Public Inference and Funding Fragility*

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Abstract

Public order flow plays two roles for a leveraged position: it moves the price, and it informs the financier. After the current mark settles, a prime broker resets continuation margin from the expected shortfall of closeout losses. The reset statistic is the adverse-selection share of adverse signed flow: at fixed price-revision volatility, a higher persistent share raises margin and can force liquidation that weakens future depth. A frictionless Kyle benchmark exactly neutralizes this channel; a funding wedge breaks the neutrality, so price discovery and funding fragility move together. Privately optimal margin sensitivity is socially excessive near the amplification threshold.

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Keywords: adverse selection, margin, funding liquidity, prime brokerage, price discovery, liquidity spirals.

1 Introduction

Informed trading is usually described from the dealer's side of the market. Order flow reveals information, dealers update prices, and adverse selection appears as a price-impact problem. Most informed positions, however, are carried on borrowed balance sheet. A leveraged trader can buy or short on private information only because a financier supplies capital, sets collateral terms, and decides whether the position can continue. The financier observes the same public market outcomes as dealers: order flow, prices, price impact, and unwind conditions. It does not observe the trader's private signal. Public information therefore has a second receiver and a second use. It moves prices, and after prices have moved, it changes the terms on which the position is financed.

The distinction from ordinary mark-to-market funding stress is central to everything that follows. A negative price change on a financed long reduces wealth, and some contracts require a contemporaneous settlement transfer. Those are current-price effects. The channel studied here begins after that accounting step. Once the public price has updated and the current mark has been absorbed or settled, the financier asks a different question: what collateral is needed to carry the

*I thank seminar participants for helpful comments. All errors are my own.

same signed position through the margin period of risk if it must be liquidated under the newly inferred conditions? The answer depends on expected closeout loss beyond the current public price, not on the loss already capitalized into that price.

The relevant object is the financed position, not the asset in isolation. Consider a trader financed long. If public order flow turns negative, dealers mark value down. After that mark, the financier is not trying to set another fair transaction price. It is asking how much it could lose if the long had to be unwound over the margin period of risk. The same negative flow can therefore raise continuation collateral even after the current price has fully adjusted. If the trader has spare collateral, the new requirement is absorbed. If not, the trader must sell. For a financed short the sign reverses: positive order flow is adverse because buying back the short becomes more expensive. Public inference must be read against the direction of the funded position.

This sequence turns adverse selection into a funding problem. Public evidence of informed trading changes expected liquidation loss over the continuation horizon. Expected liquidation loss changes continuation margin. A binding reset forces liquidation, and liquidation weakens future depth. The same public signal can be harmless when post-settlement account equity is ample and destabilizing when the reset binds. The analysis is deliberately local to this fragile region. It does not claim that every adverse-flow episode creates forced sales. It studies the region in which public information stops being only a pricing signal and becomes a financing shock.

The model keeps only the ingredients this sequence requires. A Gaussian trading block makes order flow informative about the value and unwind conditions of the financed position. A prime broker observes that public signal, not the trader's private signal, and sets continuation margin from the expected shortfall of liquidation losses beyond the current mark. A margin constraint determines whether the reset is absorbed or requires a position reduction. A depth block determines how costly that reduction is for future trading conditions. Four results organize the paper.

The first result isolates the margin channel and separates it from volatility. The broker's reset statistic is $A_t^{AS} = \tau_t a_t^+$, the product of the total adverse half-tail scale of signed public price revisions, a_t^+, and the persistent signed-flow share of those revisions, τ_t. Theorem 1 shows that continuation margin rises one-for-one with the expected closeout loss implied by this statistic, and that the response survives when the total price-revision scale a_t^+ is held fixed: $\partial m_{t+1}/\partial \tau_t = \psi_A a_t^+ > 0$, where ψ_A aggregates closeout-flow persistence and residual-demand slopes over the margin period of risk. Margin can therefore tighten because public flow became more informative, not because prices became more volatile. The fixed-dispersion comparison is not vacuous: Lemma 3 constructs an explicit path through primitive parameter space along which the half-tail scale is exactly constant while the adverse-selection share varies over an open interval.

The second result disciplines the channel with equilibrium trading, and it is the paper's sharpest message. In a frictionless Kyle benchmark with endogenous trading intensity, the informed share of order-flow variance is exactly one half for any signal quality and any volume of noise trading: strategic intensity adjustment perfectly offsets changes in noise cover, so the broker's adverse-selection share, equilibrium price informativeness, and the implied margin are all invariant to noise-trading shifts. Equilibrium trading insulates funding terms from the information environment. Theorem 2 shows that a funding wedge, the shadow cost of expanding a financed position, breaks this neutrality. With a positive wedge, the informed trader underadjusts to changes in noise trading. A decline in noise trading then raises price informativeness and the adverse-selection share together, and with them the continuation margin and the fragility of the funded position. Price discovery and funding fragility become two sides of one equilibrium object: in the wedge economy, informativeness is proportional to the broker's adverse-selection share. The friction that makes traders vulnerable to margin resets is the same friction that makes margins sensitive to information in the first place. A corollary shows the feedback runs both ways: a larger funding wedge lowers equilibrium informativeness, so funding fragility also impairs price discovery.

The third result replaces an assumed fixed point with a constructed one. Local amplification arguments in this literature typically assume the existence of a binding steady state and differentiate around it. That practice hides a difficulty: if liquidation only removes positions, a steady state with strictly positive forced liquidation cannot exist. The constructed equilibrium of Section 8 resolves this with a financed-entry flow: new informed positions arrive each period, and stationarity forces steady-state liquidation to equal entry. A direct implication is that every stationary state of the economy has a binding margin. Proposition 5 gives existence and uniqueness of the stationary binding state in closed form up to one scalar equation, and the Jacobian of the constructed system exhibits the amplification threshold rather than postulating it: as the sensitivity of public inference to depth rises, the spectral radius of the equilibrium law of motion passes through one at an interior, computable parameter value.

The fourth result is normative. The broker's expected-shortfall rule prices its own tail risk and ignores the depth externality of the liquidation it forces. Proposition 8 shows that in the binding region the privately optimal sensitivity of margin to the adverse-selection statistic is always socially excessive, and the constrained-efficient sensitivity falls as the economy approaches the amplification threshold, where the social cost of margin responsiveness diverges. Proposition 9 adds an instrument comparison: a cap on margin sensitivity attains any given reduction in amplification at no cost to price discovery, while interventions that blunt the public signal itself, such as noise injection or disclosure delay, destroy informativeness one-for-one with the fragility they remove. Margin design dominates information suppression. This maps directly into the policy debate on anti-procyclicality buffers for cleared and bilateral margin.

The mechanism has clear empirical content even though the paper is theoretical. The four slopes that compose the channel correspond to observables in a prime-brokerage or secured-financing dataset: the relation between depth and adverse public inference, the margin response to pre-event public inference after current settlement, the deleveraging response to margin increases when slack binds, and the subsequent depth response to deleveraging. The model also predicts a sharp cross-sectional contrast: public-inference events that move prices without margin resets are adverse-selection events with no depth aftermath, while observationally similar events that tighten margins against constrained accounts predict deleveraging and persistent illiquidity. Appendix A develops the measurement mapping.

The paper's contribution relative to the literature is a timing and an object. In Brunnermeier and Pedersen (2009), margins destabilize when they respond to volatility; the trigger is a risk measure. In Glebkin et al. (2021), funding terms respond to ex ante price informativeness; the trigger is the quality of the price system. Here the trigger is the ex post, position-specific adverse-selection content of realized public flow, evaluated after the current mark has settled, and the margin object is continuation collateral over the closeout horizon rather than current settlement. This timing is what allows the volatility channel to be shut down exactly: the fixed-dispersion result conditions on the realized public price-revision scale and still produces a margin reset. The neutrality result is, to my knowledge, new: it identifies the frictionless Kyle equilibrium as the exact benchmark in which information-sensitive margining has no comparative statics in noise trading, and identifies the funding wedge as the primitive that turns information sensitivity on. Section 3 develops these connections in detail.

The rest of the paper proceeds as follows. Section 2 develops the mechanism informally. Section 3 positions the paper in the literature. Section 4 presents the model. Section 5 establishes the continuation-margin repricing theorem and the fixed-dispersion separation. Section 6 establishes the neutrality benchmark and the discovery-funding tradeoff. Section 7 characterizes binding liquidation. Section 8 constructs the stationary binding equilibrium and computes its amplification threshold. Section 9 develops the general local amplification extension. Section 10 studies welfare and policy. Section 11 summarizes the empirical content. Section 12 concludes. Appendix A records measurement implications; Appendix B collects proofs and derivations.

2 Public Inference and Funding Pressure

The mechanism has one informational friction and one funding friction. The financier cannot see the trader's private signal, and the trader cannot always meet a higher continuation-margin requirement. Public market outcomes connect the two. Order flow and price impact reveal information about hidden trading. Dealers use that information to set prices. Current price changes then affect trader wealth and any contemporaneous settlement transfer. The financier's continuation decision comes later in the timing. It uses the same public information to reassess the loss it would face if the carried position had to be unwound after the current mark. For a financed long, adverse public news is a negative public price revision and weaker closeout conditions. For a financed short, adverse public news is a positive public price revision and a more expensive buy-in. The public signal is therefore signed by the direction of the funded position.

Once expected continuation unwind loss changes, the next step is contractual. A continuation-margin rule converts the updated expected shortfall into a collateral requirement. This is not yet a liquidity spiral. If the trader has enough post-settlement account equity, the higher margin is absorbed and the position continues. The spiral begins only when the reset binds. The trader then cannot maintain the inherited position and must sell or buy back part of it. That liquidation consumes depth. If marginal absorbers are constrained or strategic, the trade worsens future

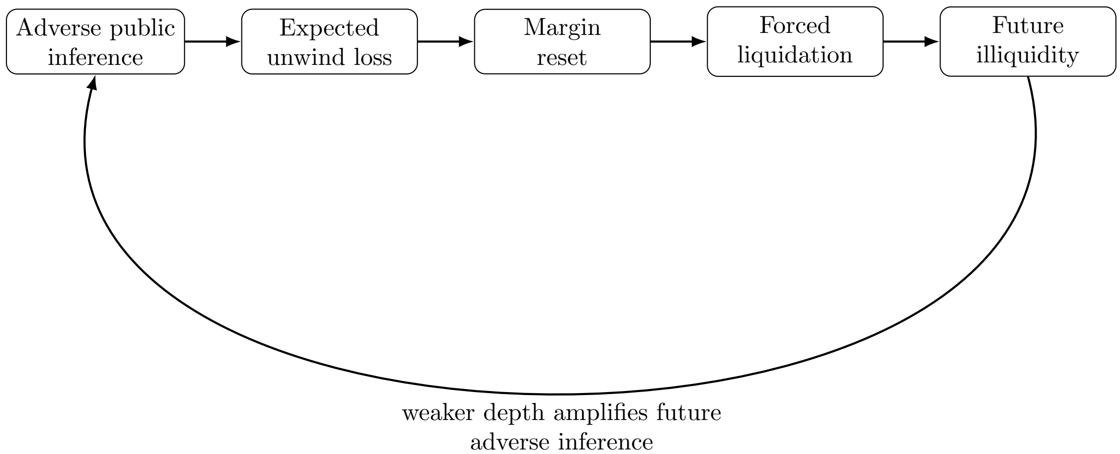

Figure 1: Public-inference funding channel. Public evidence of informed trading raises the financier's expected continuation unwind loss after the current mark. If the resulting margin reset binds, liquidation worsens future depth.

illiquidity. Weaker depth can then make later public order flow carry a larger adverse-selection component, raising expected continuation unwind losses again.

Figure 1 shows the mechanism. The trading block supplies public inference. The financier's risk rule translates that inference into margin. The margin constraint determines whether the reset is absorbed or forces liquidation. The depth block determines how costly the liquidation is for future trading conditions. The empirical content follows the same order. Order flow with adverse-selection content should matter for future depth mainly when it predicts margin tightening, when margin tightening induces deleveraging, and when deleveraging occurs in markets where marginal liquidity provision is fragile. A public signal that only moves prices is an adverse-selection event. A public signal that raises margins, binds collateral, forces liquidation, and worsens future depth is the funding-pressure event studied here.

The point is visible before the formal model. Public information is not destabilizing because it is public, and a price decline is not by itself the mechanism. It becomes destabilizing when the same signal used for price discovery also enters continuation funding terms for a constrained position after the current price update has already occurred. The formal analysis adds a second observation that is not visible without equilibrium: whether public flow carries margin-relevant information at all is itself an equilibrium outcome. When informed trading is unconstrained, intensity adjusts until the information content of flow is invariant to the trading environment, and the funding channel is dormant. When informed trading is financed and the financing has a shadow cost, that adjustment is incomplete, and the channel switches on. Funding frictions are thus not only the propagation mechanism; they are also the reason the trigger exists.

3 Related Literature

The analysis draws first on market microstructure with adverse selection. In Kyle (1985), informed trading is revealed through aggregate order flow and incorporated into prices. In Glosten and Milgrom (1985), bid and ask prices reflect the possibility of trading with better-informed agents. Easley and O'Hara (1987) and Easley et al. (1996) develop measures of information-based trading, Easley et al. (2002) link information risk to expected returns, and Easley et al. (2012) bring the language of flow toxicity to high-frequency liquidity provision. The mechanism here keeps the core microstructure idea that public order flow reveals information, but gives that public signal a second receiver. Dealers use order flow to set prices. A financier uses the same public information to set continuation funding terms for a carried position. The neutrality result of Section 6 is a statement about the Kyle equilibrium itself: the equilibrium informed share of order-flow variance is invariant to noise trading, and this invariance is exactly what insulates information-sensitive margins in the frictionless benchmark.

The funding side is closest to work on funding liquidity, constrained arbitrage, and intermediary balance sheets. Brunnermeier and Pedersen (2009) show how market liquidity and funding liquidity reinforce each other when traders provide liquidity subject to margins: traders need capital to hold positions, margins determine how much capital is required, and market illiquidity can raise the risk of financing a trade. Shleifer and Vishny (1997) emphasize that real arbitrage requires capital and can become least effective when mispricing deepens before convergence. Gromb and Vayanos (2002) show how financially constrained arbitrageurs supply liquidity and how losses or forced liquidation can widen price wedges. Adrian and Shin (2010) and He and Krishnamurthy (2013) make intermediary balance-sheet capacity central for asset prices, and Acharya and Viswanathan (2011) show how leverage interacts with moral hazard and liquidity in downturns. The channel here uses the same broad discipline of funded positions, margins, and constrained balance sheets, but the trigger is informational: funding pressure arises because public trading outcomes change the financier's expected unwind loss on a specific financed position, even at fixed price-revision volatility.

The analysis also belongs with models of leverage cycles, collateral, margins, and liquidity spirals. Geanakoplos (2003) and Fostel and Geanakoplos (2008) emphasize endogenous collateral and leverage. Chowdhry and Nanda (1998), Kyle and Xiong (2001), Morris and Shin (2004), and Plantin et al. (2008) analyze mechanisms through which losses, constraints, and market prices reinforce one another. Gârleanu and Pedersen (2011) show how margin constraints affect required returns and deviations from the law of one price. In those settings, margins matter because they limit positions or change required returns. Here the margin reset is tied to public inference: order flow and price impact alter the financier's posterior closeout-loss distribution for the funded position, and the binding constraint turns that reset into liquidation.

