

Hedge Fund Trading and Sovereign Bond Yield Sensitivity^{*}

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Abstract

This paper shows that the leveraged positioning of hedge funds amplifies the response of sovereign bond yields to shocks, leading to temporary overshooting. Combining granular regulatory data on repo positions with high-frequency monetary policy surprises, I study this amplification at the individual bond level. Four results emerge. First, even among comparable bonds, hedge funds add excess volatility on shock days, because their positioning raises the sensitivity of yields to the surprise. Second, this additional sensitivity accounts for more than a quarter of the total yield movement these surprises generate and scales with position intensity. Third, the amplification is two-sided and operates whether a shock moves prices in favor of a position or against it, consistent with leveraged investors rebalancing toward their desired exposure. Finally, it is concentrated among bonds held in directional books and essentially absent when the book offsets its long and short positions.

JEL Classification: G12, G14, G23

Keywords: Hedge funds, Leverage, Sovereign bonds, Shock transmission, Repo market

1. INTRODUCTION

Hedge funds have become increasingly important players in global financial markets, and how this growing footprint affects the sensitivity of asset prices to shocks can be viewed from two perspectives. By correcting mispricings and providing liquidity, hedge funds could push prices toward fundamental value and dampen the reaction to shocks. Their reliance on leverage, however, magnifies the effect of price changes on their capital. If they adjust their positions in response, their trading could push prices away from fundamental value and amplify the reaction to shocks. Whether hedge funds increase or decrease price sensitivity in a given situation is ultimately an empirical question.

This question has become even more important as financial intermediation has shifted away from traditional banks since the global financial crisis. Hedge funds have attracted particular attention as they were at the center of stress episodes such as the March 2020 dash-for-cash in the US Treasury market (Barth and Kahn, 2025; Kruttli, Monin, Petrsek and Watugala, 2025; Aramonte, Schrimpf and Shin, 2023). They leverage their positions through short-term repurchase agreements, yet granular data on these transactions has been largely unavailable. Moreover, the existing evidence is concentrated in stress episodes and focused on market functioning rather than the cross-sectional pricing of bonds. This leaves open whether leveraged trading by hedge funds shapes price formation outside of crises, and what kind of positioning drives the effect when it does.

This paper addresses this gap using granular regulatory data on euro area repo transactions. I show that the leveraged positioning of hedge funds amplifies the response of sovereign bond yields to shocks. For bonds traded by hedge funds, more than a quarter of the yield reaction reflects positioning rather than the fundamental news itself. This overshooting is temporary, and its strength depends not only on the size of the position but also on the directionality of the hedge fund book that holds it.

Identifying this effect requires both detailed position data and a clean source of exogenous price variation. The repo market data provide a transaction-level view of the euro area repo market and allow me to track the daily positioning of hedge funds across individual sovereign bonds. For the second requirement, I combine this micro data with bond market data and high-frequency monetary policy surprises, which serve as a laboratory for exogenous price variation. These surprises are considered exogenous shocks because they are measured in tight windows around monetary policy announcements and therefore capture only the unanticipated part of the decision (Altavilla, Brug-

nolini, Gürkaynak, Motto and Ragusa, 2019; Gürkaynak, Sack and Swanson, 2005). By interacting the pre-determined net positions of hedge funds with the shock, I estimate the additional yield sensitivity that arises when hedge funds are trading a given bond. I then use the full cross section of each fund's positions to show that the amplification depends on whether the bond sits within a hedged or directional book.

I document four main results. First, bonds held by hedge funds move more than comparable bonds when a shock hits. Hedge funds select into inherently more volatile bonds, and to account for that, I compare bonds of the same issuer, duration and date. On regular days there is no difference between the two groups, so this excess volatility reflects their positioning rather than the characteristics of the bonds they trade.

Second, the excess volatility arises because hedge fund trading amplifies the sensitivity of sovereign bond yields to shocks. This amplification scales with the fraction of the bond that hedge funds hold, with the same bond becoming more sensitive as their share rises. The dose response is consistent with a mechanical link between the volume of leveraged trading and the resulting price dislocation. Local projections show that the divergence in yields between bonds traded by hedge funds and comparable bonds appears immediately on the impact day, persists for approximately four trading days, and then reverts toward zero. This temporary overshooting indicates that hedge fund activity moves prices away from fundamentals in the short run, more consistent with the amplification view than with the view that hedge funds push prices toward fundamental value.

Third, the amplification operates regardless of whether shocks are favorable or unfavorable to the hedge fund's position. When the shock moves prices against the position, the mark-to-market loss erodes the fund's capital buffer and the fund may face margin calls that force it to reduce its exposure. When the shock moves prices in its favor, the gain adds to the capital buffer and frees up capacity, which the fund may use to expand its exposure. In both cases, the resulting trading would push yields further in the direction of the initial shock. Splitting the sample into a constraining and a relaxing regime confirms amplification in both states, and local projections verify that the two regimes correspond to position contractions and expansions. This pattern is consistent with Adrian and Shin (2014), in which leveraged intermediaries manage their balance sheets in response to the risk environment and thereby keep their leverage ratio constant, expanding positions after gains and contracting them after losses.

Fourth, the amplification depends on the structure of the hedge fund book and not only on

its size. Using the full cross section of each fund’s positions, I measure whether a bond is held within a hedged book that offsets long and short positions in duration terms, as in a relative value trade that is long Italian and short German bonds, or within a one-sided directional book. The amplification is concentrated in bonds held within directional books and is essentially absent when the book is hedged. This locates the relevant capital constraint at the level of the fund’s whole portfolio rather than the individual position. Because the sector alternates between directional and hedged configurations over time, the same volume of hedge fund positioning can pose very different amplification risks in different periods.

A first challenge in identifying the impact of hedge fund positioning is selection bias. Hedge funds do not select bonds randomly and the specific characteristics of those bonds may independently affect how strongly a bond reacts to a shock. I address this concern by introducing progressively tighter fixed effect specifications, up to duration-by-country-by-date fixed effects that compare bonds of similar duration from the same issuer on the same day, and by implementing a matched-sample design that pairs each hedge fund bond with the non-hedge fund bond in the same duration-country-date cell that is closest in terms of liquidity.

A second challenge is that any amplification could reflect the behavior of the dealers that intermediate hedge fund trades. If dealers respond to shocks in ways that systematically differ across the bonds where they maintain active hedge fund relationships, the results could capture dealer rather than hedge fund behavior. To provide evidence against this explanation, I use a dealer-bond-date panel, introduce increasingly demanding dealer fixed effect structures, and use credit default swaps to estimate whether the effect scales with dealer stress. The analysis confirms that the effect operates through hedge fund positioning, rather than the behavior of dealer banks.

My findings have several implications. The literature on leveraged intermediaries has focused on margin spirals, in which losses force liquidations during stress episodes ([Brunnermeier and Pedersen, 2009](#); [Geanakoplos, 2010](#); [Adrian and Shin, 2010](#)). The amplification I find is two-sided, which suggests that the response to gains deserves the same attention as the response to losses. It is also not confined to crises but is present on any day with sizable price shocks. Similarly, models of sovereign bond pricing feature arbitrageurs who lean against imbalances ([Greenwood and Vayanos, 2014](#); [Jansen, Li and Schmid, 2024](#)). My results suggest that allowing their demand to move with the shock would capture a further source of price pressure. For monetary policy transmission, part of the yield reaction on announcement days is a temporary positioning effect, so that estimates of

pass-through partly reflect who holds the bond. For policymakers, neither the presence nor the size of hedge fund positions is sufficient to evaluate the risk. Monitoring should extend beyond stress episodes and treat the directionality of the book as a key risk metric, since the same position amplifies a shock within a directional book and is close to neutral within a hedged one.

Related literature. This paper relates to at least three strands of the literature. The first examines the determinants of sovereign bond yields and their sensitivity to shocks. While sovereign bond yields are known to react to fundamental factors such as macroeconomic variables, debt sustainability or monetary policy, non-fundamental factors also play an important role. For example, [De Grauwe and Ji \(2013\)](#) show that euro area sovereign spreads during the debt crisis reflected self-fulfilling dynamics disconnected from fundamentals. More broadly, the literature on slow-moving capital argues that temporary dislocations in asset prices can arise from frictions in the ability of arbitrageurs to absorb imbalances ([Duffie, 2010](#); [Mitchell, Pedersen and Pulvino, 2007](#)). A related strand emphasizes the role of bond supply and investor demand in sovereign bond pricing. [Greenwood and Vayanos \(2014\)](#) show that shifts in the maturity-weighted supply of government debt move yields, consistent with arbitrageurs demanding compensation to absorb duration risk, while [Koijen, Koulischer, Nguyen and Yogo \(2021\)](#) use granular holdings data to trace how different investors contribute to the transmission of ECB asset purchases. [Jansen et al. \(2024\)](#) combine granular demand estimates with risk-averse arbitrageurs who absorb the imbalances that other investors leave behind. Because those investors substitute across maturities, monetary tightening raises term premia in their model. These papers show that sovereign yields are shaped not only by aggregate fundamentals, but also by marginal investors and the frictions that they face. This paper adds to this literature by documenting a specific source of temporary deviations from fundamental values in sovereign bond markets.

The second strand of the literature studies the role of non-bank financial intermediation, and in particular hedge funds, in financial markets. [Pelizzon, Mattiello and Schlegel \(2025a\)](#) document the growth of non-bank financial intermediation in the euro area and the US, and [Aramonte et al. \(2023\)](#) provide an overview of the types of NBFIs and the systemic risks they generate, arguing that the main risk associated with hedge funds is their reliance on leverage. Whether this implies that hedge funds are stabilizing or destabilizing for asset prices is an empirical question. On one hand, [Cao, Liang, Lo and Petrasek \(2018\)](#) find that hedge fund holdings are associated with improved

price efficiency in equity markets, consistent with the view that hedge funds correct mispricings and enhance liquidity. In the gilt market, [Czech, Huang, Lou and Wang \(2021\)](#) show that hedge fund order flow forecasts returns over the following days, partly because funds anticipate the demand of other investors and partly because they process macroeconomic news more efficiently. On the other hand, a growing literature documents episodes in which leveraged hedge fund positioning has amplified stress. The March 2020 stress episode in US Treasury markets is the most prominent example. [Barth and Kahn \(2025\)](#), [Kruttli et al. \(2025\)](#) and [Barone, Chaboud, Copeland, Kavoussi, Keane and Searls \(2022\)](#) document that the forced unwinding of leveraged hedge fund positions added to the selling pressure, and [Kashyap, Stein, Wallen and Younger \(2025\)](#) use the episode to validate a model in which the interaction of leveraged hedge funds, capital constrained dealers and asset managers creates fragility that grows with the supply of Treasuries. Moreover, regarding the role of arbitrageurs in the euro area, [Anaya, Cera, Georgiadis and Kaufmann \(2025\)](#) show that investment funds rebalance away from periphery sovereigns in response to disaster risk. [Pelizzon, Subrahmanyam and Tomio \(2025b\)](#) further show that asset scarcity induced by the ECB purchases impeded the arbitrage mechanism, generating mispricings. Related work studies the institutional infrastructure supporting hedge fund leverage, with [Dahlquist, Rottke and Sokolovski \(2023\)](#) and [Bittner and Jank \(2025\)](#) showing that hedge funds increasingly rely on multiple prime brokers to secure favorable margin terms and diversify idiosyncratic funding risk. This paper adds to this literature by documenting an amplification channel that is not confined to stress episodes and that operates whether a shock moves prices in favor of a position or against it. Its strength is governed by the directionality of the hedge fund book rather than only the size of the position.

The third strand of the literature studies the channels through which leveraged investors transmit shocks to asset prices. Foundational to this is the idea of limits to arbitrage, implying that sophisticated investors cannot perfectly respond to every shock ([Shleifer and Vishny, 1997](#); [Gromb and Vayanos, 2002](#)). A unifying perspective is provided by [Adrian and Shin \(2014\)](#), who show that leveraged intermediaries actively manage their balance sheets in response to the risk environment, generating a constraining environment when adverse shocks tighten balance sheet constraints and a relaxing environment when favorable shocks loosen them. In the constraining environment, the response aligns with the literature on deleveraging spirals, in which adverse shocks erode the capital buffer, tighten funding constraints, and force position liquidations that further depress prices ([Brunnermeier and Pedersen, 2009](#); [Geanakoplos, 2010](#); [Adrian and Shin, 2010](#); [Avalos and Sushko,](#)

2023). Empirical evidence for this mechanism is largely concentrated in stress episodes. The same forced selling also arises from the interest rate hedges of pension funds and insurers. Jansen, Klingler, Ranaldo and Duijm (2026) show that Dutch pension funds meet the margin calls on their swaps by selling government bonds, which depresses the prices of the bonds sold. Alfaro, Bahaj, Czech, Hazell and Neamtu (2024) measure this liquidity risk from sterling repo and swap transactions and find that it predicts the bond sales that contributed to the yield spike in the 2022 gilt market crisis. In the relaxing environment, the response is not enforced by margin requirements. For arbitrageurs whose desired positions exceed what their balance sheets permit, expanding into the freed funding capacity is nonetheless the optimal response (Gromb and Vayanos, 2002; Brunnermeier and Pedersen, 2009), and hedge fund leverage is indeed documented to rise when asset values increase and funding costs fall (Ang, Gorovyy and Van Inwegen, 2011). The expansion can also reflect behavior unrelated to funding constraints, such as trend following or anticipatory trading. De Long, Shleifer, Summers and Waldmann (1990) provide the theoretical foundation for the latter by showing that rational speculators may amplify price movements by anticipating the trading of less sophisticated investors. Moskowitz, Ooi and Pedersen (2012) document time-series momentum across asset classes, and Asness, Moskowitz and Pedersen (2013) extend this to a cross-sectional framework. Brunnermeier and Nagel (2004) provide evidence that hedge funds engaged in momentum trading, riding the technology bubble rather than correcting it. This paper contributes by showing empirically that leveraged hedge fund positioning amplifies yields in both environments.

2. DATA

I use the European Central Bank’s Securities Financing Transactions Data Store (SFTDS) to identify hedge fund repo positions. This regulatory dataset, established under the Securities Financing Transactions Regulation (SFTR), provides a granular transaction-level view of the euro area repo market, covering all transactions involving at least one euro area-established entity. Given the dealer-intermediated nature of sovereign bond markets, and the global importance of euro area dealers, this dataset captures the large majority of repo activity in European sovereign bonds. My sample covers euro-denominated repo and reverse repo transactions collateralized by Italian and German sovereign bonds between January 2021 and November 2025.¹

¹Italian and German sovereign bonds account for approximately 70% of absolute net daily hedge fund activity in euro area sovereigns. Appendix A1 re-estimates the main specifications on the expanded sample including French and Spanish sovereigns and finds consistent results.

I identify hedge funds in two steps. The sector-identification algorithm of [Lenoci and Letizia \(2021\)](#) assigns each counterparty to a sector, which yields the population of investment funds. Within this population, I isolate offshore hedge fund activity by restricting the sample to funds domiciled in the Cayman Islands (see [Barth, Beltran, Hoops, Kahn, Liu and Perozek, 2025](#), for a discussion on the relevance of Cayman Island domiciled hedge funds), resulting in 152 identified hedge funds. I adopt the Cayman restriction as a conservative criterion for identifying hedge fund activity. Other common fund domiciles such as Ireland and Luxembourg host a broader mix of fund types, and restricting to Cayman therefore provides a cleaner sample. The restriction discards little activity. Across all counterparties classified as investment funds in the SFTDS, regardless of domicile, the 152 identified funds account for 91% of gross outstanding repo positions in Italian and German sovereign bonds. Any bias from hedge funds among the remaining 9% is downward, since adding them would only raise the measured hedge fund footprint in a bond. All 152 entities are hedge fund vehicles, as their legal names and manager affiliations show. The strategy classification in [Appendix A2](#) goes one step further. Fixed income relative value and global macro funds, strategies for which the repo transaction is an integral part of the sovereign bond trade itself rather than a source of funding for unrelated positions, account for 85% of their repo volume, and my results are unchanged when positioning is measured from these funds only. The few funds that remain unclassified lack a documented strategy, not a hedge fund identity.

To interpret trading patterns, I first map repo market activity to the underlying directional exposure of hedge funds. Since hedge funds use the repo market primarily to finance leveraged positions or source securities for short selling, the direction of the repo transaction serves as a proxy for their trading position. Specifically, I classify net cash borrowing (repo) as a proxy for leveraged long positions, where the fund posts the bond as collateral to finance its purchase. Conversely, I classify net cash lending (reverse repo) as a proxy for short positions, where the fund borrows the specific bond to sell it in the cash market. Other instruments such as futures, total return swaps, or options might also provide leveraged sovereign bond exposure, but are not directly observable in the SFTDS.

Second, I obtain daily bond-level characteristics from Bloomberg. Most importantly, I source daily yields for each individual bond to compute the dependent variable. The dataset also includes the issue size, duration, and the bid-ask spread as a proxy for market liquidity. To capture the specific demand dynamics of the futures market, I construct a *Cheapest-to-Deliver* (CTD) indicator.

Following [Pelizzon et al. \(2025b\)](#), who document that the cheapest-to-deliver bond rarely switches over the life of a contract, I identify the CTD bond for each futures contract by observing the actual delivery outcomes on Eurex, assuming the delivered bond acted as the CTD throughout the life of the corresponding contract. I merge these characteristics with the repo transaction data at the bond-day level.

Finally, I capture exogenous market variation using high-frequency intraday monetary policy surprises from the Euro Area Monetary Policy Event-Study Database (EA-MPD) ([Altavilla et al., 2019](#)). Specifically, I employ the intraday change in the 2-year OIS rate during the ECB monetary event window as my measure of the monetary policy surprise. Because the OIS rate captures the pure risk-free rate component of the surprise, it is free of any sovereign credit or liquidity premium. On a given announcement day, every bond in my sample is therefore exposed to the same exogenous shock, and identification of the amplification effect comes entirely from cross-sectional variation in hedge fund positioning across bonds facing this common shock.

2.1. Descriptive Statistics

Table [I](#) presents descriptive statistics for the panel. Panel A shows that, while the average daily yield change is close to zero, the standard deviation is 5.79 basis points. The market is highly liquid, characterized by an average bid-ask spread of just 0.31 €, and the average bond in the sample has a duration of 7.13 years.

Panel B highlights the significant footprint of offshore hedge funds. Hedge funds are active in the market, holding positions on 53% of all bond-days. Crucially, the table distinguishes between the unconditional market footprint and the footprint conditional on hedge funds being active in the bonds. While the full-sample absolute net position averages 1.60% of issuance, this figure rises to 3.01% conditional on active participation. Thus, hedge funds hold economically meaningful fractions of the outstanding debt. The roughly symmetric split between long and short intensities (3.02% vs. 3.00% in the active sample) shows that hedge funds use these markets for both long and short positions.

Panel C provides evidence for the leveraged nature of hedge fund activity. Haircuts on long positions average just 0.24%, implying that hedge funds could achieve leverage ratios well in excess of 100x on these safe assets. These raw haircuts may understate the true margin committed by funds, as they do not capture components such as variation margin, futures-leg requirements, or unobserved

Table I: Summary Statistics

	Mean	SD	P25	Median	P75	N
<i>Panel A: Bond Market Variables (Full Sample)</i>						
Daily Yield Change ($\Delta y_{i,t}$, bps)	0.15	5.79	-2.25	0.00	2.75	477,001
Duration (Years)	7.13	7.00	1.77	5.14	10.47	477,001
Bid-Ask Spread (€)	0.31	0.42	0.03	0.11	0.44	477,001
Amount Issued (€bn)	15.43	7.36	10.52	11.99	19.87	477,001
<i>Panel B: Hedge Fund Positioning</i>						
HF Presence Indicator (Dummy)	0.53	0.50	0.00	1.00	1.00	477,001
<i>Full Sample (Unconditional):</i>						
Absolute Net Position (% of Issued)	1.60	2.83	0.00	0.15	1.99	477,001
Long Intensity (% of Issued)	0.72	2.20	0.00	0.00	0.00	477,001
Short Intensity (% of Issued)	0.87	2.10	0.00	0.00	0.39	477,001
<i>Active Sample (Conditional on Presence):</i>						
Absolute Net Position (% of Issued)	3.01	3.29	0.64	1.80	4.26	253,111
Long Intensity (% of Issued)	3.02	3.65	0.54	1.53	4.05	114,473
Short Intensity (% of Issued)	3.00	2.96	0.74	2.00	4.37	138,638
<i>Panel C: Repo Contract Terms (Active Transactions Only)</i>						
Avg. Haircut (Long, %)	0.24	0.54	0.00	0.12	0.30	109,068
Avg. Haircut (Short, %)	-0.08	0.21	-0.15	-0.05	0.00	133,503
Avg. Maturity (Long, Days)	16.49	16.42	7.50	11.00	18.65	101,535
Avg. Maturity (Short, Days)	18.50	19.25	8.67	13.17	21.93	127,962
<i>Panel D: Monetary Policy Shocks (Shock days only)</i>						
MP Surprise (All, bps)	-0.21	6.55	-3.35	-0.30	4.10	14,539
Tightening Surprise (> 0 , bps)	5.87	4.10	3.30	4.95	7.60	5,736
Easing Surprise (< 0 , bps)	-4.17	4.48	-6.72	-3.13	-0.56	8,803

Notes: This table reports summary statistics for the daily panel of Italian and German sovereign bonds from January 2021 to November 2025. *Net Position* and *Intensity* variables are calculated as the five-day moving average of positions scaled by the total amount outstanding. Panel B reports these statistics first for the full sample (including zeros) and second for the active sample (excluding zeros) to illustrate the typical trade size. Panel C reports average contract terms calculated only for active observations. Panel D reports the monetary policy surprise statistics for shock days only.

