

Internet Appendix for:
“Cyclical Dispersion in Expected Defaults”

March, 2018

Contents

1 Robustness Tests

The results presented in the main text are robust to the definition of debt repayments, and the inclusion of other variables. The results are also robust to the choice of frequency. In this latter case, portfolios are constructed directly using Compustat annual data. The following empirical results are run on non-financial non-regulated companies only.

1.1 *Cash-flows to Debtholders*

Table ?? and Table ?? reports the predictability results at annual frequency, when debt repayment is computed using the statement of cash-flows data. Debt repayment is long term debt repayed ($dltr$) plus interest paid ($xint$) minus long term debt issued ($dltis$) and change in short term debt ($ustdnc$). Regressions involving macroeconomic aggregates control for the dependent variable between time $t - 1$ and t . Excess Bond return regressions control for GDP between time $t - 1$ and t .

1.2 *Credit Spread Predictability*

Table ?? through ?? reproduce the credit spread predictability on the data and in the model. In the data, ?'s spread or EBP are the data posted by ?. BAA minus AAA instead is computed as Moody's Seasoned Baa Corporate Bond Yield (BAA) minus Moody's Seasoned Aaa Corporate Bond Yield (AAA), both retrieved from FRED. In the model we construct these indexes as follows. ?'s spread is a simple unweighted cross-sectional average of all credit spreads in the economy. ?'s EBP is constructed by first subtracting the probability of default times the loss given default (one minus the recovery rate) from credit spreads, and then taking a simple unweighted cross-sectional average of them. Both constructions follow closely the definitions in ?. As to BAA minus AAA, we approximate it with the difference in yields between High Yield firms and Investment grade firms, as defined in the main text (top

one-fifth of EDF versus bottom four-fifth of EDF).

1.3 *Alternative Default Probability Models*

In Table ?? and ??, we reproduce the results for the predictability regressions when dispersion computed from the estimates by ? (Table IV, 0 lag) is used.

1.4 *Multivariable Forecasting of Macroeconomic Quantities*

Table ?? presents the results from a host of additional robustness tests for the OLS predictability regression of output (Panel A) and investment growth (Panel B) at 1 quarter and 2 quarters. As independent variables, we use other economic series that have been empirically found helpful predictors of the economic cycle.

In column (a) we forecast macroeconomic quantities using only the average Expected Default Frequency of net repayers. The estimate exhibits a negative sign and is statistically significant at 1% level in all the cases. In column (b) we regress the same variables onto *Dispersion*, as shown in the main text. In column (c) we forecast the macroeconomic quantities using *Dispersion* and the ? Excess Bond Premium. Results are impaired by the high collinearity between the two series. *Dispersion*, which is a naive linear combination of the EDF of repayers and the one of issuers and not the one maximally correlated with EBP, has a correlation of 0.65 with EBP. In column (d) we regress the macroeconomic series onto *Dispersion*, the log of the price-dividend ratio, the term spread and the lagged dependent variable. *Dispersion* remains statistically and economically significant.

1.5 *Annual Portfolios*

In this section, we present the OLS regression estimates from predicting macroeconomic quantities and bond returns using both our *Dispersion* measure and ? *ISSEDF*. Results align

with the quarterly estimates presented in the main text. Please notice that ? measure is a decile-based measure and not a probability measure, which requires a different interpretation of the coefficient estimates compared to ours. Furthermore, please notice that ? subtract the average EDF decile of repayers from the average EDF decile of issuers, while we subtract the average EDF of issuers from the one of repayers (as repayers have always a higher average EDF). The interpretation with their measure is as follows: when firms with high net debt issuance have EDFs that are on average one decile higher than firms with low net debt issuance, excess returns on high yield bonds is expected to be 12% lower next year and excess returns on investment grade bonds 2% lower.

2 Additional Empirical Results

This section reports a few additional results concerning *Dispersion* in credit quality and other dispersion measures based on individual firms' credit-risk.

Figure ?? plots both the CBOE VIX and our main dispersion measure (based on debt repayers and issuers). Dispersion is closely related to the CBOE Volatility Index but there are some periods, like the early 90s or 2015, where a higher volatility did not necessarily imply higher default risk and vice-versa.

