Measuring real-time credit market conditions

Nina Boyarchenko

Federal Reserve Bank of New York, CEPR and CESIfo

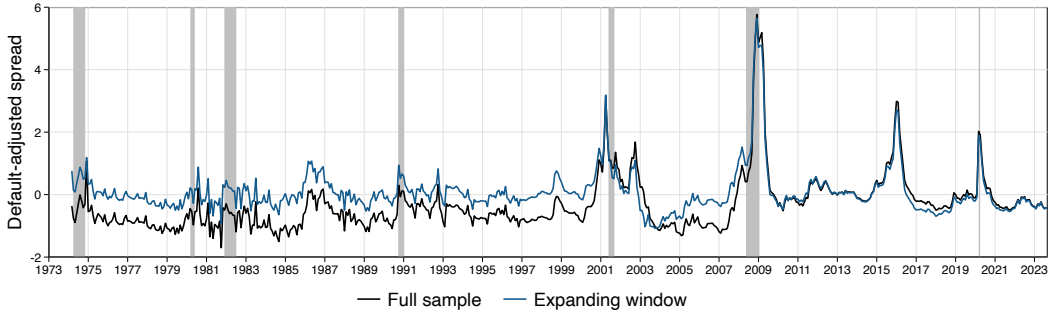
Conference on Real-Time Data Analysis, Methods, and Applications

19 October 2023

Motivation

- Much research on the information content of credit market conditions for future real activity and risks to future real activity
- Theoretical channels:
  - Slow-downs in provision of credit lead to lower investment by productive firms
  - Signaling of weakness in providers of credit
- How do we measure credit market conditions?
  - Primary or secondary market?
  - (Pseudo) real time or full sample information?
  - Prices only or broader-based measures?

U. S. default-adjusted secondary market spreads



- Based on quoted secondary market credit spreads
- Expanding window estimate:
  - Initial sample 1974 – 1984
  - Add one month at a time

Outline of talk

1. Data and methodology
2. Baseline results for the U. S.
3. International evidence
4. Non-price measures

Based on:

- Boyarchenko and Shachar (2023): "Everything you wanted to know about default-adjusted credit spreads but were afraid to ask"
- Boyarchenko and Elias (2023): "International credit cycles"
- Boyarchenko, Crump, Kovner and Shachar (2021): "Measuring corporate bond market dislocations"

Data and methodology

Credit market data

1. Primary market: Mergent FISD and SDC Platinum New Issues Database (SDC)
   - Offering (and reissuance) prices, quantities, bond characteristics, issuer industry
2. Secondary market: quotes from
   - Lehman-Warga Fixed Income database: U. S. only, monthly, 1973 – 1998
   - ICE-BAML global corporate bond and global corporate bond high yield indices: international bonds issued in global currencies, 1997 –
3. Firm-level expected default frequencies: Moody's KMV CreditEdge
   - Augmented Merton (1973) model

Data details in Boyarchenko and Elias (2023): "The good, the bad, and the ugly of international debt market data"

Measuring credit spreads: U. S.

1. Compute duration-matched credit spread for each bond-date observation:

$$z_{b,t} = y_{b,t} - rf_t^{(\tau_{b,t})}$$

   - $\tau_{b,t}$: Duration of bond b at date t
   - $rf_t^{(\tau_{b,t})}$: risk-free (Treasury) yield with duration $\tau_{b,t}$
   - Real-time measurement

2. Estimate predicted credit spread:

$$\log z_{b,t} = \alpha + \beta \log \text{EDF}_{f,t} + \vec{\gamma}' X_{b,t} + \epsilon_{b,t}$$

   - $\text{EDF}_{f,t}$: 1 year EDF
   - $X_{b,t}$: bond and firm characteristics
   - Look-ahead bias if estimated full sample

3. Compute default-adjusted credit spread:

$$d_{b,t} = z_{b,t} - \exp\left(\widehat{\log z_{b,t}} + \frac{\sigma_\epsilon^2}{2}\right)$$

Measuring credit spreads: International

1. Compute duration-matched credit spread for each bond-date observation:

$$z_{b,t} = y_{b,t} - rf_{c,t}^{(\tau_{b,t})}$$

   - $rf_{c,t}^{(\tau_{b,t})}$: sovereign yield for currency c with duration $\tau_{b,t}$