Sample period: 2021-01-01 – 2025-11-01

cash buffers. The average repo maturity is approximately two weeks (16–18 days), indicating a mix of overnight funding and term financing. Finally, Panel D summarizes the exogenous shocks. The average tightening surprise is 5.87 basis points, while the average easing surprise is -4.17 basis points.

3. A FRAMEWORK FOR LEVERAGED POSITIONING AND YIELD AMPLIFICATION

This section describes the framework that guides the empirical analysis. It traces how a price shock to a leveraged position affects the capital of the fund and, through the resulting position adjustment, the yield of the bond. The framework is intended to motivate the empirical design rather than to serve as a formal model. The empirical analysis is organized along its implications, and it is not

meant to establish the framework as the only account of the results. Appendix A4 presents a calibrated version of the framework based on sample moments.

The framework builds on Adrian and Shin (2014), who describe leveraged intermediaries that manage their balance sheets in response to the risk environment and thereby, for a given level of risk, keep their leverage ratio constant. When asset values rise, leverage falls and the intermediary expands its positions. When asset values fall, leverage rises and the intermediary contracts them. The adjustment is therefore two-sided, and the direction of the shock determines the sign of the position adjustment. While Adrian and Shin (2014) focus on US broker-dealers, I apply this logic to hedge funds that finance bond positions through repo, where the margin requirement on the collateral bounds the leverage of the position.

Consider a hedge fund financing a long bond position via the repo market. To hold this position, the fund must post capital equal to the margin requirement m_i . Since the repo loan principal is fixed, any exogenous price shock $\Delta P_{i,t}$ is absorbed entirely by the capital buffer. The rate of capital erosion depends on the leverage ratio $1/m_i$.

$$\frac{\Delta E_{i,t}}{E_{i,t-1}} \approx \frac{1}{m_i} \times \frac{\Delta P_{i,t}}{P_{i,t-1}} \quad (1)$$

Shocks of the size observed in the sample have a substantial effect on the capital buffer. The average tightening surprise in the sample is approximately 6 basis points, which moves the price of a representative bond with a duration of about seven years by roughly 0.42%. Under an effective margin of 2%, which lies well above the haircuts reported in Table I and is therefore a conservative assumption, Equation (1) implies that an average surprise moves the capital buffer by about 21%. A fund that keeps its leverage constant would therefore adjust its position until leverage returns to its initial level, which requires a position change of the same proportion as the change in capital.

After a loss, the fund must reduce the position to restore the margin ratio, and the reduction is enforced by the margin call. After a gain, the fund can expand the position to the new capacity, and the expansion is voluntary. The contraction is the deleveraging response studied in the literature on funding constraints, in which losses erode capital and force position reductions (Brunnermeier and Pedersen, 2009; Geanakoplos, 2010). The expansion follows if the fund manages its leverage in the manner described by Adrian and Shin (2014). It is also the optimal response of a constrained arbitrageur whose desired position exceeds its funding capacity. A favorable surprise enlarges the capacity while the remaining expected return may still justify a larger position than the enlarged

balance sheet permits (Gromb and Vayanos, 2002), and hedge funds are documented to raise leverage when asset values rise and funding costs fall (Ang et al., 2011). The expansion would also arise under trend following, in which funds add to positions that have gained (Moskowitz et al., 2012; De Long et al., 1990), and the empirical analysis does not distinguish between these motives. Appendix A4 works through a numerical example of both sides. In both cases, the position adjustment is in the direction of the initial shock.

The yield reaction to the position adjustment depends on the market’s ability to absorb it. The trading pressure equals the adjustment multiplied by the share of the bond that the hedge fund sector holds. Its price impact then depends on how elastic the demand for the bond is, meaning how much its yield reacts to trading pressure. The adjustment takes place within a short period after the shock, since margin calls are settled daily and the framework assumes that freed capacity is redeployed promptly rather than over months. The trading pressure is therefore concentrated in the days following the shock, and it reflects the adjustment of positions to the change in capital rather than a change in fundamentals.

In sum, the framework implies that bonds in which hedge funds hold leveraged positions react more strongly to a shock than comparable bonds, the more so the larger the position relative to the amount outstanding, that the additional reaction is temporary and reverts as other capital absorbs the imbalance, and that the amplification is two-sided, with a position contraction when the shock moves prices against the position and an expansion when it moves in its favor. Section 5.2 examines the first two implications and Section 5.3 the third. The results are read as consistent with the framework rather than as establishing it.

4. EMPIRICAL STRATEGY

4.1. Specification

To empirically test the amplification mechanism, I employ a panel regression framework that exploits monetary policy shocks and cross-sectional variation in hedge fund positioning. The strategy is to interact pre-determined hedge fund positions with exogenous price shocks to identify the additional yield sensitivity that arises specifically because hedge funds are active in a given bond. While the mechanisms explored in Section 3 are general and apply to any event that causes significant price changes, I focus on monetary policy shocks for two reasons. First, since they are identified using high-frequency intraday windows, they are well-defined and exogenous to other daily bond

market factors. Second, the shocks generate enough reaction in bond yields to trigger the discussed mechanisms.²

My baseline specification estimates the sensitivity of bond yields to monetary shocks conditional on hedge fund activity. I estimate the following model:

$$\Delta y_{i,t} = \beta_1(\text{HF}_{i,t-1} \times \text{Shock}_t) + \beta_2 \text{HF}_{i,t-1} + \gamma \mathbf{X}_{i,t-1} + \theta_k + \varepsilon_{i,t} \quad (2)$$

where the dependent variable, $\Delta y_{i,t}$, is the daily yield change of bond i on day t , and θ_k denotes the fixed effects structure, which varies across specifications as discussed in Section 4.2.

The key explanatory variable is the interaction term $\text{HF}_{i,t-1} \times \text{Shock}_t$, where Shock_t represents the monetary policy shock and $\text{HF}_{i,t-1}$ measures hedge fund positioning prior to the shock. I use two complementary definitions for the hedge fund positioning. The first is a binary indicator of hedge fund presence at $t-1$. This definition is useful because it captures the extensive margin of hedge fund activity and maps naturally onto a matched-sample design, where each hedge fund bond can be paired with an observationally similar non-hedge fund bond to address selection concerns non-parametrically. The second definition is the average of hedge fund outstanding positions over the prior five trading days scaled by the total amount outstanding, which measures the intensity of hedge fund trading. This continuous measure allows me to test whether the amplification scales with the size of the position, providing evidence on the mechanism. A third measure, the directionality of the books held by the funds active in a bond, requires the full cross section of each fund’s positions and is therefore introduced in Section 6.

The coefficient of interest is β_1 , which captures the additional sensitivity of hedge fund-traded bonds to the shock relative to comparable bonds. A positive β_1 indicates that bonds with hedge fund participation exhibit larger yield changes in response to the same shock. The vector $\mathbf{X}_{i,t-1}$ includes bond-specific controls for the bid-ask spread, the residual maturity, and the status as the CTD bond (Pelizzon et al., 2025b). Standard errors are two-way clustered at the bond and date level to account for both serial correlation within bonds and cross-sectional dependence across bonds. Section 4.2 discusses the identification strategy and the corresponding fixed effects structure in detail.

²Figure A1 validates the latter point by plotting the exceedance probability of daily yield changes. The graph shows that shock days display significant fat-tails, meaning that large yield movements are significantly more likely on days with monetary policy announcements.

Table II: Hedge Fund Bond Selection

Dependent Variable:	HF Involvement		
	(1)	(2)	(3)
<i>Bond Characteristics</i>			
Duration	0.012*** (0.004)	0.012*** (0.003)	0.013*** (0.003)
Bid-Ask Spread	−0.534*** (0.039)	−0.524*** (0.038)	−0.549*** (0.040)
Amount Issued	0.030*** (0.002)	0.032*** (0.002)	0.032*** (0.002)
CTD Flag	0.070** (0.034)	0.070** (0.032)	0.070** (0.033)
Country FE	No	Yes	No
Country × Date FE	No	No	Yes
Observations	477,001	477,001	477,001
R-squared	0.518	0.533	0.543

Notes: Linear probability model where the dependent variable is a binary indicator for offshore hedge fund repo activity in a given bond on a given day. *Duration* is in years. *Bid-Ask Spread* is in euros. *Amount Issued* is the outstanding notional in billion euros. *CTD Flag* is an indicator for cheapest-to-deliver status against an active futures contract. Column (2) adds issuer country fixed effects. Column (3) adds country × date fixed effects, identifying selection within country-day cells. Standard errors are clustered by business date and bond. *** p<0.01, ** p<0.05, * p<0.10. Sample period: 2021-01-01 – 2025-11-01

4.2. Identification Strategy

The primary challenge in identifying the causal impact of hedge fund positioning is the endogeneity of their portfolio choice. Hedge funds do not select assets randomly but rather strategically target liquid bonds, often with special status such as the CTD. Table II documents this pattern directly. In a linear probability model of hedge fund involvement on bond characteristics, a one-standard-deviation tighter bid-ask spread (0.42) is associated with a 23 percentage point higher probability of hedge fund activity, and each additional year of duration raises this probability by 1.3 percentage points. Larger issues and CTD bonds are similarly more likely to attract hedge funds, with coefficients of 3.2 and 7.0 percentage points respectively. A simple correlation between ownership and yield reactions would therefore conflate the effect of leveraged capital with the characteristics that make these bonds attractive to arbitrageurs in the first place.

My identification strategy addresses this selection bias by exploiting the unpredictability of monetary policy shocks. The key identifying assumption is that, conditional on fixed effects and bond-specific controls, the interaction between pre-determined hedge fund positioning and the high-frequency surprise is exogenous.³ Under this assumption, the coefficient on the interaction term

³A residual concern is that pre-existing positioning could be correlated with the realized surprise through a common latent factor. Appendix A6 reports an orthogonality test in which aggregate hedge fund positioning on the trading

captures the additional yield sensitivity that arises specifically because hedge funds are trading a given bond, rather than the effect of bond characteristics that are correlated with both hedge fund presence and shock sensitivity.

The first feature of the research design supporting this assumption is timing. Because monetary policy shocks are measured over a narrow intraday window around the ECB press conference, they are effectively random relative to positions established at $t-1$. Hedge funds cannot predict the precise surprise component of the announcement, ensuring that pre-existing positions are not endogenous to the shock itself. This rules out reverse causality, where hedge funds would adjust their positioning in anticipation of the realized surprise.

However, even without reverse causality, bonds traded by hedge funds may be inherently more volatile and therefore more sensitive to any market-moving event, including monetary policy surprises. Duration is the primary determinant of how strongly a bond's yield reacts to a given rate shock, so comparing a hedge fund bond to a non-hedge fund bond of materially different duration would conflate the amplification effect with mechanical differences in rate sensitivity. Bond fixed effects do not resolve this. As [Nyborg and Woschitz \(2025\)](#) point out, a bond's exposure to a curve movement is not a fixed characteristic, because its duration declines over time and the curve rarely shifts in parallel. A meaningful comparison therefore requires matching bonds on duration within the same market environment. For that reason, the preferred specification for the analyses throughout the paper includes duration-by-country-by-date fixed effects. The cells underlying these fixed effects are constructed by sorting bonds into two-year duration bins, so that a cell contains all bonds from the same issuer country whose durations fall within the same two-year interval on a given day. [Appendix A8](#) reports the within-cell duration dispersion and shows that the estimates are unchanged under one-year and three-year bins. This structure absorbs the aggregate shock, the movement of each segment of the issuer's curve on each day, and any differential volatility across duration-country-date cells, so identification comes exclusively from within-cell variation in hedge fund positioning. [Section 5.1](#) examines the volatility differential of hedge fund bonds directly as the first empirical result and confirms that this structure absorbs it.

While the duration-by-country-by-date fixed effects absorb within-cell differences in average bond characteristics, and thereby address the concern about increased volatility, there could still be concerns that it does not eliminate residual heterogeneity among bonds within the same cell,

day before each ECB meeting does not predict the realized surprise.

particularly along the liquidity dimension that most strongly predicts hedge fund selection as shown in Table II. For that reason, I use a matched approach in the binary case, which pairs each hedge fund bond on a given day with the single non-hedge fund bond in the same duration-country-date cell that is closest in terms of bid-ask spread. The baseline regression is then run on this matched sample with pair fixed effects, so that identification comes from comparing each hedge fund bond only to its most similar non-hedge fund counterpart. This design makes the comparison group transparent and eliminates residual differences in observable characteristics without imposing a functional form on how these characteristics relate to yield sensitivity. Appendix A9 describes the matched pairs and shows that the estimate is unchanged among tightly matched pairs, when the shock response is allowed to vary with the characteristics on which the pairs differ, and when each hedge fund bond keeps a single fixed comparison bond throughout the sample.

The intensity analysis provides an additional identification argument beyond the binary case. If the amplification were driven solely by unobserved bond characteristics, within-bond variation in the size of the position should not predict the yield reaction, since bond fixed effects absorb any time-invariant sensitivity. Because the sensitivity to the shock is not entirely time invariant, as discussed above, the within-bond comparison is made inside the duration-country-date cells. However, the leveraged-position mechanism implies that larger positions trigger larger forced sales, so the amplification should scale with the size of the exposure within the same bond over time. Testing the continuous intensity measure in addition to the binary indicator therefore provides a test of the mechanism that is difficult to reconcile with a selection story.

Finally, a separate but related concern is that the amplification could reflect not the leveraged positioning of hedge funds themselves but the behavior of the dealers that intermediate their trades. Because this concern cannot be addressed within the bond-date panel used in the main specifications, I restructure the panel at the dealer-bond-date level and use progressively tighter dealer fixed effects structures to hold dealer behavior constant on each day.

5. EMPIRICAL RESULTS AND DISCUSSION

5.1. *Bond Volatility*

I start from the selection concern raised in Section 4.2 and examine whether the bonds hedge funds hold are more volatile. I regress the absolute daily yield change on a hedge fund presence dummy and its interaction with the absolute shock, in order to have a measure for volatility:

$$|\Delta y_{i,t}| = \theta_k + \beta(HF_Involved_{i,t-1} \times |Shock_t|) + \gamma \mathbf{X}_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

where $HF_Involved_{i,t-1}$ is a dummy variable equal to one if bond i has active offshore hedge fund repo positions on day $t - 1$. The variable $Shock_t$ represents the high-frequency adjustment in 2-year OIS rates (Altavilla et al., 2019). θ_k denotes the fixed effects structure, which varies across specifications. The vector of controls $\mathbf{X}_{i,t-1}$ includes duration, bid-ask spreads, and the Cheapest-to-Deliver (CTD) status. Following Pelizzon et al. (2025b), I identify the CTD bond using delivery data from Eurex, assuming the delivered bond acts as the CTD throughout the futures contract life.

Table III presents the results. The coefficient on HF Involved in Columns (1) and (2) shows that the bonds selected by hedge funds are inherently more volatile. Once bond fixed effects absorb this level in Column (3), the sign flips and becomes marginally negative at -0.13 basis points, indicating that within the same bond over time, the days on which hedge funds are active are not the more volatile ones. This pattern is consistent with the unconditional differential reflecting between-bond selection into structurally more volatile bonds, while within-bond timing shows no tendency for hedge fund days to be more turbulent. Column (4) shows that once Date fixed effects are replaced with duration-by-country-by-date fixed effects, the residual differential collapses to an insignificant -0.10 basis points. Within cells of bonds with similar duration from the same issuer on the same day, hedge fund bonds are no more volatile than their peers.

The interaction with the absolute shock behaves differently. It stays positive and stable between 0.240 and 0.253 across all four columns, surviving precisely the comparisons that eliminate the level differential. Hedge funds do select more volatile bonds, but the volatility they add appears only on days when a shock meets the position. Based on this evidence, the analyses throughout the paper use duration-by-country-by-date fixed effects as the preferred specification.

5.2. Hedge Fund Amplification

Turning to the yield reaction itself, this section establishes the amplification effect in four steps, documenting the differential sensitivity of bonds with hedge fund presence, tracing the persistence of the effect over the days after the shock, showing that its trigger lies with the funds rather than the dealers that intermediate their trades, and demonstrating that it scales with the size of the position.

Table III: Bond Volatility and Hedge Fund Presence

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3)	(4)
<i>Main Interaction</i>				
HF Involved $\times$ Shock 	0.240*** (0.071)	0.241*** (0.071)	0.253*** (0.069)	0.246*** (0.058)
<i>Direct Effects</i>				
Shock	0.545*** (0.102)	0.541*** (0.102)		
HF Involved	0.459*** (0.084)	0.817*** (0.146)	−0.128* (0.072)	−0.098 (0.062)
<i>Controls</i>				
Duration		−0.000 (0.013)	0.037 (0.060)	
Bid-Ask Spread		0.838*** (0.218)	−0.533** (0.224)	−0.525** (0.217)
CTD Flag		0.413* (0.248)	0.504*** (0.124)	0.369*** (0.084)
Bond FE	No	No	Yes	Yes
Date FE	No	No	Yes	No
Duration $\times$ Date $\times$ Country	No	No	No	Yes
Observations	477,001	477,001	477,001	470,852
R-squared	0.035	0.040	0.504	0.683

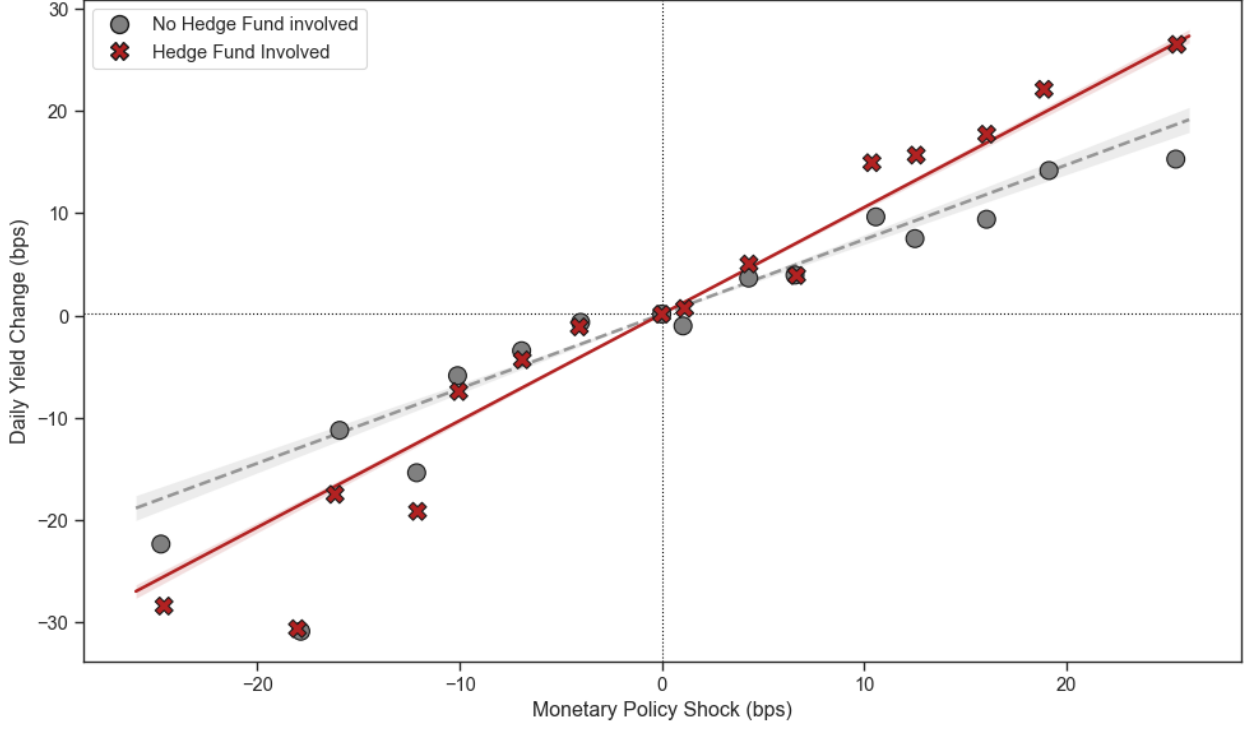
Notes: The dependent variable is the absolute daily change in bond yield (bps). *HF Involved* is a dummy indicating presence of offshore hedge fund repo activity. |Shock| is the absolute value of the 2-year OIS rate change during the ECB monetary event window. In Columns (3) and (4), the |Shock| main effect is absorbed by the fixed effects. Column (4) replaces Date FE with Duration $\times$ Date $\times$ Country FE, which compares bonds with similar duration from the same issuer country on the same day. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Sample period: 2021-01-01 – 2025-11-01

5.2.1. Hedge Fund Presence

This paper argues that the trading activity of hedge funds matters for the sensitivity of a bond's yield. To show evidence of this, Figure 1 presents a binned scatterplot with the monetary policy shocks on the x-axis and daily yield changes on the y-axis. I then differentiate whether bonds are actively traded by hedge funds.

