Appendices – For Online Publication

This Online Appendix contains supplementary material referenced in the main text of "Credit-Market Sentiment and the Business Cycle," by D. López-Salido, J. C. Stein, and E. Zakrajšek. It consists of three parts: "Data Sources & Methods" (Appendix A), "Additional Results" (Appendix B). and "A Simple Model of Credit-Market Sentiment" (Appendix C).

A Data Sources & Methods

This appendix describes our data sources, as well as sample and variable constructions. FRED refers to the Federal Reserve Economic Data and ALFRED refers to the ArchivaL Federal Reserve Economic Data, two databases maintained by the research division of the Federal Reserve Bank of St. Louis. CRSP refers to the Center for Research in Security Prices.

A.1 U.S. Economic and Financial Data

Real Economic Activity: The data on real economic activity—as measured in the National Income and Product Accounts (that is, GDP, business fixed investment, residential investment, and consumer expenditures on durable goods)—are from FRED and are in billions of 2009 dollars. For the period 1929–1947, the data are available only at an annual frequency; from 1947 onward, they are available quarterly at a seasonally adjusted annual rate. For the 1948–2015 period, we converted each quarterly series to an annual frequency by averaging the series over the four quarters of each calendar year.

Unemployment: The data are from HAVER and are available at a monthly frequency since 1919. To construct changes in the unemployment rate at an annual frequency, we take December-to-December difference in the monthly series.

Population: To construct an estimate of real GDP per capita, we divide real GDP by total population (all ages, including armed forces overseas). Population data for the period 1919–1951 are available at an annual frequency (recorded as of July 1 of each year) from the U.S. Census Bureau Historical Data Release. From 1952 onward, the same series is available quarterly from FRED. We interpolated annual (July) data to monthly frequency using standard cubic spline methods. The resulting monthly data were then converted to an annual frequency by averaging the series over the 12 months of each calendar year. From 1952 onward, we converted the quarterly population series to an annual frequency by averaging the series over the four quarters of each calendar year.

Consumer Price Index: The data are from ALFRED and are available at a monthly frequency since 1913. To construct annual inflation, we calculate the December-to-December log-changes of the seasonally unadjusted monthly index (1982–84 = 100).

Moody's Yield on Baa-Rated Corporate Bonds: The data are from FRED and are available at a monthly (average) frequency since 1919. To convert the monthly series to annual frequency, we take the December value for each calendar year (thus, annual changes are calculated as December-to-December changes of the monthly series).

Yield on 10-year Treasury Securities: Constant-maturity yields are available at a monthly (average) frequency since 1920. To convert the monthly series to annual frequency, we take the December value for each calendar year (thus, annual changes are calculated as December-to-December changes of the monthly series).

Yield on 3-month Treasury Securities: The data are from FRED and are available at various frequencies (daily and weekly) since January 31, 1920. They are expressed on the discount basis. We first convert the 3-month discount rates to a semiannual bond basis (91-day convention) and the convert the resulting series to monthly frequency by taking the average of the available values for each month. To convert the monthly series to annual frequency, we take the December value for each calendar year (thus, annual changes are calculated as December-to-December changes of the monthly series).

Equity Market Indicators: The value-weighted total log return is from CRSP and is available at a daily frequency since 1927. To calculate annual returns, we cumulate the daily log returns in each calendar year. The corresponding annual dividend-price ratio is calculated as in Cochrane (2011). Annual log returns for the S&P 500 stock price index and the corresponding valuation measures are taken from "Online Data – Robert Shiller," available at `http://www.econ.yale.edu/~shiller/data.htm`. The equity share in new issues for the 1927–2010 period is taken from "Investor Sentiment Data (annual and monthly) 1934–2010," available at Jeffrey Wurgler's webpage `http://www.people.stern.nyu.edu/jwurgler`. Using the methodology described in Baker and Wurgler (2000), we extended the series through 2015.

High-Yield Share: The high-yield share—the fraction of gross bond issuance in the U.S. nonfinancial corporate sector that is rated as high yield by Moody's—for the 1926–2008 period is taken from Greenwood and Hanson (2013); using their methodology, we extended the series through 2015.

Bank Balance Sheets: The data on bank credit and loans for the 1914–1947 period are from the *Banking and Monetary Statistics*, published by the Board of Governors of the Federal Reserve System. The release contains principal assets and liabilities for banks that were members of the Federal Reserve System—virtually all commercial banks during this period—on call due dates. Our annual measure of bank credit (loans plus investments) and bank loans for the 1914–1947 period corresponds to their respective values as reported on the December 31 call report. From 1947 onward, bank credit and loans are from the Federal Reserve's weekly "Assets and Liabilities of Commercial Banks – H.8" statistical release.