2. For each month, estimate cross-sectional regression of duration-matched credit spreads on currency, firm and rating fixed effects (as in Liao, 2020):

$$z_{b,t} = \alpha_{c,t} + \alpha_{f,t} + \alpha_{rating,t} + \epsilon_{b,t}$$

3. Compute currency-adjusted credit spreads:

$$z_{b,t}^{\$} = z_{b,t} - (\alpha_{c,t} - \alpha_{\$,t})$$

4. Estimate predicted credit spread using currency-adjusted credit spreads
5. Compute default-adjusted credit spread

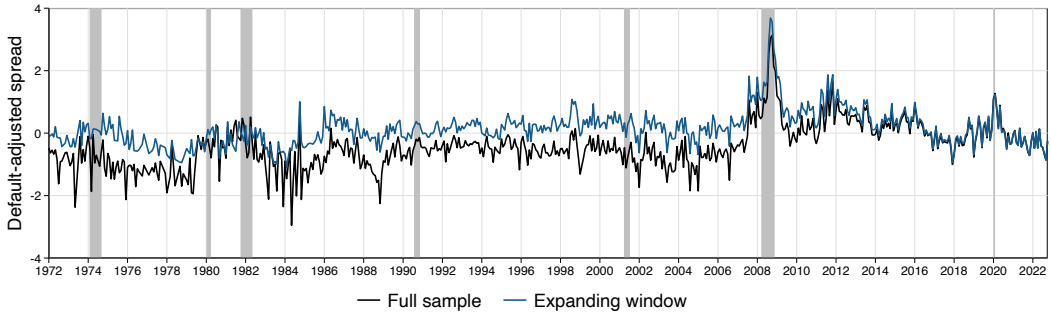
Baseline results for the U. S.

Sample definition

- Standard sample selection: non-financial senior fixed coupon corporate bonds, issued by issuers domiciled in the U. S.
- Full-sample: 1973 – 2022
- SM, expanding sample:
  - Initial sample: 1975 – 1985
  - Adding one month at a time
- PM, expanding sample:
  - Initial sample: 1973 – 1982
  - Adding one year at a time
- Monthly average using amount outstanding weights

Fact 1: Different levels of full and expanding sample estimates

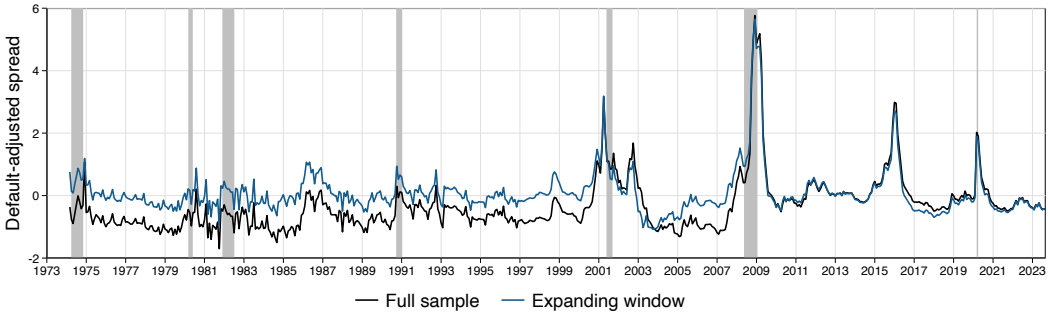
For both primary market...



- Identify different periods of overheating based on expanding vs full sample estimates

Fact 1: Different levels of full and expanding sample estimates

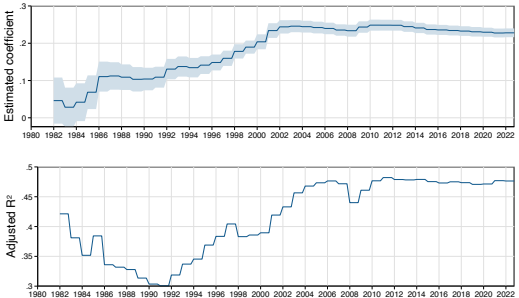
...and secondary market



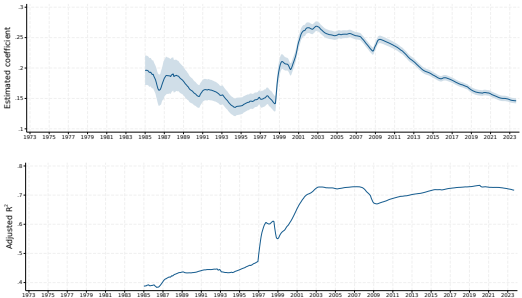
- Identify different periods of overheating based on expanding vs full sample estimates

