

Monetary Normalizations and Consumer Credit: Evidence from Fed Liftoff and Online Lending¹

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¹The views expressed in this presentation are solely the responsibility of the authors and should not be interpreted as reflecting the official views of Sveriges Riksbank.

Research question & main findings

- ▶ How did Fed liftoff affect interest rates in the uncollateralized consumer credit segment in the US?
- ▶ Evidence for a specific market segment: P2P lending
 - Hourly data from *Prosper.com*, a US lending-based crowdfunding platform (CLP)
 - Origination data from *LendingClub.com*
 - Event study: FOMC announcement on December 16
- ▶ Main findings: after liftoff we observe a decrease in
 1. average interest rates on newly posted Prosper loans by around 16.9-22.9 basis points (bps)
 2. the spread between high and low credit risk bins by 16%

Story line

- ▶ Both findings may be unexpected at first glance
- ▶ What was special about liftoff?

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."

- ▶ Monetary normalization: policy signaling matters and influences private macroeconomic forecasts

→ Reduction of perceived default probabilities dominated interest rate pass-through! Especially for borrowers with subprime characteristics.

Fed announcement and 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), since revised downward (1x25 bps)
- ▶ positive assessment of current and future labor market conditions (possibly anticipation of surprisingly good employment data: 292,000 jobs added in Dec. 2015)

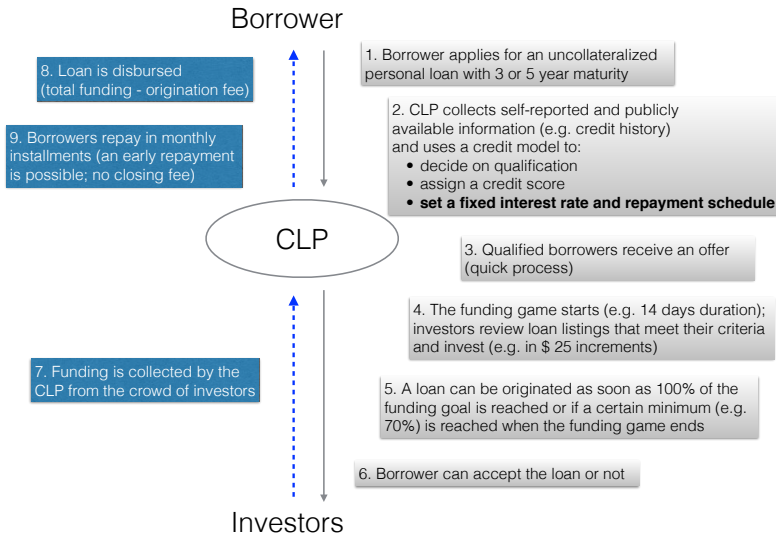
Market expectations: **the Fed did not undershoot**

- ▶ The Fed announcement *exceeded* market expectations in mid December 2015 ▶ CP / CB
- ▶ 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

Literature

- ▶ **Monetary Policy (MP) Pass-Through:** Cook & Hahn (JME, '89); Taylor (JEP, '95); and Bernanke & Blinder (AER, '92)
- ▶ **Central Bank Signaling:** Blinder et al. (JEL, '08); Andersson et al. (JME, '06); Swanson (JMCM, '06), Ehrmann & Fratzscher (IJCB, '07), Ehrmann et al. (SJE, '16), Cambell et al. (Brookings, '12), and Nakamura & Steinsson (Mimeo, '15)
- ▶ **Online Lending:** Duarte et al. (RFS, '12); Pope & Sydnor (JHR, '11); Ravina (2012); Iyer et al. (MS, '15); Crowe & Ramcharan (JMCM, '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)

How does P2P lending work?



How relevant is online lending in the US and how do platforms make money?

Relevance

- ▶ \$12-15bn loans originated by US CLPs in 2015
- ▶ The market grows rapidly: $\sim 70-100\%$ per year
- ▶ Prosper is oldest (operating since Feb. '06) and second largest US-based CLP for unsecured consumer credit
- ▶ Prosper and LendingClub cover two-thirds of the market

The CLP business model

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

Main data set

- ▶ Source: *Prosper.com* website
- ▶ 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

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
Δ funding	0.95	3.91	0	99	322,600	Total	4,257	100	Total	4,257	100

