Inflation, Default, and Corporate Bond Returns*

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Abstract

We study the inflation exposure of corporate bond returns using transaction prices of individual bonds and both realized and forward-looking measures of inflation from 2004 to 2022. We find that inflation betas of standard bond excess returns (relative to T-bill rates) are negative on average, consistent with existing studies. In striking contrast, inflation betas of credit excess returns—–corporate bond returns relative to duration-matched Treasury returns—–are positive across the board, with higher-default-risk bonds exhibiting more positive inflation betas. Moreover, inflation beta positively influences bond returns in the cross-section, with the effect being entirely driven by credit excess returns. Finally, firms with higher bond inflation betas also tend to have higher stock inflation betas. Our findings shed light on the effects of the negative inflation—default relation on the returns of corporate bonds.

Keywords: Corporate bond, Credit excess return, Credit risk, Default risk, Inflation expectation, Inflation risk, Inflation swap

JEL Codes: D4, G2

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1 Introduction

The surge in inflation since 2021 has renewed interest in the impact of inflation risk on the prices of various securities, particularly bonds denominated in nominal terms (see Cieslak and Pflueger (2023) for a recent survey). In the literature on inflation risk and nominal bonds, most studies focus on (plausibly) default-free Treasury bonds.[1] Several studies have examined the effect of inflation risk on *yield spreads* of corporate bonds (Kang and Pflueger, 2015; Bhamra, Dorion, Jeanneret and Weber, 2022), motivated by the negative relation between inflation and corporate default observed in the data. In this paper, we build on these important works and document several novel findings regarding the effects of inflation risk on the *returns* of individual corporate bonds. These findings provide further insights into the inflation exposure of corporate bonds and the effects of the negative inflation—default relation.

Our sample of individual corporate bond returns is constructed using the enhanced Trade Reporting and Compliance Engine (TRACE) data set of corporate bond transactions. We follow standard procedures in the literature to clean the data and compute monthly bond returns. Furthermore, to conduct a comprehensive analysis, we use both a measure of realized inflation and a forward-looking measure of inflation that closely reflects inflation expectations. The former is the monthly growth rate of the consumer price index (CPI), while the latter is the long-term (specifically, 10-year) inflation swap rate.[2] Though mechanically different, realized inflation and inflation expectations are economically intertwined.[3] Indeed, we find that in our sample,

[1] This large literature includes Ang and Piazzesi (2003), Ang, Bekaert and Wei (2008), Christensen, Lopez and Rudebusch (2010), Haubrich, Pennacchi and Ritchken (2012), D'Amico, Kim and Wei (2018), Ajello, Benzoni and Chyruk (2019), and Breach, D'Amico and Orphanides (2020), among many others.

[2] Both the inflation swap rate and the breakeven inflation rate implied by Treasury Inflation-Protected Securities (TIPS) are forward-looking inflation measures derived from traded securities. Because inflation swaps are less susceptible to liquidity and mispricing issues than TIPS (Haubrich et al., 2012; Campbell, Shiller and Viceira, 2009), we use them in our main analyses while considering TIPS in robustness checks. Moreover, since payments for inflation swaps (and TIPS) are based on the headline CPI, we use the headline CPI in our main analyses and examine the core CPI in further analyses. Additionally, we consider survey-based inflation forecasts as forward-looking measures. However, monthly inflation forecasts are available only for short-term horizons, such as up to two years ahead in the Blue Chip Economic Indicators (BCEF). See Appendix A.4 for details.

[3] As discussed in detail by Binder and Kamdar (2022), "a variety of mechanisms imply that inflation and inflation expectations are interconnected. For example, past inflation may shape current inflation expectations, but current inflation expectations may also shape current and future inflation." By using both realized and forward-looking inflation measures, our analysis not only accommodates their interconnection nature and ensures the robustness

spanning July 2004 to March 2022 (based on the availability of inflation measures and corporate bond transactions), both the CPI growth and inflation swap rate significantly and negatively predict future corporate defaults. This negative inflation—default relation, as already documented in the existing literature, establishes the foundation for our analyses. Specifically, we conduct three main sets of analyses.

In the first set of our main analyses (Section 3), we examine the inflation exposure of corporate bond returns. Based on the aforementioned significant negative inflation—default relation, which implies that our sample period is a "good-inflation" regime (Campbell, Pflueger and Viceira, 2020; Cieslak and Pflueger, 2023), one would expect a positive inflation exposure of corporate bond returns. Surprisingly, however, existing studies in the literature find that corporate bond returns are negatively exposed to inflation (Fang, Liu and Roussanov, 2022). We follow the literature to estimate the inflation beta of the standard excess return used in these existing studies—defined as the total return minus one-month T-bill rate—for each bond in each month using standard rolling-window regressions. Indeed, in our sample, the inflation beta of corporate bond excess return is negative on average.[4]

Importantly, we delve into the components of corporate bond excess returns to further understand their inflation exposures. In particular, the default-free benchmark of a corporate bond should be a long-term coupon bond rather than a short-term zero-coupon bond like T-bill (Merton, 1974). Hence, variations in standard excess return can arise from variations in both the return associated with interest rate risk and the return associated with risks specific corporate bonds (e.g., default risk and liquidity risk). Following Houweling and van Zundert (2017), Israel, Palhares and Richardson (2018), and particularly Binsbergen, Nozawa and Schwert (2024), we decompose a corporate bond return into the (synthetic) duration-matched Treasury return and the excess return over and above this duration-matched benchmark. The former captures the compensation for the same duration risk as that of Treasury bonds, which we denote as the du-

of the findings but also helps understand their potential distinctions.

[4]Another interesting observation is that inflation beta seems to be more negative using CPI growth than using inflation swap rate.

ration component, while the latter captures the compensation for the risks specific to corporate bonds, which we denote as the credit component.

Using this decomposition, we document a remarkable finding—the inflation exposure of the credit component of corporate bond return is positive across the board. Specifically, we estimate the inflation beta of the credit and duration components of the corporate bond excess return, respectively, following the same procedure of estimating the inflation beta of the excess return. We find that the average credit-component-inflation-beta across all individual bonds is 1.292 using CPI growth and 5.928 using inflation swap rate, both highly significant statistically. Further looking into the distributions of inflation beta, we find that the average inflation beta of the credit component is positive in 91.4% and 92.5% of the months using CPI growth and inflation swap rate, respectively. At the individual bond-month level, 73.2% and 86.3% of inflation betas of the credit component are positive using CPI growth and inflation swap rate, respectively. In contrast, the inflation beta of the duration component is strongly negative across all bonds, which results in the puzzling average negative inflation exposure of excess return that is inconsistent with the negative inflation–default relation.

Furthermore, we examine the cross-sectional variation of inflation beta across individual corporate bonds, also breaking it up into those associated with the credit and duration components separately. We find that the inflation beta of standard excess return exhibits a large and significant cross-sectional variation, and importantly, the majority of this cross-sectional variation is due to the credit component. For example, over 80% of the spread in excess return inflation beta between the quintile portfolios with the highest and lowest excess return inflation beta is accounted for by the spread in credit component inflation beta. Moreover, credit rating has significant and large explanatory power for inflation beta in regressions controlling for standard bond characteristics like maturity, coupon rate, seasoning, and so on. Overall, these findings imply that the negative inflation—default relation is also a quantitatively important driver of the cross-sectional variation of corporate bond inflation exposure.

Prompted by the significant positive inflation exposure of corporate bond returns and its substantial cross-sectional variation, we next examine whether inflation exposure has significant explanatory power for corporate bond returns in the cross section, in the second set of our main analyses (Section 4). We note that our goal is not to propose a new cross-sectional pricing factor for corporate bond returns. Nor are we seeking to construct corporate bond investment portfolios. Rather, our goal is to conduct simple and exploratory analyses to understand whether the exposure to inflation—a key macroeconomic fundamental factor—is priced in corporate bonds through its negative relation to corporate default.

We first sort bonds in each month into quintile portfolios by their inflation betas of standard excess returns. We find that higher-inflation-beta quintile portfolios deliver higher average excess returns in the next month than lower-inflation-beta ones. In particular, the average return spread between the highest and lowest inflation-beta quintile portfolios is around 0.7% per month and statistically significant, using both CPI growth and inflation swap rate. Importantly, the duration component exhibits little variation across different quintile portfolios, so the cross-sectional variation in excess return arises totally from the cross-sectional variation in the credit component (the average credit component of the high-minus-low-inflation-beta portfolio averages 0.79% per month).

Taking one step further, we sort bonds into quinte portfolios by their credit-component-inflation-betas directly. We find that these quintile portfolios feature a positive effect of inflation beta as well. In fact, the next-month excess return of the high-minus-low credit-component-inflation-beta portfolio averages 0.764% per month, closely matching that of the high-minus-low excess-return-inflation-beta portfolio (again, 0.709% per month). Even more, the cross-sectional variation in excess return of these credit-component-inflation-beta portfolios also arises totally from the cross-sectional variation in credit component, just like the the excess-return-inflation-beta portfolios.

So far, we have focused exclusively on the inflation exposure of corporate bonds. In the third set of main analyses (Section 5), we examine the relationship between a firm's bond inflation exposure and its stock inflation exposure, given that both stocks and bonds are contingent claims on the firm's underlying asset value (Merton, 1974). Specifically, the negative inflation-default relation implies not only a positive bond inflation exposure but also a positive stock inflation exposure. However, early studies in the literature found a significantly negative stock inflation beta, contradicting this implication (e.g., Lintner, 1975; Fama and Schwert, 1977; Bekaert and Wang, 2010). To reconcile this contradiction, Bhamra et al. (2022) propose a model incorporating two nominal-rigidity frictions. Nonetheless, recent studies have documented a less negative inflation exposure of stock returns after 2000, particularly with respect to headline inflation (Boons, Duarte, De Roon and Szymanowska, 2020; Fang et al., 2022). Therefore, it remains unclear whether a contradiction still exists regarding the effect of inflation on stock and bond values.

We match our bond return sample with the CRSP stock return sample by the issuing firm and estimate the inflation betas of monthly stock excess returns. We find that bond inflation betas remain significantly positive in this matched sample. Importantly, the stock inflation beta with respect to CPI growth, though slightly negative, is negligible in magnitude and statistically insignificant, which is broadly consistent with the findings of Boons et al. (2020) and Fang et al. (2022). Hence, stock inflation exposure does not significantly contradict bond inflation exposure in our sample period. Furthermore, the stock inflation beta with respect to the inflation swap rate is significantly positive, implying strong consistency between stock and bond inflation exposures.

We further utilize our granular firm-level data to examine the relationship between stock and bond inflation exposures in the cross-section. Based on both portfolio-sorting analyses and Fama-MacBeth regressions, we find a strong positive association between stock and bond inflation exposures across firms: that is, firms with higher bond inflation betas also tend to have higher stock inflation betas. In terms of magnitude, a one standard deviation increase in the bond inflation beta corresponds to a 0.397 standard deviation increase in the stock inflation beta when using the inflation swap rate, which is greater than the 0.131 increase observed when using CPI growth. This novel positive cross-sectional association that we uncover presents new empirical insights to guide further developments in the theory of inflation and credit risk.

Related literature. Our paper primarily contributes to the literature on inflation risk and the pricing of nominal bonds, which has largely focused on (plausibly) default-free Treasury bonds (as cited in Footnote 1). Several studies, including Bhamra, Fisher and Kuehn (2011), Kang and Pflueger (2015), and Gomes, Jermann and Schmid (2016) model how nominal debt leads to a negative inflation–default relation. Another relevant study is Bhamra et al. (2022), which, as mentioned above, proposes a model incorporating two nominal frictions. Both Kang and Pflueger (2015) and Bhamra et al. (2022) include empirical analyses of the effect of inflation risk on corporate bond prices using *yield spreads*. We complement these studies by examining the effect of inflation risk on corporate bond *returns* in standard portfolio frameworks.[5] Our approach and analyses yield three main findings—–regarding the inflation exposure of corporate bond returns, the explanatory power of inflation beta for corporate bond returns, and the cross-sectional relationship between a firm's bond and stock inflation exposures—–all of which contribute further insights to the existing literature.

The surge in inflation since 2021 has spurred a growing number of recent studies on inflation risk and asset pricing, but only a few examine corporate bonds. Those that do primarily focus on credit spreads or credit default swap spreads (e.g., Augustin, Cong, Corhay and Weber, 2024; Bonelli, Palazzo and Yamarthy, 2024). The most closely related study is Fang et al. (2022), which, in a comprehensive assessment of inflation exposures across various asset classes, also considers corporate bond returns. As discussed above, Fang et al. (2022) use the standard bond excess return measure and find a puzzling negative inflation exposure. By decomposing the corporate bond returns into credit and duration components, we reveal the positive inflation

[5]Numerous studies in the literature focus on yield spreads and their changes, such as Huang and Huang (2012), Bao, Pan and Wang (2011), Collin-Dufresne, Goldstein and Martin (2001), and He, Khorrami and Song (2022), among others. Returns of corporate bonds are related to but generally different from yield spreads and their changes. As Huang and Shi (2021) state, "although the determinants of corporate bond spreads and spread changes or simply spreads themselves contain information about corporate bond returns and sometimes actually predict such returns, the latter are generally different from yield spreads and changes in the spread." Furthermore, according to Asvanunt and Richardson (2017), "in a world of time varying expected returns, there can be significant differences" between corporate bond returns and credit spreads.

exposure implied by the negative inflation—–default relation.

