Internet Appendix to “Cross-Sectional Predictability of Corporate Bond Returns”

Friday 18th January, 2019

In this internet appendix, we provide the following results.

- Table A1: Bond and stock trend premium spillover discussed in Section 5.7 of the paper
- Table A2: Stock market anomaly variables and bond trend premium discussed in footnote 12 of the paper
- Table A3: Bond risk, characteristics and cross-sectional expected bond returns

1 Bond and stock trend premium spillover

Panel A of Table A1 reports the returns of stock trend portfolios using the stocks that match bond price information. All H-L returns are statistically significant. Consistent with the finding of Han, Zhou, and Zhu (2016), results show a significant stock trend premium effect. Panel B of Table A1 reports the correlation between bond and stock trend factor portfolio returns. Most correlation coefficients are small and negative and the correlations for lower rating bonds are more negative. Results show little correlation between bond and stock trend factor returns. Thus, bond trend premium is not driven by stock trend premium. The finding of low correlation suggests a potential diversification benefit by investing in both bond and stock trend portfolios.

Gebhardt, Hvidkjaer, and Swaminathan (2005) document a momentum spillover effect in which bond momentum portfolios formed by past six-month stock returns earn abnormal profits. Since the trend strategy use more sophisticated price signals than the conventional momentum strategy, it is unclear whether the spillover effect will still exist in this new strategy. To investigate this possibility, we first use both MA signals of stocks and bonds to forecast expected returns and form trend portfolios based on these expected returns. We then examine whether stock MA signals can enhance the effect of trend premium.

Panel C of Table A1 reports the results using both stock and bond MA signals in the return forecasts. Results show that including the stock MA signals does not improve the profitability of the trend premium strategy. Compared with the results in Table 15 which use only MA signals of corporate bonds, the profits (H-L) are either lower or little changed for the full sample and by rating. Result show no evidence that adding stock trend signals improves the profits.

Another way to control for the effect of stock trend premium on the bond trend premium is to adjust the bond return by the effect of stock trend. To obtain this "stock-adjusted" return, for each firm-level bond return, we subtract the average monthly return of bonds in the quintile of expected stock returns (formed by stock MA signals) to which the bond belongs. The firm-level bond returns are the returns averaged across all bonds issued by the firm weighted by issuing size.

Using this adjustment method, we control the effect of stock trend premium on the firm-level bond trend premium.[1]

Panel D of Table A1 reports the results of the raw firm-level bond returns and "stock-adjusted" firm-level bond returns. Results show that adjusting the effect of stock trend premium does not weaken the bond trend premium effect. The H-L portfolio returns continue to be highly significant for the full sample and the subsamples by rating. The bond trend premium once again shows a monotonic pattern that the profit increases as the rating decreases.

We further analyze the interactions of bond and stock trend premium by performing bivariate portfolio sorts. Bond returns are independently sorted into 5 x 5 portfolios based on bond and stock MA signals, respectively. Panel E of Table A1 reports the average returns of the portfolios over the one-month holding period. Results based on the full sample show that bond trend premium is present in all stock MA quintiles. Bond trend profits range from 1.08 to 1.37 percent monthly. There is no systematic pattern across the stock trend quintiles. We find no significant trend premium spillover from stocks to bonds at the 5% level. The spillover is slightly larger for the high bond quintile portfolio, which is only significant at the 10% level. When we divide the full sample into different rating categories, we find a similar pattern. The only discernible difference is that the trend premium spillover is stronger for speculative-grade bonds where it is significant at the 5% level for the second bond quintile and the high bond quintile. Results show that the trend premium spillover can vary for bonds with different ratings. However, there are pervasive bond trend premium effects which are not resulting from stock trend premium spillover.

