Salience Theory and Corporate Bond Pricing*

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Abstract

We document a novel salience effect in the US corporate bond market. We find that bonds with lower salience theory (ST) value have higher returns in the subsequent month. The annualized differences in one-month holding excess returns between the lowest and highest ST deciles are 3.84% and 4.44% for equal-weighted and value-weighted portfolios. However, the salience effect is only exhibited in the most salient downside returns. These results indicate that corporate bond investors overweight salient negative returns when forming their expectations of future returns. Consequently, bonds with salient downside returns are undervalued and yield higher returns in the subsequent month.

JEL code: G11; G12; G13

Keywords: Salience theory, Limited attention, Downside returns, Corporate bond pricing, Cross-sectional return predictability

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1. Introduction

The corporate bond market is dominated by institutional investors. In this paper, we investigate whether bond traders suffer from limited attention and exhibit a salience effect since some institutional investors are found to suffer from behavioral biases.[1] The gist is that when attention-constrained investors observe extreme daily returns in corporate bonds that stand out relative to the market, they tend to overweight these salient returns when forming expectations of future returns. This is because their limited attention tends to be drawn to the most unusual attributions of the options available (Bordalo, Gennaioli, and Shleifer, 2012, 2013b, 2020). In the context of bond trading, investors are much more sensitive to negative news in bond prices (Bai et al., 2019). Hence, we hypothesize that corporate bonds with the most salient downside returns are likely to be undervalued and yield higher subsequent returns in the cross-section.

Our argument is rooted in the studies on the salience effect found in the stock markets (Frydman and Mormann, 2018; Frydman and Wang, 2020; Dertwinkel-Kalt and Köster, 2020; Dertwinkel-Kalt and Wenner, 2020; Bose et al., 2020; Ramos et al., 2020; Cosemans and Frehen, 2021; Cakici and Zaremba, 2021). In particular, Cosemans and Frehen (2021) propose a measurement of the salient stock daily returns and provide evidence that stock investors overweight salient returns compared with the equal-weighted CRSP index and overlook past returns that are non-salient. Following Cosemans and Frehen (2021), we first construct the salient theory (ST) value for each bond in each month and then test whether the ST value negatively predicts bond returns.

We test our hypothesis by utilizing bond trading data from Reporting and Compliance Engine (TRACE) Enhanced database between July 2002 and March 2020. The sample includes fixed-coupon, non-convertible corporate bonds listed in the US market with prices between $5 to $1000 and more than one year to maturity. Using the same definition of ST value in Cosemans and Frehen (2021), we measure the salience of bond daily returns by comparing it

[1] A body of literature has documented that fund managers are subject to sensation seeking (Brown et al., 2018), personal experience (Bernile et al., 2020), and limited attention (Ben-Rephael, Da and Israelsen, 2017; Lu et al., 2017; Schmidt, 2019), etc. Other evidence can be found in, for example, Bantwal and Kunreuther (2000), Shiller, (2000), Fisher and Statman (2002), Grinblatt and Keloharju (2000), Otchere and Chan (2003), Verma and Soydemir (2006), Furche and Johnstone (2006), Schmeling (2007), Dichtl and Drobetz (2011), Liao et al. (2013), Andreu et al. (2015), Ben-Rephael, Da and Israelsen, (2017), Lu et al., (2016), Schmidt (2019), Jaiyeoba et al. (2018), Brown et al. (2018), Lu et al. (2022), etc. These personality traits and behavioral features shape fund managers' trading behavior and are associated with a number of phenomena documented in the financial market, for example, post announcement drifts, excessive investment risk taking, etc.

with the equal-weighted average of all other bonds in the market and calculating a bond's ST value as the distortions in return expectations and the difference between the salience-weighted and equal-weighted past returns. The bond ST values are distributed within the range of –0.84% (average of the bottom 10%) to 0.81% (average of the top 10%) at the monthly level.

We find that corporate bonds with larger salient downside returns earn higher returns in the next month. Specifically, at each month-end, we sort the corporate bonds into deciles based on their ST value within the month and form equal-weighted and value-weighted portfolios. We assume that investors hold each portfolio for a month and compare the holding excess returns across the top and bottom decile portfolios. The long-short strategy of buying bonds in the bottom decile and selling bonds in the top decile yields an annualized spread of 3.84% (*t*-value 5.44) for the equal-weighted portfolio and 4.44% (*t*-value 6.22) for the value-weighted portfolio.

The salience effect we document cannot be explained by other bond risk factors as we find similar results after controlling for seven well-acknowledged bond factors (Bai et al., 2019), including bond market index, term risk, default risk, momentum, downside risk, credit risk, and illiquidity risk. The differences in annualized alpha between the lowest ST decide bonds and the highest ST decile bonds are 3.96% (*t*-value 5.07) for the equal-weighted portfolio and 4.56% (*t*-value 5.71) for the value-weighted portfolio. This finding is robust to the inclusion of other known stock factors (Fama and French, 1993; Carhart, 1997; Pastor et al., 2003). We find similar results that bond ST value negatively predicts bond returns using Fama and MacBeth (1973) regressions after controlling for various bond characteristics.

We also find that the salience effect is concentrated in the downside of bond daily returns. In univariate-sorted portfolio tests, the annualized return spread between the bottom two decile groups in ST values (G1–G2) is 2.52% (*t*-value 3.74) for the equal-weighted portfolio and 2.76% (*t*-value 4.35) for the value-weighted portfolio. These values account for a substantial part of the low-minus-high ST return spreads. In addition, the annualized low-minus-high return spreads along the salient downside return of bonds, i.e. G1–G6 is 5.4% (*t*-value 3.97) for the equal-weighted portfolios and 5.88% (*t*-value 4.15) for the value-weighted portfolio, making it the largest return spreads between ST groups.

These results suggest that bond investors allocate more attention to the salient negative shocks to bond prices and overweight their importance when forming return expectations. The concentration of the salience effect in the lowest ST value decile is also supported by Fama-

MacBeth regressions. In particular, we regress bond returns on the ST value in the prior month and its interaction terms with dummy variables identifying the salient downside (SD) or upside (SU). We find that the salience effect coefficients are significantly negative for bonds in the ST downside group, while the coefficients for bonds in the upside group appear nonsignificant. This result further supports our argument that corporate bond investors pay attention to the salient negative returns of bonds, leading to undervaluation and positive future returns in the cross-section.

We establish the robustness of the salience effect by examining the returns of various double-sorted portfolios. Specifically, we double sort bonds into 5-by-5 portfolios at each month-end based on their ST values and (i) credit rating, (ii) amount outstanding, (iii) years to maturity, (iv) illiquidity, (v) downside risk, and (vi) idiosyncratic volatility separately. The return spreads between the lowest-ST subgroup and the highest-ST subgroup remain significantly positive across different bond characteristic-sorted subgroups. The robustness of our results is also supported by the value-weighted Fama-MacBeth regressions. In this test, we repeat the Fama-MacBeth regressions with bond size as weights. We still obtain significant and negative coefficients.

Our paper contributes to several strains of literature. First, we add to the studies on the cross-sectional return predictability of corporate bonds, which have identified several bond characteristics and risk factors that predict bond returns.[2] Our paper contributes to this stream of work by providing the first evidence from the behavioral perspective on corporate bonds' return predictability. We attribute this return predictability to the distortions in return expectations caused by limited attention and salience of downside returns. That is, attention-constrained investors tend to overweight salient downside daily returns and thus require higher returns to hold these bonds.

In this regard, our paper adds to the literature on the salience theory (Bordalo, Gennaioli, and Shleifer, 2012, 2013a, 2013b, 2020) and extrapolative beliefs. The salience theory predicts that investors' attention is drawn to the most outstanding or unlikely payoffs so that they overweight these salient payoffs when making decisions. Related studies provide evidence on the impact of salient events in several scenarios, including consumer choice (Bordalo,

[2] The risk factors and bond characteristics include term risk and default risk (Fama and French, 1993), default beta (Gebhardt et al., 2005), momentum (Jostova et al., 2014), illiquidity (Bao et al, 2011; Lin et al., 2011; Acharya et al, 2013), downside risk, credit rating and short-term reversal (Bai et al., 2019), systematic volatility (Bai et al., 2021), and long-term reversal (Bali et al., 2021).

Gennaioli, and Shleifer, 2013b), judicial decisions (Bordalo, Gennaioli, and Shleifer, 2015), corporate policies (Dessaint et al., 2017), equity investors' trading behavior (Frydman and Wang, 2020; Huang et al., 2018), and the cross-section of asset prices (Cosemans and Frehen, 2021; Cakici and Zaremba, 2021). Our paper is closely related to Dertwinkel-Kalt and Köster (2020) who rely on the salience theory to explain investors' avoidance of negatively skewed risks. We contribute to the literature by providing novel evidence that supports the salience theory in the US corporate bond market. Our paper differs from the studies that examine the salience effect on the stock market in that corporate bond investors mainly care about salient downside risks rather than upside potential.[3] We show that the negative lead-lag correlation between ST value and bond returns is indeed concentrated on the decile with the lowest ST value, confirming this distinct nature of the bond investment. Besides, our paper is also related to Cakici and Zaremba (2021), who point out that the salience effect in the stock market is primarily shown in the microcaps. Our salience effect in the corporate bond market is different as we find the value-weighted robust results. Our paper expands the burgeoning studies of salience effects on the corporate bond market.