Furthermore, we go beyond studying the inflation exposures of corporate bond returns alone to examine the inflation exposures of both bonds and stocks at the individual firm level jointly. Thus, our study also contributes to the extensive literature on the inflation exposure of stocks, including early studies from the mid-70s, such as Nelson (1976), Chen, Roll and Ross (1986), Boudoukh and Richardson (1993), and Ang, Brière and Signori (2012), among many others, as well as more recent studies like Boons et al. (2020), Hong, Pan and Tian (2022), and Chaudhary and Marrow (2024). By linking the inflation exposures of bonds and stocks at the individual firm level, we uncover a positive cross-sectional association between stock and bond inflation exposures, which can inform further theoretical developments.

In addition, the significant effect of inflation beta on corporate bond returns in the cross-section, which we document as part of our second main set of results, also relates to the recent literature on cross-sectional corporate bond returns. However, our study differs from this literature in important ways. In particular, the primary goal of this literature is to identify benchmark factors with strong cross-sectional pricing power, which can then be used to evaluate bond investment strategies and mutual fund performance.[6] Instead, our primary goal is to examine the economic effects of the negative inflation—-default relation on the inflation exposure of corporate bond returns. Moreover, regarding the effect of inflation beta on cross-sectional bond returns, our key message is not its strong performance, but rather that it works entirely through the credit components, confirming that inflation affects corporate debt predominantly through its impact on default risk.

[6]This extensive literature includes Fama and French (1993), Gebhardt, Hvidkjaer and Swaminathan (2005), Lin, Wang and Wu (2011), Houweling and van Zundert (2017), Israel et al. (2018), Bai, Bali and Wen (2019), Kelly, Palhares and Pruitt (2023), and Chung, Wang and Wu (2019), among many others. More recently, the literature has evolved to address concerns regarding the effectiveness of proposed factors and their associated bond investment strategies, particularly after Dickerson, Mueller and Robotti (2023) documented serious errors in Bai et al. (2019).

2 Data and Measures

In this section, we first introduce our sample of corporate bonds and calculation of corporate bond returns. We then discuss the inflation measures used in our analyses. We finally present some simple evidence on the negative inflation—default relation that has been documented in the literature and we shall use as the overarching principle to organize our analyses.

2.1 Corporate Bonds

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).[7] 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. The sample we obtain is from July 1, 2002 to March 31, 2022.

We first apply a number of filters to account for trade cancellation, correction, reversion, duplication, and so on (Dick-Nielsen, 2014; Bao and Hou, 2017). We also remove transactions with principal trading amount less than \$10,000, transactions with trade price less than \$5 or greater than \$1,000, transactions that are labelled as when-issued, locked-in, or have special sales conditions, and transactions that have more than a two-day settlement.

We then merge the resulting sample of corporate bond transactions with the Mergent Fixed Income Securities Database (FISD) that provides bond characteristics. We exclude bonds that are not publicly traded in the U.S. market or are denominated in foreign currencies. We also remove bonds classified as structured notes, mortgage-backed securities, asset-backed secu-

[7] 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).

rities, agency-backed securities, equity-linked or convertible bonds. Additionally, we remove privately placed bonds under Rule 144A, bonds with floating coupon rates, bi-monthly or unclassified coupons, and bonds with missing values for key variables that are used to compute accrued interest (coupon type, coupon rate, dated date, and day count basis). We further exclude transactions for which the trading date is on or before the bond offering date, the rating is missing, the time-to-maturity is less than one year, or the amount outstanding is zero.

In Table A.1 of the Appendix, we present the detailed step-by-step procedure of the data cleaning above, along with the associated change in sample coverage. The resulting sample contains 39,477 unique bonds and 14,093,218 transactions in total.

Corporate bond returns Using the above cleaned sample of corporate bond transactions, we follow the standard approach in the literature to compute monthly bond returns (Bao and Hou, 2017; Dickerson et al., 2023). 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 return using the price of the last trade day in month t, which we denote by $P_{i,t}$, and the price of the last trade day in month $t-1$, which we denote by $P_{i,t-1}$. Specifically, the month-t gross return for bond i is calculated as

$$r_{i,t} = \frac{P_{i,t} + AI_{i,t} + C_{i,t}}{P_{i,t-1} + AI_{i,t-1}} - 1, \quad (1)$$

where $AI_{i,t}$ and $C_{i,t}$ are the accrued interest and coupon payment for bond i in month t.

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 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 $P_{i,t}$.

With the gross return $r_{i,t}$, we then compute the corporate bond excess return

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

where r_t^f is the one-month U.S. T-Bill rate. This standard excess return is used by most studies in the literature of corporate bond returns (Fama and French, 1993; Huang and Shi, 2021), which we also focus on in our first set of main analyses in Section 4.

Nevertheless, to investigate the economic channels of the effects of inflation risk on corporate bond returns, we decompose the excess return $rx_{i,t}$ using a duration-matched Treasury return. Specifically, following Binsbergen et al. (2024), we compute the duration-matched Treasury return $r_{i,t}^{Tsy}$ for bond i in month t using the weighting of cash flows in the calculation of the corporate bond's Macaulay duration and the Treasury yield curve of Gürkaynak, Sack and Wright (2007); see Appendix A.2 for details. We then make the following decomposition

$$rx_{i,t} = \underbrace{r_{i,t} - r_{i,t}^{Tsy}}_{rx_{i,t}^{\text{Credit}}} + \underbrace{r_{i,t}^{Tsy} - r_t^f}_{rx_{i,t}^{\text{Duration}}}, \tag{3}$$

where $rx_{i,t}^{\text{Duration}}$ is the excess return of the synthetic Treasury security, which captures the duration component of the corporate bond return, while $rx_{i,t}^{\text{Credit}}$ is the return difference between the corporate bond and the synthetic Treasury security with the same duration, which captures the return specific to corporate bonds (compensation for their default and liquidity risk).

Overall, we construct a bond return sample at the bond×month level from July 2002 to March 2022. Nevertheless, for the proper computation of inflation beta in subsequent analyses, we keep a bond×month observation only when there are at least 24 months of valid returns within the previous 36 months associated with it. Further, our inflation measure is available starting from July 2004 (see Section 2.2 below for details), so the resulting sample of corporate bond returns for portfolio analysis starts from September 2006. Table 1 provides a summary of our sample of corporate bond returns. In total, there are 10,110 bonds issued by 2,307 firms,

Table 1. Summary of the Sample of Corporate Bond Returns

This table presents descriptive statistics for the bond sample used in our analyses. The top panel provides details on the sample period, including the number of unique firms, unique bonds, and bond-month observations in our portfolio analysis. The bottom panel summarizes the mean, median, standard deviation, and the 10th, 25th, 75th, and 90th percentiles of bond return and characteristics, i.e., time to maturity (in years), bond age (in years), coupon rate (in percent), the amount outstanding (in millions of dollars), credit rating, seasoning (age divided by original maturity), monthly excess returns (in percent), monthly excess returns (in percent), the credit components, and the duration components of bond returns for the bond-month observations. Ratings are in conventional numerical scores, where 1 refers to an AAA rating and 21 refers to a C rating.

Sample period	July 2004 - March 2022
# firms	3,923
# bonds	25,653
# bond×month	843,786

Sample	Statistics	Time to maturity	Age	Coupon	Outstanding ($mm)	Rating	Seasoning	$rx_{i,t}$	$rx^{\text{Credit}}_{i,t}$	$rx^{\text{Duration}}_{i,t}$
All	Mean	8.46	5.07	5.75	567.36	9.75	0.40	0.60	0.37	0.23
	Median	5.67	3.67	5.80	400.00	9.00	0.38	0.29	0.16	0.09
	Std	8.26	4.76	1.94	635.11	4.03	0.24	5.61	5.71	1.56
	P10	1.92	0.83	3.13	26.81	5.00	0.08	-1.82	-2.24	-1.33
	P25	3.17	1.83	4.55	200.00	7.00	0.19	-0.40	-0.56	-0.39
	P75	9.50	6.75	6.95	749.50	12.00	0.59	1.39	1.16	0.80
	P90	21.58	10.67	8.00	1250.00	16.00	0.75	3.20	3.03	1.85
IG	Mean	9.05	5.11	5.14	620.60	7.49	0.40	0.44	0.20	0.25
	Std	8.93	4.73	1.71	693.74	2.00	0.25	2.90	2.96	1.69
HY	Mean	7.17	4.97	7.05	453.10	14.59	0.40	0.93	0.73	0.20
	Std	6.38	4.82	1.75	465.89	2.82	0.23	8.99	9.14	1.21

with 394,696 bond×month observations over the sample period from September 2006 to March 2022 (hence, there are around 2,137 bonds per month on average).

The first six columns of Table 1 report the time-series average of the cross-sectional bond characteristics. We observe the average bond in our sample has a time-to-maturity of 8.1 years, an age of 6.7 years, a coupon rate of 5.75%, an outstanding amount of $677 million dollars, and a rating of 10.03 (corresponding to a BBB rating).[8] Moreover, we calculate the seasoning measure of a bond as its age divided by original maturity, which captures bond illiquidity as newly-issued bonds tend to be more liquid (Israel et al., 2018). We observe that a bond in our sample has an average seasoning of 0.51, i.e., halfway through the original maturity.

The last three columns of Table 1 present the time-series average of the cross-sectional bond distributions of the bond excess return, along with its duration and credit components. We observe that the bond excess return averages 0.59% per month, with the duration component around 0.21% and credit component around 0.37%. Hence, the duration component accounts for a sizable fraction of the corporate bond excess return.[9] However, the cross-sectional variation of the duration component is substantially lower than that of the excess return; the former has an average standard derivation of 0.77% and an average P10-to-P90 range of -0.79% to 1.28%, while the latter has an average standard derivation of 3.92% and an average P10-to-P90 range of -2.15% to 3.43%. Hence, the major portion of the cross-sectional variation of corporate bond excess return is mainly associated with its credit component.

In the last four rows of Table 1, we provide a summary of the investment grade (IG) and high yield (HY) corporate bonds, respectively. We observe that an average IG bond has a higher time to maturity, lower age, lower coupon rate, and higher outstanding amount than an aver-

[8]We convert ratings into numerical scores, where 1 refers to an AAA rating and 21 refers to a C rating; hence, a higher numerical score implies higher credit risk. Numerical ratings of 10 or below (BBB- or better) are classified as investment grade, and ratings of 11 or higher (BB+ or worse) are classified as high yield.

[9]Note that the fraction of the excess return that is accounted for by the duration component is lower in our sample ($0.21/0.59 \approx 36\%$) than in the sample used by Binsbergen et al. (2024) (more than 60%). One important reason is that their sample period is from January 1986 to December 2020 during which the long-term Treasury excess return is around 0.2%, higher than that in our sample period from August 2004 to March 2022 only around 0.2%. The higher Treasury return in earlier periods arises from the well-known secular decline in interest rates over the past several decades.

age HY bond, but their seasoning is quite similar. Moreover, in terms of the excess return, HY bonds have a *higher* mean and *higher* (within-group) cross-sectional standard deviation than IG bonds. The HY-IG difference in excess return averages around 0.5% per month, similar to the premium of the credit risk factor of Bai et al. (2019) (both the original factor and the replicated factor in Dickerson et al. (2023)). In contrast, in terms of the duration component, HY bonds have a slightly *lower* mean and greatly *lower* cross-sectional standard derivation, further confirming that the cross-sectional variation of corporate bond excess return is mainly associated with its credit component.

2.2 Inflation Measures

In this section, we introduce the two inflation measures used in our main analyses.

The first measure is the standard CPI growth defined as the difference in the natural logarithm of CPI (Chen et al., 1986; Ang et al., 2008):

$$\pi_t = log(\mathrm{CPI}_t/\mathrm{CPI}_{t-1}).$$

We use headline CPI in our main analyses because it determines the payoffs of inflation swaps, as well as TIPS, that our second inflation measure is based on (we examine core CPI in additional analyses). Moreover, because we examine monthly corporate bond returns, we obtain monthly series of CPI from the U.S. Bureau of Labor Statistics (BLS) and use the monthly CPI growth as the measure of realized inflation rate (we also examine the annual CPI growth, known as the year-over-year inflation rate, in additional analyses).

The second one is the inflation swap rate as a forward-looking measure of inflation that is closely related to inflation expectation. As discussed in detail in Appendix A.4, inflation swaps are a liquid and actively traded instrument that investors use to hedge inflation risk. Compared with TIPS, inflation swaps are less subject to liquidity and mispricing issues, so inflation swap rate provides a better gauge of inflation than TIPS-based breakeven inflation (the difference

Table 2. Summary of Inflation Measures

This table presents summary statistics of the monthly series of the two inflation measures—the 10-year inflation swap rate and the monthly headline CPI growth rate, both in annualized terms. The sample period spans from July 2004 through December 2022.

