Understanding Corporate Bond Excess Returns*

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Preliminary and Comments Welcome

Abstract

This paper provides a comprehensive analysis of excess returns specific to corporate bonds. We construct a measure of excess returns that uses synthetic Treasury securities with identical cash flows as benchmarks, thereby fully removing interest-rate effects and isolating the component of returns specific to corporate bonds. Using a monthly sample from 2002 to 2024, we find that corporate-bond-specific excess returns differ significantly from standard, T-bill-based excess returns, both on average and in the cross section. We further examine the effects of a broad set of bond-level characteristics and systematic risk factors on corporate-bond-specific excess returns. In addition, we decompose interest-rate effects into duration and higher-order components. Together, these findings provide a foundational benchmark for future research on corporate bond returns.

Keywords: Corporate bond returns; Corporate-bond-specific excess returns; Synthetic Treasury benchmark; Interest-rate risk

JEL Codes: D4, G12

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1 Introduction

The U.S. corporate bond market has grown dramatically over the past several decades, with more than $10 trillion of bonds outstanding and a cross section comprising over 80,000 individual bonds in recent years.[1] The sheer size and heterogeneity of this market make it essential to analyze returns across individual bonds within standard portfolio frameworks to understand their risk exposures and associated risk premia. Such analysis has become increasingly important for portfolio management, as a growing share of corporate bonds is now held by active asset managers—such as open-end mutual funds—whose investment strategies depend on frequent trading and portfolio rebalancing rather than holding bonds to maturity.[2]

A large body of prior research has documented various empirical facts about the cross section of corporate bond returns (see the literature review below). However, most of these studies—including early contributions such as Fama and French (1993) and more recent works such as Chung, Wang, and Wu (2019) and Dickerson, Mueller, and Robotti (2023)—measure corporate bond excess returns relative to the T-bill rate. For example, the monthly excess return of a bond is typically computed as the difference between its gross return and the one-month T-bill rate. Nevertheless, this standard, T-bill-based excess return measure includes not only components specific to corporate bonds—such as credit and liquidity risk premia—but also an interest rate risk component associated with the bond's long-term stream of coupon and principal payments, which goes far beyond what can be captured by the T-bill rate.

In this paper, we conduct a comprehensive analysis of corporate-bond-specific returns using the whole cross section of corporate bonds. Specifically, we construct a measure of corporate-bond-specific excess returns that fully removes the interest-rate-risk component by benchmarking against synthetic Treasury securities with identical cash flows—matching coupon pay-

[1] The amount of corporate bonds outstanding is based on reports from the Securities Industry and Financial Markets Association (SIFMA), while the number of individual bonds outstanding is based on the Fixed Income Securities Database (FISD).

[2] Specifically, the share of outstanding corporate bonds held by fixed-income mutual funds was below 10% before the 2008 financial crisis, but rose quickly to over 20% afterwards (Collins and Antoniewicz, 2021; Coppola, 2025). Moreover, as estimated by Giannetti and Jotikasthira (2024), corporate bond mutual funds turnover about 17% of their existing positions in a month.

ments, payment dates, and time to maturity. This approach eliminates interest-rate effects associated with changes in the entire term structure and isolates the component of returns specific to corporate bonds. Using this measure, we document a comprehensive set of empirical findings that provide a foundational benchmark for research on corporate bond returns.

In the first set of empirical analysis (Section 4), we compute monthly corporate-bond-specific excess returns and compare them with the standard excess returns. Our sample is constructed using the Enhanced Trade Reporting and Compliance Engine (TRACE) data of corporate bond transactions from July 2002 to December 2024, which we clean following standard procedures in the literature.

We find that at the aggregate market level, the standard excess return averages about 38 bps per month, consistent with estimates in the literature. However, the average corporate-bond-specific excess return is about 23 bps, i.e., roughly 41% of the standard excess return arises from the interest-rate-risk component rather than compensation specific to corporate bonds. Furthermore, corporate-bond-specific excess returns are *positively* associated with changes in interest rates, whereas standard excess returns are *negatively* associated with them. This reversal in sign arises because the interest-rate-risk component of the standard excess return is negatively related to interest-rate changes, and its effect dominates the positive association between corporate-bond-specific excess returns and interest-rate movements.

Turning to the cross section, we sort individual corporate bonds into quintile portfolios based on their standard excess returns and find that the resulting return spread is around 7% per month, of which approximately 17% is attributable to the interest-rate-risk component. We then sort bonds separately on the corporate-bond-specific component and the interest-rate-risk component to examine how these two components are related across bonds. The results reveal a novel negative cross-sectional relation: bonds with higher corporate-bond-specific excess returns tend to have lower interest-rate-risk returns, and vice versa. In consequence, when bonds are sorted on the interest-rate-risk component, the variation in interest-rate-risk returns is so large that the standard excess return spread reverses sign relative to the corporate-bond-specific excess return spread.

Overall, our analyses demonstrate that the interest-rate-risk premium accounts for a large portion of standard excess returns of corporate bonds and can significantly confound inferences about corporate-bond-specific excess returns at both the aggregate and cross-sectional levels. Distinguishing between these two components is therefore critical for understanding the sources of risk and expected returns in corporate bond markets.

In the second set of our empirical analysis (Section 5), we examine the effects of a broad set of bond-level characteristics—previously shown in the literature to predict cross-sectional variation in bond returns using the standard excess return measure—on corporate-bond-specific excess returns. We also compare these results with those based on the standard excess return measure to assess the extent to which the interest-rate-risk component confounds the effects documented in the literature.

Specifically, we consider the following bond characteristics: credit rating (Fama and French, 1993); illiquidity based on the Roll measure, as in Bao, Pan, and Wang (2011); short-term return reversal (STR), based on returns in the previous month (Khang and King, 2004); momentum, based on cumulative returns over the previous six months (Jostova, Nikolova, Philipov, and Stahel, 2013); long-term return reversal (LTR), based on cumulative returns from four to one year prior (Bali, Subrahmanyam, and Wen, 2021); value, measured by the relative difference in credit spreads compared with comparable bonds (Correia, Richardson, and Tuna, 2012; Houweling and Van Zundert, 2017); volatility of total bond returns (Chung et al., 2019); and downside risk, measured by the 5% Value-at-Risk of monthly returns over the past 36 months (Bai, Bali, and Wen, 2019). We sort individual bonds into quintile portfolios based on each characteristic in each month and examine the returns of these portfolios in the subsequent month.

We find that all of these characteristics, except momentum, generate significant spreads in standard excess returns, consistent with the existing literature. Importantly, relative to the standard excess return measure, the spreads in corporate-bond-specific excess returns are notably smaller for illiquidity, downside risk, and volatility; slightly larger for STR and LTR; and broadly unchanged for credit rating and value. Most of these spreads remain statistically significant, with the exceptions of downside risk and value. Overall, our analyses show that the predictive

effects of most bond-level characteristics documented in the existing literature primarily reflect compensation specific to corporate bonds rather than interest-rate risk.

In the third set of our empirical analysis (Section 6), we examine the effects of six systematic risk factors—previously shown to explain cross-sectional variation in corporate bond returns using the standard excess return measure—on corporate-bond-specific excess returns. These factors include the default risk factor (DEF), defined as the difference between the returns on long-term investment-grade corporate bonds and long-term government bonds (Fama and French, 1993); the term risk factor (TERM), defined as the difference between the returns on long-term government bonds and T-bills (Fama and French, 1993); the aggregate illiquidity risk factor (Lin, Wang, and Wu, 2011); market volatility risk measured by VIX (Chung et al., 2019); the intermediary capital risk factor (He, Kelly, and Manela, 2017, HKM); and headline inflation (Lu, Nozawa, and Song, 2025).

We estimate corporate bonds' betas with respect to each of these systematic risk factors using the standard rolling-window procedure in the literature. At the aggregate market level, we find that for TERM, illiquidity, HKM, and CPI, the interest-rate-risk-component beta has the opposite sign from the corporate-bond-specific beta and is larger in magnitude. For market volatility, the two component betas also have opposite signs but are similar in magnitude. Hence, using the standard excess return beta to assess the exposure of corporate-bond-specific excess returns to these risk factors is heavily confounded by interest-rate effects. In contrast, for DEF, the corporate-bond-specific component beta is the dominating component of the standard excess return beta.

Turning to the cross section, we sort bonds into quintile portfolios separately based on the betas of standard excess returns and corporate-bond-specific excess returns. We find that, for all risk factors except DEF, corporate-bond-specific-component betas are negatively related to interest-rate-risk-component betas across bonds and are larger in magnitude. For DEF, the two component betas exhibit little cross-sectional association, although the corporate-bond-specific-component beta remains the dominant component. Overall, the cross-sectional dispersion in standard excess return betas is broadly consistent with that in corporate-bond-specific-

component betas.

We then examine the cross-sectional pricing effects of these factor betas. We find that the spreads in standard excess returns between the highest and lowest beta quintiles are significant for DEF, CPI, HKM, and illiquidity, consistent with the findings of the original studies. In contrast, we find no significant pricing effects for TERM or VIX. Importantly, relative to the standard excess return measure, the corresponding spreads in corporate-bond-specific excess returns are smaller for DEF (and become statistically insignificant), larger for CPI and HKM, and essentially unchanged for illiquidity. These findings indicate that the interest-rate-risk component embedded in the standard excess return measure confounds the estimated risk premia associated with DEF, CPI, and HKM. Nevertheless, the pricing effects documented using the standard excess return measure remain largely intact when corporate-bond-specific excess returns are used, particularly for CPI, HKM, and illiquidity.

So far, we have compared corporate-bond-specific excess returns with standard excess returns and demonstrated the confounding effects of the interest-rate-risk component. These effects arise from both duration exposure associated with parallel shifts in the term structure and higher-order exposures associated with changes in the shape of the yield curve (e.g., slope and curvature). In the final part of our empirical analysis (Section 7), we examine the different components of interest-rate-risk effects.

Specifically, we use the duration-matched return proposed by Binsbergen, Nozawa, and Schwert (2025)—which uses the weights from the Macaulay duration formula to aggregate the returns of the individual zero-coupon bonds underlying the benchmark coupon bond—to measure duration effects, and the difference between the total interest-rate-risk component and the duration-matched return to measure higher-order (HO) effects.[3] Our estimates show that, at the aggregate market level, the duration-matched component accounts for most of the interest-rate-risk return, both on average and in terms of its time-series variation. However, the HO

[3] Strictly speaking, the duration-matched return still contains a corporate-bond-specific component because duration is calculated using the price of the corporate bond, which reflects not only interest-rate risk but also risks specific to the bond. Therefore, the decomposition should be interpreted as separating the effects captured by duration matching from the residual effects beyond duration matching, rather than as a pure decomposition of interest-rate risk into duration and higher-order components.

component accounts for a large share of the cross-sectional dispersion in interest-rate-risk returns, particularly during periods when the term spread changes are large in either direction. Therefore, relying on duration matching can mismeasure cross-sectional differences in corporate-bond-specific excess returns.

Nevertheless, we compute the duration-matching and HO components in the effects of bond-level characteristics and systematic risk factors, and find that the duration-matched return accounts for the majority of these effects. As a result, duration matching performs well in capturing the effects of bond-level characteristics and systematic risk factors on corporate-bond-specific excess returns.

Our analyses primarily contribute to the literature on corporate bond returns. Most existing studies, including Fama and French (1993), Gebhardt, Hvidkjaer, and Swaminathan (2005), Khang and King (2004), Jostova et al. (2013), Lin et al. (2011), Bali et al. (2021), Chung et al. (2019), Kelly, Palhares, and Pruitt (2023), and Dickerson et al. (2023), among others, use the standard excess return measure, which contains not only components specific to corporate bonds but also components related to interest-rate risk.

Using a measure that fully removes interest-rate-risk components, we conduct a comprehensive analysis of corporate-bond-specific returns. In particular, we compare corporate-bond-specific excess returns with standard excess returns at both the aggregate and cross-sectional levels, examine the effects of a broad set of bond-level characteristics and systematic risk factors, and analyze the different components of interest-rate effects. By documenting a set of novel empirical facts about corporate-bond-specific excess returns and the confounding effects of interest-rate risk along these various dimensions, our paper provides a foundational benchmark for future research on corporate bond returns.

Several important studies, including Houweling and van Zundert (2017), Israel, Palhares, and Richardson (2018), and, more recently, Binsbergen et al. (2025), analyze corporate bond returns using measures based on duration matching.[4] Houweling and van Zundert (2017) and

[4] In an earlier study examining empirical methods for detecting abnormal bond returns in corporate event studies, Bessembinder, Kahle, Maxwell, and Xu (2009) measure a corporate bond's excess return using a matched Treasury security with the most similar maturity date as the benchmark.

Israel et al. (2018) focus primarily on the effects of bond-level characteristics, while Binsbergen et al. (2025) examine the magnitude of credit risk premia and the explanatory power of the CAPM. Building on these important studies, we go a step further by fully removing the interest-rate-risk component and document a comprehensive set of empirical facts on corporate-bond-specific excess returns.[5] Our results also show that duration matching performs sufficiently well in capturing the effects of important bond characteristics and systematic risk factors.

2 Measuring Corporate Bond Excess Returns

In this section, we first introduce the standard excess return measure based on the T-bill rate used in most previous studies. We then construct our measure of corporate-bond-specific excess returns.

Standard corporate bond excess return. Consider a corporate bond i with face value normalized to one at the end of month t with time-to-maturity τ (in years) and annualized coupon payment C. Moreover, following the market practice, we use a semi-annual coupon payment frequency. Let K_τ be the total number of coupon payments and t_k be the time between t and the date of the k-th coupon payment (by default, $t_{K_\tau} = \tau$).

The monthly total return of holding this bond from t to $t+1$ is calculated as

$$r_{i,t+1} = \frac{P_{i,t+1} + C_{i,t+1}}{P_{i,t}} - 1, \tag{1}$$

where $P_{i,t}$ is the full price (sum of the clean price and accrued interest) at the end of time t and

[5] A large literature studies corporate bond yield spreads relative to Treasury securities, among which our paper is particularly related to those that measure yield spreads using Treasury securities with identical cash flows as benchmarks (Collin-Dufresne, Goldstein, and Martin, 2001; Elton, Gruber, Agrawal, and Mann, 2001; Longstaff, Mithal, and Neis, 2005; He, Khorrami, and Song, 2022). Because corporate bond returns are mechanically linked to changes in yield spreads, our measure of corporate-bond-specific excess returns can be viewed as the return-space counterpart of change in yield spreads. Of course, important distinctions remain. For example, even for a zero-coupon bond, the yield equals the return only if the bond is held to maturity; accordingly, differences in yields across bonds can diverge substantially from differences in their (monthly, quarterly, or annual) returns. Moreover, returns are nonlinear functions of bond prices, which themselves are nonlinear functions of yields—particularly for corporate bonds, most of which are coupon-bearing. For further discussion of the relation between bond returns and yield spreads, see Asvanunt and Richardson (2017), Huang and Shi (2021), and Chen and Choi (2024).

$C_{i,t+1}$ is the coupon payment, if any, in month $t+1$. The standard corporate bond excess return is then computed as

$$rx_{i,t+1}^{Tbill} = r_{i,t+1} - r_t^{Tbill}. \tag{2}$$

where r_t^{Tbill} is the one-month U.S. T-Bill rate at the end of month t.

This standard excess return is used by most previous studies in the literature of corporate bond returns (Fama and French, 1993; Lin et al., 2011; Dickerson et al., 2023; Huang and Shi, 2021). However, given the bond's long-term stream of coupon and principal payments, it includes not only components specific to corporate bonds—such as credit and liquidity risk premia—but also an interest-rate-risk component. This component captures the return to a long-term default-free coupon bond, which is driven by risks associated with the entire term structure and extends well beyond what can be captured by the T-bill rate. As a result, analyses of corporate bond excess returns using $rx_{i,t+1}^{Tbill}$ are likely confounded by the effect of interest rate risk premium.

Corporate-bond-specific excess return. Our approach to fully remove the interest-rate-risk component and isolate returns specific to corporate bonds is to compute the monthly return on a default-free bond with the same maturity date and coupon rate as corporate bond i, and subtract it from $r_{i,t+1}$. To implement this approach, we use Treasury bonds as the default-free benchmarks. However, it is difficult to find Treasury bonds that exactly match all corporate bonds in every month, given the substantial differences between the Treasury and corporate bond universes. We therefore construct *synthetic* Treasury bonds using the Treasury yield curve.

In particular, with a zero-coupon Treasury yield curve in month t, we can compute the month-t (ex-coupon) full price of a Treasury bond that fully matches the cash flows of the cor-

porate bond i as (i.e., with the same maturity date and coupon rate)

$$P_{i,t}^{Full} = \sum_{k=1}^{K_\tau} \left[C/2 \times P_{zc,t,t_k} \right] + P_{zc,t,\tau} \tag{3}$$

$$= \sum_{k=1}^{K_\tau} \frac{C/2}{\left(1 + Y_{zc,t,t_k}/2\right)^{2t_k}} + \frac{1}{\left(1 + Y_{zc,t,\tau}/2\right)^{2\tau}}, \tag{4}$$

where P_{zc,t,t_k} and Y_{zc,t,t_k} are the month-t price and yield of the Treasury zero-coupon bond with time to maturity of t_k years.

