Frosted Glass or Raised Eyebrow?

Central Bank Credit Rationing and the Bank of England's Discount Window Policies during the Crisis of 1847

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Introduction

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- Motivation
  - Long way to Bagehotian LLR: Bignon et al. (2012), Jobst & Rieder (2016), Richardson & Troost (2009)
  - Consequences: financial instability and (real) economic costs
  - Underlying roots of deep recessions & policy?
  - Policy implications for successful LLR

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- Case & strategy
  - Crisis of 1847: an archetypical case
    - *The Economist* (1847), Bignon et al (2012)
  - Turn to microdata: hand-collected loan-level data
  - Testing patterns in determinants of loan decisions

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- Data: systematic use of historical BoE loan-level info
- What drives credit rationing in 1847?
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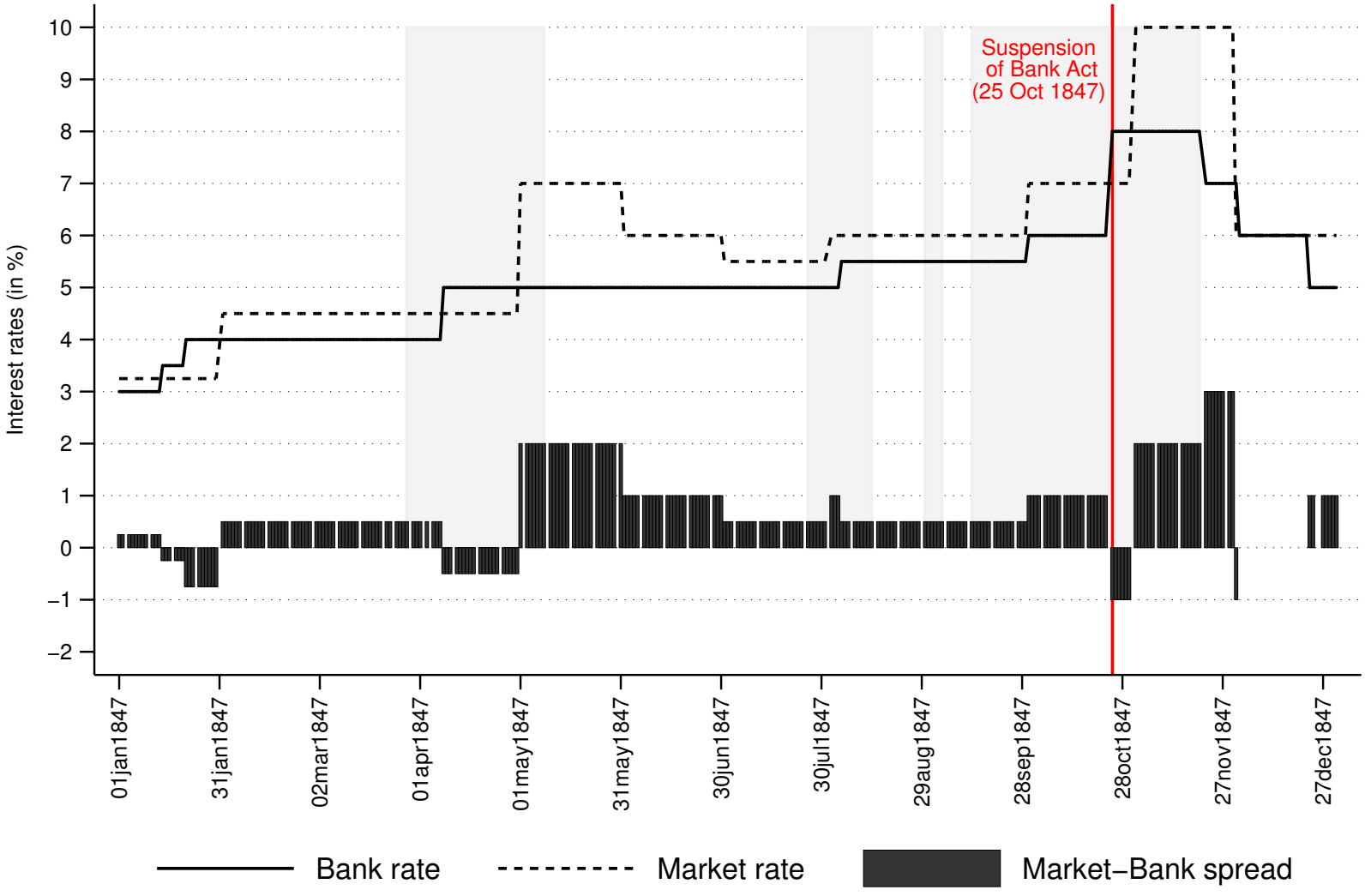
  3. Some evidence for discriminatory practices on supply side
  4. Demand side driven restrictions cannot be ruled out
- What factors matter for BoE loan decisions?
  1. Debate: "Frosted Glass" vs "Raised Eyebrow"
     - Capie (2002) vs Flandreau & Ugolini (2011-14)
  2. Loan applicant (discounter) identity seems to matter
  3. Ceteris paribus, "collateral" (bill) characteristics matter too