Table ?? demonstrates that *Dispersion* in credit quality (the one based on debt repayment) is also a strong predictor of unemployment growth.

Table ?? reports the results from out-of-sample predictability of bond returns. To interpret the economic significance of such results we use the formula suggested by ?. It can be proven that the Sharpe ratio (s^*) earned by an investor who uses the entire information from those predictability regressions (R^2) and the Sharpe ratio (s_0) otherwise earned via a buy-and-hold

strategy are related according to the following formula

$$s^* = \sqrt{\frac{s_0^2 + R^2}{1 - R^2}}$$

Given an annualized Sharpe ratio for the buy-and-hold strategy of 0.375 (obtained multiplying the quarterly Sharpe ratio by $\sqrt{2}$) and a predictive quarterly R^2 of 5.3%, the implied annualized Sharpe ratio for an active investor is about 0.51. As regards investment-grade bonds, the annualized Sharpe ratio for a buy and hold strategy equals 0.54 and once we account for the predictive information available to investors, we observe that an active investor could reach a Sharpe ratio of 0.61. In the same table we report the 25–75 confidence interval of the R^2 statistics based on 1000 bootstrapped samples of the same size of the actual sample used for the estimation.

References

- Campbell, J. Y., Hilscher, J., Szilagyi, J., 2008. In search of distress risk. *Journal of Finance* 63, 2899–2939.
- Cochrane, J. H., 1999. New facts in finance. *Economic Perspectives*, Federal Reserve Bank of Chicago 23, 36–58.
- Gilchrist, S., Zakrajšek, E., 2012. Credit spreads and business cycle fluctuations. *American Economic Review* 102, 1692–1720.
- Greenwood, R., Hanson, S. G., 2013. Issuer quality and corporate bond returns. *Review of Financial Studies* 26, 1483–1525.
- Merton, R. C., 1974. On the pricing of corporate debt: the risk structure of interest rates. *The Journal of Finance* 29, 449.
- Newey, W. K., West, K. D., 1987. A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica* 55, 703–708.

Table 1. Forecasting Macroeconomic Quantities: Cash flow to debtholders

	Horizon k (years)	
	1	2
Panel A: Δ GDP $_{t \rightarrow t+k}$		
β_1	-0.28^{***} [−3.08]	-0.16^* [−1.96]
R^2	0.324	0.162
Panel B: Δ Investment $_{t \rightarrow t+k}$		
β_1	-1.26^{***} [−4.06]	-0.72^{***} [−2.84]
R^2	0.372	0.195

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{\Delta y_{t \rightarrow t+k}} = \alpha + \beta_1 \text{Dispersion}_t + \beta_2 \Delta y_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports the slope coefficients and R^2 statistics from predictive regressions of average GDP growth (Panel A) and Investment growth (Panel B) over various horizons onto dispersion in credit quality (*Dispersion*) and growth in the dependent variable between time t and $t - 1$. We define dispersion in four different ways. Dispersion is the average EDF of firms in the higher quintile of cashflows to debtholders minus the average EDF of firms in the lowest. We construct t -statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon. Data are quarterly from January 1976 until September 2013. Statistical significance levels at 5% and 1% are denoted by ** and ***, respectively.

Table 2. Forecasting Excess Returns on Bonds: Cash flow to debt holders

	Horizon k (years)	
	1	2
Panel A: Investment Grade		
β_1	0.78** [2.71]	0.62*** [3.48]
R^2	0.195	0.334
Panel B: High Yield		
β_1	1.52* [1.75]	1.39*** [3.09]
R^2	0.214	0.421

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{r\bar{x}}_{t \rightarrow t+k} = \alpha + \beta_1 \text{Dispersion}_t + \beta_2 \Delta y_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports the slope coefficients and R^2 statistics from predictive regressions of average excess log returns on investment grade bonds (Panel A) and high yield bonds (Panel B) over various horizons onto dispersion in credit quality (*Dispersion*) and growth in GDP between time $t - 1$ and t . We define dispersion in four different ways. Dispersion is the average EDF of firms in the higher quintile of cashflows to debtholders minus the average EDF of firms in the lowest. We construct t -statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon. Investment-grade bond data are from January 1976 until September 2013. High-yield bond data are from January 1987 to June 2013. Statistical significance levels at 5% and 1% are denoted by ** and ***, respectively.