By definition, the plot results in a positive relationship between the shocks and the yield changes. For bonds that are not traded by hedge funds, the relationship is almost one-to-one, as expected. However, the slope is steeper for bonds that are actively traded by hedge funds. For positive (negative) monetary policy shocks, the yield increase (decrease) is stronger for these bonds. On days where there is no monetary policy shock, which is the center of the graph, there is no difference in the two categories. The steeper slope for hedge fund-involved bonds suggests an unconditional amplification effect.

Figure 1: Yield sensitivity to monetary policy shocks



Notes: Binned scatterplot of daily bond yield changes of German and Italian government bonds against monetary policy shocks. Shocks are defined as the change in the 2-year OIS rate during the ECB monetary event window (Altavilla et al., 2019). Yield changes are residualized for bond fixed effects. The sample is winsorized and grouped into equal-width bins. Dots represent the conditional means within each bin. Lines represent linear fits estimated on the underlying bond-level data. Sample period: 2021-01-01 – 2025-11-01

To test this pattern formally, I estimate the baseline specification using a binary indicator for hedge fund activity:

$$\Delta y_{i,t} = \theta_k + \beta(HF_Involved_{i,t-1} \times Shock_t) + \gamma \mathbf{X}_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

The variables are those of the volatility regression in Section 5.1, with the yield change and the shock now entering in signed rather than absolute terms.

Table IV presents the estimation results. Across all five specifications, the interaction coefficient of interest (β) is positive, statistically significant at the 1% level, and remarkably stable, ranging from 0.287 to 0.302.

Column (1) reports the unconditional correlation. The interaction coefficient of 0.288 implies that for every 1 basis point increase in the benchmark yield shock, bonds with hedge fund presence experience an additional yield increase of approximately 0.3 basis points. Column (2) introduces bond-specific controls which barely impacts the magnitude of the coefficient. This suggests that the

Table IV: Hedge Fund Amplification

Dependent Variable:	Δ Bond Yield (bps)				
	(1)	(2)	(3)	(4)	(5)
<i>Main Interaction</i>					
HF Involved $\times$ Shock	0.288*** (0.072)	0.288*** (0.072)	0.287*** (0.073)	0.291*** (0.062)	0.302*** (0.054)
<i>Direct Effects</i>					
Shock	0.757*** (0.123)	0.757*** (0.123)			
HF Involved	0.083** (0.037)	0.062 (0.059)	−0.000 (0.043)	−0.022 (0.038)	−0.008 (0.025)
<i>Controls</i>					
Duration		0.003 (0.005)	0.037 (0.042)		
Bid-Ask Spread		−0.034 (0.086)	−0.239*** (0.085)	−0.257*** (0.075)	
CTD Flag		0.157* (0.094)	0.033 (0.041)	0.010 (0.028)	0.007 (0.045)
Bond FE	No	No	Yes	Yes	No
Date FE	No	No	Yes	No	No
Duration $\times$ Date $\times$ Country FE	No	No	No	Yes	No
Matched Pair FE	No	No	No	No	Yes
Observations	477,001	477,001	477,001	470,852	481,824
R-squared	0.033	0.033	0.569	0.737	0.844

Notes: The dependent variable is the daily change in bond yield (bps). *HF Involved* is a dummy indicating presence of offshore hedge fund repo activity. *Shock* is the 2-year OIS rate change during the ECB monetary event window. In Columns (3) and (4), the Shock main effect is absorbed by the fixed effects. Column (4) adds bond and Duration $\times$ Date $\times$ Country fixed effects. Column (5) presents the matched-sample estimation. Standard errors are clustered by business date and bond in Columns (1)–(4), and by Duration $\times$ Date $\times$ Country and non-HF bond in Column (5). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Sample period: 2021-01-01 – 2025-11-01

excess sensitivity is not merely a proxy for a liquidity premium or the special status of the assets. Column (3) absorbs time-invariant bond characteristics (Bond FE) and aggregate daily shocks (Time FE). Even within this set-up, the interaction coefficient remains robust at 0.287. Because the bond fixed effects absorb all time-invariant characteristics, identification here comes from comparing the same bond during periods when hedge funds are active to periods when they are not, rather than from comparing different bonds to each other. A bond’s sensitivity to the shock is not itself time invariant, however, because its duration declines over the sample and the curve does not move in parallel (Nyborg and Woschitz, 2025).

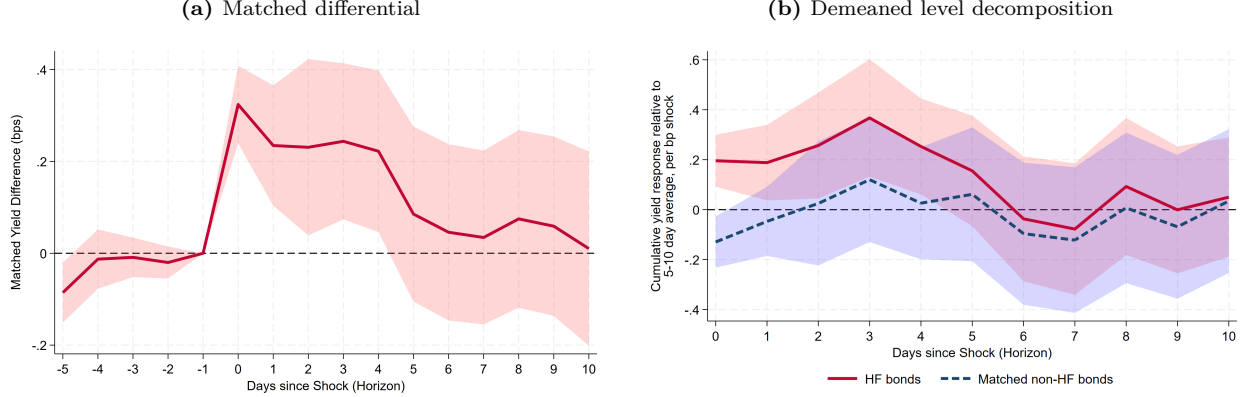
Column (4) tightens the identification further by replacing the Date fixed effects with Duration $\times$ Country $\times$ Date fixed effects. This structure compares bonds with similar duration from the same issuer country on the same day, absorbing both the aggregate shock and any differential

rate sensitivity that mechanically arises from differences in duration. Identification therefore relies exclusively on within-cell variation in hedge fund positioning among bonds that are otherwise comparable in their exposure to the shock. As shown in Section 5.1, hedge fund bonds are not more volatile than their peers within these cells on average, making this the appropriate comparison group for isolating the shock-conditional amplification. Under this tighter specification, the interaction coefficient increases slightly to 0.291 and remains significant at the 1% level, while the direct effect of HF Involved remains insignificant. Together, these results indicate that hedge fund bonds are not significantly different from comparable non-hedge fund bonds in normal times, but become significantly more sensitive precisely when a shock interacts with the leveraged positioning.

Column (5) presents the matched-sample estimation. While the duration-country-date fixed effects in Column (4) ensure that hedge fund bonds are compared to peers with similar rate sensitivity, they do not eliminate residual heterogeneity within cells, particularly along the liquidity dimension that most strongly predicts hedge fund selection (Table II). A matched-sample design addresses this concern by making the comparison group fully transparent and by eliminating residual differences in observable characteristics non-parametrically, without imposing a functional form on how these characteristics relate to yield sensitivity. Specifically, I pair each hedge fund bond on a given day with the single non-hedge fund bond in the same duration-country-date cell that is closest in terms of bid-ask spread, and estimate the regression on this matched sample with pair fixed effects. Each hedge fund bond is therefore benchmarked only against its most similar non-hedge fund counterpart. Under this design, the interaction coefficient rises slightly to 0.302 and remains significant at the 1% level. The stability of the estimate across the progressively tighter specifications indicates that the amplification is not driven by selection on observable bond characteristics, but reflects the impact of leveraged positioning itself. Appendix A9 characterizes the matched pairs and shows that the estimate is robust to restricting the sample to tightly matched pairs and to letting the shock response vary with the characteristics on which the pairs differ. Appendix A10 shows that the amplification is broad-based across the 38 announcements. An announcement-level regression reproduces the matched estimate, leave-one-out estimates range from 0.244 to 0.308 and remain significant throughout, and randomization inference on the announcement dates yields an exact p-value below 0.001.

The estimated amplification is economically substantial. To put the coefficients into perspective, consider the impact of an average six basis point monetary policy tightening surprise. The baseline

Figure 2: Persistence of the amplification



Notes: Panel (a) plots the estimated interaction coefficients β_h from regressions of cumulative yield changes ($\Delta y_{t-1 \rightarrow t+h}$) on the interaction between the HF presence dummy and monetary policy shocks, representing the differential yield response (in bps) of HF-involved bonds relative to non-HF bonds. Panel (b) plots the cumulative yield response per basis point of shock separately for HF-involved bonds and their matched non-HF counterparts, both demeaned by the average response across the two groups over days 5 to 10 after the shock, so that positive values indicate trading above the level at which yields eventually settle. Both panels are based on the matched sample set-up. Shaded areas denote 90% confidence intervals clustered by business date and bond.

Sample period: 2021-01-01 – 2025-11-01

reaction of a typical bond (captured by the direct Shock coefficient in Column 1 or 2) implies a yield change of approximately $0.757 \times 6 \text{ bps} \approx 4.54 \text{ bps}$.

For a bond with hedge fund participation, the interaction term adds an excess movement of $0.288 \times 6 \text{ bps} \approx 1.73 \text{ bps}$. Consequently, the total yield reaction for hedge fund-held bonds rises to 6.27 basis points. This implies that the trading of hedge funds in specific bonds accounts for approximately 28% of the total yield movement on shock days. In other words, more than one-quarter of the price action in these bonds is associated not with the fundamental news, but with the type of entity trading them.⁴

5.2.2. Persistence

To examine the persistence of this amplification, I estimate the impulse response function using the local projection methodology of Jordà (2005). The local projections are based on the matched-sample design from Column (5) of Table IV, with cumulative yield changes regressed on the interaction between the HF presence dummy and monetary policy shocks. Figure 2a plots the estimated coefficients β_h over a window from $h = -5$ to $h = 10$ trading days around the shock.

⁴Because hedge funds may also hold leveraged positions through instruments beyond the repo market, a natural concern is that the estimated amplification reflects unobserved derivative exposure transmitting to cash yields through the cheapest-to-deliver linkage. Appendix A11 re-estimates the main specifications on the subsample of non-CTD bonds and finds nearly identical coefficients.

Figure 2a provides two insights. First, the pre-shock coefficients are flat and insignificant, which speaks to the concern about selection bias by providing evidence that hedge fund-involved bonds and their matched counterparts do not differ significantly in the days leading up to the announcement. Second, the divergence appears immediately on the impact day, remains statistically significant for approximately four trading days, and then reverts back toward zero by the end of the horizon. Figure 2b decomposes this differential by plotting each group’s cumulative response relative to the average response across both groups over days 5 to 10 after the shock, the common level at which the reaction eventually settles. Hedge fund bonds trade above this settled level during the first days after the shock, while their matched counterparts approach it from below. Appendix A12 reports the undemeaned level responses, which converge toward a common terminal value of slightly below one basis point per basis point of shock. This gradual adjustment is consistent with theories of slow-moving capital in which the market requires time to absorb the imbalance generated by leveraged trading (Duffie, 2010; Mitchell et al., 2007).

If hedge funds were primarily correcting mispricings, their trading would push yields toward fundamental values and the effect would persist. Instead, Figure 2b shows that HF-involved bonds overshoot the settled level during the first days after the shock before reverting back, which is evidence of non-fundamental liquidity shocks (Coval and Stafford, 2007).

A complementary test of the overshooting interpretation comes from decomposing the shock itself rather than the response. Using the sign restrictions of Jarociński and Karadi (2020), each ECB surprise can be classified into a pure monetary component and a central bank information component based on the comovement of yields and equity prices within the event window. Under the price-discovery alternative, the HF amplification should be at least as strong for information-driven surprises, since that is the component where the ECB reveals new macroeconomic information that informed investors would process faster. Table V reports the HF amplification separately for each component. The interaction coefficient is 0.377 for pure monetary surprises and 0.113 for information surprises. The amplification is therefore concentrated in the component of the surprise that does not reflect new fundamental information, which is the opposite of what a price-discovery story would predict.

Taken together, the demeaned decomposition in Figure 2b and the shock decomposition in Table V point to the same conclusion through independent channels. HF bonds overshoot their own terminal level during the first days after the shock, and the amplification is concentrated in

Table V: Hedge Fund Amplification by Shock Component

Dependent Variable:	Δ Bond Yield (bps)	
	(1) Monetary	(2) Information
HF Involved $\times$ Shock	0.377*** (0.139)	0.113*** (0.042)
HF Involved	−0.019 (0.036)	−0.026 (0.037)
Controls	Yes	Yes
Bond FE	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes
Observations	470,852	470,852
R-squared	0.737	0.737

Notes: The dependent variable is the daily change in bond yield (bps). *HF Involved* is a dummy indicating presence of offshore hedge fund repo activity. The shock in Column (1) is the pure monetary component and in Column (2) the central bank information component of the ECB surprise, decomposed using the sign restrictions of [Jarociński and Karadi \(2020\)](#). Both specifications include bond fixed effects, duration $\times$ date $\times$ country fixed effects, and bond-level controls for bid-ask spread and CTD status. The Shock main effect is absorbed by the fixed effects. A Wald test of equality between the two interaction coefficients rejects the null ($p = 0.065$). Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

pure monetary rather than information-driven surprises. Hedge fund activity moves prices away from fundamentals in the short run, and the dislocation is only gradually undone as other capital arrives. Within the sovereign bond market studied here, the evidence is therefore more consistent with the amplification view of leveraged non-bank trading than with the price-discovery view.

5.2.3. The Role of Dealers

A remaining concern is that the documented amplification could reflect not the leveraged positioning of hedge funds themselves but the behavior of the dealers that intermediate their trades. Dealers may adjust inventory, hedge exposure, or update pricing more aggressively on shock days in the specific bonds where they maintain active hedge fund relationships, and these adjustments could generate yield movements that would appear in the data as an HF-associated effect even if hedge funds themselves were passive. This concern is distinct from the role of dealer intermediation capacity in transmitting the flow, which is a complement to the leveraged positioning channel rather than a substitute for it. The question I address here is whether the trigger of the amplification lies with the dealer rather than with the hedge fund.

To address this concern, I restructure the panel at the dealer-bond-date level and re-estimate the baseline specification with progressively tighter dealer-side fixed effects. The unit of observation is now a dealer-bond-date, and the panel is balanced so that dealer-bond-days without active

Table VI: Amplification Within Dealer Behavior

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3)	(4)
<i>Main Interaction</i>				
HF Involved $\times$ Shock	0.271*** (0.057)	0.294*** (0.056)	0.248*** (0.051)	0.250*** (0.054)
<i>Direct Effect</i>				
HF Involved	0.006 (0.004)	0.007* (0.004)	0.001 (0.004)	0.001 (0.007)
<i>Triple Interaction</i>				
HF Involved $\times$ Shock $\times$ Δ CDS				0.000 (0.003)
HF Involved $\times$ Δ CDS				-0.003 (0.007)
<i>Controls</i>				
Duration	0.035 (0.043)	0.053 (0.040)		
Bid-Ask Spread	-0.257*** (0.088)	-0.235*** (0.080)	-0.270*** (0.077)	-0.274*** (0.077)
CTD Flag	0.042 (0.041)	0.051 (0.040)	0.027 (0.028)	0.026 (0.028)
Bond FE	Yes	Yes	Yes	Yes
Dealer $\times$ Date FE	Yes	No	No	No
Dealer $\times$ Date $\times$ Country FE	No	Yes	No	No
Dealer $\times$ Date $\times$ Dur. FE	No	No	Yes	Yes
Observations	8,422,704	8,422,704	8,313,714	8,289,774
R-squared	0.570	0.619	0.738	0.738

Notes: The dependent variable is the daily change in bond yield (bps). The unit of observation is dealer-bond-date and the panel is balanced, with zero positions retained for dealer-bond-days without active repo intermediation. HF Involved is a dummy indicating that the dealer had an outstanding repo position with a hedge fund counterparty in the given bond over the prior five trading days. Hedge funds are offshore investment funds domiciled in the Cayman Islands. Shock is the 2-year OIS rate change during the ECB monetary event window. Δ CDS $_{t-1}$ is the five-day change in the dealer's own CDS spread measured as of the trading day before the shock. The Shock main effect is absorbed by the Dealer $\times$ Date fixed effects across all specifications. Column (1) absorbs any time-varying dealer-level behavior on each day. Column (2) additionally holds the issuer country constant within each dealer-day cell. Columns (3) and (4) tighten this further by additionally controlling for duration, so that identification comes from comparing bonds with similar rate sensitivity traded by the same dealer on the same day. Column (4) adds the triple interaction with the dealer's own five-day CDS change to test whether the amplification scales with dealer stress. Standard errors are clustered by dealer, business date, and bond. *** p<0.01, ** p<0.05, * p<0.10.

Sample period: 2021-01-01 – 2025-11-01

intermediation enter with zero positions. This structure allows me to absorb dealer behavior at the day level and identify the amplification from variation across bonds traded by the same dealer on the same day.

Table VI presents the results. Column (1) absorbs dealer-by-date fixed effects, which hold constant any time-varying behavior of a given dealer on a given day, including inventory management, funding conditions, hedging activity, and idiosyncratic risk appetite. Identification therefore comes exclusively from comparing bonds traded by the same dealer on the same day. The HF interaction

coefficient is 0.271 and significant at the 1% level. Columns (2) and (3) progressively tighten this structure by additionally holding constant the issuer country and the duration of the bond within each dealer-day cell, so that the comparison group consists of bonds with similar rate sensitivity traded by the same dealer on the same day. The coefficient remains positive and significant at the 1% level across both specifications, ranging from 0.248 to 0.294.

Column (4) adds a triple interaction with the five-day change in the dealer’s own CDS spread, measured as of the trading day before the shock. This tests whether the amplification scales with dealer-specific stress, as a dealer-driven alternative would predict. The triple interaction is economically and statistically indistinguishable from zero, and the HF interaction coefficient is unchanged at 0.250. Dealer stress, as captured by the dealer’s own credit spread, does not contribute to the amplification.

Taken together, these results indicate that the amplification documented in this section is not a byproduct of dealer behavior. Within the same dealer on the same day, bonds where hedge funds are positioned react more strongly to monetary policy shocks than otherwise comparable bonds, and this differential does not scale with the dealer’s own stress. While dealer intermediation is necessary for the flow to reach the market, the trigger of the amplification operates through the leveraged positioning of the hedge funds themselves rather than through the response of the dealers that face them.

5.2.4. *Hedge Fund Intensity*

Finally, I extend the analysis beyond the binary presence of hedge funds to examine whether the size of the position amplifies the yield reaction. As outlined in the conceptual framework, the price impact of the position adjustment should depend on the volume of trading relative to the total market depth.

To capture this, I construct a continuous measure called Hedge Fund Intensity. For each bond-day, I calculate the average absolute net position over the previous five trading days and scale it by the bond’s total amount outstanding. This ratio directly measures the percentage of a specific bond held by these offshore hedge funds. I then take the natural log of one plus this ratio. The economic rationale for the log specification is that small trading pressures can be absorbed by dealer inventory and standing arbitrage capital without measurable price impact, while larger pressures exhaust this absorption capacity and begin to move yields, with each additional unit of pressure

Table VII: Hedge Fund Intensity

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3)	(4)
<i>Main Interaction</i>				
Log HF Intensity $\times$ Shock	0.166*** (0.035)	0.165*** (0.035)	0.167*** (0.036)	0.164*** (0.032)
<i>Direct Effects</i>				
Shock	0.811*** (0.118)	0.811*** (0.118)		
Log HF Intensity	0.008 (0.024)	−0.020 (0.033)	−0.009 (0.025)	−0.011 (0.017)
<i>Controls</i>				
Duration		0.005 (0.004)	0.038 (0.042)	
Bid-Ask Spread		−0.101 (0.068)	−0.240*** (0.085)	−0.259*** (0.075)
CTD Flag		0.189* (0.100)	0.033 (0.040)	0.010 (0.028)
Bond FE	No	No	Yes	Yes
Date FE	No	No	Yes	No
Duration $\times$ Date $\times$ Country FE	No	No	No	Yes
Observations	477,001	477,001	477,001	470,852
R-squared	0.033	0.033	0.569	0.737

Notes: The dependent variable is the daily change in bond yield (bps). *Log HF Intensity* is the natural log of one plus the average absolute hedge fund net position over the prior five trading days, scaled by the bond's total amount outstanding. *Shock* is the 2-year OIS rate change during the ECB monetary event window. In Columns (3) and (4), the Shock main effect is absorbed by the fixed effects. Column (4) replaces Date FE with Duration $\times$ Date $\times$ Country FE, which compares bonds with similar duration from the same issuer country on the same day. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.
Sample period: 2021-01-01 – 2025-11-01

matter less once the dislocation is underway. A log transformation captures this concavity in a single functional form. Appendix A13 verifies that the relationship is monotone across discrete intensity buckets.