Figure: The "Rates Test" – credit rationing during the crisis of 1847



Source: Bank of England Archives, The Economist

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- Rules-based restrictions (RBR)
  1. Demand side driven restrictions
  2. Crisis $\rightarrow$ quality of loan application falls $\rightarrow$ rejections $\uparrow$
  3. Possible explanation: rarely violated rules become binding

Testing framework

Table: Testing for credit rationing using microdata

Test	BAR	PR	DR	RBR
Rationing ends with suspension	Yes	Unclear	Unclear	Unclear
Rejected applications $\neq$ accepted applications	Unclear	No	Yes	Yes
Share of low quality applications	Unclear	Unclear	Unclear	higher in crisis
Regression coefficients similar in crisis & normal times	Unclear	Unclear	No (at least some are different)	Yes
Out of sample predictions	Unclear	Unclear	Bad (underpredicting rejections)	Good (accurate predictions)
Collateral characteristics matter	Unclear	No	Yes	Yes
Applicant identity matters	Unclear	No	Yes	Yes
Intra-day ranks matter	Unclear	Yes	Unclear	No

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1. What does "loan-level" data mean in 1847?
   - Application = demand for **discount of bills of exchange**
   - Applications come in **packets**
   - BoE takes decisions on **bill-level**
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   - Discounter ledgers & rejected bills ledger
   - Random sample (200 packets, crisis-normal split 50%-50%, 1,060 bills)
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   - Additional restrictions: $\leq$ 10 bills, at least one rejected