Our paper is also related to the literature on the limited attention of institutional investors. This strand of literature argues that because institutional investors are unable to focus on all the information available in the market, their limited attention shapes their investment behavior and affects the financial markets. For example, the insufficient attention of the institutional investors is responsible for the price drifts following the earnings announcements and analyst recommendations (Ben-Rephael, Da, and Israelsen, 2017). Fund managers are also found to be easily distracted by their personal relationship change such as divorce and marriage, which in the end affects fund performance (Lu et al., 2016). Schmidt (2019) shows that managers with a large portfolio under management are likely to be distracted and fail to close losing positions. We add to this literature by showing that the salience effect caused by the limited attention of institutional investors in the corporate bond market leads to return predictability.

[3] See the burgeoning studies of salience effects, among others, Alti, and Tetlock (2014), Geenwood and Shleifer (2014), Barberis, Greenwood, Jin, and Shleifer (2015, 2018), Hirshleifer, Li, and Yu (2015), Frydman and Nave (2017), Glaesera and Nathanson (2017), Cassella and Gulen (2018), Kuchler and Zafar (2019), Choi and Mertens (2019), Li and Liu (2020), Atmaz (2021), Bordalo, Gennaioli, Kwon, and Shleifer (2021), Cassella, Gulen, and Liu (2021), Egan, MacKay, and Yang (2021), Jin and Sui (2021), Hartzmark, Hirshman, and Imas (2021), Pénasse and Renneboog (2021), Beutel and Weber (2022), and Chordia, Lin, and Xiang (2022).

Finally, we contribute to the literature on the asset pricing implication of behavioral choices as well. Existing studies have shown behavioral influences on equity premiums by prospect theory (Kahneman and Tversky, 1979, Benartzi and Thaler, 1995; Barberis et al., 2001, 2016), regret theory (Ballinari and Müller, 2021), recency effects (Mohrschladt, 2021), and salience effect (Cosemans and Frehen, 2021; Cakici and Zaremba, 2021). Our paper extends the discussions to the corporate bond market and presents novel evidence about the implications of the salience effect on corporate bond prices.

2. Data and main variables

This section introduces our data sources and pre-treatments on the data sample. We also define the main bond variables used in the analysis in this section. We finally provide the summary statistics on the data sample.

2.1 Bond Data

Our data are merged from Trade Reporting and Compliance Engine (TRACE) Enhanced and Mergent FISD dataset. In particular, TRACE records real transactions of corporate bonds since July 2002. Following Bessembinder et al.(2006) and Bessembinder et al. (2009), we exclude transactions labeled as when-issued, locked-in, or have special sales conditions, and that has more than a two-day settlement. We then remove any reversed, corrected, and canceled trades. The resulting sample contains intraday transaction records of prices, trading volumes, and buys and sell indicators. Mergent FISD contains bond characteristics information including coupon, offering date, offering amount, interest frequency, maturity, bond rating, bond option features, defaulted status, defaulted date, and other issuers' related information.

Following Bai et al. (2019), we apply the following filters. We include corporate bonds that are (i) only listed in the US market, (ii) fixed-coupon, and (iii) non-convertible. We also require that (iv) bonds are traded within the range of $5 to $1000 and (v) have at least one year to maturity. The resulting sample period is from July 2002 to March 2020.

2.2 Bond Variables

2.2.1 Bond returns

The daily corporate bond return at day *d* is defined as

$$R_{i,d} = \frac{P_{i,d} + AI_{i,d} + C_{i,d}}{P_{i,d-1} + AI_{i,d-1}} - 1,$$

where $P_{i,d}$ is bond i's daily clean price, $AI_{i,d}$ is the accrued interest and $C_{i,d}$ represents the coupon payment at day d, if there are any transactions. The daily clean prices are calculated following Bessembinder et al. (2009), as the volume-weighted average of trading prices with intraday data.

Similarly, we obtain the monthly corporate bond returns $R_{i,m}$ from monthly prices. Following Bai et al. (2019), we consider two scenarios each month and convert daily prices into monthly frequencies. Scenario one calculates the return of month *m* with prices from the end of month *m-1* to the end of month *m*. Scenario two calculates from the beginning of month *m* to the end of month *m* and is considered when the return in scenario one cannot be realized. We search for prices that are closest to the last trading day of the month within the window of the last (first) five trading days as the end (beginning) of each month. The monthly excess return of corporate bonds $r_{i,m}$ is calculated as $R_{i,m} - R_{f,m}$, where the risk-free rate $R_{f,m}$ is proxied by the 1-month T-bill rate.

We then deal with the bond default issue. It is possible that corporate bonds, high yield bonds in particular, default prior to maturity. When a bond defaults, whose defaulted return is treated as a missing value in the dataset, its holding period return will be overestimated. This results in the survivorship bias issue. We eliminate potential survivorship bias by computing the composite default returns for the defaulted bonds following Cici et al. (2017) and Bali et al. (2021). In the dataset, for defaulted bonds with missing default-month returns, we fill them with the median of the default-month returns across all defaulted bonds. In particular, the default-month returns are calculated using the post-default prices in the ± 1 month window around the defaulted date. The median of default-month returns of investment grade (IG) bonds is –27.89%, and that of the high yield (HY) bonds is –17.75%.[4] Finally, in order to eliminate extreme bond prices due to data inputting errors, we winsorize bond returns at the top and bottom 1% percentile.

[4] We use the composite data set from WRDS bond returns and filters the defaulted bonds with month-end prices after default available. Then we obtain the median return of the defaulted bonds from the data set, as calculated by the WRDS teams.

2.2.2 Salience theory value (ST)

The main argument of the salience theory is that investors' attention is drawn by the asset payoff that is in stark contrast to other assets. This distorted allocation of attention leads investors to overestimate states in which asset payoffs are salient rather the than taking the objective probability across all the states in the world. Salience is measured in a certain context. Investors tend to evaluate an asset's performance by comparing the asset's return with other assets in the same market. The asset return is considered salient if it (i) contrasts strongly with the market, (ii) presents surprising payoffs, or (iii) is of prominence. In particular, contrast means that the payoff of an asset may stand out when it is compared to the alternatives (Bordalo, Gennaioli, and Shleifer, 2012). Surprise appears when the asset price is far higher or lower than the past prices retrieved from memory (Bordalo, Gennaioli, and Shleifer, 2020). Prominence refers to the notion suggested by the psychology of selective memory that visible rather than hidden attributes draw attention to themselves (Bordalo, Gennaioli, and Shleifer, 2020). Investors are found to pay excessive attention and overweight assets with unlikely payoffs.

We study the salience effect in the corporate bond market and measure the salience of corporate bonds following Cosemans and Frehen (2021), who propose ways to measure the salience of individual stocks. We start with specifying the states of the world and their objective probabilities. Similar to stock investments as discussed in Barberis et al. (2016), Cosemans and Frehen (2021) and Cakici and Zaremba (2021), investors choose corporate bonds based on their perception on bonds' past returns and their inference on the expected payoffs based on past return distributions. Performance of corporate bonds are generally reported over a month, six months and one to three years on the investment platforms. Salient thinkers who suffer from cognitive limitations when making investment decisions, are thus most likely to recall the most recent bond performance. Besides, return predicting signals of corporate bond prices that investors can observe generally use time windows of one month to 36 months[5]. Therefore, similar to Cosemans and Frehen (2021) and Cakici and Zaremba (2021), we test the states of daily returns in the past month and each day is assumed to occur with an equal probability π_d such that $\sum_d \pi_d = 1$.

[5] E.g., one-month pricing factors include, short term reversal and illiquidity (Bai et al., 2019), six-month pricing factors include momentum (Jastova et al., 2013), 36-month pricing factors include downside risk (Bai et al., 2019), long term reversal (Bali et al., 2021).

Then we calculate ST value in the following steps. First, we calculate the salience of each corporate bond's daily return within the measurement window, i.e. one month. As Bordalo, Gennaioli, and Shleifer (2013a) suggest, salience is a relative concept and is defined with respect to investors' choice set. We assume that corporate bond investors' choice set is composed of all the corporate bonds available in the market. Therefore, investors evaluate the performance of a corporate bond in the context of all other bonds. In this sense, the salience of a corporate bond's return on day d, $r_{i,d}$ depends on its distance from the market average return on the same day, $\overline{r_d}$ such that

$$\sigma\left(r_{i,d}, \overline{r_d}\right) = \frac{|r_{i,d} - \overline{r_d}|}{|r_{i,d}| + |\overline{r_d}| + \theta} \ , \tag{1}$$

where θ is a parameter calibrated to 0.1 by Bordalo, Gennaioli, and Shleifer (2012). In particular, we use equal-weighted average of corporate bond returns in the market as the proxy for the market benchmark $\overline{r_d}$ so as to preserve the (i) ordering, (ii) diminishing sensitivity and (iii) reflection properties as reflected by equation (1). The ordering property means that individual bond's salience increases with the distance of bond's return to the market average return. Diminishing sensitivity implies that bond salience decreases as the absolute bond returns increase uniformly across the market. Reflection indicates that it is the absolute level rather than the sign that determines salience.

Second, we rank each corporate bonds' daily return salience within each month in a descending order and record the rank as $k_{i,d}$. Hence $k_{i,d}$ ranges from 1 to monthly trading days T. The number of trading days T in each month identifies the set of possible states. Each of daily return happens with equal probability π_d, so that $\sum_{d=1}^{T} \pi_d = 1$.