Table 3.
Forecasting Macroeconomic Quantities: ?'s Spread

		Horizon k				
		1	2	3	4	8
Panel A: $\Delta \text{GDP}_{t \rightarrow t+k}$						
β_1	Data	-0.17*** [-2.32]	-0.14* [-2.77]	-0.12 [-1.85]	-0.10 [-1.41]	-0.07 [-1.14]
	Model	-0.30	-0.21	-0.20	-0.17	-0.10
R^2	Data	0.171	0.168	0.144	0.123	0.050
	Model	0.155	0.327	0.351	0.352	0.271
Panel B: $\Delta \text{Investment}_{t \rightarrow t+k}$						
β_1	Data	-0.53** [-2.05]	-0.45 [-1.45]	-0.31 [-1.02]	-0.22 [-0.76]	-0.01 [-0.04]
	Model	-2.56	-1.25	-0.16	0.43	2.27
R^2	Data	0.233	0.186	0.141	0.093	0.020
	Model	0.188	0.037	0.020	0.027	0.070

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{\Delta y_{t \rightarrow t+k}} = \alpha + \beta_1 \text{Credit Spread}_t + \beta_2 \Delta y_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports the slope coefficients and R^2 statistics from predictive regressions of average GDP (Panel A) and average investment growth (Panel B) over various horizons onto ?'s spread and growth in the dependent variable between time $t - 1$ and t in the data and onto the average credit spread and lagged dependent variable growth within the model. ?'s spread is a simple un-weighted cross-sectional average of credit spreads per each month. We present t -statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon, in squared parentheses. Data are quarterly from January 1976 until September 2013. Statistical significance levels at 5% and 1% are denoted by ** and ***, respectively. For the model, simulations are run on $N = 400$ time-series paths of the same length as the empirical sample.

Table 4.
Forecasting Macroeconomic Quantities: BAA minus AAA Credit Spread

		Horizon k				
		1	2	3	4	8
Panel A: $\Delta \text{GDP}_{t \rightarrow t+k}$						
β_1	Data	−0.25 [−1.33]	−0.10 [−0.55]	−0.03 [−0.12]	0.05 [0.19]	0.15 [0.71]
	Model	−0.10	−0.07	−0.06	−0.06	−0.03
R^2	Data	0.148	0.132	0.107	0.094	0.048
	Model	0.157	0.323	0.353	0.353	0.271
Panel B: $\Delta \text{Investment}_{t \rightarrow t+k}$						
β_1	Data	−0.99 [−1.36]	−0.39 [−0.54]	0.09 [−0.11]	0.35 [0.43]	0.68 [1.02]
	Model	−0.83	−0.40	−0.03	0.16	0.80
R^2	Data	0.221	0.161	0.124	0.088	0.050
	Model	0.187	0.038	0.019	0.027	0.073

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{\Delta y_{t \rightarrow t+k}} = \alpha + \beta_1 \text{Credit Spread}_t + \beta_2 \Delta y_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports the slope coefficients and R^2 statistics from predictive regressions of average GDP (Panel A) and average investment growth (Panel B) over various horizons onto BAA minus AAA spread and growth in the dependent variable between time $t - 1$ and t in the data and onto the difference in credit spreads between high yield and investment grade bonds and lagged dependent variable growth within the model. We present t -statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon, in squared parentheses. Data are quarterly from January 1976 until September 2013. Statistical significance levels at 5% and 1% are denoted by ** and ***, respectively. For the model, simulations are run on $N = 400$ time-series paths of the same length as the empirical sample.