Fact 1: Different levels of full and expanding sample estimates

Primary market

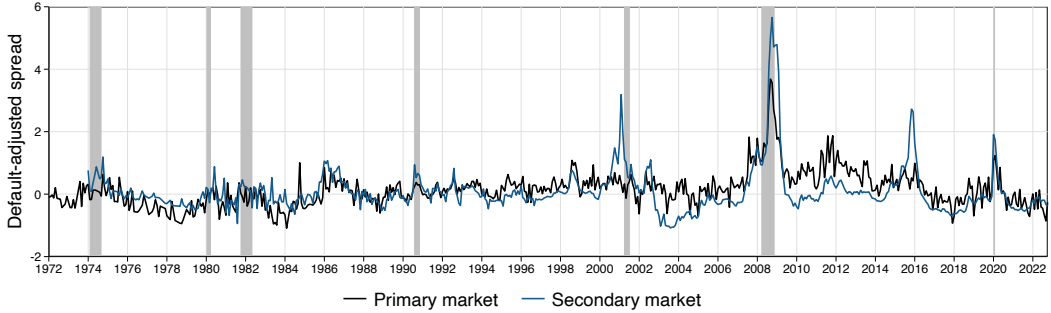


Secondary market



- Coming from changing relationship between duration-adjusted spreads and default probabilities over time

Fact 2: PM and SM credit spreads have different information



- Expanding window estimates for both
- Closer relationship earlier in the sample
  - Less heterogeneous issuers/bonds historically?
  - Less heterogeneous intermediaries historically?

Fact 3: PM and SM credit spreads predict different outcomes

	Ind. prod.	Unemployment	Real GDP
SM default-adjusted	-2.50***	0.71***	-0.32
SM predicted	-3.68**	0.49	-0.28
PM default-adjusted	-1.00	0.31	-1.26**
PM predicted	23.79	-27.56	34.62
Adj. R-sqr.	0.24	0.21	0.25
N. of obs	527	528	181

$$\Delta y_{t,t+h} = \alpha + \varphi \Delta y_{t-h,t} + \beta_{\text{FF}} \text{Real EFFR}_t + \beta_{\text{slope}} \text{TSY slope}_t + \gamma' CS_t + \epsilon_{t+h}$$

- One-year ahead growth rates
- Expanding window estimates for both

...over different periods of time

	Pre 1990	Pre 2000	Pre 2010	Pre 2020	Full sample
SM default-adjusted	-0.56	0.05	-0.26	-0.15	-0.32
SM predicted	-1.82	-4.18***	-0.69	-0.56	-0.28
PM default-adjusted	-1.13	0.17	-0.87	-1.20**	-1.26**
PM predicted	71.15	19.85	12.03	8.34	34.62
Adj. R-sqr.	0.52	0.32	0.25	0.27	0.25
N. of obs	51	91	131	171	181

$$\Delta y_{t,t+h} = \alpha + \varphi \Delta y_{t-h,t} + \beta_{\text{FF}} \text{Real EFFR}_t + \beta_{\text{slope}} \text{TSY slope}_t + \gamma' CS_t + \epsilon_{t+h}$$

- One-year ahead real GDP growth rates
- Expanding window estimates for both

Recap

- PM spreads more systematically predict real GDP growth
  - Direct measure of cost of new debt market funding for non-financials
  - Captures both cost of issuance and who is able to issue

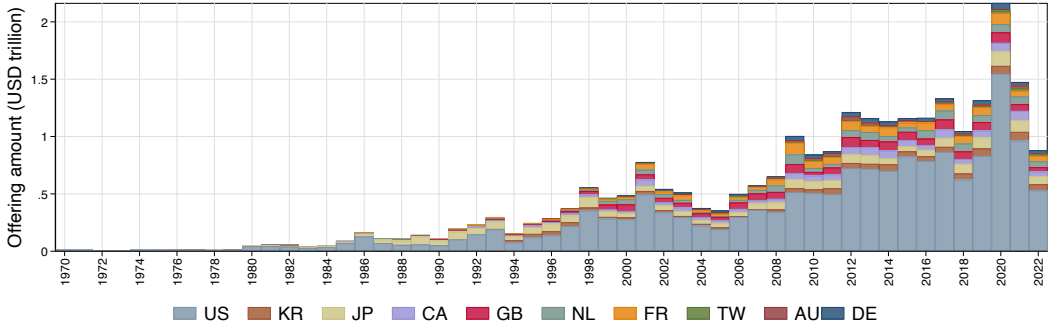
  $\Rightarrow$ More timely measure of access to credit
- More precisely measured spreads better predictors of real activity
  - PM spreads harder to measure at higher frequencies
  - SM spreads deviate more from PM spreads in later half of the sample

