How Does Low for Long Impact Credit Risk Premiums?

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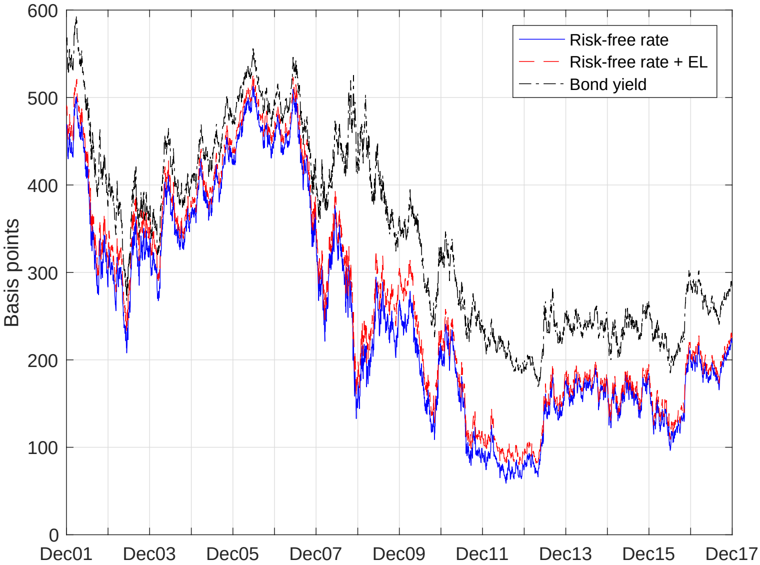
Motivation

- Just prior to the historic reduction to a zero Fed funds rate on December 16, 2008, IG bond yield spreads averaged 6.51% and HY bonds traded at a spread of nearly 22%
- CDS rates were near all-time high (310 bps for median firm)
- All 3 credit risk measures fell on FOMC announcement, but remained elevated compared to pre-recession levels
- With such extreme pressure in credit markets, accommodative monetary policy is to be expected
- However, few people would have predicted in December 2008 that low Fed funds rate would continue through most of the next decade
- How did credit markets respond to this extraordinary stimulus?

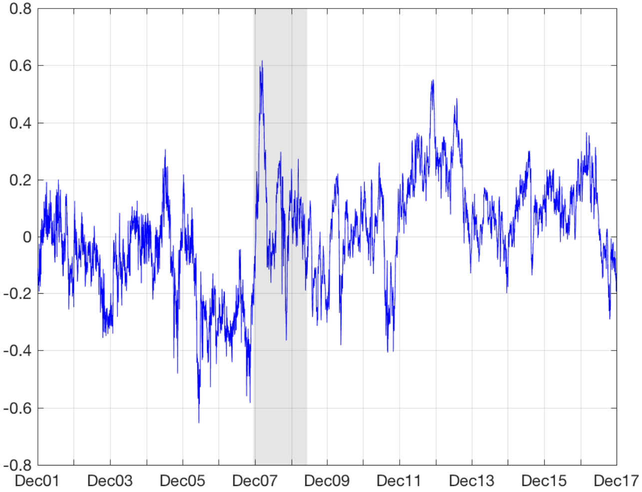
Corporate bond yields and their components