The closest information-funding comparison is Glebkin et al. (2021). Their mechanism runs through ex ante price informativeness: when prices become less informative, financiers face a riskier conditional loss distribution and tighten funding, which feeds back into information production. The mechanism here differs in timing, sign, and object. Public order flow has already been incorporated into the current mark. The prime broker then uses the same public information to reset continuation collateral for an existing signed exposure over the margin period of risk. The relevant statistic is not aggregate price informativeness but the persistence share of adverse signed public flow for the funded position. The two mechanisms are complementary, and the wedge economy of Section 6 contains an echo of theirs: a larger funding wedge lowers equilibrium informativeness, so fragility impairs discovery even as discovery, through margins, creates fragility.

Recent work on strategic and granular liquidity provision shapes the depth block. Glebkin et al. (2026) study strategic large investors in granular asset markets and show that liquidity depends on the cross-sectional distribution of wealth, holdings, and price-impact internalization. The liquidation-depth block here is deliberately local but uses the same lesson: the effect of a forced trade on future depth is not a universal constant. It depends on the market structure absorbing the trade, including concentration, holdings imbalances, and the balance-sheet capacity of marginal liquidity providers.

The welfare analysis connects to the literature on margin design and procyclicality. Figlewski (1984) and Fenn and Kupiec (1993) analyze margin setting for futures and futures-style settlement systems. Hardouvelis (1990), Day and Lewis (1997), and Kupiec (1998) study how margin policy relates to volatility and market integrity. Biais et al. (2016) study counterparty risk, incentives, and margins, emphasizing margin policy as a risk-control device. Murphy et al. (2014) document the procyclicality of risk-based initial margin models, and Glasserman and Wu (2018) characterize the tradeoff between margin responsiveness and procyclicality in risk-sensitive margin rules. The welfare section provides an equilibrium counterpart to that tradeoff: the social cost of margin responsiveness is governed by the distance to the amplification threshold, and the constrained-efficient responsiveness is strictly below the privately optimal one whenever liquidation has a depth externality. On the empirical side, Chatrath et al. (2001), Abruzzo and Park (2014), and Daskalaki and Skiadopoulos (2016) study futures margin changes using open interest, trader groups, liquidity measures, and margin-event designs. These are empirical analogues rather than the institution in the model. The direct object is a prime-brokerage or secured-financing account where signed exposure, account slack, margin resets, and closeout rights are jointly relevant.

4 Model

The economy has three layers: a one-asset trading block, a funding block, and a local depth block. Public order flow links them. It prices the asset, changes post-settlement account equity through the current mark, informs the financier's continuation-margin reset, and triggers liquidation when post-settlement equity is scarce.

4.1 Economic Environment

There is one risky asset with terminal payoff v. At date t, an informed trader carries a signed funded position q_t and trades on a private signal about v. The sign matters: a long loses when value is revised downward, while a short loses when value is revised upward. Write $s_t^q = \mathrm{sgn}(q_t)$ and $Q_t = |q_t|$.

Three other agents complete the environment. Noise traders submit liquidity orders. Competitive dealers observe aggregate order flow and set prices. A prime broker funds the carried position in a secured maintenance-margin account. The prime broker knows the position sign and size and observes public market outcomes, but not the trader's signal. Its problem is not to price the asset; dealers do that. Its problem is to decide, after the current mark has been settled, how much account equity is required to continue carrying the position through the margin period of risk and whether the position must be reduced.

The basic state at the start of a date, before current trading and settlement, is

$$(\lambda_t, e_t^-, q_t, m_t).$$

Here λ_t is persistent market illiquidity, e_t^- is pre-settlement account equity, q_t is the signed carried position, and m_t is the inherited per-unit continuation margin. The current price update and any settlement transfer convert e_t^- into post-settlement account equity e_t. Continuation margin and forced liquidation are evaluated only after e_t is known.

Throughout, λ_t is not the Kyle price-impact coefficient. Kyle-style price impact is κ_t: an instantaneous pricing coefficient inferred from current order flow and prices. The state λ_t is slower moving and governs the execution environment and next-period depth law. Locally, κ_λ maps persistent illiquidity into current price impact.

4.2 Date Structure and Information

Each date has six steps:

1. the trader enters with state $(\lambda_t, e_t^-, q_t, m_t)$, privately observes s_t, and chooses trading intensity under inherited funding terms;
2. informed and noise orders form aggregate order flow y_t;
3. dealers observe order flow and set the public price p_t; current mark-to-market gains and losses and any current settlement transfer are reflected in post-settlement account equity e_t;
4. the prime broker observes public market outcomes (y_t, p_t, κ_t), the position (s_t^q, Q_t), and post-settlement account equity e_t, but not s_t, and resets continuation margin for the margin period of risk;
5. if the new continuation-margin requirement exceeds post-settlement account equity, the

trader liquidates part of the position; realized liquidation feeds into next-period illiquidity and account equity;

6. new financed positions of size $\nu_t \geq 0$ enter the account, so the carried position evolves by liquidation and entry.

The entry step deserves comment because the prior literature usually omits it. If liquidation only removes positions, no stationary state with strictly positive forced liquidation can exist: the position would shrink every period. Financed entry, interpreted as new informed capital arriving in the strategy or the account, is the minimal ingredient that makes a stationary binding state possible. Section 8 shows that with $\nu_t = \nu > 0$, stationarity in fact forces the margin to bind, so binding steady states are not a knife-edge but the generic stationary outcome of an economy with financed turnover.

This timing creates the nonlinearity. Public order flow always updates beliefs and prices, and the current price update affects wealth before the financier acts. It affects realized depth only if the continuation reset binds. With enough post-settlement account equity, the signal changes funding terms without forcing a sale. With scarce equity, it reduces the carried position and can worsen future depth. Excess slack after a reset is the derived object

$$\xi_t(m_{t+1}) := e_t - m_{t+1}Q_t.$$

The reset binds when $\xi_t(m_{t+1}) < 0$.

The financier's public signal is position-relative. Define

$$z_{s,t} := -s_t^q p_t = -s_t^q \kappa_t y_t.$$

For a long, a negative public price revision is adverse because it lowers account equity and predicts a more difficult closeout. For a short, a positive public price revision is adverse because buying back the position becomes more expensive. This signed public price statistic is the broker-observed bridge from public trading information to funding pressure.

4.3 Primitive and Generated Objects

Before stating assumptions, separate primitives from generated local objects. The primitive ingredients are:

1. a Gaussian signal and noise structure for the risky asset and public order flow;
2. a signed funded position (s_t^q, Q_t) with financed entry flow ν;
3. a current-price settlement step that separates mark-to-market gains, wealth losses, and variation margin from continuation collateral;
4. a funding wedge $\gamma \geq 0$: the local shadow cost to the trader of expanding the financed

position;

5. a financier continuation-margin rule based on posterior expected shortfall of liquidation loss beyond the current mark;
6. a margin-ratio liquidation rule that converts binding margin resets into position reductions;
7. a strategic depth law that maps forced liquidation into next-period illiquidity.

The generated objects are induced by these primitives near a binding-region fixed point. The trader's problem generates β^*. Order flow, price impact, and trading intensity generate the public-inference statistic T. Expected-shortfall margining generates M. The margin-ratio constraint generates L. The vector map $\mathcal{F}$ composes these objects into the local law of motion for illiquidity, positions, and account equity.

The table summarizes the main objects before the formal assumptions.

Object	Meaning	Status	Empirical counterpart
β^*	trading intensity	local policy	order-flow aggressiveness
γ	funding wedge	primitive shadow cost	financing cost of position expansion
z_s	signed adverse inference	Gaussian posterior statistic	position-relative adverse flow
$\mathcal{P}_t^m$	MPOR loss law	post-update margin law	closeout-risk distribution
M	continuation margin rule	ES-implied local rule	margin response beyond current mark
L	forced liquidation rule	margin-ratio mechanics	position response
ν	financed entry	primitive turnover flow	new informed capital
Λ	strategic depth law	local transition	depth after deleveraging
Ω	liquidity-provision state	market structure	concentration and absorption capacity
W	account-equity law	local bookkeeping	constraint exposure
$\mathcal{F}$	state map	induced local system	joint dynamic response

4.4 Public Order Flow and Signed Adverse Inference

Use a linear-Gaussian trading block. Let terminal value and noise trading satisfy $v \sim N(0, \sigma_v^2)$ and $u_t \sim N(0, \sigma_u^2)$. The informed trader observes $s_t = v + \eta_t$, where $\eta_t \sim N(0, \sigma_\eta^2)$, with mutual independence. The trader submits order $x_t = \beta_t s_t$, so aggregate order flow is $y_t = x_t + u_t = \beta_t s_t + u_t$. Dealers price competitively, $p_t = \mathbb{E}[v \mid y_t]$.

The posterior loading of informed trading on public order flow is

$$\chi(\beta_t) = \frac{\beta_t^2 \sigma_s^2}{\beta_t^2 \sigma_s^2 + \sigma_u^2}, \qquad \sigma_s^2 := \sigma_v^2 + \sigma_\eta^2. \tag{4.1}$$

The financier need not observe β_t directly. In equilibrium, $\chi(\beta_t)$ is the public posterior loading implied by pricing and order flow.

The realized position-relative public signal is

$$z_{s,t} := -s_t^q p_t = -s_t^q \kappa_t y_t.$$

This is the signed public price revision against the funded position. It is not a second mark. It is the public statistic the broker can observe after dealers have set the fair price and after the current mark has entered account equity.

Because the Gaussian public signal is centered unconditionally, the reset-relevant object cannot be the unconditional mean of $z_{s,t}$. The prime-broker contract is triggered by adverse public states, and the broker estimates the relevant distribution before conditioning on the realized adverse branch. Let $\mathcal{I}_t^p$ denote the broker's pre-reset public estimation set: past public price revisions, estimated price impact, the funded position (s_t^q, Q_t), post-settlement account equity e_t, and λ_t, but not the trader's private signal or primitive trading intensity. After the current public order flow and price are observed, the broker's post-realization public history is $\mathcal{H}_t^p = \mathcal{I}_t^p \vee \sigma(y_t, p_t)$.

Let

$$\widehat{\sigma}_{z,t}^2 := \mathrm{Var}_t^p(z_{s,t})$$

denote the broker's predictive variance of the signed public price revision under $\mathcal{I}_t^p$. In the structural Gaussian benchmark,

$$\widehat{\sigma}_{z,t} = \kappa_t \sqrt{\beta_t^2 \sigma_s^2 + \sigma_u^2},$$

but the broker need not observe β_t separately; it estimates the public distribution of signed price revisions. The total adverse half-tail scale is

$$a_t^+ := \mathbb{E}[z_{s,t} \mid z_{s,t} \geq 0, \mathcal{I}_t^p] = \sqrt{\frac{2}{\pi}}\, \widehat{\sigma}_{z,t}. \tag{4.2}$$

By itself, a_t^+ is a price-revision scale. To separate information from volatility, write the persistent signed-flow or adverse-selection share of the public revision as $\tau_t \in [0, 1]$ and define the reset-relevant adverse-selection statistic

$$A_t^{AS} := \tau_t a_t^+. \tag{4.3}$$

The main theorem uses A_t^{AS}, not the raw half-tail scale. The paper's primitive comparative static is therefore about the informed and persistent component of adverse public flow. The total price-revision scale a_t^+ can be held fixed while τ_t changes, and Section 6 shows that this comparison is attainable on the primitive parameter space of the trading block, not merely well defined in

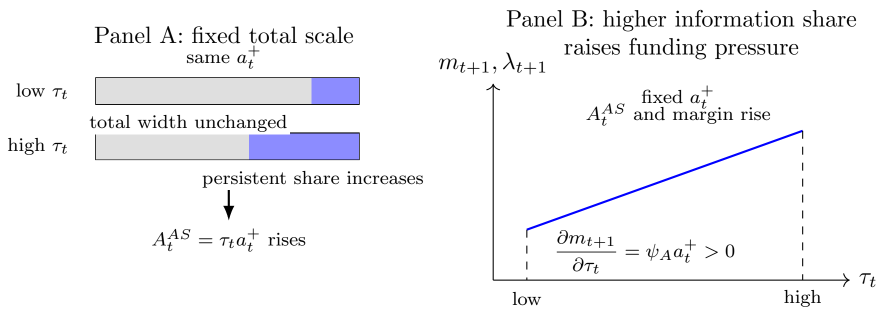

Figure 2: Fixed-dispersion information channel. Holding total public price-revision scale fixed, a higher persistent signed-flow share raises the broker's expected closeout loss and continuation margin. The channel is therefore adverse-selection-sensitive, not only volatility-sensitive.

reduced form.

4.5 The Closeout Primitive

The margin object requires a primitive description of what the broker would lose if it had to unwind the position over the margin period of risk. The following benchmark supplies the smallest such description and derives, rather than assumes, the loading of expected closeout loss on the adverse-selection statistic.

Proposition 1 (Primitive closeout benchmark)**.** *Consider a local continuation-margin benchmark in which the current public price p_t has already been set and current mark-to-market transfers have already been reflected in account equity. If the prime broker must liquidate the inherited position, it unwinds over J slices during the margin period of risk. Slice j sells or buys back fraction r_j of the position, where $r_j > 0$ and $\sum_j r_j = 1$. After signing losses by the funded position, write the per-unit loss beyond the current mark on that slice as*

$$u_{j,t+1} = C_j(z_{s,t}, \lambda_t, Q_t) + \varepsilon_{j,t+1}.$$

This loss is generated by a closeout-price concession, not by a second revision to fundamental value. The competitive mark remains $p_t = \mathbb{E}[v \mid y_t]$. If slice j is closed at

$$p^{\ell}_{j,t+1} = p_t - s^q_t C_j(z_{s,t}, \lambda_t, Q_t) + \tilde{\varepsilon}^p_{j,t+1},$$

then $u_{j,t+1} = -s^q_t(p^{\ell}_{j,t+1} - p_t) = C_j(z_{s,t}, \lambda_t, Q_t) + \varepsilon_{j,t+1}$, where $\varepsilon_{j,t+1} := -s^q_t \tilde{\varepsilon}^p_{j,t+1}$ has conditional mean zero.

The margin-period closeout flow is not imposed as an independent positive-loading shock. Let θ_t denote the persistent signed adverse-flow component inferred from current public trading, and let

$$z_{s,t} = \theta_t + \epsilon^z_t, \qquad h_{j,t+1} = b_j \theta_t + \epsilon^h_{j,t+1},$$

where $(\theta_t, \epsilon^z_t, \epsilon^h_{j,t+1})$ are jointly Gaussian conditional on $\mathcal{I}^p_t$, mutually independent after condition-

ing on θ_t, and $b_j \geq 0$. Define

$$\tau_t := \frac{\operatorname{Var}(\theta_t \mid \mathcal{I}_t^p)}{\operatorname{Var}(z_{s,t} \mid \mathcal{I}_t^p)} \in [0,1].$$

This is the persistent signed-flow share of the public price revision. Empirically, $b_j > 0$ is the local counterpart of signed order-flow persistence over the closeout horizon. It captures the idea that, during the margin period of risk, absorbers expect adverse signed flow, crowded unwind pressure, or inventory imbalance to persist rather than disappear immediately after the current mark. Then

$$\operatorname{Cov}(h_{j,t+1}, z_{s,t} \mid \mathcal{I}_t^p) = b_j \operatorname{Var}(\theta_t \mid \mathcal{I}_t^p) \geq 0.$$

For the adverse half-tail event, the joint-Gaussian projection gives

$$\mathbb{E}[h_{j,t+1} \mid \mathcal{I}_t^p, z_{s,t} \geq 0] = \rho_j(\tau_t) a_t^+, \qquad \rho_j(\tau_t) := \frac{\operatorname{Cov}(h_{j,t+1}, z_{s,t} \mid \mathcal{I}_t^p)}{\operatorname{Var}(z_{s,t} \mid \mathcal{I}_t^p)} = b_j \tau_t \geq 0. \tag{4.4}$$

The inequality is strict if $b_j > 0$ and the persistent signed component has positive conditional variance. Thus the persistence coefficient is derived from a primitive absorber belief about future signed closeout flow, not assumed directly. Holding the total half-tail scale a_t^+ fixed, an increase in τ_t raises expected closeout flow.