	Mean	Median	Std	P10	P25	P75	P90
Headline CPI Growth	2.58	2.57	4.02	-0.99	0.60	4.45	6.72
10-year Inflation Swap Rate	2.41	2.50	0.39	1.88	2.14	2.72	2.83

between yields of nominal Treasury securities and TIPS); see Campbell et al. (2009) for detailed evidence. Moreover, inflation swap rates are available at high-frequency for long maturities up to 30 years, which are not available in survey forecasts. For comparison, the *monthly* Blue Chip survey forecasts only go out to *two years ahead* at most, while ten-year ahead inflation forecasts in the Survey of Professional Forecasters (SPF) are only available on *quarterly* basis.

We use zero-coupon inflation swaps that are the most basic and actively-traded type of inflation swaps. A zero-coupon inflation swap is a forward contract, whereby a fixed nominal swap rate is determined at time 0 and only one cash flow exchange (based on the swap rate and realized inflation rate) occurs at the maturity date.[10] We obtain from Bloomberg the monthly zero-coupon inflation swap rates of 10-year maturity, which is the usual horizon for gauging long-term inflation expectation.[11] The series are available starting from July 2004.

In Table 2, we present summary statistics of these two inflation measures, both in annualized terms, for our sample period from July 2004 to December 2022. We observe that their mean values are similar, around $2.4-2.6$ percent. Moreover, the monthly CPI growth that captures inflation rate over a one-month horizon is much more volatile than the inflation swap rate that captures average inflation rate over a 10-year horizon: the standard derivation is 4.02 percent for the former but only 0.39 percent for the latter. We then plot the monthly series of the two

[10]For example, consider a 10-year zero-coupon inflation swap with the swap rate equal to 300 basis points. At the maturity in 10 years, it will have a cash flow exchange of $(1+0.05)^{10}-(1+0.03)^{10}$ if the realized inflation rate is 5% per year over the 10-year horizon of the swap.

[11]For example, the Federal Reserve focuses on the inflation expectation over the next 10 years in its "Report to the FOMC on Economic Conditions and Monetary Policy" (known as the Tealbook); see https://www.federalreserve.gov/monetarypolicy/files/FOMC20180321tealbooka20180309.pdf. We also examine the performance of 1-year, 5-year, and 30-year inflation swap rates in Table A.5.

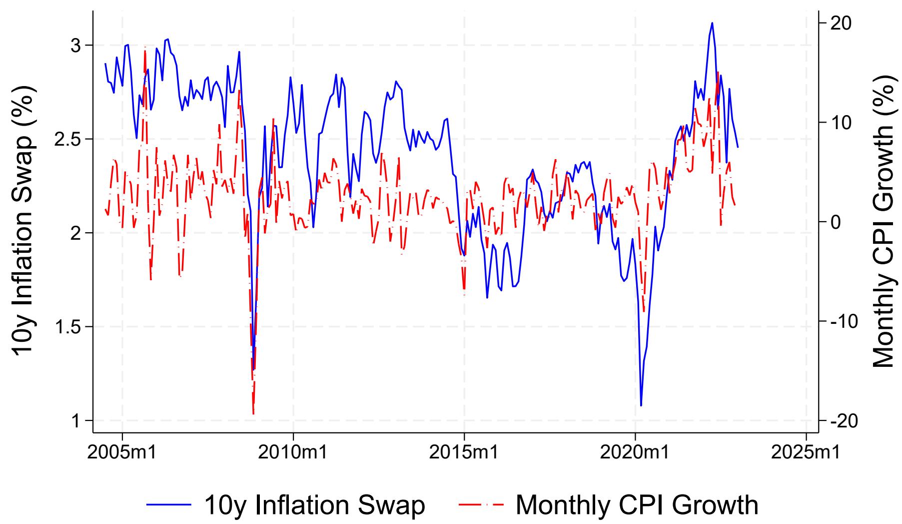

Figure 1. Time Series of Inflation Measures

This figure plots the monthly series of the 10-year inflation swap rate and monthly headline CPI growth, both in annualized terms. The sample period is from July 2004 to December 2022.

measures in Fig. 1. We observe that although the two measures have different levels because of the difference in horizons, they share significant common variations over time. For example, both dropped substantially in the 2008 and COVID-19 crises and increased greatly in the recent inflationary episode. Indeed, their time series correlation is around 0.433.

2.3 The Negative Inflation—Default Relation

The literature documents a negative association between corporate default and inflation (Kang and Pflueger, 2015; Bhamra et al., 2022). In this section, we present simple evidence of this relationship using the two main inflation measures introduced earlier. While establishing this negative inflation-default relationship is not our contribution, confirming it with our inflation measures and sample period provides reassurance for its use in structuring our analyses and interpreting our results.

Specifically, we construct the series of the number of bond defaults in each month from July 2004 through December 2022 using the FISD and Moody's Default and Recovery Database (DRD). We then plot this monthly series together with our two inflation measures in the top

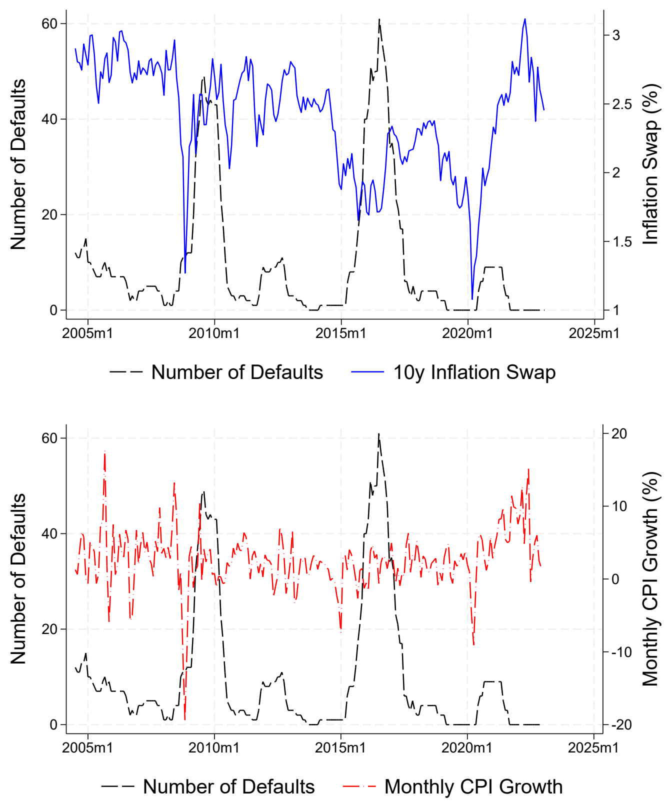

Figure 2. Monthly Series of Inflation and Bond Default Measures

This figure plots the monthly time series of the 10-year inflation swap rate and the number of monthly bond defaults. Default data are from the Moody's Default and Recovery Database. The sample period is from July 2004 to December 2022.

and bottom panels of Fig. 2, respectively. We observe that both inflation measures are negatively related to bond defaults, and seem to be leading defaults by about several quarters. For example, both inflation measures reached a trough around November 2008 and the number of bond defaults peaked around August 2009. Moreover, inflation rates dropped significantly in July - September 2015 and the number of bond defaults soared above 60 around July 2016.

To gauge the negative relation between inflation and default statistically, we regress the number of defaults on the 12-month-lagged inflation swap rate and monthly CPI growth, as reported in columns (1) and (2) of Table 3, respectively. We observe that the regression coefficients are indeed negative and statistically significant. In addition to the number of bond defaults, we also calculate, in each month, the ratio of the amount outstanding of bonds that default to the

Table 3. Inflation and Corporate Bond Defaults

In columns (1) and (2), the number of bond defaults is regressed on the 12-month-lagged inflation swap rate and monthly CPI growth rate, respectively. In columns (3) and (4), the amount ratio of bond defaults is regressed on the 12-month-lagged inflation swap rate and monthly CPI growth rate, respectively. Robust t-statistics based on Newey and West (1987) standard errors with the rule-of-thumb bandwidth choice $0.75N^{1/3}$ are reported in parentheses. The sample period is July 2004 to December 2022. Significance levels: *** for $p < 0.01$ and ** for $p < 0.05$, and * for $p < 0.1$, where p is the p-value.

	Number of Bond Defaults		Amount Ratio of Bond Defaults	
	(1)	(2)	(3)	(4)
Inflation Swap Rate	-13.281***		-0.206**	
	(-2.650)		(-2.534)	
Monthly CPI Growth		-0.676***		-0.012**
		(-2.695)		(-2.436)
Intercept	41.561***	11.272***	0.655***	0.189***
	(3.124)	(5.275)	(3.029)	(5.012)
N	222	222	222	222
R^2	0.171	0.048	0.138	0.051

outstanding amount of all bonds. We then regress this amount ratio of bond defaults on the 12-month-lagged inflation measures. As reported in columns (3) and (4) of Table 3, the regression coefficients are also negative and significant. Overall, these simple analyses corroborate the negative inflation—default relation documented in the literature using our inflation measures and sample period.

What economic channels underlie the negative inflation—default relation? Existing studies have proposed several channels either explicitly or implicitly. For example, Kang and Pflueger (2015) explicitly analyzed the "debt deflation" channel of Fisher (1933) whereby a surprise drop in inflation results in rises in real liabilities and corporate default. Moreover, inflation has been positively related to real macroeconomic fundamentals such as the real GDP growth since 2000 (Campbell et al., 2020; Song, 2017). Hence, with procyclical inflation or "good inflation" in our sample period (Cieslak and Pflueger, 2023), default is conceivably low amid solid real economic growth and should be negatively related to inflation.[12]

[12] Another indirect channel, based on the structural models, is that high inflation implies high short-term rate, which in turn lowers default probability (Longstaff and Schwartz, 1995).

We emphasize that differentiating the various channels of the negative inflation—default relation is beyond the scope of this paper. Rather, as mentioned above, we use this relation in guiding and organizing our analyses of the inflation exposure of corporate bonds. In particular, the focus of our paper is to delve into the detailed components of corporate bond returns and the cross sectional differences of individual bonds to understand their inflation exposure, taking the negative inflation—default relation as given.

3 Inflation Exposure of Corporate Bond Return

Based on the negative inflation—default relation discussed above, one would expect a positive inflation exposure of corporate bond returns. Surprisingly, however, existing studies in the literature find that corporate bond returns are negatively exposed to inflation. For example, in a recent comprehensive study of the inflation exposure of various asset classes, Fang et al. (2022) show that the inflation beta of corporate bond returns is significantly negative. In this section, we delve into the inflation exposure of corporate bond excess return by decomposing it into the duration and credit components. We show that (1) the inflation beta of the credit component is remarkably positive and (2) the cross-sectional variation of the excess return's inflation beta is mostly due to the cross-sectional variation of the credit component's inflation beta, both consistent with the negative inflation—default relation.

To estimate the inflation beta of corporate bond returns, we need to construct the innovation series of our two inflation measures. For the monthly CPI growth rate, we construct the innovation series using the ARMA(1,1) model, similar to Fama and Gibbons (1984); Ang, Bekaert and Wei (2007); Boons et al. (2020); Hong et al. (2022). For the inflation swap rate, we construct the innovation series using the first difference between two consecutive months, as is standard in the literature for forward-looking market-price-based measures.[13]

[13] For example, the first difference of VIX is used as the innovation of market volatility (Ang, Hodrick, Xing and Zhang, 2006). More relatedly, the first difference of TIPS-based breakeven inflation is use as the innovation of inflation expectation.

We estimate the inflation beta of each bond in each month, following the standard procedure in the literature. Specifically, the inflation betas of bond excess returns are estimated based on the following regression:

$$rx_{i,m} = \alpha_i + \beta_i^{\text{Inflation}} \times \Delta\text{Inflation}_m + \beta_i^{\text{Inflation, Lag}} \times \Delta\text{Inflation}_{m-1} + \varepsilon_{i,m}, \tag{4}$$

where $rx_{i,m}$ is the excess return of bond i in month m and $\Delta\text{Inflation}_m$ is the innovation of the inflation swap rate or monthly CPI growth in month m. Moreover, as discussed in Section 2.1, corporate bonds are traded infrequently, so their returns may not be calculated using end-of-the-month prices exactly and fail to match the change of inflation at the end of the month. To address this illiquidity-induced asynchronous issue, we follow Hu, Pan and Wang (2013) and Chung et al. (2019) to include the lagged inflation innovation $\Delta\text{Inflation}_{m-1}$ in the regression and use the sum of $\beta_i^{\text{Inflation}}$ and $\beta_i^{\text{Inflation, Lag}}$ as the inflation beta of bond excess return. We use the same procedure to compute the inflation betas of the credit and duration components of corporate bond return, replacing $rx_{i,m}$ in Eq. (4) by $rx_{i,m}^{\text{Credit}}$ and $rx_{i,m}^{\text{Duration}}$, respectively.