Then the salience weighted probability of each return $\tilde{\pi}_{i,d}$ is adjusted according to the rank of return salience that $\tilde{\pi}_{i,d} = \pi_d \times \omega_{i,d}$, where the salience weight of each bond is defined as

$$\omega_{i,d} = \frac{\delta^{k_{i,d}}}{\sum_{d'} \delta^{k_{i,d'}} \times \pi_{d'}}, \tag{2}$$

and δ is a parameter governing the degree that the decision weight is distorted by the salience effect and it is calibrated at 0.7 by Bordalo, Gennaioli, and Shleifer (2012).

Finally, we calculate the corporate bond's monthly salience theory value (ST) as the covariance between salience weights and daily returns, as

$$ST_i = Cov(\omega_{i,d}, r_{i,d}). \tag{3}$$

If we rewrite ST as

$$ST_i = Cov(\omega_{i,d}, r_{i,d}) = \sum_{d=1}^{T} \pi_d \, \omega_{i,d} r_{i,d} - \sum_{d=1}^{T} \pi_d \, r_{i,d} = E^{ST}(r_{i,d}) - \overline{r_{i,d}}, \tag{4}$$

the salience theory value can be interpreted as the difference between salience-weighted past returns over the equal-weighted past returns. In this sense, ST measures the distortions in the return expectations from salient thinking. We use ST as the measurement on the bond salience and test its predictability on future expected returns of corporate bonds.

2.2.3 Bond variables

We measure several important bond characteristics as control variables. Credit rating (CR) represents bond's credit quality, referring to information about bond default probabilities and loss given default. Credit ratings are determined as the average of the ratings provided by Standard & Pool's and Moody's and transformed into numbers from high qualities AAA to 1, AA+ to 2, …, to low qualities D to 22. Therefore, investment grade (IG) bonds have numbers from 1 (AAA) to 10 (BBB–), and high yield (HY) bonds have numbers from 11 (BB+) to 22 (D). Bond's years to maturity is denoted as Yrtm. Bond market value is denoted as SIZE (in $ billions). Bond market beta (β_{Mkt}) is calculated by regressing bond *i*'s excess return $r_{i,m}$ on the corporate bond market index return. At each month *m*, the regression is estimated in a 36-month rolling window and the coefficient collected at the underlying month is bond *i*'s market beta $\beta_{Mkt,i,m}$. The bond market index is proxied by the value-weighted average of corporate bonds in the market and is denoted as MKT. Similarly, default factor beta (β_{Def}) and term factor beta (β_{Term}) are obtained from the regressions of bond *i*'s excess return on the default factor and term factor respectively. Default factor (DEF) is obtained as the difference between the long-term corporate bond index and the long-term government bond. Term factor (TERM) is obtained as the long-term government bonds returns subtracting one-month T-bill rates. ILLIQ represents bond illiquidity, which is defined following Bao et al. (2011), and captures the transitory component in the trading prices and increases with its magnitude. The illiquidity of bond *i* in month m is calculated as the autocovariance of price changes, $ILLIQ_{i,m} =$

$-cov(\Delta p_{i,d}, \Delta p_{i,d+1})$, where $\Delta p_{i,d} = p_{i,d} - p_{i,d-1}$ represents the log price difference between day *d-1* and day *d*. Following Jostova et al. (2013), we measure bond momentum as the cumulative return from month *m–2* to *m–7* at each month m, denoted as MoM. Momentum is found to be priced in the corporate bond returns. We measure bond short term reversal effect with bond's one month lagged return (REV), following Bai et al. (2019), which propose a common factor model that explains a large proportion of cross-sectional variation in bond returns. Besides REV, downside risk (DR) is also an essential variable in their model and it captures the left tail of the return distribution. We measure DR as the (negative of) second lowest monthly return in the past 36 months, approximating 5% value at risk in the return distribution. Idiosyncratic volatility (IVOL) of corporate bonds is calculated following Bai et al. (2021). Similar to stocks distribution, higher bond idiosyncratic volatility is associated with more extreme tails in the bond return distribution. For bond *i* in month *m*, we regress bond *i*'s excess return on the common factors proposed by Bai et al. (2019), i.e. market factor (MKT), credit risk factor (CRF), liquidity risk factor (LRF) and downside risk factor (DRF) in a 36-month rolling window and collect the residuals in each regression. The volatility of regression residuals is defined as the IVOL of bond i in month m. We finally collect each bond's number of trading days in each month as T.

2.3 Sample Summary

Our sample starts from July 2002 to March 2020 and consists of 678,924 bond-month observations. Table 1 summarizes the sample. Panel A presents the summary statistics of each variable. The bonds' monthly average return is 0.5% and the standard deviation is 2.45%. Bond monthly return is distributed in the range from –8.27% (1st percentile) to 9.09% (99th percentile). Bond salience theory value (ST) is on average –0.03% with a standard deviation of 0.46%, and it is distributed from –1.35% (1st percentile) to 1.31% (99th percentile). The average credit rating (CR) of bonds is 8.58, falling into the level between BBB and BBB+. The average years to maturity (Yrtm) are around 8.58 and the average size of bonds is 0.86 billion USD. The mean of bond DR is 3.5%, implying that there is only a 5% probability that an average corporate bond would lose more than 3.5% over the next month. DR is distributed between 0.49% (1st percentile) and 10.17% (99th percentile). ILLIQ is on average 0.31 with a standard deviation of 0.55. Bonds' idiosyncratic volatility (IVOL) is on average 1.78% with a standard deviation of 1.13%. It has a range of 0.37% (1st percentile) to 5.29% (99th percentile). The distribution of lagged monthly returns (REV) is similar to bond returns. The momentum measurement (MoM) is on average 3.35%, indicating the average cumulative holding returns in the past six months. MoM is distributed within a wide range of –13.03% (1st percentile) to 26.29% (99th percentile). Panel B shows the correlation among these variables. It turns out that only REV is positively correlated with ST at 0.32. Other major characteristics of corporate bonds present little correlations with ST. The largest correlation is only 4%, between ST and CR and ST and IVOL. There is almost no correlation observed between ST and SIZE.

3. Empirical Results

We conduct empirical tests on the effect of salience theory value (ST) on the cross-sectional returns of corporate bonds. We start with tests on a group of univariate sorting portfolios and individual Fama-MacBeth regressions to show the existance of the salience effect. We subsequently investigate whether the salience effect is concentrated in the salient downsides. Then we control other known bond factors in a series of double sorting portfolios. Finally, we conduct robustness examinations.

3.1 The Salience Effect

3.1.1 Univariate Sorting Test

We first study the salience effect with univariate portfolio sorts. At each month-end *m*, corporate bonds are sorted into decile portfolios based on their ST value. We assume that each portfolio is held for one month and calculate equal-weighted and value-weighted excess returns in the month *m+1*. Group 1 consists of corporate bonds with the lowest ST value and these bonds present the most salient downsides, compared with their counterparts in the market. Group 10 include bonds with the largest ST value and most salient upsides in daily returns. Table 2 summaries the variable distribution in each portfolio. Panel A describes the distribution of ST in each portfolio. The average ST in each group varies from –0.84% of Group 1 to 0.81% of Group 10. Within each portfolio, the distribution of bond's ST values varies from –1.79% (1st percentile) to –0.57% (99th percentile) in Group 1 to 0.52% (1st percentile) to 1.79% (99th percentile) in Group 10. Panel B calculates group average bond characteristics variables. The last two rows show the difference of average variables between Group 1 and Group 10, as well as the *t*-values. From Group 1 to Group 10 as average ST value increases, CR, Yrtm, ILLIQ, β_{Mkt}, DR and IVOL all present a 'U' shape. The group average of these variables first decrease as the bond salient downsides diminishes and increase as the bond salient upsides increase. This trend suggests that bonds that are of poor credit quality, of longer years to maturity, more illiquid, more sensitive to market index, of larger downside and of higher idiosyncratic volatility are more likely to present a salient upside or a salient downside in their daily returns. The differences of Group 1 minus Group 10 in CR, ILLIQ, DR, IVOL are significant. As a contrast, SIZE presents an opposite trend. This implies that small bonds rather than large counterparts are more likely to present salient upsides and downsides. There is not much difference in the number of trading days T in each group, and the average trading days are around 16 to 17 days per month.

Table 3 reports for each portfolio the time-series average of excess holding returns (2nd column), the four-factor alphas (6th column), the seven-factor alphas (8th column) and the twelve-factor alphas (10th column). In particular, portfolio alphas are obtained from factor models controlling well acknowledged bond and stock risk factors. The four-factor model controls corporate bond market excess return (MKT), the default factor (DEF), the term factor (TERM), and the momentum factor (MoM) proposed by Fama et al. (1993), Elton et al. (1995), Bessembinder et al. (2009) and Jostova et al. (2013). MKT is obtained from the value-weighted average of corporate bond returns in the market minus one-month T-bill rates. DEF factor is obtained as the difference between the long-term corporate bond index and the long-term government bond, to capture the default premium. We use bonds of maturities over ten years downloaded from the ICE dataset as proxies for the long-term bonds. TERM factor is calculated as the long-term government bonds returns subtracting one-month T-bill rates to capture the risk uncertainty in the long term. MoM factor is calculated, as defined by Jostova et al. (2013), from a 5×5 bivariate portfolio sorting of CR and MoM. Bonds are first sorted into quintiles based on CR, and within each CR group, bonds are further sorted into quintiles based on their MoM measurement, i.e. cumulative returns between month *m–2* to *m–7*. MoM factor is obtained as past winners minus past losers returns. The seven-factor model controls the classical four factors and three 'common factors' proposed by Bai et al. (2019), including downside risk factor (DRF), liquidity risk factor (LRF) and short-term reversal (REV). These risk factors are calculated as the returns of the highest DR (ILLIQ, REV) group minus the returns of the lowest DR (ILLIQ, REV) group. These risk factors are accessible from Bai's website[6]. The twelve-factor model consists of seven bond factors and five stock factors including Fama and French (1993) classical three stock factors: the stock market ($MKT.s$), the size factor (SMB) and the value factor (HML) augmented with the Carhart (1997) momentum factor ($MoM.s$) and the Pastor et al. (2003) liquidity factor ($ILLIQ.s$).