The monthly total return of this synthetic Treasury bond is computed as

$$r_{i,t+1}^{Full} = \frac{P_{i,t+1}^{Full} + C_{i,t+1}}{P_{i,t}^{Full}} - 1, \tag{5}$$

similar to Eq. (1). We compute the corporate-bond-specific excess return of corporate bond i by subtracting this cash-flow-matched Treasury benchmark return from the total return:

$$rx_{i,t+1}^{Corp} = r_{i,t+1} - r_{i,t+1}^{Full}. \tag{6}$$

By using the Treasury bond with cash flows *identical* to those promised by the corporate bond,[6] the measure in Eq. (6) totally purges the effect of interest rate risk and exclusively captures the returns specific to corporate bond (e.g., driven by the credit risk and liquidity risk).[7]

To illustrate the relationship between the corporate-bond-specific and standard excess returns, we decompose $rx_{i,t+1}^{Tbill}$, based on Eqs. (2) and (6), as

$$rx_{i,t+1}^{Tbill} = \underbrace{r_{i,t+1} - r_{i,t+1}^{Full}}_{rx_{i,t+1}^{Corp}} + \underbrace{r_{i,t+1}^{Full} - r_t^{Tbill}}_{rx_{i,t+1}^{IR}} \tag{7}$$

[6] Note that the promised cash flows would be discontinued when default occurs. Our measure counts this effect into the corporate-bond-specific risk because it is induced by default risk.

[7] By using the Treasury yield curve to construct the benchmark bond return, this measure may include the premia specific to Treasury securities, e.g., the Treasury convenience premium. In Appendix A.2, we conduct robustness checks using alternative interest rate curves, such as interest rate swaps, and find that our main conclusions remain robust.

where the second term $rx^{IR}_{i,t+1} \equiv r^{Full}_{i,t+1} - r^{Tbill}_{t}$ is the excess return of the benchmark Treasury bond over the one-month T-bill rate, which captures the interest-rate-risk component of the corporate bond excess return. Hence, variation in the standard excess return may arise both from variation in the corporate-bond-specific return and from variation in the interest-rate-risk component. Drawing conclusions about returns specific to corporate bonds using $rx^{Tbill}_{i,t+1}$ may be confounded by the presence of the interest-rate-risk component in the measure.

3 Data and Sample

In this section, we describe the data on corporate bond transactions and the sample of monthly corporate bond returns.

Sample of corporate bond transactions. Following the literature, we use data of corporate bond transactions from the enhanced Trade Reporting and Compliance Engine (TRACE) maintained by the Financial Industry Regulatory Authority (FINRA).[8] Each transaction record in the data set contains the bond CUSIP, trade date, settlement date, (clean) trade price, untruncated principal amount, an indicator of whether the transaction is either between a customer and a dealer or between two dealers, and the trading direction (buy or sell) of dealers.

To construct the corporate bond sample, we start with the set of bonds covered in the Mergent Fixed Income Securities Database (FISD). We retain only bonds that are publicly traded in the U.S. market and denominated in U.S. dollars. We then restrict the sample to fixed-coupon bonds and exclude bonds with floating-rate coupons, bi-monthly coupons, or unclassified coupon structures. Moreover, we remove bonds with embedded equity or structured features, including convertible bonds, equity-linked bonds, structured notes, asset-backed securities, and mortgage-backed securities. We also exclude agency-backed and agency bonds, municipal bonds, government bonds, and privately placed issues under Rule 144A. Finally, we

[8] The TRACE data set contains all U.S. corporate bond transactions executed by broker-dealers registered with the FINRA. The transactions executed on all-to-all trading platforms or exchanges, such as the New York Stock Exchange's Automated Bond System, are not covered by the TRACE. However, these transactions account for a very small portion of total corporate bond trading volume, less than 1% in 1990 and 5% in 2014 according to reports of U.S. SEC (1992) and Bank for International Settlements (2016).

exclude bonds with missing values for key variables that are needed to compute accrued interest, including coupon type, coupon rate, dated date, and day-count basis.

We then merge the sample of filtered bonds with transaction records from TRACE over 2002–2024. We impose a series of standard filters used in the literature based on the transaction data (Dick-Nielsen, 2014; Bao and Hou, 2017). Specifically, we exclude trades with settlement periods exceeding two days and transactions for which the trade date is on or before the bond's offering date. We further remove trades identified as when-issued, locked-in, or subject to special sale conditions, as well as trades with nonstandard settlement cycles. We also exclude transactions with principal amounts below \$10,000 and trades with prices below \$5 or above \$1,000. In addition, we exclude bonds with missing information on rating, price, or trade date, bonds with remaining maturity below one year or above 30 years, and bonds with zero amount outstanding. Finally, we remove canceled, corrected, reversed, and duplicate trades.

In Table A.1 of Appendix A.1, we present the detailed step-by-step procedure of the data cleaning above, along with the associated change in sample coverage. The final sample of corporate bond transactions contains 100,037 unique bonds and around 147 million transactions.[9]

Sample of corporate bond returns. Using this sample of corporate bond transactions, we take the standard approach in the literature to compute monthly bond returns. In particular, we first calculate the price of each corporate bond on each day as the volume-weighted average of the intraday bond trade prices. Then, we calculate the month-t total return in Eq. (1) using the price of the last trade day in month $t-1$ ($P_{i,t-1}$) and the price of the last trade day in month t ($P_{i,t}$).[10]

As many corporate bonds do not trade every day, $P_{i,t}$ and $P_{i,t-1}$ may not be the end-of-the-month prices; in this case, we still keep the calculated return as long as $P_{i,t}$ and $P_{i,t-1}$ are both

[9] Some bonds in the baseline sample contain embedded call or put features. In robustness analysis, we repeat the main tests after excluding callable and putable bonds, while retaining standard noncallable bonds and bonds with only make-whole call provisions (Bao and Hou, 2017). The main conclusions are qualitatively unchanged.

[10] The day-count convention in the corporate bond market is a 360-day year, with each month having 30 days, while in the Treasury market, it is based on the actual number of days in each month and year, with a 365-day or 366-day year for leap years. In this paper, Treasury bonds are constructed synthetically based on zero-coupon Treasury yield curves and used to match corporate bonds. Hence, we shall follow the day-count convention in the corporate bond market, unless noted otherwise.

within the last five business days of (respective) month end. Moreover, when $P_{i,t-1}$ is not within the last five business days of month end but $P_{i,t}$ is, we replace $P_{i,t-1}$ using the price of the first trade day in month t (if this price is within the first five business days of the beginning of month t) and keep the return calculated using this price and $P_{i,t}$.[11]

Our final sample of monthly bond returns consists of 40,845 unique bonds, with 1,477,380 bond-month observations (see Table A.1 of Appendix A.1). Table 1 reports the time-series average of the cross-sectional bond characteristics. On average, bonds in our sample have a coupon rate of 5.47%, a time-to-maturity of 9.51 years, an outstanding amount of $581 million, and a rating of 8.5—corresponding to a BBB+/BBB rating.

Default-free benchmarks. As discussed in Section 2, we use the Treasury yield curve to compute returns of the benchmark securities in measuring corporate-bond-specific excess returns. Specifically, we use the Treasury yield curve constructed by Gürkaynak, Sack, and Wright (2007). One potential concern with using the Treasury yield curve is that Treasury securities carry convenience premiums due to their role as safe assets (Krishnamurthy and Vissing-Jorgensen, 2012). Moreover, long-term Treasury securities may suffer from inconvenience discounts in market stress (He, Nagel, and Song, 2022). These effects are beyond the returns due to interest rate risk and can also confound the computation of corporate-bond-specific excess return.[12] In Appendix A.2, we conduct robustness checks using interest rate swaps.

4 Estimates of Corporate Bond Excess Returns

In this section, we present estimates of corporate bond excess returns. To illustrate the confounding effects that arise when the interest rate risk component is not fully removed, we compare the corporate-bond-specific excess return with the standard excess return. We first con-

[11] In the month when a bond defaults, its trading price may be unavailable, in which case the default-month return is treated as missing. As a robustness check, we follow the literature and use the WRDS method to impute default-month returns, assuming a bond price of $40 at default. Our main findings remain unchanged. In fact, our main sample contains a negligible number of bond-default observations.

[12] Recently, Geng and Pan (2025) extract systematic credit, liquidity, and duration factors from the cross-section of corporate bond returns based on a structural model. They find that the duration factor exhibits strong comovement with the Treasury convenience yield, particularly during flight-to-safety episodes.

duct market-level analysis, and then examine the cross-sectional variations.

4.1 Market-Level Analysis

To conduct the market-level analysis, we compute the value-weighted averages, across all bonds i in each month t, of the standard excess return $rx_{i,t}^{\text{Tbill}}$, as well as its corporate-bond-specific component $rx_{i,t}^{\text{Corp}}$ and interest-rate-risk component $rx_{i,t}^{\text{IR}}$. Panel A of Table 2 provides the descriptive statistics of the monthly series of these measures.

We find that the standard excess return averages about 38 bps per month, consistent with estimates in the literature (e.g., Bao and Hou, 2017; Dickerson et al., 2023). In contrast, the average corporate-bond-specific excess return is considerably lower, at about 23 bps. That is, roughly 41% of the standard excess return arises from the interest-rate-risk component rather than compensation specific to corporate bonds. Moreover, the time-series variations of the standard and corporate-bond-specific excess returns are of similar magnitude. However, their difference exhibits substantial time-series variation, with a standard deviation of 1.787%, indicating distinct systematic movements in the corporate-bond-specific excess return relative to the standard excess return.

To understand these distinct systematic movements, we run time series regressions of the market-level standard and corporate-bond-specific excess returns, as well as their difference, on a number of important variables. These include the changes in the level, slope, and curvature factors of the yield curve, the aggregate stock market excess return, the change in the VIX index, and the change in the ICE BofA U.S. Bond Market Option Volatility Estimate Index (MOVE) as a leading indicator of fixed-income market volatility. Panel B of Table 2 reports the regression results.

We find that the regression coefficient on the level factor is significantly positive for the corporate-bond-specific excess return (1.260, t-stat = 5.335), but significantly negative for the standard excess return (-1.630, t-stat = -7.027), due to the dominant negative effect of the level factor on the interest-rate-risk component (-2.890, t-stat = -26.143). Consequently, using the

standard excess return measure can lead to misleading inferences about the relationship between corporate-bond-specific excess returns and the level of interest rates. We also find that the slope and curvature factors are significantly associated with the interest-rate-risk component, but not with either the standard or corporate-bond-specific excess returns. Moreover, equity market return is positively associated with both the standard and corporate-bond-specific excess returns, but shows little relation to the interest-rate-risk component. Changes in the VIX index and the MOVE index are not statistically significant in these regressions.

In sum, our analysis shows that, at the aggregate market level, the corporate-bond-specific excess return accounts for roughly 59% of the standard excess return on average. It also exhibits substantial time-series variation that is distinct from that of the interest-rate-risk component. In particular, we find a negative time-series association between corporate-bond-specific and interest-rate-risk excess returns, partly driven by fluctuations in the level of interest rates. Consequently, relying on the standard excess return measure can introduce significant confounding from interest rate risk when assessing returns specific to corporate bonds.

4.2 Cross-Sectional Analysis

To conduct the cross-sectional analysis, we sort individual corporate bonds into quintile portfolios each month based on the standard excess return. We then report the average standard excess return and its two components—the corporate-bond-specific and IR excess returns—across these portfolios in columns (1) –(3) of Table 3.

We find that both components increase monotonically across the quintile portfolios; intuitively, sorting on the standard excess return effectively combines the variation in the corporate-bond-specific and IR excess returns. In terms of magnitude, the cross-sectional dispersion in the standard excess return is 7.102% per month, while that of the corporate-bond-specific excess return is 5.866% per month. That is, about 17% ($\approx 1.236\%/7.102\%$) of the cross-sectional spread in the standard excess return arises from the IR component. Hence, using the standard excess return measure can result in an overestimation in assessing the cross-sectional disper-

sion of corporate-bond-specific excess returns.

To further examine the relationship between the two components of the standard excess return in the cross section, we sort corporate bonds into quintile portfolios each month based on the corporate-bond-specific excess return. For these portfolios, we compute the average standard excess return and its two components, as reported in columns (4)–(6) of Table 3.

We find that in contrast to the increasing pattern of the corporate-bond-specific excess return, the IR excess return decreases monotonically across the quintile portfolios. As a result, using the standard excess return measure can result in an underestimation in assessing the cross-sectional dispersion of corporate-bond-specific excess returns in this case.

We also sort corporate bonds into quintile portfolios each month based on the IR excess return. Columns (7)–(9) of Table 3 report the average standard excess return and its two components for these portfolios. We observe that in contrast to the increasing pattern of the IR excess return, the corporate-bond-specific excess return decreases monotonically across the quintile portfolios. Moreover, the cross-sectional dispersion in the IR excess return dominates that in the corporate-bond-specific excess return in magnitude, so the cross-sectional dispersion in the standard excess return is significantly positive. As a result, using the standard excess return measure can result in a totally opposite assessment of the true cross-sectional variation of corporate-bond-specific excess returns.

Note that the contrasting patterns of the corporate-bond-specific and IR component returns across quintile portfolios indicate a negative cross-sectional association between them. This negative cross-sectional relationship means that corporate bonds with higher corporate-bond-specific excess returns tend to have lower interest-rate-risk premiums, which is distinct from the negative time series correlation documented in Section 4.1 at the market level. To conduct formal statistical inference on this negative cross-sectional association, we run a panel regression of rx_{it}^{Corp} on rx_{it}^{IR} with time fixed effect. As reported in column (10) of Table 3, the regression coefficient is indeed significantly negative.

In sum, our cross-sectional analyses show that using the standard excess return measure can introduce large confounding effects from interest rate risk when assessing the cross-sectional

variation of corporate-bond-specific excess returns. Moreover, we also uncover a novel negative cross-sectional relationship between corporate-bond-specific and IR excess returns.[13]

5 Corporate Bond Characteristics and Excess Returns

In this section, we examine the effects of bond-level characteristics—previously shown in the literature to drive cross-sectional variation in bond returns using the standard excess return measure—on corporate-bond-specific excess returns.

5.1 Bond-Level Characteristics and Portfolio Sorting

We begin by introducing the set of bond-level characteristics used in our analysis, along with a brief discussion of their measurement.

Credit rating. Credit rating captures corporate bonds' credit quality and hence affects their returns. Following the literature (Fama and French, 1993), we form five rating-based cohorts each month: AA, A, BBB, BB, and B, where the AA cohort consists of bonds rated AA or higher and the B cohort consists of bonds rated B or lower.

Illiquidity. Illiquidity results in higher transaction costs and affects corporate bonds returns in equilibrium. Following the literature (Bao et al., 2011), we measure bond-level illiquidity using the Roll (1984) measure. We sort bonds into quintiles each month t based on this measure, with higher values indicating greater illiquidity. We then compute their $t+1$ returns.

Short-term return reversal (STR). Khang and King (2004) document a short-term return reversal effect in corporate bond returns. Accordingly, we measure short-term reversal using each bond's return in the previous month (t), based on which we then sort bonds into quintile portfolios. For convenience, we compute the $t+1$ return difference between the lowest- and highest-lagged-return quintiles, so a *positive* return difference indicates return reversal.

[13] Although beyond the scope of the current paper, we conduct exploratory analyses to understand what drives the negative cross-sectional relationship between corporate-bond-specific and interest rate excess returns in Appendix A.4.

Momentum. Jostova et al. (2013) document significant momentum in corporate bond returns. Accordingly, we compute cumulative bond returns over months $t-6$ to $t-1$. We then sort bonds into quintile portfolios and compute their $t+1$ returns.[14]

Long-term return reversal (LTR). Bali et al. (2021) document a long-term return reversal effect in corporate bond returns. Accordingly, we compute cumulative bond returns from month $t-47$ to $t-12$, based on which we sort bonds into quintile portfolios. Similar to STR, we compute the $t+1$ return difference between the lowest- and highest-lagged-return quintiles, so a positive return difference indicates return reversal.

Value. Correia et al. (2012) and Houweling and Van Zundert (2017) document a value effect in corporate bond returns: bonds with credit spreads that are high relative to fundamentals earn higher subsequent returns. Following their residual-spread approach, we construct a value characteristic that captures how high a bond's credit spread is relative to comparable bonds.

