*Macroeconomic News and Risk in Online Lending**

Xin Zhang
Sveriges Riksbank

FinTech HO2020 project Mid-Term Event
Bucharest, Nov. 15, 2019

*The views expressed here are not the official views of Sveriges Riksbank.

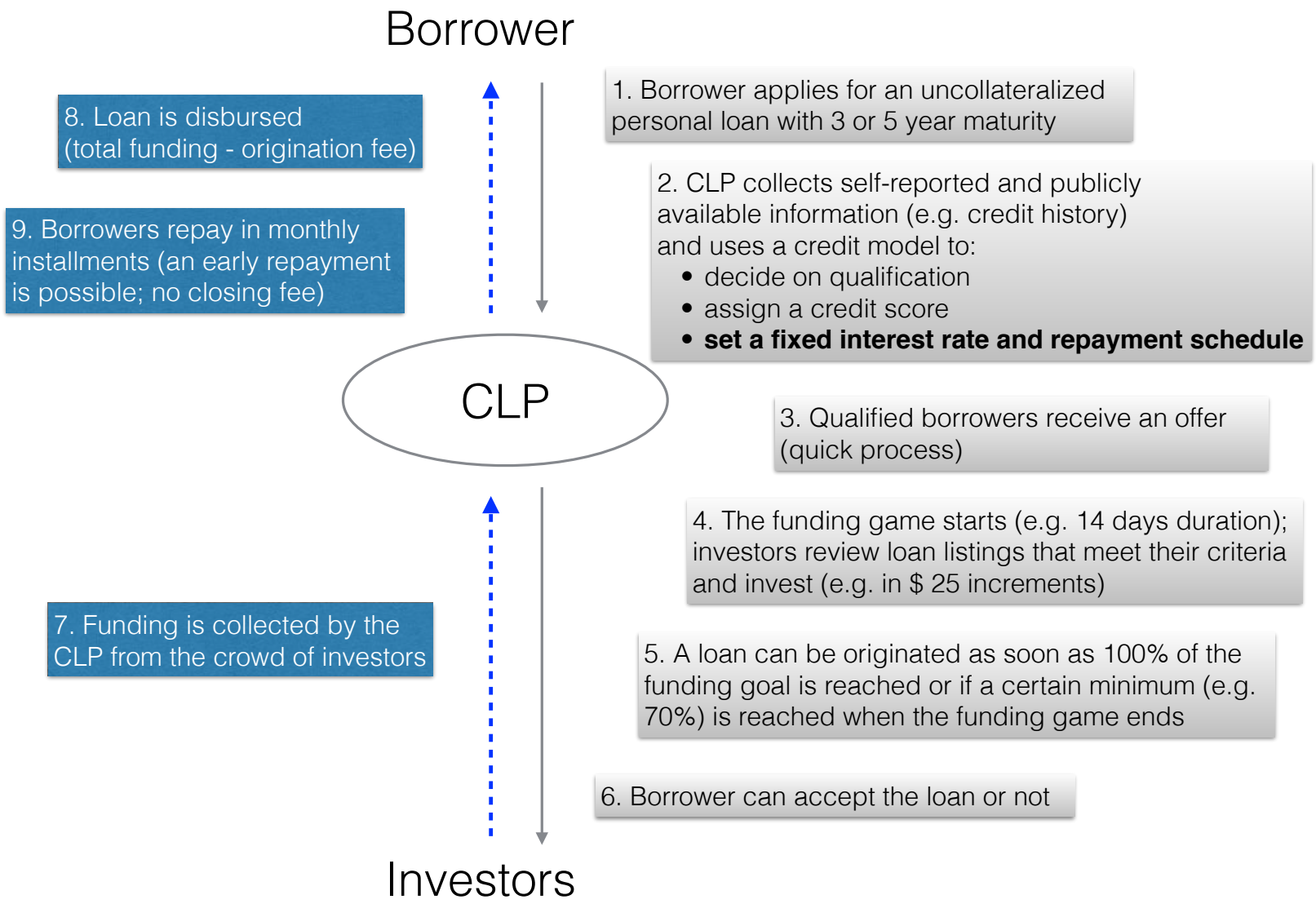
Research question

Does macroeconomic news affect credit risk in online lending?

Roadmap

- Positive news about the economy redistributes funding into the higher risk subsection of the peer to peer lending market.
  - "Monetary Normalizations and Consumer Credit: Evidence from Fed Liftoff and Online Lending".
- Negative news about Brexit motivates investors to diversify the portfolio (work in progress).
- Discussion: the (in)stability of risk pricing in online lending when there is a structural break, due to regulatory changes or macroeconomic regime switches.

Before we start: how does P2P lending work?



The Fed liftoff

- How does the monetary normalization process affect interest rates in the consumer credit market?
- Evidence from liftoff and P2P lending segment
  - Hourly data from *Prosper.com*, a US lending-based crowdfunding platform (CLP)
  - Origination data from *LendingClub.com*
- Main findings:
  1. Average interest rates *decreased* on newly posted Prosper loans by around 16.9-22.9 basis points (bps)
  2. Spread (high vs. low credit risk bins) *decreased* by 16%
  3. Increase in supply; especially to high credit risk borrowers
  4. Credit risk channel & monetary policy signalling; investor-perceived reduction in default probabilities

Monetary normalization & Fed announcement

Policy Normalization Principles and Plans, Sept. 2014:

- *"When economic conditions and the economic outlook warrant a less accommodative monetary policy, the Committee will raise its target range for the Fed funds rate."*

Pre-announcement:

James Bullard (WSJ, Dec. 7): "If we do move in December, it will certainly be momentous. It will be a great signal I think for the U.S. economy: It does signal confidence."

