ACTIVE AND TOTAL REACHING FOR YIELD

RISK-TAKING IN INVESTMENT GRADE CORPORATE BOND MUTUAL FUNDS

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Abstract:

The tendency of increasing the riskiness of one's investment when interest rates drop is referred to as "reaching for yield". We study this phenomenon among U.S. investment grade corporate bond mutual funds. While we do find evidence of an inverse relation between interest rates and portfolio riskiness, consistent with funds reaching for yield, we find no evidence of it being caused by active trading decisions made by the fund manager. We further examine if expense ratios pressure fund managers to reach for yield in times of low or decreasing interest rates, to maintain a positive net return. Our analysis reveals a positive relationship between expense ratios and reaching for yield, but no evidence of expense ratios moderating how fund managers react to interest rates for the full time period. However, there is evidence of funds with higher expense ratios reaching for yield more in response to interest rate drops during 2019-2021, a period ridden by decreasing and later near-zero interest rates. There are no major differences between retail and non-retail funds or between index and non-index funds, with regards to reaching for yield.

Keywords:

Reaching for yield, Corporate bond mutual funds, Interest rates, Expense ratio, Risk-taking

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1. Introduction

Fixed income markets went through a tumultuous period between 2018–2024. Interest rates fell rapidly as COVID-19 hit the world, only to rise quickly following the Russian invasion of Ukraine. This period of drastic changes stands in sharp contrast to the previous decade, during which interest rates remained at unprecedented low levels. While the low interest rate regime was deemed necessary, policy makers worried that it could undermine financial stability, due to incentivizing investors and portfolio managers who are dissatisfied with low returns to take on excessive risk, in an attempt to "reach for yield" (Bernanke, 2013a; Bernanke 2013b; Stein, 2013). Empirical evidence provides support to the concern that there is a relationship between risk-taking and interest rates. For instance, Dell'Ariccia et al. (2017) find evidence that the riskiness of new loans issued by banks increase as interest rates drop.

We refer to the phenomenon of increasing the riskiness of one's investments when interest rates drop as reaching for yield (henceforth RFY). Previous literature has documented RFY due to institutional frictions among a multitude of investors, such as insurance companies (Becker and Ivashina, 2015) and U.S. pension funds (Andonov et al., 2017). Evidence of RFY among retail investors, for whom institutional frictions are absent, has also been documented (Gomes et al., 2025; Lian et al., 2019). Consistent with retail investors' desire for RFY, Choi and Kronlund (2018) find that corporate bond mutual funds do RFY and that doing so attracts higher capital inflows. However, prior literature has not examined whether the relationship between RFY and interest rates found in mutual funds is caused by managers' active trading or market-wide patterns outside of the manager's control.

In this paper, we further examine the existence and determinants of RFY in U.S. investment grade corporate bond mutual funds. We largely follow the method used by Choi and Kronlund (2018), measuring RFY as the value weighted average deviation of the bid yields of all corporate bonds held by a fund, from maturity and coupon frequency matched Treasuries. Our study contributes to the identified research gap by studying both the total level of RFY (RFY^{Total}) and the active change in RFY (RFY^{Active}), allowing us to examine to what extent RFY is driven by active portfolio reallocation. The decomposition is based on the method used by Gomes et al. (2025). This empirical design allows us to examine whether corporate bond mutual funds RFY and what mechanisms drive this behaviour, but also to what extent RFY is caused by active portfolio rebalancing performed by the fund manager. If RFY^{Total} moves with interest rates, even when RFY^{Active} does not, it indicates that RFY^{Total} is driven by market-wide patterns outside of the fund manager's control.

If corporate bond mutual funds engage in RFY, we expect both RFY^{Total} and RFY^{Active} to be inversely related to the interest rate level and change respectively. We find that there indeed is a negative relationship between RFY^{Total} and the interest rate level. This implies that corporate bond mutual funds do increase the riskiness of their holdings as interest rates fall, which is in line with the findings in prior literature (Choi and Kronlund, 2018; Di Maggio and Kacperczyk, 2017). However, neither the interest rate level, nor the change in the interest rate level is negatively related to RFY^{Active}. In fact, there is a somewhat significant positive relationship between the interest rate change and RFY^{Active}. This pattern holds even when we limit the sample to only non-index funds or retail funds. The stark contrast between the findings for our two measures of RFY suggest that the identified relationship between RFY^{Total} and the interest rate level is not necessarily driven by active trading decisions made by the fund manager, but may reflect market-wide price or spread movements.

Prior literature has also documented a relationship between expense ratios and RFY. During the unprecedentedly low interest rate following the 2008 financial crisis, money market funds had their returns net of fees squeezed by the compressed fixed income returns, leading to them reducing fees and RFY in order to maintain positive net returns (Di Maggio and Kacperczyk, 2017). Similarly, Chodorow-Reich (2014) finds that high-cost money market funds took on more risk when interest rates fell post financial crisis, in an attempt to generate higher returns. The relationship between expense ratios and corporate bond mutual funds is not as extensively studied. That said, Choi and Kronlund (2018) find a similar pressure of low interest rates on expense ratios, which results in corporate bond funds being more likely to decrease their fees when interest rates are low. Furthermore, when using expense ratio as a control variable, they find a strong positive relationship between expense ratios and RFY. Our paper contributes to the understanding of how expense ratios impact corporate bond mutual funds' behaviour, by studying whether expense ratios moderate the relationship between the interest rate and RFY, such that more expensive funds engage more in RFY.

Consistent with our expectations and prior literature, we document a positive relationship between expense ratios and RFY^{Total}. We find no relation between expense ratios and RFY^{Active}, which is in line with our expectations as we do not expect more expensive funds to continuously increase the riskiness of their holdings. Furthermore, our regressions show no significant interaction effects between the expense ratio and the interest rate. Considering this, a more cautious interpretation of the relationship between expense ratio and RFY^{Total} is that funds with higher expense ratios may always hold corporate bonds with higher yields, rather than a fee pressure resulting in increased sensitivity to the interest rate, as there is a lack of evidence that they actively reallocate their portfolio in response to changes in interest rate level.

A potential concern with our method is that RFY could also be caused by the fund managers' skill in identifying underpriced bonds, due to the negative relationship between bond prices and bond yields. If higher expense ratios are associated with superior security selection skills, the identified relationship between RFY and expense ratios could be due to high-cost funds' superior ability to identify underpriced bonds, resulting in a higher portfolio yield. Similarly, if low interest rates systematically create more opportunities to find mispriced corporate bonds, our measure may misclassify better funds as more risk-taking. However, there is no evidence of RFY indicating superior performance. On the contrary, Choi and Kronlund (2018) find that the risk-adjusted performance of high-RFY investment grade corporate bond mutual funds, measured as alpha, is negative. Despite this, investors continue to attempt RFY. Having documented our main findings, we now turn to a discussion of these mechanisms.

One mechanism that can explain RFY among corporate bond mutual funds is that funds that engage in it receive higher inflows, independent of returns (Choi and Kronlund 2018). This indicates that investors have a higher demand for riskier assets when interest rates drop. When investors RFY by investing in corporate bond mutual funds, they prefer to do so by increasing their interest rate exposure, rather than taking on credit risk, resulting in greater inflows to investment grade funds as interest rates fall (Huang et al., 2025). An experimental study has found two behavioural explanations as to why retail investors' appetite for risk increases as interest rates fall. One of them is reference dependency: Investors may form a reference point based on past returns, when interest rates drop below this level investors feel that returns are too low and increase the riskiness of their holdings, to maintain returns at the level they are used to. The second is salience: investors tend to compare returns by proportions rather than differences. Thus, a 6% risky return relative to a 1% risk free return is deemed more attractive than a 10% risky return relative to a 5% risk free return, resulting in risky assets appearing attractive during times of low interest rates (Lian et al. 2019).

Another channel of mechanisms is a principal-agent problem, in which mutual fund managers increase the riskiness of their holdings during times of low interest rates, to forward their own interests. Prior studies on money market funds have shown that managers increase the riskiness of their holdings to maintain a positive net return when low interest rates pressure the net return of a fund towards zero (Di Maggio and Kacperczyk, 2017; Chodorow-Reich 2014). Furthermore, when liquidity in the corporate bond market is high, the corporate bond mutual funds that have performed the worst during the first three quarters tend to RFY more, in an attempt to improve their end-year rating (Choi and Kronlund, 2018).

Next, we perform a subsample analysis to examine whether the lack of significant relationships between the interest rate and RFY^{Active}, as well as the lack of significant interaction terms between the expense ratio and interest rate, is because no such relationship exists or if it only exists for certain funds or during certain time periods. We divide our full sample into index and non-index funds. There are two reasons for this division. The first is mechanical, index funds aim to track the performance of an index, by holding securities as similar as possible to those held by the index. This leaves less room to RFY by adjusting the riskiness of their holdings to the current interest rate level or changes in the interest rate. The second reason is that investor expectations and fund incentives might differ between index and non-index funds. Choi et al. (2026) finds that investors in passive bond funds appear insensitive to the excess return of a fund compared to its benchmark, and that passive bond funds are incentivized to keep costs low, as flows are sensitive to the expense ratio. Actively rebalancing the portfolio to RFY, by increasing the riskiness as interest rates drop, would incur substantial transaction costs. If passive fund flows do not respond to the additional return, but negatively respond to the additional costs, they would have weak or non-existent incentives to RFY.

Our regressions reveal that index funds exhibit the same negative relationship between the interest rate level and RFY^{Total} as the full sample. This could be interpreted as evidence that the relationship is caused by a systematic negative relationship between our measure of RFY^{Total} and the interest rate level, rather than active security selection performed by the manager, and that RFY^{Active} is the cleaner measure of active manager behaviour. However, this conclusion assumes that index funds do not engage in security selection. Choi et al. (2026) find that passive funds in the bond market to a large extent behave as active funds, thus we must interpret these results with caution. When studying the effect of expense ratios on RFY, we find a somewhat significant and negative interaction between the interest rate level and expense ratio on RFY^{Total} in the non-index fund sample. The index fund subsample has no such relationship. A potential explanation for the difference between the subsamples could be that investors in non-index and index funds evaluate funds based on different criteria, with index fund investors caring more about index tracking and low fees, rather than net returns.

The next part of our subsample analysis focuses on retail and non-retail funds. If the principal-agent problem is a driving mechanism for RFY, it would imply that when investors' ability to monitor the behaviour and performance of the fund manager, RFY should decrease. On average, institutional investors are likely to be more sophisticated than retail investors and exhibit a greater ability to monitor a fund manager's behaviour and performance. A study by Evans and Fahlenbrach (2012) found that the presence of institutional investors reduced agency problems between fund managers and investors. Furthermore, retail and non-retail funds might face different incentives. Investors in retail funds tend to invest disproportionately more in the best performers, while institutional fund investors have a significantly stronger tendency to divest from the worst performers (Elias et al., 2017). Thus, retail fund managers have an incentive to take on excess risk to achieve higher returns and attract greater flows. Non-retail fund managers on the other hand, have a weaker incentive to take on excessive risk, as the upside is not as rewarding, but the consequences of being one of the worst performers is worse. Consistent with this, Choi and Kronlund (2018) find that RFY attracts higher inflows for retail funds in contrast to non-retail funds, creating a stronger incentive for retail fund managers to take on excess risk.