A primitive residual-demand closeout schedule gives

$$D_j(c, h, \lambda, Q) = \eta_j(c - h) - \delta_j \lambda - \varpi_j r_j Q, \qquad \eta_j > 0, \quad \delta_j, \varpi_j \geq 0,$$

where c is the signed concession offered relative to p_t, h is margin-period adverse closeout flow inferred by absorbers, and D_j is signed residual demand for the slice. Market clearing for slice j requires $D_j(C_j, h_{j,t+1}, \lambda_t, Q_t) = r_j Q_t$. Hence

$$C_j = h_{j,t+1} + \frac{r_j Q_t + \delta_j \lambda_t + \varpi_j r_j Q_t}{\eta_j}.$$

The positive adverse-public-inference loading is therefore derived from two primitives: a persistent signed adverse-flow component that absorbers expect to continue during closeout, and downward-sloping residual demand ($\eta_j > 0$). It is not an imposed concession coefficient. The average per-unit continuation unwind loss is

$$U_{s,t+1} := \sum_{j=1}^{J} r_j u_{j,t+1}.$$

Then

$$\mathbb{E}[U_{s,t+1} \mid \mathcal{I}_t^p, z_{s,t} \geq 0] = \psi_A A_t^{AS} + \psi_\lambda \lambda_t + \psi_Q Q_t, \tag{4.5}$$

where

$$\psi_A := \sum_j r_j b_j, \qquad \psi_\lambda := \sum_j r_j \frac{\delta_j}{\eta_j}, \qquad \psi_Q := \sum_j r_j^2 \frac{1 + \varpi_j}{\eta_j}.$$

Thus $\psi_A > 0$ whenever at least one closeout slice has $b_j > 0$. Holding a_t^+ fixed, $\partial \mathbb{E}[U_{s,t+1} \mid$

$\mathcal{I}_t^p, z_{s,t} \geq 0]/\partial\tau_t = \psi_A a_t^+ > 0$. *If, in addition,* $A_t^{AS} = T(\lambda_t, Q_t, e_t; \theta)$ *locally with* $T_\lambda \geq 0$*, then the continuation-loss component entering margin has local illiquidity slope* $\psi_A T_\lambda + \psi_\lambda > 0$ *whenever at least one of* $\psi_A T_\lambda$ *or* ψ_λ *is strict.*

Proof. See Appendix B. □

The benchmark is intentionally small. It is not a full dynamic inventory model of absorbers; it is the smallest local closeout primitive needed to sign the continuation-loss loading. A concession is the price needed to clear residual demand for a signed closeout slice when absorbers infer that adverse public flow has a persistent component over the margin period. The continuation-margin object can therefore move with adverse-selection content after the current mark has settled because the financier is covering a signed closeout concession relative to p_t, not recharging the price loss already reflected in p_t.

4.6 Signed Public Signals and Current Marks

The financier's key inference is position-specific, but the accounting objects must be kept separate. Public order flow first changes the current public price. That price change creates mark-to-market gains or losses for the trader and any current settlement transfer. The continuation-margin object is different: it is the loss from liquidating the position over the margin period after the current mark. The Gaussian block records the current-price component; the closeout benchmark above supplies the margin-horizon component.

Let the current mark-to-market loss in the direction of the funded position be $R_{s,t} := -s_t^q v$. Since dealers set $p_t = \mathbb{E}[v \mid y_t] = \kappa_t y_t$, the posterior mean of the current mark-to-market loss is

$$\mu_{s,t}^{\text{mtm}} := \mathbb{E}[R_{s,t} \mid y_t] = -s_t^q \kappa_t y_t = z_{s,t}.$$

Lemma 1 (Gaussian public inference and current mark)**.** *Under Assumption 1, for a signed funded position* $q_t \neq 0$*, define* $s_t^q = \text{sgn}(q_t)$*,* $z_{s,t} = -s_t^q p_t = -s_t^q \kappa_t y_t$*, and* $R_{s,t} = -s_t^q v$*. In the Gaussian trading block with price* $p_t = \kappa_t y_t$*, the posterior mean current mark-to-market loss satisfies* $\mathbb{E}[R_{s,t} \mid y_t] = z_{s,t}$*. Adverse public inference relative to the funded position therefore raises the current mark-to-market loss one-for-one.*

Proof. By Assumption 1, competitive pricing gives $\mathbb{E}[v \mid y_t] = p_t = \kappa_t y_t$, so $\mathbb{E}[R_{s,t} \mid y_t] = -s_t^q \kappa_t y_t = z_{s,t}$. □

The lemma is not the paper's margin channel. It is the mark-to-market accounting step. The continuation-margin channel uses the same signed public inference to evaluate

$$U_{s,t+1} := -s_t^q (p_{t+1}^\ell - p_t),$$

the per-unit liquidation loss beyond the current mark. In the benchmark of Proposition 1, the conditional mean closeout loss has A_t^{AS}-derivative $\psi_A > 0$ and, holding a_t^+ fixed, τ_t-derivative $\psi_A a_t^+ > 0$. That is the primitive adverse-selection-to-continuation-loss slope used in the margin rule below.

4.7 Trading with a Funding Wedge

The trader chooses current trading intensity knowing that the same order flow that generates information rents also affects continuation funding. Since dealers price competitively,

$$p_t = \kappa(\beta_t) y_t, \qquad \kappa(\beta_t) = \frac{\beta_t \sigma_v^2}{\beta_t^2 \sigma_s^2 + \sigma_u^2}. \tag{4.6}$$

Let $\rho := \sigma_v^2/\sigma_s^2 = \operatorname{Cov}(v, s_t)/\operatorname{Var}(s_t)$. Conditional on s_t, the trader who submits x_t against the linear pricing rule earns expected current surplus

$$\Pi(x_t; s_t) = \mathbb{E}[(v - p_t)x_t \mid s_t] = \rho s_t x_t - \kappa_t x_t^2. \tag{4.7}$$

Without continuation funding concerns, the optimum is the Kyle order $x_t^K = \rho s_t/(2\kappa_t)$, hence intensity $\beta^K = \rho/(2\kappa)$.

Continuation funding adds a wedge. Expanding the financed position raises the future margin requirement and the expected cost of forced liquidation. Locally, this shadow cost is quadratic in the order:

$$\Phi(x_t) = \frac{\gamma}{2} x_t^2, \qquad \gamma \geq 0. \tag{4.8}$$

The wedge coefficient γ is generated by the margin and liquidation technology: a larger order raises the funded exposure carried into the reset, which raises the continuation margin requirement, the probability that the reset binds, and the expected liquidation cost. Appendix B records the composition $\gamma \simeq C_{\Delta Q} Q_m M_T T_\beta + C_\lambda \Lambda_2 Q_m M_T T_\beta$ in terms of the local maps defined below; for the equilibrium analysis γ is treated as a nonnegative primitive. The trader's problem is

$$\max_{x_t} \left\{ \rho s_t x_t - \kappa_t x_t^2 - \frac{\gamma}{2} x_t^2 \right\}, \tag{4.9}$$

with first-order condition

$$x_t = \frac{\rho s_t}{2\kappa_t + \gamma}, \qquad \text{hence} \qquad \beta_t = \frac{\rho}{2\kappa_t + \gamma}. \tag{4.10}$$

The funding-adjusted intensity lies below the Kyle intensity whenever $\gamma > 0$. Section 6 closes this block with the dealer's pricing rule and shows that the wedge is what allows the information environment to reach the margin rule at all.

4.8 Financier's Posterior and Margin Rule

The prime broker sets continuation margins from a posterior expected-shortfall constraint. This is a restricted-contract assumption: the broker adjusts maintenance-margin terms and can force a position reduction rather than writing a fully state-contingent interest-rate or rationing contract. Institutionally, m_{t+1} is the prime-broker margin per unit of absolute position. The current public price and any current settlement transfer have already affected account equity; the reset covers liquidation over the margin period of risk. This is the same economic object as initial or maintenance margin after current settlement: a collateral requirement sized to potential closeout loss over the margin period of risk. Prime-brokerage and cleared-margin systems commonly manage this risk through margin calls, exposure limits, and closeout rights rather than a fully state-contingent financing spread for every future liquidation state.

The prime broker estimates the public law of signed price revisions using $\mathcal{I}_t^p$ and observes the realized public history $\mathcal{H}_t^p$ after order flow and price are set. It observes order flow, price, price impact, illiquidity, position, post-settlement account equity, and the public distribution of signed price revisions, but not s_t. Realized public trading updates the predictive parameters used for margin sizing. Let $\mathcal{P}_t^m$ denote the resulting predictive margin-period law for future closeout losses in the adverse-tail branch. Conditioning on $\mathcal{P}_t^m$ is forward-looking: it does not plug in a realized closeout-flow draw. Favorable public realizations can update margins through the general expected-shortfall rule, but the funding-fragility slopes below are cross-economy derivatives of the adverse predictive branch, not impulse responses to a realized signal. Write $U_{s,t+1} = \mu_{s,t}^U + \sigma_{s,t}^U \varepsilon_{s,t}$, where $\varepsilon_{s,t}$ has fixed conditional distribution locally. In the benchmark of Proposition 1, $\mu_{s,t}^U = \psi_A A_t^{AS} + \psi_\lambda \lambda_t + \psi_Q Q_t$, so adverse-selection public inference moves the continuation-loss distribution after the current mark has settled. With $\sigma_{A^{AS}}^U = 0$ in this benchmark, the quantitative size of the information channel is carried by ψ_A, the closeout-flow persistence and residual-demand loading.

The margin m_{t+1} is required continuation equity per unit of absolute position. It is not extra collateral in addition to e_t; it is the threshold against which total post-settlement account equity is compared. Given loss tolerance $\bar{\ell}$, the prime broker chooses the smallest margin satisfying

$$G(m_{t+1}; \mu_{s,t}^U, \sigma_{s,t}^U, \lambda_t, Q_t) := \mathbb{E}\big[(Q_t U_{s,t+1} - m_{t+1} Q_t)^+ \mid \mathcal{P}_t^m\big] \le \bar{\ell}. \tag{4.11}$$

Inside the positive part, $Q_t U_{s,t+1}$ is the dollar liquidation loss beyond the current mark and $m_{t+1} Q_t$ is the required continuation equity calibrated to that loss distribution. The account-equity variable e_t enters the feasibility and liquidation rule below through excess slack $\xi_t(m_{t+1}) = e_t - m_{t+1} Q_t$; it is not subtracted again in the margin-calibration shortfall. In an interior binding reset, $G(m_{t+1}; \cdot) = \bar{\ell}$. Since $G_m = -Q_t \Pr(U_{s,t+1} > m_{t+1} \mid \mathcal{P}_t^m) < 0$, the binding condition defines the local margin rule

$$m_{t+1} = M(\mu_{s,t}^U, \sigma_{s,t}^U, \lambda_t, Q_t; \bar{\ell}). \tag{4.12}$$

The rule has an exact closed form that the constructed equilibrium of Section 8 uses directly. Let $H(c) := \mathbb{E}[(\varepsilon_{s,t} - c)^+]$ denote the residual mean-excess function, which is continuous and strictly decreasing where positive. Then Equation (4.11) at equality reads $Q_t\sigma^U_{s,t}H\big((m_{t+1}-\mu^U_{s,t})/\sigma^U_{s,t}\big)=\bar{\ell}$, so

$$m_{t+1}=\mu^U_{s,t}+\sigma^U_{s,t}\,H^{-1}\left(\frac{\bar{\ell}}{Q_t\sigma^U_{s,t}}\right). \tag{4.13}$$

Two properties follow immediately. First, $M_{\mu^U}=1$: expected-shortfall margining converts posterior mean closeout loss into margin one-for-one. Second, the margin is increasing in position size through the inverse mean-excess term, because a given dollar tolerance is spread over more units. The residual-risk derivative is

$$M_{\sigma^U}=\frac{\mathbb{E}[\varepsilon_{s,t}\mathbf{1}\{U_{s,t+1}>m_{t+1}\}\mid\mathcal{P}^m_t]}{\Pr(U_{s,t+1}>m_{t+1}\mid\mathcal{P}^m_t)}, \tag{4.14}$$

which is positive for the usual upper-tail shortfall in a centered Gaussian benchmark. Let the generated reset statistic T shift continuation-loss mean and residual risk through differentiable maps $\mu^U_s(T)$ and $\sigma^U_s(T)$. Then the local continuation-margin-to-public-inference slope is

$$M_T=M_{\mu^U}\,\mu^U_T+M_{\sigma^U}\,\sigma^U_T=\mu^U_T+M_{\sigma^U}\,\sigma^U_T. \tag{4.15}$$

In the closeout benchmark, $\mu^U_{A^{AS}}=\psi_A$ and $\sigma^U_{A^{AS}}=0$, so $M_{A^{AS}}=\psi_A>0$ and, holding the total half-tail scale fixed, $M_\tau=\psi_A a^+_t>0$. Public inference can therefore tighten continuation margin through expected liquidation loss beyond the current mark even when total price-revision dispersion is locally unchanged.

4.9 Liquidation, Entry, and State Transition

Given the new margin and total post-settlement account equity, the maximum continuation absolute position is $Q^{\max}_{t+1}=e_t/m_{t+1}$. The continued part of the inherited position is

$$\min\left\{Q_t,\frac{e_t}{m_{t+1}}\right\}, \tag{4.16}$$

and forced liquidation is

$$\Delta Q_t=\max\left\{0,Q_t-\frac{e_t}{m_{t+1}}\right\}. \tag{4.17}$$

Write $\Delta Q_t=L(m_{t+1},e_t,Q_t)$. In the interior binding region, $m_{t+1}Q_t>e_t$ and

$$Q_m=\frac{e_t}{m^2_{t+1}}>0.$$

With financed entry, the carried position evolves as

$$Q_{t+1}=Q_t-\Delta Q_t+\nu,\qquad \nu\geq 0. \tag{4.18}$$

Next-period illiquidity follows

$$\lambda_{t+1} = \Lambda(\lambda_t, \Delta Q_t; \Omega_t, \theta), \tag{4.19}$$

where Ω_t summarizes the strategic liquidity-provision environment: concentration of liquidity suppliers, intermediary balance-sheet capacity, holdings imbalance, and price-impact internalization. The local liquidation-depth slope is

$$a_t(\Omega_t) := \frac{\partial \Lambda(\lambda_t, \Delta Q_t; \Omega_t, \theta)}{\partial \Delta Q_t}. \tag{4.20}$$

The maintained binding-region condition is $a_t(\Omega_t) \geq 0$: forced liquidation weakly raises future illiquidity in the local market-structure state under study. The sign is not universal. If marginal liquidity providers absorb sales elastically, $a_t(\Omega_t)$ can be small; if liquidity provision is concentrated, balance-sheet constrained, or strategically shaded, it can be large. When no confusion is possible, the local derivative Λ_2 denotes $a_t(\Omega_t)$ evaluated at the binding fixed point.