Leverage: The data on aggregate leverage for the private nonfinancial sector, nonfinancial business sector, and the household sector are from the Federal Reserve's "Financial Accounts of the United States – Z.1" statistical release.

Corporate Financing Mix: Net debt issuance, net equity repurchases, and total assets for the U.S. nonfinancial corporate sector are from the Federal Reserve's "Financial Accounts of the United States – Z.1" statistical release. Net debt issuance is defined as total issuance minus debt reductions and net equity repurchase is defined as total equity repurchase minus total equity issuance.

A.2 Firm-Level Compustat Data

From the merged Compustat/CRSP database, we selected all nonfinancial firms, excluding firms in the following 2- or 3-digits NAICS sectors: 22 (Utilities); 491 (Postal Service); 52 (Finance & Insurance); 61 (Educational Services); 92 (Public Administration); and 99 (Unclassified). The resulting sample of firms was merged with the Moody's Default and Recovery Database (DRD), which contains credit-rating history for all corporate issuers rated by Moody's. Specifically, we matched the Moody's unique issuer identifiers (MAST_ISSR_NUM) to base CUSIPs in the merged Compustat/CRSP database.

Firm-level variables are defined as follows:

- Net equity issuance (NEI_{jt}) is from the Statement of Cash Flows and is defined as funds received from issuance of common and preferred stock (Compustat annual data item #108).
- Net debt issuance (NDI_{jt}) is from the Statement of Cash Flows and is defined as the amount of funds generated from issuance of long-term debt (Compustat annual data item #111).
- Real business investment (I_{jt}) is defined as nominal capital expenditures (Compustat annual data item #128) deflated by the implicit price deflator for business fixed investment (2009 = 100). Nominal capital expenditures correspond to cash outflows or funds used for additions to company's property, plant, and equipment, excluding amounts arising from acquisitions.
- Real sales (Y_{jt}) are defined as nominal sales (Compustat annual data item #12) deflated by the implicit GDP deflator for the U.S. nonfarm business sector (2009 = 100). Nominal sales correspond to gross sales (the amount of actual billings to customers for regular sales completed during the period) less cash discounts, trade discounts, returned sales, and allowances for which credit is given to customers.
- Tobin's Q (Q_{jt}) is defined as the book-value of total assets (Compustat annual data item #120), less the book-value of common equity (Compustat annual data item #60), plus the market-value of common equity from CRSP, divided by the book-value of total assets.
- Equity return (r_{jt}) is defined as the (total) log return during the firm's fiscal year. To construct annual returns, we cumulate the daily log returns from CRSP over the firm's fiscal year.

To ensure that our results were not influenced by a small number of extreme observations, we dropped from the sample all firm/year observations where the change in net equity issuance relative to assets ($\Delta\mathrm{NEI}_{jt}/A_{j,t-1}$), the change in net debt issuance relative to assets ($\Delta\mathrm{NDI}_{jt}/A_{j,t-1}$), the growth of real business investment ($\Delta \ln I_{jt}$), the growth of real sales ($\Delta \ln Y_{jt}$), or the growth in Tobin's Q ($\Delta \ln Q_{jt}$), was below the 2.5th or above the 97.5th percentile of its respective distribution. Table A-1 contains the selected summary statistics for the firm-level variables used in our analysis.

Table A-1 – Selected Characteristics of Rated Compustat Firms

Variable	Mean	StdDev	Min	Max
A. *Sample period*: 1985–2015[a]				
$\Delta\text{NEI}_{jt}/A_{j,t-1}$	−0.17	6.27	−40.80	54.14
$\Delta\text{NDI}_{jt}/A_{j,t-1}$	0.79	11.16	−31.62	44.86
B. *Sample period*: 1973–2015[b]				
$\Delta \ln I_{jt}$				
HY firms	3.67	51.85	−177.39	168.68
Low IG firms	3.04	35.12	−174.09	166.99
High IG firms	4.17	27.96	−147.10	132.25
All firms	3.40	42.61	−177.39	168.68
$\Delta \ln Y_{jt}$				
HY firms	6.16	18.93	−57.63	78.43
Low IG firms	3.99	14.41	−57.00	78.39
High IG firms	4.46	12.00	−55.31	72.69
All firms	4.95	16.36	−57.63	78.43
$\Delta \ln Q_{jt}$				
HY firms	−0.13	18.82	−80.46	68.80
Low IG firms	−0.16	16.86	−80.54	67.27
High IG firms	−0.71	16.42	−72.61	68.70
All firms	−0.19	17.68	−80.54	68.80