Panel B1: Sample before the Liftoff						Panel B2: Sample after the Liftoff					
	mean	sd	min	max	obs		mean	sd	min	max	obs
size	13.05	7.25	2.00	35.00	2,029	size	13.14	7.01	2.00	35.00	2,228
int-rate	14.29	6.46	4.32	30.25	2,029	int-rate	14.15	6.46	4.32	30.25	2,228
DTI	27.10	12.24	1	63	2,029	DTI	27.52	12.41	1	68	2,228
maturity	3.85	0.99	3	5	2,029	maturity	3.69	0.95	3	5	2,228
verif.	2.30	0.76	1	3	2,029	verif.	2.30	0.76	1	3	2,228

Panel C1: EMP==Employed						Panel D1: CR==High					
	mean	sd	min	max	obs		mean	sd	min	max	obs
size	13.80	7.43	2.00	35.00	3,166	size	13.28	6.44	2.00	35.00	1,198
int-rate	13.66	6.35	4.32	30.25	3,166	int-rate	7.28	1.37	4.32	9.43	1,198
DTI	27.35	12.05	1	68	3,166	DTI	24.84	10.21	1	62	1,198
maturity	3.77	0.97	3	5	3,166	maturity	3.80	0.98	3	5	1,198
CreditBin	0.95	0.76	0	2	3,166						
Panel C2: EMP==Self-employed						Panel D2: CR==Middle					
	mean	sd	min	max	obs		mean	sd	min	max	obs
size	10.59	3.66	2.00	15.00	520	size	14.38	7.84	2.00	35.00	1,825
int-rate	17.42	6.40	5.76	30.25	520	int-rate	13.06	2.21	9.49	16.97	1,825
DTI	23.60	12.12	1	63	520	DTI	27.87	12.52	1	66	1,825
maturity	3.74	0.97	3	5	520	maturity	3.79	0.98	3	5	1,825
CreditBin	1.34	0.66	0	2	520						
Panel C3: EMP==Unemployed						Panel D3: CR==Low					
	mean	sd	min	max	obs		mean	sd	min	max	obs
size	11.49	7.07	2.00	35.00	571	size	11.02	6.11	2.00	30.00	1,234
int-rate	14.37	6.27	4.32	30.25	571	int-rate	22.65	3.90	17.61	30.25	1,234
DTI	30.54	13.12	1	63	571	DTI	28.90	13.53	2	68	1,234
maturity	3.75	0.97	3	5	571	maturity	3.69	0.95	3	5	1,234
CreditBin	1.04	0.73	0	2	571						

Histogram of interest rates

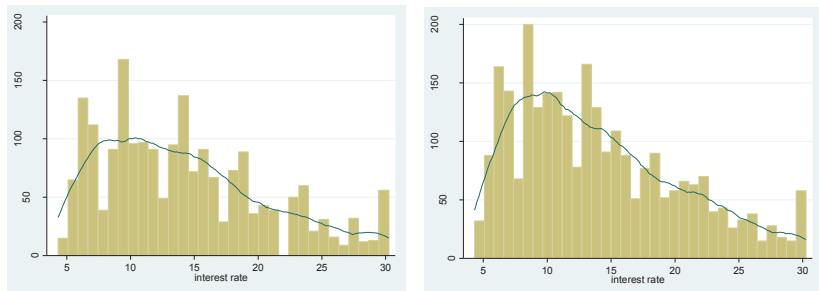


Figure: Histogram of interest rates for loans in our observed period, before (left panel) and after (right panel) Fed liftoff on December 16th, 2015.

Theoretical framework and expected effects (1)

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
- ▶ platform reacts to lasting changes in supply and demand (joint pricing and inventory control problem with a perishable inventory of listed loans)

Theoretical framework and expected effects (2)

Expected effects in the uncollateralized P2P lending market

1. The credit risk channel may dominate the risk-free rate channel if the monetary normalization signal associated with Fed liftoff was sufficiently strong
2. If the average interest rate drop after liftoff stems from a reduction in perceived credit risk, then liftoff should:
 - not be associated with a demand reduction, but the credit risk channel should become visible as:
 - a supply increase since loans are more attractive
 - a reduction of the spread, because low credit rating borrowers are most sensitive to changes in the macroeconomic outlook
3. The employment outlook is an important determinant of interest rates