We next perform the regression analysis which permits multiple controls for other variables. We run the Fama-MacBeth cross-sectional regressions of monthly bond returns against the expected bond returns using both bond and stock MAs, lagged bond returns and past ratings. Specifically, we run the following cross-sectional regression for each month:

[1]We also follow Gebhardt et al. (2005) by using the regression approach to calculate the stock-adjusted bond returns. For each bond in month t, we run regression of the bond return on the stock return using their last five years data, $r_{i,t} = \alpha_i + \beta_i r_{i,st} + \varepsilon_{i,t}$, where $r_{i,st}$ is firm i's stock return in month t. We then calculate the stock-adjusted bond return in month t by $r_{i,t} - \hat{\beta}_i r_{i,st}$. The results are similar.

$$r_{i,t} = c_{0,t} + c_{1,t}E_r^B + c_{2,t}E_r^S + c_{3,t}r_{i,t-1} + c_{4,t}Rating_{i,t-1} + e_{i,t},$$

where E_r^B is the expected bond return using bond MA signals, E_r^S is the expected bond return using stock MA signals, $r_{i,t-1}$ is the lagged bond returns and $Rating_{i,t-1}$ is the past bond rating.

Panel F of Table A1 reports the results of cross-sectional regressions. The top of the table show the results based on the full sample (All). Consistent with the portfolio analysis, results in row 1 show that bond MAs have a highly significant coefficient. When using stock MAs as an explanatory variable, we find that the coefficient is also significant at the 1% level but the size of coefficient is much smaller than that of the bond MAs. Also, the adjusted R-squares is only 1.58%. When both bond and stock MAs are included in the regression, the coefficient of stock MAs drops a little but the coefficient of bond MAs remains intact. The coefficient of bond MAs is much larger that of stock MAs, indicating that bond MAs have a much stronger effect than stock MAs on bond returns.

When we further add the lagged bond return, it has a negative coefficient which is statistically significant, suggesting a return reversal. The rating has a significant positive effect on bond returns when used alone in the regression. However, it becomes insignificant when we include it along with other explanatory variables.

The results of cross-sectional regressions by rating reveal additional information. When used alone, stock MAs have no significant effect for high-quality bonds (AAA) but have a significant effect for other bonds. The size of stock MAs coefficient increases as the rating decreases, suggesting that the trend premium spillover is more pronounced for lower-grade bonds. When used with bond MAs, the effect of stock MAs is significant for bonds with a rating of A and below. Ratings have no significant effect when used with other variables in the regression.

Overall, the results show that bond trend premium is not driven by stock trend premium spillover and suggest that the former represents an independent effect. However, we also find some evidence of trend premium spillover from stocks to bonds. This finding suggests that some information or events for the firm affect both stock and bond returns. The effect of stock trend premium spillover is stronger for lower-grade bonds, consistent with the traditional view that lower-grade bonds behave more like stocks. More importantly, all results clearly show that bond MAs contain important information for predicting future bond returns and this finding is robust to different controls for credit ratings and past bond and stock returns.

[Inset Table A1]

2 Stock market anomaly and trend premium

Chordia, Goyal, Nozawa, Subrahmanyam, and Tong (2017) and Choi and Kim (2018) show that stock market anomaly variables have the ability to predict the cross-sectional variations of expected corporate bond returns. In this section, we examine the robustness of our results to controls for these variables. Following Chordia et al. (2017) and Choi and Kim (2018), we construct the following stock market anomaly variables for each firm in our sample:

- Size: the natural logarithm of the market value of firm equity.
- Value: the ratio of book value to market value of equity.
- Accruals: the ratio of accruals to assets. Accruals are calculated by change in (current assets − cash and short-term investment − current liabilities + debt in current liabilities + income tax payable) − depreciation.
- Asset growth: the percentage change in total assets.
- Profitability: the ratio of equity income to book equity. Equity income is defined as income before extraordinary items − dividends on preferred shares + deferred taxes.
- Net stock issues: the change in the natural log of the split-adjusted shares outstanding.
- Earnings surprise: the change in split-adjusted earnings per shares divided by price.
- Idiosyncratic volatility: the residuals from three factor model regression for the issuer's equity over each month.

We first perform a bivariate portfolio analysis to control for the impact of stock market anomaly variables. We sort the firm-level returns each month by an individual stock market anomaly variable into three groups (Low, Medium and High). For each group, we conduct the trend premium analysis. If the trend premium is driven by these stock market anomaly variables, we should not find significant trend premium once the effects of these variables are controlled.