Our contribution

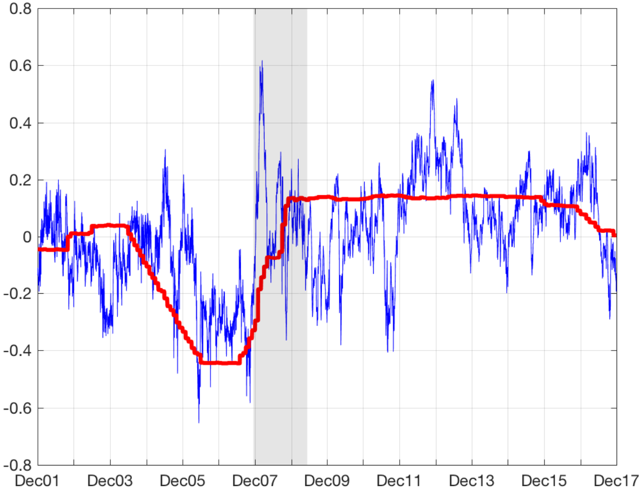
- Test for effects of low interest rate environment on risk premia in credit markets using Markit CDS data for public U.S. firms
- Decompose CDS rates into expected losses rates and risk premia. Focus on the latter component
- Data include nearly 1.3 million firm-date observations for more than 520 public U.S. firms, from 2002–2017
- Show that more than 80% of risk premia variation explained by
    - the level of and firms' exposure to systematic default risk
    - controls for mis-measuring expected losses
    - proxies for CDS market liquidity
- Yet there remains a distinct termporal pattern in residual risk premia

Residual credit risk premia



- Residuals are generally larger post-GFC than before

Residual credit risk premia and (negative) Fed funds rate



- We propose several hypotheses why post-GFC residuals may be larger and test them

What may explain higher post-GFC credit risk premia?

H1 Higher exposure to systematic default risk

H2 Ambiguity aversion

H3 Reaching for yield

H4 Higher net operating costs for financial intermediaries

H5 Tighter regulation, trading through central counterparties

Related literature

- **Exposure to systematic credit risk** Hilscher and Wilson (2016)
- **Ambiguity aversion** Shi (2017); Puhl, Savor, and Wilson (2016)
- **Reaching for yield** Borio and Zhu (2012); La Spada (2018); Greenwood and Hanson (2013); Choi and Kronlund (2018); Drechsler, Savov, and Schnabl (2018);
- **Operating costs** Di Maggio and Kacpercyzk (2017); Chodorow-Reich (2014)); Becker and Ivashina (2015)
- **Regulation** Boyarchenko et al (2016); Anderson and Stulz (2017); Bao, O'Hara, and Zhou (2018); Dick-Nielsen and Rossi (2018)

Data: CDS rates and probabilities of default (PDs)

Descriptive statistics

	CDS	PD		Rec	EL	
		RMI	Rtg		RMI	Rtg
All						
	80	28	40	0.40	16	23
By rating						
Aaa	19	10	2	0.40	6	1
Aa	27	13	6	0.40	7	3
A	40	15	15	0.40	9	9
Baa	78	25	42	0.40	14	24
Ba	185	52	158	0.40	31	92
B	342	100	564	0.40	59	302
Caa	681	176	1,327	0.37	113	735
Ca-C	1,598	311	1,816	0.30	211	1,099

Measuring credit risk premia

- Let C_t denote time-t CDS rate. In the absence of market frictions,

$$\Delta\, C_t \sum_{k=0}^{K-1} E_t \left((1 - D_{t,k\Delta}) \frac{M_{t+(k+1)\Delta}}{M_t} \right) \;\; = \;\; \sum_{k=0}^{K-1} E_t \left(L_{t+k\Delta,\Delta} D_{t+k\Delta,\Delta} \, \frac{M_{t+(k+1)\Delta}}{M_t} \right)$$

- The expected loss rate is the hypothetical CDS rate EL_t that would apply in the absence of risk aversion and market frictions:

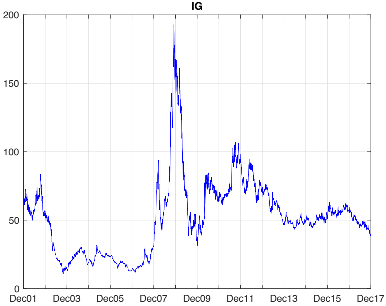
- For a flat and relatively low term structure of default probabilities,