Account equity evolves by a continuously differentiable law $e_{t+1} = W(e_t, \Delta Q_t, \lambda_{t+1}; \theta)$ with $W_e > 0$, $W_{\Delta Q} \leq 0$, and $W_\lambda \leq 0$ locally. A leading local representation is

$$e_{t+1} = \omega_0 + \omega_e e_t - \omega_q \Delta Q_t - \omega_\lambda \lambda_{t+1}, \qquad \omega_0 > 0, \quad \omega_e \in (0, 1), \quad \omega_q, \omega_\lambda \geq 0. \tag{4.21}$$

The account-equity equation captures realized losses, liquidation costs, weaker future financing capacity when depth deteriorates, and a recapitalization flow ω_0 that funds continued participation, including the financed entry ν.

4.10 Local Equilibrium

Definition 1 (Local equilibrium)**.** A local equilibrium consists of a trading policy β^*, a public-inference map T, a continuation-margin rule M, a liquidation rule L, and state-transition laws (Λ, W) together with the position law Equation (4.18) such that:

1. the trader chooses β^* optimally given the continuation funding wedge;
2. public inference is generated by equilibrium order flow, prices, and price impact;
3. the financier sets continuation margins from the posterior expected-shortfall rule after current settlement;
4. liquidation satisfies the reset margin constraint;
5. next-period illiquidity, positions, and account equity follow the state-transition laws.

4.11 Standing Local Assumptions

The preceding subsections define the economic blocks. The formal results use the following local assumptions to collect the restrictions imposed on those blocks.

Assumption 1 (Gaussian public inference)**.** The value, private signal, and noise-order components are jointly Gaussian with finite positive variances. Dealers price competitively from public order flow, so $p_t = \mathbb{E}[v \mid y_t] = \kappa_t y_t$ with $\kappa_t > 0$ in the local region. The funded position has nonzero sign $s_t^q = \operatorname{sgn}(q_t)$ and absolute size $Q_t = |q_t| > 0$.

Assumption 2 (Funding wedge)**.** The trader's continuation funding cost is locally quadratic in the submitted order, $\Phi(x) = \frac{\gamma}{2}x^2$ with $\gamma \geq 0$, and the trader takes the dealers' linear pricing rule as given. The wedge is generated by the margin and liquidation technology as recorded in Appendix B and is treated as a local primitive in the equilibrium analysis.

Assumption 3 (Generated public signal extension)**.** For the local amplification extension, the reset-relevant public statistic is generated by pricing, trading, and depth after the current mark has updated:

$$T(\lambda, Q, e; \theta) = \mathcal{Z}(\kappa(\lambda), \chi(\beta^*(\lambda, Q, e; \theta)), \lambda; \theta)\,,$$

where $\mathcal{Z}$ is the conditional adverse-tail generator defined in Section 9. The maps $\mathcal{Z}$, κ, χ, and β^* are continuously differentiable in a neighborhood of the binding fixed point. The main primitive theorem uses the adverse-selection reset statistic A_t^{AS} in Equation (4.3); T records how that statistic moves with the generated local state.

Assumption 4 (Expected-shortfall margin rule)**.** The financier sets the smallest per-unit continuation margin satisfying an expected-shortfall loss tolerance over the margin period of risk. Current mark-to-market gains and losses, including variation margin, have already been reflected in account equity. Realized public trading updates a predictive margin-period law $\mathcal{P}_t^m$ for future closeout losses in the relevant adverse-tail branch. Locally, posterior continuation unwind loss beyond the current mark admits the representation $U_s = \mu_s^U + \sigma_s^U \varepsilon_s$ under $\mathcal{P}_t^m$, where the residual distribution of ε_s is fixed in the local neighborhood. The shortfall event has positive probability, so the binding margin is differentiable by the implicit function theorem.

Assumption 5 (Interior binding liquidation)**.** The analysis is in an interior binding region with $Q_t > 0$, $e_t > 0$, $m_{t+1} > 0$, and $m_{t+1}Q_t > e_t$. Forced liquidation is $\Delta Q_t = Q_t - e_t/m_{t+1}$ locally, so $Q_m = e_t/m_{t+1}^2 > 0$.

Assumption 6 (Strategic depth and account equity)**.** Next-period illiquidity is generated by a continuously differentiable strategic depth law $\lambda_{t+1} = \Lambda(\lambda_t, \Delta Q_t; \Omega_t, \theta)$, where Ω_t summarizes the liquidity-provision state. The local liquidation-depth response is $a_t(\Omega_t) = \partial\Lambda/\partial\Delta Q_t \geq 0$, and the primitive signed theorem uses the strict case $a_t(\Omega_t) > 0$. Account equity follows a continuously differentiable law $W(e_t, \Delta Q_t, \lambda_{t+1}; \theta)$ with $W_e > 0$, $W_{\Delta Q} \leq 0$, and $W_\lambda \leq 0$ locally.

Assumption 7 (Local fixed point extension)**.** There exists an interior binding-region fixed point $z^* = (\lambda^*, Q^*, e^*)$ of the generated vector map $\mathcal{F}$ defined in Section 9, with financed entry $\nu > 0$ sustaining stationary liquidation. The map is continuously differentiable on a neighborhood of z^*. Scalar illiquidity projections hold (Q, e) at their local reference values; full local stability is governed by the spectral radius of $D\mathcal{F}(z^*)$.

Section 8 discharges Assumption 7 by construction: it exhibits a parametric economy in which the stationary binding state exists, is unique, and has a computable Jacobian. The assumption is retained for the general local analysis so that the amplification results do not depend on one parametric family.

4.12 Regularity and Scope

The analysis studies a neighborhood of an interior binding-region fixed point rather than proving global existence or uniqueness for the general model. This is the right object for the paper's question: whether the public-inference funding channel dampens or amplifies small disturbances once the margin reset binds.

The vector state matters because the channel runs through positions and account equity. The scalar illiquidity projection gives the cleanest decomposition, but the stability object is the Jacobian $D\mathcal{F}(z^*;\theta)$. The scalar coefficient Ψ is the illiquidity component of that Jacobian, not a claim that Q_t and e_t are dynamically irrelevant.

Expected and realized objects remain separate. The financier sets continuation margins from expected unwind losses beyond the current mark. Liquidation occurs only after the reset is imposed and only if the margin binds. This timing turns public inference into a nonlinear funding channel rather than a smooth pricing effect.

5 Price Discovery and Continuation-Margin Repricing

The first formal implication is a position-specific funding tension. Public order flow remains price discovering for dealers, but the adverse-selection share of the same public information raises continuation margin for a constrained signed position.

Theorem 1 (Price discovery and continuation-margin repricing)**.** *Under Assumptions 1 and 4 to 6, suppose the closeout benchmark in Proposition 1 holds locally. Dealers set the current fair mark from realized order flow,*

$$p_t = \mathbb{E}[v \mid y_t] = \kappa_t y_t.$$

After this mark and any current settlement transfer have entered account equity, the prime broker sizes continuation margin from its predictive margin-period closeout-loss distribution. Realized public trading updates the broker's predictive parameters, including the adverse half-tail scale a_t^+ and persistence share τ_t, but the margin object remains the expected shortfall of future closeout loss beyond the current mark.

In the adverse-tail branch of this predictive distribution, $A_t^{AS} = \tau_t a_t^+$ and the benchmark margin response is

$$\frac{\partial m_{t+1}}{\partial A_t^{AS}} = \psi_A > 0. \tag{5.1}$$

Equivalently, holding the total adverse half-tail scale a_t^+ fixed,

$$\frac{\partial m_{t+1}}{\partial \tau_t} = \psi_A a_t^+ > 0. \tag{5.2}$$

If the reset binds and $a_t(\Omega_t) > 0$, this margin repricing translates into future illiquidity:

$$\frac{\partial \lambda_{t+1}}{\partial A_t^{AS}} = a_t(\Omega_t)\,\frac{e_t}{m_{t+1}^2}\,\psi_A > 0, \tag{5.3}$$

and, holding the total adverse half-tail scale a_t^+ fixed,

$$\frac{\partial \lambda_{t+1}}{\partial \tau_t} = a_t(\Omega_t)\,\frac{e_t}{m_{t+1}^2}\,\psi_A a_t^+ > 0. \tag{5.4}$$

Public order flow can therefore remain price-discovering for dealers while its adverse-selection share raises continuation margin for a signed financed position. The fixed-dispersion comparison is an additional mean closeout-loss channel on top of ordinary tail-risk margining, not a claim that volatility is irrelevant.

Proof. By Assumption 1, dealers set the competitive posterior price $p_t = \mathbb{E}[v \mid y_t] = \kappa_t y_t$. By Proposition 1, residual-demand clearing during prime-broker closeout gives $\partial \mu_{s,t}^U / \partial A_t^{AS} = \psi_A > 0$ after the current mark has settled. The closed-form margin rule Equation (4.13) gives $\partial m_{t+1}/\partial \mu_{s,t}^U = 1$ at an interior binding margin with positive posterior shortfall probability, which gives Equation (5.1). Since $A_t^{AS} = \tau_t a_t^+$, holding a_t^+ fixed gives $\partial A_t^{AS}/\partial \tau_t = a_t^+$ and therefore Equation (5.2). In the binding region, $\partial \Delta Q_t / \partial m_{t+1} = e_t/m_{t+1}^2$ by Equation (4.17). Finally, by Equation (4.20), $\partial \lambda_{t+1}/\partial \Delta Q_t = a_t(\Omega_t)$. Composing these derivatives gives Equations (5.3) and (5.4). □

The theorem converts public inference into a continuation-financing object without treating the current mark-to-market loss as the margin channel. The primitive slope is the margin repricing in Equations (5.1) and (5.2); realized future illiquidity follows only when the reset binds and liquidation affects depth. This is the margin on which the paper departs from standard adverse-selection models: public order flow changes continuation funding after it has changed prices. The fixed-dispersion comparison is the key distinction from ordinary value-at-risk margining: total price-revision scale can be unchanged while the persistent signed-flow share raises closeout loss.

The benchmark sets $\sigma^U_{A^{AS}} = 0$, so the channel above is a pure mean effect. The next corollary shows the sign does not hinge on that knife-edge.

Corollary 1 (Residual-risk robustness)**.** *Suppose the adverse-selection statistic can also change residual closeout-loss risk, so that $\sigma^U_{A^{AS}}$ need not be zero. At an interior expected-shortfall margin reset,*

$$\frac{\partial m_{t+1}}{\partial A_t^{AS}} = \psi_A + M_{\sigma^U}\sigma^U_{A^{AS}},$$

so the adverse-selection margin response remains positive whenever $\psi_A + M_{\sigma^U} \sigma^U_{A^{AS}} > 0$. *In particular, any nonnegative residual-risk response reinforces the benchmark mean channel.*

Proof. Apply Equation (4.15) with $T = A_t^{AS}$, $\mu^U_{A^{AS}} = \psi_A$, and general $\sigma^U_{A^{AS}}$. The displayed condition is the condition for the derivative to be positive. □

6 Equilibrium Trading, Neutrality, and the Discovery-Funding Tradeoff

Theorem 1 takes the pair (τ_t, a_t^+) as the broker's predictive inputs. This section closes the trading block and asks where those inputs come from. The answer delivers the paper's sharpest result: whether public flow carries margin-relevant information at all is an equilibrium outcome, and the funding friction itself is what switches the channel on.

6.1 The Wedge Economy

Combine the trader's first-order condition Equation (4.10) with the dealers' pricing rule Equation (4.6). It is convenient to normalize the trading intensity by the noise scale, $\zeta := \beta\sigma_s/\sigma_u$, and the funding wedge by the information scale,

$$g := \frac{\gamma\,\sigma_s\sigma_u}{\sigma_v^2} \geq 0. \tag{6.1}$$

Lemma 2 (Wedge equilibrium)**.** *Under Assumptions 1 and 2, a linear equilibrium of the trading block exists and is unique. The normalized intensity* $\zeta^* \in (0, 1]$ *is the unique positive root of*

$$\frac{2\zeta^2}{1+\zeta^2} + g\zeta = 1, \tag{6.2}$$

and the equilibrium informed share of order-flow variance satisfies

$$\chi^* = \frac{(\zeta^*)^2}{1+(\zeta^*)^2} = \frac{1-g\zeta^*}{2} \leq \frac{1}{2}, \tag{6.3}$$

with equality if and only if $g = 0$. *Moreover* ζ^* *and* χ^* *are strictly decreasing in* g, *and equilibrium price informativeness, defined as* $I^* := \mathrm{Var}(v) - \mathrm{Var}(v \mid y)$, *satisfies*

$$I^* = \rho\sigma_v^2\,\chi^*, \qquad \rho = \frac{\sigma_v^2}{\sigma_s^2}. \tag{6.4}$$

Proof. See Appendix B. □

Equation Equation (6.4) is the section's pivot: in the wedge economy, equilibrium price informativeness is proportional to the informed share of order-flow variance. Whatever raises one raises the other. The lemma also implies a useful identity for the broker's predictive scale. Since $p_t = \mathbb{E}[v \mid y_t]$, the predictive variance of the signed public price revision equals informativeness, $\widehat{\sigma}_z^2 = \mathrm{Var}(p_t) = I^*$, so

$$a^+ = \sqrt{\frac{2}{\pi}}\sqrt{I^*} = \sqrt{\frac{2}{\pi}}\,\sigma_v\sqrt{\rho\,\chi^*}. \tag{6.5}$$

The remaining input is the persistence share τ. The closeout benchmark defines τ as the share of the predictive variance of z_s attributable to the persistent component θ. In the structural trading block, the natural identification is that the informed component of the price revision persists over the closeout horizon while the noise component does not: the informed trader, and any crowd positioned on correlated signals, continues to press in the same direction during the margin period of risk, whereas noise flow is serially independent. Formally, decompose $z_{s,t} = -s^q\kappa(\beta s_t) + (-s^q\kappa u_t)$ and set $\theta_t = -s^q\kappa\beta s_t$. Then

$$\tau^* = \frac{\mathrm{Var}(\theta_t)}{\mathrm{Var}(z_{s,t})} = \frac{\beta^2\sigma_s^2}{\beta^2\sigma_s^2 + \sigma_u^2} = \chi^*. \tag{6.6}$$

The broker's adverse-selection share is the equilibrium informed share of order flow. Combining Equations (6.5) and (6.6),

$$A^{AS} = \tau^* a^+ = \sqrt{\frac{2}{\pi}}\,\sigma_v\sqrt{\rho}\,(\chi^*)^{3/2}. \tag{6.7}$$

Every margin-relevant object in the economy is a monotone transformation of χ^*.

6.2 Neutrality in the Frictionless Benchmark

Proposition 2 (Kyle neutrality). *Set $\gamma = 0$. Then $\zeta^* = 1$ and $\chi^* = \frac{1}{2}$ for all $(\sigma_v^2, \sigma_\eta^2, \sigma_u^2)$. Consequently:*

(i) the broker's adverse-selection share is invariant to primitives, $\tau^* = \frac{1}{2}$;

(ii) equilibrium informativeness $I^* = \rho\sigma_v^2/2$ and the predictive scale a^+ are invariant to the volume of noise trading σ_u^2;

(iii) holding the funding-block state $(\lambda_t, Q_t, e_t, \sigma^U)$ fixed, the margin statistic A^{AS}, the continuation margin m_{t+1}, and the funding-fragility slopes of Theorem 1 are invariant to σ_u^2.

