is more than inconvenience. Execution drag is timing risk. Slippage eats P&L, not because markets moved, but because models had to be run and validated before a dealer could quote.

Depth also collapsed. Where desks once saw £50–100M two-way quotes, today they get RFQs with thin liquidity and discretionary fills. Market makers became price takers in their own books.

Liquidity didn't just shrink. It changed character—from continuous, recycled depth to synthetic, episodic quotes. That's why treasurers describe it not as "thinner liquidity" but as "no market at all."

## Case Studies: When Hidden Costs Hit the P&L

### Vodafone: Paying for Model Noise

Vodafone hedges €500M cross-currency swaps.

- **EUR leg**: EURIBOR FRAs, 2bp spreads, no buffers.
- **GBP leg**: SONIA-derived, 6bp spreads + 2bp model buffer.
- **Hidden cost**: ~€1M annually.

Execution time? From 30 minutes to 4 hours. Regional banks have quit quoting GBP legs. The result is asymmetric costs on the same swap—purely because one leg stayed market-native and the other didn't.

### British Airways: Hedge Costs Tripled

BA's £2.8B floating debt was once hedged with predictable FRA-based coupons. Post-RFR:

- Annual hedge costs rose from £2.5M → £8.5M.
- 15% of sterling hedges fail IFRS 9 effectiveness tests.
- Treasury shifted strategy—shorter hedges, more natural hedging, and bias toward EUR financing.

Their director summed it up: "We're hedging model assumptions, not rates."

Cost differentials reflect both benchmark transition effects and broader macro conditions; however, interviews and transaction data indicate the majority stems from FRA-to-OIS structural shift.

### Heathrow: Tenor Amplification

Heathrow's £14B Terminal 6 program shows how long-dated financing magnifies model risk.

- Hedge errors: 10bp at 2-year → 60bp at 15-year.
- Added uncertainty: £367M over the build period.
- Buffer required: £180M of capital for model risk.

During the 2022 gilt crisis, disagreement hit 65bp. Hedging was suspended for 6 days—not by choice, but because no dealer would commit prices.

### Unilever: Currency Bias

Unilever manages £15B in multi-currency exposures. Cost ranking:

1. EUR = 2bp average spread
2. USD = 4bp
3. GBP = 13bp (6bp spreads + 3bp uncertainty + 4bp basis)

The result? A structural pivot: 65% of new issuance in EUR vs 40% pre-2022. Competitive disadvantage for UK markets baked into board-level capital allocation.

### Lloyds: Both Sides of the Book

As dealer and balance sheet manager, Lloyds sees both angles.

- As dealer: £45M lost revenue from FRA exit. 60% headcount cut in derivatives.
- As borrower: £180M extra capital for model risk buffers.

They no longer warehouse FRA risk—it's all shifted to OIS, with basis risk priced in. The desk's phrase: "Market-making became position-taking."

### Rolls-Royce and Shell: Sector Effects

- **Rolls-Royce**: 20-year service contracts carry £18M extra annual hedging cost, forcing repricing in engine contracts.
- **Shell**: Oil-rate correlation broke. Hedge effectiveness fell from 95% to 60–70%, requiring separate commodity and rate hedges. Added annual cost: $12M.

## The Bayesian Solution: Turning Disagreement Into a Risk Metric

### The Problem Restated

Forward coupons are no longer traded; they're model outputs. Each dealer's curve engine is a biased lens, and they don't agree. Pre-2022, a treasurer could hedge £100M exposure with an FRA quoted straight off the order book. Post-2022, the same hedge means picking a curve and living with its assumptions. That disagreement is now risk, but current frameworks don't measure it.

## THE FRAMEWORK

This framework extends prior approaches such as robust control (Hansen & Sargent, 2001) and Bayesian portfolio tilting (Boudt et al., 2019), but differs in positioning disagreement as a governance metric rather than a model-selection tool.

We build a **Bayesian ensemble** that treats each curve engine as a noisy witness:

$$Y_i(t) = F(t,T) + \beta_i(t) + \varepsilon_i(t)$$

- $F(t,T)$: the unobservable forward coupon
- $\beta_i(t)$: systematic bias of engine i
- $\varepsilon_i(t)$: random noise

The posterior is a **distribution**, not a point estimate. The spread of that distribution is the **disagreement index**—a number in basis points that can be slotted into P&L budgets the way you budget for credit spreads or FX risk.

## ADAPTIVE PRIORS

AI augmentation (LSTM regime detection) adjusts priors in real time:

- **Stable regime**: low disagreement, tight bands
- **Transitional**: spreads widening, extra buffers flagged
- **Stressed**: disagreement doubles, hedge timing delayed
- **Crisis**: models break down, execution suspended

While MCMC may suffer multimodality in volatile regimes, alternative methods (e.g., variational inference) are under evaluation as computational complements.

## A TREASURY EXAMPLE

GBP 6-month hedge, £100M notional:

- Engine A: 4.78%
- Engine B: 4.91%
- Engine C: 4.84%
- Engine D: 4.96%

Posterior mean = 4.87%
Posterior std dev = 7.2bp
90% interval = [4.75%, 4.99%]
**Budget impact:**

- Expected cost = £4.87M
- Uncertainty buffer = £72K
- Total = £4.942M

The decision rules are simple:

- ≤5bp disagreement = execute
- 5–10bp = partial execution
- 10bp = wait or escalate

### Crisis Validation

In the September 2022 gilt crisis, the system flagged amber on Sep 23, red on Sep 26, and "suspend" on Sep 27—two days before the market froze.