[6]http://www.jenniebai.com/data.html

In Table 3, Panel A reports the equal-weighted (EW) average results and Panel B reports the value-weighted (VW) average results. From Row 1 to Row 10, results of ST groups 1 to 10 are shown. The eleventh row reports the difference between Group 1 versus Group 10. Columns 2 to column 4 show the excess returns, standard deviations and the Sharpe ratios of each ST sorted portfolio. From Group 1 to Group 10, the EW average excess holding returns decrease from 0.85% (*t*-value 4.72) to 0.54% (*t*-value 3.24) per month. This makes a monthly net gain of 0.32% (*t*-value 5.44) in holding the long-short portfolio that longs bonds of the smallest ST and shorts bonds of the largest ST. This gain is annualized at 3.84%. The Sharpe ratio of each portfolio is from 0.41 for Group 1, annualized at 1.42, to 0.3 for Group 10, annualized at 1.04. Column 6 to column 7 show four-factor alphas across ST groups. The difference between Group 1 and Group 10 is 0.32% (*t*-value 5.08), annualized at 3.84%. Column 8 and column 9 present seven-factor alphas. The difference between the lowest ST group (Group 1) and the highest ST group (Group 10) are also significant, at 3.96% per year (*t*-value 5.07). The last two columns show the twelve-factor alphas. Group 1 minus Group 10 makes a significant difference of 0.3% (*t*-value 4.95), annualized at 3.6%. Therefore, the salience effect in the corporate bonds cannot be explained by the common risk factors, such as default, term, momentum, downside risk, illiquidity, credit rating and major stock factors.

The return differences are also significant in VW portfolios. The salience effect in VW portfolios is of similar magnitude. The return spread between Group1 and Group 10 is 0.37% (*t*-value 6.32), annualized at 4.44%. Four-factor alphas, seven-factor alphas and twelve-factor alpha differences are still positive and significant, at 0.37% (*t*-value 5.64), 0.38% (*t*-value 5.71) and 0.37% (*t*-value 5.69) per month respectively.

3.1.2 Fama-MacBeth Regression

We test the cross-sectional predictability of salience on bond's next month returns on the individual bond level following Fama and MacBeth (1973). This allows us to test bond salience effect while controlling for a large number of characteristics. For each month, we estimate predictive regressions of bond i's excess return in month $m+1$ on the ST variable in month m, while controlling for a group of characteristics in month m. To eliminate the influence from the outliers in the variables, we winsorize all the variables that enter the regressions at 5%. All explanatory variables are also standardized to mean 0 and variance 1 in each month, so that the regression coefficients represent the expected change in next month excess returns per standard deviation change in the explanatory variables. The baseline regression is designed as equation (5),

$$r_{i,m+1} = \alpha_m + \gamma_{1,m} ST_{i,m} + \sum_k \gamma_{k,m} Controls_{i,k,m} + e_{i,m}, \quad (5)$$

where $r_{i,m+1}$ is bond i's excess return in month $m+1$, $ST_{i,m}$ refers to the salience theory value of bond i in month m, and $Controls_{i,k,m}$ includes bond characteristics, i.e. downside risk (DR), idiosyncratic volatility (IVOL), credit rating (CR), illiquidity (ILLIQ), market beta (β_{Mkt}), default beta (β_{Def}), term beta (β_{Term}), years to maturity (Yrtm), SIZE, and the price based variables short-term reversal (REV) and momentum (MoM). The focus of this test is the time-series average of the coefficient on ST, $\overline{\gamma_1}$. As indicated by the portfolio sorting results, we expect to see a significantly negative $\overline{\gamma_1}$, which implies the negative relationship between ST and bonds' future excess returns. Table 4 presents the regression results. From column (1) to column (12), we add one more controlling variable in each regression specification and examine the consistency of ST coefficients. Column (1) shows the univariate regression result. The coefficient of ST is significant at 1% significance level, with *t*-value of –8.29. The result implies that for each standard deviation increase in bond ST, next month's bond excess return decreases by around 7 bps. Given that the standard deviation of ST is 0.46% as shown in Table 1, this coefficient implies that for 1% of increase in bond ST, the next month return is expected to decrease by 15 bps. This coefficient remains significantly negative across different model specifications. When include more controlling variables in the regressions, as defined in column (2) to column (10), each standard deviation of increase in bond ST predict around 9 bps decrease in bond's next month returns. This salience effect is barely affected by most common bond characteristics included in the regressions. However, when including bond pricing variables REV and MoM in the regressions as shown in column (11) and column (12), the salience effect decreases much yet still significant to around 3 bps (*t*-value –5.47) for each standard deviation change in bond ST. This implies that REV explains a part of the salience effect. Besides those variables, we also observe the significant predicting power of idiosyncratic volatility, downside risk and illiquidity. The predictability of these variables remains positive in presence of bond ST.

3.2 Salient Upside or Salient Downside?

3.2.1 Low-minus-High Portfolio in Downside groups

One following question naturally generated is that it is either the salient downside or upside that drives this salience effect in the corporate bonds. Different from the stocks that present unlimited upside potentials, corporate bonds are known to be more sensitive to the crash risks (e.g. Bai et al, 2019) because of their put option-like features. In this regard, we expect the salience effect to be more concentrated in the downsides of the returns. Salient-thinkers fire sell the bonds with salient negative news relative to the market, resulting in an undervaluation in the bond price, which bounce back in the next month.

This assumption is supported by the univariate sorting tests in Table 3. Along the ST groups from the lowest to the highest ST values, we notice that the excess returns are not monotonically decreasing. The biggest jump exists between Group 1 and Group 2, making a difference in the excess returns of 0.21% per month (*t*-value 3.74) as shown in the twelfth row in Table 3. This spread is annualized at 2.52%. The difference in the four-factor alphas, the seven-factor alphas and the twelve-factor alphas between the lowest two groups are annualized at 2.28% (*t*-value 4.49), 1.56% (*t*-value 2.91) and 1.08% (*t*-value 2.2) respectively. The spreads between the lowest two ST groups are large and account for a large portion of the low-minus-high return differences.

The last row in Table 3 presents the return and alpha differences along the downside part, i.e. the result differences between Group 1 over Group 6. The largest excess return spread along the salient downside groups is negatively significant at 0.45% (*t*-value 3.97), annualized at 5.4%. The spreads in the four-factor alphas, seven-factors alphas and twelve-factor alphas are negative and significant 3.84% (*t*-value 5.16), 2.88% (*t*-value 3.44) and 2.16% (*t*-value 2.87) annually.

The return differences are also significant and of similar magnitudes in VW portfolios. The return difference between Group 1 and Group 2 is still large and accounts for a large proportion of the low-minus-high difference. The return spread is 0.23% (*t*-value 4.35) per month, annualized at 2.76%. The four-factor alpha, seven-factor alpha and twelve-factor alpha differences are 0.18% (*t*-value 4.74), 0.13% (*t*-value 3.54) and 0.09% (*t*-value 2.77) per month, annualized at 2.16%, 1.56% and 1.08% respectively. The return spread between Group 1 and Group 6 is still large at 5.88% (*t*-value 4.15) per year. The four-factor alpha, seven-factor alpha and twelve-factor alpha spreads are annualized at 3.6% (*t*-value 4.86), 2.76% (*t*-value 3.51) and 2.16% (*t*-value 2.84), respectively. This result indicates that the salient thinkers response most to the extremely left tails of corporate bond returns in comparison with the market average level. This is in line with the argument that corporate bond investors care more about the downsides rather than the upside potentials in bond prices.

3.2.2 Fama-MacBeth Regression

We then test the concentration of the salience effect in a Fama-MacBeth regression. We define two dummy variables $SD_{i,m}$, referring to the bonds with salient downsides, which equals to 1 if bond *i* falls in Group 1 to 6 in month *m*, and 0 otherwise and $SU_{i,m}$, referring to the bonds with salient upsides, which equals to 1 if bond *i* falls in the Groups 7 to 10 in month *m*, and 0 otherwise. The universe of bonds are sorted into ten ST groups as identified in Section 3.1. We regress bond next month's excess returns on the interaction terms of ST and the dummy variables as defined in equation (6) and compare the slopes in each group,

$$r_{i,m+1} = \alpha_m + \gamma_{1,m} ST_{i,m} \times SU_{i,m} + \gamma_{2,m} ST_{i,m} \times SD_{i,m} \sum_k \gamma_{k,m} Controls_{i,k,m} + e_{i,m}. \quad (6)$$

Our focus is on the average slopes of the interaction terms, i.e. $\overline{\gamma_{1,m}}$ for the downside bonds and $\overline{\gamma_{2,m}}$ for the upside bonds.