In the frictionless benchmark, equilibrium intensity adjustment exactly offsets changes in noise cover, and information-sensitive margining has no comparative statics in noise trading.

Proof. With $g = 0$, Equation (6.2) reduces to $2\zeta^2 = 1 + \zeta^2$, so $\zeta^* = 1$ and $\chi^* = 1/2$ regardless of $(\sigma_v, \sigma_\eta, \sigma_u)$. Claims (i) to (iii) follow from Equations (6.4) to (6.7) and from the margin rule Equation (4.13), whose information-sensitive argument is A^{AS}. □

The proposition identifies a hidden assumption in informal accounts of margin tightening. It is tempting to argue that when noise trading dries up, order flow becomes more informative, financiers read more adverse selection into the same flow, and margins tighten. In the canonical Kyle equilibrium this argument fails exactly: the informed trader scales intensity one-for-one with noise cover, the informed share of flow variance stays at one half, and the broker's statistic never moves. The informal argument requires something that prevents full intensity adjustment. The next result shows that the funding friction itself is that something.

6.3 The Tradeoff

Theorem 2 (Discovery-funding tradeoff)**.** *Let $\gamma > 0$ and hold $(\sigma_v^2, \sigma_\eta^2, \gamma)$ fixed. Then in the wedge economy:*

(i) $\dfrac{d\chi^*}{d\sigma_u} < 0$*: a decline in noise trading raises the equilibrium informed share;*

(ii) $\dfrac{dI^*}{d\sigma_u} < 0$ *and* $\dfrac{da^+}{d\sigma_u} < 0$*: the same decline raises equilibrium price informativeness and the predictive price-revision scale;*

(iii) $\dfrac{dA^{AS}}{d\sigma_u} < 0$ *and hence, through the margin rule Equation (4.13),* $\dfrac{dm_{t+1}}{d\sigma_u} < 0$*: the same decline tightens continuation margin;*

(iv) if in addition the reset binds and $a_t(\Omega_t) > 0$, then $\dfrac{d\lambda_{t+1}}{d\sigma_u} < 0$*: the same decline raises future illiquidity through forced liquidation.*

A single primitive shift, less noise trading, simultaneously improves price discovery and tightens continuation funding for the constrained financed position. As $\gamma \to 0$ all four derivatives converge to zero: the tradeoff exists only in the presence of the funding wedge.

Proof. See Appendix B. □

Corollary 2 (Funding fragility impairs discovery)**.** *In the wedge economy, a larger funding wedge lowers equilibrium informed intensity and price informativeness: $d\chi^*/d\gamma < 0$ and $dI^*/d\gamma < 0$.*

Proof. By Lemma 2, χ^* is strictly decreasing in g, and g is strictly increasing in γ. Apply Equation (6.4). □

The theorem and corollary together describe a two-way feedback. Funding frictions blunt informed trading, which lowers price informativeness (the corollary, an echo of the ex ante information spiral in Glebkin et al., 2021). At the same time, conditional on a positive wedge, any improvement in the information content of flow arrives at the prime broker as a larger adverse-selection share and tighter continuation terms (the theorem). Discovery and fragility are not in tension by accident; in the wedge economy they are the same equilibrium object viewed by two different receivers, dealers on one side and the financier on the other.

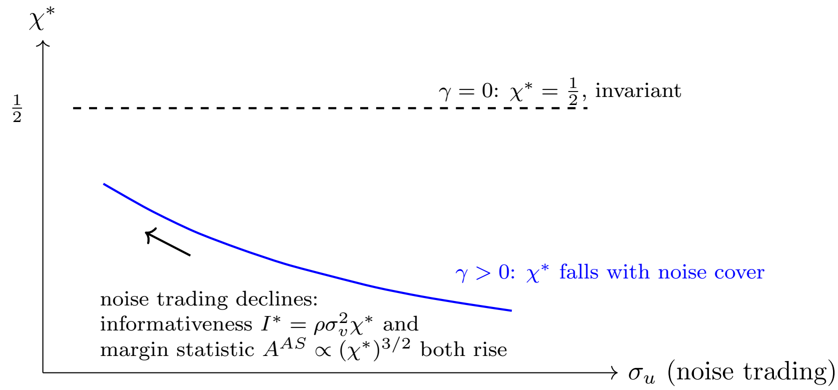

Figure 3: Neutrality and its breakdown. In the frictionless Kyle benchmark the equilibrium informed share of order-flow variance is one half for any volume of noise trading, so information-sensitive margins have no comparative statics in σ_u. With a funding wedge, intensity underadjusts: a decline in noise trading raises the informed share, price informativeness, and the broker's margin statistic together.

Figure 3 plots the equilibrium informed share against the noise-trading scale. The flat dashed line is the frictionless benchmark. The solid curve is the wedge economy: solved from Equation (6.2), the informed share rises smoothly as noise trading declines, and with it both informativeness and the margin statistic.

Three remarks bound the result's scope. First, the funding wedge is a local shadow cost, not an infinite-horizon value function; Appendix B records its composition from the margin and liquidation maps, and the proposition below restates the comparative statics in those primitives. Second, the structural identification $\tau^* = \chi^*$ rests on the maintained assumption that informed flow persists over the closeout horizon while noise flow does not; if part of noise flow also persists, τ^* is a weighted version of χ^* and the comparative statics survive as long as the informed component carries the larger persistence weight. Third, the lever σ_u is one of several; signal-quality shifts move I^* and A^{AS} in the same direction as each other through both ρ and χ^*, so the co-movement of discovery and fragility is generic in the wedge economy rather than special to noise trading.

Proposition 3 (Funding feedback disciplines informed trading)**.** *Under Assumptions 1 and 2, the funding-adjusted intensity lies strictly below the Kyle intensity whenever $\gamma > 0$: $\beta^* < \beta^K$ at the equilibrium pricing rule. In the wedge composition of Appendix B, γ is increasing in the margin sensitivity M_T, the liquidation sensitivity Q_m, and the inference sensitivity T_β, so β^* and χ^* are decreasing in each. Strategic shading by the trader therefore partially mutes the public signal even as public inference tightens margins.*

Proof. See Appendix B. □

6.4 Attainability of the Fixed-Dispersion Comparison

Theorem 1 differentiates margin with respect to τ holding a^+ fixed. A natural objection is that this comparison might not be reachable by any change in primitives: perhaps every primitive shift that moves the adverse-selection share also moves the total price-revision scale. The next lemma shows the comparison is attainable exactly, on an explicit one-dimensional manifold of primitive parameters.

Lemma 3 (Iso-dispersion primitive path)**.** *Fix $\gamma > 0$, $\sigma_v^2 > 0$, and a target dispersion level indexed by $k \in (0, \frac{1}{2})$. For each $\tau \in [k, \frac{1}{2})$ define*

$$\sigma_s^2(\tau) = \frac{\sigma_v^2\,\tau}{k}, \qquad \zeta(\tau) = \sqrt{\frac{\tau}{1-\tau}}, \qquad \sigma_u(\tau) = \frac{(1-2\tau)\,\sigma_v^2}{\gamma\,\sigma_s(\tau)\,\zeta(\tau)}.$$

Then $\sigma_\eta^2(\tau) = \sigma_s^2(\tau) - \sigma_v^2 \geq 0$ and $\sigma_u(\tau) > 0$, so the path lies in the primitive parameter space, and along the path:

(i) the wedge equilibrium of Lemma 2 has informed share $\chi^* = \tau$, so the broker's adverse-selection share traverses $[k, \frac{1}{2})$;

(ii) the adverse half-tail scale is constant, $a^+ = \sqrt{2/\pi}\,\sigma_v\sqrt{k}$;

(iii) the margin statistic $A^{AS} = \tau a^+$ and the continuation margin are strictly increasing in τ, with $dm_{t+1}/d\tau = \psi_A a^+ > 0$ as in Equation (5.2)*.*

Proof. See Appendix B. □

The fixed-dispersion derivative in Theorem 1 is therefore a comparison between economies that genuinely exist: along the path, signal quality deteriorates while noise trading thins in exactly offsetting proportions, total price-revision dispersion never moves, and the margin statistic still rises. A volatility-based margin rule sees nothing along this path. An adverse-selection-sensitive rule tightens.

7 Binding Margins and Forced Liquidation

The margin reset affects realized depth only when it binds. If $m_{t+1}Q_t \leq e_t$, the trader can carry the inherited absolute position and $\Delta Q_t = 0$. If $m_{t+1}Q_t > e_t$, the trader must reduce the position.

Proposition 4 (Binding-margin liquidation)**.** *Under Assumption 5, forced liquidation is $\Delta Q_t = Q_t - e_t/m_{t+1}$ and is increasing in the reset margin and decreasing in post-settlement account equity: $Q_m = e_t/m_{t+1}^2 > 0$ and $Q_e = -1/m_{t+1} < 0$. In the non-binding region, public inference can affect expected losses and margins but does not force liquidation.*

Proof. The continued position is $\min\{Q_t, e_t/m_{t+1}\}$ by Equation (4.16). Under Assumption 5, $m_{t+1}Q_t > e_t$, so $\Delta Q_t = Q_t - e_t/m_{t+1}$. Differentiating gives $Q_m = e_t/m_{t+1}^2 > 0$ and $Q_e = -1/m_{t+1} < 0$. If $m_{t+1}Q_t \leq e_t$, then $\Delta Q_t = 0$ locally. □

This result is the threshold property of the model. Adverse public inference is not enough to create future illiquidity. It must move margins, and margins must bind. This is why the model predicts nonlinear responses: the same public trading signal can be absorbed in a well-capitalized state and destabilizing in a constrained state.

8 A Constructed Binding Equilibrium

The amplification logic of the next section differentiates around a binding fixed point. Rather than assuming that such a point exists, this section constructs one. The construction serves three purposes. It discharges Assumption 7 for a concrete parametric family. It shows that binding steady states are the generic stationary outcome of an economy with financed turnover, not a knife-edge. And it produces a computable Jacobian whose spectral radius exhibits the amplification threshold quantitatively.

8.1 Parametric Specification

Take the closeout benchmark of Proposition 1 and the exact margin rule Equation (4.13) with a standard normal residual, so $H(c) = \phi(c) - c\,(1 - \Phi(c))$, where ϕ and Φ are the standard normal density and distribution function. Linearize the generated public-inference statistic in the depth state,

$$A^{AS}(\lambda) = \alpha_0 + \alpha_1\lambda, \qquad \alpha_0 > 0,\ \alpha_1 \geq 0, \tag{8.1}$$

so α_1 plays the role of T_λ: it measures how strongly persistent illiquidity loads adverse-selection content into public flow. The model blocks become

$$\mu^U(\lambda, Q) = \psi_A\big(\alpha_0 + \alpha_1\lambda\big) + \psi_\lambda\lambda + \psi_Q Q, \tag{8.2}$$

$$m(\lambda, Q) = \mu^U(\lambda, Q) + \sigma^U H^{-1}\left(\frac{\bar{\ell}}{Q\,\sigma^U}\right), \tag{8.3}$$

$$\Delta Q = \max\left\{0,\ Q - \frac{e}{m(\lambda, Q)}\right\}, \tag{8.4}$$

$$\lambda' = (1-\varphi)\lambda_b + \varphi\lambda + a\,\Delta Q, \tag{8.5}$$

$$Q' = Q - \Delta Q + \nu, \tag{8.6}$$

$$e' = \omega_0 + \omega_e e - \omega_q\Delta Q - \omega_\lambda\lambda', \tag{8.7}$$

with $\varphi \in (0,1)$, $\lambda_b > 0$, $a \geq 0$, $\nu > 0$, $\omega_0 > 0$, $\omega_e \in (0,1)$, and $\omega_q, \omega_\lambda \geq 0$. All maps are exactly those of Section 4; nothing is added beyond functional forms.

8.2 Existence, Uniqueness, and Generic Bindingness

Proposition 5 (Stationary binding equilibrium)**.** *Consider the system Equations* (8.1) *to* (8.7) *with* $\nu > 0$ *and*

$$\omega_0 > \omega_q \nu + \omega_\lambda \left(\lambda_b + \frac{a\nu}{1-\varphi} \right). \tag{8.8}$$

Then:

(i) ***(Stationarity forces binding.)*** *Any stationary state has* $\Delta Q^* = \nu > 0$*, so the margin constraint binds at every stationary state of the economy.*

(ii) ***(Closed-form depth and equity.)*** *The stationary depth and equity states are*

$$\lambda^* = \lambda_b + \frac{a\nu}{1-\varphi}, \qquad e^* = \frac{\omega_0 - \omega_q \nu - \omega_\lambda \lambda^*}{1-\omega_e} > 0.$$

(iii) ***(Existence and uniqueness of the position.)*** *The stationary position* Q^* *is the unique solution on* (ν, ∞) *of*

$$\big(Q - \nu\big)\, m(\lambda^*, Q) = e^*, \tag{8.9}$$

and the stationary margin is $m^* = m(\lambda^*, Q^*) = e^*/(Q^* - \nu) > 0$*.*

(iv) ***(Interior binding region.)*** *At the stationary state,* $m^* Q^* - e^* = m^* \nu > 0$*, so the state lies in the interior binding region of Assumption 5 and the local analysis of Sections 5 to 7 applies at* $z^* = (\lambda^*, Q^*, e^*)$*.*

Proof. See Appendix B. □

Part (i) deserves emphasis because it reverses the apparent fragility of the binding assumption. In an economy where financed positions turn over, the stationary state cannot have slack margins: entry adds ν to the carried position every period, and only forced liquidation removes it. Stationarity requires liquidation to equal entry, and liquidation is positive only when the margin binds. Binding margin is not a special region the analyst selects; it is the only place a stationary economy with financed turnover can rest. The empirical counterpart is familiar: secured-financing books in steady state exhibit continual margin pressure on the marginal account rather than universal slack.

8.3 The Amplification Threshold, Computed

The Jacobian of the system at z^* instantiates the general decomposition of Section 9 with $T_\lambda = \alpha_1$, $M_T T_\lambda = \psi_A \alpha_1$, $M_\lambda = \psi_\lambda$, $\Lambda_1 = \varphi$, $\Lambda_2 = a$, and $Q_m = e^*/(m^*)^2 = (Q^* - \nu)^2/e^*$. Appendix B records the entries. Table 1 reports the stationary state and the spectral radius $\rho(D\mathcal{F}(z^*))$ for the

Table 1: The constructed equilibrium across public-inference sensitivities. The stationary state re-solves at each α_1; Ψ is the scalar illiquidity-projection slope and $\rho(D\mathcal{F})$ the spectral radius of the full Jacobian. The threshold value is $\bar{\alpha}_1 \approx 0.58$.

	$\alpha_1 = 0$	$\alpha_1 = 0.30$	$\alpha_1 = 0.60$	$\alpha_1 = 0.90$
λ^*	0.114	0.114	0.114	0.114
e^*	0.479	0.479	0.479	0.479
Q^*	1.533	1.443	1.360	1.283
m^*	0.319	0.339	0.360	0.382
margin binds	yes	yes	yes	yes
Ψ (scalar projection)	0.378	0.750	1.037	1.255
$\rho(D\mathcal{F}(z^*))$	0.572	0.851	1.007	1.109

baseline parameterization

$$\alpha_0 = 0.02, \quad \psi_A = 1.0, \quad \psi_\lambda = 0.02, \quad \psi_Q = 0.12, \quad \sigma^U = 0.10, \quad \bar{\ell} = 0.010,$$
$$\varphi = 0.35, \quad \lambda_b = 0.10, \quad a = 0.30, \quad \nu = 0.03, \quad \omega_0 = 0.25, \quad \omega_e = 0.50, \quad \omega_q = 0.20, \quad \omega_\lambda = 0.04,$$

as the public-inference sensitivity α_1 varies. Only α_1 moves across columns; every other primitive, including the depth-impact slope and the margin technology, is held fixed.