Fed announcement & market expectations

FOMC announcement on Wednesday, 16 Dec. 2015:

- increase in the target federal funds rate from the range 0-25 bps to 25-50 bps
- guidance on future hikes ('gradual'; 4x25 bps in 2016), afterwards revised downward
- positive assessment of current and future labor market conditions

Market expectations? The Fed did not undershoot.

▸ Market expectations

Theoretical framework & expected effects

Two key channels

1. **Risk-free rate channel:** monetary contractions literature (e.g., Cook & Hahn '89 and Kuttner '01)
2. **Credit risk channel:** credit spreads
   - increase after surprise monetary contractions (Gertler & Karadi '15)
   - are countercyclical and regarded as a leading indicator for economic activity (Gilchrist & Zakrajsek '12)

Positive signal of a monetary normalization

- MP signaling literature (e.g., Cambell et al. '12)

Online lending

- employment risk is a key determinant of credit risk

▸ literature

Main data set

- Source: *Prosper.com* website ▸ Background
- Main sample: 326,044 loan-hour observations (Nov. 20 - Jan. 20)
- Observed characteristics: loan purpose, size, interest rate, maturity, monthly payment, employment status, income category, debt-to-income ratio, Prosper credit rating
- Employment status: employed, self-employed, unemployed
- Prosper rating: AA, A, B, C, D, E, HR
- Out of 4,257 loan applications in the dataset, 3,015 loans are identified as successfully originated
- The inflow of loan applications posted online can be continues around the clock
- Liftoff time: December 16th, 2pm ET

Histogram of interest rates

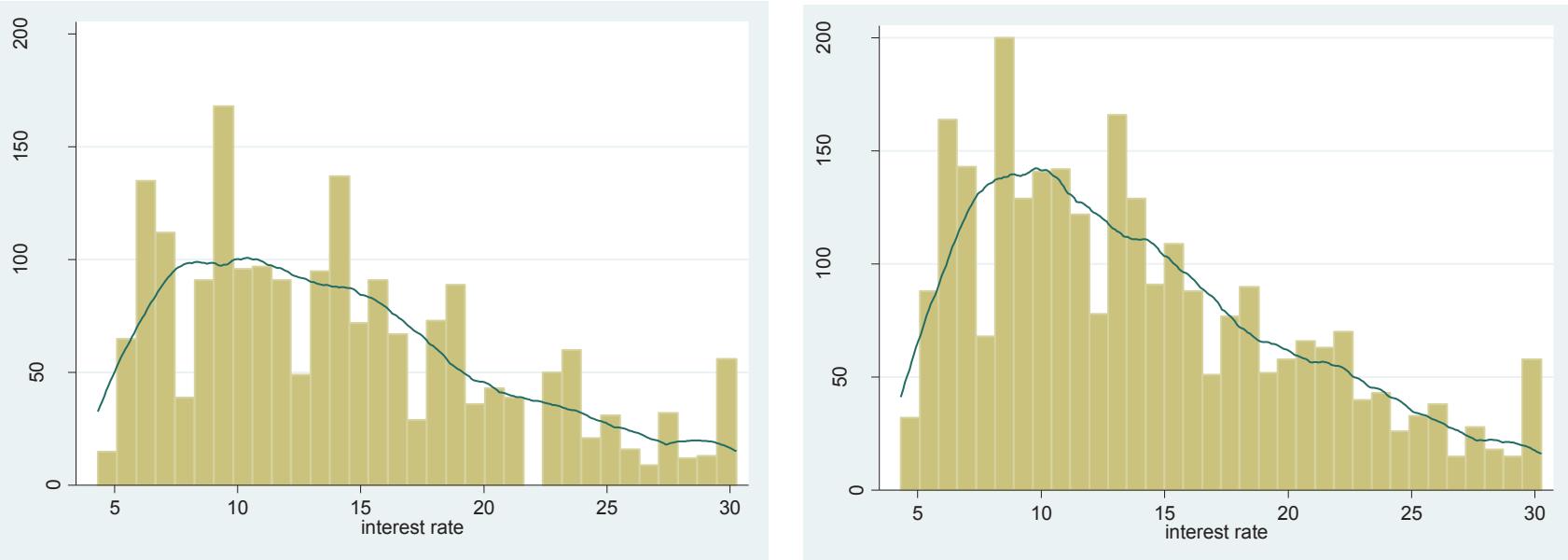


Figure: Histogram of interest rates for loans in our observed period, before (left panel) and after (right panel) Fed liftoff on December 16th, 2015.