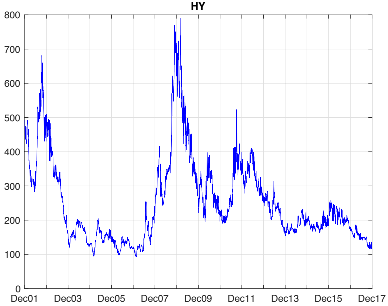
$$\mathrm{EL}_t \;\; \approx \;\; PD_t \times LGD$$

- The credit risk premium, denoted RP_t, is defined as

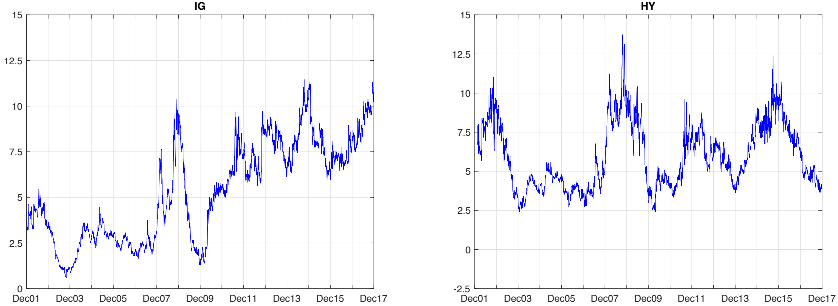
$$\mathrm{RP}_t \;\; = \;\; C_t - \mathrm{EL}_t$$

Median credit risk premia





Median credit risk premia per unit of expected loss



Unconventional monetary policy (UMP) announcements

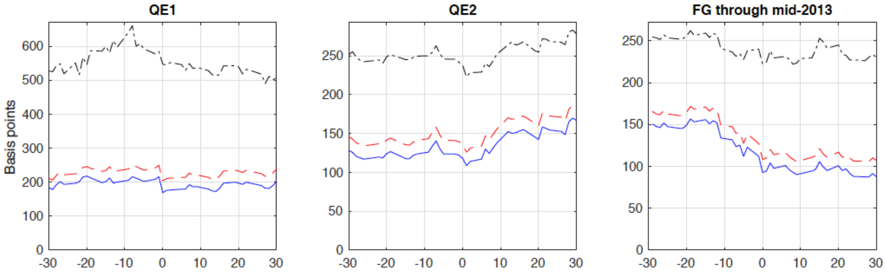
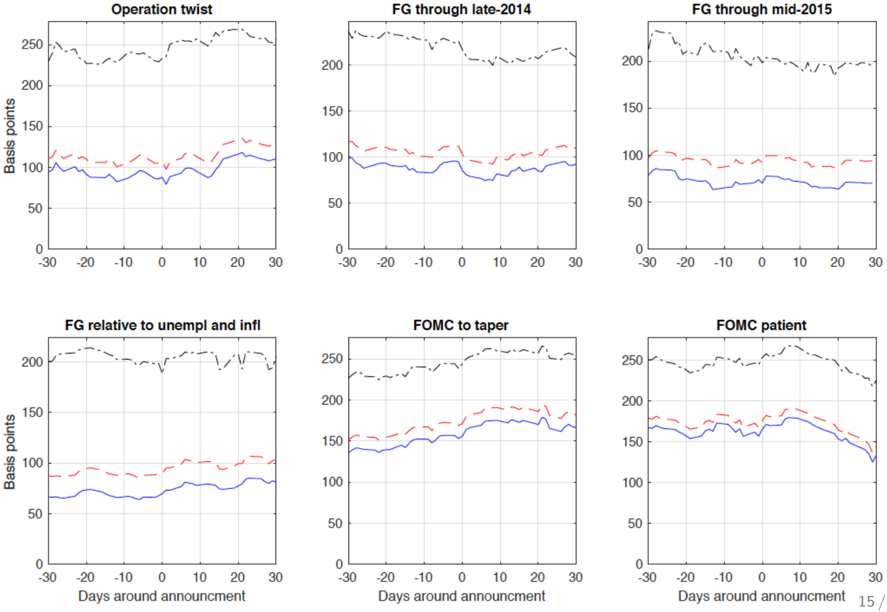


Figure: 5-year constant maturity Treasury rates (blue solid line), the Treasury rate plus the average 5-year expected loss rate (red dashed line), and the Treasury rate plus the average 5-year CDS rate (black dash-dot line), across Baa2 rated firms.