Contrary to a principal-agent channel driving RFY, we find no substantial differences between retail and non-retail funds, except for a negative relation between the expense ratio and RFY^{Total} for retail funds. There are several potential explanations for the lack of differences between retail and non-retail funds. It could be that both subsamples behave similarly with regards to RFY. Another possibility is that the small sample of retail funds over the time period of our study reduces the statistical power of our tests, obscuring any potential differences.

In the final part of our subsample analysis, we focus on time periods. In absence of institutional frictions and principal-agent problems, retail investors increase the riskiness of their portfolio as interest rates fall (Gomes et al., 2025). This behaviour does not seem to be unique for uneducated investors and does not appear to diminish with wealth or investment experience. Lian et. al (2019) document significant RFY behaviour among financially educated investors. These findings indicate that RFY, apart from a result of institutional frictions, also is a behavioural response from investors to changing interest rates. As outlined above, a potential mechanism behind this behavioural response is reference dependency, which implies that RFY is not primarily caused by low interest rates in isolation, but rather by interest rates falling below what investors are used to. The previously documented existence of RFY in corporate bond mutual funds occurred between 2002 and 2012, a time period when interest rates in general were lower than during the previous period (Choi and Kronlund, 2018). Our time period differs substantially in that it follows a decade of unprecedented low interest rates, post the 2008 financial crisis. It is therefore possible that investors were content with the returns at all interest rate levels above their reference point formed by the historically low interest rates, resulting in a lower incentive for funds to RFY.

Furthermore, it is not necessarily the case that the relationship between corporate bond mutual fund managers' risk-taking, and interest rates is consistent across all levels of interest rates. When interest rates are high, a drop does not necessarily put pressure on the fund manager to RFY, if the return remains above previous returns and with a healthy margin to the expense ratio. For instance, when the one-year Treasury yield fell from 5.06% to 4.64% during March 2023, the yield remained one of the highest recorded in the 21st century, significantly above the one-year treasury yield of 1.63% recorded one year before. Without adjusting the riskiness of their portfolio, fund managers could deliver higher yields than previous years and had a significant margin to their expense ratio. Prior literature has not examined whether corporate bond mutual funds exhibit different risk-taking behaviours across different interest rates regimes. However, Di Maggio and Kacperczyk (2017) find that money market mutual funds adjust the riskiness of their holdings in response to changes in the FED target rate when it is below 1%, but find no significant effect when it is above 1%.

Additionally, the relationship between risk-taking and changes in the interest rate might differ depending on whether rates are falling or rising. When rates are decreasing, fund managers have an incentive to RFY to deliver returns in line with historical returns and maintain the margin between their yield and expense ratio. However, it is less clear that fund managers have an incentive to decrease risk-taking and reduce yields in times of rising interest rates.

Unexpectedly, we find a positive relationship between the interest rate level and RFY^{Total} for 2019–2021, when interest rates were low and falling. We also find significant negative interaction effects between the expense ratio and the level of or change in the interest rate, on both RFY^{Total} and RFY^{Active}. For the period 2018 and 2022–2024, results are consistent with those for the full sample. This implies that when the margin between interest rates and expense ratios is low and decreasing, expensive funds become more sensitive to interest rate changes and are pressured to take on more risk to deliver a positive return net of fees.

This paper contributes to the growing literature on RFY in delegated investment management. Becker and Ivashina (2015) show a propensity among insurance companies to invest in higher yielding corporate bonds within a given rating, due to regulatory frictions. Similarly, Di Maggio and Kacperczyk (2017) find that the prolonged period of a zero-rate policy pressured money market funds to increase the riskiness of their holdings. Our paper explores RFY in a less regulated environment, where institutional frictions are not a key driver. Specifically, we study the existence and determinants of RFY among U.S. investment grade corporate bond mutual funds. Our paper is closely related to Choi and Kronlund (2018), who study RFY among U.S. corporate bond mutual funds. They find evidence of funds RFY and that this attracts greater capital inflows, especially in times of low interest rates. The key innovation of our paper is that we distinguish between active and total RFY, allowing us to examine whether the relationship between interest rate and RFY is caused by active trading decisions or market-wide movements. This decomposition of total RFY builds upon the method used by Gomes et al. (2025), who find that Chinese retail investors invest more in risky assets as interest rates drop.

We also contribute to the literature on the relationship between RFY and expense ratios, by studying whether higher expense ratios pressures fund managers to RFY. Di Maggio and Kacperczyk (2017) show that in times of low interest rates money market funds are more likely to decrease their charged fees and increase the riskiness of their holdings, in an attempt to maintain nonnegative net returns. Similarly, Chodorow-Reich (2014) finds that in 2009–2011 the low interest rate resulted in high-cost money market funds accepting a greater risk in pursuit of higher yields. We extend upon the existing literature by examining whether a similar fee pressure exists for investment grade corporate bond mutual funds, who invest in higher yielding securities than money market funds.

2. Data

To construct a portfolio level measure of RFY we combine data sets from multiple databases. Portfolio holdings and characteristics, as well as bond maturities are obtained from CRSP, while LSEG Workspace (formerly Eikon) is used to obtain other individual security data, including bid yields, bid prices, issuer classification and asset classification. Macroeconomic variables such as Treasury yields and measures of investment grade bond premiums are retrieved from the Federal Reserve Economic Data (FRED) database. Svensson yield parameters, which are used to construct benchmark yields, are sourced from the Board of Governors of the Federal Reserve System's nominal yield curve data.

2.1 Mutual Funds & Holdings Data

We first retrieve quarterly updated portfolio holdings data between Q4 2017 and Q4 2024 from the CRSP Survivor-Bias-Free Mutual Fund database. The data is then limited to only include portfolios classified as investment grade corporate bond funds, belonging to the Lipper categories A or BBB. We only include quarterly reports to avoid more frequently reporting portfolios biasing the sample. This data includes all securities held by the portfolio at a specific point in time, the security identifier (Cusip8) and maturity.

Furthermore, we obtain portfolio level data – Total Net Assets (TNA), fund age, expense ratio, percentage of cash and government issued securities of TNA, index and retail fund classifications – from CRSP. The same portfolio can be held by multiple funds; thus, we perform all analysis at the portfolio level to avoid portfolios with more share classes biasing the sample. All variables that can vary between funds are calculated as the asset weighted average of all funds associated with the portfolio.

2.2 Corporate Bond Data

The remaining security level data is obtained through LSEG Workspace. We first retrieve issuer classification, fixed income asset classification and asset status. Since our analysis is limited to risk-taking within the corporate bond holdings of portfolios, we remove all securities that are not classified as issued by a corporation, and all securities not belonging to fixed income classes flagged as straight bonds. Following the classification used by Choi and Kronlund (2018), we treat certificates of deposits and commercial papers as cash rather than corporate bonds, thus removing them. Furthermore, bond observations within 30 days of the bond becoming expired, repaid early or defaulted are removed as bid yields in this period may become distorted and not representative of the bonds underlying risk. Finally, we retrieve coupon frequency and compounding convention for all bonds.

For all corporate bonds, we retrieve bid yields and bid prices from LSEG Pricing Service (formerly known as Refinitiv Pricing Service and Thomson Reuters Pricing Service), in accordance with Choi and Kronlund (2018). Other papers often rely on transaction-based databases, such as Trade Reporting and Compliance Engine (TRACE) (see e.g. Becker and Ivashina, 2015). We do not use this approach as these databases are limited to a smaller subset of corporate bonds due to focusing on reported transactions in a relatively illiquid market. The potential downside is that bid prices can become stale and noninformative over time. However, Choi and Richardson (2016) have shown that the two approaches report similar prices, indicating that our chosen method will not distort our final results.

By nature, bid prices will be lower than transaction prices, resulting in bid yields exceeding transaction yields. Since we compare corporate bond bid yields with modeled treasury yields, there is a risk of a slight systematical overestimation of the difference in yields. However, as this method is applied consistently across all bonds it should preserve the relative differences and we believe the effect on our results to be marginal.

3. Method & Variable Construction

In our empirical tests, we aim to identify the relationship between interest rates and corporate bond mutual fund risk-taking. To do so, we construct a measure of total RFY and then decompose it into active RFY. Our method to measure total RFY builds upon the method introduced by Choi and Kronlund (2018), while the decomposition into active RFY builds upon the method used by Gomes et al. (2025).

3.1 Total Reaching for Yield

Our measure of total RFY in a portfolio is the value weighted average of the RFY of the individual corporate bonds held in the portfolio. For an individual bond, RFY is defined as the spread between its bid yield and the yield of a maturity matched Treasury. For an individual corporate bond *i* at time *t*, with maturity *T* and coupon frequency *f*, we define RFY as:

$$RFY_{i,t,T,f} = Bid\ yield_{i,t} - Treasury\ yield_{t,T,f} \tag{1}$$

where $Bid\ yield_{i,t}$ is the last reported bid yield, and the Treasury yield is a maturity-matched U.S. Treasury yield modeled based on Svensson parameters, the construction of which is described in section 3.3. Both yields are measured at time *t* and expressed using a standard bond market semi-annual compounding convention. Prior to this calculation bid yields are winsorized at the 1% level, to reduce the sensitivity of the portfolio measure to extreme outliers.

For a portfolio at time *t*, RFY^{Total} is calculated as:

$$RFY^{Total} = \sum_i w_{i,t} \cdot \left(Bid\ yield_{i,t} - Treasury\ yield_{t,T,f}\right) = \sum_i w_{i,t} \cdot RFY_{i,t} \tag{2}$$

where $w_{i,t}$ is the percentage of Total Net Assets invested in corporate bonds allocated to bond *i* at time *t*.

Given this definition, RFY^{Total} reflects only the riskiness of a portfolio's corporate bond holdings, rather than total portfolio riskiness. Although all portfolios are classified as investment grade corporate bond funds, they could differ in their allocations to non-corporate bond assets. For example, a portfolio may hold relatively risky corporate bonds, but offset some of this risk by maintaining a relatively larger buffer of cash and Treasuries. In such cases, our measure of total RFY will overstate the riskiness of the portfolio. However, prior literature has not identified any such offsetting behaviour. In fact, Choi and Kronlund (2018) find a significant negative relationship between the share invested in cash and Treasuries and RFY, as well as a significant positive relationship between the share invested in equities and RFY. This indicates that RFY is an economically meaningful measure of portfolio risk-taking, as it is positively associated with investments in riskier asset classes and not systematically offset by larger allocations to safe asset classes.