Key result 1: interest rate reduction

	Dependent variable: Interest rate			
	(1)	(2)	(3)	(4)
Explanatory variables				
Liftoff	-0.195*	-0.229***	-0.173***	-0.169***
	(-1.74)	(-3.10)	(-3.17)	(-4.36)
Controls				
Loan Characteristics	✓	✓	✓	✓
Borrower Characteristics	✓	✓	✓	✓
Main Effects				
Weekday FE		✓	✓	✓
Hour FE	✓	✓	✓	✓
Adj. R^2	0.971	0.972	0.972	0.970
Observations	445	987	1,818	4,257
Window Size (days)	±3d	±7d	±14d	60d

Notes. The baseline regression of

$$\text{InterestRate}_{i,t} = \alpha + \alpha_h + \alpha_d + \beta_1 \text{Liftoff}_t + \gamma_1 \text{LoanCharacteristics}_i + \gamma_2 \text{BorrowerCharacteristics}_i + \epsilon_{i,t}.$$

The interest rate is in percentage points. The variable Liftoff_t is a dummy that equals 1 after the liftoff announcement on December 16, 2015. t statistics are shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

▸ robustness ▸ placebo test 1

Interest rate dynamics

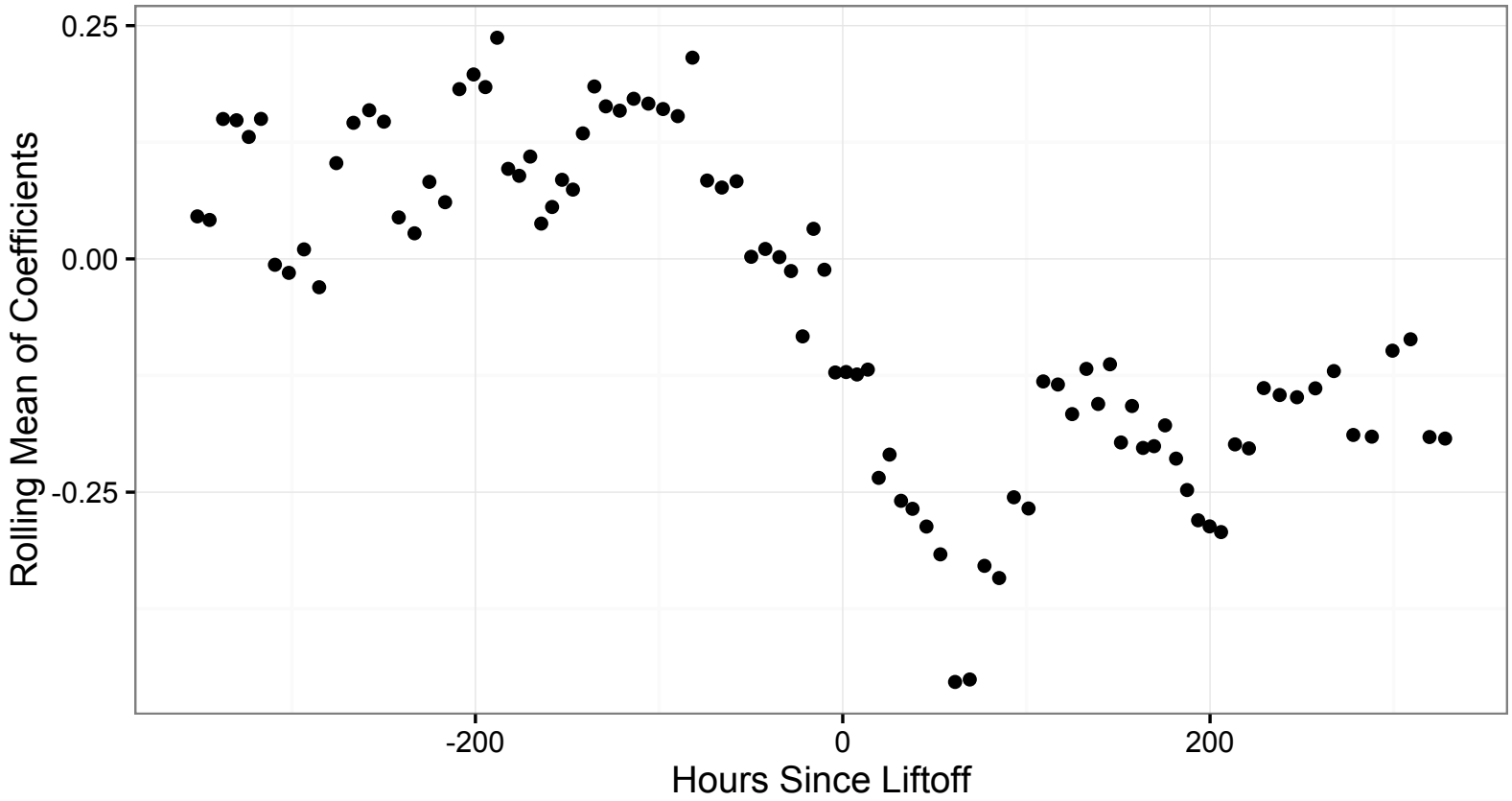


Figure: Plot of the rolling mean of the coefficients from a regression of the interest rate residuals on time dummies over a $\pm$14-day window around liftoff.