Table 5.
Forecasting Macroeconomic Quantities: ?'s Excess Bond Premium

		Horizon k				
		1	2	3	4	8
Panel A: Δ GDP $_{t \rightarrow t+k}$						
β_1	Data	-0.35*** [-3.06]	-0.29** [-2.45]	-0.23* [-1.88]	-0.16 [-1.37]	-0.02 [-0.02]
	Model	-0.36	-0.26	-0.23	-0.21	-0.13
R^2	Data	0.180	0.175	0.142	0.113	0.029
	Model	0.156	0.326	0.352	0.355	0.271
Panel B: Δ Investment $_{t \rightarrow t+k}$						
β_1	Data	-1.39*** [-3.34]	-1.27*** [-2.64]	-0.93* [-1.90]	-0.65 [-1.40]	0.19 [0.45]
	Model	-3.13	-1.52	-0.18	0.55	2.82
R^2	Data	0.257	0.219	0.164	0.107	0.023
	Model	0.188	0.036	0.020	0.027	0.072

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{\Delta y_{t \rightarrow t+k}} = \alpha + \beta_1 \text{Credit Spread}_t + \beta_2 \Delta y_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports the slope coefficients and R^2 statistics from predictive regressions of average GDP (Panel A) and average investment growth (Panel B) over various horizons onto ?'s excess bond premium and growth in the dependent variable between time $t - 1$ and t in the data and onto the average credit spread and lagged dependent variable growth within the model. ?'s excess bond premium is a simple un-weighted cross-sectional average of credit spreads net of the credit spread predicted by the default probability per each month. A quarterly average of the series is then considered. In the model the excess bond premium is computed as simple un-weighted cross-sectional average of credit spreads net of the default probability times the loss upon default. We present t -statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon, in squared parentheses. Data are quarterly from January 1976 until September 2013. Statistical significance levels at 5% and 1% are denoted by ** and ***, respectively. For the model, simulations are run on $N = 400$ time-series paths of the same length as the empirical sample.

Table 6. Forecasting Macroeconomic Quantities: Alternative model

	Horizon k				
	1	2	3	4	8
Panel A: $\Delta \text{GDP}_{t \rightarrow t+k}$					
β_1	-0.26^{**} [−2.41]	-0.12 [−1.16]	-0.05 [−0.53]	0.02 [0.18]	0.05 [0.57]
R^2	0.159	0.137	0.109	0.093	0.033
Panel B: $\Delta \text{Investment}_{t \rightarrow t+k}$					
β_1	-1.15^{***} [−2.98]	-0.77^* [−1.79]	-0.34 [−0.86]	0.05 [0.13]	0.27 [0.74]
R^2	0.242	0.181	0.127	0.082	0.024

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{\Delta y_{t \rightarrow t+k}} = \alpha + \beta_1 \text{Distress}_t + \beta_2 \Delta y_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports coefficients and R^2 statistics from predictive regressions of average GDP (Panel A) and average investment growth (Panel B) over various horizons onto dispersion in credit quality between debt repayers and issuers and growth in GDP between time $t - 1$ and t . Credit quality is measured using the distress risk measure based on ?. We construct t-statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon. Data are quarterly from January 1976 until September 2013. Statistical significance levels at 10%, 5% and 1% are denoted by *, ** and ***, respectively.

Table 7. Forecasting Excess Returns on Bonds: Alternative model

	Horizon k				
	1	2	3	4	8
Panel A: Investment Grade					
β_1	0.74 [1.31]	1.13*** [2.92]	1.03** [2.48]	0.88** [2.25]	0.52* [1.92]
R^2	0.019	0.117	0.135	0.117	0.088
Panel B: High Yield					
β_1	1.80* [1.66]	2.72*** [2.90]	2.59** [2.46]	2.10** [2.48]	1.13*** [2.87]
R^2	0.066	0.198	0.231	0.239	0.337

Source: Barclays Capital, Global Financial Data, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{r\bar{x}}_{t \rightarrow t+k} = \alpha + \beta_1 \text{Distress}_t + \beta_2 \Delta y_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports coefficients and R^2 statistics from predictive regressions of average excess log returns on bonds over various horizons onto dispersion in credit quality between debt repayers and issuers and growth in GDP between time $t - 1$ and t . Credit quality is measured using the distress risk measure based on ?. Panel A reports results for investment grade bonds; panel B reports results for high yield bonds. We construct t-statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon. Investment-grade bond data are quarterly from January 1976 until September 2013. High-yield bond data are quarterly from January 1987 to June 2013. Statistical significance levels at 10%, 5% and 1% are denoted by *, ** and ***, respectively.