Moreover, we compute the inflation beta of each bond i in each month t with the standard rolling-window approach, using observations of the past 36 months (i.e., $m \in [t-35, t]$) and requiring at least 24 months of return observations.[14] Hence, for each bond i in each month t, we have the inflation betas of the bond's excess return, credit component return, and duration component return, which we denote by $\beta\left(rx_{i,t}, \Delta\text{Inflation}_t\right)$, $\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$, and $\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$, respectively. Note that based on Eqs. (3) and (4), we have

$$\beta(rx_{i,t}, \Delta\text{Inflation}_t) = \beta(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t) + \beta(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t). \tag{5}$$

That is, the inflation beta of a bond's excess return can be decomposed into two components: the inflation beta of its credit component and the inflation beta of its duration component. Fur-

[14]To mitigate the impact of outliers on the beta estimation, we winsorize corporate bond excess returns at the upper and lower 0.5 percentiles each month in the beta estimation; however, we still use the original returns in examining the performance of the inflation-β portfolios.

ther, two estimates are available—with respect to the monthly CPI growth and inflation swap rate separately—for each of these three beta estimates.

3.1 Level of Inflation Beta

Inflation betas of bond excess returns. We first examine inflation betas of bond excess returns as done in the literature. Specifically, in each month, we compute the value-weighted average inflation beta of excess return across the bonds available in this month and use it as the measure of market-level inflation beta of corporate bond excess return. In column (1) of Table 4, we report the time series mean of this market-level inflation beta estimate. From panel A, we observe that the mean inflation beta with respect to monthly CPI growth is equal to -0.367 and statistically significant. From panel B, the mean inflation beta with respect to inflation swap rate is -0.135, though statistically insignificant.

Given that we have bond-level estimates over time, we take one step further by looking into the distribution of the excess return's inflation beta. Specifically, we first calculate the proportion of months with positive market-level inflation beta among all months in our sample. As also reported in column (1) of Table 4, this fraction is 23.5% using CPI growth and 50.3% using inflation swap rate. We then calculate the proportion of bond-month inflation beta estimates that are positive among the whole bond-month sample. As reported in the last row of column (1) of each panel, this fraction is 36.8% using CPI growth and 46.2% using inflation swap rate.

In summary, we find that inflation beta of corporate bond excess return is indeed negative on average, consistent with existing studies in the literature (Fang et al., 2022). Moreover, an interesting finding out of our analyses is that inflation beta is more negative with respect to realized CPI inflation rate than forward-looking inflation swap rate, both on average and across the distribution of individual bonds. In any case, the negative inflation exposure is inconsistent with the negative inflation—default relation and puzzling.

Table 4. Level of Inflation Beta of Corporate Bond Returns

This table presents inflation beta estimates derived from three distinct bond return measures: the inflation beta calculated using the total excess returns ($\beta(rx_{i,t}, \Delta\text{Inflation}_t)$), the inflation beta calculated using credit component returns ($\beta(rx_{i,t}^{Credit}, \Delta\text{Inflation}_t)$), and the inflation beta calculated using the duration component returns ($\beta(rx_{i,t}^{Duration}, \Delta\text{Inflation}_t)$). The betas are estimated using two inflation proxies: (1) shocks to inflation swap rates and (2) innovations in headline CPI. For each beta type, the table reports the time-series average of cross-sectional value-weighted monthly beta estimates (labeled Mean). The corresponding Newey-West t-statistics with 12 lags are shown in parentheses. Additionally, the table exhibits two fraction measures. % Positive Month is the proportion of months where the cross-sectional value-weighted beta is positive. % Positive Bond-Month is the proportion of individual bond-month beta estimates that were positive across the full sample.

	(1) $\beta\left(rx_{i,t}, \Delta\text{Inflation}_t\right)$	(2) $\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$	(3) $\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$
A: Monthly CPI Growth			
Mean	-0.367	1.292	-1.657
t-stat	(-2.92)	(6.92)	(-13.83)
% of Positive Month	23.5%	91.4%	0.0%
% of Positive Bond-Month	36.8%	73.2%	2.0%
B: Inflation Swap Rate			
Mean	-0.135	5.928	-6.057
t-stat	(-0.19)	(7.60)	(-11.05)
% of Positive Month	50.3%	92.5%	0.0%
% of Positive Bond-Month	46.2%	86.3%	3.1%

Inflation betas of the credit and duration components of bond excess returns. Next, we delve into this puzzling negative inflation exposure of corporate bond excess return by decomposing it into the inflation exposures of the credit and duration components of bond return as in Eq. (5).

In particular, we report the time series mean of the market-level inflation beta estimates of the credit and duration components (calculated in the same way as for the excess return) in columns (2) and (3) of Table 4, respectively. We observe that inflation beta of the duration component is equal to -1.657 using CPI growth and -6.057 using inflation swap rate, both highly significant statistically. In remarkable contrast, inflation beta of the credit component is positive: it is equal to 1.292 using CPI growth and 5.928 using inflation swap rate, both also highly significant statistically. Therefore, the negative inflation beta of bond excess return is primarily due to the duration component, whereas the credit component has strongly positive inflation beta consistent with the negative inflation—default relation.

The contrast is even more striking when we look into the distributions of the inflation betas of the credit and duration components. First, as reported in column (3) of Table 4, market-level inflation beta of the duration component is never positive using either inflation measures, whereas as reported in column (2), market-level inflation beta of the credit component is positive in 91.4% and 92.5% of the months in our sample using CPI growth and inflation swap rate, respectively. Second, at the individual bond-month level, up to about 3% of inflation betas of the duration component are positive, whereas 73.2% and 86.3% of inflation betas of the credit component are positive using CPI growth and inflation swap rate, respectively.

In summary, we find that the duration component of a corporate bond, which is equivalent to a Treasury bond whose payoff is negatively affected by rising inflation (Campbell et al., 2020; Fang et al., 2022), has strong negative inflation beta. This results in the puzzling average negative inflation exposure of corporate bond excess return as documented in the literature. In contrast, inflation beta of the credit component of a corporate bond is predominately positive, consistent with the negative inflation—default relation in the data.

3.2 Cross-Sectional Variation of Inflation Beta

In this section, we examine the cross-sectional variation of inflation beta to understand the differential inflation exposure of different bonds. In particular, in each month t, we sort bonds i into quintile portfolios based on their excess return inflation betas, i.e., $\beta(rx_{i,t}, \Delta\text{Inflation}_t)$. Quintile 1 contains the bonds with the lowest betas, and quintile 5 contains the bonds with the highest betas. In Table 5, we report, for each quintile, the average inflation betas of the excess return, the credit component, and the duration component in columns (1) - (3), respectively. The results using the monthly CPI growth and inflation swap rate are reported in panels A and B, respectively.

Table 5. Inflation-Beta-Sorted Corporate Bond Portfolios

This table presents inflation beta estimates using two inflation proxies: CPI growth (CPI) and inflation swap rates (SWAP). Bonds are sorted into quintile portfolios based on their overall inflation beta $\beta(rx_{i,t}, \Delta\text{Inflation}_t)$. The table reports the average beta estimates for three bond return measures: the inflation beta calculated using total excess returns $\beta(rx_{i,t}, \Delta\text{Inflation}_t)$, the inflation beta calculated using credit component returns $\beta(rx_{i,t}^{Credit}, \Delta\text{Inflation}_t)$, and the inflation beta calculated using duration component returns $\beta(rx_{i,t}^{Duration}, \Delta\text{Inflation}_t)$. The high-minus-low (H-L) row represents the difference between the highest and lowest quintile portfolios. t-statistics are reported in parentheses.

	(1)	(2)	(3)
	$\beta\left(rx_{i,t}, \Delta\text{Inflation}_t\right)$	$\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$	$\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$
		A: Monthly CPI Growth	
1	-4.265	-1.879	-2.386
	(-6.045)	(-2.503)	(-9.982)
2	-1.268	0.314	-1.582
	(-9.632)	(3.336)	(-12.315)
3	-0.408	0.803	-1.210
	(-5.496)	(7.873)	(-14.078)
4	0.584	1.805	-1.221
	(3.381)	(7.448)	(-12.669)
5	4.995	6.351	-1.356
	(6.628)	(7.760)	(-12.907)
High-Low	9.260***	8.230***	1.031***
	(6.975)	(6.116)	(5.569)
		B: Inflation Swap Rate	
1	-8.517	0.811	-9.330
	(-6.093)	(0.448)	(-10.088)
2	-2.582	2.586	-5.168
	(-4.420)	(5.216)	(-11.559)
3	-0.488	3.775	-4.274
	(-0.977)	(7.707)	(-11.603)
4	2.247	6.840	-4.622
	(3.464)	(9.752)	(-11.130)
5	13.658	18.922	-5.288
	(8.481)	(11.566)	(-10.655)
High-Low	22.174***	18.111***	4.042***
	(9.360)	(7.116)	(8.015)

From column (1), we observe that the excess return's inflation beta varies greatly across the quintile portfolios. Specifically, it is negative for the first three portfolios and turns positive for the last two, using both CPI growth and inflation swap rate. The high-minus-low difference is 9.26 with a t-stat of 6.975 for the inflation beta with respect to CPI growth and 22.174 with a t-stat of 9.36 for the inflation beta with respect to inflation swap rate.

Moreover, from columns (2) and (3), we observe that the duration component's inflation beta is negative across all quintile portfolios using both inflation measures, and the credit component's inflation beta is all positive (except only the first quintile portfolio using CPI growth), consistent with the results reported above in Section 3.1. Most importantly, the credit component's inflation beta varies greatly across the quintile portfolios whereas the variation of the duration component's inflation beta is quite muted relatively. Specifically, the high-minus-low difference of the credit component's inflation beta ranges from 8.23 to 18.111 using the two inflation measures while the high-minus-low difference of the duration component's inflation beta ranges only from 1.031 to 2.042.

In sum, these analyses show that inflation exposure varies greatly in the cross section of corporate bonds, and the majority of this cross-sectional variation is associated with the credit component of corporate bond return, consistent with the negative inflation—default relation.

A further natural implication along this direction is that higher-default-risk bonds, which are more exposed to default shocks by definition, should have larger inflation exposure. To examine this implication, we report the average rating for the quintile portfolios sorted by $\beta\left(rx_{i,t}, \Delta\text{Inflation}\right)$ (as reported in Table 5) using CPI growth and inflation swap rate in the first column of Panels A and B of Table 6, respectively. We observe that higher-inflation-beta bonds indeed have significantly lower credit ratings. Specifically, the highest-inflation-beta quintile portfolio has an average rating of around 14 (corresponding to a B-rating category) while the lowest-inflation-beta quintile portfolio has an average rating of around 9 (corresponding to a BBB-rating category).

We also report the average of other bond characteristics, including time to maturity, coupon

Table 6. Inflation Beta and Bond Characteristics

This table presents the relation between bond inflation beta and bond characteristics. In Panel A and B, bonds are sorted into quintile portfolios based on their $\beta(rx_{i,t}, \Delta\text{Inflation}_t)$, where inflation proxies are CPI growth and inflation swap rate, respectively. The two panels report the average characteristics of bonds in each quintile, including credit rating (in numerical scores), time to maturity (in years), coupon rate (in percent), seasoning (age divided by original maturity), and the amount outstanding (in millions of dollars). Panel C presents Fama-MacBeth regression results of inflation beta on bond characteristics.