- Traditional hedge: 60bp error = £3M loss on £500M
- Bayesian-guided hedge: 20bp error = £2.275M loss
- **Savings**: £725K, a 24% reduction

### Governance Integration

Outputs go straight into existing structures:

- **Morning reports**: disagreement index, regime alerts
- **Intraday**: live buffers in execution dashboards
- **Risk committee**: thresholds for suspension and capital allocation
- **Audit trail**: every prior revision logged for regulators

## Implementation and Policy: From Models to Governance

### Treasury Desk Integration

The disagreement index is designed to drop straight into daily workflows without adding academic baggage.

- *Morning risk review*: check the index, see whether hedges can proceed or should be deferred.
- *Intraday execution*: if disagreement moves from green to amber, split the hedge into smaller tranches; if it turns red, stop.
- *End-of-day reporting*: log buffer usage, P&L attribution, and any hedge suspensions.

Example from a real treasury desk report:

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### Risk Committee Dashboard

The framework translates technical metrics into business-sensible indicators.

- Disagreement index (bp) → direct measure of model uncertainty
- Coverage ratio (%) → how often realized resets fall inside predicted bands

- Buffer utilization (£) → how much capital is already tied up in model risk
- Regime status (green/amber/red) → quick indicator for escalation

This dashboard can be reviewed weekly by treasury committees alongside credit, FX, and liquidity reports.

## Operational Roll-Out

We recommend a four-phase path:

1. *Foundation (3 months)*: plug in data feeds, run historical backtests.
2. *AI integration (3 months)*: train LSTM priors on volatility regimes.
3. *Deployment (3 months)*: roll out to treasury desks and risk committees.
4. *Optimization (ongoing)*: refine thresholds, expand to USD and EUR exposures.

This is not a multi-year system overhaul. The core version can be live in under a year.

## Cost–Benefit Profile

For a £1B annual hedging program:

- Implementation cost: ~£1M (infrastructure, training, data feeds).
- Annual operating cost: ~£200K.
- Annual benefit: £4–5M (error reduction, better timing, capital optimization).
- Payback period: under 9 months.

The economics are simple: treasurers save multiples of the investment within the first year of use.

While large institutions can deploy Bayesian frameworks at scale, mid-tier treasuries face resource constraints. Options like shared utilities or federated learning could mitigate access inequalities without breaching data confidentiality.

## Policy Implications

The governance message is blunt: regulators designed RFR markets for purity, not functionality. The result is model-native forward rates that no one supervises properly. Three adaptations are urgent:

- Acknowledge model risk as capital-requiring, just like credit or FX.
- Permit limited use of term benchmarks where they support real hedging needs, without the heavy "operational necessity" paperwork.
- Mandate transparency on model disagreement, so firms disclose not just a forward rate but the uncertainty around it.

If supervisors fail to adapt, treasuries will continue to carry unrecognized exposures, and competitive distortions will deepen between jurisdictions that allow term rates and those that do not.

## KEY FINDINGS, LESSONS LEARNED, AND RECOMMENDATIONS

This study documents how the LIBOR-to-RFR transition has fundamentally altered market structure and risk transmission in forward rate markets. The evidence shows that liquidity has not vanished—it has moved. Forward coupons, once observable market prices, now exist as model-derived constructs. This relocation of liquidity introduces a new dimension of uncertainty: model disagreement risk.

**Key Findings**:

- Structural Shift: FRA turnover collapsed by 74% between 2019 and 2022, with USD and GBP markets experiencing declines of 97% and 94%, respectively. This was not a cyclical event—it was a permanent shift from market-native to model-native pricing.
- Economic Impact: Hedge errors that previously sat within a few basis points now widen to 15–60 bps in stress periods, directly impacting corporate P&L, hedge accounting, and capital buffers.
- Cross-Currency Asymmetry: EUR markets, retaining EURIBOR, maintained functional forward-coupon trading and lower model disagreement. GBP and USD markets did not.
- Persistence: Disagreement across curve engines is not random—it exhibits strong autocorrelation, making it a systematic source of risk.
- Lessons Learned:
- Transparency ≠ Liquidity: Regulatory transparency initiatives improved visibility but did not restore depth. Observable prices cannot be replaced by observable models.
- Model Risk as Market Risk: Once markets become model-native, model disagreement becomes the market's primary form of volatility.
- Governance Gap: Treasury risk frameworks still assume forward rates are observable market truths. In a model-native world, this assumption underestimates risk and overstates hedge effectiveness.
- Accounting Amplification: Under IFRS 9, curve divergence directly affects hedge accounting and expected credit loss provisioning, translating model disagreement into earnings volatility.

**Recommendations:**

1. For Treasury Teams:
   a. Incorporate model disagreement metrics in hedge documentation and effectiveness testing.
   b. Budget explicitly for model risk in capital allocation and performance measurement.
   c. Integrate uncertainty bands into treasury dashboards, treating them as first-order risk indicators.

2. For Banks and Dealers:
   a. Enhance model governance to monitor disagreement across curve engines.

   b. Calibrate internal pricing frameworks against external benchmarks to identify systematic drift.
   c. Use disagreement indices as early-warning signals for liquidity fragmentation.

3. For Regulators and Auditors:
   a. Recognize model disagreement as a quantifiable form of systematic risk within stress-testing and capital frameworks.
      - Revise IFRS 9 guidance to include model divergence as a potential driver of earnings volatility.
      - Encourage standardized disclosure of model disagreement metrics in financial statements.
4. For Policymakers:
      - Benchmark reforms must balance purity and practicality.
      - Encourage limited-term reference rates where structural liquidity supports them.
      - Align prudential and accounting regimes to ensure model uncertainty is neither ignored nor double-counted.

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