Interest rate dynamics

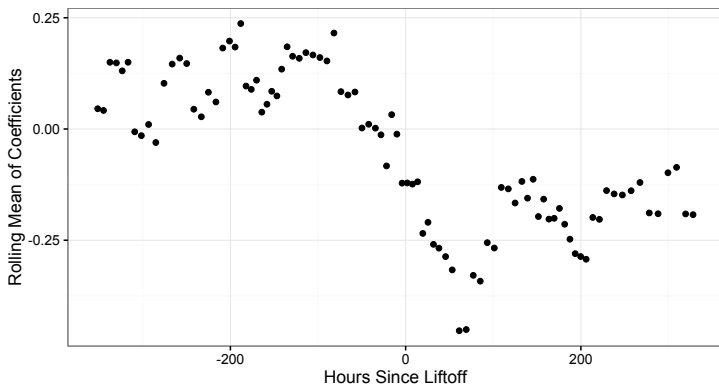


Figure: Plot of the rolling mean of the coefficients from a regression of the interest rate residuals on time dummies over a ± 14 -day window around liftoff.

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} × Liftoff	1.536**	1.654**	1.601**	1.658**
	(2.01)	(2.16)	(2.08)	(2.15)
Controls				
Loan Characteristics			x	x
Borrower Characteristics			x	x
Main Effects				
Weekday FE		x		x
Hour FE		x		x
Pre-Liftoff, int.rate mean 1{EMP, HighCR} = 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.

$$\text{InterestRate}_{i,t} = \alpha + \alpha_d + \alpha_h + \beta_0 \mathbf{1}\{EMP, High\}_i + \beta_1 \text{Liftoff}_t + \beta_2 \mathbf{1}\{EMP, High\}_i \times \text{Liftoff}_t + \gamma_1 \text{LoanCharacteristics}_i + \gamma_2 \text{BorrowerCharacteristics}_i + \epsilon_{i,t}.$$

Funding success measures

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 loans:
Funding Increase $_{i,t} = \Delta(\text{Funding Percentage})_{i,t}$
- ▶ the speed of funding increase:
Funding Speed $_{i,t} = \Delta(\text{Funding Increase})_{i,t}$.

Funding success regressions

Dependent variable	(1) $1\{\text{LoanFunded}\}$	(2) Funding Increase	(3) Funding Speed
Explanatory variables			
Liftoff	0.238** (2.39)	0.137*** (11.23)	0.028** (1.98)
Controls			
Loan Characteristics	x	x	x
Borrower Characteristics	x	x	x
Main Effects			
Weekday FE	x	x	x
Hour FE	x	x	x
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 $1\{\text{LoanFunded}\}$. t statistics are shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Findings on the funding gap & on new demand

Deterioration of outside option of high rated borrowers?

- ▶ Funding gaps narrow after liftoff, but less so for the group of high rated borrowers ▶ funding gap regressions
- ▶ The reduction in average interest rates cannot be explained by a collapse in demand
- ▶ To the contrary: demand increases after liftoff, and more so for the the group of high rated borrowers

▶ demand regressions

What did we learned so far and what is missing?

So far we know that

- ▶ both interest rates and the credit spread drop after liftoff
- ▶ the reduction in interest rates cannot be explained by a collapse in demand
- ▶ the credit risk channel becomes visible as:
 - a supply increase, measured as an increase in the funding speed and success
 - a reduction of the credit spread

Next, we

- ▶ show the important role played by employment risk
- ▶ generalize the link between improvements in the expected economic outlook and our key findings on the interest rate and credit spread

Employment risk: use state-level heterogeneity

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

- ▶ 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)

▶ state level evidence

External validity *across markets* and *over time*

We establish two additional results:

1. We validate our key findings by studying our second dataset from LendingClub
2. We generalize the link between improvements in the expected economic outlook and our key findings
 - Improvements in the expected future state of the economy, *as measured by changes in the real yield curve* (Harvey '88; Estrella & Hardouvelis '91), are associated with a reduction in the P2P lending rates
 - The liftoff dummy remains significant

Summary and conclusion

- ▶ Interest rate pass-through in the online consumer credit market during the Fed liftoff
- ▶ Key findings
 - average interest rates and spreads go down
 - perceived default probability reduction dominates pass-through; especially for subprime borrowers
- ▶ Our main results show to be very robust (time window, changes in borrower composition, collapse in demand, changes in risk appetite, placebo effect) ▶ robustness
- ▶ Contributions
 - high frequency study of credit market response to MP
 - MP signaling: credit risk vs. risk-free rate channel
 - interaction of P2P lending market and alternative finance

Thanks for your attention!

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