A. Portfolios by CPI Growth Beta					
Portfolio	Rating	Time-to-Maturity	Coupon	Seasoning	Outstanding
1	9.957	12.632	5.834	0.400	699.728
	(30.613)	(39.173)	(26.720)	(31.135)	(19.283)
2	8.705	7.106	5.309	0.511	769.362
	(46.856)	(23.050)	(22.884)	(32.034)	(31.742)
3	8.735	5.571	5.284	0.578	753.984
	(122.204)	(17.776)	(26.121)	(52.668)	(36.795)
4	9.795	6.386	5.730	0.567	646.801
	(48.073)	(13.345)	(31.217)	(48.078)	(35.877)
5	12.993	7.938	6.545	0.528	506.049
	(37.301)	(21.179)	(51.437)	(65.490)	(19.841)
High-Low	3.036***	-4.694***	0.712***	0.128***	-193.679***
	(6.540)	(-6.985)	(4.745)	(8.583)	(-7.664)
B. Portfolios by Inflation Swap Rate Beta					
Portfolio	Rating	Time-to-Maturity	Coupon	Seasoning	Outstanding
1	8.833	13.340	5.558	0.386	755.438
	(20.833)	(39.508)	(24.920)	(58.430)	(16.585)
2	8.372	6.463	5.127	0.538	760.858
	(59.221)	(19.331)	(21.444)	(34.745)	(42.667)
3	8.830	5.392	5.302	0.585	730.697
	(108.250)	(20.025)	(26.549)	(50.730)	(44.798)
4	10.442	6.311	6.008	0.566	617.285
	(78.931)	(19.017)	(39.204)	(50.853)	(32.986)
5	13.754	8.123	6.724	0.509	513.105
	(63.541)	(30.502)	(56.276)	(56.978)	(17.024)
High-Low	4.921***	-5.217***	1.166***	0.123***	-242.332***
	(14.210)	(-12.670)	(9.326)	(11.295)	(-5.659)

C. Fama-MacBeth Regressions					
	CPI Growth			Inflation Swap Rate	
Rating	0.266***	0.273***		0.948***	0.940***
	(4.369)	(4.436)		(7.026)	(6.993)
Time-to-Maturity		0.078***			0.259***
		(9.050)			(9.246)
Coupon		0.118**			0.375***
		(2.024)			(3.991)
Seasoning		0.015			-3.293***
		(0.062)			(-2.831)
Log(Outstanding)		0.144			-0.061
		(0.781)			(-0.192)
R^2	0.093	0.168		0.165	0.322
Obs	187	187		187	187

rate, seasoning, and amount outstanding, for the quintile portfolios. These characteristics are mainly related to bond duration and liquidity risks and indirectly related to default risk at most. From the last four columns of Panels A and B of Table 6, we observe that higher-inflation-beta bonds have shorter time-to-maturity, carry higher coupon rate, are more seasoned, and have lower outstanding balance, all significant statistically. We then report the results of Fama and MacBeth (1973) regressions of inflation beta on bond characteristics in Panel C. Comparing the results in the first and third columns using rating as the only regressor with the results in the second and fourth columns including all bond characteristics, we find that the explanatory power of rating is substantial: the regression R^2 using only rating is higher than half of the regression R^2 of all bond characteristics together. Overall, the results confirm the key role played by the negative inflation—default relation in driving the cross-sectional variation of corporate bond inflation exposure.

4 Effects of Inflation Beta on Corporate Bond Return

The significant positive inflation exposure of corporate bond return and its substantial cross-sectional variation documented so far prompts the natural question of whether inflation exposure has explanatory power for corporate bond returns in the cross section. In this section, we show that the answer is yes, and importantly, the effects bear on the credit component of corporate bond return totally.

Effects on bond excess returns. We first analyze the effects of inflation beta on corporate bond excess return. Specifically, for each quintile portfolio based on excess return inflation beta $\beta(rx_{i,t}, \Delta\text{Inflation}_t)$ (those reported in Table 5), we report the value-weighted average excess return next month ($rx_{i,t+1}$) in columns (1) and (4) of Panel A of Table 7 using CPI growth and inflation swap rate, respectively. Recall from Table 5 that the average inflation beta increases monotonically from quintile 1 to quintile 5. Accordingly, from Table 7, higher-inflation-beta quintile portfolios deliver significantly higher future average excess returns than lower-inflation-beta ones, using both CPI growth and inflation swap rate. That is, inflation beta has a positive effect on bond excess return in the cross section.

Moreover, we observe that the spreads in the average excess return between the quintile 5 and quintile 1 portfolios are remarkably similar using CPI growth and inflation swap rate, both around 0.7% per month. The statistical significance, though, is slightly stronger using inflation swap rate than CPI growth.

Effects on the credit and duration components of bond excess returns. We then decompose the effects of inflation beta on corporate bond excess return into those on the credit and duration components separately. Specifically, for the average excess return of each quintile portfolio reported in column (1) of Panel A of Table 7 using CPI growth, we report its credit and duration components in columns (2) and (3), respectively. The credit and duration components of the average excess return reported in column (4) using inflation swap rate are reported in columns (5) and (6), respectively.

We observe that the duration component $rx_{i,t+1}^{\text{Duration}}$ exhibits minimal variation across different quintile portfolios. In particular, the high-minus-low average duration component is only -0.093% and -0.084% per month using CPI growth and inflation swap rate, respectively, and both are insignificant statistically. In contrast, the credit component $rx_{i,t+1}^{\text{Credit}}$ exhibits large variation across different quintile portfolios, with the high-minus-low average around 0.79% per month and highly significant statistically using both CPI growth and inflation swap rate. That is, the cross-sectional variation in excess return across these inflation-beta-sorted bond portfolios arises totally from the cross-sectional variation in its credit component $rx_{i,t+1}^{\text{Credit}}$.

Note that the quintile portfolios analyzed above are sorted by the excess return's inflation beta $\beta\left(rx_{i,t}, \Delta\text{Inflation}_t\right)$. Next, we take one step further by sorting bonds into quintile portfolios in each month based on the credit component's inflation beta $\beta(rx_{i,t}^{Credit}, \Delta\text{Inflation}_t)$. In Panel B of Table 7, we report the value-weighted average excess return together with its credit and duration components for each of these quintile portfolios, in columns (1) - (3) using CPI

Table 7. Inflation Beta and Corporate Bond Returns

This table presents the average portfolio excess returns and alphas for each inflation-beta quintile portfolio. Specifically, quintile portfolios are constructed monthly by sorting corporate bonds based on their excess return inflation betas. The portfolio excess returns are value-weighted, using the amount outstanding as weights. We report the alphas against duration-adjusted factor (BndRisk) and the duration-matched Treasury factor (BndDur) in Binsbergen et al. (2024) and the liquidity risk Factor (LRF) in Dickerson et al. (2023) as indicated. Newey-West t-statistics with 12 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	$rx_{i,t+1}$	$rx^{\text{Credit}}_{i,t+1}$	$rx^{\text{Duration}}_{i,t+1}$	$rx_{i,t+1}$	$rx^{\text{Credit}}_{i,t+1}$	$rx^{\text{Duration}}_{i,t+1}$
A: Portfolios Sorted by Excess Return Beta						
	CPI Growth			Inflation Swap Rate		
1	0.434	0.145	0.289	0.373	0.090	0.282
	(1.674)	(0.533)	(2.288)	(1.390)	(0.332)	(2.076)
2	0.310	0.110	0.200	0.304	0.105	0.199
	(2.462)	(0.839)	(2.462)	(2.401)	(0.817)	(2.545)
3	0.293	0.128	0.165	0.330	0.171	0.159
	(3.053)	(1.319)	(2.286)	(3.137)	(1.711)	(2.222)
4	0.468	0.297	0.171	0.520	0.342	0.178
	(2.868)	(1.990)	(1.937)	(3.381)	(2.386)	(2.222)
5	1.134	0.939	0.196	1.081	0.883	0.198
	(2.715)	(2.241)	(2.278)	(2.778)	(2.223)	(2.398)
High-Low	0.700*	0.794**	-0.093	0.709**	0.793***	-0.084
	(1.905)	(2.340)	(-1.577)	(2.103)	(2.658)	(-1.209)
Panel B: Portfolios Sorted by Credit Component Beta						
	CPI Growth			Inflation Swap Rate		
1	0.387	0.196	0.191	0.298	0.118	0.181
	(1.484)	(0.714)	(2.371)	(1.116)	(0.425)	(2.741)
2	0.215	0.055	0.160	0.239	0.082	0.157
	(1.821)	(0.439)	(2.374)	(2.169)	(0.697)	(2.369)
3	0.348	0.157	0.191	0.387	0.207	0.180
	(3.210)	(1.480)	(2.273)	(3.362)	(1.890)	(2.125)
4	0.547	0.304	0.242	0.584	0.321	0.263
	(3.227)	(1.851)	(2.157)	(3.445)	(1.934)	(2.197)
5	1.103	0.832	0.271	1.062	0.784	0.278
	(2.831)	(2.066)	(2.383)	(2.851)	(2.008)	(2.229)
High-Low	0.716**	0.636*	0.080	0.764**	0.667**	0.097
	(2.232)	(1.908)	(1.432)	(2.575)	(2.103)	(1.084)

growth and columns (4) - (6) using inflation swap rate. These portfolios paint a similar picture. The credit component $rx_{i,t+1}^{\text{Credit}}$ exhibits large and significant variation across different quintile portfolios, whereas the duration component exhibits minimal and insignificant variation. For example, the high-minus-low average excess return is 0.716% per month, with the credit component equal to 0.636% and the duration component equal to 0.08% using CPI growth.

To summarize, we find that inflation exposure has significantly positive effects on corporate bond returns in the cross section. Intuitively, high-inflation-beta bonds underperform when inflation is low and default is high (because of the negative inflation—default relation). Hence, investors with exposure to systematic default risk would command high returns to hold high-inflation-beta bonds. Most importantly, our analyses uncover a remarkable pattern—the positive effect of inflation beta on corporate bond excess return in the cross section bears on its credit component totally.

In addition, although proposing a new cross-sectional pricing factor for corporate bond returns is not our goal, it is worth checking whether the explanatory power of inflation beta is already consolidated into existing benchmark factors, especially those that capture credit risk. Specifically, insofar as the negative effect of inflation on default has been consolidated into existing credit risk factors in the literature (Fama and French, 1993; Dickerson et al., 2023; Binsbergen et al., 2024), inflation beta should not have significant incremental power. As reported in **??**, however, we find that the effects of inflation beta on future corporate bond return are barely affected by existing factors. Hence, either credit risk measures that can account for the negative effect of inflation on default have not been discovered, or this negative effect necessitates a multi-factor framework to capture different drivers of credit risk in affecting corporate bond returns. Further investigation along this direction is important but beyond the scope of the current paper and hence left for future research.

5 Relationship between Bond and Stock Inflation Exposures

So far, we have focused exclusively on the inflation exposure of corporate bonds. In this section, we analyze the relationship between bond and stock inflation exposures, given that both are contingent claims on a firm's underlying asset value (Merton, 1974). While combining stocks and bonds opens the door to studying various economic issues,[15] our primary goal is to develop a more comprehensive understanding of how the negative inflation—default relation affects corporate bond returns by examining its connection to stock returns' inflation exposure.

Specifically, in addition to the positive inflation beta of corporate bond returns, the negative inflation—default relation also suggests a generally positive inflation beta for stock returns. Higher inflation is associated with lower default risk, indicating stronger firm fundamentals and, consequently, higher equity values. However, early studies dating back to the 1980s found that stock inflation betas were significantly negative (e.g., Lintner, 1975; Fama and Schwert, 1977; Bekaert and Wang, 2010). To reconcile this contradiction, Bhamra et al. (2022) propose a model incorporating two nominal-rigidity frictions: one that drives the negative effect of inflation on default and another that drives the negative effect of inflation on equity value. Yet, several recent studies have documented less negative inflation exposure of stock returns after 2000, particularly concerning headline inflation (Boons et al., 2020; Fang et al., 2022). Therefore, it remains unclear whether a contradiction still exists regarding the effect of inflation on stock and bond values.

To analyze the relationship between inflation exposures of the stock and bond of the same firm, for each bond in each month in our sample, we search for the corresponding stock of the issuing firm in CRSP.[16] A summary of the matched sample is reported in Table 8. In particular, as reported in the left panel, the matched sample has 8206 bonds and 318,400 bond-month observations, slightly smaller than the baseline bond sample (as reported in Table A.2) but with all the characteristics being similar. For instance, the average bond excess return, credit com-

[15] For example, one can study the integration of equity and credit markets. We leave investigations into these issues for future research.

[16] We use the Bond-Compustat-CRSP Link file provided by Chuck Fang to link bond to their corresponding stocks.

Table 8. Summary of the Stock-Bond Matched Sample

This table presents descriptive statistics for the bond sample merged with the corresponding stocks. The left panel provides details on the bond sample that can be matched with stocks, including the number of unique firms, unique bonds, and bond-month observations. The mean, median, standard deviation, and the 10th, 25th, 75th, and 90th percentiles of the monthly excess returns (in percent), the credit components, and the duration components of bond returns for the bond-month observations are exhibited. The right panel provide the descriptive statistics at the firm-month level. Specifically, the number of unique stocks and stock-month observations are included. Descriptive statistics for the number of bonds that is matched with each stock in each month, and monthly stock excess returns (in percent) are also provided.

Bond-Level				Firm Level		
# issuer_id	1777			# permno	1101	
# bonds	8206			# stock×month	79,721	
# bond×month	318,400					
	$rx_{i,t}$	$rx_{i,t}^{\text{Credit}}$	$rx_{i,t}^{\text{Duration}}$		# bonds per stock	Stock excess ret
Mean	0.49	0.26	0.23	Mean	3.99	0.98
Median	0.25	0.13	0.08	Median	2.00	0.98
Std	4.45	4.57	1.54	Std	6.20	13.72
P10	-1.47	-1.91	-1.21	P10	1.00	-11.03
P25	-0.29	-0.45	-0.32	P25	1.00	-4.32
P75	1.17	0.97	0.69	P75	4.00	6.01
P90	2.77	2.60	1.76	P90	8.00	12.15

ponent and duration component are 0.49%, 0.26%, and 0.23%, respectively (they equal 0.59%, 0.35%, and 0.23% for the baseline sample as reported in Table A.2). As reported in the right panel, the matched sample has 1,101 unique firms in CRSP (based on permno), yielding a stock-month sample of 79,721 observations. On average, each stock is linked to about 3 bonds, and the monthly stock excess return is 0.98%.