▸ placebo test 2

Key result 2: credit spread reduction

	Dependent variable: Interest rate			
	(1)	(2)	(3)	(4)
Explanatory variables				
Liftoff	-1.810***	-1.884***	-1.891***	-1.934***
	(-2.81)	(-2.92)	(-2.87)	(-2.94)
$1\{EMP, HighCR\}$	-10.360***	-10.376***	-9.605***	-9.629***
	(-21.52)	(-21.37)	(-17.61)	(-17.55)
$1\{EMP, HighCR\} \times$ Liftoff	1.536**	1.654**	1.601**	1.658**
	(2.01)	(2.16)	(2.08)	(2.15)
Controls				
Loan Characteristics			✓	✓
Borrower Characteristics			✓	✓
Main Effects				
Weekday FE		✓		✓
Hour FE		✓		✓
Pre-Liftoff, int. rate meain $1\{UnEMP, LowCR\} = 0$	17.805	16.085	19.974	19.315
Adj. R^2	0.663	0.668	0.671	0.675
Observations	355	355	355	355

Notes. We focus on ±7-day windows around liftoff. The interest rate is regressed on the liftoff dummy, borrower riskiness (Employment and Credit Rating), and their interaction terms.

$$\begin{aligned} \text{InterestRate}_{i,t} \quad = \quad & \alpha + \alpha_h + \alpha_d + \beta_0 1\{EMP, HighCR\}_i + \beta_1 \text{Liftoff}_t + \beta_2 1\{EMP, HighCR\}_i \times \text{Liftoff}_t \\ & + \gamma_1 \text{LoanCharacteristics}_i + \gamma_2 \text{BorrowerCharacteristics}_i + \epsilon_{i,t}. \end{aligned}$$

Supply measures: funding success

We use three measures for the dependent variable $Y_{i,t}$

- the success of loan origination: $1\{LoanFunded\}_i$
- the increase of funding for each loan:
  $\text{Funding Increase}_{i,t} = \Delta(\text{Funding Percentage})_{i,t}$
- the speed of funding increase:
  $\text{Funding Speed}_{i,t} = \Delta(\text{Funding Increase})_{i,t}$.

Supply regressions

Dependent variable	(1) $1\{LoanFunded\}$	(2) Funding Increase	(3) Funding Speed
Explanatory variables			
Liftoff	0.238**	0.137***	0.028**
	(2.39)	(11.23)	(1.98)
Controls			
Loan Characteristics	✓	✓	✓
Borrower Characteristics	✓	✓	✓
Main Effects			
Weekday FE	✓	✓	✓
Hour FE	✓	✓	✓
R^2	0.094	0.098	0.015
Observations	2,858	237,296	237,296
Window size (days)	60d	60d	60d

Notes. Funding success is regressed on a liftoff dummy, loan-borrower characteristics (as in previous regressions), and time dummies. The corresponding regressions are

$$Y_{i,t} = \alpha_t + \beta_1 \text{Liftoff}_t + \gamma_1 \text{LoanCharacteristics}_i + \gamma_2 \text{BorrowerCharacteristics}_i + \epsilon_{i,t}.$$

Results are from OLS regressions, except for a Logit regression with the funding probability $1\{LoanFunded\}$. t statistics are shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Funding gap & demand regressions

Panel A: aggregate	(1) FundingGap	(2) FundingGap	(3) Demand	(4) Demand
Explanatory variables				
Liftoff	-0.474***	-0.477***	0.031***	0.030***
	(-23.12)	(-23.47)	(5.81)	(5.79)
Controls				
Main Effects				
Weekday FE		✓		✓
Hour FE		✓		✓
Window size (days)	60d	60d	60d	60d
Pre-Liftoff, $\{UnEMP, LowCR\}$ mean	2.475	2.347	0.103	0.087
Adj. R^2	0.113	0.128	0.023	0.039
Observations	1,403	1,403	1,403	1,403

Notes. t statistics are shown in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

▸ regression segments

Summary of robustness tests

- ✓ Placebo tests
- ✓ Perceived default risk vs. risk appetite: variance risk premium
- ✓ Borrower composition
- ✓ External validity across markets and time?
  - LendingClub data
  - Real yield curve slope
- ✓ State-level heterogeneity in unemployment rates
  - State-level unemployment is an important determinant of interest rate setting
  - Reduction in interest rates after liftoff tends to be larger for states with higher unemployment rates

▸ tables

Liftoff and state-level heterogeneity

	Dependent variable: Interest rate		
	(1)	(2)	(3)
Explanatory variables			
Liftoff	-0.294***	-0.438***	-0.237***
	(-3.26)	(-3.70)	(-3.90)
1{Unemp}	0.207**		
	(2.35)		
1{Unemp}×Liftoff	-0.049		
	(-0.39)		
1{CreditCard}		-0.058	
		(-0.62)	
1{CreditCard}×Liftoff		0.244*	
		(1.69)	
1{BankDeposit}			0.191**
			(2.10)
1{BankDeposit}×Liftoff			-0.398**
			(-2.65)
Controls			
Loan Characteristics	✓	✓	✓
Borrower Characteristics	✓	✓	✓
Main Effects			
Weekday FE	✓	✓	✓
Hour FE	✓	✓	✓
Window size (days)	60d	60d	60d
Benchmark int.rate mean	15.291	15.500	15.463
Adj. R^2	0.839	0.838	0.839
Observations	4,257	4,257	4,257

The Brexit uncertainty

- How does the Brexit uncertainty affect investors' behavior in the peer to corporate lending market?
- Evidence from FundingCircle data between September 7, 2016 and February 8, 2017.
  - Bidding history from *FundingCircle*, a UK lending-based crowdfunding platform (CLP).
  - UK economic uncertainty index from Bloom et al..