Three features of Table 1 carry the section's message. First, the threshold is real and interior: as α_1 rises from 0 to 0.90, the spectral radius passes through one at $\bar{\alpha}_1 \approx 0.58$. Below the threshold, small illiquidity disturbances die out; above it, the same margin technology and depth law amplify them. Second, the stationary state itself adjusts against the channel: higher α_1 raises the stationary margin and shrinks the stationary position, which lowers the liquidation sensitivity $Q_m = (Q^* - \nu)^2/e^*$. This general-equilibrium re-margining is stabilizing, and it is why the threshold requires a genuinely strong information channel rather than a marginal one. Third, the scalar projection Ψ tracks the full spectral radius closely near the threshold and crosses one at almost the same α_1, which justifies using the transparent scalar decomposition of Section 9 for interpretation while reporting the vector condition for rigor.

The lesson is not that instability follows from any one large coefficient. It requires a particular alignment: public outcomes must be informative about hidden position risk, margins must respond to that information, post-settlement account equity must be scarce, and liquidation must impair future depth. The constructed equilibrium shows the alignment is attainable at moderate parameter values, and the next section shows exactly which composite slope governs it in general.

9 Local Amplification

This section develops the general local dynamics. It first records how the reset statistic is generated by equilibrium trading, pricing, and depth, then composes the model blocks into a vector law of motion and characterizes when the public-inference channel moves the system across the instability

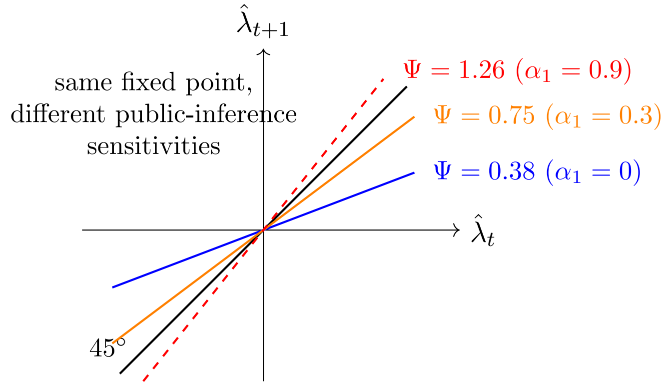

Figure 4: Amplification threshold in the constructed equilibrium. Holding the margin technology, liquidation rule, and depth law fixed, raising the sensitivity of public inference to depth moves the local continuation slope from stable to unstable.

threshold.

9.1 The Generated Public-Inference Map

The broader equilibrium extension allows the reset statistic to depend on trading intensity and depth. Let $\bar{z} \geq 0$ be the local adverse-tail threshold used by the prime broker, and define the conditional adverse-tail generator

$$\mathcal{Z}(\kappa, \chi, \lambda; \theta) := \mathbb{E}[z_{s,t} \mid z_{s,t} \geq \bar{z},\, \kappa_t = \kappa, \chi_t = \chi, \lambda_t = \lambda, \theta],$$

where κ is the public price-impact coefficient, χ is the posterior loading of informed order flow, and λ is persistent market illiquidity. The equilibrium reset statistic is

$$T(\lambda, Q, e; \theta) := \mathcal{Z}(\kappa(\lambda), \chi(\beta^*(\lambda, Q, e; \theta)), \lambda; \theta)\,. \tag{9.1}$$

The map T is not the primitive channel of Theorem 1; it is the extension that records how the adverse-selection statistic varies with strategic trading, price impact, and persistent depth near the binding fixed point. Suppressing arguments, its local illiquidity slope decomposes as

$$T_\lambda = \mathcal{Z}_\kappa \kappa_\lambda + \mathcal{Z}_\chi \chi_\beta \beta^*_\lambda + \mathcal{Z}_\lambda. \tag{9.2}$$

The first term is the price-impact channel: weaker depth raises price impact and can make public flow more adverse for the funded position. The second is strategic shading: depth changes trading intensity, which changes the posterior loading of informed order flow. Since funding feedback can make $\beta^*_\lambda < 0$, shading can dampen the spiral. The third term is the direct depth-to-adverse-inference channel.

Proposition 6 (Generated adverse-tail public-inference slope)**.** *If $\mathcal{Z}$, κ, χ, and β^* are continuously differentiable near the binding fixed point, then T is continuously differentiable and its local* *illiquidity derivative is given by Equation* (9.2)*. Moreover,* $T_\lambda > 0$ *whenever*

$$\mathcal{Z}_\kappa \kappa_\lambda + \mathcal{Z}_\lambda > -\mathcal{Z}_\chi \chi_\beta \beta^*_\lambda.$$

Proof. The differentiability claim follows from the chain rule applied to Equation (9.1). Differentiating with respect to λ while holding (Q, e) fixed at the local projection gives Equation (9.2). The sign condition is a rearrangement of $T_\lambda > 0$. □

The inequality is the paper's disciplined version of the phrase "weaker depth makes public flow more adverse for the funded position." The direct price-impact and depth channels must dominate any strategic shading that reduces informed trading intensity. If shading is strong enough, public inference can dampen rather than amplify the funding spiral.

Corollary 3 (Gaussian adverse-tail reset statistic)**.** *Suppose that, conditional on* (κ, χ, λ) *and the inherited position sign,* $z_{s,t}$ *is locally centered Gaussian with standard deviation* $\sigma_z(\kappa, \chi, \lambda; \theta)$ *and the broker uses the adverse half-tail* $\bar{z} = 0$*. Then* $\mathcal{Z} = \sqrt{2/\pi}\, \sigma_z(\kappa, \chi, \lambda; \theta)$*, and if* σ_z *is continuously differentiable with*

$$\sigma_{z,\kappa} \kappa_\lambda + \sigma_{z,\chi} \chi_\beta \beta^*_\lambda + \sigma_{z,\lambda} > 0,$$

then $T_\lambda > 0$*.*

Proof. For a centered Gaussian random variable X with standard deviation σ, $\mathbb{E}[X \mid X \geq 0] = \sigma\sqrt{2/\pi}$. Differentiating the composite map Equation (9.1) gives the displayed sign condition. □

9.2 The Vector System and the Threshold

In the binding region, define the composite margin and liquidation maps

$$\mathcal{M}(\lambda, Q, e; \theta) := M\left(\mu^U_s(T(\lambda, Q, e; \theta)), \sigma^U_s(T(\lambda, Q, e; \theta)), \lambda, Q; \theta\right), \tag{9.3}$$

$$\mathcal{Q}(\lambda, Q, e; \theta) := L(\mathcal{M}(\lambda, Q, e; \theta), e, Q). \tag{9.4}$$

The vector continuation map, including financed entry, is

$$\mathcal{F}(\lambda, Q, e; \theta) = \begin{pmatrix} \Lambda(\lambda, \mathcal{Q}(\lambda, Q, e; \theta); \Omega, \theta) \\ Q - \mathcal{Q}(\lambda, Q, e; \theta) + \nu \\ W(e, \mathcal{Q}(\lambda, Q, e; \theta), \Lambda(\lambda, \mathcal{Q}(\lambda, Q, e; \theta); \Omega, \theta); \theta) \end{pmatrix}. \tag{9.5}$$

Because ν is constant, it shifts the location of the fixed point without entering the Jacobian. Let $z^* = (\lambda^*, Q^*, e^*)$ be an interior binding-region fixed point, $z^* = \mathcal{F}(z^*; \theta)$. For local deviations $\hat{z}_t := z_t - z^*$,

$$\hat{z}_{t+1} = D\mathcal{F}(z^*; \theta)\hat{z}_t + o(\|\hat{z}_t\|).$$

The information-based funding coefficient in the illiquidity projection is

$$\mathcal{A}_{\text{info}} := \Lambda_2^* Q_m^* M_T^* T_\lambda^*. \tag{9.6}$$

It is large when generated public inference is sensitive to depth, expected-shortfall margins respond to that inference, margin resets force large liquidation, and forced liquidation has a large strategic-depth impact.

Proposition 7 (Generated local funding threshold)**.** *Under Assumptions 3 to 7, in the scalar illiquidity projection holding (Q, e) at their local reference values,*

$$F_\lambda(\lambda^*; \theta) = \Lambda_1^* + \Lambda_2^* Q_m^* \left(M_\lambda^* + M_T^* T_\lambda^* \right). \tag{9.7}$$

The public-inference component is $\Lambda_2^* Q_m^* M_T^* T_\lambda^*$. Holding noninformational terms fixed, the public-inference channel moves the scalar projection across the local instability threshold whenever

$$\Lambda_1^* + \Lambda_2^* Q_m^* M_\lambda^* < 1 \quad \textit{and} \quad \Lambda_1^* + \Lambda_2^* Q_m^* \left(M_\lambda^* + M_T^* T_\lambda^* \right) > 1. \tag{9.8}$$

For the full vector system, the binding fixed point is locally stable if $\rho(D\mathcal{F}(z^*; \theta)) < 1$ and locally unstable if $\rho(D\mathcal{F}(z^*; \theta)) > 1$.

Proof. See Appendix B. □

The proposition contains standard local-stability logic; the finance content is the final inequality. A funding-liquidity system in the tradition of Brunnermeier and Pedersen (2009) can be locally stable without public-inference margins. The same system becomes unstable when public order flow is sufficiently informative about hidden unwind risk and margins respond to that posterior. The scalar inequality is a transparent condition in the illiquidity projection; the full vector condition is the spectral-radius extension, and Table 1 shows both crossing near the same parameter value in the constructed equilibrium.

9.3 Economic Decomposition

At the fixed point, write the scalar slope as

$$\Psi = \Lambda_1^* + \Lambda_2^* Q_m^* \left(M_T^* T_\lambda^* + M_\lambda^* \right). \tag{9.9}$$

The first term is direct illiquidity persistence. The product term is funding amplification: it is large when public inference is sensitive to depth, margins are sensitive to that inference, margin resets create large liquidation, and liquidation has a large effect on future depth. The term $M_T^* T_\lambda^*$ is the information-based funding channel; M_λ^* is the direct funding-liquidity component, which tightens funding in weak depth states apart from the public-inference statistic. Both channels matter only through liquidation when post-settlement account equity is scarce.

The vector Jacobian makes the same point in the full local state. In the binding region,

$$\begin{aligned}\lambda_\lambda &= \Lambda_1 + \Lambda_2 Q_m(M_T T_\lambda + M_\lambda),\\ Q_\lambda &= -Q_m(M_T T_\lambda + M_\lambda),\\ e_\lambda &= W_{\Delta Q} Q_m(M_T T_\lambda + M_\lambda) + W_\lambda \lambda_\lambda,\end{aligned} \tag{9.10}$$

where, for example, $\lambda_\lambda = \partial\lambda_{t+1}/\partial\lambda_t$ evaluated at z^*. Public inference does not affect only the illiquidity projection. It also changes how quickly positions are reduced and how account equity evolves. Since $Q_m > 0$ and $W_{\Delta Q} \leq 0$, a larger $M_T T_\lambda$ increases future illiquidity, lowers future carried positions, and weakens future account equity through the same binding-margin channel. The primitive theorem deliberately separates two effects: a larger total half-tail scale a_t^+ raises margin in the usual risk-measure sense, while the identifying contribution is the fixed-dispersion effect, in which the persistent signed-flow share raises the closeout-flow projection at unchanged price-revision scale.

10 Welfare and Margin Design

The positive analysis shows that information-sensitive margining can amplify illiquidity. This section asks whether the margin rule that emerges privately is socially appropriate. The answer is no in a precise sense: the broker prices its own tail risk and ignores the depth externality of the liquidation its margin forces, so the privately optimal sensitivity of margin to the adverse-selection statistic is socially excessive in the binding region, and the gap widens as the economy approaches the amplification threshold.

10.1 The Planner's Problem

Work in the local binding region of Proposition 7 with stable scalar dynamics. Let $\hat{\psi} \geq 0$ denote the implemented sensitivity of margin to the adverse-selection statistic; $\hat{\psi} = \psi_A$ is the broker's expected-shortfall rule from Equation (4.13), and $\hat{\psi} < \psi_A$ is a capped rule. With sensitivity $\hat{\psi}$, the scalar continuation slope is

$$\Psi(\hat{\psi}) = \Lambda_1 + \Lambda_2 Q_m\big(M_\lambda + \hat{\psi}\, T_\lambda\big), \tag{10.1}$$

and the local stability domain is $\hat{\psi} < \bar{\psi}$, where $\Psi(\bar{\psi}) = 1$. Write $\mathcal{A} := 1 - \Lambda_1 - \Lambda_2 Q_m M_\lambda > 0$ and $\mathcal{B} := \Lambda_2 Q_m T_\lambda > 0$, so $\bar{\psi} = \mathcal{A}/\mathcal{B}$.

A unit adverse innovation in the reset statistic raises margin by $\hat{\psi}$, forced liquidation by $Q_m\hat{\psi}$, and current illiquidity by $\Lambda_2 Q_m\hat{\psi}$. In the stable region, the innovation then propagates through the local dynamics, so its cumulative illiquidity impact is the geometric sum

$$S(\hat{\psi}) := c_\lambda \frac{\Lambda_2 Q_m \hat{\psi}}{1-\Psi(\hat{\psi})} = c_\lambda \frac{\Lambda_2 Q_m \hat{\psi}}{\mathcal{A}-\mathcal{B}\hat{\psi}}, \qquad \hat{\psi} \in [0, \bar{\psi}), \tag{10.2}$$

where $c_\lambda > 0$ prices the depth externality: the execution costs imposed on other market participants, and the financing costs imposed on other levered accounts, by persistent illiquidity. The broker does not internalize S. Capping the broker's sensitivity below its expected-shortfall level leaves tail losses imperfectly covered; locally, the broker's expected uncovered tail loss is quadratic in the shortfall of sensitivity, $\frac{\kappa_B}{2}(\psi_A - \hat{\psi})^2$ with $\kappa_B > 0$. The planner solves

$$\min_{\hat{\psi}\in[0,\bar{\psi})} V(\hat{\psi}) := \frac{\kappa_B}{2}\left(\psi_A - \hat{\psi}\right)^2 + S(\hat{\psi}). \tag{10.3}$$

Proposition 8 (Constrained-efficient margin sensitivity)**.** *The function S is strictly increasing and strictly convex on $[0, \bar{\psi})$ with $S(\hat{\psi}) \to \infty$ as $\hat{\psi} \uparrow \bar{\psi}$, so V is strictly convex and attains a unique minimum $\hat{\psi}^* \in [0, \bar{\psi})$. Moreover:*

(i) ***(Private sensitivity is socially excessive.)*** $\hat{\psi}^* < \min\{\psi_A, \bar{\psi}\}$*: whenever the depth externality is priced, $c_\lambda > 0$, the constrained-efficient sensitivity is strictly below the broker's expected-shortfall sensitivity.*

(ii) ***(Comparative statics.)*** *$\hat{\psi}^*$ is decreasing in the externality price c_λ, the depth-impact slope Λ_2, the liquidation sensitivity Q_m, the inference sensitivity T_λ, and the baseline persistence Λ_1.*

(iii) ***(Threshold divergence.)*** *As the no-information system approaches the threshold, $\mathcal{A} \downarrow 0$, the marginal social cost $S'(0) = c_\lambda \Lambda_2 Q_m / \mathcal{A}$ diverges and $\hat{\psi}^* \to 0$: near the threshold, the constrained-efficient information sensitivity of margin vanishes.*

Proof. See Appendix B. □

The economics of part (i) is an externality, not a behavioral error. The expected-shortfall rule is exactly the right private response to the broker's own closeout risk; Theorem 1 shows it transmits adverse-selection content into margin one-for-one. The inefficiency is that the forced liquidation the margin triggers consumes depth that does not belong to the broker. Part (iii) is the policy-relevant boundary: precisely in fragile states, where liquidation sensitivity is high and absorbers are weak, the social value of information-sensitive margining collapses while its private value is unchanged.