Note: All variables are expressed in percent; statistics are based on trimmed (P2.5/P97.5) data.
[a] No. of firms = 1,844; Total Obs. = 15,895.
[b] No. of HY firms = 1,262; No. of Low IG firms = 749; No. of High IG firms = 117; No. of firms = 1,674; Total Obs. = 17,540. Credit-rating categories (based on $t-1$ senior unsecured credit rating): HY (high yield) = Ba1, Ba2, Ba3, B1, B2, B3, Caa1, Caa2, Caa3, Ca; Low IG (low investment grade) = A1, A2, A3, Baa1, Baa2, Baa3; and High IG (high investment grade) = Aaa, Aa1, Aa2, Aa3.

B Additional Results

This appendix contains additional results, which are referenced in the main text.

Table B-1 – Stock-Market Sentiment and Economic Growth
(Full Sample Analysis)

	Dependent Variable: Δy_t			
Regressors	(1)	(2)	(3)	(4)
$\hat{r}_t^{SP}$	0.145**	.	0.010	.
	(0.057)		(0.046)	
$\hat{r}_t^{M}$	.	0.400	.	0.156
		(0.267)		(0.133)
R^2	0.332	0.353	0.306	0.335
	Auxiliary Regressions			
	r_t^{SP}	r_t^{M}	r_t^{SP}	r_t^{M}
$\ln[P/E10]_{t-2}$	−0.134***	.	.	.
	(0.036)			
$\ln[D/P]_{t-2}$	.	0.058**	.	.
		(0.029)		
$\ln \text{ES}_{t-2}$	.	−0.035	.	.
		(0.025)		
$\ln[P/E10]_{t-1}$		.	−0.128***	.
			(0.037)	
$\ln[D/P]_{t-1}$	.	.	.	0.107**
				(0.047)
$\ln \text{ES}_{t-1}$	.	.	.	−0.080**
				(0.038)
R^2	0.086	0.019	0.079	0.072

Note: Sample period: annual data from 1929 to 2015. The dependent variable is Δy_t, the log-difference of real GDP per capita from year $t-1$ to year t. Explanatory variables: $\hat{r}_t^{SP}$ = predicted S&P 500 (log) return; and $\hat{r}_t^{M}$ = predicted value-weighted stock market (log) return. Additional explanatory variables (not reported) include Δy_{t-1}. In the auxiliary return forecasting equations: $[P/E10]_t$ = cyclically adjusted P/E ratio for the S&P 500 (Shiller, 2000); ES_t = equity share in total (debt + equity) new external finance issuance (Baker and Wurgler, 2000); and $[D/P]_t$ = dividend-price ratio for the (value-weighted) stock market. All specifications include a constant (not reported) and are estimated jointly with their auxiliary return forecasting equation by NLLS. Heteroskedasticity- and autocorrelation-consistent asymptotic standard errors reported in parentheses are computed according to Newey and West (1987) with the automatic lag selection method of Newey and West (1994): * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table B-2 – Stock-Market Sentiment and Economic Growth
(Subsample Analysis)

	Dependent Variable: Δy_t					
Regressors	(1)	(2)	(3)	(4)	(5)	(6)
$\hat{r}_t^{SP}$	0.066*	.	.	−0.066	.	.
	(0.036)		.	(0.055)	.	.
$\hat{r}_t^{M}$	.	0.068	0.033	.	−0.010	−0.004
		(0.065)	(0.030)		(0.027)	(0.041)
R^2	0.035	0.034	0.027	0.036	0.019	0.018
	Auxiliary Regressions					
	r_t^{SP}	r_t^{M}	r_t^{M}	r_t^{SP}	r_t^{M}	r_t^{M}
$\ln[P/E10]_{t-2}$	−0.108***	.	.	.	.	.
	(0.033)					
$\ln[D/P]_{t-2}$	.	0.088	.	.	.	.
		(0.077)				
$\ln \text{ES}_{t-2}$	.	0.018	.	.	.	.
		(0.077)				
cay_{t-2}	.	.	3.124***	.	.	.
			(0.613)			
$\ln[P/E10]_{t-1}$	.	.	.	−0.108***	.	.
				(0.031)		
$\ln[D/P]_{t-1}$	.	.	.	.	0.225***	.
					(0.073)	
$\ln \text{ES}_{t-1}$	.	.	.	.	−0.115	.
					(0.077)	
cay_{t-1}	.	.	.	.	.	2.786***
						(0.300)
R^2	0.079	0.058	0.135	0.080	0.149	0.112