Table 8. Multivariable forecasting - Horizon k quarters**Panel A:** $\overline{\Delta \text{GDP}}_{t \rightarrow t+k}$

	$k=1$				$k=2$			
	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
EDF_t^R	-0.29^{***} [−5.80]				-0.23^{***} [−4.38]			
Dispersion_t		-0.40^{***} [−6.05]	-0.25^{***} [−2.67]	-0.33^{***} [−4.55]		-0.31^{***} [−4.54]	-0.18^* [−1.81]	-0.27^{***} [−3.59]
EBP_t			-0.31^{**} [−2.38]				-0.28^* [−1.94]	
$\log(\text{pd})_t$				0.001 [0.48]				0.0003 [0.23]
TS_t				0.12 ^{**} [2.17]				0.16 ^{***} [3.75]
$\overline{\Delta \text{GDP}}_{t-k \rightarrow t}$				0.24 ^{***} [2.60]				0.22 ^{**} [2.11]
R^2	0.134	0.124	0.149	0.226	0.121	0.112	0.140	0.263

Panel B: $\overline{\Delta I}_{t \rightarrow t+k}$

	$k=1$				$k=2$			
	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
EDF_t^R	-1.26*** [-7.48]				-1.00*** [-5.02]			
$Dispersion_t$		-1.10*** [-7.11]	-1.06*** [-3.13]	-1.38*** [-5.14]		-1.38*** [-5.16]	-0.82** [-2.31]	-1.32*** [-4.53]
EBP_t			-1.474*** [-2.90]				-1.15** [-2.33]	
$\log(pd)_t$				0.006 [1.23]				0.005 [1.13]
TS_t				0.52** [2.36]				0.70*** [4.63]
$\overline{\Delta I}_{t-k \rightarrow t}$				0.29*** [3.02]				0.16 [1.32]
R^2	0.192	0.174	0.209	0.335	0.1672	0.1561	0.1921	0.3389

Notes: The table reports coefficients and R^2 statistics from predictive regressions of average GDP growth (Panel A) and average Investment Growth (Panel B) over one and two quarterly horizons for four different specifications. We define dispersion as average EDF of repayers minus average EDF of issuers. EDF_t^R is the average expected default frequency of repayers only. EBP is the quarterly average of the monthly series of ? excess bond premium. $\log(pd)$ is the log of the price-dividend ratio of the CRSP index (all CRSP firms incorporated in the US and listed on the NYSE, AMEX, or NASDAQ). TS refers to the term spread and is computed as the yield (at a quarterly level) on Treasury nominal securities of 10 year “constant maturity” minus the yield (at a quarterly level) on the 3-Month Treasury Bill. We construct t-statistics from ? standard errors, with $k-1$ lags, where k is the regression horizon. Data are quarterly from January 1976 until September 2013. Statistical significance levels at 10%, 5% and 1% are denoted by *, ** and ***, respectively.

Table 9. Forecasting Economic Activity: Horizon 1 and 2 year

Panel A: Δ Per Capita GDP $_{t \rightarrow t+1}$

	(a)		(b)	
	$k=1$	$k=2$	$k=1$	$k=2$
β	-0.35^{**} [−2.17]	-0.22 [−1.60]	-0.14 [−0.22]	-0.35 [−0.56]
R^2	0.0920	0.0589	0.0009	0.0096

Panel B: Δ Per Capita Investment $_{t \rightarrow t+1}$

	(a)		(b)	
	$k=1$	$k=2$	$k=1$	$k=2$
β	-1.42^{**} [−2.50]	-0.90^* [−2.03]	-3.14 [−1.37]	-4.24^* [−1.99]
R^2	0.1096	0.0734	0.0324	0.1046

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: The table presents OLS coefficient estimates and t-statistics in parentheses. We construct t-statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon. Columns (a) presents the results for the raw measure of *Dispersion* in credit quality. Column (b) is ? ISSEDF. The frequency is annual. Statistical significance levels at 10%, 5% and 1% are denoted by *, ** and ***, respectively. Data are from 1973 to 2008.