There is no single standard method to measure RFY. Our definition of total RFY builds on the method introduced by Choi and Kronlund (2018), but it differs in the choice of the benchmark yield which bond bid yields are compared to. We compare bid yields to a maturity-matched Treasury yield, while Choi and Kronlund (2018) construct a benchmark yield based on all bonds in the FISD database that satisfy the requirements for inclusion in a Barclays bond index (investment grade or high yield, based on the individual bond grade). In an additional decomposition they also control for rating and maturity by comparing the bond bid yield to that of bonds with a similar rating and maturity.

Using a maturity-matched Treasury yield as the benchmark yield allows us to control for the maturity component of risk. While this approach does not explicitly control for rating, our sample only consisting of investment grade corporate bond mutual funds limits differences in ratings compared to the broader sample used by Choi and Kronlund (2018), who study all bond funds that hold at least one corporate bond, including high yield funds.

More broadly, our definition of RFY captures excess yield against a risk-free investment with the same maturity, whereas Choi and Kronlund's (2018) definition captures excess yield against a bond index of the same rating and maturity. However, since we are primarily interested in changes over time and within funds, we expect both measures to exhibit similar patterns. Furthermore, not controlling for rating allows us to construct a measure which examines the total riskiness of a portfolio's bond holdings, also capturing a movement from higher grade bonds to lower grade bonds in an attempt to reach for yield.

3.2 Active Reaching for Yield

A further detail that must be taken into consideration is the active rebalancing in portfolio holdings between quarters. As bond prices and yields move in opposite directions, an increase in total RFY can be caused by an active decision to increase the riskiness of the portfolio, or falling bond prices. To isolate the effect of a portfolio manager's active trading decisions, we decompose total RFY and calculate active RFY. Following the method used by Gomes et al. (2025), we compute a counterfactual measure of total RFY, under the assumption that no trades occurred between the previous quarter *t-1* and current quarter *t*. For a portfolio held at time *t*, the counterfactual RFY is defined as:

$$RFY^{CF}{}_t = \sum_i w_{i,t}^{CF} \cdot (Bid\ yield_{i,t} - Treasury\ yield_{t,T}) = \sum_i w_{i,t}^{CF} \cdot RFY_{i,t}$$

where $w_{i,t}^{CF}$ denotes the counterfactual portfolio weight of bond *i* at time *t*, defined as the weight the bond would have had, had the portfolio not made any changes to its holdings since the previous quarter *t-1*.

$$w_{i,t}^{CF} = \frac{Q_{i,t-1} \cdot Bid\ price_t}{\sum_i Q_{i,t-1} \cdot Bid\ price_t}$$

where $Q_{i,t-1}$ denotes the quantity, measured as the total face value, of the bond *i* held at time *t-1*, and $bid\ price_t$ denotes the bond's price, expressed as a percentage of face value, at time *t*.

To ensure consistency, we apply the same data cleaning procedure as described in section 3.1, winsorizing bid yields at the 1% level. Any observations within 30 days of a bond becoming expired, repaid early or defaulted are disregarded, as their yields risk becoming disconnected from the underlying risk.

Finally, we can compute the active change in RFY as:

$$RFY^{Active} = RFY^{Total} - RFY^{CF} \tag{3}$$

This definition allows us to isolate the component of RFY that is intentional and due to active trading since the last quarter, from changes in RFY due to price movements of bonds already held by the portfolio.

3.3 Benchmark Yield

When calculating RFY for an individual bond we isolate the yield component attributable to risk-taking, by constructing a benchmark yield with as similar characteristics as possible to each corporate bond, but free of credit risk. We specifically use the Svensson (1994) nominal yield curve model, based on daily parameter estimates published by the Federal Reserve (Gürkaynak et al., 2007).

The main advantage of using the Svensson nominal yield curve model is that for a corporate bond *i* at time *t*, with maturity *T* and coupon frequency *f*, we can construct the yield of a U.S. Treasury with matching maturity and coupon frequency. Relying on yields from traded U.S. Treasuries would restrict us to available maturities, which would introduce interpolation errors. This is a large concern for maturities exceeding 30 years, as the U.S. Treasury does not issue securities with maturities beyond this horizon. Since corporate bonds occasionally trade at these maturities, relying on observed Treasury yields is not ideal. Conversely, the Svensson model can be applied to any maturity, including those exceeding 30 years.

In the Svensson (1994) model the continuously compounded yield of a zero-coupon U.S. Treasury with maturity *T* is given by:

$$y_t(T) = \beta_0 + \beta_1 \frac{1 - exp(-\frac{T}{\tau_1})}{\frac{T}{\tau_1}} + \beta_2 \left[\frac{1 - exp(-\frac{T}{\tau_1})}{\frac{T}{\tau_1}} - exp(-\frac{T}{\tau_1})\right] + \beta_3 \left[\frac{1 - exp(-\frac{T}{\tau_2})}{\frac{T}{\tau_2}} - exp(-\frac{T}{\tau_2})\right] \quad (4)$$

where β_0, β_1, β_2, β_3, τ_1, and τ_2 are the Svensson model parameters, as estimated by the Federal Reserve. From this, one can then derive the discount factor for maturity *T*:

$$d(T) = e^{-y(T) \cdot T}$$

For all zero-coupon and stripped corporate bonds, the zero-coupon yield from equation (4), converted to a semi-annual compounding convention, is the benchmark yield used in equation (1).

For coupon bearing bonds a par yield must be constructed. Due to data availability, the par yield cannot be constructed using the exact cash flow timeline. Instead, we assume that for a corporate bond *i* at time *t,* with coupon frequency *f* (defined as coupons per year) a coupon is paid at maturity and then at equal intervals of 1/*f* years, working backwards towards time *t.* The first period is a stub period and can be shorter than 1/*f*, if *T* is not a perfect multiple of 1/*f.* In such cases, the first coupon payment is scaled proportionally to the length of the stub period. Formally, the coupon payments occur at times times $t_1, t_2, t_3... t_n$ where $t_n = T$.

The par yield is defined as the coupon rate at which a hypothetical Treasury would trade at par (Gürkaynak et al., 2007). For a given bond *i* with maturity *T* and coupon frequency *f*, it is given by:

$$y_{par\ yield}(f,T) = \frac{f \cdot [1 - d_{zero\ coupon}(T)]}{\sum_i d_{zero\ coupon}(t_i) \cdot \Delta t_i \cdot f} \tag{5}$$

where $\Delta t_i = t_i - t_{i-1}$ is the length of the i:th coupon period, which is $1/f$ for all periods except the stub period. $d_{zero\ coupon}(t_i)$ is the discount factor for maturity t_i.

For all coupon bearing bonds, the par yield from equation (5), converted to a semi-annual compounding convention, is the benchmark yield used in equation (1).

3.4 Interest Rate Variables Construction

Interest rates are the primary explanatory variables in our analysis of RFY. Given that our sample consists of U.S. corporate bond mutual funds, we use U.S. Treasury yields as our proxy for the *interest rate level*, consistent with common practice in literature. In line with Choi and Kronlund (2018), we use the one-year Treasury market yield, retrieved from the FRED.

When studying active RFY, the *interest rate level* is not expected to be the primary explanatory variable. If rates remain persistently low for an extended period of time, as they did following the 2008 financial crisis, corporate bond mutual funds are not expected to continuously increase the riskiness of their holdings in every period. Active RFY is primarily expected to respond to changes in the interest rate, as funds adjust the riskiness of their portfolios in response to the new rate environment. Thus, we regress active RFY at time *t* on the change in the interest rate level, following the method used by Gomes et al. (2025).

We define the *interest rate change* as the difference in the *interest rate level* between the current quarter *t* and the previous quarter *t-1*. However, as both the trading that results in active RFY and the change in *interest rate level* occur within the same period, identifying causality may be difficult. A fund taking on more risk before interest rates are lowered can be misinterpreted as the fund reallocating its portfolio in response to the interest rate change. To mitigate this concern, we regress active RFY at time *t* on the change in the *interest rate level* between the quarters *t-1* and *t-2*. This lagged definition provides a cleaner interpretation of how funds respond to changes in interest rates. Furthermore, given the illiquid nature of corporate bonds, there is likely to be a lag between changes in the interest rate and portfolio adjustments, better captured by the lagged definition.

3.5 Other Explanatory Variables

As time fixed effects would absorb the interest rate variation of interest, we instead control for differences in the macroeconomic environment through other variables. Similarly, when examining the effect of expense ratios on RFY we control for fund differences through various fund-level control variables. The selection of both macroeconomic and fund level variables largely follows Choi and Kronlund (2018).

We control for the market's sentiment regarding future economic outcomes, proxied by the slope of the yield curve. Following the method used by Choi and Kronlund (2018) we define the *yield slope* as the difference in market yields between thirty-year and one-year U.S. Treasuries. We also control for bond market illiquidity, proxied by the Volatility Index (VIX), from the Chicago Board Options Exchange (CBOE). This is an established proxy for bond market illiquidity and has a strong positive correlation with other illiquidity measures such as the Dick-Nielsen, Feldhutter, and Lando Index (DFL Index) used by Choi and Kronlund (2018) (Goldstein et al., 2017). Some regressions include *bond premium*, defined as the extra yield required by investors to hold investment grade corporate debt. This is proxied by the ICE BofA U.S. Corporate Index Option-Adjusted Spread data, which measures the spread between an index of investment grade rated corporate debt publicly issued in the U.S. domestic market, and a Treasury yield curve. All macroeconomic data are obtained from FRED.

The main fund-level variable of interest is the *expense ratio*. Since it can vary between share classes associated with a portfolio, it is calculated as the Total Net Asset weighted average of the expense ratios of all funds associated with the portfolio. Waivers and reimbursements are included in the *expense ratio*. To avoid any lookahead bias, we use the expense ratio as of the most recently completed fiscal year end.

We also include other fund-level characteristics that could be associated with a fund's degree of risk-taking. Younger funds could be incentivized to RFY, as they have less built-up reputational capital to lose in case the strategy backfires and leads to poor performance (Choi and Kronlund, 2018). Therefore, we control for *Fund Age*, measured as the log age of the earliest fund offering associated with the portfolio. We also control for *Fund Size*, measured as the log of Total Net Assets (expressed in million USD), and *Fund Style,* proxied by the Lipper code. Finally, we include the *Safe Asset Share*, which is the percentage of Total Net Assets invested in government securities and cash. This reflects the idea that holding a liquidity buffer of safe assets may influence a fund's risk-taking behaviour. All fund-level variables are obtained from CRSP.

4. Testable Predictions

In this section we present the testable predictions that will guide our empirical analysis. The most fundamental prediction is that interest rates are inversely related to the riskiness of corporate bond mutual funds' holdings. We therefore expect a significant negative relationship between the *interest rate level* and RFY^{Total}. However, we do not expect *interest rate level* to predict RFY^{Active}, since that would imply that funds continuously increase the riskiness of their holdings during prolonged periods of low interest rates. Instead, we expect funds to adjust the riskiness of their holdings in response to changes in the interest rate. If decreasing interest rates induce fund managers to actively RFY, we should see a negative relation between *change in interest rate* and RFY^{Active}. If RFY^{Total} does not reflect active trading decisions, but rather market-wide spread movements or benchmark exposure, RFY^{Total} may move with interest rates, even when RFY^{Active} does not.