We estimate stock inflation beta by regressing the monthly stock excess return on the contemporaneous monthly inflation innovation, similar to Chen et al. (1986), Boons et al. (2020), Fang et al. (2022), and Hong et al. (2022).[17] In Panel A of Table 9, we report the monthly average of the market-level bond and stock inflation betas computed as the weighted average of individual bond and stock inflation betas each month. We observe that bond inflation betas

[17] That is, unlike the estimation of bond inflation beta in Eq. (4), we do not include lagged inflation innovation because monthly stock returns are computed using end-of-month prices and do not face asynchronicity issues.

are significantly positive as in the baseline bond sample (see Table 4). Moreover, the stock inflation beta with respect to CPI growth, though slightly negative, is negligible in magnitude and statistically insignificant, broadly consistent with the findings of Boons et al. (2020) and Fang et al. (2022). Hence, stock inflation exposure does not significantly contradict bond inflation exposure in our sample period.[18] More importantly, the stock inflation beta with respect to the inflation swap rate is significantly positive. That is, using a forward-looking inflation measure, our analyses indicate strong consistency between the stock and bond inflation exposures.

Next, moving beyond the average relationship between stocks' and bonds' inflation exposures, we utilize our granular firm-level data to examine this relationship in the cross-section. Specifically, we first sort firms into quintile portfolios based on their bond inflation betas. Then, for each quintile portfolio, we compute the average bond and stock inflation betas. From Panel B of Table 9, we observe that the bond inflation beta increases monotonically across the quintile portfolios as expected (the magnitudes are similar to those reported in Table 4). Importantly, the corresponding stock inflation beta also increases monotonically, indicating a strong positive association between the stock and bond inflation exposures in the cross section of firms. That is, firms with higher bond inflation betas also have higher stock inflation betas.

To assess the magnitude of this cross-sectional relationship, we perform Fama-MacBeth regressions of a firm's stock inflation beta on its bond inflation beta. To facilitate the interpretation of the regression coefficient, we use normalized stock and bond inflation betas—demeaned and scaled by their respective cross-sectional standard deviations. As reported in Panel C of Table 9, the coefficient is significantly positive for both the CPI growth and the inflation swap rate, confirming the statistical significance of the positive cross-sectional association. In terms of magnitude, a one standard deviation increase in the bond inflation beta corresponds to a 0.397 standard deviation increase in the stock inflation beta when using the inflation swap rate, which is greater than the 0.131 increase observed when using CPI growth.

To summarize, two main takeaways arise from the analyses in this section, which con-

[18] We also estimate the stock inflation betas with respect to CPI growth using the sample prior to 2004 and find that the inflation beta is significantly negative.

Table 9. Stock Inflation Beta and Credit Inflation Beta

This table analyzes the cross-sectional relationship between a firm's stock inflation beta and the inflation beta of the credit component of its bond returns, using two inflation measures. For each bond beta in a given month, we match it with the corresponding stock beta. The stock inflation betas are estimated using a similar approach to bond inflation betas, with one key distinction: the stock inflation beta estimation excludes the lagged inflation innovation term, as stock returns do not face the same illiquidity issues as bond returns. Panel A reports the time-series mean of the cross-sectional value-weighted average bond beta and stock beta, computed similar to Table 4. Panel B reports average betas for each credit beta quintile. In particular, we compute the average credit beta for each stock, and then form portfolios by the average credit beta. We then report the average credit beta and stock beta for each quintile, as well as for the high-minus-low portfolio. Panel C reports the Fama-MacBeth regression result using the normalized inflation betas, where beta is demeaned and scaled by cross-sectional standard deviation in each month. Newey-West t-statistics with 12 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Stock Inflation Betas				
	Credit Beta(CPI)	Stock Beta(CPI)	Credit Beta(SWAP)	Stock Beta(SWAP)
Average	1.292	-0.008	5.928	16.385
t-stat	(6.71)	(-1.46)	(7.35)	(5.28)
Panel B: Average Betas by Credit Beta Quintiles				
Portfolio	Credit Beta(CPI)	Stock Beta(CPI)	Credit Beta(SWAP)	Stock Beta(SWAP)
1	-1.116	-0.021	-0.296	12.249
	(-6.116)	(-2.618)	(-0.402)	(4.791)
2	0.405	-0.012	3.038	13.686
	(3.417)	(-2.732)	(5.602)	(6.017)
3	1.172	-0.009	5.300	15.929
	(5.939)	(-1.908)	(7.834)	(5.927)
4	2.289	-0.004	8.454	20.320
	(6.301)	(-0.821)	(9.060)	(6.029)
5	6.871	0.010	19.871	38.123
	(7.180)	(1.358)	(10.517)	(5.856)
High-Low	7.987***	0.031***	20.168***	25.874***
	(8.935)	(8.237)	(12.174)	(5.575)

Panel C: Normalized Inflation Betas		
	(1)	(2)
	Stock Beta(CPI)	Stock Beta(SWAP)
Credit Beta (CPI)	0.131***	
	(6.195)	
Credit Beta (SWAP)		0.397***
		(7.254)
R^2	0.185	0.023
Months	187	187

nect the inflation exposures of bonds and stocks at the individual firm level for the first time to the best of our knowledge. First, there is no significant contradiction between stocks' and bonds' inflation exposures, but instead some evidence of strong consistency, especially when the forward-looking measure of inflation and post-2000 sample are used. Second, there is a strong and positive cross-sectional association between a firm's stock and bond inflation exposures, which presents new empirical facts to guide further developments of the theory of inflation and credit risk.

6 Conclusion

In this paper, we examine the inflation exposure of corporate bond returns and contribute to the recent literature on inflation risk and asset pricing, motivated by the surge in inflation since 2021. Using transaction prices of individual bonds and both realized and forward-looking measures of inflation from 2004 to 2022, we document three key sets of novel evidence on the impact of inflation on individual corporate bond returns.

Specifically, we find that while the inflation betas of standard bond excess returns (measured relative to T-bill rates) are negative on average, the inflation betas of credit excess returns—corporate bond returns relative to duration-matched Treasury returns—are consistently positive, with higher-default-risk bonds exhibiting more pronounced positive inflation betas. Furthermore, inflation beta positively influences bond returns in the cross-section, with the effect driven entirely by credit excess returns. Lastly, firms with higher bond inflation betas also tend to have higher stock inflation betas.

Our results contribute further insights to the literature on the inflation exposure of corporate bonds and the economic implications of the negative inflation—-default relationship. For example, by decomposing standard corporate bond excess returns into credit and duration components, we reveal the positive inflation exposure of credit excess returns, which aligns with the negative inflation—-default relation. This finding helps to reconcile the puzzling negative inflation exposures documented in existing studies that rely on standard excess returns. Moreover, by linking the inflation exposures of bonds and stocks at the individual firm level, we not only provide evidence of consistency in the effect of inflation on bond and equity valuations but also uncover a positive cross-sectional association between stock and bond inflation exposures, which can inform further theoretical developments. Additionally, the significant explanatory power of inflation beta for future bond returns in the cross-section suggests that future work that comprehensively evaluates the pricing power of inflation risk in factor models is likely to be promising.

References

Ajello, Andrea, Luca Benzoni, and Olena Chyruk, "Core and 'Crust': Consumer Prices and the Term Structure of Interest Rates," *The Review of Financial Studies*, 09 2019, *33* (8), 3719–3765.

Ang, Andrew and Monika Piazzesi, "A no-arbitrage vector autoregression of term structure dynamics with macroeconomic and latent variables," *Journal of Monetary Economics*, 2003, *50* (4), 745–787.

______, Geert Bekaert, and Min Wei, "Do macro variables, asset markets, or surveys forecast inflation better?," *Journal of Monetary Economics*, 2007, *54* (4), 1163–1212.

______, ______, and ______, "The Term Structure of Real Rates and Expected Inflation," *The Journal of Finance*, 2008, *63* (2), 797–849.

______, Marie Brière, and Ombretta Signori, "Inflation and Individual Equities," *Financial Analysts Journal*, 2012, *68* (4), 36–55.

______, Robert J. Hodrick, Yuhang Xing, and Xiaoyang Zhang, "The Cross-Section of Volatility and Expected Returns," *The Journal of Finance*, 2006, *61* (1), 259–299.

Asvanunt, Attakrit and Scott Richardson, "The Credit Risk Premium," *Journal of Fixed Income*, 2017, *26* (3), 6–24.

Augustin, Patrick, Linxiao Francis Cong, Alexandre Corhay, and Michael Weber, "Price Rigidities and Credit Risk," *Chicago Booth Research Paper No. 21-14*, 2024.

Bai, Jennie, Turan G. Bali, and Quan Wen, "Common risk factors in the cross-section of corporate bond returns," *Journal of Financial Economics*, 2019, *131* (3), 619–642.

Bank for International Settlements, "Electronic trading in fixed income markets," *Report submitted by a Study Group established by the Markets Committee and chaired by Joachim Nagel (Deutsche Bundesbank)*, 2016.

Bao, Jack and Kewei Hou, "De Facto Seniority, Credit Risk, and Corporate Bond Prices," *Review of Financial Studies*, 08 2017, *30* (11), 4038–4080.

______, Jun Pan, and Jiang Wang, "The Illiquidity of Corporate Bonds," *Journal of Finance*, 2011, *66* (3), 911–946.

Bekaert, Geert and Xiaozheng Wang, "Inflation risk and the inflation risk premium," *Economic Policy*, 2010, *25* (64), 755–806.

Bhamra, Harjoat S., Adlai J. Fisher, and Lars-Alexander Kuehn, "Monetary policy and corporate default," *Journal of Monetary Economics*, 2011, *58* (5), 480–494.

Bhamra, Harjoat S, Christian Dorion, Alexandre Jeanneret, and Michael Weber, "High Inflation: Low Default Risk and Low Equity Valuations," *Review of Financial Studies*, 06 2022, *36* (3), 1192–1252.

Binder, Carola and Rupal Kamdar, "Expected and Realized Inflation in Historical Perspective," *The Journal of Economic Perspectives*, 2022, *36* (3), pp. 131–156.

Bonelli, Diego, Berardino Palazzo, and Ram Yamarthy, "Good inflation, bad inflation: Implications for risky asset prices," *working paper*, 2024.

Boons, Martijn, Fernando Duarte, Frans De Roon, and Marta Szymanowska, "Time-varying inflation risk and stock returns," *Journal of Financial Economics*, 2020, *136* (2), 444–470.

Boudoukh, Jacob and Matthew Richardson, "Stock Returns and Inflation: A Long-Horizon Perspective," *The American Economic Review*, 1993, *83* (5), 1346–1355.

Breach, Tomas, Stefania D'Amico, and Athanasios Orphanides, "The term structure and inflation uncertainty," *Journal of Financial Economics*, 2020, *138* (2), 388–414.

Campbell, John, Robert Shiller, and Luis Viceira, "Understanding Inflation-Indexed Bond Markets," *Brookings Papers on Economic Activity*, 2009, *40* (1 (Spring)), 79–138.

Campbell, John Y., Carolin Pflueger, and Luis M. Viceira, "Macroeconomic drivers of bond and equity risks," *Journal of Political Economy*, 2020, *128* (8), 3148–3185.

Chaudhary, Manav and Benjamin Marrow, "Inflation Expectations and Stock Returns," *working paper*, 2024.

Chen, Nai-Fu, Richard Roll, and Stephen A. Ross, "Economic Forces and the Stock Market," *The Journal of Business*, 1986, *59* (3), 383–403.

Christensen, JENS H. E., JOSE A. Lopez, and GLENN D. Rudebusch, "Inflation Expectations and Risk Premiums in an Arbitrage-Free Model of Nominal and Real Bond Yields," *Journal of Money, Credit and Banking*, 2010, *42* (s1), 143–178.

Chung, Kee H., Junbo Wang, and Chunchi Wu, "Volatility and the cross-section of corporate bond returns," *Journal of Financial Economics*, 2019, *133* (2), 397–417.

Cieslak, Anna and Carolin Pflueger, "Inflation and Asset Returns," *Annual Review of Financial Economics*, 2023, *15* (Volume 15, 2023), 433–448.

Collin-Dufresne, Pierre, Robert S. Goldstein, and Spencer Martin, "The determinants of credit spread changes," *Journal of Finance*, 2001, *56* (6), 2177–2207.

D'Amico, Stefania, Don H. Kim, and Min Wei, "Tips from TIPS: The Informational Content of Treasury Inflation-Protected Security Prices," *Journal of Financial and Quantitative Analysis*, 2018, *53* (1), 395–436.

Dick-Nielsen, Jens, "How to clean enhanced TRACE data," 2014. Working paper.

Dickerson, Alexander, Philippe Mueller, and Cesare Robotti, "Priced risk in corporate bonds," *Journal of Financial Economics*, 2023, *150* (2).

Fama, Eugene F. and G.William Schwert, "Asset returns and inflation," *Journal of Financial Economics*, 1977, *5* (2), 115–146.