The UK EPU index

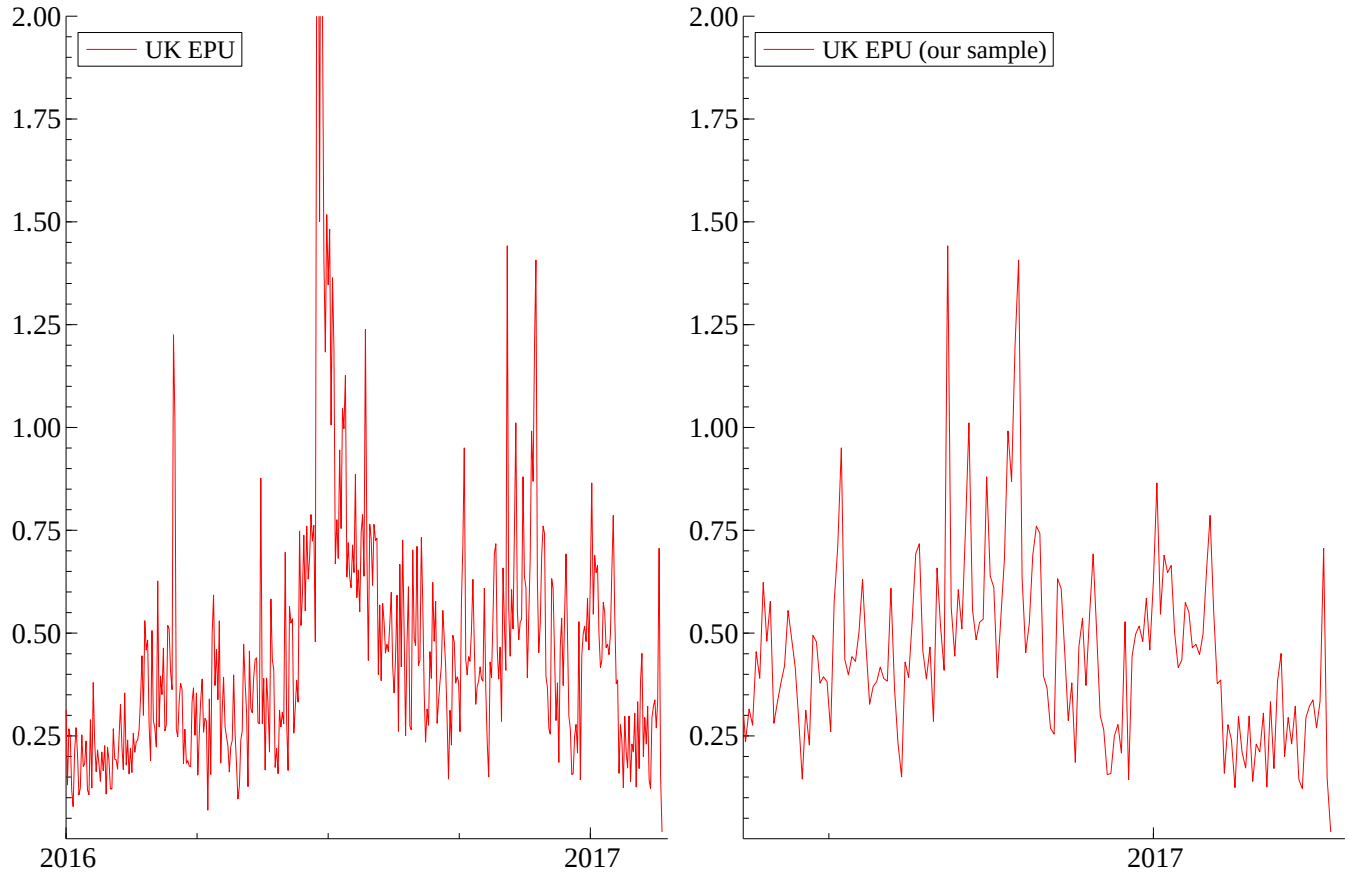


Figure: The UK EPU index: it captures the high uncertainty when the Brexit news shocks arrive.

Preliminary results

	(1) Bid S.D.	(2) Bid HHI_i	(3) Bid HHI_t
Explanatory variables			
EPU	-0.007**	-0.006**	-0.019***
	(0.003)	(0.003)	(0.005)
Controls			
Loan Characteristics	✓	✓	✓
Firm Characteristics	✓	✓	✓
Fixed Effects			
Location	✓	✓	✓
Industry	✓	✓	✓
Risk level	✓	✓	✓
Adj. R^2	0.055	0.034	0.201
Observations	3,107	3,107	3,107

Notes. The baseline regression of

$$y_{i,t} = \alpha + \alpha_{location,industry,risk} + \beta_1 \text{EPU}_t + \gamma_1 \text{LoanCharacteristics}_i + \gamma_2 \text{FirmCharacteristics}_i + \epsilon_{i,t}.$$

The variable EPU_t is a continuous variable over time. t statistics are shown in parentheses. Most results hold if we use the ΔEPU in the regression. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Industry effects

- The results are stronger for firms in export-oriented industries.
- Even opposite results for non-exporting industries.
- Possible explanations:
  - Rational attention allocation: macro news dominates the private firm information.
  - Risk management of the investors: diversify the portfolio.