Table VII presents the estimation results. Across all four specifications, the interaction coefficient is positive and statistically significant, ranging from 0.164 to 0.167.

Column (1) establishes the baseline relationship. The significant interaction confirms that as hedge fund exposure increases, so does the yield sensitivity to the shock. Crucially, in Column (2), the inclusion of bond-specific controls leaves the coefficient virtually unchanged. This implies that the amplification is not explained by observable differences in duration, liquidity or CTD status. Column (3) absorbs all time-invariant heterogeneity via bond fixed effects. The coefficient remains robust at 0.167, confirming that the result is not driven by the selection of specific bonds but rather by the time-varying intensity of the leveraged position within the same bond. Column (4) replaces

the time fixed effects with Duration $\times$ Date $\times$ Country fixed effects, which also hold the time-varying part of the shock sensitivity fixed (Section 4.2). The matched-sample design used in the binary case does not extend naturally to the continuous setting, since matching requires a discrete treatment status, so the duration-country-date cells provide the tightest comparison group here. Under this specification, the coefficient is 0.164 and remains significant at the 1% level.

The results display the same robustness patterns observed in the binary analysis. First, the direct effect of HF Intensity is statistically insignificant across all columns, indicating that bonds with heavier hedge fund positioning do not exhibit abnormal yield movements on non-shock days. Second, the stability of the coefficient after including controls and fixed effects provides evidence against omitted variable bias from observable characteristics.

Beyond robustness, this continuous specification offers an additional identification argument that complements the matched-sample evidence in Section 5.2.1. If the amplification were driven merely by the fact that hedge funds select "special" bonds such as CTD issues, the effect should be captured fully by their presence and the size of the position should not matter. The finding that yield sensitivity scales with the size of the position instead implies a mechanical link in which the larger the volume of forced trading relative to the outstanding amount, the greater the price dislocation. This is consistent with the mechanisms outlined in Section 3 and provides further evidence against a pure selection story.

In terms of economic magnitude, consider an average monetary tightening shock of six basis points and an average hedge fund intensity of 3%. Based on the specification in Column (4) ($\beta = 0.164$), this translates to an additional yield impact of $6 \times \ln(1 + 3) \times 0.164 \approx 1.36$ basis points. While this is smaller than the binary estimate, the continuous specification isolates the marginal price pressure per unit of exposure. The following subsection asks if the amplification depends on whether the shock moves against the position or in its favor.

5.3. Two-Sided Amplification

The amplification mechanism outlined in Section 3 predicts that hedge fund positioning amplifies yields in the direction of the initial shock regardless of whether the shock tightens or relaxes the constraints of the leveraged position. When the shock moves prices against the position, the eroded capital buffer forces the fund to reduce its exposure. When the shock moves prices in favor of the position, the relaxed constraint allows the fund to expand its exposure. In both cases, the

Table VIII: Hedge Fund Intensity by Constraint Regime

Dependent Variable:	Δ Bond Yield (bps)	
	(1) Constraining	(2) Relaxing
<i>Main Interaction</i>		
Log HF Intensity $\times$ Shock	0.140*** (0.036)	0.224*** (0.050)
<i>Direct Effects</i>		
Log HF Intensity	−0.016 (0.017)	−0.009 (0.017)
<i>Controls</i>		
Bid-Ask Spread	−0.257*** (0.074)	−0.255*** (0.075)
CTD Flag	0.006 (0.027)	0.007 (0.028)
Bond FE	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes
Observations	466,942	466,918
R-squared	0.734	0.735

Notes: This table reports the baseline intensity regression estimated separately for the constraining and relaxing regimes. The constraining regime (Column 1) includes bond-days where the hedge fund position is on the losing side of the shock (long on tightening days or short on easing days). The relaxing regime (Column 2) includes bond-days where the position is on the winning side (short on tightening or long on easing). Both samples also include all non-shock days and all bond-days with zero hedge fund intensity, which serve as the within-bond baseline. The dependent variable is the daily change in bond yield (bps). *Log HF Intensity* is the natural log of one plus the average absolute hedge fund net position over the prior five trading days, scaled by the bond's total amount outstanding. *Shock* is the 2-year OIS rate change during the ECB monetary event window. The Shock main effect is absorbed by the fixed effects. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

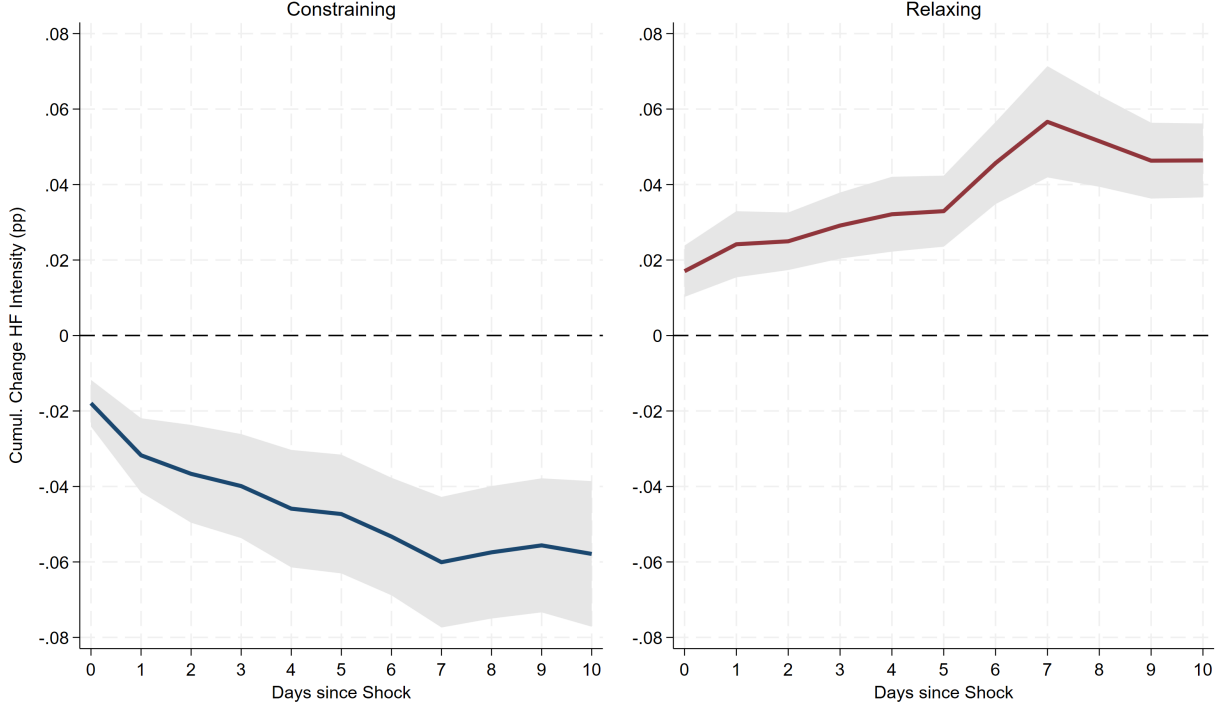
Sample period: 2021-01-01 – 2025-11-01

resulting position adjustment pushes yields further in the direction of the initial shock. To examine this implication, I split the sample into a constraining and a relaxing regime and re-estimate the intensity specification within each.

Table VIII presents the results. In both regimes, the interaction coefficient is positive and statistically significant at the 1% level. The constraining regime in Column (1) yields a coefficient of 0.140 and the relaxing regime in Column (2) yields a coefficient of 0.224. A Wald test of equality between the two coefficients, estimated in a pooled specification that explicitly compares the regimes, fails to reject the null ($p = 0.16$). The two regimes are therefore statistically indistinguishable in the pooled sample.

The fact that the two coefficients are not statistically different indicates that hedge fund trading amplifies yields with comparable strength regardless of whether the shock is tightening or relaxing constraints. This is consistent with the framework in Section 3, where the same leveraged investor adjusts position size in opposite directions across the two regimes, with both adjustments pushing

Figure 3: Impulse responses of hedge fund intensity to monetary policy shocks (overnight)



Notes: Dependent variable is the cumulative change in HF Intensity (pp) from $t - 1$ to $t + h$. Intensity is measured as % of amount issued. Sample restricted to overnight repo transactions. All specifications include bond fixed effects and duration $\times$ country $\times$ date fixed effects, with the latter absorbing the shock main effect. Identification of β_h comes from within-cell variation in pre-shock positioning interacted with the shock. Standard errors clustered by date and bond. Shaded areas denote 90% confidence intervals.

Sample period: 2021-01-01 – 2025-11-01

yields in the direction of the initial shock. Appendix A16 splits the two regimes by the side of the position. The constraining-side response is the same for long and short positions, as a constraint that binds mechanically implies, while the relaxing-side response is present for both but largest for short positions on tightening surprises, consistent with the expansion being discretionary. To further assess this interpretation, I now investigate the dynamic response of hedge fund positioning itself to the shock, which allows me to verify whether the position adjustments of hedge funds align with the outlined mechanism.

To do so, I estimate the cumulative response of hedge fund intensity using local projections (Jordà, 2005). This approach tests whether the position adjustments in the two regimes align with the predicted pattern. In the constraining regime, positions should contract as the shock erodes the collateral buffer. In the relaxing regime, positions should expand as the freed capacity is redeployed into the existing exposure.

Figure 3 presents the impulse responses of hedge fund intensity to monetary policy shocks for overnight repo transactions. I focus on the overnight segment because these positions roll over daily and therefore allow for immediate adjustment, whereas term repo transactions are contractually locked until maturity and can adjust only with a lag. Appendix A14 reports the corresponding results for the term segment, which display the same qualitative patterns with a delay of approximately five days, in line with the maturity profile of those contracts.

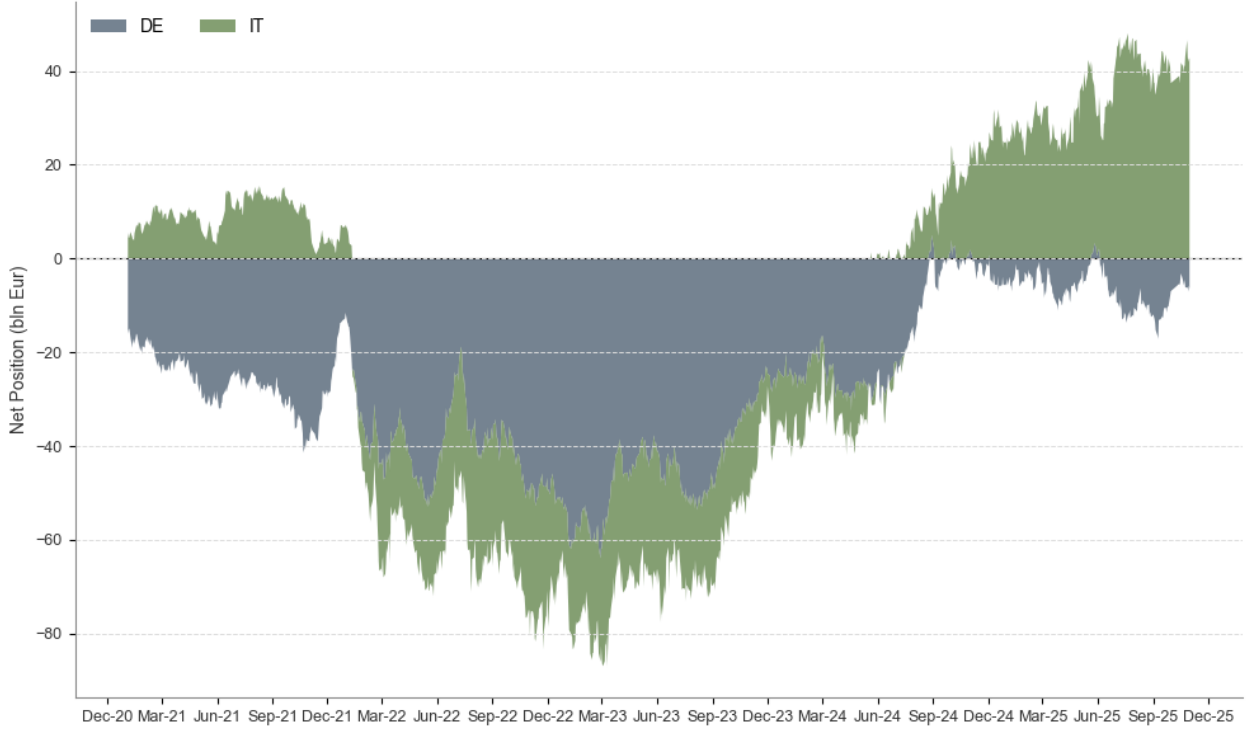
The patterns are consistent with the implications of Section 3. In the constraining regime, the cumulative change in hedge fund intensity is negative, consistent with funds reducing exposure as the shock erodes their collateral buffer. In the relaxing regime, the opposite pattern emerges. Rather than reducing exposure, hedge funds expand their positioning when the policy surprise moves prices in their favor. The similar size of the contraction and the expansion is consistent with the single position rule of Section 3, under which a constrained fund adjusts its exposure with its margin capacity in both directions, whether because it keeps its leverage constant (Adrian and Shin, 2014) or because it redeploys freed capacity while its underlying view remains ahead of the market. The data do not distinguish between these readings, and since the expansion, unlike the contraction, is not forced, I interpret the relaxing-side evidence as consistent with the mechanism rather than as establishing it.

6. HEDGE FUND DIRECTIONALITY

Section 5.3 establishes that the amplification is two-sided. Whether a fund is long or short, and whether the shock tightens or relaxes its constraint, the effect is present. A natural next question concerns the structure of the positions rather than their direction. Figure 4 shows that the sector’s net positions move between two configurations over the sample. In the periods around the hiking cycle the sector is net long Italian and net short German government bonds, so that the two legs partly offset. During the hiking cycle both legs sit on the short side and the net exposure becomes one-sided. This section asks whether that distinction shapes the amplification. I answer it within the empirical strategy of Section 4, interacting hedge fund positioning with the shock under the same fixed effects, and add only a measure of how directional each fund’s book is.

The mechanism in Section 3 describes the capital constraint at the level of an individual position. A fund, however, manages a single pool of capital against its entire bond book, so a shock erodes its capital in proportion to the net exposure of the whole portfolio rather than the exposure of any

Figure 4: Hedge fund net positions



Notes: Euro outstanding volumes. Positive (negative) values indicate net cash borrowing (lending).
Sample period: 2021-01-01 – 2025-11-01

single bond.⁵ A fund that is long Italian and short German bonds of similar duration carries little net exposure to a parallel move in rates. A shock barely moves its capital and it has little reason to rebalance. A fund running a directional bond book absorbs the full capital loss and rebalances accordingly. The amplification that a given bond experiences should therefore depend on whether the funds holding it run a hedged or a directional bond book, and not only on how much they hold. A more hedged book corresponds to a higher effective margin in the mechanism of Section 3, so the directionality of a bond's holders is the cross-sectional counterpart to the single margin that Section 3 assumes.

To take this to the data I construct a measure of book directionality at the bond level. For each fund and day I summarize its bond book by the directionality of its positions,

$$\text{Dir}_{f,t} = \frac{|\sum_i D_i q_{f,i,t}|}{\sum_i D_i |q_{f,i,t}|}, \quad (5)$$

⁵Positions are observed at the level of the individual legal entity, and margin in bilateral repo binds at the same level. Netting and collateral calls apply to each counterparty entity separately, and funds operated by the same manager are separately capitalized pools. A position that is offset in a sibling fund of the same manager therefore does not relieve a margin call on a fund's own book.

where $q_{f,i,t}$ is the net position of fund f in bond i ahead of the shock, taken positive for long and negative for short, and D_i is the duration of bond i . The numerator is the absolute net duration exposure of the book and the denominator is its gross duration exposure. The ratio equals zero when the long and short legs offset in duration terms and it approaches one when the book is one-sided. I then assign each bond the position weighted average of the directionality of the funds holding it,

$$\text{HolderDir}_{i,t} = \frac{\sum_f |q_{f,i,t}| \text{Dir}_{f,t}}{\sum_f |q_{f,i,t}|}. \quad (6)$$

This variable lies between zero and one and is high when a bond is held mainly within directional books. As with the intensity measure, I average it over the five trading days before each shock so that it is predetermined.

Two points of interpretation matter. First, every fund in the data is a hedge fund, so the distinction is not between hedged and unhedged institutions but between bonds held within a hedged bond book and bonds held within a directional bond book, set against a baseline of bonds without hedge fund activity. Second, I observe only the cash leg of these positions and not the strategy behind them, so hedged and directional describe the net duration exposure of the observed bond book and not a particular trade. If cross-product margining is applied, a book that looks directional in the cash market could in fact be hedged with derivatives that I do not observe, as is possible in the cash-futures basis trade. This does not bias the comparison. If the hedge insulates the fund, the book carries little net exposure to the shock, so its presence in the directional group only pulls the measured difference toward zero and the estimate is conservative. If instead the bonds and the futures are financed and cleared with different counterparties, the two legs are margined separately, so the bond leg may face its own margin call and trades like the directional position the measure already treats it as.

Table IX describes how the sector’s configuration evolves at the level where capital is committed, the fund. Three facts stand out. First, the sector unwinds its net exposure over the sample. Weighting books by their gross exposure, average directionality falls from 0.53 in 2022 to 0.13 in 2025, and the decline is concentrated among the large books, since the equal-weighted mean falls far less. Second, during the hiking cycle the one-sided books point overwhelmingly in the same direction. Coordination reaches 0.92 in 2022 and 2023, and around three quarters of the one-sided books are net short duration. Third, by 2025 both margins have unwound. The large books are internally hedged, and the remaining one-sided books, mostly small ones, offset each other, with coordination

Table IX: The Hedge Fund Sector’s Book by Year

	Fund-level directionality				Net Short Share	Coordination
	Mean	Median	Gross-w. Mean	Share > 0.8		
2021	0.66	0.77	0.46	0.48	0.41	0.68
2022	0.66	0.76	0.53	0.49	0.69	0.92
2023	0.55	0.49	0.35	0.37	0.79	0.92
2024	0.51	0.36	0.20	0.38	0.65	0.48
2025	0.47	0.33	0.13	0.33	0.52	0.28

Notes: This table describes the configuration of the hedge fund sector’s bond book by year, computed from 95,952 fund-day observations of between 102 and 116 funds active per year. *Mean* and *Median* summarize fund-level directionality, the fund’s absolute net DV01 exposure over its gross DV01 exposure as defined in Section 6, across fund-days. *Gross-w. Mean* weights fund-days by gross DV01 exposure, so that large books count more. *Share > 0.8* is the share of fund-days with directionality above 0.8. *Net Short Share* is the share of one-sided fund-days (directionality above 0.5) with negative net DV01, i.e. positioned for rising yields. *Coordination* is the daily ratio of the absolute sum of fund net DV01 exposures to the sum of absolute fund net DV01 exposures, averaged within the year; it equals one when all net exposures point in the same direction and zero when they fully offset.

Sample period: 2021-01-01 – 2025-11-01

at 0.28. Appendix Figure A6 plots the corresponding bond-level aggregate over time. The bond-level measure also varies in the cross section, with an average within-cell standard deviation of about 0.11, but this dispersion is compressed precisely because the configuration moves largely as one, meaning on a given date, most books sit on the same side. The identification of the results that follow therefore draws on both cross-sectional and time-series variation, and Appendix A15 separates the two.

I first add holder directionality to the intensity specification reported in Table VII. Since holder directionality is defined only for bonds that hedge funds hold, I let it enter through the intensity term rather than as a separate regressor. I estimate

$$\begin{aligned} \Delta y_{i,t} = & \beta_1(\text{HF}_{i,t-1} \times \text{Shock}_t) + \beta_2(\text{HF}_{i,t-1} \times \text{Shock}_t \times \text{HolderDir}_{i,t-1}) \\ & + \beta_3(\text{HF}_{i,t-1} \times \text{HolderDir}_{i,t-1}) + \gamma \mathbf{X}_{i,t-1} + \theta_k + \varepsilon_{i,t} \end{aligned} \quad (7)$$

where $\text{HF}_{i,t-1}$ is Log HF Intensity and Shock_t is the monetary policy shock. The coefficient of interest is β_2 , which measures how the amplification per unit of positioning changes as the holders of a bond become more directional. Column (1) of Table X reports $\beta_2 = 0.236$, significant at the five percent level. The amplification per unit of hedge fund intensity is larger for bonds held within directional books, holding the amount of positioning fixed.

Columns (2) and (3) report a less parametric version of the same result. In Column (2) I split

the hedge fund bonds at the median of holder directionality and interact each group with the shock against the baseline of bonds without hedge fund activity. The amplification of bonds held within hedged books is 0.098, while that of bonds held within directional books is 0.363. A Wald test rejects equality of the two coefficients with an F statistic of 24.8. Column (3) replaces the binary split with quartiles. The interaction rises monotonically from 0.057 in the most hedged quartile, which is not statistically distinguishable from zero, to 0.367 in the most directional quartile, and a test rejects equality of the extreme quartiles with an F statistic of 28.3. The amplification is concentrated among the bonds held within the most directional books and is essentially absent when the book is hedged. Appendix A16 shows that this absence holds for every combination of position side and shock direction, with the amplification within hedged books close to zero whether the position is long or short and whether the shock moves against it or in its favor.