Table 5 reports the regression coefficients on the interaction terms. The baseline regression is shown in column (1), with only bond ST on the right-hand side of regression (6). The coefficient on ST is still –0.07 (*t*-value –8.29) and significant at 1% significance level. In column (2), we include the interactions between ST and SU, ST and SD instead and compare the slopes in these two groups of bonds. The coefficient on ST × SD is significantly negative at –0.24 (*t*-value –8.16), suggesting that if the bond is suffering from a salient downside, each standard deviation decrease in ST will predict 24 bps increase in the expected return in the next month. In contrast, the coefficient of ST × SU is significantly positive, at 0.07 (*t*-value 2.59). This implies that for salient upsides observed by the corporate bond traders, each standard deviation increase in the bond ST is expected to be associated with a 7 bps inecrease in the next month. The opposite signs of the slopes in two groups of bonds are in line with the univariate sorting portfolio results in Table 3, in which we obtain a mirrored 'J' shape in the portfolio holding excess returns. This result supports the argument that the salience effect is concentrated in the salient downsides. To eliminate the effect from other bond characteristics, in column (3) we add controlling variables on the right-hand side of equation (6). The slope of ST × SD becomes smaller at –0.05 (*t*-value –5.27). It turns out that REV still influences much on the salience effect, accounting for 24 bps increase in the next month returns per standard deviation decrease in REV. However, the significance of ST slope in the downside part remains unchanged, suggesting that the salience effect plays a role in the cross-sectional prediction. The ST × SU slope becomes none and not significant anymore. This manifests the common idea about the corporate bonds that when the bond is hit by the crash risk, bond traders tend to fire sale and fly to safety so as to avoid the potential loss, resulting in an undervalued price, which bounce back in the near future. However, due to limited upside potentials of corporate bond prices, it is uncommon to observe the traders chasing for lottery-like assets in the corporate bond market as seen in the stock market (e.g., Barberis and Huang, 2008; Bali et al., 2011; Lin et al., 2018; Green et al., 2012, etc.). Therefore, the slope on the upside group of bonds appears insignificant. Other characteristics that are helpful in predicting the corporate bond future returns are IVOL (0.08, *t*-value 3.68), DR (0.05, *t*-value 2.34), ILLIQ (0.01, *t*-value 2.22) and MoM (–0.05, *t*-value 3.17).

3.3 Other known factors

We then examine whether the salience effect can be explained or affected by the well-acknowledged corporate bond factors. We construct several double sorted portfolios and test the excess returns of each portfolio. In each month, we sort bonds into quintiles based on one of the characteristics, then conditional on each characteristic quintile, we sort bonds into quintiles based on ST. This makes in total 25 portfolios. Each portfolio is assumed to be held for one month and the excess return in the next month is examined. We calculate the difference between the excess returns of low ST subgroups versus high ST subgroups within each bond characteristic sorted group.

Table 6 reports the VW average of excess returns in each portfolio[7]. Each panel shows portfolio excess returns sorted based on ST and CR (Panel A), SIZE (Panel B), Yrtm (Panel C), ILLIQ (Panel D), DR (Panel E) and IVOL (Panel F) respectively. Each column presents ST sorted portfolios within each characteristic subgroup from the smallest (subgroup 1) to the largest level (subgroup 5). Row 1 to row 5 represent low ST subgroups to high ST subgroups respectively. The last row 1–5 reports the difference in holding excess returns between the lowest ST subgroup and the highest ST subgroup within in each bond characteristic sorted quintile. The bottom right value in the table reports the return spread between the diagonal portfolios on the two extremes (in bold), e.g., in Panel A, it presents the low ST × high CR versus the high ST × low CR portfolios. Across the six bond characteristics examined, the average return spreads of low ST subgroups minus high ST subgroups are all negative and significant. In particular, the return spreads controlling CR vary within the range of 0.21% (*t*-value 5.35) to 0.26% (*t*-value 3.49) per month. The return difference between low ST × high

[7] We also calculate the EW average of portfolio returns, and the results remain significant as shown from VW portfolios. EW portfolio results are available upon request.

CR versus the high ST × low CR portfolio is 0.54% (*t*-value 2.42) per month, annualized at 6.48%. In panel B, the return spread between the lowest ST subgroups versus the highest ST subgroups across SIZE subgroups vary monotonically from 0.25% (*t*-value 5.40) to 0.18% (*t*-value 3.85) per month. The return difference between low ST × low SIZE versus the high ST × high SIZE portfolio is 0.38% (*t*-value 3.29) per month, annualized at 6.48%. In Panel C controlling years to maturity, the return spreads decrease from 0.42% (*t*-value 7.91) in the bonds of longest years to maturity to 0.16% (*t*-value 4.11) in bonds of the shortest years to maturity. In Panel D, the return spreads are 0.15% (*t*-value 2.28) in the most liquid subgroup and 0.33% (*t*-value 7.65) in the most illiquid subgroups. The return spread of the diagonal portfolios is significant, of 0.42% (*t*-value 5.90) per month, annualized at 5.04%. Controlling DR (Panel E) and IVOL (Panel F), the return spreads are still large and significant, varying from 0.15% (*t*-value 7.00) to 0.38% (*t*-value 4.12) in DR subgroups and 0.1% (*t*-value 4.77) to 0.32% (*t*-value 3.26) in IVOL subgroups. The results imply that the salience effect is stronger in long, illiquid bonds and bonds of high downside risks and large idiosyncratic volatilities.

The double sorted portfolios show that bond characteristics have limited impact on the salience effect of corporate bonds. This is in line with variable distributions in univariate sorted portfolios as shown in Table 2. Most of these characteristics exhibit 'U' shapes along ST groups and are of little correlation with ST, hence they provide limited explanation on the return spreads of low-minus-high ST portfolios.

3.4 Robustness

To eliminate concerns that the salience effect is only concentrated in the small bonds, we repeat the Fama-MacBeth regressions in the value-weighted setting as a robustness examination. The amount outstanding (SIZE) of each bond in each bond is taken as the weight. Table 7 and Table 8 report the coefficients of the value-weighted Fama-MacBeth regressions in equation (5) and equation (6) respectively. In Table 7, we run the bond next month excess returns on ST and controlling variables as explanatory variables. The average coefficients of ST are still significantly negative at 7 bps to 10 bps with bond characteristics included. The bond price variables REV and MoM still account for a large part of the salience effect, driving the coefficients of ST to a lower but significant level around 3bps. This is in line with our main results shown in Table 4. In Table 8 we include the interaction terms ST × SU and ST× SD in the regressions, and obtain same results as found in Table 5. The slope of ST in the downside groups is –0.24 (*t*-value –7.11), while this coefficient in the upside group is 0.07 (*t*-value 2.11), suggesting the concentration of the salience effect in the salient downsides in bonds' daily returns. After controlling for other bond variables, the slope of the downside group become –0.04 (*t*-value –4.99), while the slope of the upside group become insignificant at –0.01 (*t*-value –1.08). The salience effect in the downside group is still affected much by the bond REV (–0.23, *t*-value –11.04). The value-weighted Fama-MacBeth regressions present consistent results as equal-weighted regressions. These robust results help resolve the concern as found in the stock market that the salience effect primarily exists in the microcaps. Our results, which uses the bond sizes as weights, show that the salience effect in the corporate bond market is not only concentrated in the small bonds.

4. Conclusion

We provide empirical evidence of the salience effect in the corporate bond market. We find that bond salience theory value (ST) negatively predicts the future excess returns. As shown in our univariate sorted portfolios, bonds with a lower ST within the month present higher expected returns in the subsequent month. The return spread between bonds with the most salient downsides minus those with most salient upsides is significantly positive. This is because corporate bond investors allocate their limited attention to the salient returns that stand out relative to the market average, and tend to overweight the salient returns when forming their expectation on future returns. This leads to an undervaluation of bonds with salient downsides, followed by a higher subsequent return.

In particular, the salience effect is concentrated in the bonds of the most salient downsides. The return spread between the bottom two ST groups accounts for a substantial part of the total return spread. Besides, the return spread along the ST downside groups presents the largest value. The Fama-MacBeth regression shows that the slope of ST is significantly negative in the bonds with salient downsides. However, there is no significant salience effect found in the bonds with salient upsides. This is in line with the argument that bond investors care more about potential losses rather than gains from the investment due to the feature of limited upsides in corporate bond prices.

Our finding is robust to controlling for a series of important bond characteristics that are believed to price the corporate bonds. First of all, bond ST variable is found to have little correlation with main variables including credit rating, size, years to maturity, downside risk, idiosyncratic volatility, illiquidity and short-term reversal and momentum measurement. The short-term reversal measurements is found to be capable to explain part of the salience effect.

Second, the double sorted portfolios based on bond characteristics and ST show that the return spreads between low-versus-high ST subgroups are significantly positive in each bond characteristic sorted subgroup. Finally, the coefficient measuring the salience effect in the Fama-MacBeth regression is consistent across model specifications with different controlling variables included.