When it comes to expense ratios, the most fundamental prediction is that more expensive funds will engage more in RFY, such that there is a negative relation between *expense ratio* and RFY^{Total}. However, we do not expect this relationship to exist for RFY^{Active}, since it is a measure of how risk-taking changes within a fund. If expense ratios moderate the relationship between interest rates and risk-taking, such that more expensive funds have a stronger pressure to RFY when interest rates are low, there should be a significant negative interaction effect between *expense ratio* and the *interest rate level* on RFY^{Total}. Similarly, the interaction between *expense ratio* and *change in interest rate* should be negatively related to RFY^{Active}, if the most expensive funds face a stronger pressure to RFY when interest rates are falling.

When splitting our sample into subsamples, we predict non-index funds to act in accordance with the predictions for the full sample. We expect the results to be weaker for index funds, as they might face lower incentives to RFY, if they are evaluated based on costs and index tracking performance rather than returns. Similarly, if RFY is partially explained as a principal-agent problem, we expect retail funds to conduct more RFY than non-retail funds whose investors have a stronger monitoring ability. Finally, when splitting our sample based on time, we expect to find stronger evidence of the expense ratio-pressure channel resulting in RFY during 2019–2021, when interest rates were low and falling towards the level of corporate bond mutual funds' expense ratios. If reference dependency is a mechanism that drives RFY, we also expect stronger evidence of RFY in the 2019–2021 subsample.

5. Results & Discussion

5.1 Summary Statistics

In Table 1 we present summary statistics for our final merged sample, which post cleaning consist of 201 unique funds over 28 quarters, and a total of 3867 unique fund-quarter observations. The difference in number of observations between RFY^{Total} and RFY^{Active} is due to data availability, as we are unable to construct a measure of RFY^{CF} for the following quarter $t+1$ when CRSP does not cover a fund's holding for quarter t, resulting in two lost observations of RFY^{Active} (t and $t+1$). Although we are not able to construct RFY^{Total} for quarter t, the variable is observable for the following quarter $t+1$, explaining the slight difference in sample size.

In terms of holdings, our funds mainly invest in corporate bonds, making up 75.5% of their assets on average (median 89.0%), showcasing the novelty of our sample compared to prior literature, as it is more narrowly focused on corporate bond mutual funds. Specifically, the average weight in corporate bonds in our sample is approximately 30 percentage points (p.p.) higher than the one used by Choi and Kronlund (2018), and roughly 40 p.p. higher than in their investment grade subsample. This allows us to more closely approximate the total risk-taking in a fund by studying only the corporate bond holdings, since they allocate less of their portfolio to other asset classes, limiting their ability to either offset or increase the risk elsewhere in the portfolio. Despite limiting the sample to investment grade corporate bond mutual funds, there are still some funds that only allocate 10% of their assets to corporate bonds. This is a result of corporate bond funds having lenient investment mandates. However, more than 75% of our observations are of portfolios with a majority of their assets invested in corporate bonds, which along with the high mean and median limits the impact of portfolios with a low corporate bond allocation on our final results. The lenient investment mandate is also seen in the variation in allocations to other asset classes.

There is a noteworthy variation in RFY^{Total} across our sample, with an interquartile range of 1.06 to 1.69. On average, funds in our sample hold corporate bonds with an excess return of 1.45 p.p. compared to a risk-free investment. As for RFY^{Active}, we see not only a high variation, but also more than a quarter of our funds reporting negative numbers, meaning that they actively shift their portfolios to reduce risk-taking. Consistent with the nature of investment grade corporate bond mutual funds, the average expense ratio is low. However, there is a substantial variation between funds, with an interquartile range of 0.10 to 0.60.

In terms of macroeconomic variables, Table 1 showcases high variations, highlighting the tumultuous nature of our time period. The 1Y Treasury yield drops to almost 0% during the COVID-19 pandemic, to then recover to more than 5.4% towards the end of 2023.

Table 1

Summary statistics

	Mean	Sd	p1	p25	p50	p75	p99	N
A. Fund characteristics								
Total RFY	1.45	0.61	0.49	1.06	1.33	1.69	3.62	3,867
Active RFY	0.01	0.10	−0.24	−0.01	0.01	0.03	0.25	3,703
TNA ($M)	1,875	5,162	6	78	381	1,404	31,889	3,865
Age (years)	17.2	15.0	0.3	5.3	12.9	27.0	59.0	3,867
Expense ratio (%)	0.39	0.29	0.00	0.10	0.37	0.60	1.22	3,013
Cash (%)	0.3	12.7	−42.1	0.0	0.7	1.8	18.0	3,867
Government (%)	11.0	17.5	0.0	0.3	3.5	15.0	62.5	3,867
Municipal (%)	1.1	4.0	0.0	0.0	0.0	0.9	10.6	3,867
Corporate bonds (%)	75.5	26.5	10.0	52.4	89.0	96.9	99.8	3,867
Asset-backed (%)	3.2	6.5	0.0	0.0	0.0	2.0	27.0	3,867
Mortgage-backed (%)	5.4	11.1	0.0	0.0	0.0	2.8	40.4	3,867
Common stocks (%)	0.2	1.6	0.0	0.0	0.0	0.0	6.1	3,867
Preferred stocks (%)	0.5	2.0	0.0	0.0	0.0	0.1	10.2	3,867
Other equity (%)	0.1	0.3	0.0	0.0	0.0	0.0	1.2	3,867
Other (%)	0.7	10.5	−20.2	0.0	0.1	1.0	29.0	3,867
B. Macroeconomic variables								
1Y Treasury yield (%)	2.51	1.92	0.07	0.34	2.37	4.28	5.44	28
Change in 1Y yield	0.09	0.60	−1.34	−0.11	0.03	0.27	1.25	28
Yield slope	0.48	0.99	−1.39	−0.34	0.60	1.20	2.25	28
Bond premium	1.26	0.430	0.83	0.98	1.22	1.40	2.68	28
Market illiquidity	20.19	8.57	12.21	14.76	17.44	22.85	47.62	28

The sample consists of all investment grade corporate bond mutual funds in the CRSP Mutual Funds database. Investment grade is defined as belonging to the Lipper style codes A or BBB. The sample period is from Q1 2018 to Q4 2024. Observations are at the fund-quarter level and there are 201 unique funds over 28 periods. Panel A reports fund level characteristics. The measures of *Total RFY* and *Active RFY* are defined in equations (2) and (3) respectively. *TNA*, *age* and *expense ratio* are calculated based on data from CRSP. *Expense ratio* is the value weighted average of the expense ratio of all funds associated with a portfolio, as of the most recently completed fiscal year. *Cash*, *government*, *municipal*, *corporate bonds*, *asset-backed*, *mortgage-backed*, *common stocks*, *preferred stocks, other equity* and *other* are all defined as the percentage of a portfolio invested in that security class. All holdings data is sourced from CRSP. Panel B reports macroeconomic variables. *Change in 1Y yield* is defined as the change in the *1Y Treasury yield* over a quarter. *Yield slope* is computed as the difference in yield between the thirty-year and one-year Treasury. *Bond premium* is estimated by the ICE BofA U.S. Corporate Index Option-Adjusted Spread, *market illiquidity* by Volatility Index (VIX) from the Chicago Board Options Exchange (CBOE). All macroeconomic data is sourced from FRED.

Consequently, the change in interest rate spans from -1.34 p.p. to 1.25 p.p. The wide fluctuations in interest rate are expected to result in a time period with drastically changing pressure to RFY. The low interest rates in 2020 are likely to compress returns and provide a strong incentive to RFY, whereas the high interest rates in 2023 are likely to remove most incentives to RFY.

5.2 Reaching for Yield and the Macroeconomic Environment

To investigate the existence and extent of RFY in corporate bond mutual funds during the period March 2018 to December 2024, we first examine the relationship between macroeconomic factors and our measures of RFY^{Total} and RFY^{Active} in our full sample.

Table 2

Regression of RFY on macroeconomic variables

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	−0.132***	0.001		
	(0.030)	(0.003)		
Yield slope	−0.413***	0.004	0.003	0.004*
	(0.057)	(0.006)	(0.002)	(0.002)
Market illiquidity	0.046***	−0.001***	−0.001***	−0.001***
	(0.005)	(0.000)	(0.000)	(0.000)
Interest rate change			0.008**	
			(0.004)	
Lagged interest rate change				0.006*
				(0.003)
Fund FEs	Yes	Yes	Yes	Yes
R^2	0.844	0.200	0.203	0.201
N	3,863	3,701	3,701	3,701

This table presents regression estimates of RFY on macroeconomic variables. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions include fund fixed effects, to control for a changing fund population over time. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

If funds are RFY, we expect a significant negative relationship between the *interest rate level* and RFY^{Total}, as well as between *interest rate change* and RFY^{Active}. In Table 2, we regress RFY^{Total} on *interest rate level*, the *yield slope* of the term structure and *market illiquidity*. The choice of independent variables largely follows Choi and Kronlund (2018), except for our exclusion of credit spread as a control variable. For RFY^{Active}, we also examine the interest rate variables *interest rate change* and *lagged interest rate change* in separate regressions.

In line with our expectations, Column 1 of Table 2 shows that when interest rates are lower, corporate bond mutual funds reach more for yield. A 1 p.p. decrease in interest rates leads to funds increasing their RFY^{Total} by 0.132 p.p. This relationship is strongly significant, as is the negative relationship between the yield slope and RFY^{Total}. These findings are consistent with corporate bond mutual funds RFY and imply that when bond yields are compressed due to low interest rates, funds take on more risk in an attempt to increase their yield. Similarly, our results imply that when expectations of future returns are low, as proxied by the *yield slope*, funds take on more risk to maintain a higher yield. Both of these relationships are similar to those found by Choi and Kronlund (2018).

We also find a strongly significant, positive relationship between *market illiquidity* and RFY^{Total}. This is unexpected and goes against previous literature, which finds a significant negative relationship between RFY in investment grade funds and market illiquidity, when controlling for maturity and rating (Choi and Kronlund, 2018). However, when we examine RFY^{Active} in columns 2-4, we find a strongly significant, negative relationship with *market* *illiquidity*, implying that when markets are illiquid, fund managers actively trade to reduce the riskiness of their holdings, although the economic magnitude of the effect is relatively small. Column 4 also shows a positive relationship between the *yield slope* and RFY^{Active} significant at the 10% level.