Because the directional configuration coincides with the hiking cycle, one might worry that holder directionality partly proxies for calendar time, with the hedged and directional groups drawing on different periods. Table IX shows why this concern cannot be resolved by simply comparing bonds within a date. The sector’s configuration moves largely as one, so in the crowded years there are few bonds held within hedged books to compare against, and in the calm years the remaining one-sided books are small and the surprises smaller. Appendix A15 separates the margins formally by giving every date its own hedge fund baseline. Three results emerge. First, the directional-hedged contrast among hedge fund bonds on the same date is close to zero on average, as the common configuration predicts, but increases significantly with the sector’s exposure, reaching about 0.16 at hiking-cycle levels. Second, the amplification per unit of intensity remains significant under the same fixed effects, and third, at the announcement level, the amplification slope rises steeply with the sector’s directionality while a 2022 indicator adds nothing. The amplification thus tracks the sector’s book rather than the calendar. It is strong when exposed capital is large and aligned, and absent when books are hedged.

These results carry two implications. First, they sharpen the interpretation of the amplification. The effect appears only for bonds held within directional books, which is exactly where the leverage mechanism predicts a dislocation. This concentration is hard to reconcile with a price-discovery account, in which hedge fund trading would push yields toward fundamentals regardless of how the position sits within the book. Second, the result speaks to how the sector should be monitored. The effect of leveraged positioning is not captured by its size alone. The same amount of positioning

Table X: Hedge Fund Directionality and Yield Amplification

Dependent Variable:	Δ Bond Yield (bps)		
	(1) Continuous	(2) Categorical	(3) Quartile
<i>Continuous interaction</i>			
Log HF Intensity $\times$ Shock $\times$ Holder Dir.	0.236**		
	(0.100)		
Log HF Intensity $\times$ Shock	0.066		
	(0.048)		
<i>By holder regime (relative to no HF)</i>			
Hedged book $\times$ Shock		0.098***	
		(0.034)	
Directional book $\times$ Shock		0.363***	
		(0.057)	
<i>By holder directionality quartile (relative to no HF)</i>			
Q1 most hedged $\times$ Shock			0.057
			(0.035)
Q2 $\times$ Shock			0.137***
			(0.037)
Q3 $\times$ Shock			0.361***
			(0.065)
Q4 most directional $\times$ Shock			0.367***
			(0.057)
Controls	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes
Observations	472,320	472,320	472,320

Notes: The table reports the amplification of bond yields to monetary policy shocks as a function of the directionality of the hedge funds holding each bond. The dependent variable is the daily yield change in basis points. Holder directionality is the position weighted average across a bond's hedge fund holders of each fund's absolute net duration exposure over its gross duration exposure, measured over the five trading days before the shock and scaled to lie between zero and one. Column (1) interacts Log HF Intensity and the shock with holder directionality, with holder directionality entering only through the intensity term. Columns (2) and (3) compare bonds held by hedge funds, split at the median and into quartiles of holder directionality, against the baseline of bonds without hedge fund activity. The median and quartile cutoffs are computed over the pooled sample of hedge fund bond-days. Log HF Intensity is the natural log of one plus the average absolute net position over the prior five trading days scaled by amount outstanding. Shock is the change in the two year OIS rate during the ECB event window. All columns include the bid-ask spread and a CTD indicator as controls, bond fixed effects, and duration by country by date fixed effects, with the latter absorbing the shock main effect. A Wald test rejects equality of the hedged and directional coefficients in Column (2) with $F = 24.8$ and equality of the extreme quartiles in Column (3) with $F = 28.3$. Standard errors clustered by business date and bond in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Sample period: 2021-01-01 – 2025-11-01

amplifies a shock when it sits within a directional book and is close to neutral when it sits within a hedged book. Supervisors gauging the systemic footprint of hedge funds therefore need to account for the directionality of the book, and not only the gross size of the positions.

7. ROBUSTNESS

7.1. Volatility-Standardized Yield Changes

The duration-by-country-by-date fixed effects used in Section 5 ensure that bonds with similar rate sensitivity facing the same shock are compared against each other, and Table III shows that within these cells the average absolute yield change of hedge fund bonds is statistically indistinguishable from that of their peers on regular days. This addresses the concern that hedge funds systematically select bonds with higher unconditional volatility. A more subtle concern is that bond yield volatility is time-varying and might cluster in high-volatility regimes. Figure A1 documents that shock days fall disproportionately into such regimes. Two bonds with identical unconditional volatility can therefore differ in their conditional volatility on any given day. If hedge fund bonds happen to be in elevated conditional volatility states on announcement days specifically, the interaction coefficient in the baseline specification could partly reflect this state-dependent volatility rather than the amplification of leveraged positioning. To address this concern, I normalize each bond’s daily yield change by its own conditional volatility estimated from a GARCH(1,1) model, which rescales the dependent variable into units of the bond’s own typical daily variation at that point in time.

For each bond in the sample, I estimate a GARCH(1,1) model on the time series of daily yield changes, restricting the estimation sample to non-announcement days. The model takes the form

$$\begin{aligned}\Delta y_{i,t} &= \mu_i + \varepsilon_{i,t}, & \varepsilon_{i,t} &\sim \mathcal{N}(0, \sigma_{i,t}^2), \\ \sigma_{i,t}^2 &= \omega_i + \alpha_i \varepsilon_{i,t-1}^2 + \beta_i \sigma_{i,t-1}^2.\end{aligned}$$

where $\Delta y_{i,t}$ is the daily yield change of bond i on day t , μ_i is the bond-specific mean, $\varepsilon_{i,t}$ is the innovation with conditional variance $\sigma_{i,t}^2$, ω_i is the long-run variance parameter, α_i governs the response of conditional variance to past innovations, and β_i captures the persistence of volatility.

Restricting the estimation to non-announcement days ensures that the estimated parameters describe each bond’s baseline volatility dynamics rather than absorbing the announcement-day reactions that the analysis is designed to study. Bonds with fewer than 250 non-announcement observations are excluded to ensure stable parameter estimates, which reduces the panel to approximately 370,000 bond-day observations. Using the fitted parameters, I then construct a one-step-ahead conditional variance forecast $\hat{\sigma}_{i,t}^2$ for every bond-day in the sample, and standardize the yield change

Table XI: Hedge Fund Amplification on GARCH-Standardized Yield Changes

Dependent Variable:	Standardized Δ Bond Yield (σ units)			
	(1)	(2)	(3) Constraining	(4) Relaxing
<i>Main Interaction</i>				
HF Involved $\times$ Shock	0.043*** (0.010)			
Log HF Intensity $\times$ Shock		0.020*** (0.004)	0.016*** (0.004)	0.031*** (0.008)
<i>Direct Effects</i>				
HF Involved	−0.007 (0.010)			
Log HF Intensity		−0.004 (0.003)	−0.005 (0.003)	−0.004 (0.004)
<i>Controls</i>				
Bid-Ask Spread	−0.056*** (0.015)	−0.057*** (0.015)	−0.056*** (0.015)	−0.055*** (0.015)
CTD Flag	−0.001 (0.005)	−0.000 (0.005)	−0.000 (0.005)	−0.000 (0.005)
Bond FE	Yes	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Observations	374,058	374,058	370,520	370,449
R-squared	0.681	0.681	0.675	0.677

Notes: This table re-estimates the main specifications with the dependent variable replaced by the GARCH-standardized daily yield change. For each bond, conditional volatility $\hat{\sigma}_{i,t}$ is estimated from a GARCH(1,1) model fit on non-shock days, and $\Delta y_{i,t}$ is normalized by $\hat{\sigma}_{i,t}$. The standardized dependent variable is therefore expressed in units of each bond's own conditional standard deviation, removing differences in time-varying volatility across bonds. *HF Involved* is a dummy indicating presence of offshore hedge fund repo activity. *Log HF Intensity* is the natural log of one plus the average absolute hedge fund net position over the prior five trading days, scaled by the bond's total amount outstanding. *Shock* is the 2-year OIS rate change during the ECB monetary event window. Column (1) corresponds to Column (4) in Table IV, Column (2) to Column (4) in Table VII, and Columns (3) and (4) to Columns (1) and (2) in Table VIII. The Shock main effect is absorbed by the fixed effects. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Sample period: 2021-01-01 – 2025-11-01

as $\Delta \tilde{y}_{i,t} = \Delta y_{i,t} / \hat{\sigma}_{i,t}$. The standardized variable measures each yield change in units of the bond's own conditional standard deviation on that day, so two bonds in different volatility regimes contribute comparably to the estimation. I re-estimate the specifications in Section 5 based on this standardized dependent variable.

Table XI presents the estimation results on the standardized dependent variable. Across all four specifications, the interaction coefficient remains positive and statistically significant at the 1% level. Column (1) re-estimates the binary specification of Column (4) in Table IV and yields an interaction coefficient of 0.043. Column (2) replicates the continuous intensity specification of Column (4) in Table VII and yields a coefficient of 0.020. Columns (3) and (4) split the continuous specification into the constraining and relaxing regimes, mirroring Table VIII. The interaction coefficient is 0.016

in the constraining regime and 0.031 in the relaxing regime, both significant at the 1% level. The direct effects of HF Involved and Log HF Intensity are statistically indistinguishable from zero across all specifications, indicating that bonds with hedge fund positioning do not exhibit abnormally large standardized yield changes on regular days.

The coefficients in Table [XI](#) are measured in standard deviation units rather than basis points, but they can be mapped back to the baseline magnitudes through the average conditional volatility in the sample. The average $\hat{\sigma}_{i,t}$ across bond-days is approximately 6 basis points, so the binary interaction coefficient of 0.043 in Column (1) implies an additional yield reaction of roughly $0.043 \times 6 \approx 0.26$ basis points per basis point of shock, close to the baseline estimate of 0.291 in Column (4) of Table [IV](#). The continuous intensity coefficient of 0.020 in Column (2) implies an additional reaction of roughly $0.020 \times 6 \approx 0.12$ basis points per basis point of shock, comparable to the baseline estimate of 0.164 in Column (4) of Table [VII](#). The corresponding coefficients in the constraining and relaxing regimes map to $0.016 \times 6 \approx 0.10$ and $0.031 \times 6 \approx 0.19$ basis points per basis point of shock, comparable to the baseline estimates of 0.140 and 0.224 in Table [VIII](#). The amplification of hedge fund positioning therefore survives normalization by each bond’s own time-varying conditional volatility, indicating that the effect documented in the main analysis does not reflect hedge fund bonds being in elevated volatility regimes on announcement days, but rather the additional yield reactivity that arises from leveraged positioning interacting with the shock.

7.2. CDS-based shocks

The monetary policy surprises used so far provide a clean laboratory because they are exogenous and sharply timed, but the amplification mechanism is not specific to monetary news. The framework in Section [3](#) predicts that leveraged positioning amplifies yields whenever an unusually large price change interacts with pre-existing positions, regardless of what moves the price. A natural way to test the external validity of the mechanism is therefore to subject it to an independent shock that originates from a different economic source. To this end, I construct shocks from large changes in Italian sovereign credit default swap spreads. Because these shocks reflect credit risk rather than the risk-free rate, they are economically distinct from the monetary surprises and provide a test of whether the same leveraged positioning channel operates when the trigger is sovereign credit risk rather than monetary policy. I focus on Italy only for two reasons. First, German sovereign CDS is thinly traded and exhibits little price variation over the sample, so a comparable shock measure

cannot be constructed for it. Second, German bunds are sometimes considered a euro area safe haven (e.g., [Ehrmann and Fratzscher, 2017](#)), so a credit shock that widens spreads elsewhere might coincide with a flight-to-safety in German yields. The sign of the yield response to a credit shock would therefore differ across the two issuers, which would confound the constraining and relaxing regime classification that the mechanism relies on. Restricting the credit shock analysis to Italy avoids this and keeps the sign mapping between the shock and the yield response unambiguous.

I measure sovereign credit risk using the five year Italian sovereign CDS spread denominated in US dollars. The dollar-denominated contract isolates credit risk more cleanly than its euro-denominated counterpart, which is contaminated by the correlation between Italian default risk and a depreciation of the euro. To separate the unanticipated component of the credit shock from movements that are predictable or potentially related to the trading I study, I residualize the daily change in the CDS spread on its own lag, the lagged change in the V2X equity volatility index, and the lagged aggregate net position of the hedge fund sector in Italian sovereign bonds. The residual from this regression is used to construct the credit shock. I define a credit shock day as a day on which the absolute shock falls in the 2% most extreme part of its distribution.^{6,7} Finally, because a credit shock that coincides with a monetary policy announcement could not be attributed to credit risk alone, I exclude any credit shock day that falls on or adjacent to an ECB monetary event, so that the credit shock is identified entirely off non-monetary variation.

Table [XII](#) reports the estimates. Column (1) uses the binary indicator of hedge fund presence and Columns (2) to (4) use the continuous intensity measure. Columns (3) and (4) split the sample into the constraining and the relaxing regime in the same way as in the baseline analysis. Across all four specifications the interaction between hedge fund positioning and the credit shock is positive and statistically significant at the 1% level. In the binary specification the coefficient on the interaction is 0.225, and in the continuous specification it is 0.107. The split by regime yields an interaction coefficient of 0.129 in the constraining regime and 0.117 in the relaxing regime. The direct effects of hedge fund presence and intensity are small and statistically insignificant, indicating that bonds with hedge fund positioning do not display different yield changes on days without a credit shock.

The estimates show that the amplification documented for monetary policy surprises is not specific to that shock. The interaction coefficients in the binary specification and in the continuous

⁶Figure [A7](#) shows that credit shock days carry substantially more tail risk in bond yields than ordinary days, mirroring the pattern for monetary surprises.

⁷Results are robust to alternative thresholds.

Table XII: Hedge Fund Amplification under Credit Shocks

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3) Constraining	(4) Relaxing
<i>Main Interaction</i>				
HF Involved $\times$ Shock	0.225*** (0.058)			
Log HF Intensity $\times$ Shock		0.107*** (0.034)	0.129*** (0.040)	0.117*** (0.042)
<i>Direct Effects</i>				
HF Involved	-0.030 (0.045)			
Log HF Intensity		-0.021 (0.022)	-0.022 (0.022)	-0.020 (0.021)
<i>Controls</i>				
Bid-Ask Spread	-0.427*** (0.113)	-0.417*** (0.113)	-0.413*** (0.114)	-0.409*** (0.113)
CTD Flag	0.041 (0.046)	0.046 (0.046)	0.037 (0.046)	0.048 (0.049)
Bond FE	Yes	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Observations	297,411	297,411	295,028	294,834
R-squared	0.721	0.721	0.719	0.719

Notes: This table re-estimates the main specifications using the sovereign credit shock in place of the monetary policy surprise. The credit shock is the residual from a regression of the daily change in the five-year US dollar Italian sovereign CDS spread on its own lag, the lagged change in the V2X index, and the lagged aggregate net hedge fund position in Italian sovereign bonds. A credit shock day is a day on which the absolute residual falls in the 2% most extreme part of its distribution, and days on or adjacent to an ECB monetary event are excluded. *HF Involved* is a dummy indicating presence of offshore hedge fund repo activity. *Log HF Intensity* is the natural log of one plus the average absolute hedge fund net position over the prior five trading days, scaled by the bond's total amount outstanding. *Shock* is the residualized credit shock defined above. Column (1) corresponds to Column (4) in Table IV, Column (2) to Column (4) in Table VII, and Columns (3) and (4) to Columns (1) and (2) in Table VIII. The Shock main effect is absorbed by the fixed effects. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

specification are of the same order of magnitude as the corresponding coefficients in the monetary baseline and carry the same sign and significance, even though the credit shock originates from an entirely different economic source and the two shocks are measured on different scales. Thus, this provides more evidence that the mechanism operates whenever a large price change meets pre-existing leveraged positioning, rather than being a feature of monetary announcements in particular. The regime split reinforces this reading. The interaction is 0.129 in the constraining regime and 0.117 in the relaxing regime, so the two are close in magnitude with the constraining side only slightly larger. This near equality provides independent support for the two-sided nature of the framework, since in the baseline analysis the point estimates in the two regimes appeared more dispersed even though they were not statistically distinguishable. Under this shock the two regimes deliver almost

the same amplification, which is what the constant-leverage logic of Section 3 predicts.

8. CONCLUSION

This paper uses a transaction-level dataset to document evidence for a non-bank amplification channel in sovereign bond markets. Even among comparable bonds, hedge funds add excess volatility on shock days but not on regular days. The leveraged positioning of offshore hedge funds amplifies the sensitivity of sovereign bond yields to monetary policy shocks, accounting for more than a quarter of the total yield movement on shock days. The amplification scales with the position's share of the bond's outstanding volume. It is also two-sided. Funds contract when a shock moves prices against their position and expand when it moves prices in their favor, and the amplification is present in both cases. The amplification is concentrated among bonds held within directional hedge fund books and is essentially absent when the book offsets its long and short positions, which places the binding constraint at the level of the fund's portfolio rather than the individual position.

A central concern when interpreting these results is that hedge funds may select bonds that are inherently more sensitive to shocks, and the first result shows that this selection is real. The estimates therefore rest on a sequence of progressively tighter identification strategies, up to duration-by-country-by-date fixed effects and a matched-sample design that pairs each hedge fund bond with its closest non-hedge fund counterpart. The amplification is stable across these specifications, is not driven by the dealers that intermediate the trades, and holds under a range of further robustness tests, including a credit shock constructed from Italian sovereign CDS spreads that shows the channel is not specific to monetary news.

These findings relate to the broader question of how leveraged non-bank investors shape the dynamics of sovereign bond markets. The evidence presented here is more consistent with the amplification than with the price-discovery view. The leveraged positioning of hedge funds contributes to sovereign bond yields temporarily overshooting in response to shocks, with the dislocation only gradually reverting over subsequent days. These results isolate one specific channel and are not an overall assessment of hedge fund participation in these markets, which would also have to weigh contributions to aspects such as liquidity that this paper does not measure. What they do imply is that assessing the risks from hedge fund activity in sovereign bond markets requires granular information not only on the size of positions, but also on how they sit relative to the shock environment and on the directionality of the book.

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APPENDIX FOR
"HEDGE FUND TRADING AND SOVEREIGN BOND YIELD SENSITIVITY"

Felix Hermes

A. APPENDIX

A1. External validity

Table A1 extends the sample to include French and Spanish sovereign bonds alongside the German and Italian bonds used in the main analysis. All coefficients remain positive, statistically significant, and of similar magnitude to the baseline, indicating that the amplification is not specific to the two largest euro area sovereigns. The point estimates are lower than in the baseline, consistent with hedge funds being less actively engaged in French and Spanish sovereigns, but remain within the same order of magnitude and retain strong statistical significance across all four specifications.

Table A1: Expanded Sovereign Sample

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3) Constraining	(4) Relaxing
<i>Main Interaction</i>				
HF Involved $\times$ Shock	0.192*** (0.041)			
Log HF Intensity $\times$ Shock		0.122*** (0.023)	0.107*** (0.037)	0.171*** (0.048)
<i>Direct Effects</i>				
HF Involved	-0.046 (0.032)			
Log HF Intensity		-0.015 (0.014)	-0.019 (0.014)	-0.012 (0.014)
<i>Controls</i>				
Bid-Ask Spread	0.001 (0.004)	0.001 (0.004)	0.001 (0.004)	0.002 (0.004)
CTD Flag	0.029 (0.027)	0.030 (0.027)	0.030 (0.027)	0.025 (0.027)
Bond FE	Yes	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Observations	958,644	958,644	951,978	952,023
R-squared	0.753	0.753	0.750	0.751

Notes: This table re-estimates the main specifications on the expanded sample of German, Italian, French, and Spanish sovereign bonds. The dependent variable is the daily change in bond yield (bps). *HF Involved* indicates the presence of offshore hedge fund repo activity. *Log HF Intensity* is the natural log of one plus the average absolute hedge fund net position over the prior five trading days, scaled by the bond's total amount outstanding. Column (1) corresponds to Column (4) in Table IV, Column (2) to Column (4) in Table VII, and Columns (3) and (4) to Columns (1) and (2) in Table VIII. The Shock main effect is absorbed by the fixed effects. Standard errors are clustered by date and bond and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A2. Hedge fund strategy classification

Table A2 reports the strategy composition of the 152 Cayman-domiciled hedge funds in the sample. Each fund is classified at the level of the transacting legal entity rather than the manager, since managers may operate several vehicles with different mandates. The classification proceeds in three steps. First, funds whose legal names contain an unambiguous strategy identifier are classified directly. Second, I link the remaining funds to their investment advisers through SEC Form ADV, on which advisers report each private fund they manage (Schedule D, Section 7.B.(1)), and classify a fund from the adviser’s Form ADV Part 2A brochure whenever the brochure names the fund and describes its strategy. Third, funds whose advisers file no brochure or whose brochures do not identify the specific vehicle are classified from documented public sources, primarily regulatory filings and the managers’ own published strategy descriptions, with the source recorded for each fund. Funds without sufficient evidence remain unclassified. Fixed income relative value and global macro funds, the strategies for which sovereign bond repo transactions form part of the position itself rather than a source of funding for unrelated trades, account for 63% of funds and 85% of repo volume, while unclassified funds account for a negligible share of volume. Appendix A3 shows that the main results are unchanged when positioning is measured exclusively from fixed income relative value and global macro funds.