Panel A of Table A2 reports the results of bivariate portfolio analysis. Results continue to show strong trend premium in each group, suggesting that the trend premium in corporate bond market is not driven by stock market anomaly variables. The results for investment-grade bonds are much stronger than for junk bonds. These results are different from those without controlling for stock market anomaly variables. This implies stock market anomaly variables explain the cross-section of junk bonds more than the cross-sectional of investment-grade bonds, which is consistent with the view that junk bonds behave more like stocks.

We next run the cross-sectional regression of firm-level bond returns on their return forecasts with and without stock market anomaly variables as controls each month. Panel B of Table A2 reports the mean, t-stats of coefficients of return forecast and the mean adjusted R-squared of cross-sectional regressions. The results continue to show that there is significant relationship between bonds' return forecasts and their future returns with and without the stock market control variables. The increase in adjusted R-squared by adding stock market anomaly variables is more significant for speculative-grade bonds than for investment-grade bonds, which again shows more important role played by stock market anomaly variables in the high-yield bond market.

[Insert Table A2]

3 Bond risk, characteristics and cross-sectional expected bond returns

One question of great interest is to understand why the cross-sectional expected bond returns using bond trend signals could forecast the bond returns well. One possible reason is that the expected bond returns reflect the information about bond risk and characteristics. For example, the bonds with high bond trend returns might have high risks. They might also have bond characteristics that tend to generate high expected returns. We address this question by running the WLS Fama-Macbeth cross-sectional regression of bond expected returns on bond risk and characteristics. The weights used are the inverse of variance of corporate bond returns estimated using the whole sample data as suggested by Shanken and Zhou (2007). We use the beta of term, default, Fama-French three factor and momentum factor to measure the risk of individual bonds. The betas are estimated using time series regression of last five years data. We only choose the bonds that have at least twenty observations used in the regressions. The bond characteristics variables include bond indiosyncratic volatility (Ivol), age, maturity, size, coupon rate and bond rating. All the betas and characteristic variables are standardized in each month to have mean of zero and variance of one.[2]

Table A3 reports the cross-sectional results. When only term beta (β_{TERM}) is used, the coefficient is significantly positive and explains up to 7.84% of the cross-sectional expected bond returns. Default beta (β_{DEF}) is also significantly positive and explains 5.33% of the cross-sectional expected bond returns. Term beta and default beta jointly explain 12.84% of the cross-sectional expected bond returns. The betas of Fama-French three factor and momentum factor also help explain the cross-sectional bond expected returns. The mean adjusted R-squared increase to 23.40% when they are used in the regressions. The coefficient of indiosyncratic volatility (Ivol) is highly positive and significant. The use of Ivol increases the adjusted R-squared by more than 4%.

Introducing other bond characteristic variables including age, maturity, size, coupon rate and bond rating significantly increases the explanatory power from 27.48% to 46.74%. All coefficients of bond characteristic variables are significant and consistent with the literature. For example, the coefficient of size is negative, which implies that bonds with high trend tend to be small. The coefficient of coupon rate is positive, and suggests that bonds with high trend tend to pay high coupon. The coefficients of term and default beta become insignificant once the bond characteristic

[2] We also control the standardized variables to be between -10 and 10.

variables are used in the regressions. Overall, both bond risks and characteristic variables explain nearly half of the cross-sectional expected bond returns. This leaves a future research question about how to explain the other half.

[Insert Table A3]

References

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Chordia, T., Goyal, A., Nozawa, Y., Subrahmanyam, A., Tong, Q., 2017. Are capital market anomalies common to equity and corporate bond markets? An empirical investigation. Journal of Financial and Quantitative Analysis 52, 1301–1342.

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Shanken, J., Zhou, G., 2007. Estimating and testing beta pricing models: Alternative methods and their performance in simulations. Journal of Financial Economics 84, 40–86.