As shown in column 2, we find no significant relationship between the *interest rate level* and RFY^{Active}. In column 3 and 4 we find a positive relationship between both *interest rate change* and *lagged interest rate change* with RFY^{Active} that are significant at the 5% and 10% levels respectively. This implies that when interest rates are falling, funds respond by decreasing the riskiness of their holdings. The economic magnitude of this effect is small, as a 1 p.p. drop in the interest rate only corresponds to a 0.006 p.p. decrease in active RFY. If fund managers were RFY by increasing the riskiness of their corporate bond holdings as interest rates fall, we would expect a significant negative relationship between changes in interest rates and RFY^{Active}. The absence of such a relationship implies that the evidence of RFY found in column 1 is not driven by active trading decisions. This raises the question of what alternative mechanisms can explain the observed relationship between RFY^{Total} and *interest rate level*. One possible explanation is that fund managers design their portfolios to automatically respond to changes in the interest rate, ensuring that RFY^{Total} increases when interest rates fall. Another possible explanation is that investment grade bonds have a structural connection to the *interest rate level*, such that when the latter is low, the spread between investment grade bond yields and Treasury yields increases. This is more likely to occur in times of crisis when interest rates drop and the credit spread widens. In our sample period we observe this pattern following COVID-19, when the *bond premium* drastically rose simultaneously as the *interest rate level* fell towards zero.

In Appendix A, Table 7, we control for *bond premium*, to explore whether the identified relationship between RFY^{Total} and interest rate level is driven by changes in the spread between investment grade bond and Treasuries, rather than the interest rate level itself. Column 1 shows a strongly significant positive relationship between *bond premium* and RFY^{Total}. When controlling for bond premium, the relationship between the *interest rate level* and RFY^{Total} disappears. However, these results must be interpreted with caution, as there is a risk of *bond premium* being a bad control. There is a strong conceptual and mechanical overlap between our measure of RFY^{Total} (the weighted average of the spread between bid yields and Treasury yields of all bonds in a portfolio) and *bond premium* (the spread between all investment grade bonds and Treasuries), making the disappearance of the significant effect of the *interest rate level* less informative. Due to this, the regressions without *bond premium* are more likely to represent reality and are our primary evidence. This is also the reason why we do not use credit spread as a control variable, unlike Choi and Kronlund (2018).

5.3 Reaching for Yield and Expense Ratios

Given that there seems to be a relationship between the *interest rate level* and RFY, we investigate what mechanisms can explain this relationship. In this section we examine whether the pressure of low interest rates on fees incentivize funds with higher expense ratios to conduct more RFY. Due to the significant variation in expense ratios across the funds in our sample, as presented in Table 1, we expect to identify significantly different responses to the *interest rate level* and *interest rate change*, if such a relationship exists.

Table 3

Regression of RFY on expense ratio

A. No interaction

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	−0.118***	0.003		
	(0.027)	(0.004)		
Yield slope	−0.394***	0.008	0.003	0.004*
	(0.049)	(0.006)	(0.002)	(0.002)
Market illiquidity	0.046***	−0.001***	−0.001***	−0.001***
	(0.004)	(0.000)	(0.000)	(0.000)
Interest rate change			0.010***	
			(0.004)	
Lagged interest rate change				0.008**
				(0.003)
Expense ratio	0.526***	−0.006	−0.007	−0.007
	(0.187)	(0.016)	(0.016)	(0.016)
Log age	0.076	0.006	0.007	0.007
	(0.045)	(0.005)	(0.005)	(0.005)
% safe assets	−0.000	−0.000	−0.000	−0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Log TNA	0.001	−0.003	−0.003	−0.003
	(0.016)	(0.003)	(0.003)	(0.003)
BBB objective	0.166	0.021	0.021	0.021
	(0.101)	(0.017)	(0.017)	(0.017)
R^2	0.545	0.020	0.023	0.021
N	3,013	2,931	2,931	2,931

Continued.

In Table 3, panel A, we first examine whether a direct relationship exists between *expense ratio* and RFY^{Total} or RFY^{Active}. The macroeconomic variables included are identical to those in Table 2. However, as we can no longer control for fund differences through fund fixed effects, we add a series of fund control variables that may be related to the level of risk-taking. These are *log (Fund Age)*, *log (Fund Size)*, *percentage safe assets* and a dummy variable for *fund style*. These regressions are run on a slightly smaller sample, due to some of the fund-quarter observations included in Table 2 not having any matching expense ratio data.

When regressing RFY^{Total} on *expense ratio*, we observe a positive and significant relationship, as presented in column 1 of Table 3, panel A. This is consistent with our expectations, but cannot in itself be interpreted as clear evidence that higher-costs funds RFY because of fee pressure. A more prudent interpretation of the result in column 1 is that funds with higher expense ratios generally hold higher-yielding bonds. One possible explanation as to why more expensive funds hold higher yielding bonds is that they follow a more active strategy, trying to identify underpriced securities. Due to the negative relationship between bond prices and bond yields, a fund that attempts to invest in underpriced assets will hold higher yielding bonds and appear to be RFY. In return for attempting to find mispriced assets, the fund charges a higher fee. Another possible explanation is that it is more costly to engage in trades of higher yielding bonds.

Table 3

Regression of RFY on expense ratio

B. With interaction

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	−0.102***	0.005		
	(0.029)	(0.004)		
Int. rate level × Exp. ratio	−0.043	−0.004		
	(0.028)	(0.005)		
Yield slope	−0.395***	0.008	0.003	0.004*
	(0.049)	(0.006)	(0.002)	(0.002)
Market illiquidity	0.046***	−0.001***	−0.001***	−0.001***
	(0.004)	(0.000)	(0.000)	(0.000)
Interest rate change			0.008	
			(0.005)	
Int. rate change × Exp. ratio			0.005	
			(0.013)	
Lagged interest rate change				0.015*
				(0.007)
Lagged int. rate chg. × Exp. ratio				−0.019
				(0.019)
Expense ratio	0.631***	0.003	−0.007	−0.005
	(0.181)	(0.023)	(0.017)	(0.017)
Log age	0.076	0.006	0.007	0.006
	(0.045)	(0.005)	(0.005)	(0.005)
% safe assets	−0.000	−0.000	−0.000	−0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Log TNA	0.000	−0.003	−0.003	−0.003
	(0.016)	(0.003)	(0.003)	(0.003)
BBB objective	0.166	0.021	0.021	0.021
	(0.101)	(0.017)	(0.017)	(0.017)
R^2	0.546	0.020	0.023	0.023
N	3,013	2,931	2,931	2,931

This table presents regressions of RFY on *expense ratio* (calculated as the value weighted average across all share classes). Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent macroeconomic variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). Fund level control variables include *age (log)*, *percentage invested in safe assets* (defined as cash and government securities), *TNA* (log) and a Lipper objective code dummy. In panel B we further interact the *expense ratio* with the interest rate variable used in each regression. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

They might have a higher illiquidity and require a greater degree of effort from the fund manager to ensure that the underlying corporation will not default. Funds trading higher yielding bonds therefore charge a higher fee to cover these costs.

When studying RFY^{Active} we find no significant relationship with *expense ratios*, as shown in column 2 to 4. This is expected since RFY^{Active} is a measure relative to a portfolio's previous holdings, and funds with higher expense ratios are not expected to consistently increase the riskiness of their holdings over time.

To examine whether *expense ratio* moderates the relationship between interest rates and RFY, such that higher expense ratios result in a stronger incentive to RFY, we add an interaction effect between the interest rate variable and *expense ratio* to each of the regression in Table 3, panel A. The results are presented in panel B of Table 3. As none of the interaction effects are significant, we find no evidence that a higher expense ratio pressures funds to RFY more. This indicates that the strongly significant relationship between *expense ratio* and RFY^{Total} identified in panel A, column 1 is due to high-cost funds following riskier or more active investment strategies at all times, rather than expense ratios impacting how funds respond to the level of interest rates or changes in it.

However, the absence of significant results does not necessarily imply that no relationship exists. It is possible that the relationship is present only for specific types of funds or during particular time periods. If that is the case, our broad sample is likely to obscure the results. To address this possibility, we conduct a subsample analysis in the following section.

5.4 Subsample Analysis

Our subsample analysis to examine whether our full sample obscures results is divided into three different sections. Our first two sections are focused on portfolio holdings, first we divide our sample into index and non-index funds and in the second division we divide it into retail and non-retail funds. The third and final division is based on the time period. We look at the years 2019–2021 and 2018 & 2022–2024.

5.4.1 Index & Non-Index Funds

We first divide our full sample into index and non-index funds. In Table 4, panel A, we perform the same regressions as those presented in Table 2, for both subsamples. As shown in column 1 and 5 the relationships between RFY^{Total} with *yield slope* and *market illiquidity* are similar across both subsamples and the full sample. Furthermore, the *interest rate level* and its relationship with RFY^{Total}, also shown in column 1 and 5 is almost identical across both subsamples and the full sample, indicating no evidence of differences in this relationship for index and non-index funds. This suggests that the relationship found in the full sample captures some market-wide movement or benchmark component outside of the fund managers control, rather than active rebalancing or portfolio design decisions by managers.

This conclusion relies on the assumption that index funds track an index rather than engaging in security selection. However, Choi et al. (2026) find that the characteristics of the bond market, specifically the illiquidity and index-tracking frictions, result in passive bond funds behaving similar to active funds and actively engaging in security selection. In their study, they document a median active share of passive bond funds of 59%, as compared to the median active share of passive equity funds of 2%, found by Crane and Crotty (2018). This suggests that the identified relationship for index funds between *interest rate level* and RFY^{Total} should not necessarily be interpreted as evidence in favour of the relationship for all funds being driven by market-wide effects rather than active portfolio choices. It could also imply that index fund managers make similar active choices as their non-index counterparts.

Table 4

Regression of RFY — Index & non-index funds

Panel A: Macroeconomic variables

	Index funds				Non-index funds			
	RFY (Total)	RFY (Active)			RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Interest rate level	−0.136***	−0.001			−0.130***	0.003		
	(0.031)	(0.006)			(0.031)	(0.003)		
Yield slope	−0.374***	−0.003	−0.000	0.002	−0.434***	0.009	0.005*	0.005*
	(0.054)	(0.010)	(0.002)	(0.002)	(0.062)	(0.006)	(0.003)	(0.003)
Market illiquidity	0.038***	−0.001**	−0.001***	−0.001***	0.050***	−0.001***	−0.001***	−0.001***
	(0.006)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)
Interest rate change			0.006				0.009*	
			(0.004)				(0.005)	
Lagged interest rate change				0.013**				0.002
				(0.005)				(0.005)
Fund FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.827	0.182	0.184	0.190	0.835	0.208	0.210	0.207
N	1,305	1,253	1,253	1,253	2,558	2,448	2,448	2,448

Continued.