Summary and conclusion

- Impact of macroeconomic news on credit risk management for the P2P and P2C lending.
- Key takeaways
  - Online lending serves as a good laboratory to investigate impact of macro shocks: timely update and rich borrower/lender information.
  - Investors take into account the macroeconomic news shocks: a supply-side explanation.
  - Challenges for complex risk modeling when there is a structural break/macroeconomic regime switch (Future work on model (in)stability with macroeconomic news shocks).
- **Thank you!**

Fed announcement & market expectations (2)

- The Fed announcement *exceeded* market expectations in mid December 2015

Table: Selected interest rates around Fed liftoff

Date	Commercial Paper	Corporate Bonds
Dec. 9	0.23	2.76
Dec. 16	0.35	2.93
Dec. 23	0.39	2.92

Notes. The rates given are for 1-month, AA financial commercial paper and 3-5 year effective yields on U.S. corporate bonds (investment grade).

- Bloomberg: Futures contracts implied a .84 probability of the federal funds rate range increasing from 0-25 bps to 25-50 bps and a .16 probability of remaining at 0-25 bps

▸ jump back

P2P lending in the US and *Prosper.com*

Relevance

- $12-15bn loans originated by US CLPs in 2015
- The market grows rapidly; a PWC study expects P2P lending to reach 10% of the volume of revolving US consumer debt by 2025.
- Prosper is oldest (operating since Feb. '06) and second largest US-based CLP for unsecured consumer credit with more than 2 million members (investors and borrowers)
- Prosper and LendingClub cover two-thirds of the market

The CLP business model

- Fee-based income
- Objective: maximize the origination volume

▸ jump back

Table II: Descriptive statistics

Panel A: Full Sample

	mean	sd	min	max	obs		obs	pct		obs	pct
size	13.10	7.13	2.00	35.00	4,257	Business	93	2.18	$1-24,999	175	4.11
int-rate	14.22	6.46	4.32	30.25	4,257	Cons.	415	9.75	$25,000-49,999	1,682	39.51
DTI	27.32	12.33	1	68	4,257	Debt	3,222	75.69	$50,000-74,999	1,213	28.49
maturity	3.77	0.97	3	5	4,257	Other	344	8.08	$75,000-99,999	601	14.12
verif.	2.30	0.76	1	3	4,257	Special	183	4.30	$100,000+	586	13.77
Δfunding	0.95	3.91	0	99	322,600	Total	4,257	100	Total	4,257	100

Panel B1: Sample before the Liftoff

	mean	sd	min	max	obs
size	13.05	7.25	2.00	35.00	2,029
int-rate	14.29	6.46	4.32	30.25	2,029
DTI	27.10	12.24	1	63	2,029
maturity	3.85	0.99	3	5	2,029
verif.	2.30	0.76	1	3	2,029

Panel B2: Sample after the Liftoff

	mean	sd	min	max	obs
size	13.14	7.01	2.00	35.00	2,228
int-rate	14.15	6.46	4.32	30.25	2,228
DTI	27.52	12.41	1	68	2,228
maturity	3.69	0.95	3	5	2,228
verif.	2.30	0.76	1	3	2,228

Panel C1: EMP==Employed

	mean	sd	min	max	obs
size	13.80	7.43	2.00	35.00	3,166
int-rate	13.66	6.35	4.32	30.25	3,166
DTI	27.35	12.05	1	68	3,166
maturity	3.77	0.97	3	5	3,166
CreditBin	0.95	0.76	0	2	3,166

Panel C2: EMP==Self-employed

size	10.59	3.66	2.00	15.00	520
int-rate	17.42	6.40	5.76	30.25	520
DTI	23.60	12.12	1	63	520
maturity	3.74	0.97	3	5	520
CreditBin	1.34	0.66	0	2	520

Panel C3: EMP==Unemployed

size	11.49	7.07	2.00	35.00	571
int-rate	14.37	6.27	4.32	30.25	571
DTI	30.54	13.12	1	63	571
maturity	3.75	0.97	3	5	571
CreditBin	1.04	0.73	0	2	571

Panel D1: CR==High

	mean	sd	min	max	obs
size	13.28	6.44	2.00	35.00	1,198
int-rate	7.28	1.37	4.32	9.43	1,198
DTI	24.84	10.21	1	62	1,198
maturity	3.80	0.98	3	5	1,198

Panel D2: CR==Middle

size	14.38	7.84	2.00	35.00	1,825
int-rate	13.06	2.21	9.49	16.97	1,825
DTI	27.87	12.52	1	66	1,825
maturity	3.79	0.98	3	5	1,825

Panel D3: CR==Low

size	11.02	6.11	2.00	30.00	1,234
int-rate	22.65	3.90	17.61	30.25	1,234
DTI	28.90	13.53	2	68	1,234
maturity	3.69	0.95	3	5	1,234

Robustness 1

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Δ Int-Rate	273	-0.266	0.120	1.987	-0.503	-0.029

mean = mean(Δ Int-Rate)	t = -2.213
H0: mean = 0	degrees of freedom = 272

Ha: mean $<$ 0	Ha: mean $\neq$ 0	Ha: mean $>$ 0
Pr(T $< t$) = 0.014	Pr(|T| $>$ |t|) = 0.028	Pr(T $> t$) = 0.986

Notes. To conduct the sample t test, we measure the difference of regression coefficients by regressing the interest rate on a large set of dummies with all possible combinations of borrower characteristics: loan size, loan type, borrower income, debt-to-income ratio, credit rating, employment status, maturity, and a liftoff dummy. After the regression, we take the difference of the coefficients for the dummies that share all characteristics before and after liftoff. We then test whether the sample mean of the differences is smaller than 0. It is significant at the 5% level.