______ **and James D. MacBeth**, "Risk, return, and equilibrium: Empirical tests," *Journal of Political Economy*, 1973, *81* (3), 607–636.

______ **and Kenneth R. French**, "Common risk factors in the returns on stocks and bonds," *Journal of Financial Economics*, 1993, *33* (1), 3–56.

Fama, Eugene F and Michael R Gibbons, "A comparison of inflation forecasts," *Journal of Monetary Economics*, 1984, *13* (3), 327–348.

Fang, Xiang, Yang Liu, and Nikolai Roussanov, "Getting to the Core: Inflation Risks Within and Across Asset Classes," 2022, (30169).

Fisher, Irving, "The Debt-Deflation Theory of Great Depressions," *Econometrica*, 1933, *1* (4), 337–357.

Fleckenstein, Matthias, Francis A Longstaff, and Hanno Lustig, "The TIPS-treasury bond puzzle," *the Journal of Finance*, 2014, *69* (5), 2151–2197.

Gebhardt, William R., Soeren Hvidkjaer, and Bhaskaran Swaminathan, "The cross-section of expected corporate bond returns: Betas or characteristics?," *Journal of Financial Economics*, 2005, *75* (1), 85–114.

Gomes, João, Urban Jermann, and Lukas Schmid, "Sticky Leverage," *American Economic Review*, December 2016, *106* (12), 3800–3828.

Gürkaynak, Refet S., Brian Sack, and Jonathan H. Wright, "The U.S. Treasury yield curve: 1961 to the present," *Journal of Monetary Economics*, 2007, *54* (8), 2291–2304.

Haubrich, Joseph, George Pennacchi, and Peter Ritchken, “Inflation Expectations, Real Rates, and Risk Premia: Evidence from Inflation Swaps,” *The Review of Financial Studies*, 03 2012, *25* (5), 1588–1629.

He, Zhiguo, Paymon Khorrami, and Zhaogang Song, “Commonality in Credit Spread Changes: Dealer Inventory and Intermediary Distress,” *Review of Financial Studies*, 01 2022, *35* (10), 4630–4673.

Hong, Claire Yurong, Jun Pan, and Shiwen Tian, “Inflation Forecasting from Cross-Sectional Stocks,” 2022. Working paper.

Houweling, Patrick and Jeroen van Zundert, “Factor Investing in the Corporate Bond Market,” *Financial Analysts Journal*, 2017, *73* (2), 100–115.

Hu, Grace Xing, Jun Pan, and Jiang Wang, “Noise as information for illiquidity,” *The Journal of Finance*, 2013, *68* (6), 2341–2382.

Huang, Jing-Zhi and Ming Huang, “How much of the corporate-Treasury yield spread is due to credit risk?,” *Review of Asset Pricing Studies*, 2012, *2* (2), 153–202.

______ **and Zhan Shi**, “What Do We Know About Corporate Bond Returns?,” *Annual Review of Financial Economics*, 2021, *13*, 363–399.

Israel, Ronen, Diogo Palhares, and Scott Richardson, “Common factors in corporate bond returns,” *Journal of Investment Management*, 2018, *16* (2), 17–46.

Kang, Johnny and Carolin E Pflueger, “Inflation risk in corporate bonds,” *The Journal of Finance*, 2015, *70* (1), 115–162.

Kelly, Bryan, Diogo Palhares, and Seth Pruitt, “Modeling Corporate Bond Returns,” *Journal of Finance*, 2023, *78* (4), 1967–2008.

Lin, Hai, Junbo Wang, and Chunchi Wu, “Liquidity risk and expected corporate bond returns,” *Journal of Financial Economics*, 2011, *99*, 628–650.

Lintner, John, “Inflation and Security Returns,” *The Journal of Finance*, 1975, *30* (2), 259–280.

Longstaff, Francis A. and Eduardo S. Schwartz, “A simple approach to valuing risky fixed and floating rate debt,” *Journal of Finance*, 1995, *50* (3), 789–819.

Merton, Robert, “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” *Journal of Finance*, 1974, *29* (2), 449–70.

Nelson, Charles R., "Inflation and Rates of Return on Common Stocks," *The Journal of Finance*, 1976, *31* (2), 471–483.

Newey, Whitney K. and Kenneth D. West, "A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix," *Econometrica*, 1987, *55* (3), 703–708.

Pond, Michael and Chirag Mirani, "Barclays Capital," *Market Strategy Americas*, June 2011, pp. 12–14.

Song, Dongho, "Bond Market Exposures to Macroeconomic and Monetary Policy Risks," *The Review of Financial Studies*, 05 2017, *30* (8), 2761–2817.

U.S. SEC, "The Corporate Bond Markets: Structure, Pricing and Trading," *U.S. Securities and Exchange Commission: Division of Market Regulation*, 1992, *Washington, D.C.*

van Binsbergen, Jules, Yoshio Nozawa, and Michael Schwert, "Duration-Based Valuation of Corporate Bonds," *The Review of Financial Studies*, 2024, *forthcoming.*

Appendix

In the appendix, we provide additional details and robustness checks of our main analyses.

A.1 TRACE Data Cleaning and Filtering

Table A.1 outlines the detailed procedure for sample cleaning and construction. As seen from Panel A, we begin with TRACE corporate bond transactions data from July 2002 to March 2022. After removing canceled, corrected, and duplicated trades, the number of transactions is reduced to 202,037,248. We then eliminate transactions with abnormal trading conditions. Next, we merge the transaction-level data with the Mergent Fixed Income Securities Database (FISD) and apply additional filters based on bond characteristics, resulting in a final sample of 14,093,218 transactions from 39,477 bonds.

Panel B further reports the cleaning process for the sample at bond-month level. Following established literature, we construct monthly bond returns and exclude bond-months without valid monthly return and duration-adjusted return estimates. In addition, we require each bond-month to satisfy the criteria for estimating a valid inflation beta, resulting in the final sample for which we provide summary statistics in Table 1.

A.2 Duration-Matched Treasury Returns

We adopt the approach of Binsbergen et al. (2024) to construct a duration-matched Treasury return for each corporate bond in each month. Specifically, we calculate the duration-matched Treasury return using the concept of Macaulay duration. Macaulay duration is commonly computed as the weighted average time it takes for an asset to return the discounted cash flows to its owner:

$$\mathrm{Dur}_t = \sum_{k=1}^{\infty} w_{t,k} t_k, \tag{A.1}$$

where $w_{t,k}$ is the weight that the present value of the kth cash ow has in the asset value and t_k is the time until the kth cash ow. For a corporate bond with semiannual coupon payments and \$100 face value, the Macaulay duration is defined as:

$$\mathrm{Dur}_{i,t} = \frac{1}{2P_{i,t}} \left[\sum_{k=1}^{K} \left(t_k \times \frac{\frac{C_i}{2}}{\left(1+\frac{y_{i,t}}{2}\right)^{t_k}} \right) + t_K \times \frac{100}{\left(1+\frac{y_{i,t}}{2}\right)^{t_K}} \right], \tag{A.2}$$

where P_t is the all-in price of the bond (i.e., including accrued interest), C_i is the annual coupon rate, y_t is the yield to maturity, k indexes the semiannual coupon periods, K denotes the terminal period, and t_k is the number of semiannual coupon periods from the present date t until the kth cash ow under the 30/360 daycount convention. Each term in the summation maps into a weight $w_{i,t,k}$ in equation Eq. (A.1).

After determining the duration-based weighting of the cash ows for each bond-month observation, we compute the duration-matched Treasury return as:

$$r_{i,t+1}^{Tsy} = \sum_{k=1}^{K} w_{i,t,k} r_{b,t+1,k} \tag{A.3}$$

The monthly return on the k-period zero-coupon Treasury bond is given by:

$$r_{b,t+1,k} = \frac{\exp\left(-t_{k-1} y_{b,t+1,k-1}\right)}{\exp\left(-t_k y_{b,t,k}\right)} - 1, \tag{A.4}$$

where Gürkaynak et al. (2007) and t_k is the actual time until the cash flow k in years.

A.3 Bond Samples with Inflation Betas and Matched Stocks

The summary provided in Table 1 correspond to the sample of bonds with available monthly returns. As discussed in Section 3, the bond sample is further reduced after the inflation beta estimation.

Panel A of Table A.2 presents the summary statistics for the observations used in our main analyses in Section 3, which require a valid estimated inflation beta. Panel B of Table A.2 reports the summary statistics for the subset of observations that can be further matched with stock information for the analyses in Section 5.

A.4 Inflation Measures

In this section, we compare alternative inflation measures and discuss their implications for our analyses.

Starting in the late 1990s, inflation swaps have become a liquid and actively traded instrument that investors use to hedge inflation risk. The notional outstanding amount of the inflation swap market in early years was on the order of hundreds of billions (Pond and Mirani, 2011). In recent years, the inflation swap market has been growing rapidly. For example, according to a survey by the International Swaps and Derivatives Association, the notional outstanding amount of inflation swaps increased by 24% in 2019, reaching $2.4 trillion.

Trading of inflation swaps is reasonably liquid, usually incurring a bid-ask spread on the order of six to ten basis points (Haubrich et al., 2012; Fleckenstein, Longstaff and Lustig, 2014).Importantly, as shown by Haubrich et al. (2012), the bid-ask spread of inflation swaps stayed flat mostly during the global financial crisis, only increasing above 10 bps for very brief periods. In contrast, the Treasury inflation-protected securities (TIPS) experienced a fairly large, sustained rise in illiquidity. Hence, inflation swaps are less subject to liquidity and mispricing issues than TIPS, and inflation swap rate is likely a better gauge of inflation than TIPS-based breakeven inflation (the difference between yields of nominal Treasury securities and yields of TIPS of the same maturity). Indeed, Campbell et al. (2009) show that inflation swaps provided a more reliable assessment of inflation than TIPS during the global crisis.

Moreover, inflation swaps are quoted and traded for a set of fixed maturities, ranging from 6 months to 30 years, at daily frequency. Hence, they provide high-frequency assessment of future long-term inflation, which are rarely available through other sources. For example, the *monthly* BlueChip survey forecasts, including the Blue Chip Economic Indicators and Blue Chip Financial Forecasts, only go out to at most *two years ahead*. The Survey of Professional Forecasters (SPF) does cover the next ten years but is only available at a *quarterly* frequency.[19]

Overall, the inflation swap rate is a forward-looking measure, in contrast to realized CPI inflation, which is backward-looking. It captures longer-term future expectations at a higher frequency than survey-based inflation forecasts and is less affected by liquidity issues compared to TIPS-based breakeven inflation. Therefore, we use the inflation swap rate alongside headline CPI as our primary inflation measure.

In this section, we assess the performance of alternative inflation measures. Specifically, we consider four proxies: (1) the 1-year inflation swap rate, (2) the 10-year TIPS breakeven inflation rate, (3) the Blue Chip Financial Forecasts Inflation (4Q ahead), and (4) core CPI. We replicate our main analyses using each of these four alternatives. Table A.3 reports the average betas based on these alternative inflation proxies, while Table A.4 presents the cross-section variation of betas for each measure. Finally, Table A.5 shows the cross-sectional return results using these alternative inflation proxies.

[19]The Blue Chip Economic Indicators also provide inflation forecasts 5-10 years ahead, which, however, are available at an an even lower semi-annual frequency.

Table A.1. Bond Sample Cleaning and Construction

This table reports step-by-step cleaning of the TRACE corporate bond transactions data. The original data sample is from July 2002 to March 2022 with canceled/corrected/duplicated trades excluded. Panel A reports the cleaning at the bond trade level. The resulting sample is used to produce the bond-month sample in Panel B. The procedure in each cleaning step is described in the first column, and the resulting number of unique CUSIPs and total number of observations are reported in the second and third columns, respectively. The bond characteristics are from the Mergent Fixed Income Securities Database (FISD).