International evidence

Sample definition

- Standard sample selection: non-financial senior fixed coupon corporate bonds, issued by issuers in a particular country of risk
- Full-sample: 1997 – 2022
- SM, expanding sample:
  - Initial sample: 1997 – 1999
  - Adding one month at a time
  - Monthly average using amount outstanding weights (in USD equivalent)
- PM, expanding sample:
  - Initial sample: 1997– 1999
  - Adding one year at a time
  - Quarterly average using offering amount weights (in USD equivalent)

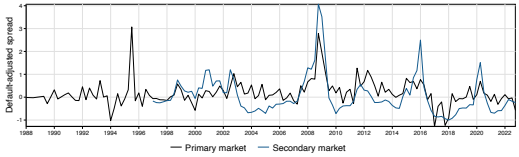
Expanding bond market issuance over time



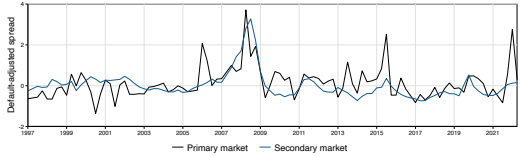
- Especially over the last 20 years
- Do debt market conditions predict real activity internationally?

Fact 4: PM and SM spreads more correlated internationally

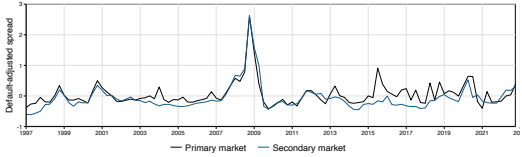
CA



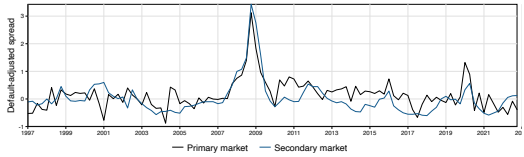
AU



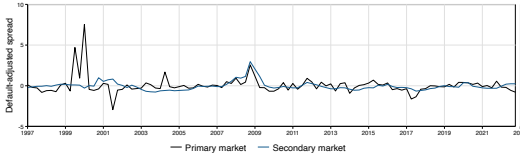
JP



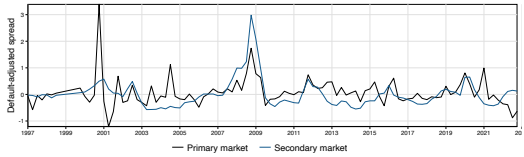
GB



NL



FR



Fact 4: PM and SM spreads more correlated internationally

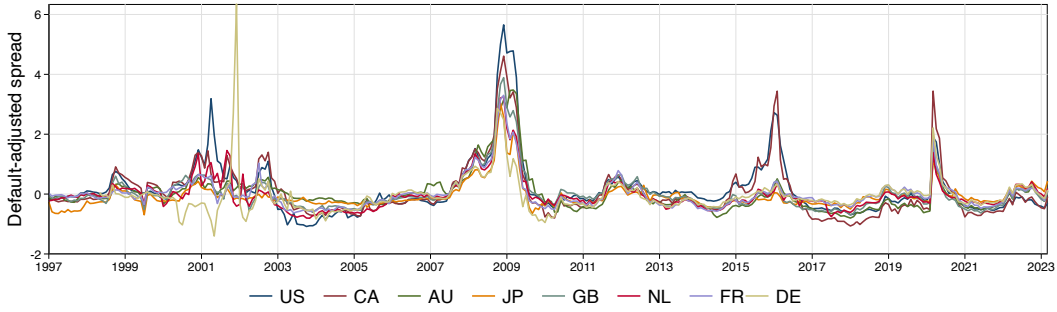
	CA	AU	JP	GB	NL	FR	DE
SM default-adjusted	-1.67***	0.46	-1.59	-2.63*	-2.07***	-1.81**	-1.55***
SM predicted	4.47**	-2.66	0.28	-1.77	0.75	0.54	0.35
PM default-adjusted	-0.67	-0.33	-0.60	-1.58	-0.17	0.07	-0.71
PM predicted	0.01	0.03	0.20	-0.38	0.20	-0.05	-0.07
Adj. R^2	0.12	0.06	0.27	0.22	0.12	0.19	0.27
N. obs	101	95	101	101	99	96	79

$$\Delta y_{t,t+h} = \alpha + \varphi \Delta y_{t-h,t} + \beta_{\text{FF}} \text{Real policy rate}_t + \beta_{\text{slope}} \text{Sov. slope}_t + \gamma' CS_t + \epsilon_{t+h}$$