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Table 1 Sample Description

This table describes the sample and main variables. Panel A shows summary statistics of the variables. Return (%) is the monthly return of the corporate bonds. ST (%) is the monthly bond salience theory value, constructed following Cosemans and Frehen (2021), as described in Section 2.2.2. In the table, CR is credit rating of corporate bonds, with ratings transferred to numbers from the highest rating AAA as 1 to the lowest rating D as 22. The credit ratings of bonds are the average of the ratings provided by S&P and Moody's. Yrtm is years to maturity. SIZE is the amount of outstanding of bonds, denominated in $ billios. DR (%) is the downside risk of the bonds, taken as the second-lowest monthly return in the past 36 months, and multiplied by –1 following Bai et al. (2019). ILLIQ is bond illiquidity, measured following Bao et al. (2011) as the covariance of the daily log price changes. IVOL (%) is idiosyncratic volatility, measured as the volatility of the residuals from the time-series regression of bond excess returns on the common corporate bond factors proposed by Bai et al. (2019), namely MKT, CRF, LRF, DRF, in a 36-month rolling window. REV (%) is the return in the previous month of corporate bonds. MoM (%) is measured with bond cumulative returns between month m–2 to m–7. The number of observations N, mean, median, standard deviation, and distribution (1^{st}, 10^{th}, 25^{th}, 75^{th}, 90^{th}, 99^{th}) of the variables are reported. Panel B reports the correlation of these variables contemporaneously.

Panel A: Summary Statistics

					Percentiles					
	N	Mean	Median	SD	1	10	25	75	90	99
Return (%)	678924	0.50	0.38	2.45	–8.27	–1.65	–0.33	1.36	2.87	9.09
ST (%)	678917	–0.03	–0.04	0.46	–1.35	–0.52	–0.24	0.18	0.47	1.31
CR	676373	8.58	8.00	3.58	1.00	5.00	6.00	10.00	14.00	18.00
Yrtm	678924	8.58	5.79	8.28	1.10	1.97	3.34	9.13	24.18	30.14
SIZE ($billion)	678924	0.86	0.62	0.76	0.07	0.26	0.41	1.05	1.70	3.56
DR (%)	308673	3.50	2.67	2.62	0.49	0.98	1.54	4.67	7.71	10.17
ILLIQ	678924	0.31	0.07	0.55	–0.01	0.00	0.01	0.30	0.98	2.28
IVOL (%)	308597	1.78	1.44	1.13	0.37	0.62	0.91	2.42	3.38	5.29
REV (%)	678924	0.56	0.40	2.42	–7.26	–1.58	–0.31	1.40	2.94	9.41
MoM (%)	616742	3.35	2.46	6.56	–13.03	–2.13	0.40	5.58	9.99	26.29

Panel B: Variable Correlation

	ST	CR	Yrtm	SIZE	DR	ILLIQ	IVOL	REV	MoM
ST	1	0.04	0.02	0	0.02	0.01	0.04	0.32	–0.01
CR		1	–0.07	–0.22	0.41	0.14	0.45	0.04	0.12
Yrtm			1	0.09	0.4	0.2	0.45	0.04	0.11
SIZE				1	–0.08	–0.24	–0.12	0.01	0
DR					1	0.36	0.87	0.09	0.21
ILLIQ						1	0.39	0.02	0.07
IVOL							1	0.12	0.28
REV								1	0.05
MoM									1

Table 2 Distribution of salience theory value

This table summarises the ten ST groups sorted at each month-end based on the bond ST, as defined in Section 2.2.2. Panel A describes the distribution of ST in each group. The second column presents the value-weighted average ST of each group. The third to ninth columns present the 1st, 10th, 25th, 50th, 75th, 90th, 99th percentiles of the distribution of bond ST in each group. Panel B describes the major bond characteristics in each group. The second to ninth columns report the average of the amount outstanding (SIZE), credit rating (CR), years to maturity (Yrtm), illiquidity (ILLIQ), market beta (β_{mkt}), downside risk (DR), idiosyncratic volatility (IVOL) and trading days (T) in each group.

Panel A: Distribution of Salience Theory Value

ST Group	ST (VW, %)	Percentiles 1	10	25	50	75	90	99
1	–0.84	–1.79	–1.27	–1.00	–0.79	–0.66	–0.60	–0.57
2	–0.44	–0.56	–0.53	–0.49	–0.43	–0.39	–0.36	–0.35
3	–0.28	–0.34	–0.33	–0.31	–0.28	–0.25	–0.23	–0.22
4	–0.17	–0.22	–0.21	–0.19	–0.17	–0.15	–0.14	–0.13
5	–0.09	–0.13	–0.12	–0.11	–0.09	–0.07	–0.06	–0.05
6	–0.004	–0.05	–0.04	–0.03	–0.005	0.02	0.03	0.04
7	0.09	0.04	0.05	0.07	0.09	0.12	0.14	0.15
8	0.21	0.15	0.16	0.18	0.21	0.25	0.27	0.29
9	0.39	0.29	0.31	0.33	0.38	0.45	0.49	0.52
10	0.81	0.52	0.56	0.62	0.75	0.98	1.25	1.79

Panel B: Average Bond Characteristics

ST Group	SIZE ($billion)	CR	Yrtm	ILLIQ	β_{mkt}	DR (%)	IVOL (%)	T
1	0.66	9.61	12.89	0.73	0.35	5.21	2.48	16.43
2	0.77	8.76	9.52	0.41	0.26	3.94	1.90	16.68
3	0.83	8.28	7.56	0.30	0.21	3.31	1.62	16.92
4	0.89	7.84	6.33	0.23	0.18	2.93	1.45	17.24
5	0.97	7.52	5.64	0.19	0.17	2.67	1.33	17.56
6	1.00	7.51	5.67	0.19	0.16	2.70	1.34	17.66
7	0.90	8.08	6.63	0.24	0.19	3.03	1.49	17.14
8	0.80	8.65	7.90	0.31	0.23	3.49	1.70	16.43
9	0.74	9.16	9.91	0.43	0.28	4.12	2.00	16.12
10	0.65	9.95	13.30	0.76	0.38	5.37	2.61	16.01
1–10	0.01	–0.33	–0.41	–0.03	–0.03	0.16	0.13	0.43
(t-stat)	1.07	–2.54	–1.34	–2.65	–1.36	1.87	3.86	7.53

Table 3 Univariate portfolio sorts of monthly ST

This table describes ten ST sorted groups. At each month, bonds are sorted into deciles according to their salience theory value (ST). Portfolios are constructed in each group with equal weights or value weights and held for one month. For each portfolio, the holding excess returns are reported in the second column with one-month T-bill as the risk-free rate and the *t*-statistics in the third column. The fourth columns present the standard deviation of the portfolio holding returns and the fifth column report the Sharpe ratio of each portfolio. The sixth and seventh columns present the intercept (alpha) of regressions of portfolio excess returns on the four basic bond factors, namely MKT, DEF, TERM and MoM, as well as the *t*-statistics. The eighth and ninth columns report alphas obtained from regressions of portfolio excess returns on the seven bond factors, namely MKT, DEF, TERM, MoM, DRF, CRF, LRF, as well as the *t*-statistics. The tenth and eleventh columns report the alphas obtained from regressions of portfolio excess returns on the seven bond factors and the five stock factors, namely MKT.s, SMB, HML, MoM.s and ILLIQ.s. Rows 1 to 10 present portfolios from lowest ST to highest ST. The eleventh row 1–10 reports the difference in the excess returns and alphas between the bottom and top groups. The twelfth row 1–2 reports the difference in the excess returns and alphas between the bottom two groups. The last row 1–6 reports the difference in the excess returns and alphas between Group 1 and Group 6. Panel A presents results of equal-weighted portfolios and Panel B reports results of value-weighted portfolios. We report Newey-West adjusted *t*-statistics with 12 lags for each estimate.

Panel A: Equal-weighted										
ST Group	Excess Ret (%)	t-stat	Ret SD (%)	Sharpe Ratio	4 Bond Factors	t-stat	7 Bond Factors	t-stat	12 Factors	*t*-stat
1	0.85	4.72	2.06	0.41	0.48	7.07	0.40	5.28	0.36	4.75
2	0.64	4.78	1.61	0.40	0.29	6.77	0.28	5.77	0.27	5.37
3	0.53	5.08	1.32	0.40	0.23	6.39	0.22	5.80	0.23	5.09
4	0.46	5.17	1.14	0.40	0.19	6.10	0.20	5.90	0.21	5.62
5	0.40	5.01	1.03	0.39	0.16	4.50	0.17	4.42	0.18	4.40
6	0.40	5.18	1.01	0.40	0.16	4.47	0.17	4.44	0.18	4.47
7	0.46	5.16	1.11	0.41	0.20	5.62	0.20	5.32	0.21	5.07
8	0.48	4.85	1.24	0.39	0.19	5.88	0.20	5.59	0.20	5.18
9	0.50	4.18	1.45	0.35	0.18	4.22	0.15	3.64	0.15	3.17
10	0.54	3.24	1.82	0.30	0.16	2.08	0.08	1.10	0.06	0.81
1–10	0.32	5.44	0.88	0.36	0.32	5.08	0.33	5.07	0.30	4.95
1–2	0.21	3.74	0.71	0.30	0.19	4.49	0.13	2.91	0.09	2.20
1–6	0.45	3.97	1.31	0.34	0.32	5.16	0.24	3.44	0.18	2.87