Table A2: Hedge Fund Strategy Composition

Strategy	Number of Funds	Share of Funds (%)	Share of Volume (%)
Fixed income / rates relative value	54	35.5	72.4
Multi-strategy	29	19.1	14.6
Global macro	42	27.6	12.8
Credit	13	8.6	0.1
Commodity or Equity	3	2.0	0.0
Unclassified	11	7.2	0.0
Total	152	100.0	100.0

Notes: This table reports the strategy composition of the 152 Cayman-domiciled hedge funds in the sample, classified as described above. *Share of Volume* is each strategy’s share of the total gross repo volume of the 152 funds, computed as the sum of nominal transaction amounts across repo and reverse repo transactions collateralized by German and Italian sovereign bonds. Shares may not sum to 100 due to rounding.

Sample period: 2021-01-01 – 2025-11-01

A3. Positioning from fixed income and macro funds only

Table A3 re-estimates the main specifications with hedge fund positioning measured exclusively from funds classified as fixed income relative value or global macro in Appendix A2. This addresses the concern that repo positions of other fund types need not reflect sovereign bond trades. A multi-strategy fund, for example, may post a bond in repo and use the cash to finance positions in other asset classes, in which case its repo activity proxies for funding demand rather than directional bond exposure. The estimated coefficients are nearly identical to the main specifications across the binary, continuous intensity, constraining, and relaxing regime tests. The amplification is therefore driven by funds that use the repo market to run leveraged sovereign bond positions.

Table A3: Positioning from Fixed Income and Macro Funds Only

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3) Constraining	(4) Relaxing
<i>Main Interaction</i>				
HF Involved $\times$ Shock	0.292*** (0.062)			
Log HF Intensity $\times$ Shock		0.173*** (0.032)	0.147*** (0.036)	0.235*** (0.050)
<i>Direct Effects</i>				
HF Involved	-0.030 (0.037)			
Log HF Intensity		-0.003 (0.017)	-0.009 (0.017)	-0.001 (0.017)
<i>Controls</i>				
Bid-Ask Spread	-0.256*** (0.074)	-0.259*** (0.074)	-0.257*** (0.074)	-0.256*** (0.074)
CTD Flag	0.010 (0.028)	0.008 (0.028)	0.007 (0.027)	0.003 (0.028)
Bond FE	Yes	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Observations	470,372	470,372	466,524	466,495
R-squared	0.738	0.738	0.734	0.735

Notes: This table re-estimates the main specifications with hedge fund positioning measured exclusively from funds classified as fixed income relative value or global macro. The dependent variable is the daily change in bond yield (bps). *HF Involved* indicates the presence of repo activity by these funds. *Log HF Intensity* is the natural log of one plus their average absolute net position over the prior five trading days, scaled by the bond's total amount outstanding. Bond-days on which only hedge funds of other strategy types are active are excluded from the sample. Column (1) corresponds to Column (4) in Table IV, Column (2) to Column (4) in Table VII, and Columns (3) and (4) to Columns (1) and (2) in Table VIII. The Shock main effect is absorbed by the fixed effects. Standard errors are clustered by date and bond and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A4. Calibrated example of the amplification mechanism

This appendix works through the framework of Section 3 with representative sample moments. It first quantifies the constraining side, then the relaxing side, and finally compares the implied amplification with the estimates of Section 5.2. The purpose of the example is to assess whether the mechanism can generate amplification of the order of magnitude observed in the data. It is not an estimate.

The average monetary policy tightening surprise in the sample is approximately 6 basis points. Regarding leverage, the transaction data in Table I shows haircuts averaging 0.24% for long positions. However, these raw figures may understate the true capital committed by funds due to practices such as portfolio margining, netting, unobserved cash buffers, or hedging activity that reduces the net price exposure relative to the raw repo position (Hempel, Kahn, Mann and Paddrik, 2023; Hill and Westphal, 2025; Hermes, Schmeling and Schrimpf, 2025). Therefore, to capture these effects in a stylized way, I assume an effective margin (m_i) of 2%. The representative sovereign bond has a duration of approximately 7 years, and the hedge fund sector is assumed to hold 3% of its total outstanding volume ($Q_{HF}/Q_{Total} = 0.03$), in line with the conditional sample in Table I.

Consider first the constraining side. A positive monetary policy shock of 6 basis points induces a price decline of approximately 0.42% ($6 \text{ bps} \times 7$) for a fund holding the representative bond financed via repo under the 2% margin assumption. Substituting these values into Equation (1) gives the change in the capital buffer.

$$\frac{\Delta E}{E} = \frac{-0.42\%}{2\%} = -21\%$$

Thus, even under this conservative margin assumption, a standard 6 basis point yield move is sufficient to wipe out 21% of the daily margin buffer.

To restore the margin ratio, the fund must adjust its position. The resulting yield reaction depends on the market's ability to absorb this activity. Let λ denote the inverse market elasticity, meaning how much yields react in response to net trading pressure. The additional yield change attributable to the position adjustment can be expressed as in Equation (A.1), where the term in parentheses represents the volume of trading normalized by the bond's total amount outstanding.

$$\Delta y_{i,t}^{\text{Amp}} = \lambda \times \left(\frac{\Delta E_{i,t}}{E_{i,t-1}} \times \frac{Q_{i,t-1}}{Q_i^{\text{Total}}} \right) \quad (\text{A.1})$$

Recall that the exogenous price change necessitates adjusting the position by 21%. With the hedge fund sector holding 3% of the bond, the aggregate trading pressure amounts to

$$\text{Trading pressure} = 21\% \times 3\% = 0.63\% \text{ of outstanding debt}$$

To quantify the yield impact, I choose a market elasticity of $\lambda = 5$ basis points per percentage point of outstanding traded, based on empirical estimates for US and euro area sovereign bond markets (D’Amico and King, 2013; Eser and Schwaab, 2016; De Santis and Holm-Hadulla, 2020). Substituting these parameters into Equation (A.1) yields the total amplification.

$$\Delta y^{\text{Amp}} = 5 \text{ bps/pp} \times 0.63 \text{ pp} = \mathbf{3.15 \text{ bps}}$$

Thus, in this example, the position adjustment triggered by a 6 basis point policy surprise generates sufficient trading pressure to amplify the yield reaction by an additional 3.15 basis points. In terms of price, this implies that the position adjustment triggered by the 42 basis point valuation change leads to an additional 22.05 basis point price movement in the direction of the shock.

The requirement to keep meeting margin makes the constraining side mechanical. The relaxing side is not. When the same 6 basis point surprise moves in favor of the position, the bond gains 0.42%, the fund receives the corresponding variation margin in cash, and its capital buffer rises by 21%. Nothing compels the fund to redeploy this capacity, so the expansion on the relaxing side cannot be taken for granted.

To see when redeployment is nonetheless the optimal response, consider the same fund when its position reflects a view on the path of policy rates. Suppose the fund expects the yield of the seven year bond to fall 25 basis points below what is currently priced and holds the bond at the maximum size its margin permits. In analogy to Equation (1), the position then offers

$$\text{Expected return on capital} = \frac{25 \text{ bps} \times 7}{2\%} = \frac{1.75\%}{2\%} \approx 88\%$$

The numerator is the expected price gain and the denominator is the margin capital backing the position. Such a return puts the position at the funding constraint rather than at an interior optimum. The fund would hold more if its capacity allowed it.

A favorable 6 basis point surprise then does two things at once. It consumes 6 of the 25 expected basis points and it raises the fund’s capacity by 21%. The remaining gap still offers

$$\text{Expected return on capital} = \frac{19 \text{ bps} \times 7}{2\%} = \frac{1.33\%}{2\%} \approx 66\%$$

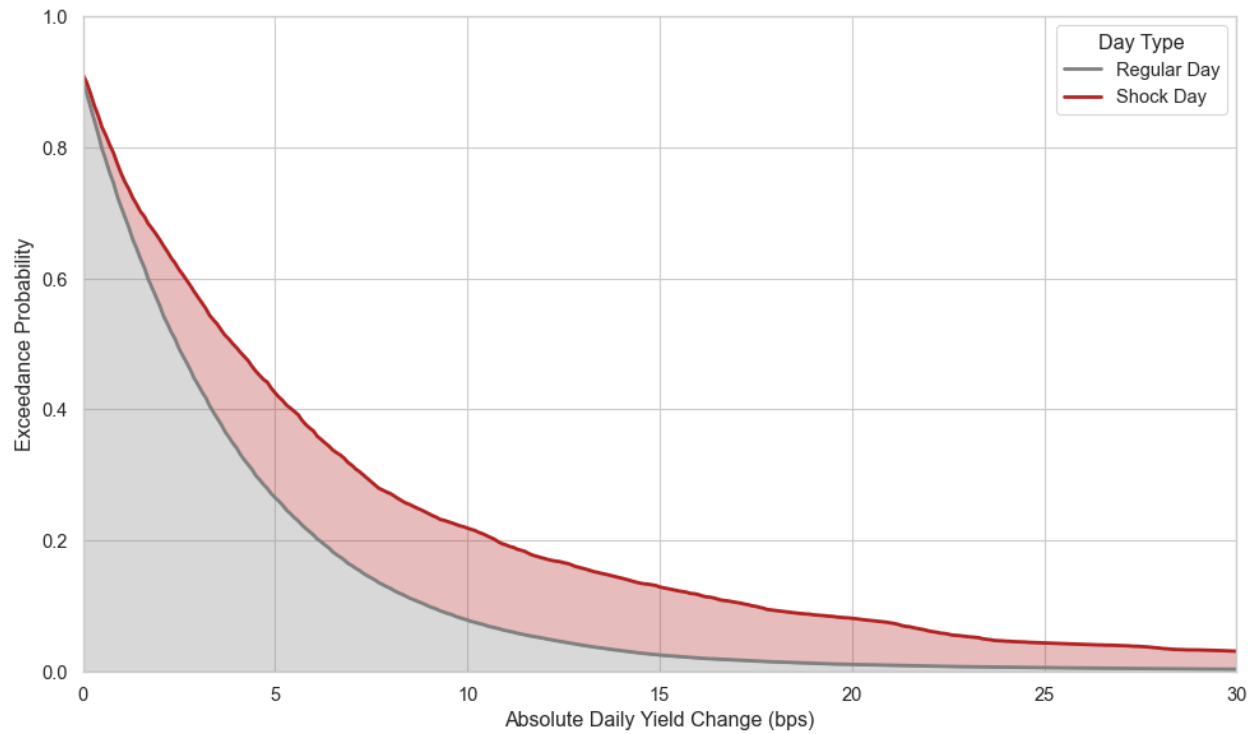
so the position justified by the view continues to exceed what the balance sheet permits. Expanding to the new capacity is the optimal response, and the fund buys an additional 21% of its position, the same magnitude that the capital erosion forces on the constraining side. As long as the view stays ahead of the market, capacity is the binding limit, and favorable and unfavorable shocks move the position by the same proportion with opposite sign. Once yields reach the view, the expected return is exhausted. The fund stops adding and eventually unwinds, so the expansion ends on its own. Under the same market elasticity, the expansion generates the same trading pressure as the contraction and an additional yield move of 3.15 basis points in the direction of the shock.

The size of the expansion relative to the gain in capital merits comment. The fund adds bonds worth fifty times its capital gain. The multiplier is the leverage ratio $1/m_i$, and it is the same multiplier that turns a 0.42% price loss into a 21% position reduction on the constraining side. The two-sided response therefore follows from the leverage of the position and not from an additional assumption.

Finally, the calibrated amplification can be compared with the estimates of Section 5.2. The binary interaction coefficient of 0.288 in Table IV implies an additional yield move of approximately 1.73 basis points for a 6 basis point surprise, and the intensity specification in Table VII implies approximately 1.36 basis points at an average intensity of 3%. The calibrated value of 3.15 basis points is of the same order of magnitude and lies within a factor of two of the estimates. Given the stylized parameters, in particular the effective margin and the market elasticity, the example indicates that the mechanism can generate amplification of the observed order of magnitude, but it does not provide a quantitative prediction. A higher effective margin or a deeper market would lower the calibrated value toward the estimates.

A5. Exceedance probability of Monetary Policy Shocks

Figure A1: Probability of the Yield Change exceeding a Threshold by Day Type



Notes: The figure plots the share of observations where the absolute daily yield change in German and Italian government bonds ($|\Delta y|$) is strictly larger than the threshold value displayed on the horizontal axis. The red line represents days with monetary policy announcements, while the gray line represents regular trading days. The shaded region between the curves highlights the excess tail risk generated by monetary policy surprises.

Sample period: 2021-01-01 – 2025-11-01

A6. Orthogonality of hedge fund positioning

Table A4 tests whether pre-existing hedge fund positioning is correlated with the realized monetary policy surprise through a common latent factor such as a shared macroeconomic outlook. By construction the test is based on the number of monetary events in the sample, but the estimated relationship is economically negligible, explains essentially none of the variation in the surprise, and is not statistically distinguishable from zero ($p = 0.95$). This supports the identifying assumption that pre-existing positioning is orthogonal to the realized surprise.

Table A4: Pre-existing Positioning and Monetary Policy Surprise

Dependent Variable:	OIS 2-Year Surprise (bps)
	(1)
Lagged Aggregate HF Net Position	0.009 (0.039)
Constant	0.134 (1.160)
Observations	38
R-squared	0.002

Notes: This table reports the orthogonality test of hedge fund positioning against the realized monetary policy surprise. The dependent variable is the 2-year OIS rate change during the ECB monetary event window (Altavilla et al., 2019). *Lagged Aggregate HF Net Position* is the sum of Cayman-domiciled hedge fund net repo positions across all bonds on the trading day before each ECB meeting. The sample is restricted to ECB announcement days. Robust standard errors are reported in parentheses.

Sample period: 2021-01-01 – 2025-11-01

A7. Placebo shocks

Table A5 presents placebo tests. In these tests, I shift the monetary policy shock dates by 15 trading days, thereby breaking the temporal link between the actual ECB announcements and the observed yield reactions. If the amplification effects documented in the main analysis were driven by slow-moving or persistent correlations between hedge fund activity and bond returns that operate independently of announcement timing, the placebo shocks should produce similar results. Instead, the strong amplification effects disappear entirely. These results provide evidence that the amplification requires temporal coincidence between the actual shock and the yield observation.

Table A5: Shifted Shock Dates

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3) Constraining	(4) Relaxing
<i>Main Interaction</i>				
HF Involved $\times$ Placebo Shock	−0.030 (0.036)			
Log HF Intensity $\times$ Placebo Shock		−0.018 (0.016)	−0.014 (0.017)	−0.028 (0.025)
<i>Direct Effects</i>				
Placebo Shock	0.007 (0.052)	0.004 (0.049)	0.002 (0.057)	−0.003 (0.047)
HF Involved	−0.031 (0.037)			
Log HF Intensity		−0.018 (0.016)	−0.017 (0.016)	−0.020 (0.016)
<i>Controls</i>				
Duration	0.078** (0.037)	0.078** (0.036)	0.080** (0.036)	0.082** (0.036)
Bid-Ask Spread	−0.259*** (0.076)	−0.258*** (0.076)	−0.260*** (0.076)	−0.259*** (0.076)
CTD Flag	0.025 (0.029)	0.028 (0.029)	0.035 (0.031)	0.033 (0.029)
Bond FE	Yes	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Observations	470,852	470,852	466,851	466,817
R-squared	0.737	0.737	0.737	0.737

Notes: This table reports placebo tests where monetary policy shocks are shifted to break the causal timing. The dependent variable is the daily change in bond yield (bps). *HF Involved* indicates the presence of offshore hedge fund repo activity. *Log HF Intensity* is the natural log of one plus pre-period hedge fund intensity. Column (1) corresponds to Column (4) in Table IV, Column (2) to Column (4) in Table VII, and Columns (3) and (4) to Columns (1) and (2) in Table VIII. The Shock main effect is not absorbed by fixed effects in this specification as the placebo shock does not coincide with the benchmark date cells. Standard errors are clustered by date and bond and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A8. *Alternative duration bin widths*

The duration-by-country-by-date cells used throughout the paper are built from two-year duration bins. Within these cells, duration still varies. The average within-cell standard deviation of duration is 0.53 years under the baseline two-year bins, 0.26 years under one-year bins, and 0.83 years under three-year bins. Table A6 shows that the estimates do not depend on this choice. It re-estimates the four main specifications, corresponding to Column (4) of Table IV, Column (4) of Table VII, and Columns (1) and (2) of Table VIII, with the two-year bins replaced by one-year bins in Panel A and three-year bins in Panel B. The binary interaction is 0.282 with one-year bins and 0.294 with three-year bins, compared to 0.291 in the baseline, and the intensity, constraining, and relaxing coefficients move equally little. Finer bins mechanically produce more single-bond cells, which drop out of the estimation, so the sample is somewhat smaller in Panel A. The stability of the coefficients while the within-cell dispersion varies threefold across bin widths shows that neither the width of the bins nor the residual duration heterogeneity within cells drives the amplification.

Table A6: Alternative Duration Bin Widths

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3) Constraining	(4) Relaxing
<i>Panel A: One-year duration bins</i>				
HF Involved $\times$ Shock	0.282*** (0.062)			
Log HF Intensity $\times$ Shock		0.155*** (0.032)	0.120*** (0.036)	0.218*** (0.049)
HF Involved	-0.024 (0.039)			
Log HF Intensity		-0.014 (0.015)	-0.018 (0.015)	-0.013 (0.015)
Observations	466,815	466,815	462,923	462,913
R-squared	0.760	0.760	0.757	0.758
<i>Panel B: Three-year duration bins</i>				
HF Involved $\times$ Shock	0.294*** (0.064)			
Log HF Intensity $\times$ Shock		0.168*** (0.032)	0.145*** (0.039)	0.221*** (0.051)
HF Involved	-0.023 (0.039)			
Log HF Intensity		-0.019 (0.016)	-0.024 (0.016)	-0.015 (0.016)
Observations	474,658	474,658	470,786	470,773
R-squared	0.721	0.721	0.717	0.718
Bond FE	Yes	Yes	Yes	Yes
Duration Bin $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Bid-Ask Spread and CTD Controls	Yes	Yes	Yes	Yes

Notes: This table re-estimates the main specifications with the two-year duration bins underlying the duration-by-country-by-date fixed effects replaced by one-year bins (Panel A) and three-year bins (Panel B). Column (1) corresponds to Column (4) in Table IV, Column (2) to Column (4) in Table VII, and Columns (3) and (4) to Columns (1) and (2) in Table VIII. *HF Involved* indicates the presence of offshore hedge fund repo activity. *Log HF Intensity* is the natural log of one plus the average absolute hedge fund net position over the prior five trading days, scaled by the bond's total amount outstanding. All specifications include bond fixed effects, duration-bin-by-date-by-country fixed effects, and controls for bid-ask spread and CTD status. The Shock main effect is absorbed by the fixed effects. Cells containing a single bond drop out of the estimation, so the sample is smaller under finer bins. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A9. Matched-pair balance

Table A7 describes the matched sample underlying Column (5) of Table IV. Each pair consists of a bond with active hedge fund repo positions on a given day and the non-hedge fund bond from the same duration-country-date cell that is closest in terms of bid-ask spread. The matched sample comprises 240,912 pairs, formed from 471 distinct hedge fund bonds and 582 distinct control bonds across 1,242 trading days. In the median pair, the hedge fund bond has a duration of 4.1 years and a bid-ask spread of 0.05 € and its control bond a duration of 4.0 years and a spread of 0.13 €. The median within-pair duration gap is 0.55 years, and half of all pairs are matched to within 0.05 € of bid-ask spread, a quarter to within 0.004 €.

Duration, the characteristic that governs a bond’s mechanical sensitivity to rate shocks, is closely balanced, with a standardized difference of 0.03. The remaining rows reflect the selection documented in Table II. Hedge fund bonds are more liquid than their matched controls, are concentrated in larger issues, and carry a somewhat longer residual maturity at the same duration, which reflects coupon differences rather than differences in rate exposure. Because the hedge fund bond is typically the most liquid bond of its cell, the matched control is the closest feasible comparison but remains less liquid in the average pair. The two bonds differ in cheapest-to-deliver status in 6.4% of pairs. CTD status is controlled for in all specifications, and Appendix A11 shows that the results hold when CTD bonds are excluded entirely.

Table A7: Matched-Pair Balance

	HF Bond	Non-HF Bond	Mean Diff.	Median Diff.	Std. Diff.
Duration (years)	5.46	5.31	0.15	0.55	0.03
Residual Maturity (years)	6.66	5.39	1.27	0.79	0.20
Amount Issued (€ bn)	19.81	11.36	8.45	8.28	1.43
Bid-Ask Spread (€)	0.08	0.20	−0.13	0.05	−0.83
Pairs	240,912				
Distinct HF bonds	471				
Distinct non-HF bonds	582				
Distinct dates	1,242				
CTD mismatch rate	6.4%				

Notes: This table reports balance statistics for the matched sample used in Column (5) of Table IV. Each hedge fund bond-day is paired with the non-hedge fund bond in the same duration-country-date cell that is closest in terms of bid-ask spread, with replacement. *HF Bond* and *Non-HF Bond* report the means of each characteristic. *Mean Diff.* and *Median |Diff.|* refer to the within-pair difference (HF minus non-HF) and the absolute within-pair difference. *Std. Diff.* is the mean difference divided by the square root of the average of the two group variances. The *CTD mismatch rate* is the share of pairs in which the two bonds differ in cheapest-to-deliver status.