Table 10. Forecasting Excess Returns on Bonds ($rx_{t \rightarrow t+1}$): Horizon 1 and 2 year

Panel A: Investment Grade

	(a)		(b)	
	$k=1$	$k=2$	$k=1$	$k=2$
β	0.52 [0.99]	0.50 [1.43]	-1.89 [-1.04]	-0.73 [-0.64]
R^2	0.0229	0.0518	0.0184	0.0067

Panel B: High Yield

	(a)		(b)	
	$k=1$	$k=2$	$k=1$	$k=2$
β	2.58 [1.53]	3.97*** [3.64]	-12.03** [-2.35]	-10.93*** [-4.87]
R^2	0.0932	0.3664	0.1131	0.2572

Source: Barclays Capital, Global Financial Data, CRSP/Compustat merged, CRSP

Notes: The table presents OLS coefficient estimates and t-statistics in parentheses. We construct t-statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon. Columns (a) presents the results for the raw measure of *Dispersion* in credit quality. Column (b) is ? ISSEDF. The frequency is annual. Investment-grade bond data are from January 1973 until September 2013. High-yield bond data are from January 1987 to June 2013. Statistical significance levels at 10%, 5% and 1% are denoted by *, ** and ***, respectively.

Table 11. Forecasting Macroeconomic Quantities: Dispersion in debt repayment

	Horizon k				
	1	2	3	4	8
Unemployment					
β_1	1.70*** [3.72]	1.49*** [3.36]	1.23*** [2.68]	1.04** [2.09]	0.38 [0.67]
R^2	0.4818	0.4461	0.3760	0.2926	0.1006

Source: Bureau of Economic Analysis, CRSP/Compustat merged, CRSP

Notes: Estimation of

$$\overline{\Delta Unemp}_{t \rightarrow t+k} = \alpha + \beta_1 \text{Dispersion}_t + \beta_2 \Delta Unemp_{t-1 \rightarrow t} + \epsilon_{t+k}.$$

The table reports coefficients and R^2 statistics from predictive regressions of average unemployment growth over various horizons onto dispersion in credit quality (*Dispersion*). We define dispersion as average EDF of repayers minus average EDF of issuers. We construct t-statistics from ? standard errors, with $k - 1$ lags, where k is the regression horizon. Data are quarterly from January 1976 until September 2013. Statistical significance levels at 5% and 1% are denoted by ** and ***, respectively.

Table 12. Bond Return Predictions - Horizon 1 Quarter

	High Yield		Investment Grade	
	R^2	CI [25, 75]	R^2	CI [25, 75]
Out-of-sample	0.053	[0.033 , 0.138]	0.033	[0.026 , 0.062]

Notes: We report out-of-sample percentage R^2 for OLS forecasts of 1-quarter bond excess returns from from January 1976 until September 2013 for investment grade bonds and from January 1987 to June 2013 for High-yield bonds. The predictor variable is *Dispersion* in credit quality. Our out-of-sample procedure splits the sample after the first 55 observations, uses the first 55 observations as a training window, and recursively forecasts returns using all available information to obtain parameter estimates, i.e. using an increasing estimation window. We also report the 25-75 confidence interval for the R^2 computed using 1000 bootstrapped samples of the same size of the actual samples.