Note: Sample period: annual data from 1952 to 2015. The dependent variable is Δy_t, the log-difference of real GDP per capita from year $t-1$ to year t. Explanatory variables: $\hat{r}_t^{SP}$ = predicted S&P 500 (log) return; and $\hat{r}_t^{M}$ = predicted value-weighted stock market (log) return. Additional explanatory variables (not reported) include Δy_{t-1}. In the auxiliary return forecasting equations: $[P/E10]_t$ = cyclically adjusted P/E ratio for the S&P 500 (Shiller, 2000); ES_t = equity share in total (debt + equity) new external finance issuance (Baker and Wurgler, 2000); $[D/P]_t$ = dividend-price ratio for the (value-weighted) stock market; and cay_t = consumption-wealth ratio (Lettau and Ludvigson, 2001). All specifications include a constant (not reported) and are estimated jointly with their auxiliary return forecasting equation by NLLS. Heteroskedasticity- and autocorrelation-consistent asymptotic standard errors reported in parentheses are computed according to Newey and West (1987) with the automatic lag selection method of Newey and West (1994): * $p < .10$; ** $p < .05$; and *** $p < .01$.

Table B-3 – Predicting Credit-Market and Stock-Market Sentiment

	Dependent Variable			
Regressors	Δs_t	r_t^{SP}	Δs_t	r_t^{SP}
$\ln \text{HYS}_{t-2}$	0.098***	1.938*	0.103***	1.903*
	(0.035)	(1.054)	(0.027)	(1.012)
s_{t-2}	−0.219***	−0.809	−0.149***	−1.296
	(0.051)	(1.175)	(0.047)	(1.143)
TS_{t-2}	.	.	−0.141**	0.975
			(0.058)	(1.462)
$\ln[P/E10]_{t-2}$	0.002	−0.166***	0.002	−0.168***
	(0.002)	(0.035)	(0.001)	(0.034)
R^2	0.109	0.099	0.148	0.103

Note: Sample period: annual data from 1929 to 2015. The dependent variables are Δs_t, the change in the Baa-Treasury spread from year $t-1$ to year t and r_t^{SP}, the S&P 500 (log) return in year t. Regressors: HYS_t = fraction of debt that is rated as high yield (Greenwood and Hanson, 2013, the coefficient is multiplied by 100); s_t = Baa-Treasury spread; TS_t = term spread; and $[P/E10]_t$ = cyclically adjusted P/E ratio for the S&P 500 (Shiller, 2000). All specifications include a constant (not reported) and are estimated by OLS. Heteroskedasticity- and autocorrelation-consistent asymptotic standard errors reported in parentheses are computed according to Newey and West (1987) with the automatic lag selection method of Newey and West (1994): * $p < .10$; ** $p < .05$; and *** $p < .01$.

TABLE B-4 – Credit-Market Sentiment and Economic Activity at Different Horizons (Baseline Measures of Credit-Market Sentiment, 1929–2015)

	Forecast Horizon (years)		
	$h = 0$	$h = 1$	$h = 2$
A. *Dep. Variable: real GDP per capita*			
$\Delta\hat{s}_t$	-4.802^{***}	-5.436^{**}	-3.088
	(1.151)	(2.591)	(2.313)
Cumulative effect (pct.)[a]	-1.507^{***}	-3.213^{***}	-4.182^{**}
	(0.361)	(1.153)	(1.868)
B. *Dep. Variable: real business fixed investment*			
$\Delta\hat{s}_t$	-10.183^{***}	-9.569^{**}	-0.045
	(3.491)	(4.062)	(2.963)
Cumulative effect (pct.)	-3.196^{***}	-6.199^{***}	-6.213^{**}
	(1.095)	(2.306)	(3.050)
C. *Dep. Variable: real residential investment*			
$\Delta\hat{s}_t$	-12.381^{***}	-10.167^{*}	-0.352
	(3.704)	(5.235)	(5.814)
Cumulative effect (pct.)	-3.885^{***}	-7.076^{***}	-7.189^{**}
	(1.162)	(1.722)	(3.238)
D. *Dep. Variable: real durable goods consumption*			
$\Delta\hat{s}_t$	-6.402^{***}	-3.616	3.864
	(1.577)	(2.330)	(2.917)
Cumulative effect (pct.)	-2.009^{***}	-3.144^{***}	-1.931
	(0.495)	(0.706)	(1.378)
E. *Dep. Variable: unemployment rate*			
$\Delta\hat{s}_t$	2.316^{***}	2.288^{***}	1.670^{*}
	(0.579)	(0.738)	(0.936)
Cumulative effect (pps.)	0.707^{***}	1.405^{***}	1.915^{***}
	(0.177)	(0.393)	(0.673)