Table A1. Bond and stock trend premium spillover

This table reports the returns of quintile bond (stock) portfolios sorted by bond (stock) expected returns. We only use the bonds of public firms or the stocks that have bonds outstanding in this analysis. For bonds, the MA signals include the bond's moving average yields with lag lengths 1-, 3-, 6-, 12-, 24-, 36-, and 48-months. The MA signals for stocks include the stock's MAs with lag lengths 3-, 5-, 10-, 20-, 50-, 100-, 200- 400-, 600-, 800- and 1000-days. We then sort the bonds (stocks) into quintile portfolios (Low, 2, 3, 4, and High) based on their expected returns. H-L is the return difference between High and Low portfolios. Portfolios are equally weighted and rebalanced in every month. The t-statistics measure the significance of H-L returns. The sample period of bonds is from January 1973 to September 2015, while the sample period of stocks is from January 1973 to December 2014. Panel A reports the results of stock trend portfolios. Panel B reports the correlation between the bond and stock trend factor portfolios. Panel C reports the results of bond trend portfolios using both bond and stock's MAs. Panel D reports the results using firm-level bond returns and stock-adjusted bond returns. Monthly firm-level bond returns are average returns across all available bonds weighted by issuing size. The stock-adjusted bond return is calculated by subtracting the average monthly bond return of the expected return decile to which the bond belongs in that month using stock MAs from each bond-month return. Panel E reports the returns of 5×5 independently sorted portfolios based on bond and stock MAs respectively. In panel F, we run the monthly Fama-MacBeth cross-sectional regressions of monthly bond returns on expected bond returns using bond MAs (E_r^B), expected returns using stock MAs (E_r^S), lagged bond returns ($r_{i,t-1}$) and lagged bond numeric ratings ($Rating_{i,t-1}$):

$$r_{i,t} = c_{0,t} + c_{1,t}E_r^B + c_{2,t}E_r^S + c_{3,t}r_{i,t-1} + c_{4,t}Rating_{i,t-1} + e_{i,t}.$$

The numeric ratings are defined as $1 = AAA, 2 = AA+, 3 = AA, , 20 = CC, 21 = C$ and below. We do not use $Rating_{i,t-1}$ for the regressions within AAA since they are all one. Panel F reports the time-series averages of the cross-sectional regression coefficients with t-statistics and average adjusted R-squared. [a], [b], and [c] indicate the significance level of 1%, 5% and 10%, respectively.

Panel A. Stock portfolios

Rating	Low	2	3	4	High	H-L	t-stats
All	1.08	1.21	1.33	1.56	2.12	1.04	2.57
AAA	0.61	1.54	1.32	1.63	1.96	1.35	1.84
AA	1.08	1.14	1.41	1.54	1.85	0.77	1.75
A	1.25	1.17	1.39	1.51	1.97	0.71	2.02
BBB	1.16	1.26	1.40	1.62	1.99	0.84	2.26
Junk	1.05	1.25	1.20	1.59	2.14	1.09	2.14

Panel B. Correlation between bond and stock trend factor portfolio returns

	All	AAA	AA	A	BBB	Junk
Correlation	-0.06	-0.03	0.04	0.04	-0.15[a]	-0.03

Panel C. Bond portfolios by MAs of bonds and stocks

Rating	Low	2	3	4	High	H-L	t-stats
All	0.32	0.53	0.65	0.81	1.24	0.92	6.92
AAA	0.52	0.47	0.60	0.70	0.83	0.32	2.46
AA	0.36	0.50	0.63	0.75	1.04	0.68	6.00
A	0.30	0.49	0.62	0.76	1.20	0.90	7.22
BBB	0.41	0.54	0.65	0.84	1.31	0.90	6.39
Junk	0.44	0.64	0.83	1.03	1.48	1.04	6.31

Panel D. Firm-level bond returns and stock-adjusted bond returns

	Firm-level bond returns				Stock-adjusted bond returns			
Rating	Low	High	H-L	t-stats	Low	High	H-L	t-stats
All	0.40	1.11	0.71	6.23	-0.40	0.51	0.91	17.66
AAA	0.48	0.97	0.49	3.51	-0.28	0.40	0.68	10.20
AA	0.41	0.94	0.53	4.80	-0.32	0.40	0.72	15.45
A	0.39	1.07	0.68	5.29	-0.39	0.53	0.92	17.07
BBB	0.38	1.16	0.78	6.11	-0.39	0.52	0.91	12.27
Junk	0.48	1.41	0.94	4.83	-0.38	0.83	1.20	8.14