While the relationship between *market illiquidity* and RFY^{Active} is consistent across both subsamples and the full sample, there is a positive relationship between *yield slope* and RFY^{Active}, significant at the 10% level, for non-index funds, as shown in column 7 and 8. This implies that contradictory to the relationship between RFY^{Total} and the *yield slope,* found by both us and Choi and Kronlund (2018), non-index funds might trade to increase the riskiness of their holdings when the economic outlook is good. A potential explanation is that the positive beliefs result in fund managers feeling more comfortable with taking on additional risk. However, as seen in column 6, the significance disappears when we regress RFY^{Active} on the *interest rate level*.

Furthermore, while both subsamples exhibit a weakly significant relationship between changes in interest rates and RFY^{Active}, there is a difference in timing. Index funds increase their RFY^{Active} in the same quarter as the change occurs, while the increase is lagged by one quarter for non-index funds. This suggests that index funds adjust their portfolios quicker than non-index funds, which is unintuitive as tracking the index is assumed to be less associated with portfolio reallocation.

In Table 4, panel B, we perform the same regressions as performed for the full sample in Table 3, panel B, for both of our subsamples. Similarly to our full sample, we find no evidence of expense ratios moderating the relationship between the level of or changes in the interest rate and RFY^{Total} or RFY^{Active} in our index fund subsample. However, for non-index funds we do find a negative interaction term between the *interest rate level* and *expense ratio* on RFY^{Total}, significant at the 10% level, as shown in column 5. This implies that the tendency of high-cost funds engaging more in RFY is stronger when interest rates are low, and decreases as interest rates rise. An alternative explanation, if high-cost funds generally follow more active strategies, is that low interest rates act as a monitoring device for high-cost funds. When interest rates are low, the manager needs to spend a lot of effort on identifying underpriced, and therefore high yielding assets in order to deliver a return that justifies the high fee.

Panel B: Expense ratio

	Index funds				Non-index funds			
	RFY (Total)	RFY (Active)			RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Interest rate level	−0.100***	−0.002			−0.122***	0.010*		
	(0.031)	(0.007)			(0.030)	(0.005)		
Int. rate level × Exp. ratio	0.141	0.001			−0.046*	−0.004		
	(0.143)	(0.011)			(0.027)	(0.005)		
Yield slope	−0.321***	−0.004	0.000	0.002	−0.449***	0.017**	0.005	0.005
	(0.042)	(0.010)	(0.002)	(0.002)	(0.056)	(0.008)	(0.003)	(0.003)
Market illiquidity	0.039***	−0.001**	−0.001***	−0.001***	0.049***	−0.001**	−0.001	−0.001***
	(0.005)	(0.001)	(0.000)	(0.000)	(0.004)	(0.000)	((−))	(0.000)
Interest rate change			−0.002				0.021**	
			(0.010)				(0.008)	
Int. rate change × Exp. ratio			0.040				−0.011	
			(0.038)				(0.012)	
Lagged interest rate change				0.010				0.018*
				(0.009)				(0.010)
Lagged int. rate chg. × Exp. ratio				0.001				−0.023
				(0.028)				(0.020)
Expense ratio	0.105	−0.103	−0.106	−0.098	0.277	0.017	0.006	0.007
	(0.690)	(0.165)	(0.146)	(0.145)	(0.200)	(0.017)	(0.009)	(0.010)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.500	0.042	0.043	0.047	0.569	0.022	0.027	0.022
N	1,138	1,115	1,115	1,115	1,875	1,816	1,816	1,816

This table presents regressions of RFY for the index and non-index fund subsamples. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. In panel A, macroeconomic independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions in panel A include fund fixed effects, to control for a changing fund population over time. In panel B, we add *expense ratio* (calculated as the value weighted average across all share classes) and interact it with the interest rate variable used in each regression. All regressions in panel B further include the following fund level controls: *age (log)*, *percentage invested in safe assets* (defined as cash and government securities), *TNA* (log) and a Lipper objective code dummy. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

As interest rates and corporate bond yields rise, the manager can deliver a sufficient return without having to identify underpriced assets. This could explain why the relationship only exists for non-index funds, as index-funds do not claim to identify mispriced assets.

Another possible explanation as to why we only identify this relationship for non-index funds is the difference in investor expectations between index and non-index funds. Investors in passive funds might evaluate fund performance based on how well it tracks an index, rather than excess returns above the index, in line with the findings of Choi et al. (2026). This would result in a weaker incentive for index funds to RFY. Additionally, passive bond funds tend to have lower expense ratios than active funds (Choi et al., 2026). Thus, their return net of fees will face less pressure when interest rates fall, compared to active funds, as they have a greater margin between the interest rate and their expense ratio. When studying RFY^{Active} we find no significant interaction effects for either subsample, consistent with the findings for our full sample.

Table 5

Regression of RFY — Retail & non-retail funds

Panel A: Macroeconomic variables

	Retail funds				Non-retail funds			
	RFY (Total)	RFY (Active)			RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Interest rate level	−0.101***	0.008			−0.130***	0.001		
	(0.034)	(0.005)			(0.030)	(0.003)		
Yield slope	−0.351***	0.013	0.000	0.003	−0.413***	0.004	0.003	0.003
	(0.059)	(0.009)	(0.005)	(0.004)	(0.057)	(0.006)	(0.002)	(0.002)
Market illiquidity	0.042***	−0.001	−0.001	-0.001***	0.047***	−0.001***	−0.001***	−0.001***
	(0.005)	(0.001)	((−))	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)
Interest rate change			0.018**				0.007	
			(0.007)				(0.004)	
Lagged interest rate change				0.019***				0.004
				(0.003)				(0.003)
Fund FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.846	0.125	0.143	0.142	0.850	0.218	0.220	0.219
N	363	348	348	348	3,497	3,350	3,350	3,350

Continued.

5.4.2 Retail & Non-Retail Funds

In this section, we divide our full sample into retail and non-retail funds. Following the definition used by Choi and Kronlund (2018), we define retail funds as those with at least 80% of their assets in retail share classes, and the remainder as non-retail funds. In Table 5, panel A, we conduct the same regressions as those presented in Table 2 for both subsamples. It should be noted that our full sample only consists of 25 unique retail funds.

When examining the relationship between the macroeconomic environment and RFY^{Total} in column 1 and 5, the relationships identified for our full sample are consistent across both subsamples, indicating that both retail and non-retail funds conduct RFY. However, the significant positive relationship between both interest rate change variables and RFY^{Active} identified in the full sample only appears in the retail fund subsample, indicating that the results in Table 2 are primarily driven by retail funds. This implies that when interest rates rise retail funds actively increase their risk, and when interest rates fall, they decrease their risk. These results contradict our expectation that retail funds would exhibit a greater degree of RFY. However, they must be interpreted with caution, given the small sample of retail funds and few fund-quarter observations.

In Table 5, panel B, we perform the same regressions as performed for the full sample in Table 3, panel B, for both of our subsamples. Consistent with the results in our full sample, we find no evidence of a significant interaction between the level of or change in interest rates and expense ratio on RFY^{Total}, or RFY^{Active}, in either subsample. As shown in column 1 retail funds exhibit a strongly significant negative relationship between *expense ratio* and RFY^{Total}. This implies that retail funds with higher expense ratios take on less risk. However, these results must once again be interpreted with caution, due to the small sample size and few observations. For non-retail funds, the relationship is strongly significant and positive.

Panel B: Expense Ratio

	Retail funds				Non-retail funds			
	RFY (Total)	RFY (Active)			RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Interest rate level	−0.168***	0.014**			−0.094***	0.005		
	(0.036)	(0.006)			(0.028)	(0.005)		
Int. rate level × Exp. ratio	0.015	−0.002			−0.034	−0.007		
	(0.029)	(0.004)			(0.037)	(0.006)		
Yield slope	−0.411***	0.020**	0.001	0.004	−0.383***	0.007	0.003	0.004*
	(0.071)	(0.010)	(0.005)	(0.004)	(0.046)	(0.006)	(0.002)	(0.002)
Market illiquidity	0.040***	−0.002	−0.002***	−0.002**	0.047***	−0.001***	−0.001***	−0.001***
	(0.006)	(0.001)	(0.000)	(0.001)	(0.004)	(0.000)	(0.000)	(0.000)
Interest rate change			0.015				0.010	
			(0.009)				(0.007)	
Int. rate change × Exp. ratio			0.025				−0.007	
			(0.015)				(0.020)	
Lagged interest rate change				0.027**				0.017**
				(0.010)				(0.008)
Lagged int. rate chg. × Exp. ratio				−0.004				−0.031
				(0.016)				(0.022)
Expense ratio	−0.386***	0.022	0.009	0.011	0.987***	0.007	−0.008	−0.006
	(0.131)	(0.020)	(0.010)	(0.012)	(0.175)	(0.031)	(0.024)	(0.024)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.685	0.081	0.118	0.101	0.603	0.019	0.020	0.021
N	339	325	325	325	2,674	2,606	2,606	2,606

This table presents regressions of RFY for the retail and non-retail fund subsamples. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. In panel A, macroeconomic independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions in panel A include fund fixed effects, to control for a changing fund population over time. In panel B, we add *expense ratio* (calculated as the value weighted average across all share classes) and interact it with the interest rate variable used in each regression. All regressions in panel B further include the following fund level controls: *age (log)*, *percentage invested in safe assets* (defined as cash and government securities), *TNA* (log) and a Lipper objective code dummy. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

5.4.3 Different Macroeconomic Environments

To study whether RFY differs across different interest rates regimes, we divide our subsample into two time periods. We look at the years 2019–2021 when interest rates initially decreased to then remain close to 0%. We compare this time period to the years 2018 & 2022–2024, when interest rates were mostly increasing. It should be noted that for the 2019–2021 subsample there are only 12 quarters. There is thus a risk that our method of two-way clustering standard errors at both the fund and quarter level overstates the significance of results. In Appendix C, we run the same regressions while only clustering standard errors at the fund level, with no substantial differences in results.

Table 6

Regression of RFY — Different macroeconomic environments

Panel A: Macroeconomic variables

	2019–2021				2018 & 2022–2024			
	RFY (Total)	RFY (Active)			RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Interest rate level	0.218**	−0.002			−0.204***	−0.003		
	(0.093)	(0.010)			(0.048)	(0.004)		
Yield slope	−0.116	0.003	0.003	0.004	−0.437***	−0.001	0.003	0.003
	(0.140)	(0.010)	(0.007)	(0.007)	(0.047)	(0.006)	(0.003)	(0.003)
Market illiquidity	0.060***	−0.001***	−0.001*	−0.001***	0.036***	−0.000	−0.001	−0.000
	(0.003)	(0.000)	(0.001)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)
Interest rate change			0.008				0.007**	
			(0.013)				(0.003)	
Lagged interest rate change				0.006				−0.000
				(0.003)				(0.003)
Fund FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.904	0.260	0.260	0.260	0.844	0.253	0.254	0.253
N	1,685	1,606	1,606	1,606	2,170	2,089	2,089	2,089

Continued.

In Table 6, panel A, we conduct the same regressions as those presented in Table 2, for both of our subsamples. The results for the subsample covering the years 2018 & 2022–2024, when interest rates are mostly increasing, is similar to the full sample. We find a negative significant relationship between *interest rate level* and RFY^{Total} and further similarities when looking at *yield slope* and *market illiquidity*.