NOTE: Sample period: annual data from 1929 to 2015. In each panel, the dependent variable is Δy_{t+h}, the log-difference (simple difference in the case of the unemployment rate) in specified indicator of economic activity from year $t+h-1$ to year $t+h$. The entries denote the estimates of the coefficients associated with $\Delta\hat{s}_t$, the predicted change in the Baa-Treasury spread; additional explanatory variables (not reported) include Δy_{t-1}. The explanatory variables in the auxiliary forecasting equation for Δs_t are $\ln \mathrm{HYS}_{t-2}$ and s_{t-2} (see the main text for details). All specifications include a constant (not reported) and are estimated jointly with the auxiliary forecasting equation for Δs_t by NLLS. Heteroskedasticity- and autocorrelation-consistent asymptotic standard errors reported in parentheses are computed according to Newey and West (1987) with the automatic lag selection method of Newey and West (1994): * $p < .10$; ** $p < .05$; and *** $p < .01$.

[a] The entries denote the estimated cumulative effect of a deterioration in credit-market sentiment from P25 to P75 of its historical distribution—a 30-basis-point increase in $\Delta\hat{s}_t$—on the specified measure of economic activity between $t-1$ and $t+h$.

Table B-5 – Credit-Market Sentiment and Economic Activity at Different Horizons (Alternative Measures of Credit-Market Sentiment, 1952–2015)

	Forecast Horizon (years)		
	$h = 0$	$h = 1$	$h = 2$
A. *Dep. Variable: real GDP per capita*			
$\Delta\hat{s}_t$	−2.490***	−1.289**	0.411
	(0.602)	(0.589)	(0.725)
Cumulative effect (pct.)[a]	−1.113***	−1.689***	−1.505**
	(0.269)	(0.473)	(0.681)
B. *Dep. Variable: real business fixed investment*			
$\Delta\hat{s}_t$	−8.228***	−6.546***	−1.917
	(1.381)	(1.482)	(1.451)
Cumulative effect (pct.)	−3.677***	−6.603***	−7.460***
	(0.617)	(1.061)	(1.366)
C. *Dep. Variable: real residential investment*			
$\Delta\hat{s}_t$	−17.418***	−7.883*	1.700
	(3.296)	(4.099)	(6.404)
Cumulative effect (pct.)	−7.784***	−11.308***	−10.548**
	(1.473)	(2.539)	(4.297)
D. *Dep. Variable: real durable goods consumption*			
$\Delta\hat{s}_t$	−7.584***	−2.294	4.190
	(2.069)	(1.667)	(2.671)
Cumulative effect (pct.)	−3.389***	−4.415***	−2.542
	(0.925)	(1.286)	(1.888)
E. *Dep. Variable: unemployment rate*			
$\Delta\hat{s}_t$	1.439***	0.997***	0.320
	(0.214)	(0.285)	(0.402)
Cumulative effect (pps.)	0.643***	1.089***	1.232***
	(0.096)	(0.205)	(0.353)

Note: Sample period: annual data from 1952 to 2015. In each panel, the dependent variable is Δy_{t+h}, the log-difference (simple difference in the case of the unemployment rate) in specified indicator of economic activity from year $t+h-1$ to year $t+h$. The entries denote the estimates of the coefficients associated with $\Delta\hat{s}_t$, the predicted change in the Baa-Treasury spread; additional explanatory variables (not reported) include Δy_{t-1}. The explanatory variables in the auxiliary forecasting equation for Δs_t are $\ln \text{HYS}_{t-2}$, s_{t-2}, and TS_{t-2} (see the main for details). All specifications include a constant (not reported) and are estimated jointly with the auxiliary forecasting equation for Δs_t by NLLS. Heteroskedasticity- and autocorrelation-consistent asymptotic standard errors reported in parentheses are computed according to Newey and West (1987) with the automatic lag selection method of Newey and West (1994): * $p < .10$; ** $p < .05$; and *** $p < .01$.