- One-year ahead real GDP growth rates
- Expanding window estimates for both

$\Rightarrow$ Predictability primarily from SM spreads

Fact 5: Credit cycle is (largely) international



Fact 5: Credit cycle is (largely) international

	CA	AU	JP	GB	NL	FR	DE
U.S. default-adjusted	-1.29***	-0.37	-1.71***	-1.65***	-1.50***	-1.06***	-1.31***
U.S. predicted	0.88	1.11	2.34*	3.30**	0.75	1.24	-0.25
Adj. R^2	0.15	0.05	0.16	0.15	0.17	0.07	0.10
N. obs	193	193	110	193	102	166	122

$$\Delta y_{t,t+h} = \alpha + \varphi \Delta y_{t-h,t} + \beta_{\text{FF}} \text{U.S. real policy rate}_t + \beta_{\text{slope}} \text{TSY slope}_t + \gamma' CS_t^{U.S.} + \epsilon_{t+h}$$

- One-year ahead real GDP growth rates
- SM, expanding window estimate

Fact 6: And credit cycle distinct from other measures

	CA	AU	JP	GB	NL	FR	DE
U.S. default-adjusted	-1.61***	-0.49	-1.41***	-2.02***	-1.41**	-1.50***	-1.27***
U.S. predicted	0.67	1.11	3.01**	4.78**	0.01	0.96	-0.40
VIX	0.06	0.03	-0.07	-0.02	0.01	0.07	-0.00
Adj. R^2	0.07	-0.00	0.16	0.12	0.18	0.13	0.09
N. obs	129	129	110	129	102	129	122

$$\Delta y_{t,t+h} = \alpha + \varphi \Delta y_{t-h,t} + \beta_{\text{FF}} \text{U.S. real policy rate}_t + \beta_{\text{slope}} \text{TSY slope}_t + \gamma' CS_t^{U.S.} + \epsilon_{t+h}$$

- One-year ahead real GDP growth rates
- SM, expanding window estimate

Fact 6: And credit cycle distinct from other measures

	CA	AU	JP	GB	NL	FR	DE
U.S. default-adjusted	-1.23***	-0.28	-1.83***	-1.62***	-1.51***	-1.05***	-1.43***
U.S. predicted	1.01	1.29	2.03	3.34**	0.73	1.28	-0.63
Δ TWI USD	-0.04	-0.05	0.07	-0.02	-0.03	-0.01	0.07
Adj. R^2	0.14	0.05	0.16	0.14	0.17	0.06	0.10
N. obs	193	193	110	193	102	166	122

$$\Delta y_{t,t+h} = \alpha + \varphi \Delta y_{t-h,t} + \beta_{\text{FF}} \text{U.S. real policy rate}_t + \beta_{\text{slope}} \text{TSY slope}_t + \gamma' CS_t^{U.S.} + \epsilon_{t+h}$$

- One-year ahead real GDP growth rates
- SM, expanding window estimate

Non-price measures

Beyond credit spreads?

- Corporate bond market distress multifaceted:
  1. Primary market issuance slow downs
  2. Secondary market prices decrease and liquidity dries-up ("liquidity black holes")
  3. Ambiguous effect on secondary market volume
- Corporate Bond Market Distress Index (CMDI):
  - Pseudo-real time index of corporate bond market distress in the U. S.
  - Based on a "preponderance of metrics" approach
  - Captures primary market pricing and volume, secondary market pricing and volume, secondary market liquidity, pricing of untraded bonds
  - Sample: 2005 – current

CMDI predicts real activity over and above credit spreads

	Industrial production	Unemployment	Real GDP
Market CMDI	-27.15 ***	4.05**	-6.44 **
Default-adjusted spread	-0.78	0.68 **	-0.87
Predicted spread	16.53**	-1.94	0.40
Adj. R-sqr.	0.51	0.69	0.54
N. of obs	158	158	53

$$\Delta y_{t,t+h} = \alpha + \varphi \Delta y_{t-h,t} + \beta_{\text{FF}} \text{Real EFFR}_t + \beta_{\text{slope}} \text{TSY slope}_t + \gamma' CS_t + \epsilon_{t+h}$$

- One-year ahead growth rates
- SM, expanding window estimate

Conclusion

Conclusion

Credit spreads commonly accepted predictors of real activity

But care is needed in

- Constructing (pseudo) real time estimates
- Understanding which credit markets matter
- Recognizing information beyond credit spreads