Panel B: Value-weighted										
ST Group	Excess Ret (%)	*t*-stat	Ret SD (%)	Sharpe Ratio	4 Bond Factors	*t*-stat	7 Bond Factors	*t*-stat	12 Factors	*t*-stat
1	0.86	4.89	2.20	0.39	0.42	6.61	0.38	5.31	0.34	4.73
2	0.63	4.71	1.75	0.36	0.24	5.31	0.26	4.93	0.25	4.83
3	0.51	5.04	1.44	0.35	0.17	4.92	0.19	5.31	0.19	5.02
4	0.45	5.26	1.20	0.37	0.16	4.73	0.19	5.39	0.21	5.58
5	0.39	5.31	1.07	0.37	0.13	3.31	0.16	4.09	0.17	4.06
6	0.38	5.52	1.05	0.36	0.12	3.15	0.15	3.95	0.16	3.99
7	0.44	5.32	1.17	0.38	0.15	4.46	0.18	4.94	0.18	4.69
8	0.49	5.08	1.33	0.37	0.17	4.93	0.19	5.23	0.18	4.86
9	0.49	4.15	1.60	0.31	0.13	3.21	0.13	3.14	0.12	2.72
10	0.49	2.98	1.97	0.25	0.05	0.77	0.00	0.00	–0.03	–0.39
1–10	0.37	6.32	1.03	0.36	0.37	5.64	0.38	5.71	0.37	5.69
1–2	0.23	4.35	0.72	0.32	0.18	4.74	0.13	3.54	0.09	2.77
1–6	0.49	4.15	1.45	0.34	0.30	4.86	0.23	3.51	0.18	2.84

Table 4 Fama-MacBeth Regression

This table reports results of Fama-MacBeth (1973) regression with individual bond next month excess return (%) on bond characteristics including ST, IVOL, DR, CR, ILLIQ, β_{mkt}, β_{def}, β_{term}, Yrtm, SIZE, REV, MoM. Each column reports the average regression coefficients from different regression specifications. All the variables are winsorized at 5% to exclude outliers. All the explanatory variables are standardized before entering the regressions. *T*-statistics of regression coefficients are presented in the parentheses. The last row reports the average adjusted R-square of each regression specification. We report Newey-West adjusted *t*-statistics with 12 lags for each estimate. "$*$" indicates statistical significance at 10% confidence level, "$**$" at 5% level, "$***$" at 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ST	–0.07***	–0.09***	–0.09***	–0.09	–0.09***	–0.09***	–0.09***	–0.09***	–0.09***	–0.09***	–0.02***	–0.03***
	(–8.29)	(–10.47)	(–10.89)	(–13.16)	(–12.87)	(–13.29)	(–13.97)	(–13.53)	(–15.63)	(–15.54)	(–5.22)	(–5.47)
IVOL		0.16***	0.09***	0.09	0.08***	0.07***	0.08***	0.07***	0.06***	0.06***	0.08***	0.09***
		(4.58)	(3.11)	(3.18)	(2.82)	(2.75)	(3.08)	(3.06)	(3.07)	(2.94)	(3.69)	(3.82)
DR			0.09***	0.07	0.07***	0.07***	0.06**	0.06**	0.05***	0.05***	0.05***	0.05**
			(2.66)	(2.48)	(2.55)	(2.60)	(2.35)	(2.49)	(2.93)	(2.99)	(2.58)	(2.33)
CR				0.02	0.02	0.01	0.02	0.02	0.03	0.03	0.04	0.04
				(0.66)	(0.71)	(0.43)	(0.52)	(0.53)	(1.13)	(1.16)	(1.37)	(1.44)
ILLIQ					0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
					(3.22)	(2.96)	(3.06)	(3.14)	(3.22)	(3.46)	(3.02)	(2.59)
β_{mkt}						0.02*	0.03**	0.02	0.02	0.02	0.02	0.01
						(1.73)	(2.27)	(1.01)	(1.02)	(1.02)	(0.79)	(0.75)
β_{def}							–0.01	–0.01	0.00	0.01	0.00	0.00
							(–0.70)	(–0.28)	(0.34)	(0.49)	(0.00)	(0.23)
β_{term}								0.01	0.01	0.01	0.02	0.02
								(0.63)	(0.44)	(0.47)	(0.83)	(0.95)
Yrtm									0.04	0.04	0.04	0.04
									(0.83)	(0.83)	(0.87)	(0.90)
SIZE										0.00	0.00	0.00
										(0.54)	(0.69)	(0.74)
REV											–0.23***	–0.24***
											(-11.31)	(–11.31)
MoM												–0.05***
												(–3.14)
Intercept	0.52***	0.48***	0.48***	0.48	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***
	(7.65)	(6.58)	(6.58)	(6.63)	(6.64)	(6.64)	(6.66)	(6.66)	(6.58)	(6.59)	(6.62)	(6.60)
Aver.R2	0.01	0.09	0.11	0.15	0.16	0.17	0.18	0.18	0.23	0.23	0.26	0.27

Table 5 Bond level Fama-MacBeth Regression: Heterogeneity across groups

This table reports results of Fama-MacBeth (1973) regression with individual bond next month excess return on bond salience theory value ST and the interaction term of ST and dummy variables identifying upside (SU) or downside (SD) ST groups. Variable SU equals to 1 if the corporate bond is sorted into Groups 7 to 10, otherwise equals to 0. Variable SD equals to 1 if the corporate bond is sorted into Groups 1 to 6, otherwise equals to 0. Each column reports the average regression coefficients from different regression specifications. All the variables are winsorized at 5% to exclude outliers. All the variables are standardized before entering the regressions. *T*-statistics of regression coefficients are presented in the parentheses. The last row reports the average adjusted R-square of each regression specification. We report Newey-West adjusted *t*-statistics with 12 lags for each estimate. "∗" indicates statistical significance at 10% confidence level, "∗∗" at 5% level, "∗∗∗" at 1% level.

	(1)	(2)	(3)
ST	–0.07***		
	(–8.29)		
ST×SD		–0.24***	–0.05***
		(–8.16)	(–5.27)
ST×SU		0.07***	0.00
		(2.59)	(–0.05)
IVOL			0.08***
			(3.68)
DR			0.05**
			(2.34)
CR			0.04
			(1.44)
ILLIQ			0.01**
			(2.22)
β_{Mkt}			0.01
			(0.72)
β_{Def}			0.00
			(0.24)
β_{Term}			0.02
			(0.94)
Yrtm			0.04
			(0.87)
SIZE			0.01
			(0.96)
REV			–0.24***
			(–11.33)
MoM			–0.05***
			(–3.17)
Intercept	0.52***	0.40***	0.46***
	(7.65)	(7.17)	(6.68)
Aver.R2	0.01	0.04	0.27

Table 6 Double portfolio sorts

This table shows the results of double-sorted portfolios. At each month, bonds are sorted into quintiles according to the credit rating (Panel A), size (Panel B), years to maturity (Panel C), illiquidity (Panel D), downside risk (Panel E), idiosyncratic volatility (Panel F). Then within each characteristic sorted quintile, bonds are further sorted into quintiles according to ST, making 5 × 5 sorted portfolios. The portfolios are value-weighted and are held for one month. The holding excess returns and *t*-statistics (in parentheses) are reported for each portfolio. Within each panel, rows represent ST quintiles from lowest ST (Group 1) to highest ST (Group 5). The last two rows report the difference between Group 1 versus Group 5. Columns in each panel represent quintiles sorted according to bond controlling characteristics. The last column reports the difference between Group 1 and Group 5 . Values in the bottom right in bold report the differences between diagonal portfolios with the highest holding returns versus the lowest holding returns and *t*-statistics. We report Newey-West adjusted *t*-statistics with 12 lags for each estimate in the parentheses.

	Panel A: Credit Rating						Panel B: SIZE					
ST	1	2	3	4	5	5–1	1	2	3	4	5	1–5
1	0.59	0.61	0.74	0.75	**0.91**	0.33	**0.87**	0.75	0.69	0.70	0.68	0.20
	(5.42)	(4.88)	(5.26)	(4.24)	**(3.76)**	(1.54)	**(4.43)**	(4.48)	(4.75)	(5.06)	(4.68)	(1.94)
2	0.39	0.39	0.49	0.49	0.72	0.33	0.60	0.51	0.48	0.45	0.43	0.17
	(5.45)	(4.47)	(4.83)	(4.38)	(4.47)	(2.30)	(4.62)	(4.93)	(5.18)	(5.18)	(5.06)	(2.31)
3	0.31	0.35	0.42	0.46	0.63	0.32	0.49	0.44	0.39	0.39	0.38	0.10)
	(5.68)	(4.85)	(5.07)	(4.59)	(4.43)	(2.44)	(4.39)	(4.30)	(4.92)	(5.51)	(5.85)	(1.64
4	0.33	0.37	0.44	0.49	0.64	0.31	0.55	0.45	0.47	0.43	0.41	0.13
	(5.66)	(4.68)	(4.68)	(4.42)	(4.15)	(2.32)	(4.17)	(4.47)	(5.14)	(5.53)	(4.97)	(1.77)
5	**0.38**	0.40	0.45	0.47	0.65	0.27	0.62	0.50	0.48	0.48	**0.50**	0.13
	(3.66)	(3.34)	(3.28)	(2.82)	(3.05)	(1.40)	(3.41)	(3.33)	(3.70)	(3.80)	**(3.63)**	(1.27)
1–5	0.21	0.21	0.28	0.29	0.26	**0.54**	0.25	0.25	0.22	0.22	0.18	**0.38**
	(5.35)	(4.05)	(6.31)	(5.44)	(3.49)	**(2.42)**	(5.40)	(5.15)	(4.70)	(4.26)	(3.85)	**(3.29)**