[a] The entries denote the estimated cumulative effect of a deterioration in credit-market sentiment from P25 to P75 of its historical distribution—a 45-basis-point increase in $\Delta\hat{s}_t$—on the specified measure of economic activity between $t-1$ and $t+h$.

C A Simple Model of Credit-Market Sentiment

The model that follows is adapted from Stein (1996), and it is also similar to that in Ma (2016). Consider a firm that can invest an amount I, which yields a net present value of $\theta f(I)$, where $f(I)$ is a concave function, and θ is a measure of the profitability of investment opportunities. The firm can finance the investment with either newly raised debt D or equity E, subject to the budget constraint that $I = D + E$. To capture the idea that there can be credit-market sentiment, we allow for the possibility that the credit spread on the debt deviates from its fundamental value by an amount δ; our sign convention here is that a positive value of δ represents debt that is expensive relative to a benchmark of frictionless financial markets and vice versa. For simplicity, we assume that equity is always fairly priced.

The firm also faces a cost of deviating from its optimal debt-to-capital ratio, which is denoted by d^*. This cost is assumed to be proportional to the scale of the firm and quadratic in the difference between d^* and the actual debt-to-capital ratio $d \equiv D/I$. Thus overall, the firm's problem is to choose the level of investment I and its capital structure d to maximize the following objective function:

$$\theta f(I) - \delta D - I\frac{\gamma}{2}\big(d - d^*\big)^2. \tag{C-1}$$

There are three terms in the objective function. The first term, $\theta f(I)$, is the net present value of investment. The second term, δD, is the relative cost associated with issuing debt as opposed to equity; this cost can be either positive or negative, depending on the sign of δ. And the third term, $I\frac{\gamma}{2}\big(d - d^*\big)^2$, is the cost associated with deviating from the optimal capital structure of d^*.

We can rewrite the firm's objective function as:

$$\theta f(I) - \delta dI - I\frac{\gamma}{2}\big(d - d^*\big)^2. \tag{C-2}$$

This yields the following first-order conditions with respect to I and d:

$$\theta f'(I) = \delta d + \frac{\gamma}{2}\big(d - d^*\big)^2; \tag{C-3}$$

$$d = d^* - \frac{\delta}{\gamma}. \tag{C-4}$$

Substituting equation (C-4) into equation (C-3) gives

$$\theta f'(I) = \delta d^* - \frac{\delta^2}{2\gamma}. \tag{C-5}$$

Equations (C-4) and (C-5) express the firm's choice of capital structure d and investment I as functions of the exogenous parameters. In so doing, they make clear the identification problem that arises in interpreting the results from Section **??**. Suppose we know that elevated credit-market sentiment at time $t-2$ forecasts a decline in investment at time t. This could be either: (1) because the sentiment proxy is able to forecast a reduction in the appeal of future investment θ, as would be implied by a story where high levels of sentiment are associated with over-investment or mis-investment; or (2) because the sentiment proxy is able to forecast an increase in the future cost of borrowing δ. Based on observation of just investment I, one can see from equation (C-5) that these two hypotheses cannot be separated. However, equation (C-4) tells us that looking at the firm's financing mix can help in distinguishing between these two stories because the financing mix is unaffected by θ. Thus if both investment and the debt-to-capital ratio fall, this can only be explained by an increase in δ—that is, by an inward shift in the supply of credit. This motivates our first set of tests, which focus on relative movements in the aggregate net debt and net equity issuance of U.S. nonfinancial firms.

The model also suggests a set of cross-sectional tests. These come from noting that if our credit-sentiment proxy is able to forecast market-wide changes in the effective cost of credit, these changes should be more pronounced for lower credit-quality firms because such firms have, in effect, a higher loading on the aggregate market factor. In other words, the ratio of price-to-fundamentals falls by more for a Caa-rated issuer than for an Aa-rated issuer when market-wide sentiment deteriorates. Thus if firm i has a lower credit rating than firm j and we are predicting an increase in the market-wide spread δ, then we should also be predicting that δ_i will go up by more than δ_j. This implies that when credit-market sentiment is elevated at time $t-2$, we should expect that at time t firms with lower credit ratings will exhibit a larger drop in their investment; this can be seen explicitly in equation (C-5).

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