10.2 Margin Design versus Information Suppression

A planner who dislikes the amplification coefficient $\mathcal{A}_{\text{info}} = \Lambda_2 Q_m M_T T_\lambda$ has two broad instruments. It can regulate the margin rule, capping M_T below ψ_A as above. Or it can blunt the public signal itself: delay disclosure, coarsen post-trade transparency, or tolerate additional noise trading, all of which raise the effective σ_u facing the broker's inference problem. Both reduce fragility. They are not equivalent.

Proposition 9 (Margin design dominates information suppression)**.** *Consider the wedge economy of Section 6 with $\gamma > 0$, and fix a target reduction in the information-amplification coefficient $\mathcal{A}_{\text{info}}$. A sensitivity cap attains the target while weakly raising equilibrium price informativeness I^*: capping M_T lowers the funding wedge composed in Appendix B, and I^* is decreasing in the wedge by Corollary 2. Noise injection attains the target only by lowering I^*, by Theorem 2. Hence for any social objective strictly increasing in I^* and strictly decreasing in $\mathcal{A}_{\text{info}}$, the sensitivity cap strictly dominates information suppression.*

Proof. See Appendix B. □

The proposition formalizes a clean policy asymmetry. Discovery and fragility travel together on the information side: any intervention that protects funding by making public flow less informative pays for stability with price discovery. The margin side has no such price, and can even refund some discovery, because relaxing the funding wedge lets informed intensity recover. The practical counterpart is the anti-procyclicality toolkit for cleared and bilateral margin studied by Murphy et al. (2014) and Glasserman and Wu (2018): buffers, floors, and smoothing rules that cap the responsiveness of margin to risk inputs. The model adds two refinements. The input whose responsiveness matters here is not volatility but the adverse-selection content of flow, so anti-procyclicality design should contemplate flow-based inputs explicitly. And the optimal cap is state-contingent through part (iii) of Proposition 8: it should bind hardest when system slack is scarce and marginal absorbers are fragile, which is when Q_m and Λ_2 are large.

11 Empirical Content

The model is theoretical, but its composition is measurable. Four slopes compose the channel, and each has a direct observable counterpart in a prime-brokerage or secured-financing dataset: the relation between prior depth and adverse public inference for funded positions (T_λ), the margin response to pre-event public inference after current settlement ($M_{A^{AS}}$), the deleveraging response to margin increases when account slack binds (Q_m), and the subsequent depth response to deleveraging (Λ_2). The adverse-selection share τ_t has established empirical proxies: flow-toxicity measures in the tradition of Easley et al. (2012) and the autocorrelation of signed order flow over closeout-length horizons, which is the empirical counterpart of the persistence loading b_j in Proposition 1.

The sharpest prediction is a contrast, not a regression coefficient. Public-inference events that move prices without margin resets are adverse-selection events; the model predicts no depth aftermath beyond the price change. Observationally similar events that tighten margins against accounts with positive slack are funding repricings; the model predicts margin and position responses without depth damage. Only events that combine adverse public inference, a margin reset, binding slack, and forced liquidation should predict persistent future illiquidity, and predominantly in markets where marginal liquidity provision is concentrated or constrained. The fixed-dispersion result sharpens the identification further: among events with the same realized price-revision scale, those with a higher persistent signed-flow share should produce larger margin resets. A volatility-margining alternative predicts no difference across that comparison.

Appendix A develops the measurement mapping, the data objects required, and the contrasts that should be reported before any structural estimation.

12 Conclusion

This paper studies how informed trading becomes funding fragility. A prime broker cannot observe a trader's private signal, but it observes public trading outcomes. When those outcomes are adverse for the funded position and carry a larger persistent signed-flow component, the financier raises continuation margin to control expected closeout losses over the margin period of risk. If post-settlement account equity is scarce, the reset forces liquidation, and liquidation weakens future depth.

The analysis delivers four results. Continuation margin responds to the adverse-selection share of public flow even at fixed total price-revision scale, so the channel is informational rather than a relabeled volatility effect, and the fixed-dispersion comparison is attainable on an explicit primitive path. Whether the channel operates at all is an equilibrium question: in the frictionless Kyle benchmark, strategic intensity adjustment holds the informed share of flow constant and insulates margins entirely, while a funding wedge breaks the neutrality and makes price discovery and funding fragility move together under a single primitive lever. Binding steady states are the generic stationary outcome of an economy with financed turnover, and a constructed equilibrium exhibits the amplification threshold at moderate parameter values. And the margin sensitivity that is privately optimal for the financier is socially excessive near the threshold, where capping margin responsiveness dominates suppressing the public signal because only the latter destroys price discovery.

The broader implication is that some liquidity spirals are information shocks translated through financing contracts. Public order flow affects prices because it reveals private information. When positions are financed externally, the same public signal also affects funding terms, and the friction that makes financed positions fragile is the very friction that makes their funding terms information-sensitive. A public-inference event that only moves prices is an adverse-selection event. A public-inference event that changes margins, forces deleveraging, and weakens future depth is a funding-fragility event. Distinguishing the two, in models and in data, is what this paper's machinery is for.

A Measurement Implications

This appendix is a measurement roadmap, not an identification design. The model is written as a prime-brokerage theory: the financier knows the signed funded position, observes post-settlement account equity, resets continuation margin, and can force a position reduction under closeout rights. A direct empirical design would therefore need data that jointly observe signed exposure, account slack, margin resets, forced reductions, closeout timing, and subsequent depth. Those objects are rarely visible together.

The necessary sequence is still sharp. A public-inference event that only moves prices is an adverse-selection event. A public-inference event that changes continuation margin but leaves slack positive is a funding repricing. The funding-fragility event studied here requires all four objects: adverse public inference for a signed financed position, a continuation-margin increase, binding post-settlement slack, and forced liquidation that worsens future depth.

The cleanest empirical setting would be a prime-brokerage or secured-financing dataset with position-level margin calls and closeout records. In such a setting the theory disciplines four measurement slopes: the adverse-selection reset statistic A_t^{AS} from public order flow and signed-flow persistence; the margin response $M_{A^{AS}}$ to that statistic after current mark-to-market settlement; the liquidation response Q_m when account slack binds; and the depth response Λ_2 after forced liquidation. The components of A_t^{AS} have separate proxies: the half-tail scale a_t^+ from the predictive distribution of signed price revisions, and the persistence share τ_t from flow-toxicity measures and the autocorrelation of signed order flow over closeout-length horizons, the empirical counterpart of b_j in Proposition 1. Without signed position and slack data, the model can be illustrated but not tightly identified.

Exchange-traded futures and clearinghouse margin changes are only analogues. They provide public margin schedules, depth, volume, open interest, and sometimes trader-category positions, but they do not naturally reveal the prime-broker objects that the theory requires. Such data could motivate reduced-form patterns: whether adverse public-inference proxies precede margin increases, whether margin increases coincide with position reductions in constrained-looking contracts, and whether those reductions precede weaker depth. Those tests should be presented as external discipline rather than as a direct test of the prime-broker model.

A future empirical design should therefore report three contrasts before estimating any full sequence: adverse public inference without margin tightening, margin tightening without binding slack, and binding margin episodes without material forced liquidation. The theory predicts that the full future-depth effect should appear mainly in the fourth case, where public inference raises continuation margin, slack binds, liquidation occurs, and marginal absorbers are fragile. The fixed-dispersion comparison adds a falsification test: among events with the same realized price-revision scale, only adverse-selection-sensitive margining predicts larger resets for higher persistent signed-flow shares.

B Proofs and Local Derivations

This appendix collects the proofs and local arguments. All derivatives are evaluated in a neighborhood of an interior binding-region fixed point $z^* = (\lambda^*, Q^*, e^*)$ unless stated otherwise. Notation follows the standing assumptions: Q denotes absolute funded position size, e post-settlement account equity, z_s signed adverse public inference, and T, M, L, Λ, and W are generated local maps rather than independent primitive shocks.

B.1 Proof of Proposition 1 (Closeout Benchmark)

For jointly Gaussian $(h_{j,t+1}, z_{s,t})$ conditional on $\mathcal{I}_t^p$,

$$\mathbb{E}[h_{j,t+1} \mid z_{s,t}, \mathcal{I}_t^p] = \frac{\operatorname{Cov}(h_{j,t+1}, z_{s,t} \mid \mathcal{I}_t^p)}{\operatorname{Var}(z_{s,t} \mid \mathcal{I}_t^p)} z_{s,t}.$$

Taking expectations over the adverse half-tail gives Equation (4.4), because $\mathbb{E}[z_{s,t} \mid z_{s,t} \geq 0, \mathcal{I}_t^p] = a_t^+$, and the projection coefficient equals $b_j \operatorname{Var}(\theta_t \mid \mathcal{I}_t^p)/\operatorname{Var}(z_{s,t} \mid \mathcal{I}_t^p) = b_j \tau_t$. Solving the residual-demand clearing condition $D_j(C_j, h_{j,t+1}, \lambda_t, Q_t) = r_j Q_t$ for the concession gives

$$C_j = h_{j,t+1} + \frac{r_j Q_t + \delta_j \lambda_t + \varpi_j r_j Q_t}{\eta_j}.$$

Taking expectations conditional on the prime-broker public state and the adverse half-tail event gives

$$\mathbb{E}[C_j \mid \mathcal{I}_t^p, z_{s,t} \geq 0] = b_j A_t^{AS} + \frac{\delta_j}{\eta_j}\lambda_t + \frac{(1+\varpi_j) r_j}{\eta_j} Q_t.$$

Since $\varepsilon_{j,t+1}$ has conditional mean zero, linearity of conditional expectation and $U_{s,t+1} = \sum_j r_j u_{j,t+1}$ give Equation (4.5) with

$$\psi_A = \sum_j r_j b_j, \qquad \psi_\lambda = \sum_j r_j \frac{\delta_j}{\eta_j}, \qquad \psi_Q = \sum_j r_j^2 \frac{1+\varpi_j}{\eta_j}.$$

The sign of ψ_A follows from $r_j > 0$ and $b_j \geq 0$, strict when at least one b_j is strict. Holding a_t^+ fixed, $A_t^{AS} = \tau_t a_t^+$ gives $\partial A_t^{AS}/\partial \tau_t = a_t^+$, so the fixed-dispersion derivative is $\psi_A a_t^+$. Differentiating the conditional mean with respect to λ_t along the generated public-inference map, holding Q_t fixed in the scalar projection, gives $\psi_A T_\lambda + \psi_\lambda$. The loss is generated by a closeout-price concession relative to the current fair mark, not a second posterior markdown of fundamental value, and the argument requires the financier to observe only public order-flow information, the current mark, and the sign of the funded position. □

B.2 Expected-Shortfall Margin: Closed Form and Monotonicity

Let

$$G(m;\mu^U,\sigma^U,\lambda,Q)=\mathbb{E}\left[(Q(\mu^U+\sigma^U\varepsilon)-mQ)^+ \mid \mathcal{P}_t^m\right]=Q\sigma^U\,H\!\left(\frac{m-\mu^U}{\sigma^U}\right),$$

where $H(c):=\mathbb{E}[(\varepsilon-c)^+]$ and the local posterior residual ε has fixed conditional distribution. The mean-excess function H is continuous, convex, and strictly decreasing wherever positive, with $H'(c)=-\Pr(\varepsilon>c)$. The account-equity variable e is not subtracted in this margin-calibration shortfall; it enters the separate feasibility condition $e\ge mQ$ and the liquidation rule. Setting $G=\bar{\ell}$ and inverting gives the closed form Equation (4.13). Direct differentiation of the closed form gives $M_{\mu^U}=1$. Alternatively, $G_m=-Q\Pr(U_s>m\mid\mathcal{P}_t^m)<0$ and $G_{\mu^U}=Q\Pr(U_s>m\mid\mathcal{P}_t^m)>0$ when the shortfall event has positive probability, so the implicit function theorem gives $M_{\mu^U}=-G_{\mu^U}/G_m=1$. For the residual-risk derivative, $G_{\sigma^U}=Q\,\mathbb{E}[\varepsilon\mathbf{1}\{U_s>m\}\mid\mathcal{P}_t^m]$, so

$$M_{\sigma^U}=-\frac{G_{\sigma^U}}{G_m}=\frac{\mathbb{E}[\varepsilon\mathbf{1}\{U_s>m\}\mid\mathcal{P}_t^m]}{\Pr(U_s>m\mid\mathcal{P}_t^m)}.$$

If the generated reset statistic T affects both posterior continuation-loss mean and residual risk, the chain rule gives $M_T=\mu_T^U+M_{\sigma^U}\sigma_T^U$. In the closeout benchmark, $\mu^U_{A^{AS}}=\psi_A$ and $\sigma^U_{A^{AS}}=0$, hence $M_{A^{AS}}=\psi_A>0$ and, holding a^+ fixed, $M_\tau=\psi_A a^+>0$. Finally, differentiating the closed form in Q gives

$$\frac{\partial m}{\partial Q}=\mu_Q^U+\frac{\bar{\ell}}{Q^2\,\Pr(\varepsilon>\bar{c})},\qquad \bar{c}:=H^{-1}\!\left(\frac{\bar{\ell}}{Q\sigma^U}\right), \tag{B.1}$$

which is the form used in the constructed equilibrium.

B.3 The Funding Wedge: Composition

The wedge coefficient in Assumption 2 is generated by the margin and liquidation technology. Let the trader's local continuation cost be $C(\Delta Q,\lambda')$, increasing and locally convex in forced liquidation and future illiquidity, and let the generated reset statistic respond locally to trading intensity as $T_\beta>0$. A marginal increase in the order raises the reset statistic, the margin, forced liquidation in the binding region, and future illiquidity through the depth law. The chain $x\to T\to M\to L\to(\Lambda,C)$ gives the local quadratic representation $\Phi(x)=\frac{\gamma}{2}x^2$ with

$$\gamma\simeq C_{\Delta Q}\,Q_m\,M_T\,T_\beta+C_\lambda\,\Lambda_2\,Q_m\,M_T\,T_\beta, \tag{B.2}$$

all terms evaluated at the binding fixed point. The first term is the direct forced-liquidation cost; the second is the additional cost from weaker future depth. All factors are nonnegative under the standing assumptions, so $\gamma\ge 0$, and γ is increasing in M_T, Q_m, and T_β. The wedge is a local shadow cost induced by the margin rule and liquidation technology, not a full infinite-horizon value function; if the local objective is twice continuously differentiable and satisfies a strict second-order condition, the implicit function theorem gives a continuously differentiable policy $\beta^* = \beta^*(\lambda, Q, e; \theta)$ holding the inherited position sign fixed locally.