Panel E. Bivariate portfolio returns

	Stock quintiles	Bond quintiles Low	2	3	4	High	H-L	*t*-stats
All	L	0.18	0.51	0.59	0.71	1.08	0.91	6.21
	2	0.30	0.55	0.64	0.91	1.24	0.93	6.66
	3	0.23	0.47	0.65	0.83	1.13	0.90	6.08
	4	0.32	0.57	0.74	0.86	1.28	0.96	7.51
	H	0.35	0.65	0.70	0.87	1.37	1.02	7.75
	H-L	0.18	0.15	0.10	0.16	0.29		
	t-stats	1.38	1.20	0.80	1.21	1.93		
AAA	L	0.32	0.52	0.58	0.74	1.20	0.87	5.51
	2	0.08	0.37	0.45	0.48	1.00	0.92	4.62
	3	0.48	0.60	0.54	0.94	1.02	0.54	2.09
	4	0.43	0.56	0.47	0.74	1.02	0.60	2.80
	H	0.33	0.63	0.53	0.72	1.24	0.90	3.89
	H-L	0.01	0.11	-0.05	-0.02	0.04		
	t-stats	0.06	0.65	-0.29	-0.09	0.18		
AA	L	0.33	0.51	0.63	0.75	1.08	0.75	6.01
	2	0.31	0.49	0.59	0.70	0.99	0.68	5.36
	3	0.24	0.49	0.59	0.67	1.04	0.81	6.42
	4	0.26	0.52	0.66	0.74	1.08	0.82	6.26
	H	0.26	0.47	0.64	0.71	1.06	0.80	6.38
	H-L	-0.07	-0.03	0.00	-0.03	-0.02		
	t-stats	-0.62	-0.28	0.04	-0.26	-0.16		
A	L	0.25	0.44	0.51	0.71	1.13	0.88	5.59
	2	0.22	0.54	0.68	0.72	1.22	1.00	7.09
	3	0.19	0.49	0.61	0.73	1.22	1.03	7.34
	4	0.23	0.54	0.66	0.76	1.32	1.08	7.44
	H	0.36	0.53	0.69	0.85	1.44	1.08	7.43
	H-L	0.11	0.09	0.18	0.14	0.30		
	t-stats	0.85	0.71	1.36	1.05	1.80		
BBB	L	0.27	0.65	0.64	0.65	1.15	0.88	4.06
	2	0.13	0.55	0.70	0.80	1.38	1.25	7.11
	3	0.35	0.61	0.72	0.87	1.42	1.07	6.95
	4	0.29	0.56	0.70	0.89	1.50	1.21	7.74
	H	0.35	0.62	0.82	0.96	1.55	1.20	6.79
	H-L	0.08	-0.03	0.18	0.31	0.40		
	t-stats	0.41	-0.18	1.21	1.81	1.96		
Junk	L	0.16	0.09	0.45	0.97	1.24	1.08	3.90
	2	0.44	0.72	0.91	1.22	2.07	1.63	5.17
	3	0.09	0.39	0.94	1.00	1.68	1.59	6.00
	4	0.37	0.47	0.85	0.92	1.52	1.15	4.66
	H	0.32	0.74	0.87	1.13	1.68	1.36	3.86
	H-L	0.17	0.65	0.42	0.16	0.44		
	t-stats	0.64	2.76	1.66	0.62	2.20		

Panel F. Cross-sectional regressions of bond returns on bond and stock MA signals