Specifically, the credit spread $CS_{i,t}$ is computed as the difference between the corporate bond yield and the yield of a benchmark Treasury bond with the same duration.[15] To isolate the residual component of credit spreads relative to comparable bonds, we estimate the following cross-sectional regression each month:

$$CS_{i,t} = \alpha_t + \sum_{r=1}^{21} \beta_{r,t} \mathbf{I}_{i,r,t} + \gamma_t TTM_{i,t} + \delta_t \Delta CS_{i,t} + \varepsilon_{i,t}, \tag{8}$$

where $\mathbf{I}_{i,r,t}$ denotes credit-rating dummy, $TTM_{i,t}$ is time to maturity, and $\Delta CS_{i,t}$ is the three-month change in the credit spread. The value measure, $CSP_{i,t}$, is then calculated as the percentage deviation of the observed spread from the fitted spread of Eq. (8):

$$CSP_{i,t} = \frac{CS_{i,t} - \widehat{CS}_{i,t}}{CS_{i,t}}. \tag{9}$$

We sort bonds into quintiles each month based on $CSP_{i,t}$ and compute their $t+1$ returns.

[14] We also compute a momentum return for a holding period of six month and find that the results are similar.
[15] We also use a maturity-matched benchmark and find that the results are similar.

Volatility. Chung et al. (2019) show that bond volatility is positively associated with subsequent corporate bond returns. Accordingly, we compute bond-level volatility as the standard deviation of daily returns of a bond within each month t, based on which we sort bonds into quintile portfolios and compute their $t+1$ returns.

Downside risk. Bai et al. (2019) document a significant relation between downside risk and future returns on corporate bonds. Accordingly, we measure bond-level downside risk using the 5% Value-at-Risk (VaR) of the monthly returns from $t-35$ to t. We multiply it by -1, so that higher values indicate greater downside risk. We sort bonds into quintile portfolios based on this downside risk measure and compute their $t+1$ returns.

5.2 Results

In Table 4, we report the value-weighted average return spreads for portfolios sorted by bond-level characteristics, using both the standard excess return and the corporate-bond-specific excess return. We find that seven of the eight characteristics generate significant spreads in standard excess returns, consistent with the findings of the original studies. In contrast, momentum does not exhibit a significant effect, with the average return spread close to zero.

Moreover, relative to the standard excess return measure, the spreads in corporate-bond-specific excess returns are notably smaller for illiquidity, downside risk, and volatility. Specifically, the reductions are approximately 10 basis points, corresponding to about 13–21% of the spreads in standard excess returns. For the remaining characteristics, the spreads in corporate-bond-specific excess returns are only slightly larger for STR and LTR and are virtually unchanged for credit rating and value.

Overall, using the corporate-bond-specific excess return, the significant effects of most characteristics, as well as the insignificant effect of momentum, remain valid. Hence, our analyses show that the effects of most bond-level characteristics documented in the existing literature primarily reflect compensation specific to corporate bonds rather than interest-rate risk. That said, the effects of downside risk and value become statistically weaker, while those of illiquid-

ity, volatility, STR, and LTR differ in magnitude, highlighting the extent to which the standard excess return measure is confounded by interest-rate risk.

6 Systematic Risk Factors and Excess Returns

In this section, we examine the effects of several systematic risk factors—previously shown to explain cross-sectional variation in corporate bond returns using the standard excess return measure—on corporate-bond-specific excess returns. We compare the results with those obtained using the standard excess return measure to examine the confounding effects of the interest-rate-risk component and to gain insight into the pricing of systematic risk factors.

6.1 Systematic Risk Factors

We consider six factors that have been shown in the literature to drive cross-sectional variation in corporate bond returns.

Default risk. As shown by Fama and French (1993), aggregate default risk significantly affects the cross section of corporate bond excess returns. Following Fama and French (1993), we construct the default factor (DEF) as the difference between the monthly returns on long-term investment-grade corporate bonds and long-term government bonds.

Term risk. Fama and French (1993) also show that term risk arising from unexpected changes in the term structure of interest rates is priced in the cross section of corporate bond returns. Following Fama and French (1993), we construct the term factor (TERM) as the difference between the monthly returns on long-term government bonds and one-month T-bills.

Liquidity risk. As documented by Lin et al. (2011), sensitivity to aggregate illiquidity in the corporate bond market significantly affects cross-sectional variation in bond returns. Following Bao et al. (2011), we use the cross-sectional median of the bond-level Roll measure—as discussed in Section 5—across all bonds in each month as our measure of aggregate illiquidity.

Volatility risk. As documented by Chung et al. (2019), market volatility risk is significantly priced in the cross-section of corporate bond returns. Following Chung et al. (2019), we use VIX as the measure of market volatility.

Intermediary capital risk factor. He et al. (2017) show that differential exposure to intermediary capital risk can explain the variation in returns across portfolios of corporate bonds sorted on yield spread, as well as portfolios of Treasury bonds sorted on time to maturity. We use the capital risk factor of He et al. (2017) (HKM), which is computed as the aggregate market equity divided by the sum of the aggregate market equity and book debt of the holding companies of Primary Dealers recognized by the Federal Reserve Bank of New York.

Inflation risk. As shown by Lu et al. (2025), inflation risk significantly affects corporate bond returns in the cross section. Following Lu et al. (2025), we use the monthly growth rate of the headline CPI as the measure of realized inflation.

6.2 Risk Exposures

We first examine corporate bonds' exposures to these systematic risk factors, as measured by factor betas. Following the standard procedure in the literature, we construct factor innovations and estimate each bond's beta with respect to each factor innovation on a monthly basis using a rolling window of 36 months, requiring at least 24 observations. Because corporate bonds trade infrequently, their monthly returns may not be based on prices observed exactly at the end of the month and therefore may not align with contemporaneous factor innovations. To address this issue, we follow Hu, Pan, and Wang (2013) and Chung et al. (2019) to include the one-month-lagged factor innovation in the estimation and use the sum of coefficients on the current and lagged innovations as the risk factor beta.[16]

[16] In addition, we follow the relevant studies to include control variables in beta estimation. Specifically, for VIX, we follow Chung et al. (2019) to include seven market factors; for HKM, we follow Dickerson et al. (2023) to include equity-market control variables; for illiquidity, we use the corporate bond market excess return as the control. DEF and TERM are included jointly in the beta regression, with no additional controls.

Market-level risk exposures. To examine risk exposures at the market level, we compute the value-weighted average betas of the standard excess return β^{Tbill} across the bonds available each month. Moreover, we also decompose the beta of the standard excess return into the corporate-bond-specific component β^{Corp} and the interest-rate-risk component β^{IR}. In Table 5, we report the time series means of these market-level beta estimates.

We find that, for all factors except DEF, β^{IR} has the opposite sign of β^{Corp} and is mostly larger in magnitude. Specifically, for TERM, β^{IR} is orders of magnitude larger than β^{Corp}. For headline CPI, HKM, and Illiquidity, β^{IR} and β^{Corp} are of the same order of magnitude, although the former remains dominating. For VIX, β^{IR} is similar in magnitude to β^{Corp}. As a result, using β^{Tbill} to assess the risk exposures of corporate-bond-specific excess returns is heavily confounded by interest-rate effects.

Cross-sectional differences of risk exposures. To examine cross-sectional differences of corporate bonds' risk exposures, we sort bonds into quintile portfolios in each month based on the estimated betas with respect to each factor and compute the value-weighted average beta of each quintile portfolio. The first three columns of Table 6 report the spreads between the betas—both $\beta_{i,t}^{Tbill}$ and its two components $\beta_{i,t}^{Corp}$ and $\beta_{i,t}^{IR}$—of the highest (Q5) and lowest (Q1) beta portfolios sorted based on the standard excess return beta $\beta_{i,t}^{Tbill}$.

We observe that for all factors, the three beta spreads are all positive, showing that they increase monotonically across the quintile portfolios; intuitively, sorting on $\beta_{i,t}^{Tbill}$ effectively combines the variation in $\beta_{i,t}^{Corp}$ and $\beta_{i,t}^{IR}$. In terms of magnitude, the cross-sectional dispersion in $\beta_{i,t}^{Tbill}$ is driven primarily by the dispersion in $\beta_{i,t}^{Corp}$ for all factors except TERM. Specifically, the cross-sectional dispersion in $\beta_{i,t}^{Corp}$ accounts for more than 95% of the dispersion in $\beta_{i,t}^{Tbill}$ for DEF and VIX, and more than 70% for headline CPI, HKM, and Illiquidity. In contrast, for TERM, the cross-sectional dispersion in $\beta_{i,t}^{IR}$ accounts for about 72% of the dispersion in $\beta_{i,t}^{Tbill}$.

The next three columns of Table 6 report the results for portfolios sorted by the corporate-bond-specific excess return beta, $\beta_{i,t}^{Corp}$. As expected, the spreads in $\beta_{i,t}^{Corp}$ are positive by construction. Importantly, for all factors except DEF, the corresponding spreads in $\beta_{i,t}^{IR}$ are negative,

indicating a negative cross-sectional association between the betas of corporate-bond-specific excess returns and those of the interest-rate-risk component. To conduct formal statistical inference on this negative cross-sectional association, we run a panel regression of $\beta_{i,t}^{Corp}$ on $\beta_{i,t}^{IR}$ with time fixed effects. From the last two columns of Table 6, we observe that the coefficients are negative for all factors and also statistically significant except for DEF. Moreover, the cross-sectional dispersion in $\beta_{i,t}^{Corp}$ is larger than that in $\beta_{i,t}^{IR}$, implying that the dispersion in $\beta_{i,t}^{Tbill}$ is largely driven by that in $\beta_{i,t}^{Corp}$.

6.3 Risk Premia

To examine the risk premia associated with these systematic risk factors, we compute the value-weighted average return spread between the highest (Q5) and lowest (Q1) beta quintiles for portfolios formed by sorting bonds on the standard excess return beta (reported in the first two columns of Table 7) and for portfolios formed by sorting bonds on the corporate-bond-specific excess return beta (reported in the last two columns of Table 7). We report the spreads both in standard excess return and in corporate-bond-specific excess return.

We find that the spreads in standard excess return are significantly positive for DEF, headline CPI, and HKM, but significantly negative for Illiquidity, all consistent with the prior studies (Fama and French, 1993; Lin et al., 2011; He et al., 2017; Lu et al., 2025). In contrast, we do not find significant pricing effects for TERM and VIX.

Furthermore, relative to the standard excess return measure, the spread in corporate-bond-specific excess returns is smaller for DEF. Combined with the positive spread in β_{it}^{IR} reported in Table 6, this finding implies that DEF commands a positive risk premium in the interest-rate-risk component. By contrast, the spread for illiquidity is virtually unchanged, indicating little contribution from the interest-rate-risk component.

For headline CPI and HKM, the spread in corporate-bond-specific excess returns is larger than that based on the standard excess return measure when sorting bonds by β_{it}^{Tbill} but smaller when sorting bonds by β_{it}^{Corp}. This opposite difference in return spread, together with the op-

posite difference in β_{it}^{IR} reported in Table 6, implies that headline CPI and HKM carry a negative risk premium in the interest-rate-risk component, thereby attenuating the positive risk premia in the corporate-bond-specific component.[17] Nevertheless, because the corporate-bond-specific component remains dominant in magnitude, the pricing effects documented using the standard excess return measure largely reflect compensation specific to corporate bonds.

7 Components of Interest Rate Risk Effects

The analyses so far have demonstrated the confounding effects of interest rate risk when using the standard excess return measure. These interest-rate-risk effects reflect not only duration effects associated with parallel shifts in the term structure, but also higher-order effects—such as convexity—arising from changes in the shape of the yield curve (e.g., slope and curvature). In this section, we decompose the interest-rate-risk effects into the duration and higher-order components.

7.1 Decomposition

Specifically, we use the duration-matched return proposed by Binsbergen et al. (2025) to measure duration effects and define the higher-order (HO) component as the difference between the total interest-rate-risk component and duration-matched return. To construct the duration-matched return, note that the benchmark coupon bond associated with corporate bond i in month t can be represented as a portfolio of zero-coupon bonds. The monthly return on each zero-coupon bond is given by

$$r_{zc,t+1,t_k} = \frac{P_{zc,t+1,t_k-\frac{1}{12}}}{P_{zc,t,t_k}} - 1, \tag{10}$$

[17] The opposite signs of the risk premia for headline CPI are consistent with the findings of Lu et al. (2025), who show that inflation is negatively associated with corporate bond default risk and also negatively affects nominal bonds. For HKM, He et al. (2017) originally document a positive risk premium using portfolios that combine corporate and Treasury bonds. The opposite signs of the risk premia for HKM we document provide novel insights into the differential pricing of intermediary capital risk in corporate bonds versus Treasury bonds.

where P_{zc,t,t_k} denotes the end-of-month-t price of a zero-coupon bond with a remaining maturity of t_k years. The return on the coupon bond is then obtained by aggregating the returns of the underlying zero-coupon bonds using duration-based weights.

In particular, the end of month-t Macaulay duration of the corporate bond i is

$$D_{i,t} = \frac{1}{P_{i,t}} \left[\sum_{k=1}^{K_\tau} \frac{C/2}{\left(1 + Y_{i,t}/2\right)^{2t_k}} \times t_k + \frac{1}{\left(1 + Y_{i,t}/2\right)^{2\tau}} \times \tau \right], \tag{11}$$

where $Y_{i,t}$ is the yield to maturity of the corporate bond. Note that the Macaulay duration in Eq. (11) equals the weighted average time it takes to receive all cash flows, with the weight equal to the cash flow discounted by the bond's yield to maturity $Y_{i,t}$. Accordingly, Binsbergen et al. (2025) use the weights in Eq. (11) to aggregate the returns of the individual zero-coupon bonds to compute the duration-matched return:[18]

$$r^{Dur}_{i,t+1} = \frac{1}{P_{i,t}} \left[\sum_{k=1}^{K_\tau} \frac{C/2}{\left(1 + Y_{i,t}/2\right)^{2t_k}} \times r_{zc,t+1,t_k} + \frac{1}{\left(1 + Y_{i,t}/2\right)^{2\tau}} \times r_{zc,t+1,\tau} \right] + \frac{C_{i,t+1}}{P_{i,t}}. \tag{12}$$

The duration-adjusted excess return is then computed as

$$rx^{DurAdj}_{i,t+1} = r_{i,t+1} - r^{Dur}_{i,t+1}. \tag{13}$$

Next, we compare our corporate-bond-specific excess return measure with the duration-adjusted measure. Based on Eqs. (6) and (13), the comparison boils down to the difference between $r^{Full}_{i,t+1}$ in Eq. (5) and $r^{Dur}_{i,t+1}$ in Eq. (12). Based on Eqs. (3), (5) and (10), we have

$$\begin{aligned} r^{Full}_{i,t+1} &= \frac{1}{P^{Full}_{i,t}} \left[P^{Full}_{i,t+1} - P^{Full}_{i,t} \right] + \frac{C_{i,t+1}}{P^{Full}_{i,t}} \\ &= \frac{1}{P^{Full}_{i,t}} \left[\sum_{k=1}^{K_\tau} \left(C/2 \times P_{zc,t,t_k} \times r_{zc,t+1,t_k} \right) + P_{zc,t,\tau} \times r_{zc,t+1,\tau} \right] + \frac{C_{i,t+1}}{P^{Full}_{i,t}} \\ &= \frac{1}{P^{Full}_{i,t}} \left[\sum_{k=1}^{K_\tau} \frac{C/2}{\left(1 + Y_{zc,t,t_k}/2\right)^{2t_k}} \times r_{zc,t+1,t_k} + \frac{1}{\left(1 + Y_{zc,t,\tau}/2\right)^{2\tau}} \times r_{zc,t+1,\tau} \right] + \frac{C_{i,t+1}}{P^{Full}_{i,t}}. \end{aligned} \tag{14}$$

[18] We separate the coupon payment in month $t+1$ ($C_{i,t+1}$) out, if any, to be consistent with the notation in Eqs. (3) and (4), where ex-coupon prices are computed.

Comparing Eq. (14) with Eq. (12), we observe that both $r^{Full}_{i,t+1}$ and $r^{Dur}_{i,t+1}$ involve value-weighted averages of returns on associated zero-coupon bonds, but differ in two key respects.

First, the weights in $r^{Full}_{i,t+1}$ are based on the entire zero-coupon yield curve, $Y_{zc,t,t_k}, k = 1, \cdots, K_\tau$, whereas those in $r^{Dur}_{i,t+1}$ are based solely on the yield to maturity of the corporate bond, $Y_{i,t}$. Consequently, while $r^{Dur}_{i,t+1}$ primarily removes duration effects associated with parallel shifts in the yield curve, $r^{Full}_{i,t+1}$ additionally accounts for higher-order effects arising from changes in the shape of the yield curve, such as changes in its slope and curvature.

Second, because both the yield to maturity $Y_{i,t}$ used in the weights and the corporate bond price $P_{i,t}$ used in the denominator reflect corporate-bond-specific risks, $r^{Dur}_{i,t+1}$ incorporates components of corporate-bond-specific returns. In contrast, $r^{Full}_{i,t+1}$ is constructed solely from benchmark securities that match the cash flow structure of the corporate bond. Moreover, in coupon-payment months (when $C_{i,t+1} = C/2$ rather than zero), the use of $P_{i,t}$ in $r^{Dur}_{i,t+1}$ introduces an additional confounding component related to corporate-bond-specific returns.