▸ jump back

Robustness 2

	Dependent variable: Interest rate		
	(1)	(2)	(3)
Explanatory variables			
Liftoff	-0.476**	-0.136***	-0.169***
	(-2.13)	(-3.93)	(-4.36)
Controls			
Loan Characteristics		x	x
Borrower Characteristics		x	x
Main Effects			
Weekday FE	x		x
Hour FE	x		x
Adj. R^2	0.004	0.970	0.970
Observations	4,257	4,257	4,257

Notes. We focus on the main sample form the Prosper over the period November 20, 2015 till January 20, 2016. t statistics are shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robustness 3

	Dependent variable: interest rate					
	(1) High CR	(2) Middle CR	(3) Low CR	(4) Emp	(5) Self-emp	(6) Unemp
Explanatory variables						
liftoff	-0.0854	-0.415***	-0.393*	-0.368***	0.143	-0.427*
	(-0.95)	(-3.56)	(-1.71)	(-3.60)	(0.46)	(-1.69)
ES==Self-employed	-0.206	0.136	-0.686**			
	(-1.61)	(0.89)	(-2.10)			
ES==Unemployed	0.932***	0.848***	0.275			
	(4.82)	(5.26)	(0.96)			
CR==Middle				5.621***	5.737***	5.979***
				(52.30)	(11.88)	(21.61)
CR==Low				14.980***	14.698***	15.070***
				(123.24)	(29.63)	(47.70)
Controls						
Loan Characteristics	x	x	x	x	x	x
Borrower Characteristics	x	x	x	x	x	x
Main Effects						
Weekday FE	x	x	x	x	x	x
Hour FE	x	x	x	x	x	x
Average Int.Rate.	4.240	11.91	60.98	15.55	32.41	13.56
Observations	1,198	1,825	1,234	3,166	520	571
Adj. R^2	0.047	0.027	0.148	0.843	0.775	0.832

Notes. The sample divided into subgroups with credit rating (CR) or employment status (ES). "High CR" includes ratings AA and A, "Middle CR" includes B and C, and "Low CR" includes the rest. Employment statuses: Employed ("Full-time" or "Employed"), Self-employed, and Unemployed (reported as "Other").

Funding gap & demand regressions: segments

Panel B: market segments	(1) FundingGap	(2) FundingGap	(3) Demand	(4) Demand
Explanatory variables				
Liftoff	-0.047***	-0.044***	0.005*	0.006**
	(-7.99)	(-9.81)	(1.70)	(2.01)
$1\{EMP, HighCR\}$	0.181***	0.181***	0.031***	0.031***
	(31.09)	(41.40)	(10.36)	(11.77)
$1\{EMP, HighCR\} \times$ Liftoff	0.101***	0.101***	0.030***	0.030***
	(12.03)	(16.03)	(6.87)	(7.77)
Controls				
Main Effects				
Weekday FE		✓		✓
Hour FE		✓		✓
Window size	±7d	±7d	±7d	±7d
Pre-Liftoff, $\{UnEMP, LowCR\}$ mean	0.232	0.184	0.028	0.007
Adj. R^2	0.828	0.903	0.463	0.583
Observations	650	650	650	650

Notes. t statistics are shown in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

▸ jump back

Robustness 1: before/after regressions using LendingClub origination data (SEC)

	Dependent variable: Interest rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory variables						
Liftoff	-0.158***	-0.210***	-0.169***	-0.363**	-0.335**	-0.279*
	(-3.55)	(-5.55)	(-4.33)	(-2.33)	(-2.34)	(-1.93)
$1\{EMP, HighCR\}$				-2.670***	-1.263***	-1.200**
				(-21.14)	(-2.70)	(-2.57)
$1\{EMP, HighCR\} \times$ Liftoff				0.389**	0.289*	0.262*
				(2.26)	(1.82)	(1.65)
Controls						
Loan Characteristics		✓	✓		✓	✓
Borrower Characteristics		✓	✓		✓	✓
Main Effects						
Weekday FE	✓		✓	✓		✓
Window size (days)	60d	60d	60d	±7d	±7d	±7d
Adj. R^2	0.002	0.231	0.232	0.058	0.196	0.198
Observations	37,717	37,717	37,717	13,880	13,880	13,880

Notes. Regressions use the daily loan-origination reports of LendingClub, another major P2P lender in the US, to the US Securities and Exchange Commission. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robustness 2: changes in risk appetite (Prosper)

	Dependent variable: Interest rate	
	(1)	(2)
Explanatory variables		
Liftoff	-0.174***	-1.933***
	(-4.38)	(-2.92)
$1\{EMP, HighCR\}$		-9.630***
		(-17.52)
$1\{EMP, HighCR\} \times$ Liftoff		1.658**
		(2.14)
VRP	-0.0264	-0.0203
	(-1.21)	(-0.03)
Controls		
Loan Characteristics	✓	✓
Borrower Characteristics	✓	✓
Main Effects		
Weekday FE	✓	✓
Hour FE	✓	✓
Window size (days)	60d	±7d
Adj. R^2	0.971	0.674
Observations	4,257	355