UMP announcement effects



Explaining risk premia variation

- Approximately,

$$C \;=\; E\left[m\,(L\,D)\right] = \mathrm{EL} + \mathrm{Cov}(m, L\,D),$$

- Dividing by EL and taking logs on both sides yields

$$\log\left(\frac{C}{\mathrm{EL}}\right) \;=\; \log\left(1 + \frac{1}{\mathrm{EL}}\,\beta\,L\,\mathrm{Var}(m)\right),$$

where $\beta = \mathrm{Cov}(m, D)/\mathrm{Var}(m)$

- Index firms by i, time by t, assume $\log(C_t^i)$ is measured with noise:

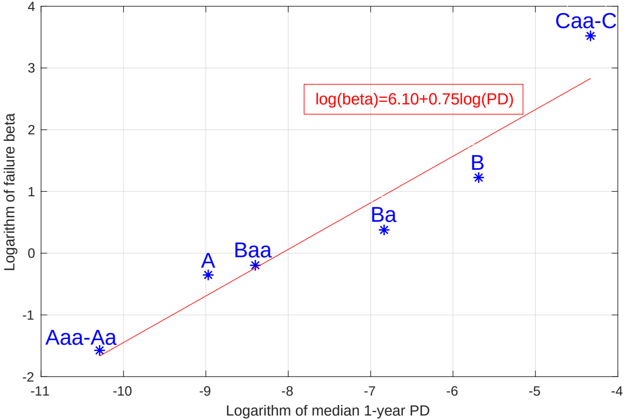
$$\log\left(\frac{C_t^i}{\mathrm{EL}_t^i}\right) = \log\left(\beta_i\right) - \log\left(\mathrm{EL}_t^i\right) + \log(L_t^i) + \log\left(\mathrm{Var}(m_t)\right) + z_t^i + \varepsilon_t^i$$

where $z = \log\left(1 + \frac{\mathrm{Cov}(m,L\,D)}{\mathrm{EL}}\right) - \log\left(\frac{\mathrm{Cov}(m,L\,D}{\mathrm{EL}}\right)$

Failure betas

- Assuming β is same for firms of rating k, and $\widetilde{m}$ denotes market performance variable (e.g., realized market average default rate), run