Overall, we use the duration-matched return measure to decompose the interest rate risk component $rx^{IR}_{i,t+1}$ of the standard excess return in Eq. (7) as

$$rx^{IR}_{i,t+1} = \underbrace{r^{Full}_{i,t+1} - r^{Dur}_{i,t+1}}_{rx^{HO}_{i,t+1}} + \underbrace{r^{Dur}_{i,t+1} - r^{Tbill}_{t}}_{rx^{Dur}_{i,t+1}} \tag{15}$$

where $rx^{Dur}_{i,t+1}$ is the excess return of the duration-matched benchmark over the one-month T-bill rate, while $rx^{HO}_{i,t+1}$ equals the difference in return between the fully-matched and duration-matched benchmarks and is expected to capture the higher-order component of the interest rate risk effect. Nevertheless, because the duration-matched return captures not only duration effects but also effects related to corporate-bond-specific returns, the decomposition should be interpreted as separating the effects captured by duration matching from the residual effects beyond duration matching, rather than as a pure decomposition of interest-rate risk into duration and higher-order components of interest rate risk.[19]

[19] When the HO component is negligible, i.e., $r^{Full}_{i,t+1} \approx r^{Dur}_{i,t+1}$, the corporate-bond-specific excess return is close

7.2 Estimates of the Components

In this section, we analyze the estimated duration-matching and HO components of the interest-rate effect. We begin with a market-level analysis. Specifically, Panel A of Table 8 presents summary statistics for the market-level estimates of the two components of rx^{IR} (whose summary statistics are reported in the last row of Panel A of Table 2). We observe that the average duration-matching component is substantially larger than the average HO component.

Panel B of Table 8 reports the results of time-series regressions of the two components on the same set of explanatory variables used in Panel B of Table 2. We find that rx^{Dur} loads negatively on the Level and Slope factors (-2.746 and -1.074, with t-statistics of -23.914 and -4.942), while rx^{HO} also loads significantly negatively on these two factors (-0.144 and -0.172, with t-statistics of -5.151 and -4.446). In contrast, the two components have opposite loadings on changes in Curvature: the coefficient is positive for rx^{Dur} (0.752, t-statistic = 2.386) but negative for rx^{HO} (-0.099, t-statistic = -2.981). Moreover, the loadings of rx^{Dur} are substantially larger in magnitude and therefore account for most of the corresponding loadings of rx^{IR}. The coefficients on MOVE are not statistically significant for either component.

We then conduct a cross-sectional analysis. As discussed in Section 7.1, the difference between the fully-matched and duration-matched returns that is captured by r^{HO} arises from both the effects of nonparallel shifts in the term structure and the corporate-bond-specific effects. Accordingly, we partition the sample into three subsamples based on the monthly change in the term spread, which captures the effects of nonparallel shifts in the term structure, and within each subsample, we sort bonds into quintile portfolios based on their credit spreads, which are related to the corporate-bond-specific effects. Table 9 reports the interest-rate-risk excess return, and its two components for each of these portfolios. We also report the average across all bonds and the difference between the quintiles 5 and 1 portfolios.

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to the duration-adjusted excess return:

$$rx^{Corp}_{i,t+1} = r_{i,t+1} - r^{Full}_{i,t+1} \approx r_{i,t+1} - r^{Dur}_{i,t+1} = rx^{DurAdj}_{i,t+1}.$$

The standard excess return can then be written as $rx^{Tbill}_{i,t+1} = rx^{DurAdj}_{i,t+1} + rx^{Dur}_{i,t+1}$, which is the decomposition used by Binsbergen et al. (2025).

We find that the average interest-rate-risk excess return, rx^{IR}, is lower when the change in the term spread is larger, consistent with its negative loading on the Slope factor reported in Panel B of Table 2. More importantly, the cross-sectional dispersion in rx^{IR} also declines as the change in the term spread increases, with the HO component accounting for a substantial share of this variation.[20] Specifically, the cross-sectional spread in rx^{HO} decreases from 0.160% ($t = 5.956$) in the low-term-spread-change subsample to -0.129% ($t = -5.023$) in the high-term-spread-change subsample. Although the cross-sectional spread in rx^{Dur} also declines with the change in the term spread, it is statistically insignificant within each subsample. Overall, the HO component accounts for approximately 30–40% of the cross-sectional spread in rx^{IR}, particularly in the low- and high-term-spread-change subsamples where the spread in rx^{IR} is statistically significant.

In sum, we find that, at the market level, the duration-matched component accounts for the majority of the interest-rate-risk component, both on average and in terms of time-series variation. Moreover, the differences between our corporate-bond-specific excess return and the duration-adjusted excess return vary significantly with credit spreads in the cross section. This cross-sectional variation depends on the term spread change and accounts for a large fraction of the cross-sectional variation in the IR excess return. Hence, accounting for the effects of nonparallel shifts in the term structure and excluding the corporate-bond-specific effects are both important for accurately capturing corporate-bond-specific excess returns.

7.3 Characteristics, Risk Factors, and Interest-Rate-Risk Components

In this section, we decompose the interest rate risk components in the effects of bond-level characteristics and systematic risk factors documented in Sections 5 and 6 into the duration-matching and HO components.

Specifically, Panel A of Table 10 reports the duration-matching and HO components of the interest-rate-risk excess return rx^{IR}_{t+1} associated with bond-level characteristics (which is the

[20] In unreported results, we also find that the average corporate-bond-specific excess return and its cross-sectional spread is higher when the change in the term spread is larger.

difference between rx_{t+1}^{Tbill} and rx_{t+1}^{Corp} reported in Table 4). We find that, for the three characteristics with notable interest-rate-risk effects—illiquidity, downside risk, and volatility—the duration-matching component accounts for most of the interest-rate-risk effect. For the remaining characteristics, whose interest-rate-risk effects are relatively small, both the duration-matching and HO components are correspondingly small.

Panel B of Table 10 reports the duration-matching and HO components of the IR beta (β_t^{IR}) and return spreads (rx_{t+1}^{IR}) associated with systematic risk factors, corresponding to the results reported in Tables 6 and 7. We find that the duration-matching components of β_t^{IR} dominate the HO components for all risk factors. Moreover, among the four risk factors with significant pricing effects, the duration-matching component accounts for most of the interest-rate-risk effect for DEF, HKM, and headline CPI, whereas both the duration-matching and HO components are small for illiquidity.

In sum, for the effects of bond-level characteristics and systematic risk factors, duration matching performs sufficiently well in capturing the relevant variation in corporate-bond-specific excess returns. One reason, as analyzed in Section 7.1, is that the duration-matched return captures not only duration effects but also effects related to corporate-bond-specific returns.

8 Conclusion

The U.S. corporate bond market has grown dramatically over the past several decades, with a growing share of bonds now held by active asset managers whose investment strategies involve frequent trading and portfolio rebalancing rather than holding bonds to maturity. Accordingly, analyzing returns across individual bonds within standard portfolio frameworks is essential for understanding their risk exposures and associated risk premia. A large body of research has documented numerous empirical regularities in the cross section of corporate bond returns. However, most studies measure bond excess returns relative to the T-bill rate. This standard excess return measure captures not only components specific to corporate bonds—such as credit and liquidity risk premia—but also an interest-rate-risk component that extends far beyond

what is captured by the T-bill rate. Consequently, it remains unclear to what extent variation in standard excess returns reflects changes in risks specific to corporate bonds.

In this paper, we conduct a comprehensive analysis of corporate-bond-specific excess returns across individual bonds. Specifically, we construct a measure of corporate-bond-specific excess returns that fully removes the interest-rate-risk component by using default-free benchmark securities with identical cash flows. Using this measure, we document a comprehensive set of empirical regularities for monthly corporate-bond-specific excess returns. In particular, we compare corporate-bond-specific and standard excess returns at both the aggregate and cross-sectional levels, examine the effects of a broad set of bond-level characteristics and systematic risk factors, and analyze the different components of the interest-rate-risk effects. Our findings provide a foundational benchmark for future research on corporate bond returns.

Table 1. Summary of the Corporate Bond Return Sample

This table summarizes the corporate bond return sample used in the main analyses. The top panel reports the sample period, the number of unique bonds, and the number of bond-month observations. The bottom panel reports the number of non-missing observations, mean, standard deviation, and selected percentiles for monthly bond returns, coupon rates, credit ratings, time to maturity, amount outstanding, and duration. Ratings are converted into numerical scores, where 1 denotes AAA and 21 denotes C. Macaulay duration is computed assuming semiannual coupon payments. The reported summary statistics are time-series averages of monthly cross-sectional statistics.

Sample period	July 2002 - December 2024
# bonds	40,845
# bond×month	1,477,380

				Percentiles						
Variable	N	Mean	SD	p1	p5	p25	Median	p75	p95	p99
Bond return (r)	1,477,380	0.569	3.572	-7.532	-3.503	-0.684	0.426	1.647	5.054	10.223
Coupon Rate	1,477,380	5.469	1.666	1.996	2.936	4.375	5.338	6.401	8.466	10.071
Rating	1,471,612	8.513	3.580	1.509	2.822	6.107	8.059	10.262	15.128	18.127
Time to Maturity	1,477,380	9.507	8.012	1.109	1.541	3.639	6.567	12.805	26.964	29.363
Amount Outstanding	1,477,380	581.476	608.815	3.804	16.772	230.074	416.195	742.024	1694.734	2922.276
Duration	1,477,380	6.514	4.111	1.066	1.473	3.281	5.470	8.956	14.625	16.043

Table 2. Standard and Corporate-Bond-Specific Excess Returns: Market Level

This table summarizes value-weighted market-level corporate bond excess return measures. Panel A reports time-series statistics for the monthly standard excess return, rx_t^{Tbill}, the corporate-bond-specific component, rx_t^{Corp}, and the interest-rate-risk component, rx_t^{IR}. Panel B reports time-series regressions for the value-weighted corporate bond market portfolio. The dependent variables are rx_t^{Tbill}, rx_t^{Corp}, and rx_t^{IR}. Regressors are month-over-month changes in the first three principal components of the Treasury yield curve (level, slope, and curvature), the CRSP value-weighted equity market excess return, and monthly changes in the VIX and ICE BofAML MOVE indexes, with the VIX and MOVE changes scaled by 100. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for Panel B regression coefficients. The sample period is August 2002 to December 2024 for Panel A, where the first return month (July 2002) is dropped because value weights are based on the previous month's amount outstanding. The sample period is December 2002 to December 2024 for Panel B, because the monthly change in the MOVE index is first available in December 2002. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary Statistics

	Mean	SD	P1	P25	P50	P75	P99
rx_t^{Tbill}	0.384	1.988	-5.520	-0.502	0.444	1.259	5.863
rx_t^{Corp}	0.225	2.079	-8.111	-0.631	0.288	1.246	7.577
rx_t^{IR}	0.159	1.787	-4.354	-0.913	0.074	1.161	4.653

Panel B: Time-Series Regressions

	Intercept	ΔLevel_t	ΔSlope_t	$\Delta\text{Curvature}_t$	Mkt_t^s	ΔVIX_t	ΔMOVE_t
rx_t^{Tbill}	0.188*	-1.630***	-0.642	0.492	0.202***	-6.397	-1.350
	(1.716)	(-7.027)	(-1.096)	(0.545)	(4.430)	(-1.457)	(-0.911)
rx_t^{Corp}	0.028	1.260***	0.605	-0.162	0.201***	-7.524	-1.567
	(0.251)	(5.335)	(1.008)	(-0.157)	(4.426)	(-1.626)	(-1.019)
rx_t^{IR}	0.161***	-2.890***	-1.247***	0.654**	0.000	1.127	0.218
	(4.002)	(-26.143)	(-5.870)	(2.024)	(0.011)	(1.306)	(0.749)

Table 3. Standard and Corporate-Bond-Specific Excess Returns: Cross Section

This table reports value-weighted quintile portfolios formed each month on bond-level excess return measures. Columns (1)–(3) sort bonds on the current month's standard excess return, $rx_{i,t}^{\text{Tbill}}$, and report the standard excess return, rx_t^{Tbill}, the corporate-bond-specific component, rx_t^{Corp}, and the interest-rate-risk component, rx_t^{IR}. Columns (4)–(6) repeat the exercise for portfolios sorted on $rx_{i,t}^{\text{Corp}}$, and columns (7)–(9) for portfolios sorted on $rx_{i,t}^{\text{IR}}$. Column (10) reports a panel regression of $rx_{i,t}^{\text{Corp}}$ on $rx_{i,t}^{\text{IR}}$ with time fixed effects and standard errors double-clustered by bond and month. All returns are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses for the HML spreads in columns (1)–(9); the double-clustered t-statistic is reported in parentheses for the regression coefficient in column (10). Significance stars are reported only for HML spreads and the regression coefficient. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort on $rx_{i,t}^{\text{Tbill}}$			Sort on $rx_{i,t}^{\text{Corp}}$			Sort on $rx_{i,t}^{\text{IR}}$			Regression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	rx_t^{Tbill}	rx_t^{Corp}	rx_t^{IR}	rx_t^{Tbill}	rx_t^{Corp}	rx_t^{IR}	rx_t^{Tbill}	rx_t^{Corp}	rx_t^{IR}		$rx_{i,t}^{\text{Corp}}$
Low	-2.943	-2.501	-0.442	-2.350	-3.074	0.725	-0.322	0.974	-1.296	$rx_{i,t}^{\text{IR}}$	-0.505***
	(-7.825)	(-5.735)	(-2.637)	(-6.184)	(-7.239)	(4.565)	(-1.830)	(5.764)	(-8.529)		(-13.326)
2	-0.552	-0.393	-0.159	-0.249	-0.705	0.457	0.044	0.443	-0.399		
	(-4.426)	(-2.622)	(-1.370)	(-2.076)	(-4.551)	(3.594)	(0.307)	(3.145)	(-3.664)		
3	0.301	0.131	0.170	0.254	0.145	0.109	0.399	0.236	0.164		
	(3.105)	(1.296)	(1.830)	(2.605)	(1.370)	(0.998)	(2.608)	(1.419)	(1.651)		
4	1.226	0.744	0.482	0.864	1.040	-0.176	0.689	-0.029	0.718		
	(8.202)	(4.963)	(4.547)	(5.769)	(7.140)	(-1.597)	(5.266)	(-0.206)	(6.224)		
High	4.159	3.365	0.794	3.608	3.912	-0.303	1.137	-0.537	1.674		
	(8.298)	(6.644)	(5.102)	(7.051)	(7.975)	(-2.359)	(7.866)	(-3.155)	(9.471)		
HML	7.102***	5.866***	1.236***	5.958***	6.986***	-1.028***	1.459***	-1.511***	2.970***	Time FE	Yes
	(9.475)	(7.524)	(8.667)	(7.738)	(9.104)	(-9.894)	(10.021)	(-10.852)	(16.706)	Adj R^2	0.232

Table 4. Corporate Bond Characteristics and Excess Returns

This table reports long-short return spreads based on bond characteristics. For each characteristic, bonds are sorted into quintiles using information from the preceding month, and value-weighted long-short portfolios are formed. The portfolio goes long the highest quintile and short the lowest quintile except for short-term reversal and long-term reversal, for which the direction is reversed. The credit-rating portfolio is long bonds rated B or lower and short bonds rated AA or higher. For each characteristic portfolio, the table reports time-series averages of the next-month standard excess return, rx_{t+1}^{Tbill}, and the corporate-bond-specific component, rx_{t+1}^{Corp}. The sample period is August 2002 to December 2024, with start dates varying by characteristic availability. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	rx_{t+1}^{Tbill}	rx_{t+1}^{Corp}
Credit rating	0.910^{***}	0.901^{***}
	(2.71)	(2.80)
Roll	0.523^{***}	0.414^{**}
	(2.85)	(2.22)
Downside risk	0.667^{**}	0.561
	(1.99)	(1.59)
Volatility	0.789^{**}	0.687^{**}
	(2.54)	(2.12)
STR	0.455^{***}	0.479^{***}
	(2.91)	(3.61)
Value	0.226^{*}	0.227
	(1.77)	(1.58)
LTR	0.426^{*}	0.450^{*}
	(1.82)	(1.96)
Momentum	0.001	0.032
	(0.00)	(0.13)