Sample period: 2021-01-01 – 2025-11-01

Table A8 shows that these residual within-pair differences do not drive the amplification. Column (1) repeats the matched-sample specification of Table IV on the full matched sample. Columns (2) to (4) restrict the sample to increasingly tightly matched pairs, with within-pair bid-ask differences below 0.10 €, below the median difference of 0.05 €, and below the 25th-percentile difference of 0.004 €, the latter constituting near-exact liquidity matches. If residual liquidity differences drove the estimate, the coefficient should fall as the pairs become tighter. Instead, it ranges between 0.31 and 0.41 and never falls below the full-sample estimate. Column (5) allows the yield response to the shock to vary with the bid-ask spread on the full matched sample. The liquidity interaction is positive and statistically insignificant, indicating that, if anything, less liquid bonds react more strongly to shocks. Since the hedge fund bond is the more liquid side of almost every pair, residual liquidity mismatch biases the estimated amplification toward zero, and the hedge fund interaction indeed rises to 0.35 once liquidity-dependent shock sensitivity is absorbed. Column (6) additionally allows the shock response to vary with residual maturity and amount issued, so that the hedge fund interaction is identified only from variation in hedge fund status among bonds with comparable exposure to all characteristics in which the pairs are imbalanced. The coefficient is 0.376 and remains significant at the 1% level, while none of the characteristic interactions is statistically distinguishable from zero. The amplification attaches to the hedge fund position itself rather than to the characteristics of the bonds hedge funds select.

A final feature of the matched design is that pairs are re-formed every day, so the comparison bond attached to a given hedge fund bond changes over time. Partner turnover is indeed substantial. The partner changes on 41% of consecutive matched days, between consecutive announcement days the typical hedge fund bond keeps the same partner only 29% of the time, and the median hedge fund bond is matched on 373 days to 22 distinct partners, with its most frequent partner accounting for 23% of its matched days. Table A9 shows that this re-matching does not drive the estimate. Each hedge fund bond is instead assigned a single fixed comparison bond for the entire sample, either the control it is matched to most often under the baseline procedure (Column 1) or the control from its first matched day (Column 2). Pair-days on which the fixed partner has no data or carries hedge fund positions itself are dropped, which costs about a quarter of the pair-days, and the fixed pair no longer needs to occupy the same duration cell on every day. The interaction coefficient is 0.252 with modal partners and 0.288 with first partners, both significant at the 1% level and

Table A8: Matched-Sample Robustness: Pair Quality and Bond Characteristics

Dependent Variable:	Δ Bond Yield (bps)					
	(1)	(2)	(3)	(4)	(5)	(6)
Pairs included	All	Gap $\leq$ 0.10	Gap $\leq$ 0.05	Gap $\leq$ 0.004	All	All
<i>Main Interaction</i>						
HF Involved $\times$ Shock	0.302*** (0.054)	0.406*** (0.076)	0.387*** (0.075)	0.310*** (0.050)	0.347*** (0.065)	0.376*** (0.082)
<i>Direct Effect</i>						
HF Involved	-0.008 (0.025)	-0.016 (0.030)	0.006 (0.029)	-0.001 (0.033)	-0.023 (0.030)	-0.018 (0.030)
<i>Characteristic Interactions</i>						
Bid-Ask Spread $\times$ Shock					0.382 (0.263)	0.313 (0.272)
Residual Maturity $\times$ Shock						-0.005 (0.010)
Amount Issued $\times$ Shock						-0.003 (0.005)
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
CTD Flag Control	Yes	Yes	Yes	Yes	Yes	Yes
Characteristic Main Effects	No	No	No	No	Yes	Yes
Observations	481,824	285,936	240,456	126,300	481,824	481,824
R-squared	0.844	0.775	0.756	0.712	0.844	0.844

Notes: This table re-estimates the matched-sample specification of Column (5) in Table IV. The dependent variable is the daily change in bond yield (bps). *HF Involved* indicates the hedge fund side of each matched pair. *Gap* refers to the absolute within-pair difference in bid-ask spread (€) at the time of matching. The thresholds in Columns (3) and (4) correspond to the median and the 25th percentile of the gap distribution. Columns (5) and (6) use the full matched sample and allow the yield response to the shock to vary with the bid-ask spread, and additionally with residual maturity and amount issued. The main effects of the interacted characteristics are included. The Shock main effect is absorbed by the matched-pair fixed effects. Standard errors are clustered by Duration $\times$ Date $\times$ Country and non-HF bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

within one standard error of the baseline estimate of 0.302. The slightly lower point estimates are consistent with fixed partners being coarser comparisons than the daily nearest match, and confirm that the amplification does not depend on how or when the comparison bond is re-selected.

Table A9: Matched-Sample Robustness: Fixed Partners

Dependent Variable:	Δ Bond Yield (bps)	
	(1)	(2)
Fixed partner	Modal	First
HF Involved $\times$ Shock	0.252*** (0.092)	0.288*** (0.069)
HF Involved	0.002 (0.020)	0.003 (0.012)
Pair-Day FE	Yes	Yes
CTD Flag Control	Yes	Yes
Pair-days	185,622	171,902
Observations	371,244	343,804
R-squared	0.873	0.869

Notes: This table re-estimates the matched-sample specification of Column (5) in Table IV with each hedge fund bond assigned a single fixed comparison bond over the whole sample instead of the day-specific nearest match. In Column (1) the fixed partner is the control bond that the hedge fund bond is matched to on the most days under the baseline procedure. In Column (2) it is the control bond from the hedge fund bond's first matched day. Pair-days on which the fixed partner has no data or carries hedge fund repo positions itself are excluded. *HF Involved* indicates the hedge fund side of each pair. Pair-day fixed effects absorb the Shock main effect. Standard errors are clustered by Duration $\times$ Date $\times$ Country and partner bond. *** p<0.01, ** p<0.05, * p<0.10. Sample period: 2021-01-01 – 2025-11-01

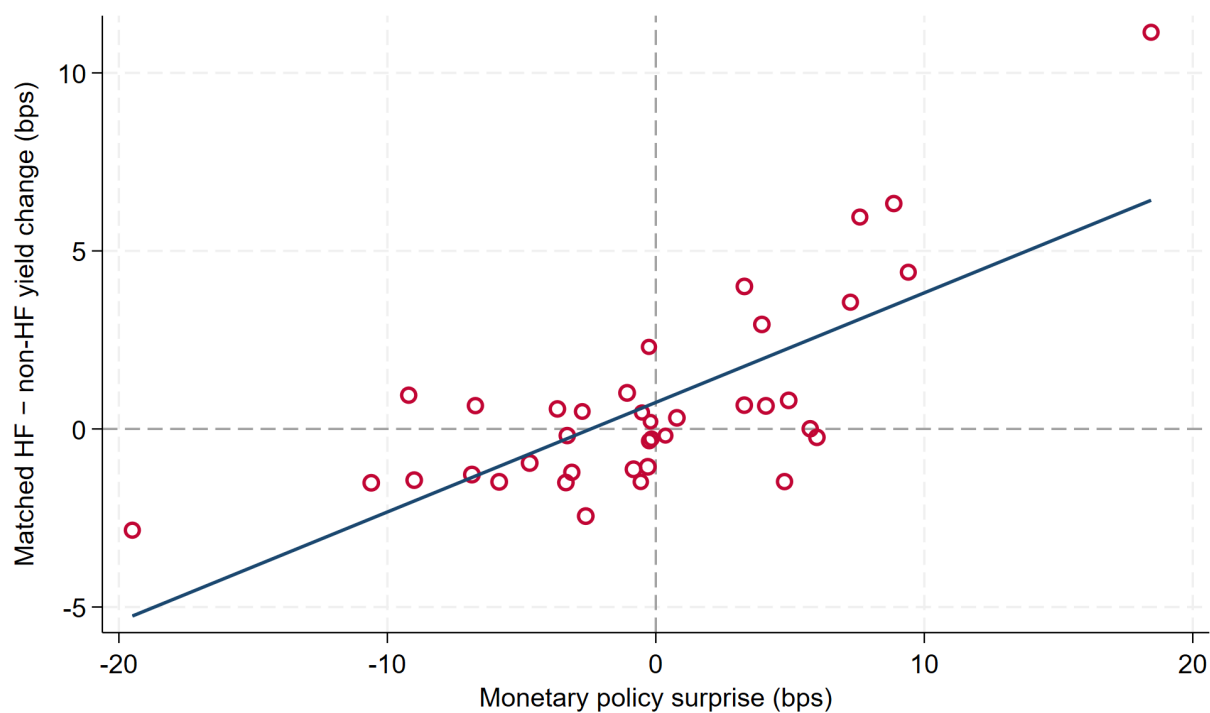
A10. Announcement-level evidence

The identification of the amplification coefficient rests on 38 ECB announcements. This section shows that the estimate is broad-based across these announcements rather than generated by a few influential meetings. Figure A2 collapses the matched sample to one point per announcement, the average matched difference in daily yield changes between hedge fund bonds and their paired controls, plotted against the monetary policy surprise. The relationship is visible across the full range of surprises, in the interior of the distribution as well as in the tails. The slope of this announcement-level regression is 0.308 with a robust standard error of 0.072, nearly identical to the matched panel estimate of 0.302 in Table IV, and it is not drawn by the extreme meetings. Excluding the two largest absolute surprises, the slope is 0.264 with a t-statistic of 4.0.

Two formal exercises confirm the visual impression. First, I re-estimate the baseline specification of Column (4) in Table IV 38 times, dropping one announcement day at a time. The interaction coefficient ranges from 0.244, when the December 2022 meeting with the largest surprise of the sample is excluded, to 0.308, and every estimate remains significant at the 1% level. No single announcement is necessary for the result.

Second, randomization inference addresses the concern that conventional standard errors overstate precision when the shock takes only 38 effective draws. Under the null hypothesis that hedge fund positioning does not amplify monetary policy surprises, the announcement dates are arbitrary relative to the daily matched differential. I therefore draw, within each calendar year, as many placebo days from the non-announcement days as there are actual announcements, assign them that year's actual surprise values, and re-estimate the announcement-level slope. The within-year draws ensure that the placebo dates face the same volatility environment as the actual announcements. Figure A3 plots the distribution of placebo slopes across 1,000 permutations. The distribution is centered at zero with a standard deviation of 0.045, and the largest placebo slope in absolute value is 0.157, about half the actual estimate. No permutation reaches the actual slope of 0.308, corresponding to an exact permutation p-value below 0.001. The amplification is thus tied to the actual announcement dates and their surprises, not to the number of draws or to distributional assumptions underlying the clustered standard errors.

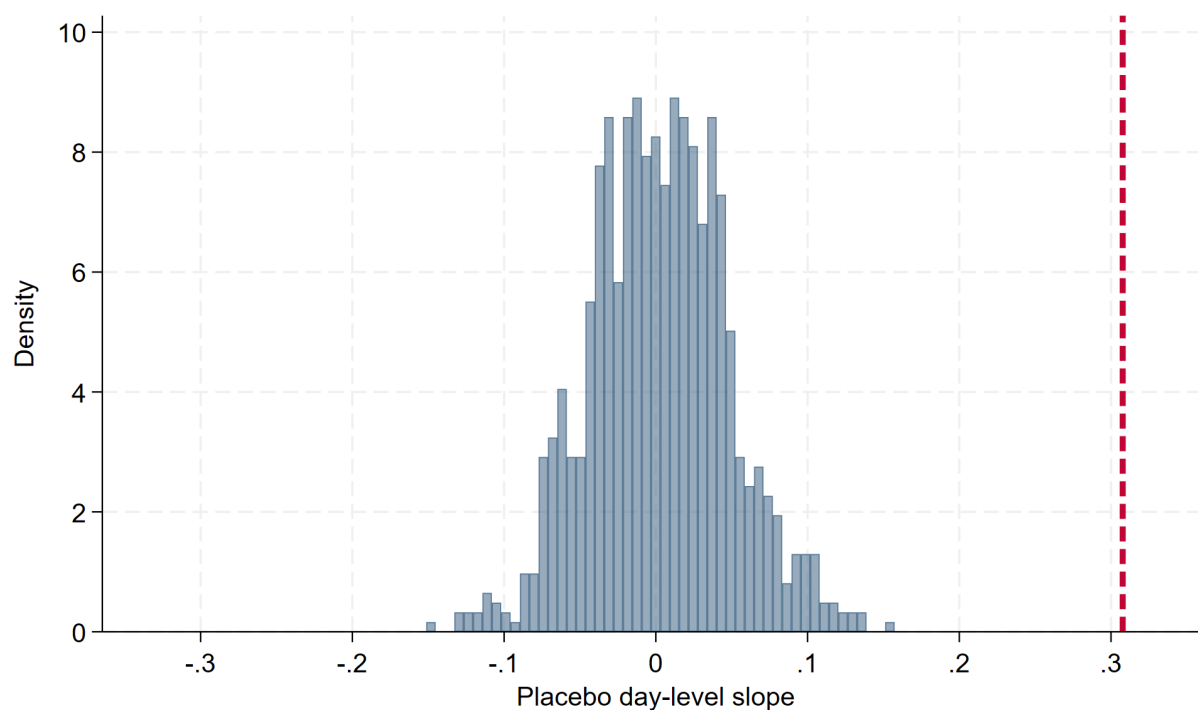
Figure A2: Announcement-Level Amplification



Notes: Each point is one of the 38 ECB announcements in the sample. The vertical axis is the average matched difference in daily yield changes between hedge fund bonds and their paired non-hedge fund controls on the announcement day (bps). The horizontal axis is the monetary policy surprise, measured as the change in the 2-year OIS rate during the ECB event window (bps). The line is the unweighted linear fit. Its slope is 0.308 with a robust standard error of 0.072, and a pair-weighted fit gives 0.305.

Sample period: 2021-01-01 – 2025-11-01

Figure A3: Randomization Inference on the Announcement Dates



Notes: The histogram shows the distribution of announcement-level slopes across 1,000 permutations in which the actual monetary policy surprises are assigned to randomly drawn non-announcement days from the same calendar year. The vertical line marks the actual announcement-level slope of 0.308. No placebo slope reaches the actual estimate in absolute value, corresponding to an exact permutation p-value below 0.001.
Sample period: 2021-01-01 – 2025-11-01

A11. *Excluding CTD bonds*

Table A10 re-estimates the main specifications on the subsample of non-CTD bonds to address the concern that unobserved futures exposure may transmit to cash yields through the cheapest-to-deliver linkage. Since CTD bonds are the primary instrument through which derivative positions affect underlying bond prices, amplification driven by off-balance-sheet futures exposure should be concentrated in this subset. The estimated coefficients are nearly identical to the main specifications across the binary, continuous intensity, constraining, and relaxing regime tests. This indicates that the amplification documented in the paper does not depend on the futures-cash linkage and reflects leveraged positioning observable through repo transactions.

Table A10: Excluding CTD Bonds

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3) Constraining	(4) Relaxing
<i>Main Interaction</i>				
HF Involved $\times$ Shock	0.281*** (0.061)			
Log HF Intensity $\times$ Shock		0.157*** (0.031)	0.132*** (0.037)	0.222*** (0.052)
<i>Direct Effects</i>				
HF Involved	-0.020 (0.038)			
Log HF Intensity		-0.013 (0.018)	-0.018 (0.018)	-0.010 (0.018)
<i>Controls</i>				
Bid-Ask Spread	-0.265*** (0.076)	-0.267*** (0.076)	-0.264*** (0.075)	-0.264*** (0.075)
Bond FE	Yes	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Observations	455,303	455,303	451,642	451,598
R-squared	0.730	0.730	0.726	0.727

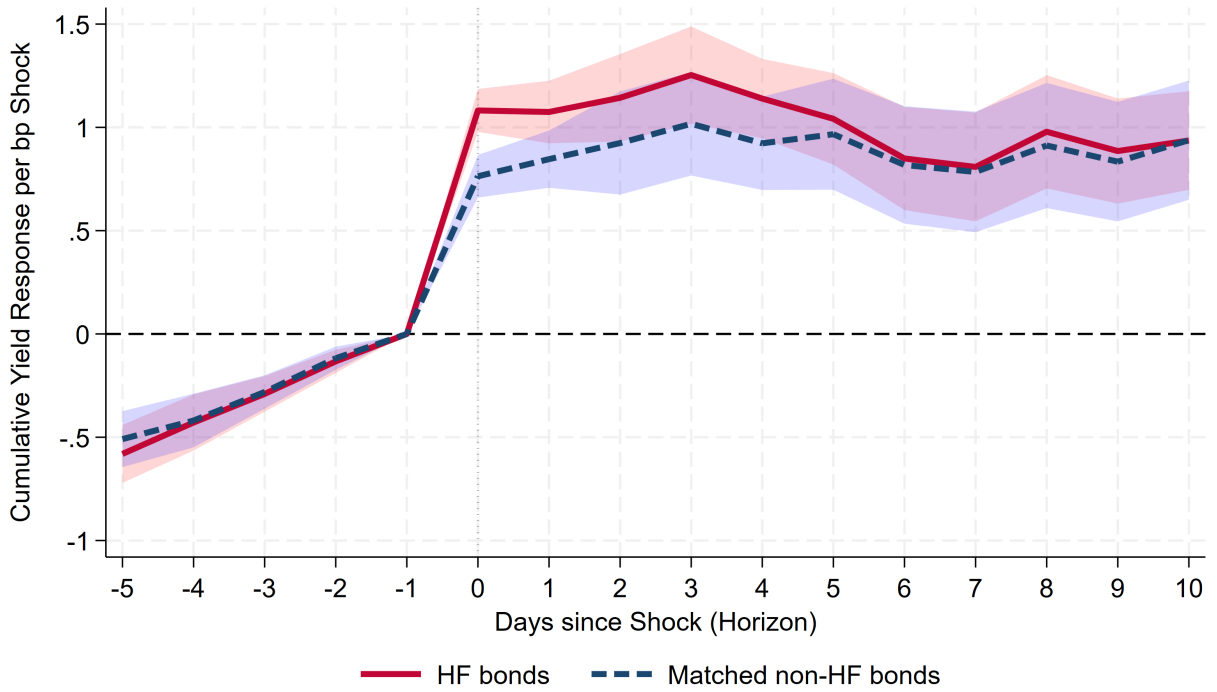
Notes: This table re-estimates the main specifications on the subsample of non-CTD bonds. The dependent variable is the daily change in bond yield (bps). *HF Involved* indicates the presence of offshore hedge fund repo activity. *Log HF Intensity* is the natural log of one plus the average absolute hedge fund net position over the prior five trading days, scaled by the bond's total amount outstanding. Column (1) corresponds to Column (4) in Table IV, Column (2) to Column (4) in Table VII, and Columns (3) and (4) to Columns (1) and (2) in Table VIII. The Shock main effect is absorbed by the fixed effects. Standard errors are clustered by date and bond and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A12. Level decomposition of the persistence

Figure A4 reports the level responses underlying the demeaned decomposition in Figure 2b in the main text. The cumulative yield response per basis point of shock is plotted separately for HF-involved bonds and their matched non-HF counterparts. Both series converge toward a common terminal value of slightly below one basis point per basis point of shock. Hedge fund bonds overshoot this level during the first days after the shock while their matched counterparts approach it from below, which is the pattern that the demeaned representation in the main text makes explicit.

Figure A4: Persistence of the amplification in levels



Notes: The figure plots the cumulative yield response per basis point of shock separately for HF-involved bonds and their matched non-HF counterparts, based on the matched sample set-up. Shaded areas denote 90% confidence intervals clustered by business date and bond.

Sample period: 2021-01-01 – 2025-11-01

A13. Categorical hedge fund intensity

Table A11 replaces the continuous intensity measure with categorical buckets to verify that the main results do not depend on the linearity assumption. Bonds are sorted into two buckets based on the distribution of hedge fund positioning, with bond-days that have no hedge fund activity serving as the omitted base category. The amplification increases monotonically from Low to High intensity across all specifications, and a Wald test of equality between the Low and High coefficients in Column (4) rejects the null at the 5% level ($p = 0.03$), consistent with the linear functional form imposed by the continuous measure.