However, column 1 shows that between 2019–2021, when interest rates were low and decreasing, there was a positive relationship between the *interest rate level* and RFY^{Total}, significant at the 5% level. This suggests that rising interest rates resulted in more RFY^{Total}, an unintuitive result. One possible explanation for the lack of a negative relationship is that funds may not have engaged in RFY during this time period. A reason behind this could be that investors RFY when interest rates fall below levels that they are used to, due to reference dependency (Lian et al., 2019). As the previous decade was ridden by historically low interest rates, fund managers may not have been pressured to RFY, since investors already were used to these low interest rate levels. However, the two previous years leading up to the decrease in 2019 had seen a constant increase in the interest rates, the first documented instance since the 2008 financial crisis. It could be argued that two years is enough for the reference point to update and no longer be the past decade. In that instance, the positive relationship between RFY^{Total} and *interest rate level* during 2019–2021, goes against the expected relationship that fund managers RFY when interest rates fall below investors' historical reference points.

Another possible explanation is that the relationship between *interest rate level* and RFY^{Total} is caused by a systematic relationship between the *interest rate level* and the spread between investment grade corporate bond yields and Treasury yields, which could be positive during 2019–2021, but negative for the full sample. This would imply that the positive relationship is not a phenomenon directly linked to fund manager behaviour. Fund managers might still engage in RFY, but the effect of their behaviour is muted by the changing spread. In Appendix A, Table 8, we run the same regression when controlling for *bond premium* and find that the relationship becomes negative and no longer significant.

Panel B: Expense ratio

	2019–2021				2018 & 2022–2024			
	RFY (Total)	RFY (Active)			RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Interest rate level	0.269***	0.026			−0.173***	−0.002		
	(0.085)	(0.020)			(0.042)	(0.005)		
Int. rate level × Exp. ratio	−0.118**	−0.052*			−0.020	−0.000		
	(0.052)	(0.026)			(0.028)	(0.008)		
Yield slope	−0.113	0.012	0.006	0.005	−0.406***	0.001	0.004	0.003
	(0.131)	(0.007)	(0.007)	(0.008)	(0.037)	(0.007)	(0.004)	(0.004)
Market illiquidity	0.059***	−0.001***	−0.001**	−0.001***	0.036***	−0.000	−0.001**	−0.000
	(0.002)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	((−))
Interest rate change			−0.001				0.007*	
			(0.019)				(0.003)	
Int. rate change × Exp. ratio			0.013				0.005	
			(0.033)				(0.009)	
Lagged interest rate change				0.041***				0.003
				(0.010)				(0.002)
Lagged int. rate chg. × Exp. ratio				−0.081***				−0.010
				(0.025)				(0.011)
Expense ratio	0.618**	0.034	−0.001	−0.021	0.532***	−0.009	−0.012	−0.006
	(0.207)	(0.023)	(0.034)	(0.033)	(0.092)	(0.035)	(0.012)	(0.012)
Fund controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.704	0.046	0.033	0.041	0.361	0.011	0.014	0.012
N	1,276	1,242	1,242	1,242	1,737	1,689	1,689	1,689

This table presents regressions of RFY for two time periods: 2019–2021, and 2018 & 2022–2024. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. In panel A, macroeconomic independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions in panel A include fund fixed effects, to control for a changing fund population over time. In panel B, we add *expense ratio* (calculated as the value weighted average across all share classes) and interact it with the interest rate variable used in each regression. All regressions in panel B further include the following fund level controls: *age (log)*, *percentage invested in safe assets* (defined as cash and government securities), *TNA* (log) and a Lipper objective code dummy. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

However, as discussed in section 4.2, these results must be interpreted with caution, as there is a risk of *bond premium* being a bad control.

We also find that in this time period of decreasing interest rates there is no significant relationship between the *yield slope* and RFY^{Total}. This is the only instance where we do not find such a relationship. One possible explanation is that during tumultuous time periods, such as this, when interest rates rapidly decline to then remain at a constant level of almost 0%, fund managers do not take future economic outlook into consideration to the same degree as during normal times.

In Table 6, panel B, we conduct the same regressions as those presented in Table 3, panel B, for both of our subsamples. The results for the time period 2018 & 2022–2024 are similar to those found in the full sample, with no significant interactions between the level of or changes in the interest rate and *expense ratio* on RFY^{Total} or RFY^{Active}. However, for the years 2019–2021 the results differ substantially from those of the full sample.

As shown in column 1, we find a negative interaction between *interest rate level* and *expense ratio* on RFY^{Total}, significant at the 5% level. We also find a positive significant relationship between *expense ratio* and RFY^{Total}. This indicates that while more expensive funds in general take on more risk, the relationship is stronger in low interest rate periods. Similarly, we find a negative interaction between *interest rate level* and *expense ratio* on RFY^{Active}, significant at the 10% level, indicating that the lower the interest rate level, the more the most expensive funds actively increase the riskiness of their holdings. While we find no evidence of an interaction between the change in interest rate over the current quarter and *expense ratio* on RFY^{Active}, we find a strongly significant negative interaction effect between the *lagged interest rate change* and the *expense ratio*. The difference between both variables of interest rate change is reasonable, given the illiquid nature of the corporate bond market fund managers can not immediately react to changes in the interest rate. The significant negative interaction effect implies that when interest rates drop, the most expensive funds will increase the riskiness of their holdings the most.

Taken together, these findings imply that during a period of falling and low interest rates, *expense ratio* does moderate the relationship between interest rate variables and RFY, such that more expensive funds conduct more RFY. Notably, these results are only found in this subsample. There are two primary mechanisms that may explain this pattern.

The first is reference dependency. In 2018 & 2022–2024, the one-year Treasury yield was higher than it had been in the years prior. If investors engage in RFY due to reference dependency, as shown by Lian et al. (2019), there would be a relatively low pressure to conduct RFY during these time periods. A corporate bond mutual fund manager would be able to outperform past returns, serving as reference points, without taking on additional risk. In contrast, during 2019–2021, interest rates were generally declining. Under these conditions, managers would find it increasingly hard to deliver returns in line with previous years without increasing the riskiness of their holdings, creating a strong incentive to RFY. This effect may be amplified for more expensive funds, who face greater pressure to deliver returns that satisfy investors' expectations, based on reference points, to justify the high cost and avoid large outflows. If managers receive bonuses based on fund performance compared to previous years' performance, this effect would be further reinforced.

The second mechanism is a principal-agent problem. In 2018 & 2022–2024, interest rates were generally rising, and except for the first months of 2022 they were substantially higher than even the 99th percentile *expense ratio* found in our sample. During this time, fund managers were able to maintain a yield above their expense ratio without increasing the riskiness of their holdings, even as interest rates fell. Thus, the pressure from having a high expense ratio would be limited. However, during 2019–2021, interest rates fell towards and remained at the level of most corporate bond mutual funds' expense ratios. In this environment, there is a strong pressure on the managers of the most expensive funds to increase their yield, to avoid it falling below the expense ratio and delivering a negative net return to their investors. This creates more pronounced principal-agent problems, as managers may increase the riskiness of their holdings to avoid delivering a negative net return.

6. Robustness Checks

To assess the validity of our findings we perform a series of robustness checks. Following Di Maggio and Kacperczyk (2017), we first test whether our results are robust when also considering that the population of corporate bond mutual funds change over time. A potential explanation for the significant negative relationship between the *interest rate level* and RFY^{Total} is changes in the fund population. Times of low interest rate may push low yield funds to exit the market, as they struggle to deliver positive returns net of fees, while investor demand for higher returns result in more high-yielding funds entering the market. To address this concern, we limit our sample to only those funds that report their holdings both in Q1 2018 and Q4 2024, and then rerun the regressions of macroeconomic variables on RFY performed in Table 2. This gives us a sample consisting of 73 corporate bond mutual funds. As shown in Appendix B, Table 9, the relationship between the *interest rate level* and RFY^{Total} remains negative, significant at the 1% level and of similar economic magnitude as in Table 2. This suggests that the relationship is not driven by a changing corporate bond mutual fund population.

We expect this robustness test to have the greatest impact on our 2019–2021 subsample, given the turbulent environment on the fixed income market following COVID-19. A potential explanation for the identified positive relationship between the *interest rate level* and RFY^{Total} during this period is that the shock caused by the pandemic pushed the riskiest funds out of the market, while the safe, low-yielding funds survived. If that is the case, the low interest rate regime that followed the shock would primarily be populated by low-yielding funds, mechanically generating the identified positive relationship. To test for this, we rerun the regressions performed in Table 6 for the time period 2019–2021, only on the subsample of surviving funds. As shown in Appendix B, Table 10 and 11 our results for this subsample are robust to restricting the analysis to only surviving funds. The relationship between the *interest rate level* and RFY^{Total} remains positive and significant at a 10% level, indicating that this finding is not caused by fund exits or entries. Similarly, the identified negative interactions between *expense ratio* and *interest rate level* on RFY^{Total}, and *expense ratio* and *lagged interest rate change* on RFY^{Active} during this period remain significant at the 1% and 5% level respectively.

To ensure that our results are not driven by outliers, we also rerun all the regressions, after winsorizing all independent variables at the 1% level. Our measures of RFY are not winsorized, as they are already constructed using the winsorized variable *bid yield*. We find that winsorizing does not materially alter the regression results. There are only two changes of interest. Firstly, the identified negative interaction between *expense ratio* and *interest rate level* on RFY^{Total}, for non-index funds, shown in Table 4, panel B, becomes non-significant, suggesting that the relationship might have been driven by outliers. Secondly, we find a positive interaction effect between *expense ratio* and *interest rate change* on RFY^{Active} for retail funds. This unintuitive result is most likely due to the small sample size and the fact that *interest rate change* and RFY^{Active} appear contemporarily. Since retail funds still do not exhibit any significant interaction effect between *expense ratio* and the *lagged interest rate change*, which provides a cleaner interpretation of funds' responses to interest rate movement, we interpret the result with caution and do not consider it strong evidence of an actual economic relation. Overall, our results remain robust, suggesting our findings are not driven by extreme observations.

Finally, as discussed briefly in section 5.4.3, there is a risk that two-way clustered standard errors for the period 2019–2021 overstate the significance due to the limited number of quarters. We therefore rerun all regressions for this time period using one-way clustered standard errors at the fund level. As shown in Appendix C, our findings remain qualitatively unchanged. While the statistical significance of the interaction between *interest rate change* and *expense ratio* on RFY^{Active} decreases from the 1% level to the 5% level, the interaction between *interest rate level* and *expense ratio* on RFY^{Total} becomes significant at the 1% level rather than the 5% level. The economic magnitude of all relationships remains unchanged, suggesting that the findings reported in section 5.4.3 are not driven by our choice of clustering.