	Panel C: Years to maturity						Panel D: ILLIQ					
ST	1	2	3	4	5	5–1	1	2	3	4	5	5–1
1	0.51	0.59	0.74	0.71	**0.88**	0.37	0.63	0.57	0.64	0.78	**0.90**	0.27
	(5.20)	(4.78)	(4.72)	(4.37)	**(4.76)**	(2.77)	(4.32)	(5.07)	(5.30)	(5.34)	**(4.86)**	(4.51)
2	0.28	0.40	0.52	0.54	0.74	0.46	0.39	0.39	0.51	0.54	0.70	0.31
	(5.58)	(5.41)	(5.05)	(4.67)	(4.46)	(3.25)	(4.78)	(5.42)	(5.30)	(4.68)	(4.40)	(3.06)
3	0.25	0.36	0.47	0.53	0.68	0.44	0.30	0.35	0.45	0.53	0.66	0.35
	(5.73)	(5.61)	(5.16)	(4.67)	(4.34)	(3.12)	(4.68)	(5.43)	(5.19)	(5.34)	(4.39)	(3.24)
4	0.23	0.37	0.47	0.50	0.62	0.39	0.37	0.37	0.46	0.52	0.66	0.29
	(5.54)	(5.80)	(5.05)	(4.40)	(3.98)	(2.78)	(4.96)	(5.66)	(4.97)	(4.82)	(4.28)	(2.82)
5	**0.36**	0.42	0.49	0.47	0.46	0.10	**0.48**	0.42	0.45	0.43	0.57	0.09
	(3.81)	(3.64)	(3.34)	(3.45)	(2.72)	(0.77)	**(3.35)**	(4.35)	(3.74)	(3.23)	(3.32)	(1.63)
1–5	0.16	0.18	0.25	0.24	0.42	**0.52**	0.15	0.15	0.20	0.36	0.33	**0.42**
	(4.11)	(3.31)	(4.86)	(3.26)	(7.91)	**(3.67)**	(2.28)	(3.52)	(3.97)	(7.60)	(7.65)	**(5.90)**

Table 6-Continued Double portfolio sorts

	Panel E: Downside Risk						Panel F: IVOL					
ST	1	2	3	4	5	5–1	1	2	3	4	5	5–1
1	0.37	0.51	0.65	0.78	**0.95**	0.58	0.34	0.48	0.66	0.80	**0.84**	0.50
	(5.78)	(5.06)	(4.64)	(4.16)	**(3.52)**	(2.54)	(5.38)	(4.55)	(4.51)	(4.04)	**(3.07)**	(2.09)
2	0.27	0.39	0.43	0.53	0.80	0.52	0.26	0.39	0.48	0.59	0.86	0.60
	(5.13)	(4.66)	(4.36)	(3.41)	(3.46)	(2.61)	(4.99)	(4.28)	(4.49)	(3.64)	(3.93)	(3.17)
3	0.24	0.32	0.37	0.47	0.69	0.46	0.23	0.34	0.43	0.45	0.75	0.52
	(4.74)	(4.69)	(4.10)	(3.31)	(3.23)	(2.35)	(4.85)	(4.50)	(4.08)	(3.18)	(3.58)	(2.73)
4	0.23	0.35	0.41	0.47	0.70	0.47	0.23	0.33	0.43	0.55	0.62	0.40
	(4.72)	(4.76)	(4.37)	(3.24)	(3.17)	(2.31)	(4.84)	(4.64)	(4.23)	(3.18)	(2.86)	(1.97)
5	**0.22**	0.30	0.33	0.35	0.58	0.36	**0.24**	0.27	0.37	0.39	0.52	0.28
	(4.07)	(3.25)	(2.78)	(1.90)	(2.42)	(1.68)	**(4.15)**	(3.09)	(2.74)	(2.25)	(2.15)	(1.28)
1–5	0.15	0.21	0.32	0.42	0.38	**0.73**	0.10	0.22	0.29	0.41	0.32	**0.60**
	(7.00)	(5.18)	(6.46)	(5.73)	(4.12)	**(3.08)**	(4.77)	(8.16)	(5.51)	(6.57)	(3.26)	**(2.42)**

Table 7 Robustness: Value-weighted Fama-MacBeth Regression

This table reports results of value-weighted Fama-MacBeth (1973) regression with individual bond next month excess return on bond characteristics including ST, IVOL, DR, CR, ILLIQ, β_{mkt}, β_{def}, β_{term}, Yrtm, SIZE, REV, MoM. Each column reports the average regression coefficients from different regression specifications. All the variables are winsorized at 5% to exclude outliers. All the variables are standardized before entering the regressions. *T*-statistics of regression coefficients are presented in the parentheses. The last row reports the average adjusted R-square of each regression specification. We report Newey-West adjusted *t*-statistics with 12 lags for each estimate. "*" indicates statistical significance at 10% confidence level, "**" at 5% level, "***" at 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ST	–0.07***	–0.09***	–0.09***	–0.10***	–0.10***	–0.10***	–0.09***	–0.09***	–0.09***	–0.09***	–0.03***	–0.03***
	(–7.26)	(–8.27)	(–8.89)	(–10.84)	(–10.91)	(–11.38)	(–11.85)	(–11.51)	(–13.17)	(–13.10)	(–5.28)	(–5.68)
IVOL		0.17***	0.08**	0.08**	0.07*	0.07*	0.06*	0.06*	0.06**	0.06**	0.08***	0.09***
		(4.00)	(2.24)	(2.10)	(1.87)	(1.79)	(1.93)	(1.90)	(2.53)	(2.39)	(3.16)	(3.43)
DR			0.10**	0.09**	0.09**	0.09**	0.07**	0.08**	0.07***	0.07***	0.07***	0.06***
			(2.33)	(2.28)	(2.36)	(2.49)	(2.24)	(2.39)	(3.37)	(3.36)	(2.93)	(2.68)
CR				0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.03	0.03
				(0.61)	(0.62)	(0.35)	(0.47)	(0.51)	(0.93)	(0.99)	(1.30)	(1.48)
ILLIQ					0.02**	0.02**	0.02**	0.02**	0.02***	0.02***	0.02***	0.02**
					(2.27)	(2.16)	(2.33)	(2.50)	(3.01)	(3.44)	(3.03)	(2.53)
β_{Mkt}						0.02	0.02	0.02	0.02	0.02	0.01	0.01
						(1.03)	(1.44)	(0.65)	(0.74)	(0.68)	(0.50)	(0.51)
β_{Def}							–0.01	–0.01	0.00	0.01	–0.01	0.00
							(–0.60)	(–0.20)	(0.11)	(0.32)	(–0.31)	(–0.15)
β_{Term}								0.01	0.00	0.01	0.01	0.01
								(0.55)	(0.16)	(0.30)	(0.51)	(0.45)
Yrtm									0.02	0.02	0.02	0.02
									(0.40)	(0.41)	(0.42)	(0.52)
SIZE										0.01	0.01	0.01
										(0.93)	(1.00)	(0.84)
REV											–0.22***	–0.23***
											(–10.85)	(–11.08)
MoM												–0.06***
												(–3.04)
Intercept	0.50***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***	0.48***
	(7.12)	(6.14)	(6.18)	(6.33)	(6.31)	(6.33)	(6.40)	(6.41)	(6.45)	(6.46)	(6.46)	(6.45)
Aver.R2	0.02	0.12	0.14	0.19	0.19	0.21	0.22	0.23	0.29	0.29	0.32	0.33

Table 8 Robustness: Value-weighted Fama-MacBeth Regression

This table reports results of value-weighted Fama-MacBeth (1973) regression with individual bond next month excess return on bond salience theory value ST and the interaction term of ST and dummy variables identifying upside (SU) or downside (SD) ST groups. Variable SU equals to 1 if the corporate bond is sorted into Groups 7 to 10, otherwise equals to 0. Variable SD equals to 1 if the corporate bond is sorted into Groups 1 to 6, otherwise equals to 0. Each column reports the average regression coefficients from different regression specifications. All the variables are winsorized at 5% to exclude outliers. All the variables are standardized before entering the regressions. *T*-statistics of regression coefficients are presented in the parentheses. The last row reports the average adjusted R-square of each regression specification. We report Newey-West adjusted *t*-statistics with 12 lags for each estimate. "∗" indicates statistical significance at 10% confidence level, "∗∗" at 5% level, "∗∗∗" at 1% level.

	(1)	(2)	(3)
ST	–0.07***		
	(–7.26)		
ST×SD		–0.24***	–0.04***
		(–7.11)	(–4.99)
ST×SU		0.07**	–0.01
		(2.11)	(–1.08)
IVOL			0.09***
			(3.36)
DR			0.06***
			(2.70)
CR			0.03
			(1.49)
ILLIQ			0.01**
			(2.46)
β_{Mkt}			0.01
			(0.48)
β_{Def}			0.00
			(–0.14)
β_{Term}			0.01
			(0.44)
Yrtm			0.02
			(0.50)
SIZE			0.01
			(1.02)
REV			–0.23***
			(–11.04)
MoM			–0.06***
			(–3.04)
Intercept	0.50***	0.39***	0.46***
	(7.12)	(7.07)	(6.54)
Aver.R2	0.02	0.06	0.33