B.4 Proof of Lemma 2 (Wedge Equilibrium)

Given the linear pricing rule $p = \kappa y$ with $\kappa > 0$, the trader's objective $\rho s\, x - \kappa x^2 - \frac{\gamma}{2}x^2$ is strictly concave, so the unique best response is $x = \rho s/(2\kappa + \gamma)$, hence $\beta = \rho/(2\kappa + \gamma)$, equivalently $2\kappa\beta + \gamma\beta = \rho$. Competitive pricing requires $\kappa(\beta) = \beta\sigma_v^2/(\beta^2\sigma_s^2 + \sigma_u^2)$, so

$$\kappa\beta = \frac{\beta^2\sigma_v^2}{\beta^2\sigma_s^2 + \sigma_u^2} = \rho\,\chi(\beta), \qquad \chi(\beta) = \frac{\beta^2\sigma_s^2}{\beta^2\sigma_s^2 + \sigma_u^2},$$

and the equilibrium condition becomes $2\rho\chi(\beta) + \gamma\beta = \rho$, that is,

$$\chi(\beta) = \frac{1 - \gamma\beta/\rho}{2}. \tag{B.3}$$

Substituting $\beta = \zeta\sigma_u/\sigma_s$ and $g = \gamma\sigma_s\sigma_u/\sigma_v^2$ gives $\gamma\beta/\rho = g\zeta$ and $\chi = \zeta^2/(1 + \zeta^2)$, which is Equation (6.2). The left side of Equation (6.2) is continuous and strictly increasing in $\zeta \geq 0$, equals 0 at $\zeta = 0$, and equals $1 + g \geq 1$ at $\zeta = 1$; hence there is a unique root $\zeta^* \in (0, 1]$, with $\zeta^* = 1$ if and only if $g = 0$. Identity Equation (6.3) restates Equation (B.3). Implicit differentiation of Equation (6.2) gives

$$\frac{d\zeta^*}{dg} = -\frac{\zeta^*}{\dfrac{4\zeta^*}{(1 + (\zeta^*)^2)^2} + g} < 0, \tag{B.4}$$

and χ is strictly increasing in ζ, so χ^* is strictly decreasing in g. For informativeness,

$$I^* = \mathrm{Var}(v) - \mathrm{Var}(v \mid y) = \frac{\mathrm{Cov}(v, y)^2}{\mathrm{Var}(y)} = \frac{\beta^2\sigma_v^4}{\beta^2\sigma_s^2 + \sigma_u^2} = \frac{\sigma_v^4}{\sigma_s^2}\,\chi^* = \rho\sigma_v^2\chi^*.\square$$

B.5 Proof of Theorem 2 (Discovery-Funding Tradeoff)

Hold $(\sigma_v^2, \sigma_\eta^2, \gamma)$ fixed with $\gamma > 0$. The normalized wedge $g = \gamma\sigma_s\sigma_u/\sigma_v^2$ is strictly increasing in σ_u, with $dg/d\sigma_u = \gamma\sigma_s/\sigma_v^2 > 0$. By Equation (B.4) and the strict monotonicity of χ in ζ,

$$\frac{d\chi^*}{d\sigma_u} = \frac{d\chi^*}{d\zeta^*}\,\frac{d\zeta^*}{dg}\,\frac{dg}{d\sigma_u} < 0,$$

which is claim (i). Claim (ii) follows from Equation (6.4) with ρ fixed and from $a^+ = \sqrt{2/\pi}\sqrt{I^*}$ in Equation (6.5). For claim (iii), Equation (6.7) gives $A^{AS} = \sqrt{2/\pi}\,\sigma_v\sqrt{\rho}\,(\chi^*)^{3/2}$, strictly increasing in χ^*, so $dA^{AS}/d\sigma_u < 0$; the margin rule Equation (4.13) with benchmark loadings gives $dm_{t+1}/d\sigma_u = \psi_A\, dA^{AS}/d\sigma_u < 0$ at local values of (λ, Q, σ^U). Claim (iv) composes claim (iii) with Equation (5.3): in the binding region, $d\lambda_{t+1}/d\sigma_u = a_t(\Omega_t)(e_t/m_{t+1}^2)\,\psi_A\, dA^{AS}/d\sigma_u < 0$. Finally, as $\gamma \to 0$, $dg/d\sigma_u = \gamma\sigma_s/\sigma_v^2 \to 0$ while $d\zeta^*/dg$ remains bounded, so all four derivatives converge to zero, consistent with Proposition 2. $\square$

B.6 Proof of Proposition 3 (Funding Feedback)

In normalized terms the frictionless Kyle equilibrium has $\zeta^K = 1$, so $\beta^K = \sigma_u/\sigma_s$. For $\gamma > 0$, $g > 0$ and Lemma 2 gives $\zeta^* < 1$, hence $\beta^* = \zeta^*\sigma_u/\sigma_s < \beta^K$. By Equation (B.4), ζ^* and therefore β^* and χ^* are strictly decreasing in g, hence in γ. By Equation (B.2), γ is increasing in M_T, Q_m, and T_β, so β^* and χ^* are decreasing in each. □

B.7 Proof of Lemma 3 (Iso-Dispersion Path)

Fix $k \in (0, \frac{1}{2})$ and $\tau \in [k, \frac{1}{2})$. Since $\tau \geq k$, $\sigma_s^2(\tau) = \sigma_v^2\tau/k \geq \sigma_v^2$, so $\sigma_\eta^2(\tau) = \sigma_s^2(\tau) - \sigma_v^2 \geq 0$ and the path lies in the primitive space. Since $\tau < \frac{1}{2}$, $\sigma_u(\tau) > 0$. To verify that $\zeta(\tau) = \sqrt{\tau/(1-\tau)}$ is the equilibrium intensity at these primitives, note $\chi(\zeta(\tau)) = \tau$ and compute the normalized wedge implied by the displayed $\sigma_u(\tau)$:

$$g(\tau) = \frac{\gamma\,\sigma_s(\tau)\,\sigma_u(\tau)}{\sigma_v^2} = \frac{1-2\tau}{\zeta(\tau)},$$

so $2\chi + g\zeta = 2\tau + (1-2\tau) = 1$, which is Equation (6.2); by uniqueness, $\zeta^* = \zeta(\tau)$ and $\chi^* = \tau$, proving (i). For (ii), $\rho(\tau) = \sigma_v^2/\sigma_s^2(\tau) = k/\tau$, so $\rho(\tau)\chi^* = k$ for every τ on the path, and Equation (6.5) gives $a^+ = \sqrt{2/\pi}\,\sigma_v\sqrt{k}$, constant. For (iii), $A^{AS} = \tau a^+$ is strictly increasing in τ with a^+ constant, and the margin response follows from Equation (5.2). □

B.8 Proof of Proposition 5 (Constructed Equilibrium)

(i) At a stationary state, Equation (8.6) requires $\Delta Q^* = \nu > 0$. By Equation (8.4), $\Delta Q > 0$ only if $Q > e/m$, that is, only if the margin binds.

(ii) Stationarity of Equation (8.5) gives $(1-\varphi)\lambda^* = (1-\varphi)\lambda_b + a\nu$, hence the displayed λ^*. Stationarity of Equation (8.7) gives $(1-\omega_e)e^* = \omega_0 - \omega_q\nu - \omega_\lambda\lambda^*$, hence the displayed e^*, strictly positive by Equation (8.8).

(iii) The binding liquidation condition $\Delta Q^* = Q^* - e^*/m(\lambda^*, Q^*) = \nu$ rearranges to Equation (8.9). The margin map $Q \mapsto m(\lambda^*, Q)$ is continuous and strictly increasing on $(0, \infty)$: μ^U is nondecreasing in Q ($\psi_Q \geq 0$) and the term $\sigma^U H^{-1}(\bar{\ell}/(Q\sigma^U))$ is strictly increasing because H is strictly decreasing wherever positive. Define $f(Q) := (Q-\nu)\,m(\lambda^*, Q) - e^*$ on (ν, ∞). As $Q \downarrow \nu$, $f \to -e^* < 0$; as $Q \to \infty$, $m \to \infty$ and $f \to \infty$; continuity gives existence of a root. For uniqueness, let $Q_0 := \inf\{Q > \nu : m(\lambda^*, Q) > 0\}$. On $(\nu, Q_0]$, $f(Q) \leq -e^* < 0$. On (Q_0, ∞), both factors of $(Q-\nu)m(\lambda^*, Q)$ are positive and strictly increasing, so f is strictly increasing and crosses zero exactly once. The stationary margin $m^* = e^*/(Q^*-\nu)$ is positive because $e^* > 0$ and $Q^* > \nu$.

(iv) $m^*Q^* - e^* = m^*Q^* - m^*(Q^*-\nu) = m^*\nu > 0$. □

Jacobian entries. At z^*, write $m_\lambda = \psi_A\alpha_1 + \psi_\lambda$ and $m_Q = \psi_Q + (\bar{\ell}/Q^2)/\Pr(\varepsilon > \bar{c})$ from Equation (B.1). The liquidation derivatives are $\Delta Q_\lambda = (e/m^2)m_\lambda$, $\Delta Q_Q = 1 + (e/m^2)m_Q$, and

$\Delta Q_e = -1/m$. The Jacobian rows are

$$D\mathcal{F}(z^*) = \begin{pmatrix} \varphi + a\Delta Q_\lambda & a\Delta Q_Q & a\Delta Q_e \\ -\Delta Q_\lambda & 1 - \Delta Q_Q & -\Delta Q_e \\ -\omega_q \Delta Q_\lambda - \omega_\lambda(\varphi + a\Delta Q_\lambda) & -\omega_q \Delta Q_Q - \omega_\lambda a \Delta Q_Q & \omega_e + \dfrac{\omega_q}{m} + \dfrac{\omega_\lambda a}{m} \end{pmatrix},$$

which instantiates Equation (9.10) with $\Lambda_1 = \varphi$, $\Lambda_2 = a$, $T_\lambda = \alpha_1$, $M_T T_\lambda = \psi_A \alpha_1$, $M_\lambda = \psi_\lambda$, $Q_m = e/m^2$, $W_e = \omega_e$, $W_{\Delta Q} = -\omega_q$, and $W_\lambda = -\omega_\lambda$. The spectral radii in Table 1 are computed from these entries at the re-solved stationary state for each α_1.

B.9 Proof of Proposition 7 (Local Threshold)

Along the scalar projection, $\lambda_{t+1} = F(\lambda_t;\theta) = \Lambda(\lambda_t, \mathcal{Q}(\lambda_t, Q^*, e^*;\theta); \Omega, \theta)$. The chain rule gives $F_\lambda = \Lambda_1 + \Lambda_2 \mathcal{Q}_\lambda$. In the binding region, $\mathcal{Q} = L(\mathcal{M}(\lambda, Q, e), e, Q)$ and the binding margin-ratio rule has no direct dependence on λ, so holding (Q, e) fixed, $\mathcal{Q}_\lambda = Q_m(M_T T_\lambda + M_\lambda)$. Substitution gives Equation (9.7). The threshold inequality follows by comparing the scalar derivative without and with the public-inference term. The vector statement is the standard local linearization result for the differentiable system $z_{t+1} = \mathcal{F}(z_t;\theta)$ at a hyperbolic fixed point. The entry flow ν is constant and drops out of every derivative. $\square$

B.10 Proof of Proposition 8 (Constrained-Efficient Sensitivity)

On $[0, \bar\psi)$ write $S(\hat\psi) = c_\lambda \Lambda_2 Q_m \hat\psi/(\mathcal{A} - \mathcal{B}\hat\psi)$ with $\mathcal{A}, \mathcal{B} > 0$. Then

$$S'(\hat\psi) = \frac{c_\lambda \Lambda_2 Q_m \mathcal{A}}{(\mathcal{A} - \mathcal{B}\hat\psi)^2} > 0, \qquad S''(\hat\psi) = \frac{2c_\lambda \Lambda_2 Q_m \mathcal{A}\mathcal{B}}{(\mathcal{A} - \mathcal{B}\hat\psi)^3} > 0,$$

and $S \to \infty$ as $\hat\psi \uparrow \bar\psi = \mathcal{A}/\mathcal{B}$. Hence $V = \frac{\kappa_B}{2}(\psi_A - \hat\psi)^2 + S$ is strictly convex on $[0, \bar\psi)$ with $V' \to \infty$ at the right boundary, so a unique minimizer $\hat\psi^* \in [0, \bar\psi)$ exists.

(i) If $\psi_A \geq \bar\psi$, then $\hat\psi^* < \bar\psi \leq \psi_A$. If $\psi_A < \bar\psi$, then $V'(\psi_A) = S'(\psi_A) > 0$, so by strict convexity the minimizer lies strictly to the left of ψ_A. In both cases $\hat\psi^* < \min\{\psi_A, \bar\psi\}$.

(ii) At an interior optimum, $V'(\hat\psi^*) = 0$ and $V''(\hat\psi^*) > 0$, so for any parameter p, $d\hat\psi^*/dp = -V'_{\hat\psi p}/V''$, and it suffices to sign $\partial S'/\partial p$. Directly, $\partial S'/\partial c_\lambda = S'/c_\lambda > 0$. For $\mathcal{B}$ (through which T_λ enters), $\partial S'/\partial \mathcal{B} = 2c_\lambda \Lambda_2 Q_m \mathcal{A}\hat\psi/(\mathcal{A} - \mathcal{B}\hat\psi)^3 \geq 0$, strict for $\hat\psi > 0$. For $\mathcal{A}$,

$$\frac{\partial S'}{\partial \mathcal{A}} = c_\lambda \Lambda_2 Q_m \frac{-(\mathcal{A} + \mathcal{B}\hat\psi)}{(\mathcal{A} - \mathcal{B}\hat\psi)^3} < 0,$$

and $\mathcal{A}$ is decreasing in Λ_1 and in $\Lambda_2 Q_m M_\lambda$, so $\partial S'/\partial \Lambda_1 > 0$. The composite parameters Λ_2 and Q_m raise the prefactor and $\mathcal{B}$ and lower $\mathcal{A}$, so all three effects raise S'. Each sign gives the stated comparative static. At a corner $\hat\psi^* = 0$ the comparative statics hold weakly.

(iii) The feasible domain is $[0, \mathcal{A}/\mathcal{B})$, which collapses to $\{0\}$ as $\mathcal{A} \downarrow 0$; since $\hat{\psi}^*$ lies in this domain, $\hat{\psi}^* \to 0$. The divergence of the marginal social cost at zero is direct: $S'(0) = c_\lambda \Lambda_2 Q_m / \mathcal{A} \to \infty$. $\square$

B.11 Proof of Proposition 9 (Instrument Comparison)

Consider any target level $\mathcal{A}' < \mathcal{A}_{\text{info}}$ of the information-amplification coefficient. A sensitivity cap attains it by reducing M_T, since $\mathcal{A}_{\text{info}} = \Lambda_2 Q_m M_T T_\lambda$ is continuous and increasing in M_T with value 0 at $M_T = 0$. By Equation (B.2), the wedge γ is increasing in M_T, so the cap weakly lowers γ, hence weakly lowers g, and by Lemma 2 weakly raises χ^* and $I^* = \rho\sigma_v^2\chi^*$. Now consider any intervention that attains the same target by raising the effective noise scale to some $\sigma_u' > \sigma_u$. By Theorem 2, I^* is strictly decreasing in σ_u when $\gamma > 0$, so the intervention strictly lowers I^*. For any social objective strictly increasing in I^* and strictly decreasing in $\mathcal{A}_{\text{info}}$, both instruments deliver the same amplification term while the cap delivers weakly higher and noise injection strictly lower informativeness; the cap therefore strictly dominates. $\square$

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