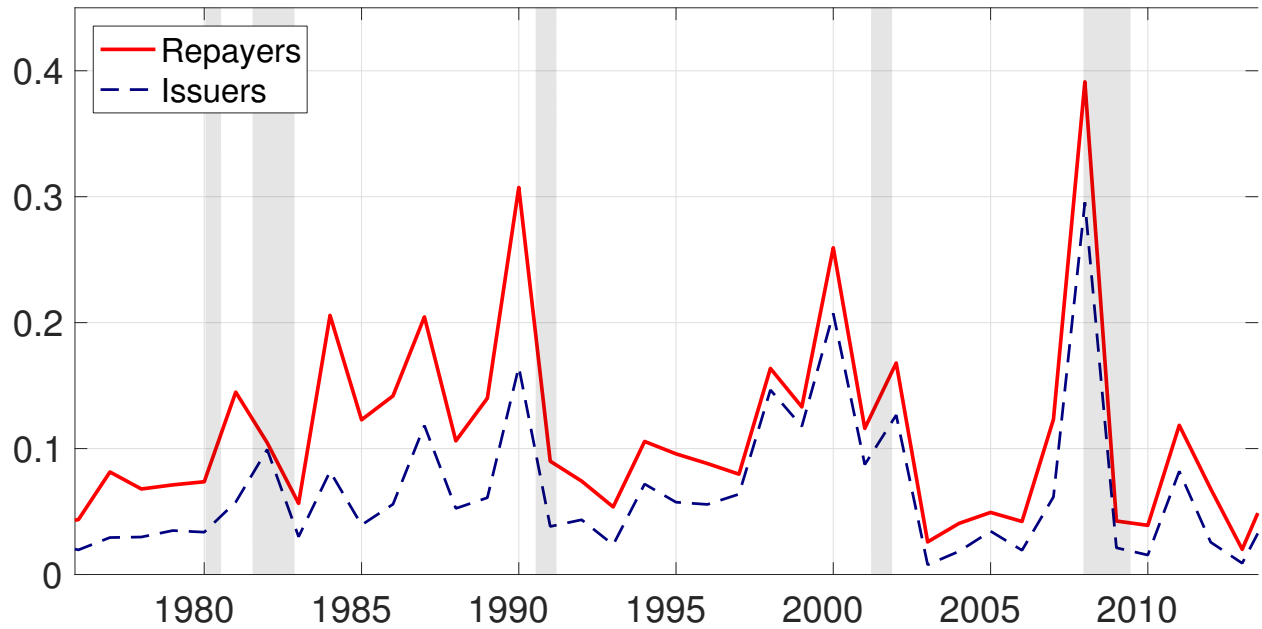


Fig. 1. **Expected default frequency: Cash-flows to Debtholders.** Each year, we sort firms in the data into quintiles based on cash-flows to debtholders. We define cash-flow to debtholders as long term debt repayed plus interest expenses minus change in short term debt and long term debt issued (from the statement of cash-flows). Repayers are the firms in the top quintile; issuers are the firms in the bottom. EDF is the annual expected default frequency from the ? model. Shaded areas correspond to NBER recessions.