$$\mathrm{PD}_i \quad = \quad \alpha_i + \beta_{k(i)} E(\widetilde{m}) + u_i,$$



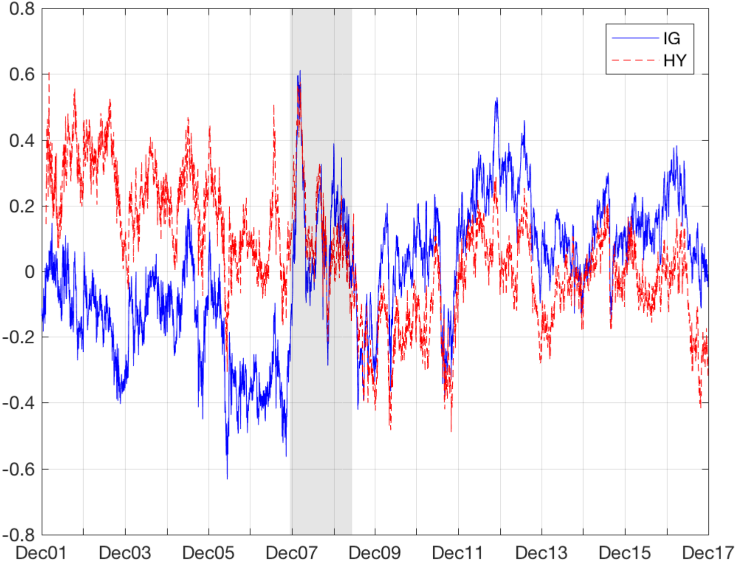
Benchmark panel regression

- Our benchmark model of credit risk premia is specified as

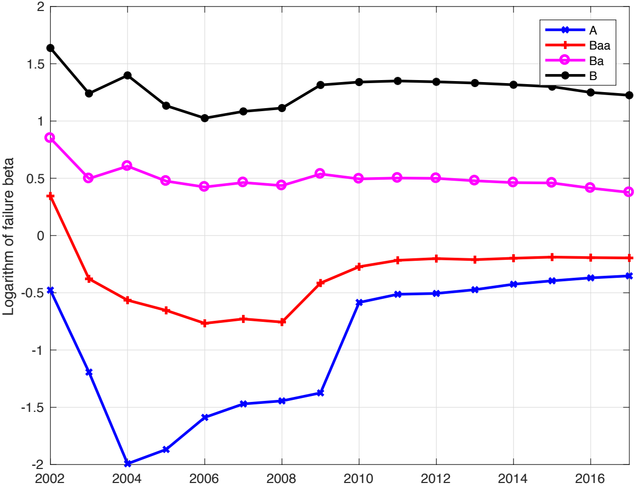
$$\log\left(C_t^i/\mathrm{EL}_t^i\right) = a + b\log(\mathrm{EL}_t^i) + X_t^i\, b_X' + Y_t\, b_Y' + \varepsilon_t^i$$

	RMI	Rtg		RMI	Rtg
Constant	10.226	9.760	$\log(\mathrm{IV}^{\mathrm{SPX}}_{atm})$	0.199	0.157
	(0.331)	(0.320)		(0.039)	(0.040)
$\log(\mathrm{EL})$	-0.940	-0.735	$\log(\mathrm{IV}^{SPX}_{otm}/\mathrm{IV}^{SPX}_{atm})$	3.118	3.120
	(0.003)	(0.018)		(0.160)	(0.165)
$\log(\mathrm{IV}_{atm})$	0.727	0.856	log(CSENT)	-1.281	-1.318
	(0.019)	(0.017)		(0.088)	(0.088)
$\log(\mathrm{IV}_{otm}/\mathrm{IV}_{atm})$	0.826	0.823	Nbr of CDS quotes	-0.013	-0.010
	(0.040)	(0.039)		(0.002)	(0.001)
Recent upgrade	-0.036	-0.040	1/CDS notional	0.529	0.535
	(0.004)	(0.004)		(0.048)	(0.047)
Recent downgrade	0.123	0.122	Refined rtg dummies	Yes	Yes
	(0.007)	(0.007)	Sector dummies	Yes	Yes
Recent upgr HY to IG	-0.053	-0.051	R^2	0.831	0.729
	(0.015)	(0.015)	RMSE	0.464	0.464
Recent dngr IG to HY	0.108	0.098			

Median residuals by credit quality



Higher exposure to systematic default risk post-GFC for IG firms



H1: Changes in systematic default risk exposure

	RMI	Rtg	no EL
Failure beta	0.106	0.086	0.107
	(0.008)	(0.008)	(0.008)
R^2	0.833	0.728	0.797
RMSE	0.462	0.462	0.465

- All else the same, for RMI PDs, C/EL is estimated to be

$$\exp(0.106 \times \log(0.76/0.66)) - 1 = 16\%$$

higher when the failure beta increases from 2009 Baa value of 0.66 to 2010 Baa value of 0.76

H2: Ambiguity aversion

	RMI	Rtg		RMI	Rtg
FF range	0.391	0.395	Firm VoV	0.136	0.126
	(0.097)	(0.097)		(0.022)	(0.023)
R^2	0.832	0.731	R^2	0.831	0.729
RMSE	0.463	0.463	RMSE	0.464	0.464