Table 5. Market-Level Betas

This table reports time-series averages of monthly value-weighted averages of bond-level beta estimates. β_t^{Tbill}, β_t^{Corp}, and β_t^{IR} denote betas estimated from the standard excess return, $rx_{i,t}^{\text{Tbill}}$, the corporate-bond-specific component, $rx_{i,t}^{\text{Corp}}$, and the interest-rate-risk component, $rx_{i,t}^{\text{IR}}$, respectively. Betas are estimated from 36-month rolling OLS regressions requiring at least 24 observations. Each regression includes the contemporaneous and one-month-lagged factor innovations, and the reported beta is the sum of the two coefficients. DEF and TERM are included jointly in the beta estimation regression, with no additional controls. The CPI beta is estimated using the one-step-ahead forecast error from an expanding-window ARMA(1,1) model of monthly headline CPI inflation, with no controls. The HKM beta is estimated with the stock market excess return as the only control. The illiquidity beta is estimated using the first difference of the monthly cross-sectional median of the bond-level Roll illiquidity measure, with the bond market excess return as the only control. The VIX beta is estimated using the one-step-ahead forecast error from an expanding-window AR(1) model of the VIX level, with seven controls following Chung et al. (2019). The sample period is September 2004 to December 2024. Newey–West t-statistics with 36 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	β_t^{Tbill}	β_t^{Corp}	β_t^{IR}
DEF	1.048***	1.052***	-0.005
	(9.030)	(7.998)	(-0.109)
TERM	0.574***	-0.038	0.612***
	(13.571)	(-1.193)	(10.992)
Headline CPI	-0.671***	1.186***	-1.857***
	(-2.892)	(2.730)	(-6.129)
HKM	-4.078	9.573***	-13.651***
	(-1.338)	(3.989)	(-4.070)
Illiquidity	0.920**	-17.516***	18.436***
	(2.501)	(-2.856)	(2.867)
VIX	-0.002	-0.062*	0.059**
	(-0.097)	(-1.743)	(2.366)

Table 6. Cross-Sectional Differences of Risk Exposures

This table reports value-weighted HML spreads in factor betas for quintile portfolios sorted on estimated factor betas. β_t^{Tbill}, β_t^{Corp}, and β_t^{IR} denote betas estimated from the standard excess return, the corporate-bond-specific component, and the interest-rate-risk component, respectively, as described in Table 5. The first three columns sort bonds on $\beta_{i,t}^{\text{Tbill}}$, and report spreads in β_t^{Tbill}, β_t^{Corp}, and β_t^{IR}. The next three columns repeat the analysis for portfolios sorted on $\beta_{i,t}^{\text{Corp}}$. The right two columns report panel regressions of $\beta_{i,t}^{\text{Corp}}$ on $\beta_{i,t}^{\text{IR}}$ over the same bond-month formation panel, with time fixed effects and standard errors double-clustered by month and bond. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is September 2004 to December 2024. Newey-West t-statistics with 5 lags are reported in parentheses for the portfolio spreads; double-clustered t-statistics are reported in parentheses for the panel regressions. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort by $\beta_{it}^{\text{Tbill}}$			Sort by β_{it}^{Corp}			Regress $\beta_{i,t}^{\text{Corp}}$ on $\beta_{i,t}^{\text{IR}}$	
	β_t^{Tbill}	β_t^{Corp}	β_t^{IR}	β_t^{Tbill}	β_t^{Corp}	β_t^{IR}	Coeff	Adj R^2
DEF	2.912***	2.775***	0.137***	2.849***	2.846***	0.002	-0.023	0.083
	(11.045)	(10.224)	(3.342)	(10.890)	(10.519)	(0.108)	(-0.520)	
TERM	1.161***	0.324***	0.836***	0.339***	0.859***	-0.520***	-0.306***	0.163
	(21.179)	(3.877)	(18.764)	(3.213)	(12.268)	(-11.020)	(-39.214)	
Headline CPI	8.434***	6.576***	1.857***	6.545***	8.186***	-1.641***	-0.507***	0.150
	(13.920)	(10.823)	(10.675)	(10.788)	(13.999)	(-9.953)	(-21.306)	
HKM	55.602***	39.373***	16.229***	38.859***	55.409***	-16.550***	-0.558***	0.182
	(14.422)	(8.484)	(10.724)	(8.187)	(14.879)	(-9.600)	(-37.295)	
Illiquidity	67.391***	49.007***	18.384***	44.389***	67.989***	-23.600***	-0.594***	0.272
	(9.804)	(10.418)	(6.696)	(10.896)	(10.283)	(-7.315)	(-36.344)	
VIX	0.891***	0.864***	0.027***	0.833***	0.919***	-0.086***	-0.806***	0.085
	(12.586)	(12.265)	(5.964)	(11.454)	(13.239)	(-7.334)	(-32.825)	

Table 7. Risk Premia

This table reports value-weighted long-short returns for quintile portfolios sorted on factor betas. Betas are estimated as described in Table 5. The left two columns sort bonds on betas of the standard excess return, $\beta_{i,t}^{\text{Tbill}}$, and report HML spreads in next-month rx_{t+1}^{Tbill} and rx_{t+1}^{Corp}. The right two columns repeat the analysis for portfolios sorted on betas of the corporate-bond-specific excess return, $\beta_{i,t}^{\text{Corp}}$. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is September 2004 to December 2024. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort by β_t^{Tbill}		Sort by β_t^{Corp}	
	rx_{t+1}^{Tbill}	rx_{t+1}^{Corp}	rx_{t+1}^{Tbill}	rx_{t+1}^{Corp}
DEF	0.488*	0.378	0.491*	0.379
	(1.788)	(1.277)	(1.883)	(1.330)
TERM	0.051	-0.105	0.020	0.041
	(0.292)	(-0.757)	(0.159)	(0.325)
Headline CPI	0.504**	0.610***	0.623***	0.479 *
	(1.970)	(2.671)	(2.614)	(1.913)
HKM	0.367*	0.397**	0.474**	0.427**
	(1.884)	(2.375)	(2.448)	(2.186)
Illiquidity	-0.328*	-0.305*	-0.369*	-0.363 *
	(-1.844)	(-1.847)	(-1.882)	(-1.808)
VIX	-0.119	-0.045	-0.082	-0.055
	(-1.224)	(-0.538)	(-0.822)	(-0.648)

Table 8. Estimates of Duration and Higher-Order Effects: Market Level

This table summarizes value-weighted market-level duration-matched and higher-order components of the interest-rate-risk excess return. We decompose the interest-rate-risk component as $rx_t^{\text{IR}} = rx_t^{\text{Tbill}} - rx_t^{\text{Corp}} = rx_t^{\text{Dur}} + rx_t^{\text{HO}}$, where rx_t^{Dur} is the duration-matched component and rx_t^{HO} is the higher-order component. Monthly value-weighted returns use prior-month bond size. Panel A reports time-series summary statistics. Panel B reports time-series regressions on the same explanatory variables as in Table 2: changes in the first three principal components of the Treasury yield curve (level, slope, and curvature), the CRSP value-weighted equity market excess return, and monthly changes in the VIX and MOVE indexes, with the VIX and MOVE changes scaled by 100. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for Panel B regression coefficients. The sample period is August 2002 to December 2024 for Panel A and December 2002 to December 2024 for Panel B (see Table 2). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Market-Level Summary Statistics							
	Mean	SD	P1	P25	P50	P75	P99
rx_t^{Dur}	0.154	1.697	-4.164	-0.863	0.084	1.099	4.505
rx_t^{HO}	0.005	0.116	-0.317	-0.042	0.003	0.044	0.292
Panel B: Time-Series Regressions							
	Intercept	ΔLevel_t	ΔSlope_t	$\Delta\text{Curvature}_t$	Mkt_t^s	ΔVIX_t	ΔMOVE_t
rx_t^{Dur}	0.154***	-2.746***	-1.074***	0.752**	0.003	1.508	0.170
	(3.992)	(-23.914)	(-4.942)	(2.386)	(0.279)	(1.569)	(0.598)
rx_t^{HO}	0.007	-0.144***	-0.172***	-0.099***	-0.003	-0.382	0.048
	(1.136)	(-5.151)	(-4.446)	(-2.981)	(-1.136)	(-1.083)	(0.791)

Table 9. Duration-Matched and Higher-Order Effects in the Cross Section

This table reports realized-return decompositions for credit-spread portfolios across term-spread regimes. We first sort months into three groups based on the monthly change in the term spread, $\Delta TS_t = TS_t - TS_{t-1}$. Within each month, bonds are then sorted into quintile portfolios based on their credit spreads. For each term-spread-change group and credit-spread quintile, the table reports time-series averages of the interest-rate-risk component, rx_t^{IR}, the duration-matched excess-return component, rx_t^{Dur}, and the higher-order component, rx_t^{HO}. The Average row reports the average across the five credit-spread quintiles, and the HML row reports the difference between the high- and low-credit-spread portfolios. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. The sample period is August 2002 to December 2024. Significance stars are reported for the Average and HML rows. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Low ΔTS ($\leq -0.155\%$)			Medium $\Delta TS \in (-0.155\%, 0.11\%)$			High ΔTS ($\geq 0.11\%$)		
	rx_t^{IR}	rx_t^{Dur}	rx_t^{HO}	rx_t^{IR}	rx_t^{Dur}	rx_t^{HO}	rx_t^{IR}	rx_t^{Dur}	rx_t^{HO}
Low	1.039	1.018	0.021	-0.009	-0.008	-0.001	-0.574	-0.563	-0.012
	(4.771)	(4.947)	(1.296)	(-0.103)	(-0.090)	(-1.448)	(-2.843)	(-2.853)	(-1.206)
2	1.750	1.695	0.056	-0.018	-0.015	-0.003	-1.101	-1.066	-0.035
	(7.024)	(7.203)	(2.434)	(-0.130)	(-0.108)	(-1.311)	(-4.225)	(-4.190)	(-2.425)
3	2.115	2.019	0.097	-0.002	0.002	-0.004	-1.501	-1.421	-0.080
	(9.365)	(9.381)	(5.701)	(-0.010)	(0.011)	(-0.609)	(-4.889)	(-4.768)	(-4.279)
4	1.972	1.840	0.132	-0.008	-0.006	-0.002	-1.435	-1.324	-0.111
	(8.694)	(8.638)	(6.773)	(-0.044)	(-0.033)	(-0.233)	(-4.540)	(-4.355)	(-5.522)
High	1.433	1.252	0.181	-0.043	-0.043	0.000	-0.960	-0.819	-0.141
	(8.401)	(8.304)	(4.487)	(-0.271)	(-0.297)	(0.028)	(-3.644)	(-3.292)	(-4.311)
Average	1.625***	1.538***	0.086***	-0.017	-0.015	-0.003	-1.090***	-1.023***	-0.067 ***
	(9.115)	(9.233)	(5.477)	(-0.148)	(-0.131)	(-0.544)	(-6.183)	(-6.075)	(-5.456)
HML	0.394**	0.234	0.160***	-0.034	-0.035	0.001	-0.386**	-0.257	-0.129***
	(2.494)	(1.350)	(5.956)	(-0.413)	(-0.495)	(0.111)	(-2.361)	(-1.532)	(-5.023)

Table 10. Duration-Matched and Higher-Order Components: Bond-Level Characteristics and Risk Factors

This table decomposes the interest-rate-risk effects into the duration-matched excess-return and higher-order (HO) components, where the interest-rate-risk spread equals the difference between the spreads in standard and corporate-bond-specific excess returns. Panel A reports the two components, rx_{t+1}^{Dur} and rx_{t+1}^{HO}, of the interest-rate-risk return spreads associated with the bond-level characteristic portfolios in Table 4. Panel B reports the two components of the beta spreads, β_t^{Dur} and β_t^{HO}, and of the next-month return spreads, rx_{t+1}^{Dur} and rx_{t+1}^{HO}, for quintile portfolios sorted on factor betas of the standard excess return, $\beta_{i,t}^{\text{Tbill}}$, and of the corporate-bond-specific excess return, $\beta_{i,t}^{\text{Corp}}$, as in Tables 6 and 7. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is August 2002 to December 2024 for Panel A, with start dates varying by characteristic availability, and September 2004 to December 2024 for Panel B. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

A: Bond-Level Characteristics			B: Cross-Sectional Variations by Risk Factor Betas								
				Sort by β_t^{Tbill}				Sort by β_t^{Corp}			
	rx_{t+1}^{Dur}	rx_{t+1}^{HO}		β_t^{Dur}	β_t^{HO}	rx_{t+1}^{Dur}	rx_{t+1}^{HO}	β_t^{Dur}	β_t^{HO}	rx_{t+1}^{Dur}	rx_{t+1}^{HO}
Credit rating	-0.008	0.017*	DEF	0.134***	0.003	0.093	0.016	0.008	-0.005	0.096	0.016
	(-0.15)	(1.91)		(3.742)	(0.567)	(0.803)	(0.870)	(0.411)	(-1.501)	(0.888)	(0.862)
Roll	0.100	0.009	TERM	0.778***	0.059***	0.148	0.008	-0.466***	-0.053***	-0.021	-0.001
	(1.50)	(1.01)		(17.769)	(21.074)	(0.824)	(0.559)	(-10.617)	(-13.508)	(-0.206)	(-0.068)
Downside	0.091	0.015	Headline CPI	1.770***	0.087***	-0.110	0.005	-1.385***	-0.256***	0.130	0.014
	(0.68)	(0.79)		(10.841)	(6.326)	(-1.321)	(0.593)	(-8.731)	(-7.653)	(1.645)	(1.231)
Volatility	0.087	0.016	HKM	15.560***	0.669***	-0.030	0.000	-14.362***	-2.188***	0.051	-0.004
	(0.73)	(0.99)		(11.097)	(4.518)	(-0.319)	(0.058)	(-8.749)	(-9.927)	(0.528)	(-0.351)
STR	-0.043	0.019	Illiquidity	18.226***	0.158	-0.020	-0.003	-20.684***	-2.916***	-0.012	0.006
	(-0.52)	(1.65)		(6.770)	(1.387)	(-0.243)	(-0.576)	(-7.248)	(-7.585)	(-0.184)	(0.678)
Value	-0.000	-0.001	VIX	0.027***	-0.001	-0.068	-0.006	-0.080***	-0.006***	-0.027	-0.000
	(-0.01)	(-0.08)		(6.200)	(-0.589)	(-1.461)	(-1.421)	(-7.098)	(-5.099)	(-0.450)	(-0.008)
LTR	-0.023	-0.001									
	(-0.25)	(-0.09)									
Momentum	-0.030	-0.001									
	(-0.27)	(-0.11)									

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Appendix

In this appendix, we provide details of data and measures, and also conduct robustness checks and further analyses.

A.1 Data Cleaning and Sample Construction

In Panels A and B of Table A.1, we outline the detailed, step-by-step cleaning process of the Mergent FISD and TRACE datasets, covering the period from July 2002 to December 2024. For each step, we report the remaining number of bonds (CUSIPs) and transactions after the cleaning is completed. The final cleaned sample of corporate bond transactions consists of 100,037 bonds and around 147 million observations.

Based on this cleaned sample of corporate bond transactions, we construct a sample of monthly corporate bond returns used in our main analysis (the summary of this sample is reported in Table 1), which consists of 40,845 unique bonds and 1,477,380 bond-month observations. In Panel C of Table A.1, we outline the detailed, step-by-step procedures used to compute monthly returns of individual corporate bonds.

A.2 Returns of Benchmark Bonds using Interest Rate Swaps

As discussed in Section 3, we use the Treasury yield curve of Gürkaynak et al. (2007) to construct the benchmark bonds in the main analysis. One potential concern with using the Treasury yield curve is that Treasury securities have been shown to carry convenience premiums due to their role as safe assets (Krishnamurthy and Vissing-Jorgensen, 2012). Moreover, it has also been documented that long-term Treasury securities may also suffer from inconvenience discounts in market stress (He et al., 2022). These components are beyond the returns due to interest rate risk and may confound the computation of corporate-bond-specific excess returns.

To address this concern, we construct benchmark securities using Libor and interest rate swap (IRS) rates, which are not affected by Treasury convenience premiums or inconvenience discounts (He et al., 2022). Specifically, we obtain Libor and IRS rates from Barclays for the period of January 1, 1995 to September 30, 2009 and from Bloomberg thereafter.[21] We construct zero-coupon yields implied from Libor and IRS rates, using the procedure in Gürkaynak et al. (2007). Using these IRS-implied zero-coupon yields, we compute benchmark bond returns and

[21] The IRS rates from Barclays cover the maturities of 1, 2, 5, 7, 10, 20, and 30 years, while those from Bloomberg cover the maturities of 1, 2, 3, 4, 5, 7, 10, 15, 20, and 30 years. The Libor rate is for the three-month maturity; it is available till June 30, 2023, after which a synthetic rate equal to the three-month term SOFR plus the fixed Libor fallback spread is used (CME Group, 2023).

construct corporate bond excess returns using the same procedure as in the main analysis. Tables A.2 to A.10 report the results of the main analyses conducted using IRS-based benchmarks; all the main findings remain essentially the same. One difference is that the DEF beta exposure regression in Table A.6 becomes significantly negative under the IRS-based benchmark, whereas it is small and insignificant in the baseline Treasury-based benchmark.