Notes. The interest rate is regressed on the liftoff dummy and variance risk premium (VRP), a model-free measure of investors' risk appetite proposed in **?**. t statistics are shown in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robustness 3: Placebo test 1: January 27, 2016 FOMC meeting

	Dependent variable: Interest rate		
	(1)	(2)	(3)
Explanatory variables			
Post-Announcement	-0.105	0.002	0.025
	(-0.54)	(0.08)	(0.72)
Controls			
Loan Characteristics		✓	✓
Borrower Characteristics		✓	✓
Main Effects			
Weekday FE	✓		✓
Hour FE	✓		✓
Adj. R^2	0.001	0.969	0.969
Observations	6,589	6,589	6,589

Notes. The dependent variable is the interest rate, in percentage points, posted on the P2P lending platform. The variable Post-Announcement$_t$ is a dummy variable that is equal to 1 after the FOMC's announcement on January 27, 2016 to leave the target federal funds rate range unchanged. The characteristic controls include the borrower's debt-to-income ratio, income group, Prosper credit score, and employment status. The loan characteristics include the loan size, the maturity, the loan purpose, and the verification stage. We also include state fixed effect, the weekday fixed effect, hour-of-the-day fixed effect, and additional covariates, such as cross products of loan-borrower characteristics and the liftoff dummy. t statistics are shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

▸ jump back ▸ placebo test 2

Robustness 4: slope of the real yield curve

	Dependent variable: interest rate	
	(1)	(2)
Explanatory variables		
Liftoff	-0.490***	-0.451**
	(-2.59)	(-2.45)
$1\{EMP, HighCR\}$	-8.298***	-8.801***
	(-28.46)	(-47.25)
$\text{Slope}^{(5)}$	-2.026***	
	(-3.00)	
$1\{EMP, HighCR\} \times \text{Slope}^{(5)}$	1.781**	
	(2.15)	
$\text{Slope}^{(10)}$		-1.816***
		(-3.02)
$1\{EMP, HighCR\} \times \text{Slope}^{(10)}$		1.749***
		(2.19)
Controls		
Loan Characteristics	✓	✓
Borrower Characteristics	✓	✓
Main Effects		
Weekday FE	✓	✓
Hour FE	✓	✓
Window size (days)	60d	60d
Adj. R^2	0.390	0.390
Observations	4,257	4,257

Notes. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Employment risk: state-level heterogeneity

What can we learn from state-level heterogeneity in unemployment rates?

- We define a dummy variable that takes on a value of 1 for states with an unemployment rate higher than the national average
- Overall, we find evidence that the unemployment rate is an important determinant of interest rate setting on Prosper, which resonates with our story line
- The reduction in interest rates after liftoff tends to be larger for states with higher unemployment rates (but insignificant coefficient)

▸ specification

Hypo. revisited: use state-level heterogeneity

Regressions with state-level heterogeneity:

$$\begin{aligned}\text{InterestRate}_{i,t} = \alpha_t + \gamma_1 \text{LoanCharacteristics}_i + \gamma_2 \text{BorrowerCharacteristics}_i \\ + \beta_0 1\{\text{StateHeterogeneity}\}_i + \beta_1 \text{Liftoff}_t + \beta_2 1\{\text{StateHeterogeneity}\}_i \times \text{Liftoff}_t + \epsilon_{i,t}.\end{aligned}$$

with different heterogeneity measures,

- Unemployment rate: $1\{\text{Unemp}\} = 1$ for states with an unemployment rate higher than the national average, i.e. $> 5.2\%$ as of 2015.
- FRBNY CCP 2015Q4: $1\{\text{CreditCard}\} = 1$ for states with credit card balance above the national median level.
- FDIC SoD + CCP: $1\{\text{BankDeposit}\} = 1$ for states with lower deposits per capita and outstanding credit card balances per capita than the median.
- FDIC SoD: $1\{\text{BankComp}\} = 1$ for stronger local deposit market competition (HHI lower than the sample median).

▸ jump back

Related literature

- **Monetary Policy (MP) Path-Through:** Taylor (JEP, '95); and Bernanke & Blinder (AER, '92)
- **Bank Lending Channel of MP:** Kashyap and Stein (AER, '00); Jiminez et al. (AER, '12); Di Maggio ('14)
- **Central Bank Signaling:** Blinder et al. (JEL, '08); Andersson et al. (JME, '06); Swanson (JMCB, '06), Ehrmann & Fratzscher (IJCB, '07), Ehrmann et al. (SJE, '16), Cambell et al. (Brookings, '12), Nakamura & Steinsson (Mimeo,'15)
- **Online Lending:** Duarte et al. (RFS, '12); Pope & Sydnor (JHR, '11); Ravina ('12); Iyer et al. (MS, '15); Crowe & Ramcharan (JMCB, '13), Senney (Mimeo,'16); Chen et al. (GEB, '15); Wei & Lin (Mimeo,'15); Butler et al. (MS, 2015), Paravisini et al. (MS, '16)
- **Household Credit:** Bertola et al. (Eds., '06); Agarwal & Ambrose (Eds., '07); Guiso & Sodini (HEF, '13)

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