H3: Reaching for yield

- Dependent variable is residual credit risk premium from benchmark regression

	RMI-based EL			Refined-ratings-based EL		
	post-GFC	ZLB	ISS/ZLB	post-GFC	ZLB	ISS/ZLB
Constant	-0.100	-0.064	-0.050	-0.095	-0.059	-0.047
	(0.015)	(0.014)	(0.012)	(0.014)	(0.014)	(0.012)
HY	0.140	0.097	0.060	0.115	0.087	0.052
	(0.011)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)
RFY $\times$ IG	0.200	0.153	0.166	0.191	0.142	0.155
	(0.018)	(0.018)	(0.019)	(0.018)	(0.018)	(0.190)
RFY $\times$ HY	-0.075	-0.073	-0.033	-0.037	-0.061	-0.016
	(0.015)	(0.015)	(0.016)	(0.015)	(0.015)	(0.016)
R^2	0.037	0.022	0.020	0.032	0.018	0.018
RMSE	0.453	0.457	0.457	0.455	0.458	0.458

Issuer quality

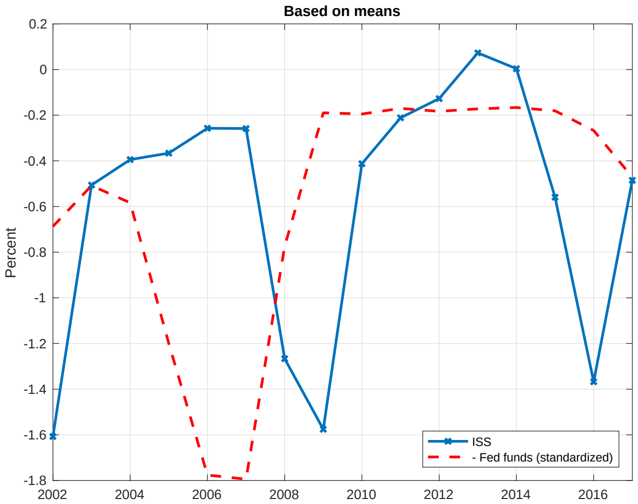


Figure: Our estimates for issuer quality measure ISS in Greenwood and Hanson (2013)

H4: Operating costs for financial intermediaries

	RMI	**Rtg**		**RMI**	**Rtg**
MMMF OC	0.116	0.113	MMMF OC $\times 1_{\mathrm{IG}}$	0.145	0.143
	(0.006)	(0.006)		(0.006)	(0.006)
			MMMF OC $\times 1_{\mathrm{HY}}$	0.032	0.034
				(0.005)	(0.005)
R^2	0.845	0.749	R^2	0.849	0.755
RMSE	0.446	0.447	RMSE	0.439	0.441

H5: Regulation

	RMI	Rtg		RMI	Rtg
Dodd-Frank	0.421	0.398	CCP market share	2.306	2.272
	(0.023)	(0.024)		(0.133)	(0.128)
Volcker Rule	0.082	0.098			
	(0.020)	(0.022)			
R^2	0.845	0.749	R^2	0.842	0.745
RMSE	0.445	0.446	RMSE	0.450	0.450

Conclusion

- While long period of low interest rates after GFC led to a lower cost of borrowing for U.S. corporations, higher residual credit risk premia that accompanied the ultra-low rates did not
- More than 80% of risk premia variation explained by
  - level of and firms' exposure to systematic default risk
  - controls for mis-measuring expected losses
  - proxies for CDS market liquidity
- In ZLB period, residual risk premia lower for HY debt compared to IG debt, consistent with reaching for yield interpretation
- Findings also consistent with
  - ambiguity aversion related to the end of the low-rate environment
  - a decrease in the supply of risk capital
  - higher costs of trading credit risky instruments