Model	c_0	t-stats	E_r^B	t-stats	E_r^S	t-stats	$r_{i,t-1}$	t-stats	Rating	t-stats	$adj.R^2$
						All					
1	0.14	(1.50)	0.65	(13.23)							8.98
2	1.67	(8.25)			0.26	(4.59)					1.58
3	1.19	(5.34)	0.68	(14.34)	0.24	(4.26)					10.42
4	1.38	(6.25)	0.56	(11.29)	0.25	(4.57)	-0.08	(-5.23)			16.69
5	0.57	(8.22)							0.02	(3.57)	2.75
6	1.21	(5.89)	0.61	(11.91)	0.24	(4.75)	-0.08	(-5.39)	0.00	(-0.31)	18.65
						AAA					
1	0.00	(-0.01)	0.43	(9.21)							11.92
2	6.75	(2.14)			0.08	(1.69)					4.12
3	4.29	(1.01)	0.44	(9.71)	0.11	(1.64)					16.30
4	-3.26	(-0.88)	0.31	(5.34)	0.06	(0.88)	-0.22	(-4.65)			29.61
						AA					
1	-0.30	(-2.64)	0.64	(12.10)							14.64
2	0.89	(3.54)			0.08	(2.14)					1.53
3	-0.15	(-0.53)	0.65	(12.02)	0.07	(1.69)					16.25
4	0.09	(0.34)	0.59	(11.34)	0.04	(1.07)	-0.09	(-4.63)			25.53
5	0.64	(8.19)							0.00	(-0.26)	1.36
6	0.11	(0.40)	0.59	(11.41)	0.05	(1.35)	-0.09	(-4.68)	-0.00	(-0.03)	26.27
						A					
1	-0.43	(-3.07)	0.68	(11.19)							14.04
2	0.91	(3.81)			0.11	(2.18)					1.24
3	-0.56	(-1.92)	0.69	(11.40)	0.16	(3.04)					15.40
4	-0.35	(-1.24)	0.64	(11.02)	0.21	(3.97)	-0.07	(-3.82)			22.93
5	0.49	(4.79)							0.05	(2.26)	1.46
6	-0.37	(-1.29)	0.64	(11.09)	0.19	(3.89)	-0.07	(-3.85)	0.00	(0.08)	24.04
						BBB					
1	-0.02	(-0.12)	0.52	(8.14)							13.54
2	1.72	(2.79)			0.18	(3.09)					3.55
3	-0.47	(-0.71)	0.55	(8.32)	0.34	(4.57)					16.73
4	-1.63	(-2.17)	0.52	(8.63)	0.22	(3.70)	-0.01	(-0.17)			25.21
5	0.73	(4.55)							0.03	(1.81)	0.55
6	-1.02	(-1.37)	0.52	(8.56)	0.22	(3.60)	0.01	(0.29)	0.01	(0.60)	25.33
						Junk					
1	0.14	(0.86)	0.39	(7.88)							10.05
2	-5.46	(-2.75)			0.26	(4.72)					5.22
3	-3.55	(-2.34)	0.42	(8.12)	0.23	(4.33)					14.28
4	-2.13	(-1.55)	0.23	(3.65)	0.23	(4.44)	-0.13	(-4.14)			19.17
5	0.60	(2.71)							0.03	(1.89)	4.15
6	-0.92	(-0.45)	0.25	(3.72)	0.20	(3.68)	-0.19	(-3.59)	0.01	(0.47)	20.43

Table A2. Stock market anomaly variables and bond trend premium
This table report the results of bond trend premium controlling for stock market anomaly variables. Following Chordia et al. (2017) and Choi and Kim (2018), we consider eight stock market anomaly variables including the size, value, accruals, asset growth, profitability, net stock issuance, earnings surprise, and idiosyncratic volatility. We sort the firm-level return observations in each month by their individual stock market anomaly variables into three groups (Low, Medium and High). In each group we run the bond trend premium analysis to calculate the H-L returns. Panel A report these results. We next run the cross-sectional regression of firm-level bond returns on their return forecasts with and without the stock market anomaly variables as controls each month. The mean, t-stats of coefficients of return forecast and the mean adjusted R-squared of cross-sectional regressions are reported in Panel B.