Table A11: Categorical Hedge Fund Intensity

Dependent Variable:	Δ Bond Yield (bps)			
	(1)	(2)	(3)	(4)
<i>Main Interactions</i>				
Low Intensity $\times$ Shock	0.248*** (0.075)	0.248*** (0.075)	0.244*** (0.076)	0.250*** (0.063)
High Intensity $\times$ Shock	0.327*** (0.078)	0.327*** (0.078)	0.329*** (0.077)	0.330*** (0.067)
<i>Direct Effects</i>				
Shock	0.757*** (0.123)	0.757*** (0.123)		
Low Intensity	0.116*** (0.043)	0.097 (0.062)	0.002 (0.044)	−0.019 (0.038)
High Intensity	0.050 (0.043)	0.025 (0.063)	−0.006 (0.048)	−0.029 (0.039)
<i>Controls</i>				
Duration		0.003 (0.005)	0.037 (0.042)	
Bid-Ask Spread		−0.032 (0.086)	−0.238*** (0.085)	−0.257*** (0.075)
CTD Flag		0.177* (0.098)	0.033 (0.040)	0.010 (0.028)
Bond FE	No	No	Yes	Yes
Date FE	No	No	Yes	No
Duration $\times$ Date $\times$ Country FE	No	No	No	Yes
Observations	477,001	477,001	477,001	470,852
R-squared	0.033	0.034	0.569	0.737

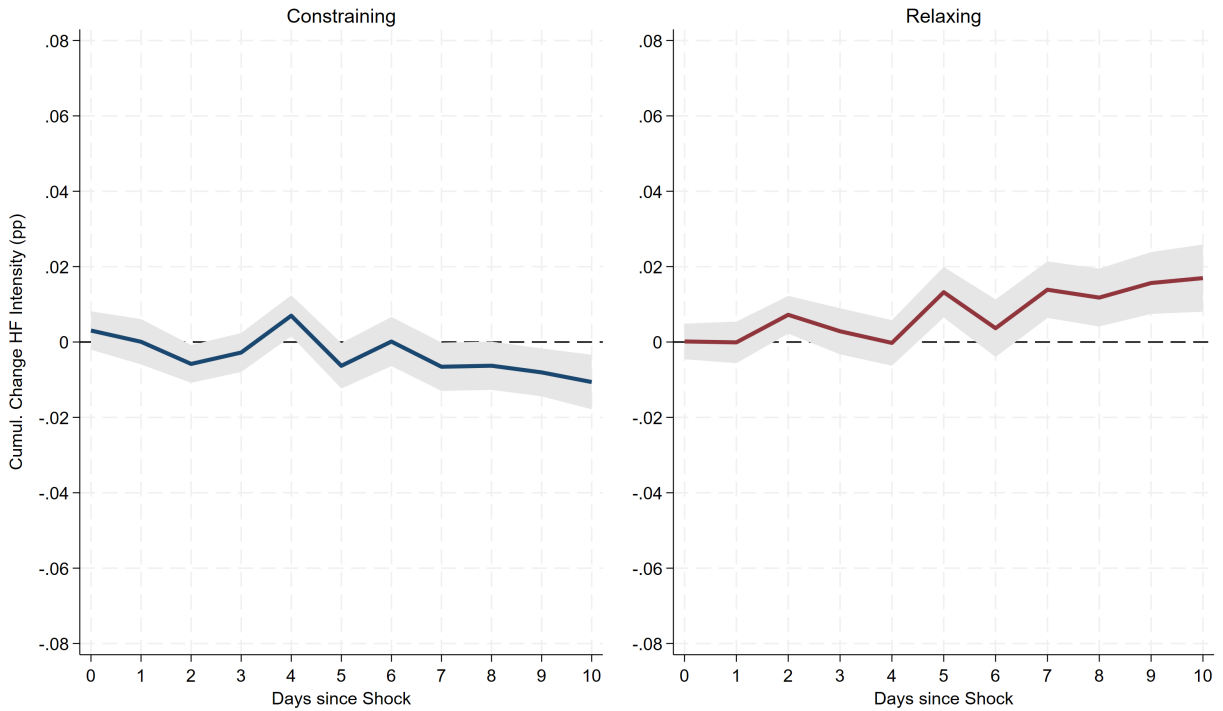
Notes: The dependent variable is the daily change in bond yield (bps). The continuous *HF Intensity* measure from Table VII is replaced with two categorical indicators, *Low Intensity* and *High Intensity*, based on the distribution of hedge fund positioning across active bond-days. The omitted base category is bond-days with no hedge fund activity. *Shock* is the 2-year OIS rate change during the ECB monetary event window. In Columns (3) and (4), the Shock main effect is absorbed by the fixed effects. Column (4) replaces Date FE with Duration $\times$ Date $\times$ Country FE, which compares bonds with similar duration from the same issuer country on the same day. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A14. Term repo position adjustment

Figure A5 replicates the impulse response analysis of Section 5.3 for the term repo segment to verify that the dynamics in the overnight segment are not specific to that maturity. The patterns mirror the overnight results in both regimes but appear with a lag of approximately five days. This delay is mechanically consistent with the maturity profile of these contracts, as the descriptive statistics in Table I show that the 25th percentile of the long maturity distribution is 7.5 days, which is roughly the point at which the first quartile of contracts begins to mature and reprice.

Figure A5: Impulse responses of hedge fund intensity to monetary policy shocks (term)



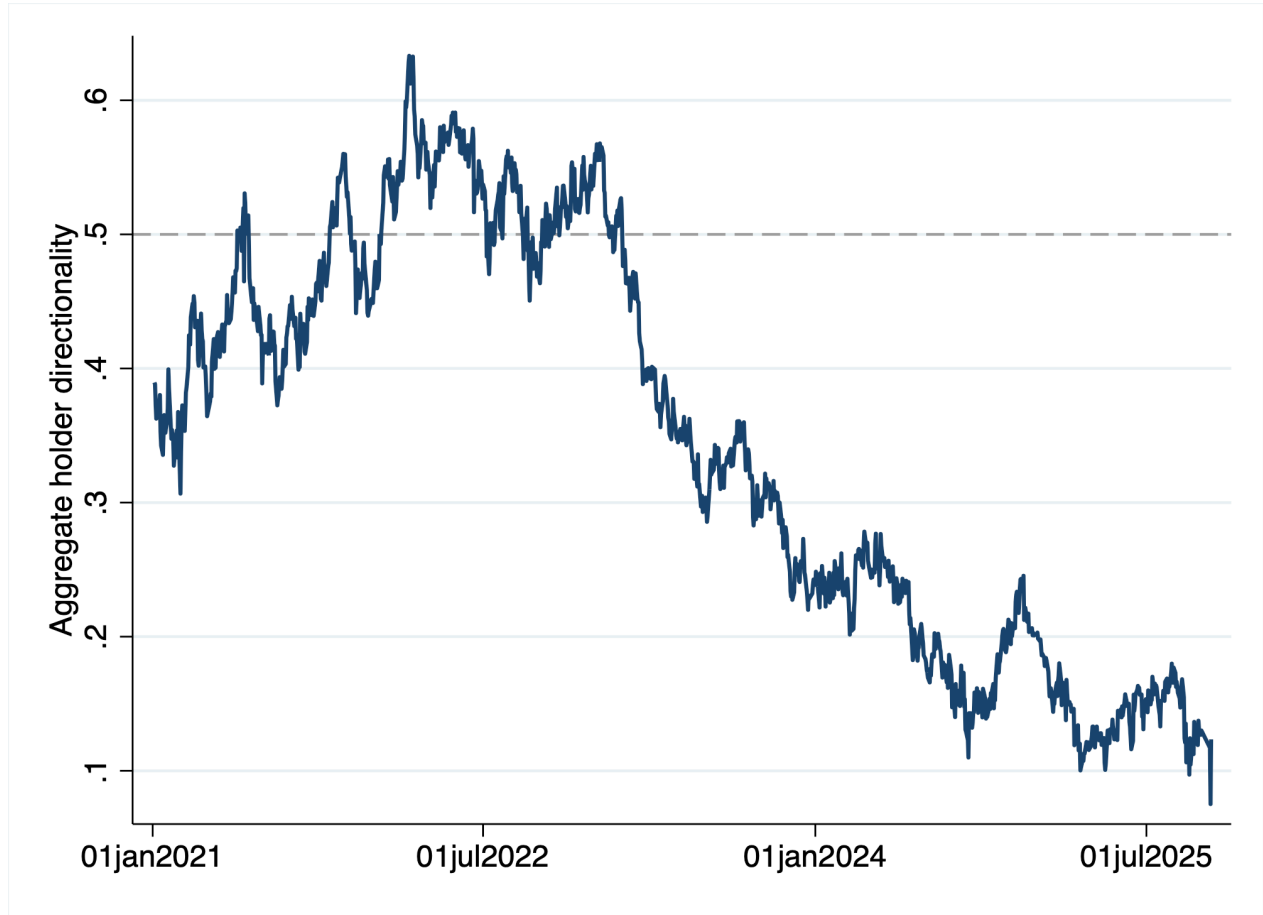
Notes: Dependent variable is the cumulative change in HF Intensity (pp) from $t - 1$ to $t + h$. Intensity is measured as % of amount issued. Sample restricted to term repo transactions. All specifications include bond fixed effects and duration $\times$ country $\times$ date fixed effects, with the latter absorbing the shock main effect. Identification of β_h comes from within-cell variation in pre-shock positioning interacted with the shock. Standard errors clustered by date and bond. Shaded areas denote 90% confidence intervals.

Sample period: 2021-01-01 – 2025-11-01

A15. Directionality and calendar time

The directionality results in Section 6 split hedge fund bonds at cutoffs computed over the pooled sample. Because the sector’s configuration trends over the sample, the groups draw unevenly on different periods. Of the directional group’s bond-days, 40% fall in 2022 and 91% in 2021–2023, while 69% of the hedged group’s bond-days fall in 2024–2025. This raises the concern that the directionality contrast partly reflects calendar time rather than the configuration of the books. This appendix separates the two. Figure A6 plots the aggregate path of the bond-level measure that generates the composition tilt.

Figure A6: Aggregate hedge fund holder directionality over time



Notes: The figure plots the position weighted average across bonds of holder directionality on each date. Holder directionality is high when a bond is held mainly within directional books and low when it is held within hedged relative value books. The series shows pronounced low-frequency variation in how directional the sector is. Directionality is elevated through the first half of the sample and declines to its lowest levels in 2024 and 2025, when the relative value structure of Figure 4 re-emerges. Sample period: 2021-01-01 – 2025-11-01

Table A12 augments the fixed effects of the baseline specification with hedge-fund-presence-by-

date fixed effects. Because the shock is constant within a date, these absorb, date by date, both the level and the shock response of hedge fund bonds relative to non-hedge fund bonds, so that identification comes exclusively from differences among hedge fund bonds on the same date. Column (1) shows that the unconditional same-date contrast between directional-held and hedged-held bonds is small and statistically insignificant. This is what the common configuration implies. On most dates, the books holding different bonds are similarly exposed, so there is little to compare. Column (2) lets the contrast vary with the sector’s exposure, measured as the position-weighted average of holder directionality across bonds on each date, the pre-shock counterpart of the series in Figure A6. The triple interaction is 0.700 and significant. The same-date contrast is absent when the sector is hedged and reaches approximately 0.16 at hiking-cycle levels of exposure, exactly when the mechanism predicts that directional books face binding constraints. Column (3) shows that the amplification per unit of hedge fund intensity survives the same fixed effects at 0.067, significant at the 1% level. On the same date, among hedge fund bonds, those with larger positions react more strongly, a comparison in which calendar time plays no role.

Table A13 tests the time-series margin directly at the announcement level, using the per-announcement matched differential of Appendix A10. Column (1) regresses the differential on the surprise, the surprise interacted with sector directionality, and the level of sector directionality. The amplification slope at the average configuration is 0.214, and the interaction of 0.797 implies a slope of effectively zero in the most hedged regime and approximately 0.43 in the most directional one. Column (2) adds the surprise interacted with a 2022 indicator. The directionality interaction is essentially unchanged at 0.765, while the 2022 interaction enters at 0.012 and is indistinguishable from zero. The variation in amplification across announcements is explained by the configuration of the sector’s books, not by the calendar year in which the largest surprises happened to occur.

Table A12: Same-Date Identification of the Directionality Contrast

Dependent Variable:	Δ Bond Yield (bps)		
	(1)	(2)	(3)
Directional-held $\times$ Shock	0.054 (0.042)	0.031 (0.031)	
Directional-held $\times$ Shock $\times$ Sector Dir.		0.700** (0.287)	
Directional-held $\times$ Sector Dir.		−0.035 (0.197)	
Directional-held	0.007 (0.021)	0.005 (0.021)	
Log HF Intensity $\times$ Shock			0.067*** (0.024)
Log HF Intensity			−0.010 (0.016)
Bond FE	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes
HF $\times$ Date FE	Yes	Yes	Yes
Observations	472,318	459,196	472,318
R-squared	0.748	0.749	0.748

Notes: The dependent variable is the daily change in bond yield (bps). *Directional-held* indicates hedge fund bonds with holder directionality above the pooled median, as in Table X. *Sector Dir.* is the position-weighted average of holder directionality across bonds on each date, demeaned. Its main effect and its interaction with the shock are constant within a date and absorbed by the fixed effects, as is the Shock main effect. *HF $\times$ Date FE* interact an indicator for hedge fund presence with the date, absorbing each date’s level and shock response of hedge fund bonds relative to non-hedge fund bonds. All columns include the bid-ask spread and a CTD indicator as controls. Column (2) is restricted to dates with a defined sector directionality. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

Table A13: Announcement-Level Amplification and the Sector's Book

Dependent Variable:	Matched HF Differential (bps)	
	(1)	(2)
Surprise	0.214*** (0.045)	0.209*** (0.064)
Surprise $\times$ Sector Dir.	0.797*** (0.248)	0.765*** (0.269)
Surprise $\times$ 2022		0.012 (0.137)
Sector Dir.	5.564*** (1.457)	5.546*** (1.579)
Constant	0.588** (0.255)	0.584** (0.286)
Observations	37	37
R-squared	0.743	0.743

Notes: The dependent variable is the average matched difference in daily yield changes between hedge fund bonds and their paired controls on each announcement day (bps), as in Appendix A10. *Surprise* is the change in the 2-year OIS rate during the ECB event window (bps). *Sector Dir.* is the position-weighted average of holder directionality across bonds on the announcement day, demeaned (sample mean 0.35). *2022* is an indicator for announcements in 2022. One announcement precedes the first available directionality measurement, leaving 37 of the 38 announcements. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A16. *Position side, constraint regime, and book directionality*

Table A14 splits the constraint-regime regressions of Table VIII by the side of the hedge fund position and by the directionality of the books holding the bond. Panel A shows that within directional books the amplification is present in all four cells. On the constraining side it is almost the same for long and short positions, as a margin constraint that binds mechanically implies. On the relaxing side it is 0.124 for long positions and 0.379 for short positions, which is the configuration in which the coordinated net-short book of the hiking cycle meets a surprise that confirms its direction. Panel B shows that within hedged books the amplification is close to zero in every cell. The absence of amplification within hedged books therefore holds regardless of the side of the position and of whether the shock moves against it or in its favor.

Table A14: Amplification by Position Side, Constraint Regime, and Book

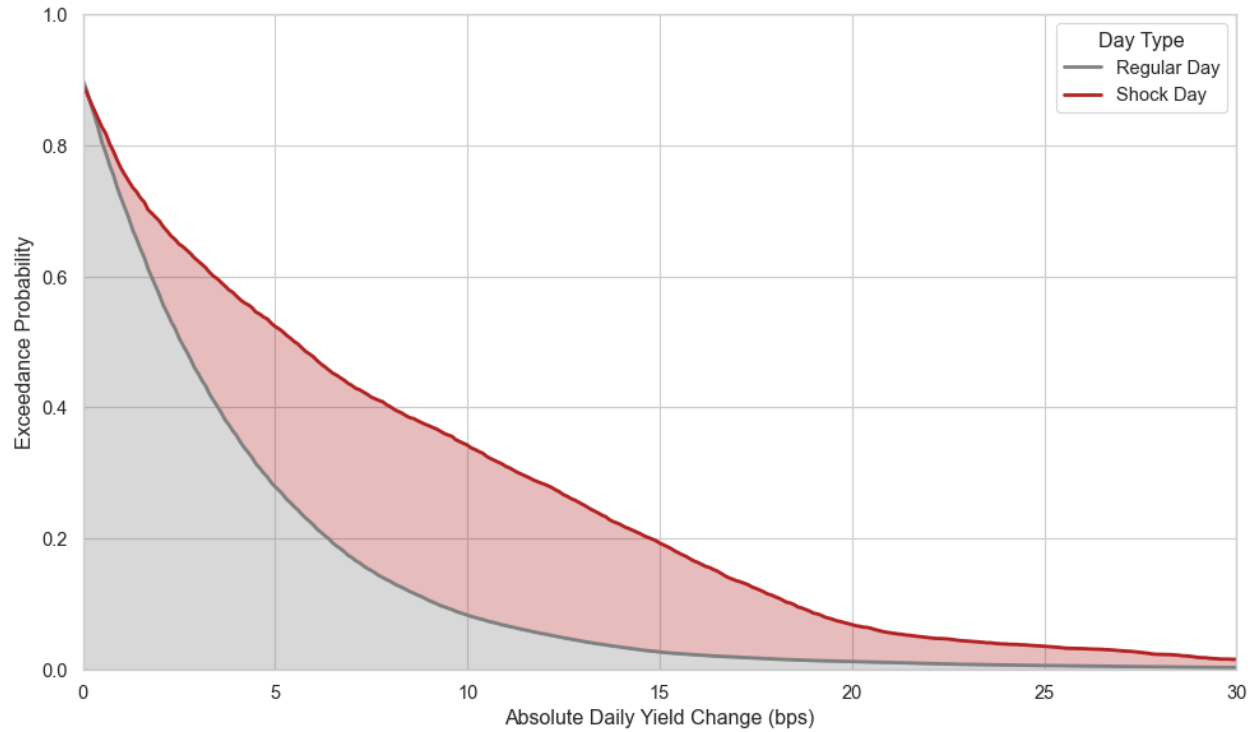
Dependent Variable:	Δ Bond Yield (bps)			
	Net long		Net short	
	Constraining	Relaxing	Constraining	Relaxing
<i>Panel A: Bonds held within directional books</i>				
Log HF Intensity $\times$ Shock	0.185*** (0.040)	0.124*** (0.035)	0.172*** (0.042)	0.379*** (0.030)
Log HF Intensity	-0.020 (0.017)	-0.013 (0.017)	-0.014 (0.017)	-0.022 (0.017)
Observations	464,293	464,633	464,908	464,589
R-squared	0.731	0.731	0.733	0.734
<i>Panel B: Bonds held within hedged books</i>				
Log HF Intensity $\times$ Shock	0.061 (0.054)	0.050** (0.023)	0.034** (0.017)	0.044 (0.060)
Log HF Intensity	-0.017 (0.017)	-0.015 (0.017)	-0.016 (0.017)	-0.017 (0.017)
Observations	464,334	464,767	464,904	464,441
R-squared	0.731	0.731	0.731	0.732
Bond FE	Yes	Yes	Yes	Yes
Duration $\times$ Date $\times$ Country FE	Yes	Yes	Yes	Yes
Bid-Ask Spread and CTD Controls	Yes	Yes	Yes	Yes

Notes: The dependent variable is the daily change in bond yield (bps). Each column re-estimates the intensity regression of Table VIII on one cell. *Net long* and *Net short* refer to the sign of the hedge fund sectors net position in the bond, and the constraining and relaxing regimes are defined as in Table VIII. Panel A restricts the hedge fund bond-days on shock days to bonds held within directional books and Panel B to bonds held within hedged books, split at the median of holder directionality as in Table X. All non-shock days and all bond-days with zero hedge fund intensity are included in every column as the within-bond baseline. The Shock main effect is absorbed by the fixed effects. Standard errors are clustered by business date and bond. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Sample period: 2021-01-01 – 2025-11-01

A17. Exceedance probability of CDS shocks

Figure A7: Probability of the Yield Change exceeding a Threshold by Day Type



Notes: The figure plots the share of observations where the absolute daily yield change in Italian government bonds ($|\Delta y|$) is strictly larger than the threshold value displayed on the horizontal axis. The red line represents days with CDS shocks, while the gray line represents regular trading days. The shaded region between the curves highlights the excess tail risk generated by credit shocks.

Sample period: 2021-01-01 – 2025-11-01

A18. Orthogonality of hedge fund positioning to the credit shock

Table A15 repeats the orthogonality test of Section A6 for the sovereign credit shock. It tests whether pre-existing hedge fund positioning is correlated with the realized credit shock through a common latent factor such as a shared macroeconomic outlook. As in the corresponding test for monetary surprises, the test is by construction based on the number of shock events in the sample, but the estimated relationship is economically negligible, explains essentially none of the variation in the shock, and is not statistically distinguishable from zero ($p = 0.77$). This supports the identifying assumption that pre-existing positioning is orthogonal to the realized credit shock.

Table A15: Pre-existing Positioning and the Credit Shock

Dependent Variable:	Credit Shock (bps)
	(1)
Lagged Aggregate HF Net Position	0.034 (0.118)
Constant	−0.374 (2.578)
Observations	38
R-squared	0.002

Notes: This table reports the orthogonality test of hedge fund positioning against the realized credit shock. The dependent variable is the residualized change in the five-year US dollar Italian sovereign CDS spread on credit shock days. *Lagged Aggregate HF Net Position* is the sum of Cayman-domiciled hedge fund net repo positions across all bonds on the trading day before each credit shock. Robust standard errors are reported in parentheses.

Sample period: 2021-01-01 – 2025-11-01