A.3 Robustness to Call Options

The TRACE sample of corporate bonds we use in the main analyses contains bonds with call options, which may affect bond prices and returns. To check the robustness of our main findings to call options, we exclude bonds with conversion, put, or fixed-price call options, but similar to Bao et al. (2011), we retain bonds with make-whole call options because these options have negligible effects. Table A.11 reports the summary of the resulting sample, while Tables A.12 to A.20 report the results of the main analyses conducted using this sample; all the main findings remain essentially the same.

A.4 Characteristics of Bond Portfolios Sorted on Excess Returns

Table A.21 reports the characteristics of the quintile portfolios sorted by excess returns that are analyzed in Section 4.2 and reported in Table 3. We observe that portfolios sorted on rx^{Tbill} and rx^{Corp} display similar characteristic patterns. Bonds in the high-return quintile have significantly higher numerical rating scores and coupon rates than those in the low-return quintile, while differences in maturity and illiquidity are economically smaller and statistically insignificant. In contrast, portfolios sorted on rx^{IR} exhibit much weaker cross-sectional dispersion in these characteristics: the HML spreads in rating, maturity, and illiquidity are small and insignificant, and the coupon spread is only marginally significant. These patterns suggest that the standard excess return and corporate-bond-specific return sorts capture similar variation in bond characteristics, whereas the interest-rate-risk component reflects a distinct source of return variation.

Table A.1. Corporate Bond Data Cleaning and Sample Construction

This table presents the step-by-step filter procedure for the FISD and TRACE datasets. For each step, we report the number of bonds (#CUSIP) and, where applicable, the number of observations remaining after each filter. For Step B4, we exclude trades with special conditions, including those reported outside regular market hours, cash sales, next-day settlement trades, seller's option settlement trades, weighted-average-price trades, and out-of-sequence trades (reported late).

Sample period: July 2002 - December 2024			
A: FISD		#CUSIP	
A0:	All bonds in FISD	680,291	
A1:	Discard all non-US Bonds	512,429	
A2:	Retain bonds with a fixed coupon,		
	Remove bi-monthly, and unclassified coupons	378,799	
A3:	Remove convertible,	372,772	
	Remove asset-backed	371,758	
	Remove mortgage-backed	371,706	
	Exclude MTN program types often related to structured-notes	338,822	
A4:	Remove muni/government types	330,528	
	Remove agency/agency-backed types	194,286	
A5:	Remove those privately placed bonds under Rule 144A	181,471	
A6:	Remove bonds lacking information for accrued interest	178,139	
B: TRACE		#CUSIP	#Observations
B1:	Match the CUSIPs from FISD after A6 to TRACE data	144,281	300,367,917
B2:	Remove trades with more than two days to settlement	144,118	299,225,666
B3:	Retain trades after offering date	105,564	288,208,321
B4:	Remove when-issued trades	105,564	288,191,923
	Remove locked-in trades	105,562	283,479,245
	Remove trades with special conditions	105,328	279,245,911
B5:	Remove trades with volume lower than $10,000	102,257	217,594,275
	Retain trades with prices between $5 and $1,000	101,665	217,374,869
B6:	Remove canceled, corrected, and reversal trades	100,037	146,598,085
C: The Sample of Monthly Corporate Bond Returns		#CUSIP	#Observations
C1:	Construct daily data	99,493	24,360,943
C2:	Construct monthly data:		
	Use trades in the last/first five days to calculate returns		
	Keep trades in the last five days	49,987	2,467,219
C3:	Retain bonds with time-to-maturity between 1 and 30 years	45,810	2,263,615
C4:	Keep observations with nonmissing bond returns	40,845	1,477,380

Table A.2. Standard and Corporate-Bond-Specific Excess Returns: Market Level using Interest Rate Swaps

This table summarizes value-weighted market-level corporate bond excess return measures. All excess return components are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. Panel A reports time-series statistics for the monthly standard excess return, rx_t^{Tbill}, the corporate-bond-specific component, rx_t^{Corp}, and the interest-rate-risk component, rx_t^{IR}. Panel B reports time-series regressions for the value-weighted corporate bond market portfolio. The dependent variables are rx_t^{Tbill}, rx_t^{Corp}, and rx_t^{IR}. Regressors are month-over-month changes in the first three principal components of the Treasury yield curve (level, slope, and curvature), the CRSP value-weighted equity market excess return, and monthly changes in the VIX and ICE BofAML MOVE indexes, with the VIX and MOVE changes scaled by 100. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for Panel B regression coefficients. The sample period is August 2002 to December 2024 for Panel A, where the first return month (July 2002) is dropped because value weights are based on the previous month's amount outstanding. The sample period is December 2002 to December 2024 for Panel B, because the monthly change in the MOVE index is first available in December 2002. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary Statistics

	Mean	SD	P1	P25	P50	P75	P99
rx_t^{Tbill}	0.384	1.988	-5.517	-0.502	0.444	1.259	5.862
rx_t^{Corp}	0.231	2.200	-9.922	-0.618	0.414	1.242	8.473
rx_t^{IR}	0.154	1.719	-4.008	-0.820	-0.104	1.177	4.653

Panel B: Time-Series Regressions

	Intercept	ΔLevel_t	ΔSlope_t	$\Delta\text{Curvature}_t$	Mkt_t^s	ΔVIX_t	ΔMOVE_t
rx_t^{Tbill}	0.188	-1.716***	0.552	0.315	0.217***	-5.225	-1.549
	(1.629)	(-7.987)	(0.740)	(0.428)	(4.473)	(-1.165)	(-1.247)
rx_t^{Corp}	0.055	1.036***	1.806**	-0.393	0.227***	-6.156	-1.569
	(0.476)	(4.418)	(2.183)	(-0.467)	(4.697)	(-1.294)	(-1.145)
rx_t^{IR}	0.133***	-2.752***	-1.253***	0.709**	-0.010	0.931	0.020
	(4.327)	(-27.587)	(-6.851)	(2.380)	(-0.888)	(0.942)	(0.067)

Table A.3. Standard and Corporate-Bond-Specific Excess Returns: Cross Section using Interest Rate Swaps

This table reports value-weighted quintile portfolios formed each month on bond-level excess return measures. All excess return components are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. Columns (1)–(3) sort bonds on the current month's standard excess return, $rx_{i,t}^{\text{Tbill}}$, and report the standard excess return, rx_t^{Tbill}, the corporate-bond-specific component, rx_t^{Corp}, and the interest-rate-risk component, rx_t^{IR}. Columns (4)–(6) repeat the exercise for portfolios sorted on $rx_{i,t}^{\text{Corp}}$, and columns (7)–(9) for portfolios sorted on $rx_{i,t}^{\text{IR}}$. Column (10) reports a panel regression of $rx_{i,t}^{\text{Corp}}$ on $rx_{i,t}^{\text{IR}}$ with time fixed effects and standard errors are double-clustered by bond and month. All returns are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported only for HML spreads and the regression coefficient. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort on rx^{Tbill}			Sort on rx^{Corp}			Sort on rx^{IR}			Regression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	rx^{Tbill}	rx^{Corp}	rx^{IR}	rx^{Tbill}	rx^{Corp}	rx^{IR}	rx^{Tbill}	rx^{Corp}	rx^{IR}		rx^{Corp}
Low	-2.943	-2.606	-0.337	-2.399	-3.145	0.746	-0.178	1.062	-1.240	rx^{IR}	-0.594***
	(-7.825)	(-5.871)	(-2.160)	(-6.437)	(-7.170)	(4.430)	(-0.967)	(5.418)	(-8.650)		(-15.061)
2	-0.552	-0.449	-0.102	-0.269	-0.753	0.484	0.096	0.453	-0.357		
	(-4.426)	(-2.783)	(-0.905)	(-2.222)	(-4.331)	(3.554)	(0.663)	(3.058)	(-3.497)		
3	0.301	0.137	0.164	0.240	0.153	0.086	0.397	0.244	0.153		
	(3.105)	(1.294)	(1.747)	(2.484)	(1.355)	(0.806)	(2.620)	(1.469)	(1.573)		
4	1.226	0.814	0.413	0.897	1.092	-0.195	0.646	-0.013	0.660		
	(8.202)	(5.318)	(3.883)	(6.026)	(7.261)	(-1.836)	(5.022)	(-0.099)	(5.737)		
High	4.159	3.492	0.667	3.663	3.998	-0.335	0.979	-0.642	1.622		
	(8.298)	(6.927)	(4.240)	(7.242)	(8.080)	(-2.847)	(6.789)	(-3.064)	(8.155)		
HML	7.102***	6.098***	1.004***	6.061***	7.143***	-1.081***	1.157***	-1.704***	2.861***	Time FE	Yes
	(9.475)	(7.900)	(8.424)	(8.053)	(9.204)	(-10.071)	(7.739)	(-9.105)	(15.243)	Adj R^2	0.254

Table A.4. Corporate Bond Characteristics and Excess Returns using Interest Rate Swaps

This table reports long-short return spreads based on bond characteristics. All excess return components are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. For each characteristic, bonds are sorted into quintiles using information from the preceding month, and value-weighted long-short portfolios are formed. The portfolio goes long the highest quintile and short the lowest quintile except for short-term reversal and long-term reversal, for which the direction is reversed. The credit-rating portfolio is long bonds rated B or lower and short bonds rated AA or higher. For each characteristic portfolio, the table reports time-series averages of the next-month standard excess return, rx_{t+1}^{Tbill}, and the corporate-bond-specific component, rx_{t+1}^{Corp}. The sample period is August 2002 to December 2024, with start dates varying by characteristic availability. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	rx^{Tbill}	rx^{Corp}
Credit rating	0.910***	0.910***
	(2.71)	(2.86)
Roll	0.523***	0.447**
	(2.85)	(2.30)
Downside	0.667**	0.554
	(1.99)	(1.49)
Volatility	0.789**	0.701**
	(2.54)	(2.09)
STR	0.455***	0.458***
	(2.91)	(3.40)
Value	0.226*	0.250*
	(1.77)	(1.66)
LTR	0.426*	0.460*
	(1.82)	(1.91)
Momentum	0.001	0.031
	(0.00)	(0.12)

Table A.5. Market-Level Betas using Interest Rate Swaps

This table reports time-series averages of monthly value-weighted averages of bond-level beta estimates. All excess return components and betas are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. β_t^{Tbill}, β_t^{Corp}, and β_t^{IR} denote betas estimated from the standard excess return, $rx_{i,t}^{\text{Tbill}}$, the corporate-bond-specific component, $rx_{i,t}^{\text{Corp}}$, and the interest-rate-risk component, $rx_{i,t}^{\text{IR}}$, respectively. Betas are estimated from 36-month rolling OLS regressions requiring at least 24 observations. Each regression includes the contemporaneous and one-month-lagged factor innovations, and the reported beta is the sum of the two coefficients. DEF and TERM are included jointly in the beta estimation regression, with no additional controls. The CPI beta is estimated using the one-step-ahead forecast error from an expanding-window ARMA(1,1) model of monthly headline CPI inflation, with no controls. The HKM beta is estimated with the stock market excess return as the only control. The illiquidity beta is estimated using the first difference of the monthly cross-sectional median of the bond-level Roll illiquidity measure, with the bond market excess return as the only control. The VIX beta is estimated using the one-step-ahead forecast error from an expanding-window AR(1) model of the VIX level, with seven controls following Chung et al. (2019). The sample period is September 2004 to December 2024. Newey–West t-statistics with 36 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	β^{Tbill}	β^{Corp}	β^{IR}
DEF	1.048***	1.042***	0.006
	(9.030)	(9.511)	(0.132)
TERM	0.574***	-0.025	0.599***
	(13.571)	(-0.780)	(18.060)
Headline CPI	-0.671***	1.387**	-2.058***
	(-2.892)	(2.453)	(-4.840)
HKM	-4.078	10.727***	-14.805***
	(-1.338)	(5.383)	(-4.904)
Illiquidity	0.920**	-17.995***	18.915***
	(2.501)	(-2.852)	(2.860)
VIX	-0.002	-0.063	0.060*
	(-0.097)	(-1.522)	(1.871)

Table A.6. Cross-Sectional Differences of Risk Exposures using Interest Rate Swaps

This table reports value-weighted HML spreads in factor betas for quintile portfolios sorted on estimated factor betas. All excess return components and betas are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. β_t^{Tbill}, β_t^{Corp}, and β_t^{IR} denote betas estimated from the standard excess return, the corporate-bond-specific component, and the interest-rate-risk component, respectively, as described in Table A.5. The first three columns sort bonds on $\beta_{i,t}^{\text{Tbill}}$, and report spreads in β_t^{Tbill}, β_t^{Corp}, and β_t^{IR}. The next three columns repeat the analysis for portfolios sorted on $\beta_{i,t}^{\text{Corp}}$. The right two columns report panel regressions of $\beta_{i,t}^{\text{Corp}}$ on $\beta_{i,t}^{\text{IR}}$ over the same bond-month formation panel, with time fixed effects and standard errors double-clustered by month and bond. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is September 2004 to December 2024. Newey-West t-statistics with 5 lags are reported in parentheses for the portfolio spreads; double-clustered t-statistics are reported in parentheses for the panel regressions. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort by $\beta_{it}^{\text{Tbill}}$			Sort by β_{it}^{Corp}			Regress $\beta_{i,t}^{\text{Corp}}$ on $\beta_{i,t}^{\text{IR}}$	
	β_t^{Tbill}	β_t^{Corp}	β_t^{IR}	β_t^{Tbill}	β_t^{Corp}	β_t^{IR}	Coeff	Adj R^2
DEF	2.912***	2.876***	0.036	2.839***	2.924***	-0.085***	-0.373***	0.075
	(11.045)	(11.033)	(1.269)	(10.867)	(11.090)	(-3.728)	(-4.311)	
TERM	1.161***	0.372***	0.789***	0.421***	0.870***	-0.449***	-0.286***	0.185
	(21.179)	(4.337)	(21.313)	(4.123)	(12.464)	(-9.630)	(-22.233)	
Headline CPI	8.434***	6.634***	1.800***	6.338***	8.432***	-2.094***	-0.612***	0.237
	(13.920)	(11.470)	(9.015)	(11.567)	(14.076)	(-10.275)	(-26.774)	
HKM	55.602***	39.142***	16.460***	38.225***	56.509***	-18.285***	-0.598***	0.182
	(14.422)	(8.401)	(9.444)	(7.979)	(15.433)	(-8.905)	(-41.159)	
Illiquidity	67.391***	48.379***	19.012***	43.630***	68.588***	-24.958***	-0.615***	0.297
	(9.804)	(10.572)	(6.838)	(11.059)	(9.965)	(-7.156)	(-37.672)	
VIX	0.891***	0.874***	0.017***	0.820***	0.938***	-0.118***	-0.861***	0.109
	(12.586)	(12.287)	(2.857)	(11.546)	(13.105)	(-10.100)	(-36.296)	

Table A.7. Risk Premia using Interest Rate Swaps

This table reports value-weighted long-short returns for quintile portfolios sorted on factor betas. All excess return components and betas are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. Betas are estimated as described in Table A.5. The left two columns sort bonds on betas of the standard excess return, $\beta_{i,t}^{\text{Tbill}}$, and report HML spreads in next-month rx_{t+1}^{Tbill} and rx_{t+1}^{Corp}. The right two columns repeat the analysis for portfolios sorted on betas of the corporate-bond-specific excess return, $\beta_{i,t}^{\text{Corp}}$. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is September 2004 to December 2024. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort by β_t^{Tbill}		Sort by β_t^{Corp}	
	rx_{t+1}^{Tbill}	rx_{t+1}^{Corp}	rx_{t+1}^{Tbill}	rx_{t+1}^{Corp}
DEF	0.488*	0.372	0.484*	0.355
	(1.788)	(1.200)	(1.894)	(1.175)
TERM	0.051	-0.100	0.026	0.034
	(0.292)	(-0.625)	(0.201)	(0.244)
Headline CPI	0.504**	0.575**	0.583**	0.487**
	(1.970)	(2.473)	(2.572)	(2.053)
HKM	0.367*	0.415**	0.448**	0.381*
	(1.884)	(2.520)	(2.368)	(1.874)
Illiquidity	-0.328*	-0.309*	-0.365*	-0.409*
	(-1.844)	(-1.914)	(-1.884)	(-1.869)
VIX	-0.119	-0.075	-0.065	-0.054
	(-1.224)	(-0.888)	(-0.645)	(-0.572)

Table A.8. Duration-Matched and Higher-Order Components at the Market Level using Interest Rate Swaps

This table summarizes value-weighted market-level duration-matched and higher-order components of the interest-rate-risk excess return. All excess return components are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. We decompose the interest-rate-risk component as $rx_t^{\text{IR}} = rx_t^{\text{Tbill}} - rx_t^{\text{Corp}} = rx_t^{\text{Dur}} + rx_t^{\text{HO}}$, where rx_t^{Dur} is the duration-matched component and rx_t^{HO} is the higher-order component. Monthly value-weighted returns use prior-month bond size. Panel A reports time-series summary statistics. Panel B reports time-series regressions on the same explanatory variables as in Table A.2: changes in the first three principal components of the Treasury yield curve (level, slope, and curvature), the CRSP value-weighted equity market excess return, and monthly changes in the VIX and MOVE indexes, with the VIX and MOVE changes scaled by 100. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for Panel B regression coefficients. The sample period is August 2002 to December 2024 for Panel A and December 2002 to December 2024 for Panel B (see Table A.2). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Whole-Sample Summary Statistics