Panel A. Trend portfolios controlling for firm characteristic variables

	Low		Medium		High		Low		Medium		High	
	H-L	t-stats	H-L	t-stats	H-L	t-stats	H-L	t-stats	H-L	t-stats	H-L	t-stats
			Size						Value			
ALL	0.72	5.9	0.55	4.43	0.57	5.08	0.64	5.2	0.64	5.16	0.46	3.66
IG	0.75	6.12	0.63	4.88	0.52	4.63	0.65	5.29	0.64	5.38	0.59	4.83
Junk	0.61	2.69	0.99	3.29	0.57	2.22	0.6	2.63	0.38	1.8	0.05	0.19
			Accruals						Asset growth			
ALL	0.42	3.31	0.6	4.85	0.54	4.15	0.5	3.94	0.61	5.14	0.52	4.1
IG	0.56	4.34	0.61	4.96	0.72	5.66	0.61	5.14	0.63	5.31	0.64	5.17
Junk	-0.32	-1.29	0.02	0.1	0.15	0.59	0.39	1.76	0.36	1.21	0.54	2.68
			Profitability						Net stock issuance			
ALL	0.55	4.44	0.70	5.55	0.56	4.78	0.59	4.89	0.49	3.91	0.62	4.72
IG	0.59	4.67	0.72	5.72	0.66	5.65	0.62	5.28	0.69	5.65	0.56	4.33
Junk	0.33	1.73	0.65	2.73	0.02	0.09	0.60	2.48	0.29	1.12	0.61	2.00
			Earnings surprise						Idiosyncratic volatility			
ALL	0.49	3.86	0.73	6.03	0.68	5.43	0.70	6.26	0.52	4.16	0.68	5.18
IG	0.65	5.32	0.68	5.53	0.59	4.62	0.72	6.35	0.55	4.28	0.64	5.06
Junk	0.43	1.66	0.33	1.40	0.58	2.68	0.43	1.74	0.45	1.90	0.59	2.08

Panel B. Regression

	Without controlling variables			With controlling variables		
	Coefficient	t-stats	$Adj.R^2$	Coefficient	t-stats	$Adj.R^2$
All	0.60	9.53	8.33	0.71	11.03	16.35
IG	0.78	11.90	10.17	0.83	11.50	15.72
Junk	0.44	2.18	7.52	0.71	1.98	18.74

Table A3. Bond risk, characteristics and cross-sectional of expected bond returns.

This table reports the results of weighted least squares (WLS) Fama-Macbeth cross-sectional regression of monthly expected bond returns on bond risk and characteristics. The weights used are the inverse of variance of corporate bond returns estimated using the whole sample data as suggested by Shanken and Zhou (2007). Bond risk measures include term beta (β_{TERM}), default beta (β_{DEF}), Fama-French three factor beta (β_{MKT},β_{SMB} and β_{HML}) and momentum factor beta (β_{MOM}). The betas at time t are estimated using the information between $t-60$ and t. Bond characteristics variables include bond return indiosyncratic volatility (Ivol), Age, maturity (Mat.), size, coupon rate, and bond rating. The indiosyncratic volatilities at time t are measured by the standard deviation of the residuals from the time series regression of bond returns on term, default, Fama-French three factors and momentum factor using last five years data. The sample period is from January 1973 to September 2015.

	β_{TERM}	β_{DEF}	β_{MKT}	β_{SMB}	β_{HML}	β_{MOM}	Ivol	Age	Mat.	Size	Coupon	Rate	$Adj.R^2$ (%)
Coef.	0.04												7.84
t-stats	(6.40)												
Coef.		0.05											5.33
t-stats		(3.64)											
Coef.	0.05	0.05											12.84
t-stats	(7.38)	(3.57)											
Coef.	0.05	0.07	0.07	0.03	-0.01	-0.04							23.40
t-stats	(5.88)	(4.48)	(4.00)	(1.77)	(-0.54)	(-2.15)							
Coef.	0.04	0.04	0.03	0.01	-0.01	-0.03	0.10						27.48
t-stats	(5.41)	(2.63)	(1.36)	(0.77)	(-0.34)	(-1.83)	(8.90)						
Coef.	-0.01	-0.01	0.02	0.02	0.01	0.01	0.03	-0.03	0.09	-0.02	0.03	0.03	46.74
t-stats	(-1.08)	(-0.64)	(1.76)	(3.55)	(1.64)	(2.05)	(4.78)	(-4.59)	(7.86)	(-4.98)	(3.38)	(6.93)	