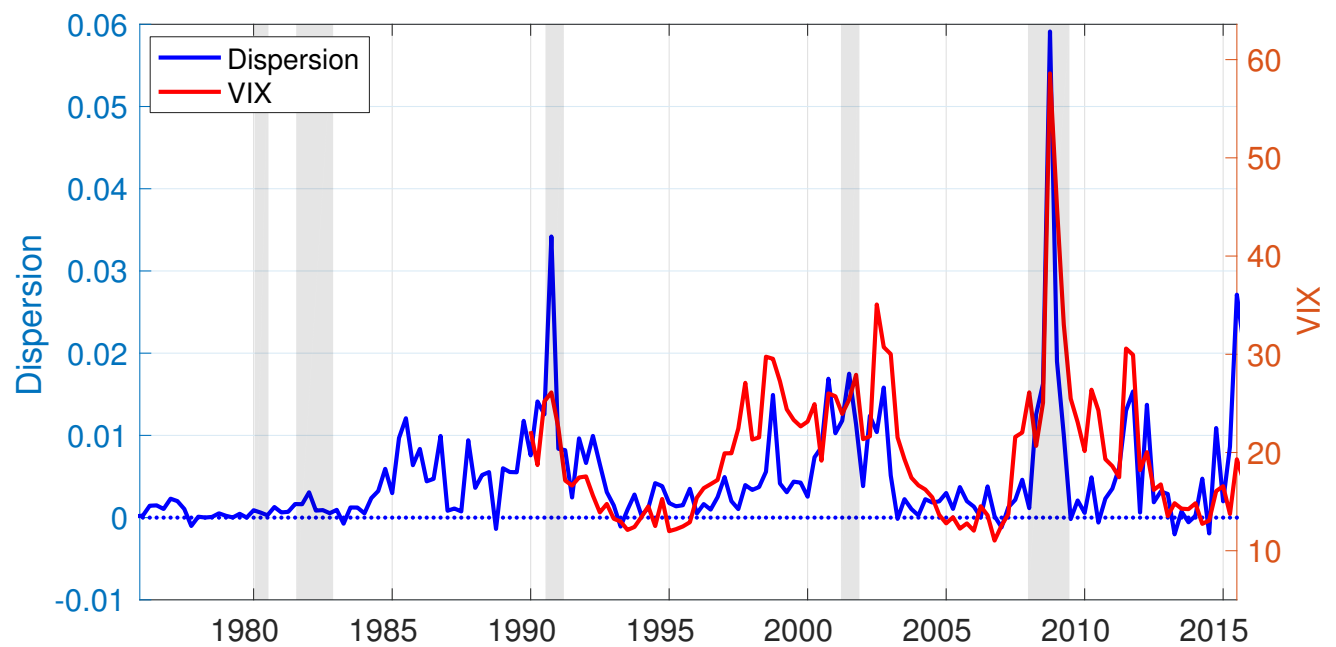


Fig. 2. **Dispersion and VIX.** The figure shows the dispersion between the average EDF for firms which repay their debt minus the average EDF for issuers and compares the series with the quarterly average of VIX. The shaded areas correspond to NBER recessions.

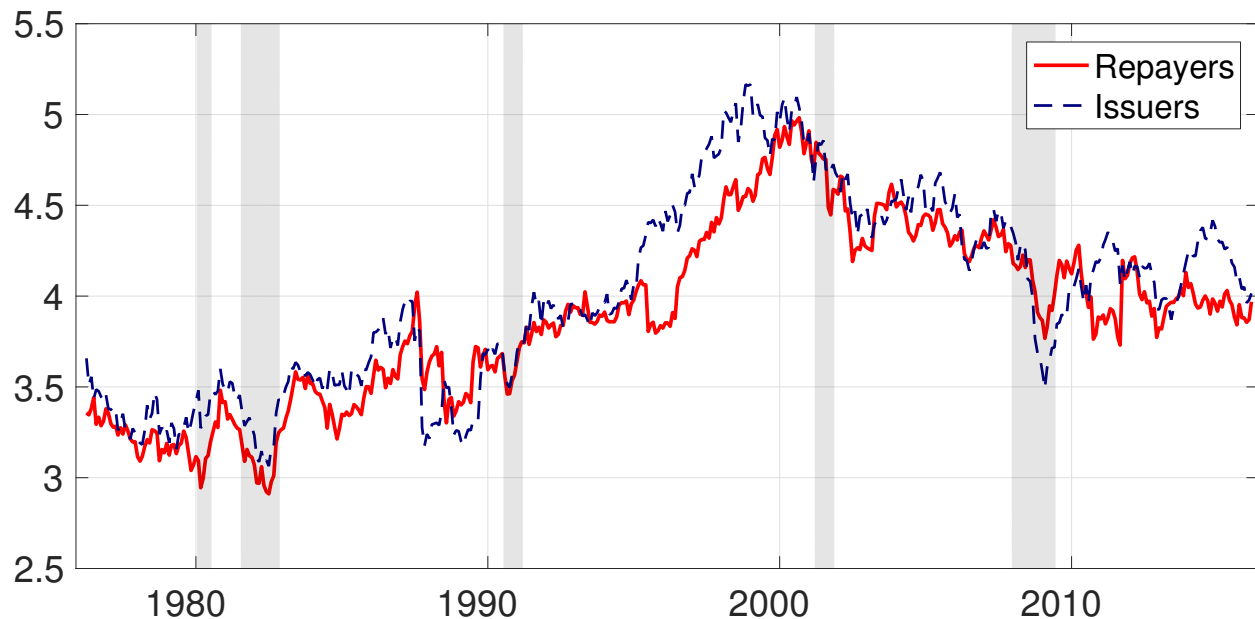


Fig. 3. **Price-dividend ratio.** The figure shows the log price-dividend ratio for repayers and issuers. To eliminate seasonality in dividends, we construct annualized dividends by adding the current months dividends to the dividends of the past 11 months. Prices are computed assuming no dividend reinvestment. Each quarter, we sort firms into quintiles based on debt repayment. We define debt repayment as the change in book value of equity minus change in book value of assets over the quarter divided by lagged book value of assets. Repayers (solid line) are the firms in the top quintile; issuers (dashed line) are the firms in the bottom.