	Mean	SD	P1	P25	P50	P75	P99
rx_t^{Dur}	0.147	1.612	-3.865	-0.771	-0.100	1.148	4.368
rx_t^{HO}	0.006	0.137	-0.423	-0.040	-0.001	0.039	0.306

Panel B: Time-Series Regressions

	Intercept	ΔLevel_t	ΔSlope_t	$\Delta\text{Curvature}_t$	Mkt_t^s	ΔVIX_t	ΔMOVE_t
rx_t^{Dur}	0.129***	-2.589***	-1.021***	0.850***	-0.007	1.156	-0.003
	(4.336)	(-26.124)	(-6.431)	(3.061)	(-0.616)	(1.144)	(-0.013)
rx_t^{HO}	0.004	-0.163***	-0.232***	-0.141**	-0.003	-0.225	0.024
	(0.607)	(-4.200)	(-3.712)	(-1.963)	(-1.251)	(-0.672)	(0.321)

Table A.9. Duration-Matched and Higher-Order Effects in the Cross Section using Interest Rate Swaps

This table reports realized-return decompositions for credit-spread portfolios across term-spread regimes. All excess return components are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. We first sort months into three groups based on the monthly change in the term spread, $\Delta TS_t = TS_t - TS_{t-1}$, where TS_t is the term spread. Within each month, bonds are then sorted into quintile portfolios based on their credit spreads. For each term-spread-change group and credit-spread quintile, the table reports time-series averages of the interest-rate-risk component, rx_t^{IR}, the duration-matched component, rx_t^{Dur}, and the higher-order component, rx_t^{HO}. The Average row reports the average across the five credit-spread quintiles, and the HML row reports the difference between the high- and low-credit-spread portfolios. Because the term-spread-change grouping is contemporaneous, the table should be interpreted as a realized-return decomposition rather than an ex ante trading strategy. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for the Average and HML rows. The sample period is August 2002 to December 2024. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Low ΔTS ($\leq -0.155\%$)			Medium $\Delta TS \in (-0.155\%, 0.11\%)$			High ΔTS ($\geq 0.11\%$)		
	rx^{IR}	rx^{Dur}	rx^{HO}	rx^{IR}	rx^{Dur}	rx^{HO}	rx^{IR}	rx^{Dur}	rx^{HO}
Low	0.963	0.939	0.024	0.014	0.015	-0.001	-0.460	-0.450	-0.010
	(4.344)	(4.533)	(1.318)	(0.155)	(0.163)	(-1.169)	(-2.433)	(-2.433)	(-1.031)
2	1.613	1.550	0.063	-0.002	0.002	-0.004	-0.979	-0.943	-0.036
	(6.563)	(6.830)	(2.346)	(-0.014)	(0.012)	(-1.092)	(-3.805)	(-3.758)	(-2.255)
3	1.943	1.843	0.100	0.007	0.012	-0.005	-1.366	-1.284	-0.082
	(8.464)	(8.578)	(4.919)	(0.038)	(0.068)	(-0.692)	(-4.601)	(-4.468)	(-3.956)
4	1.790	1.662	0.128	0.026	0.029	-0.002	-1.292	-1.184	-0.108
	(7.775)	(7.831)	(5.950)	(0.136)	(0.156)	(-0.195)	(-4.432)	(-4.259)	(-5.109)
High	1.298	1.127	0.170	-0.013	-0.011	-0.002	-0.836	-0.709	-0.127
	(7.932)	(8.178)	(4.254)	(-0.083)	(-0.075)	(-0.163)	(-3.594)	(-3.274)	(-4.003)
Average	1.488***	1.400***	0.087***	0.005	0.008	-0.003	-0.963***	-0.898***	-0.065***
	(7.978)	(8.255)	(4.026)	(0.043)	(0.070)	(-0.535)	(-5.525)	(-5.421)	(-5.061)
HML	0.334**	0.188	0.146***	-0.027	-0.026	-0.002	-0.376***	-0.259*	-0.117***
	(2.132)	(1.127)	(5.637)	(-0.348)	(-0.384)	(-0.112)	(-2.844)	(-1.915)	(-4.521)

Table A.10. Duration-Matched and Higher-Order Components using Interest Rate Swaps: Bond-Level Characteristics and Risk Factors

This table decomposes the interest-rate-risk effects into the duration-matched excess-return and higher-order (HO) components, where the interest-rate-risk spread equals the difference between the spreads in standard and corporate-bond-specific excess returns. All excess return components are constructed using interest-rate-swap (IRS) benchmark returns in place of Treasury benchmarks. Panel A reports the two components, rx_{t+1}^{Dur} and rx_{t+1}^{HO}, of the interest-rate-risk return spreads associated with the bond-level characteristic portfolios in Table A.4. Panel B reports the two components of the beta spreads, β_t^{Dur} and β_t^{HO}, and of the next-month return spreads, rx_{t+1}^{Dur} and rx_{t+1}^{HO}, for quintile portfolios sorted on factor betas of the standard excess return, $\beta_{i,t}^{\text{Tbill}}$, and of the corporate-bond-specific excess return, $\beta_{i,t}^{\text{Corp}}$, as in Tables A.6 and A.7. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is August 2002 to December 2024 for Panel A, with start dates varying by characteristic availability, and September 2004 to December 2024 for Panel B. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

A: Bond-Level Characteristics			B: Cross-Sectional Variations by Risk Factor Betas								
				Sort by β_t^{Tbill}				Sort by β_t^{Corp}			
	rx^{Dur}	rx^{HO}		β_t^{Dur}	β_t^{HO}	rx_{t+1}^{Dur}	rx_{t+1}^{HO}	β_t^{Dur}	β_t^{HO}	rx_{t+1}^{Dur}	rx_{t+1}^{HO}
Credit rating	0.015	-0.014	DEF	0.049**	-0.013**	0.095	0.020	-0.062***	-0.023***	0.109	0.019
	(0.31)	(-1.37)		(2.154)	(-2.008)	(0.885)	(0.858)	(-3.552)	(-3.361)	(0.901)	(0.713)
Roll	0.070	0.007	TERM	0.724***	0.065***	0.137	0.015	-0.395***	-0.054***	-0.006	-0.002
	(1.17)	(0.59)		(20.757)	(19.273)	(0.793)	(0.719)	(-9.466)	(-9.840)	(-0.071)	(-0.186)
Downside	0.095	0.019	Headline CPI	1.715***	0.085***	-0.074	0.003	-1.728***	-0.367***	0.086	0.010
	(0.79)	(0.76)		(9.297)	(4.736)	(-0.890)	(0.399)	(-9.515)	(-7.338)	(0.953)	(0.621)
Volatility	0.073	0.015	HKM	15.364***	1.096***	-0.041	-0.007	-15.550***	-2.735***	0.073	-0.007
	(0.69)	(0.78)		(9.737)	(5.566)	(-0.443)	(-0.713)	(-8.254)	(-9.664)	(0.698)	(-0.420)
STR	-0.026	0.022	Illiquidity	18.334***	0.678***	-0.018	-0.002	-21.484***	-3.474***	0.031	0.013
	(-0.33)	(1.53)		(6.906)	(4.186)	(-0.220)	(-0.300)	(-7.158)	(-6.973)	(0.418)	(0.967)
Value	-0.023	-0.002	VIX	0.017***	-0.000	-0.039	-0.004	-0.106***	-0.012***	-0.011	0.000
	(-0.61)	(-0.15)		(3.147)	(-0.348)	(-0.900)	(-0.943)	(-10.296)	(-5.656)	(-0.153)	(0.006)
LTR	-0.030	-0.004									
	(-0.39)	(-0.43)									
Momentum	-0.029	-0.001									
	(-0.28)	(-0.09)									

Table A.11. Summary of the Corporate Bond Return Sample for Noncallable Bonds

This table summarizes the noncallable corporate bond return sample. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. The top panel reports the sample period, the number of unique bonds, and the number of bond-month observations. The bottom panel reports the number of non-missing observations, mean, standard deviation, and selected percentiles for monthly bond returns, coupon rates, credit ratings, time to maturity, amount outstanding, and duration. Ratings are converted into numerical scores, where 1 denotes AAA and 21 denotes C. Macaulay duration is computed assuming semiannual coupon payments. The reported summary statistics are time-series averages of monthly cross-sectional statistics.

Sample period	July 2002 - December 2024
# bonds	29,464
# bond×month	1,291,306

				Percentiles						
Variable	N	Mean	SD	p1	p5	p25	Median	p75	p95	p99
Bond return (r)	1,291,306	0.521	3.258	-6.888	-3.083	-0.619	0.407	1.529	4.309	9.265
Coupon Rate	1,291,306	5.408	1.653	1.943	2.865	4.303	5.299	6.380	8.325	9.855
Rating	1,286,519	8.358	3.389	1.432	3.187	6.104	7.967	9.906	14.861	18.022
Time to Maturity	1,291,306	9.114	7.996	1.097	1.495	3.427	6.147	11.827	27.217	29.416
Amount Outstanding	1,291,306	632.958	623.765	6.578	44.170	284.074	459.897	783.625	1806.765	3015.035
Duration	1,291,306	6.322	4.100	1.058	1.436	3.126	5.237	8.627	14.694	16.096

Table A.12. Standard and Corporate-Bond-Specific Excess Returns for Noncallable Bonds: Market Level

This table summarizes value-weighted market-level corporate bond excess return measures. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. Panel A reports time-series statistics for the monthly standard excess return, rx_t^{Tbill}, the corporate-bond-specific component, rx_t^{Corp}, and the interest-rate-risk component, rx_t^{IR}. Panel B reports time-series regressions for the value-weighted corporate bond market portfolio. The dependent variables are rx_t^{Tbill}, rx_t^{Corp}, and rx_t^{IR}. Regressors are month-over-month changes in the first three principal components of the Treasury yield curve (level, slope, and curvature), the CRSP value-weighted equity market excess return, and monthly changes in the VIX and ICE BofAML MOVE indexes, with the VIX and MOVE changes scaled by 100. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for Panel B regression coefficients. The sample period is August 2002 to December 2024 for Panel A, where the first return month (July 2002) is dropped because value weights are based on the previous month's amount outstanding. The sample period is December 2002 to December 2024 for Panel B, because the monthly change in the MOVE index is first available in December 2002. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary Statistics

	Mean	SD	P1	P25	P50	P75	P99
rx_t^{Tbill}	0.374	1.977	-5.521	-0.517	0.425	1.230	5.930
rx_t^{Corp}	0.216	2.029	-7.335	-0.634	0.278	1.198	7.042
rx_t^{IR}	0.158	1.797	-4.223	-0.911	0.090	1.164	4.672

Panel B: Time-Series Regressions

	Intercept	ΔLevel_t	ΔSlope_t	$\Delta\text{Curvature}_t$	Mkt_t^s	ΔVIX_t	ΔMOVE_t
rx_t^{Tbill}	0.184*	-1.734***	-0.648	0.463	0.195***	-6.629	-1.328
	(1.737)	(-7.856)	(-1.129)	(0.512)	(4.160)	(-1.523)	(-0.906)
rx_t^{Corp}	0.026	1.175***	0.606	-0.130	0.194***	-7.809*	-1.558
	(0.241)	(5.145)	(1.023)	(-0.125)	(4.150)	(-1.696)	(-1.021)
rx_t^{IR}	0.159***	-2.909***	-1.253***	0.593*	0.001	1.181	0.230
	(3.864)	(-25.308)	(-5.726)	(1.762)	(0.104)	(1.323)	(0.765)

Table A.13. Standard and Corporate-Bond-Specific Excess Returns: Cross Section for Noncallable Bonds

This table reports value-weighted quintile portfolios formed each month on bond-level excess return measures. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. Columns (1)–(3) sort bonds on the current month's standard excess return, $rx_{i,t}^{\text{Tbill}}$, and report the standard excess return, rx_t^{Tbill}, the corporate-bond-specific component, rx_t^{Corp}, and the interest-rate-risk component, rx_t^{IR}. Columns (4)–(6) repeat the exercise for portfolios sorted on $rx_{i,t}^{\text{Corp}}$, and columns (7)–(9) for portfolios sorted on $rx_{i,t}^{\text{IR}}$. Column (10) reports a panel regression of $rx_{i,t}^{\text{Corp}}$ on $rx_{i,t}^{\text{IR}}$ with time fixed effects and standard errors are double-clustered by bond and month. All returns are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported only for HML spreads and the regression coefficient. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort on rx^{Tbill}			Sort on rx^{Corp}			Sort on rx^{IR}			Regression	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
	rx^{Tbill}	rx^{Corp}	rx^{IR}	rx^{Tbill}	rx^{Corp}	rx^{IR}	rx^{Tbill}	rx^{Corp}	rx^{IR}		rx^{Corp}
Low	-2.721	-2.246	-0.475	-2.077	-2.780	0.703	-0.347	0.924	-1.272	rx^{IR}	-0.441***
	(-8.737)	(-6.068)	(-2.847)	(-6.704)	(-7.772)	(4.431)	(-2.028)	(5.714)	(-8.444)		(-11.494)
2	-0.510	-0.331	-0.179	-0.184	-0.618	0.434	0.024	0.422	-0.397		
	(-4.528)	(-2.506)	(-1.523)	(-1.683)	(-4.565)	(3.517)	(0.172)	(3.073)	(-3.677)		
3	0.282	0.120	0.162	0.238	0.135	0.103	0.378	0.227	0.151		
	(3.025)	(1.285)	(1.721)	(2.529)	(1.419)	(0.981)	(2.739)	(1.544)	(1.573)		
4	1.137	0.636	0.500	0.765	0.933	-0.168	0.682	-0.010	0.692		
	(8.663)	(4.942)	(4.671)	(5.724)	(7.468)	(-1.539)	(5.410)	(-0.074)	(6.186)		
High	3.822	3.001	0.821	3.238	3.537	-0.299	1.128	-0.501	1.629		
	(9.187)	(7.187)	(5.265)	(7.604)	(8.750)	(-2.318)	(7.957)	(-3.034)	(9.450)		
HML	6.542***	5.246***	1.296***	5.315***	6.317***	-1.002***	1.475***	-1.425***	2.900***	Time FE	Yes
	(10.618)	(8.154)	(9.193)	(8.476)	(10.001)	(-9.641)	(10.272)	(-10.594)	(16.799)	Adj R^2	0.238

Table A.14. Bond-Level Characteristics and Excess Returns for Noncallable Bonds

This table reports long-short return spreads based on bond characteristics. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. For each characteristic, bonds are sorted into quintiles using information from the preceding month, and value-weighted long-short portfolios are formed. The portfolio goes long the highest quintile and short the lowest quintile except for short-term reversal and long-term reversal, for which the direction is reversed. The credit-rating portfolio is long bonds rated B or lower and short bonds rated AA or higher. For each characteristic portfolio, the table reports time-series averages of the next-month standard excess return, rx_{t+1}^{Tbill}, and the corporate-bond-specific component, rx_{t+1}^{Corp}. The sample period is August 2002 to December 2024, with start dates varying by characteristic availability. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	rx^{Tbill}	rx^{Corp}
Credit rating	1.004***	0.993***
	(2.87)	(2.95)
Roll	0.429***	0.319**
	(2.84)	(2.09)
Downside	0.616**	0.494*
	(2.24)	(1.67)
Volatility	0.696***	0.588**
	(2.62)	(2.11)
STR	0.483***	0.508***
	(3.24)	(4.09)
Value	0.246**	0.243*
	(1.98)	(1.75)
LTR	0.365*	0.405**
	(1.85)	(2.09)
Momentum	-0.026	0.013
	(-0.12)	(0.06)