7. Conclusion

In this paper, we examine the existence and determinants of RFY in U.S. investment grade corporate bond mutual funds. Consistent with prior literature, we identify an inverse relationship between the interest rate and the riskiness of portfolio holdings, implying that corporate bond mutual funds do engage in RFY. However, we find no such relationship between the level of, or change in, the interest rate and our measure of active RFY. The stark contrast in results between our two measures of RFY indicates that the relationship between interest rates and riskiness does not reflect active trading decisions made by fund managers. Instead, it may partly reflect market-wide patterns, such as changes in the market spread between investment grade corporate bonds and U.S. Treasuries. We further study whether there is a fee-pressure channel, such that high-cost funds engage more in RFY when interest rates are low or decreasing. While we do find a positive relationship between expense ratios and total RFY, we do not find any evidence that expense ratios moderate the relationship between interest rates and RFY. Thus, a more prudent interpretation of our results is that high-cost funds hold higher-yielding portfolios at all times.

Our subsample analysis reveals no major differences between index and non-index funds. The fact that index funds also exhibit a negative relation between interest rates and total RFY supports the interpretation that total RFY is caused by market-wide patterns rather than active trading decisions. However, this must be interpreted with caution, as passive bond funds in many aspects behave similar to active bond funds (Choi et al., 2026). Likewise, the division into retail and non-retail funds reveal no major differences between the two subsamples. However, we do find evidence of expense ratios negatively moderating the relationship between interest rates and both total and active RFY between 2019–2021. This suggests that the fee-pressure channel only is active when interest rates are lower than historical reference points and close to expense ratios.

A limitation of our paper is that we only study one measure of portfolio riskiness. Purchasing higher-yielding bonds is not the only option a corporate bond fund manager has to increase return-variance in pursuit of a higher gross return. An alternative way to achieve similar results would be to reduce diversification by concentrating corporate bond holdings to fewer business sectors. Studying how portfolio diversification relates to interest rates would thus be an interesting extension to our paper. Furthermore, our evidence of the relationship between expense ratios and RFY is from a short time period following the COVID-19 outbreak and could be a result of the unusual market environment. It would be interesting to extend our findings by examining whether other periods of low and declining interest rates exhibit similar patterns.

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Appendix A: Controlling for Bond Premium

Table 7

Regression of RFY on macroeconomic variables – controlling for bond premium

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	0.000	−0.001		
	(0.012)	(0.003)		
Yield slope	−0.042*	−0.001	0.002	0.002
	(0.024)	(0.007)	(0.003)	(0.003)
Market illiquidity	0.003	−0.000	−0.001	−0.001
	(0.002)	(0.001)	(0.001)	(0.001)
Bond premium	0.986***	−0.015	−0.005	−0.012
	(0.044)	(0.017)	(0.014)	(0.015)
Interest rate change			0.008**	
			(0.003)	
Lagged interest rate change				0.005*
				(0.003)
Fund FEs	Yes	Yes	Yes	Yes
R^2	0.893	0.201	0.203	0.202
N	3,863	3,701	3,701	3,701

This table presents regression estimates of RFY on macroeconomic variables as presented in Table 2, while controlling for *bond premium*, proxied by the ICE BofA U.S. Corporate Index Option-Adjusted Spread. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions include fund fixed effects, to control for a changing fund population over time. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Table 8

Regression of RFY on macroeconomic variables 2019–2021 – controlling for bond premium

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	−0.033	0.007		
	(0.038)	(0.012)		
Yield slope	−0.063	0.001	−0.003	−0.008
	(0.044)	(0.011)	(0.009)	(0.011)
Market illiquidity	0.002	0.001	0.000	0.001
	(0.003)	(0.001)	(0.001)	(0.001)
Bond premium	0.995***	−0.035*	−0.027	−0.034
	(0.049)	(0.019)	(0.015)	(0.020)
Interest rate change			−0.001	
			(0.012)	
Lagged interest rate change				0.010**
				(0.003)
Fund FEs	Yes	Yes	Yes	Yes
R^2	0.923	0.261	0.261	0.262
N	1,685	1,606	1,606	1,606

This table presents regression estimates of RFY on macroeconomic variables for the time period 2019–2021, as presented in Table 6, Panel A, while controlling for *bond premium*, proxied by the ICE BofA U.S. Corporate Index Option-Adjusted Spread. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions include fund fixed effects, to control for a changing fund population over time. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Appendix B: Survivors

Table 9

Regression of RFY on macroeconomic variables – only survivors

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	−0.145***	−0.000		
	(0.028)	(0.004)		
Yield slope	−0.436***	0.002	0.003	0.003
	(0.055)	(0.006)	(0.002)	(0.002)
Market illiquidity	0.046***	−0.001**	−0.001**	−0.001**
	(0.004)	(0.000)	(0.000)	(0.000)
Interest rate change			0.004	
			(0.003)	
Lagged interest rate change				0.002
				(0.003)
Fund FEs	Yes	Yes	Yes	Yes
R^2	0.837	0.125	0.126	0.125
N	2,002	1,958	1,958	1,958

This table presents regression estimates of RFY on macroeconomic variables, as presented in Table 2, for the subsample of surviving mutual funds. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions include fund fixed effects, to control for a changing fund population over time. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Table 10

Regression of RFY on macroeconomic variables 2019–2021 – only survivors

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	0.192*	0.003		
	(0.100)	(0.011)		
Yield slope	−0.149	0.001	−0.004	−0.003
	(0.150)	(0.009)	(0.009)	(0.011)
Market illiquidity	0.059***	−0.001**	−0.001	−0.001**
	(0.003)	(0.000)	(0.001)	(0.000)
Interest rate change			0.008	
			(0.014)	
Lagged interest rate change				0.006
				((−))
Fund FEs	Yes	Yes	Yes	Yes
R^2	0.883	0.165	0.165	0.165
N	859	834	834	834

This table presents regression estimates of RFY on macroeconomic variables for the time period 2019–2021, as presented in Table 6, panel A, for the subsample of surviving mutual funds. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions include fund fixed effects, to control for a changing fund population over time. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Table 11

Regression of RFY on expense ratio 2019–2021 – only survivors

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	0.283***	0.042		
	(0.084)	(0.025)		
Int. rate level × Exp. ratio	−0.163***	−0.060		
	(0.032)	(0.037)		
Yield slope	−0.144	0.014	−0.001	−0.006
	(0.136)	((−))	(0.009)	(0.013)
Market illiquidity	0.059***	−0.000***	−0.001	−0.001**
	(0.001)	(0.000)	(0.001)	(0.000)
Interest rate change			−0.016	
			(0.019)	
Int. rate change × Exp. ratio			0.012	
			(0.040)	
Lagged interest rate change				0.039***
				(0.010)
Lagged int. rate chg. × Exp. ratio				−0.065**
				(0.024)
Expense ratio	0.442	0.010	−0.033	−0.049
	(0.292)	(0.034)	(0.057)	(0.057)
Fund controls	Yes	Yes	Yes	Yes
R^2	0.690	0.039	0.019	0.025
N	685	669	669	669

This table presents regressions of RFY on *expense ratio* (calculated as the value weighted average across all share classes), with interaction terms between *expense ratio* and the interest rate variable used in each regression, for the time period 2019–2021, as presented in Table 6, panel B. The subsample is limited to the surviving mutual funds. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent macroeconomic variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). Fund level control variables include *age (log)*, *percentage invested in safe assets* (defined as cash and government securities), *TNA* (log) and a Lipper objective code dummy. Standard errors are two-way clustered at the fund and quarter levels and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Appendix C: One-way Clustering

Table 12

Regression of RFY on macroeconomic variables 2019–2021 – one-way clustering

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	0.218***	−0.002		
	(0.017)	(0.009)		
Yield slope	−0.116***	0.003	0.003	0.004
	(0.020)	(0.009)	(0.006)	(0.007)
Market illiquidity	0.060***	−0.001***	−0.001*	−0.001***
	(0.001)	(0.000)	(0.001)	(0.000)
Interest rate change			0.008	
			(0.013)	
Lagged interest rate change				0.006
				(0.009)
Fund FEs	Yes	Yes	Yes	Yes
R^2	0.904	0.260	0.260	0.260
N	1,685	1,606	1,606	1,606

This table presents regression estimates of RFY on macroeconomic variables for the time period 2019–2021, as presented in Table 6, panel A. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). All regressions include fund fixed effects, to control for a changing fund population over time. Standard errors are one-way clustered at the fund level and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Table 13

Regression of RFY on expense ratio 2019–2021 – one-way clustering

	RFY (Total)	RFY (Active)		
Dependent variable:	(1)	(2)	(3)	(4)
Interest rate level	0.269***	0.026		
	(0.031)	(0.021)		
Int. rate level × Exp. ratio	−0.118***	−0.052*		
	(0.045)	(0.028)		
Yield slope	−0.113***	0.012	0.006	0.005
	(0.030)	(0.009)	(0.007)	(0.009)
Market illiquidity	0.059***	−0.001**	−0.001**	−0.001***
	(0.002)	(0.001)	(0.001)	(0.000)
Interest rate change			−0.001	
			(0.016)	
Int. rate change × Exp. ratio			0.013	
			(0.034)	
Lagged interest rate change				0.041***
				(0.010)
Lagged int. rate chg. × Exp. ratio				−0.081**
				(0.033)
Expense ratio	0.618***	0.034**	−0.001	−0.021
	(0.189)	(0.016)	(0.026)	(0.028)
Fund controls	Yes	Yes	Yes	Yes
R^2	0.704	0.046	0.033	0.041
N	1,276	1,242	1,242	1,242

This table presents regressions of RFY on *expense ratio* (calculated as the value weighted average across all share classes), with interaction terms between *expense ratio* and the interest rate variable used in each regression, for the time period 2019–2021, as presented in Table 6, panel B. Observations are at the fund-quarter level. Dependent variables are total RFY and active RFY, as defined in equations (2) and (3) respectively. Independent macroeconomic variables are *interest rate level* (the one-year Treasury yield), *yield slope* (difference between the thirty-year and one-year Treasury yield), *market illiquidity* proxied by the volatility Index (VIX) from the Chicago Board Options Exchange (CBOE), *interest rate change* (difference in the one-year Treasury yield between a quarter *t* and its predecessor *t-1*) and *lagged interest rate change* (difference in the one-year Treasury yield between the previous quarter *t-1* and its predecessor *t-2*). Fund level control variables include *age (log)*, *percentage invested in safe assets* (defined as cash and government securities), *TNA* (log) and a Lipper objective code dummy. Standard errors are one-way clustered at the fund level and presented in parentheses. *, ** and *** represent statistical significance at the 10%, 5% and 1% level, respectively.

Appendix D: AI Disclosure

We have used Claude, Gemini and ChatGPT to aid us in the coding process. Claude has also been used to support the formatting of tables. All AI output has been individually checked to ensure correctness. No AI-model has been used to generate or edit any text.