	A: The Sample of Corporate Bond Transactions and Characteristics	# CUSIPs	# Transactions
A1.	Standard filtering of the enhanced TRACE data of corporate bond transactions from 07/01/2002 to 03/31/2022 for canceled/corrected/duplicated trades.	281,578	202,037,248
A2.	Remove transactions with principal trading amount less than $10,000, transactions with trade price less than $5 or greater than $1,000, transactions that are labelled as when-issued, locked- in, or have special sales conditions, and transactions that have more than a two-day settlement.	273,575	28,768,352
A3.	Merge the transactions with Mergent FISD bond characteristics; remove observations that cannot be matched in the Mergent FISD Data	230,302	26,300,648
A4	Remove bonds that are not publicly traded in the U.S. market, or denominated in foreign currencies; remove bonds that are classified as structured notes, mortgage backed or asset backed, agency backed, equity linked or convertible; remove private placed bond under Rule 144A; remove bonds that have a floating coupon rate or have bi-monthly and unclassified coupons; remove bonds with missing values for key variables that are used to compute accrued interest (coupon type, coupon rate, dated date, and day count basis); exclude transactions for which the trading date is on or before the bond offering date, the rating is missing, the time-to-maturity is less than one year, or the amount outstanding is not positive.	39,477	14,093,218
	B. The Sample of Monthly Corporate Bond Returns (Based on the sample after A4)	**# CUSIPs**	**# Bond×Month**
B1	We calculate monthly bond returns based on the weighted average daily prices (see the detailed procedure in Section 2.1).	29,694	975,795
B2	For each corporate bond i in each month t, we also compute the duration-matched Treasury return; we exclude the bond×month observation for which a valid duration-matched Treasury return is not available.	29,261	951,415
B3	To align with the availability of inflation swap data, the sample is restricted to begin in July 2004. Additionally, for estimating the inflation beta, a bond-month is included in the final sample only if it has at least 24 months of valid returns within the preceding 36 months.	10,110	394,696

Table A.2. Summary Statistics for Different Bond Samples

This table presents descriptive statistics for the bond samples used in different analyses. The top panel reports the bond sample with available beta estimation includes the number of unique firms, unique bonds, and bond-month observations with available beta estimation. The bottom panel reports the bond sample that can be matched with corresponding stocks. We further include the number of unique stocks and stock-month observation. For each sample, the mean, median, standard deviation, and the 10th, 25th, 75th, and 90th percentiles of bond return and characteristics, i.e., time to maturity (in years), bond age (in years), coupon rate (in percent), the amount outstanding (in millions of dollars), credit rating, seasoning (age divided by original maturity), monthly excess returns (in percent), monthly excess returns (in percent), the credit components, and the duration components of bond returns for the bond-month observations are provided for each sample. Ratings are in conventional numerical scores, where 1 refers to an AAA rating and 21 refers to a C rating.

Panel A. Bond sample with available beta estimation

# Issuer ID	2,232								
#bonds	10,110								
#bond*month	394,696								
Statistics	Time to maturity	Age	Coupon	Outstanding ($mm)	Rating	Seasoning	$rx_{i,t}$	$rx_{i,t}^{\text{Credit}}$	$rx_{i,t}^{\text{Duration}}$
Mean	8.01	6.59	5.76	677.59	10.02	0.51	0.59	0.35	0.23
Median	5.00	5.25	5.85	500.00	9.00	0.51	0.26	0.15	0.08
Std	8.11	4.56	1.77	654.84	3.99	0.21	6.02	6.13	1.50
P10	1.75	2.67	3.35	145.12	6.00	0.23	-1.60	-2.07	-1.16
P25	2.75	3.50	4.63	300.00	7.00	0.35	-0.31	-0.47	-0.31
P75	8.42	7.83	6.88	800.00	12.00	0.68	1.24	1.04	0.69
P90	22.00	12.83	7.88	1360.00	16.00	0.79	2.98	2.81	1.73

Panel B. Bond sample matched with stocks

# Issuer ID	1,777			# permno	1,377				
#bonds	8,206			# stock*month	79,721				
#bond*month	318,400								
Statistics	Time to maturity	Age	Coupon	Outstanding ($mm)	Rating	Seasoning	$rx_{i,t}$	$rx_{i,t}^{\text{Credit}}$	$rx_{i,t}^{\text{Duration}}$
Mean	8.29	6.62	5.64	706.00	9.55	0.51	0.49	0.26	0.23
Median	5.08	5.25	5.75	500.00	9.00	0.51	0.25	0.13	0.08
Std	8.42	4.63	1.73	656.58	3.72	0.21	4.45	4.57	1.54
P10	1.75	2.67	3.22	183.00	6.00	0.22	-1.47	-1.91	-1.21
P25	2.75	3.50	4.50	300.00	7.00	0.34	-0.29	-0.45	-0.32
P75	9.17	7.83	6.80	900.00	11.00	0.68	1.17	0.97	0.69
P90	22.92	13.17	7.75	1500.00	15.00	0.79	2.77	2.60	1.76

Table A.3. Level of Alternative Inflation Betas

This table presents inflation beta estimates derived from three distinct bond return measures: the inflation beta calculated using the total excess returns ($\beta(rx_{i,t}, \Delta\text{Inflation}_t)$), the inflation beta calculated using credit component returns ($\beta(rx_{i,t}^{Credit}, \Delta\text{Inflation}_t)$), and the inflation beta calculated using the duration component returns ($\beta(rx_{i,t}^{Duration}, \Delta\text{Inflation}_t)$). The betas are estimated using shocks to four alternative inflation proxies: (1) 1 year inflation swap rates, (2) 10 year TIPS break-event inflation rate, (3) Bluechip Financial Forecasts Inflation (4Q ahead), and (4) core CPI. For each beta type, the table reports the time-series average of cross-sectional value-weighted monthly beta estimates (labeled Mean). The corresponding Newey-West t-statistics with 12 lags are shown in parentheses. Additionally, the table exhibits two fraction measures. % Positive Month is the proportion of months where the cross-sectional value-weighted beta is positive. % Positive Bond-Month is the proportion of individual bond-month beta estimates that were positive across the full sample.

	(1) $\beta\left(rx_{i,t}, \Delta\text{Inflation}_t\right)$	(2) $\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$	(3) $\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$
	A. SWAP (1Y)		
Mean	0.238	1.596	-1.355
t-stat	(2.22)	(9.51)	(-11.42)
% of PositiveMonth	59.4%	100.0%	0.0%
% of Positive Bond-Month	50.1%	88.0%	0.8%
	B. Break-Even Rate (10Y)		
Mean	0.235	5.770	-5.522
t-stat	(0.31)	(8.03)	(-9.72)
% of PositiveMonth	64.7%	93.0%	0.0%
% of Positive Bond-Month	50.2%	89.1%	5.3%
	C. BCFF Survey Forecast		
Mean	-0.276	0.252	-0.552
t-stat	(-0.44)	(0.22)	(-0.39)
% of PositiveMonth	46.0%	42.8%	40.6%
% of Positive Bond-Month	47.4%	49.5%	44.9%
	D. CPI Core		
Mean	-2.160	-2.132	-0.047
t-stat	(-3.08)	(-2.07)	(-0.05)
% of PositiveMonth	24.6%	27.3%	40.1%
% of Positive Bond-Month	38.5%	39.8%	44.3%

Table A.4. Alternative Inflation-Beta-Sorted Corporate Bond Portfolios

This table presents inflation beta estimates using four alternative inflation proxies:(1) 1 year inflation swap rates, (2) TIPS break-event inflation rate, (3) Bluechip Financial Forecasts Inflation (4Q ahead), and (4) core CPI. Bonds are sorted into quintile portfolios based on their overall inflation beta $\beta(rx_{i,t}, \Delta\text{Inflation}_t)$. The table reports the average beta estimates for three bond return measures: the inflation beta calculated using total excess returns $\beta(rx_{i,t}, \Delta\text{Inflation}_t)$, the inflation beta calculated using credit component returns $\beta(rx_{i,t}^{Credit}, \Delta\text{Inflation}_t)$, and the inflation beta calculated using duration component returns $\beta(rx_{i,t}^{Duration}, \Delta\text{Inflation}_t)$. The high-minus-low (H-L) row represents the difference between the highest and lowest quintile portfolios. t-statistics are reported in parentheses.

	(1)	(2)	(3)		(4)	(5)	(6)
	A. SWAP (1Y)				B. Break-Even Rate (10Y)		
	$\beta(rx_{i,t}, \Delta\text{Inflation}_t)$	$\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$	$\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$		$\beta(rx_{i,t}, \Delta\text{Inflation}_t)$	$\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$	$\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$
1	-1.966	0.022	-2.003	1	-7.090	1.525	-8.598
	(-5.122)	(0.053)	(-10.029)		(-6.006)	(1.086)	(-9.724)
2	-0.466	0.692	-1.154	2	-2.080	2.561	-4.627
	(-4.577)	(6.807)	(-10.478)		(-3.203)	(5.519)	(-9.564)
3	0.038	1.016	-0.978	3	-0.215	3.718	-3.932
	(0.565)	(8.237)	(-10.061)		(-0.386)	(8.307)	(-9.974)
4	0.790	1.876	-1.092	4	2.523	6.732	-4.253
	(8.573)	(10.860)	(-9.971)		(3.515)	(9.280)	(-9.637)
5	3.980	5.179	-1.198	5	13.247	17.945	-4.709
	(12.498)	(13.502)	(-9.980)		(7.557)	(10.104)	(-8.818)
High-Low	5.946***	5.157***	0.805***	High-Low	20.337***	16.420***	3.890***
	(10.220)	(8.593)	(6.593)		(9.977)	(7.704)	(9.837)
	C. BCFF				D. CPI core		
	$\beta(rx_{i,t}, \Delta\text{Inflation}_t)$	$\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$	$\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$		$\beta(rx_{i,t}, \Delta\text{Inflation}_t)$	$\beta\left(rx_{i,t}^{\text{Credit}}, \Delta\text{Inflation}_t\right)$	$\beta\left(rx_{i,t}^{\text{Duration}}, \Delta\text{Inflation}_t\right)$
1	-17.525	-15.899	-1.789	1	-20.067	-19.129	-1.069
	(-5.364)	(-5.101)	(-1.111)		(-4.412)	(-3.948)	(-0.923)
2	-3.881	-2.969	-0.907	2	-5.073	-4.453	-0.568
	(-4.954)	(-3.278)	(-0.658)		(-5.288)	(-4.061)	(-0.651)
3	-0.088	0.053	-0.155	3	-1.627	-1.712	0.089
	(-0.178)	(0.071)	(-0.133)		(-3.141)	(-2.521)	(0.125)
4	3.622	3.463	0.088	4	1.217	0.670	0.501
	(5.588)	(2.757)	(0.065)		(2.090)	(0.895)	(0.663)
5	17.206	16.293	0.599	5	11.583	10.184	1.263
	(7.723)	(4.906)	(0.367)		(4.735)	(3.767)	(1.135)
High-Low	34.731***	32.193***	2.388***	High-Low	31.650***	29.312***	2.332***
	(6.986)	(6.599)	(9.006)		(4.831)	(4.480)	(6.267)

Table A.5. Alternative Inflation Betas and Corporate Bond Returns

This table presents the average portfolio excess returns, credit component, and duration component for each inflation-beta quintile portfolio. Specifically, quintile portfolios are constructed monthly by sorting corporate bonds based on their excess return inflation betas. The portfolio returns are value-weighted, using the amount outstanding as weights. Newey-West t-statistics with 12 lags are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)		(4)	(5)	(6)
	A. SWAP (1Y)				B. Break-Even Rate (10Y)		
	$rx_{i,t+1}$	$rx^{\text{Credit}}_{i,t+1}$	$rx^{\text{Duration}}_{i,t+1}$		$rx_{i,t+1}$	$rx^{\text{Credit}}_{i,t+1}$	$rx^{\text{Duration}}_{i,t+1}$
1	0.518	0.230	0.288	1	0.307	0.032	0.275
	(2.351)	(1.032)	(2.233)		(1.248)	(0.130)	(2.012)
2	0.323	0.137	0.186	2	0.253	0.080	0.173
	(2.762)	(1.250)	(2.401)		(2.181)	(0.645)	(2.411)
3	0.301	0.139	0.162	3	0.332	0.157	0.175
	(2.779)	(1.259)	(2.167)		(3.049)	(1.458)	(2.400)
4	0.451	0.261	0.190	4	0.583	0.399	0.184
	(2.800)	(1.528)	(2.173)		(3.039)	(2.240)	(2.224)
5	1.014	0.817	0.197	5	1.177	0.975	0.202
	(2.522)	(1.975)	(2.302)		(2.792)	(2.288)	(2.454)
High-Low	0.497*	0.587**	-0.090	High-Low	0.870**	0.942***	-0.073
	(1.880)	(2.462)	(-1.515)		(2.302)	(2.754)	(-1.031)
	C. BCFF				D. CPI core		
	$rx_{i,t+1}$	$rx^{\text{Credit}}_{i,t+1}$	$rx^{\text{Duration}}_{i,t+1}$		$rx_{i,t+1}$	$rx^{\text{Credit}}_{i,t+1}$	$rx^{\text{Duration}}_{i,t+1}$
1	0.533	0.271	0.261	1	0.434	0.173	0.261
	(2.135)	(1.002)	(2.081)		(1.332)	(0.499)	(2.246)
2	0.348	0.154	0.195	2	0.335	0.120	0.215
	(2.668)	(1.128)	(2.162)		(2.163)	(0.737)	(2.475)
3	0.285	0.112	0.174	3	0.287	0.108	0.179
	(2.793)	(1.072)	(2.409)		(2.901)	(1.037)	(2.479)
4	0.482	0.284	0.198	4	0.426	0.254	0.172
	(2.876)	(1.835)	(2.504)		(2.982)	(1.937)	(2.071)
5	0.976	0.754	0.222	5	1.030	0.820	0.210
	(2.629)	(2.029)	(2.493)		(2.778)	(2.255)	(2.139)
High-Low	0.443	0.482*	-0.039	High-Low	0.596	0.647*	-0.051
	(1.520)	(1.744)	(-0.633)		(1.542)	(1.784)	(-0.968)