Table A.15. Market-Level Betas for Noncallable Bonds

This table reports time-series averages of monthly value-weighted averages of bond-level beta estimates. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. β_t^{Tbill}, β_t^{Corp}, and β_t^{IR} denote betas estimated from the standard excess return, $rx_{i,t}^{\text{Tbill}}$, the corporate-bond-specific component, $rx_{i,t}^{\text{Corp}}$, and the interest-rate-risk component, $rx_{i,t}^{\text{IR}}$, respectively. Betas are estimated from 36-month rolling OLS regressions requiring at least 24 observations. Each regression includes the contemporaneous and one-month-lagged factor innovations, and the reported beta is the sum of the two coefficients. DEF and TERM are included jointly in the beta estimation regression, with no additional controls. The CPI beta is estimated using the one-step-ahead forecast error from an expanding-window ARMA(1,1) model of monthly headline CPI inflation, with no controls. The HKM beta is estimated with the stock market excess return as the only control. The illiquidity beta is estimated using the first difference of the monthly cross-sectional median of the bond-level Roll illiquidity measure, with the bond market excess return as the only control. The VIX beta is estimated using the one-step-ahead forecast error from an expanding-window AR(1) model of the VIX level, with seven controls following Chung et al. (2019). The sample period is September 2004 to December 2024. Newey–West t-statistics with 36 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	β^{Tbill}	β^{Corp}	β^{IR}
DEF	1.023***	1.030***	-0.007
	(9.866)	(8.623)	(-0.155)
TERM	0.578***	-0.031	0.609***
	(13.472)	(-0.924)	(10.637)
Headline CPI	-0.704***	1.146***	-1.850***
	(-3.077)	(2.641)	(-6.084)
HKM	-4.414	9.178***	-13.592***
	(-1.451)	(3.706)	(-4.047)
Illiquidity	1.036***	-17.354***	18.390***
	(3.693)	(-2.789)	(2.865)
VIX	-0.001	-0.061*	0.060**
	(-0.055)	(-1.755)	(2.373)

Table A.16. Cross-Sectional Differences of Risk Exposures for Noncallable Bonds

This table reports value-weighted HML spreads in factor betas for quintile portfolios sorted on estimated factor betas. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. β_t^{Tbill}, β_t^{Corp}, and β_t^{IR} denote betas estimated from the standard excess return, the corporate-bond-specific component, and the interest-rate-risk component, respectively, as described in Table A.15. The first three columns sort bonds on $\beta_{i,t}^{\text{Tbill}}$, and report spreads in β_t^{Tbill}, β_t^{Corp}, and β_t^{IR}. The next three columns repeat the analysis for portfolios sorted on $\beta_{i,t}^{\text{Corp}}$. The right two columns report panel regressions of $\beta_{i,t}^{\text{Corp}}$ on $\beta_{i,t}^{\text{IR}}$ over the same bond-month formation panel, with time fixed effects and standard errors double-clustered by month and bond. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is September 2004 to December 2024. Newey-West t-statistics with 5 lags are reported in parentheses for the portfolio spreads; double-clustered t-statistics are reported in parentheses for the panel regressions. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort by $\beta_{it}^{\text{Tbill}}$			Sort by β_{it}^{Corp}			Regress $\beta_{i,t}^{\text{Corp}}$ on $\beta_{i,t}^{\text{IR}}$	
	β_t^{Tbill}	β_t^{Corp}	β_t^{IR}	β_t^{Tbill}	β_t^{Corp}	β_t^{IR}	Coeff	Adj R^2
DEF	2.628***	2.492***	0.135***	2.570***	2.565***	0.004	0.034	0.062
	(12.084)	(11.164)	(3.262)	(11.872)	(11.488)	(0.208)	(0.881)	
TERM	1.109***	0.259***	0.850***	0.242***	0.757***	-0.515***	-0.271***	0.200
	(25.595)	(3.691)	(19.742)	(2.702)	(13.702)	(-10.743)	(-41.924)	
Headline CPI	7.934***	6.089***	1.844***	5.987***	7.585***	-1.598***	-0.480***	0.182
	(14.372)	(10.784)	(10.884)	(11.018)	(13.762)	(-9.508)	(-20.129)	
HKM	51.193***	34.859***	16.334***	33.994***	50.428***	-16.435***	-0.535***	0.202
	(16.122)	(8.886)	(10.844)	(8.629)	(16.637)	(-9.559)	(-34.057)	
Illiquidity	65.508***	47.016***	18.492***	42.049***	65.341***	-23.292***	-0.583***	0.272
	(9.220)	(9.367)	(6.832)	(9.700)	(9.505)	(-7.226)	(-33.954)	
VIX	0.804***	0.778***	0.026***	0.746***	0.830***	-0.084***	-0.792***	0.104
	(14.258)	(13.873)	(5.431)	(12.840)	(15.140)	(-7.188)	(-31.346)	

Table A.17. Risk Premia for Noncallable Bonds

This table reports value-weighted long-short returns for quintile portfolios sorted on factor betas. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. Betas are estimated as described in Table A.15. The left two columns sort bonds on betas of the standard excess return, $\beta_{i,t}^{\text{Tbill}}$, and report HML spreads in next-month rx_{t+1}^{Tbill} and rx_{t+1}^{Corp}. The right two columns repeat the analysis for portfolios sorted on betas of the corporate-bond-specific excess return, $\beta_{i,t}^{\text{Corp}}$. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is September 2004 to December 2024. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Sort by β_t^{Tbill}		Sort by β_t^{Corp}	
	rx_{t+1}^{Tbill}	rx_{t+1}^{Corp}	rx_{t+1}^{Tbill}	rx_{t+1}^{Corp}
DEF	0.483**	0.366	0.479**	0.358
	(2.279)	(1.538)	(2.363)	(1.551)
TERM	0.070	-0.092	0.010	0.026
	(0.408)	(-0.674)	(0.085)	(0.213)
Headline CPI	0.489**	0.596***	0.634***	0.490**
	(2.024)	(2.810)	(2.702)	(1.978)
HKM	0.324*	0.358**	0.457***	0.405**
	(1.954)	(2.574)	(2.649)	(2.285)
Illiquidity	-0.394**	-0.367**	-0.459**	-0.457**
	(-2.324)	(-2.387)	(-2.498)	(-2.402)
VIX	-0.156*	-0.081	-0.111	-0.079
	(-1.723)	(-1.055)	(-1.152)	(-0.980)

Table A.18. Duration and Higher-Order Effects at the Market Level for Noncallable Bonds

This table summarizes value-weighted market-level duration-matched and higher-order components of the interest-rate-risk excess return. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. We decompose the interest-rate-risk component as $rx_t^{IR} = rx_t^{Tbill} - rx_t^{Corp} = rx_t^{Dur} + rx_t^{HO}$, where rx_t^{Dur} is the duration-matched component and rx_t^{HO} is the higher-order component. Monthly value-weighted returns use prior-month bond size. Panel A reports time-series summary statistics. Panel B reports time-series regressions on the same explanatory variables as in Table A.12: changes in the first three principal components of the Treasury yield curve (level, slope, and curvature), the CRSP value-weighted equity market excess return, and monthly changes in the VIX and MOVE indexes, with the VIX and MOVE changes scaled by 100. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for Panel B regression coefficients. The sample period is August 2002 to December 2024 for Panel A and December 2002 to December 2024 for Panel B (see Table A.12). *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Market-Level Summary Statistics

	Mean	SD	P1	P25	P50	P75	P99
rx_t^{Dur}	0.153	1.707	-4.063	-0.863	0.076	1.096	4.530
rx_t^{HO}	0.005	0.114	-0.306	-0.041	0.003	0.043	0.300

Panel B: Time-Series Regressions

	Intercept	ΔLevel$_t$	ΔSlope$_t$	ΔCurvature$_t$	Mkt$_t^s$	ΔVIX$_t$	ΔMOVE$_t$
rx_t^{Dur}	0.152***	-2.767***	-1.086***	0.703**	0.004	1.541	0.181
	(3.868)	(-23.381)	(-4.884)	(2.152)	(0.347)	(1.577)	(0.620)
rx_t^{HO}	0.006	-0.142***	-0.168***	-0.110***	-0.003	-0.360	0.049
	(1.082)	(-5.237)	(-4.454)	(-3.231)	(-1.084)	(-1.077)	(0.833)

Table A.19. Duration-Matched and Higher-Order Effects for Noncallable Bonds

This table reports realized-return decompositions for credit-spread portfolios across term-spread regimes. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. We first sort months into three groups based on the monthly change in the term spread, $\Delta TS_t = TS_t - TS_{t-1}$, where TS_t is the term spread. Within each month, bonds are then sorted into quintile portfolios based on their credit spreads. For each term-spread-change group and credit-spread quintile, the table reports time-series averages of the interest-rate-risk component, rx_t^{IR}, the duration-matched component, rx_t^{Dur}, and the higher-order component, rx_t^{HO}. The Average row reports the average across the five credit-spread quintiles, and the HML row reports the difference between the high- and low-credit-spread portfolios. Because the term-spread-change grouping is contemporaneous, the table should be interpreted as a realized-return decomposition rather than an ex ante trading strategy. All variables are in monthly percentage terms. Newey-West t-statistics with 5 lags are reported in parentheses. Significance stars are reported for the Average and HML rows. The sample period is August 2002 to December 2024. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Low ΔTS ($\leq -0.155\%$)			Medium $\Delta TS \in (-0.155\%, 0.11\%)$			High ΔTS ($\geq 0.11\%$)		
	rx^{IR}	rx^{Dur}	rx^{HO}	rx^{IR}	rx^{Dur}	rx^{HO}	rx^{IR}	rx^{Dur}	rx^{HO}
Low	0.978	0.958	0.020	-0.010	-0.009	-0.001	-0.521	-0.511	-0.009
	(4.644)	(4.836)	(1.251)	(-0.121)	(-0.109)	(-1.452)	(-2.709)	(-2.718)	(-1.149)
2	1.683	1.635	0.048	-0.018	-0.015	-0.004	-1.048	-1.018	-0.031
	(6.738)	(6.889)	(2.244)	(-0.129)	(-0.105)	(-1.370)	(-4.143)	(-4.118)	(-2.196)
3	2.102	2.016	0.086	0.002	0.006	-0.004	-1.474	-1.403	-0.071
	(8.570)	(8.636)	(4.595)	(0.011)	(0.033)	(-0.629)	(-4.925)	(-4.822)	(-3.786)
4	2.042	1.916	0.126	0.004	0.006	-0.002	-1.490	-1.385	-0.105
	(9.402)	(9.394)	(6.732)	(0.022)	(0.034)	(-0.204)	(-4.707)	(-4.550)	(-5.563)
High	1.485	1.315	0.170	-0.035	-0.035	0.000	-1.014	-0.877	-0.137
	(8.471)	(8.396)	(5.179)	(-0.218)	(-0.237)	(0.025)	(-3.821)	(-3.507)	(-4.580)
Average	1.627***	1.543***	0.084***	-0.013	-0.011	-0.002	-1.088***	-1.023***	-0.065***
	(9.053)	(9.170)	(5.474)	(-0.109)	(-0.094)	(-0.471)	(-6.217)	(-6.114)	(-5.459)
HML	0.507***	0.357**	0.150***	-0.025	-0.026	0.001	-0.493***	-0.365**	-0.128***
	(3.398)	(2.274)	(7.152)	(-0.295)	(-0.358)	(0.111)	(-3.185)	(-2.351)	(-5.249)

Table A.20. Duration-Matched and Higher-Order Components for Noncallable Bonds: Bond-Level Characteristics and Risk Factors

This table decomposes the interest-rate-risk effects into the duration-matched excess-return and higher-order (HO) components, where the interest-rate-risk spread equals the difference between the spreads in standard and corporate-bond-specific excess returns. The sample excludes bonds with conversion, put, or fixed-price call options, retaining bonds with make-whole call options. Panel A reports the two components, rx^{Dur}_{t+1} and rx^{HO}_{t+1}, of the interest-rate-risk return spreads associated with the bond-level characteristic portfolios in Table A.14. Panel B reports the two components of the beta spreads, β^{Dur}_t and β^{HO}_t, and of the next-month return spreads, rx^{Dur}_{t+1} and rx^{HO}_{t+1}, for quintile portfolios sorted on factor betas of the standard excess return, $\beta^{\text{Tbill}}_{i,t}$, and of the corporate-bond-specific excess return, $\beta^{\text{Corp}}_{i,t}$, as in Tables A.16 and A.17. The factor specifications are DEF, TERM, Headline CPI, HKM, Illiquidity, and VIX. The sample period is August 2002 to December 2024 for Panel A, with start dates varying by characteristic availability, and September 2004 to December 2024 for Panel B. Newey-West t-statistics with 5 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

A: Bond-Level Characteristics			B: Cross-Sectional Variations by Risk Factor Betas								
				Sort by β^{Tbill}_t				Sort by β^{Corp}_t			
	rx^{Dur}	rx^{HO}		β^{Dur}_t	β^{HO}_t	rx^{Dur}_{t+1}	rx^{HO}_{t+1}	β^{Dur}_t	β^{HO}_t	rx^{Dur}_{t+1}	rx^{HO}_{t+1}
Credit rating	-0.008	0.019*	DEF	0.133***	0.002	0.102	0.015	0.010	-0.006	0.107	0.015
	(-0.15)	(1.81)		(3.677)	(0.442)	(0.847)	(0.790)	(0.540)	(-1.516)	(0.948)	(0.816)
Roll	0.102	0.007	TERM	0.790***	0.060***	0.151	0.011	-0.464***	-0.051***	-0.018	0.002
	(1.57)	(0.88)		(18.748)	(23.850)	(0.829)	(0.688)	(-10.400)	(-12.504)	(-0.179)	(0.231)
Downside	0.110	0.013	Headline CPI	1.768***	0.076***	-0.111	0.004	-1.341***	-0.257***	0.131	0.013
	(0.80)	(0.74)		(11.148)	(5.316)	(-1.338)	(0.484)	(-8.379)	(-6.791)	(1.609)	(1.098)
Volatility	0.095	0.013	HKM	15.617***	0.717***	-0.032	-0.002	-14.324***	-2.111***	0.059	-0.007
	(0.78)	(0.90)		(11.194)	(4.962)	(-0.330)	(-0.302)	(-8.802)	(-9.761)	(0.599)	(-0.551)
STR	-0.042	0.017	Illiquidity	18.273***	0.219**	-0.025	-0.002	-20.486***	-2.806***	-0.010	0.008
	(-0.49)	(1.57)		(6.887)	(2.014)	(-0.303)	(-0.381)	(-7.175)	(-7.358)	(-0.145)	(0.849)
Value	0.003	-0.000	VIX	0.027***	-0.001	-0.069	-0.005	-0.078***	-0.006***	-0.031	-0.001
	(0.10)	(-0.05)		(5.678)	(-0.669)	(-1.440)	(-1.265)	(-6.942)	(-5.031)	(-0.495)	(-0.097)
LTR	-0.032	-0.008									
	(-0.34)	(-0.79)									
Momentum	-0.037	-0.002									
	(-0.32)	(-0.20)									

Table A.21. Bond Characteristics of Portfolios Sorted on Excess Returns

This table reports average bond characteristics for quintile portfolios sorted on excess return measures. Panel A sorts bonds on the standard excess return (rx^{Tbill}), Panel B sorts bonds on the corporate-bond-specific component (rx^{Corp}), and Panel C sorts bonds on the interest-rate-risk component (rx^{IR}). For each sorted portfolio, we report the value-weighted averages of credit rating, coupon rate, time to maturity (TTM), and Roll illiquidity. The HML row reports the difference between the highest and lowest quintile portfolios. Newey-West t-statistics with 5 lags are reported in parentheses.

	Panel A: Sort on Excess Returns (rx^{Tbill})				Panel B: Sort on Corp. Specific Returns (rx^{Corp})				Panel C: Sort on IR Component Returns (rx^{IR})			
Rank	Rating	Coupon	TTM	Illiquidity	Rating	Coupon	TTM	Illiquidity	Rating	Coupon	TTM	Illiquidity
Low	8.769	5.648	11.842	3.086	8.779	5.669	12.037	3.108	7.709	5.321	12.466	1.409
	(59.585)	(33.631)	(29.339)	(3.243)	(62.143)	(33.331)	(36.105)	(3.304)	(128.004)	(34.560)	(20.889)	(4.034)
2	7.506	5.050	7.460	0.551	7.587	5.119	8.186	0.629	8.254	5.338	7.325	1.214
	(112.251)	(32.917)	(30.769)	(3.736)	(122.458)	(31.370)	(37.299)	(3.744)	(139.107)	(36.070)	(25.662)	(3.647)
3	7.524	5.046	6.866	0.416	7.512	5.058	7.290	0.426	8.684	5.463	6.672	1.230
	(138.000)	(31.946)	(53.821)	(4.041)	(122.315)	(31.903)	(68.949)	(4.184)	(119.196)	(30.169)	(58.334)	(3.150)
4	8.099	5.378	8.773	0.734	8.056	5.359	8.897	0.683	8.224	5.341	7.839	1.356
	(96.735)	(32.129)	(42.217)	(3.654)	(92.578)	(32.404)	(38.713)	(3.995)	(158.607)	(34.294)	(37.364)	(3.230)
High	9.647	6.028	12.668	2.668	9.695	6.021	12.101	2.726	7.793	5.407	13.312	1.544
	(51.072)	(34.554)	(36.253)	(3.811)	(54.216)	(35.282)	(37.522)	(3.718)	(137.392)	(33.155)	(23.579)	(4.016)
HML	0.878***	0.380***	0.826	-0.418	0.916***	0.352***	0.063	-0.382	0.084	0.086*	0.847	0.136
	(3.964)	(5.767)	(1.250)	(-0.902)	(4.834)	(5.039)	(0.124)	(-0.951)	(1.314)	(1.771)	(0.757)	(0.878)