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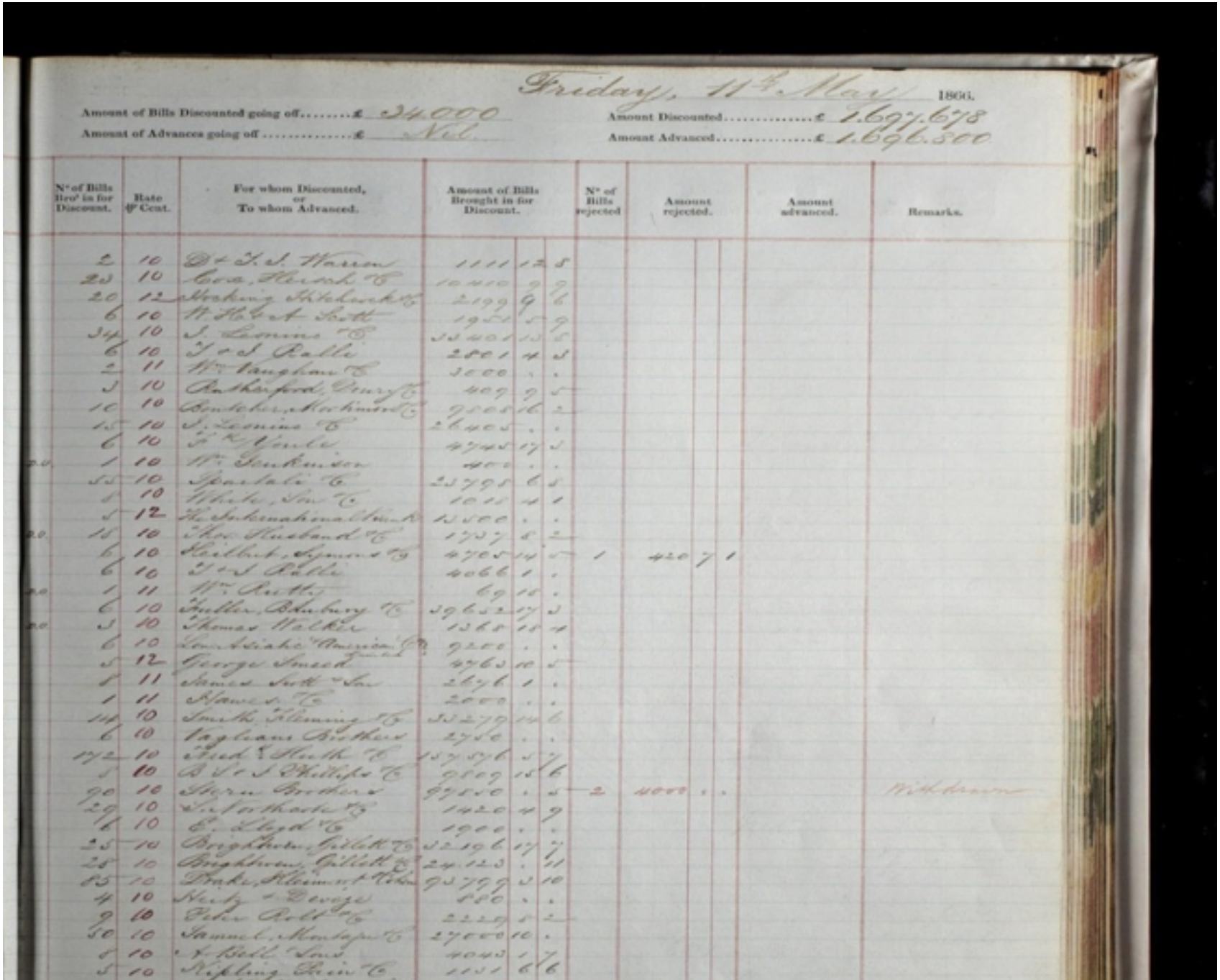
4. Bill-level sample 2: **work in progress**
   - Same as above, but no restrictions
   - Goal: representative "horse race"

Figure: Daily transactional ledgers



Friday, 11th May 1866.

Amount of Bills Discounted going off..... £ 34.000
Amount of Advances going off ..... £ Nil

Amount Discounted..... £ 1.697.678
Amount Advanced..... £ 1.696.500

N° of Bills Brot in for Discount.	Rate ℔ Cent.	For whom Discounted, or To whom Advanced.	Amount of Bills Brought in for Discount.			N° of Bills rejected	Amount rejected.			Amount advanced.	Remarks.
2	10	D+ J. J. Warren	1111	12	8						
23	10	Cora, Hirsch &	10410	9	9						
20	12	Hocking Stokes &	2199	9	6						
6	10	W. Hall & Sett	1951	5	9						
34	10	J. Lemmin &	33401	13	8						
6	10	J. & J. Ralli	2801	4	3						
2	11	W. Vaughan &	3000	.	.						
3	10	Rutherford, Drury &	409	9	5						
10	10	Boutcher, Hutchinson &	9205	16	2						
15	10	J. Lemmin &	24405	.	.						
6	10	J. R. Yonle	4745	17	3						
1	10	W. Jenkinson	400	.	.						
55	10	Spartali &	23795	6	8						
8	10	White, Son &	1011	4	1						
8	12	The International Bank	13500	.	.						
18	10	Thos. Husband &	1737	8	2						
6	10	Heilbut, Symons &	4705	14	5	1	420	7	1		
6	10	J. & J. Ralli	4066	1	.						
1	11	W. Rutty	69	10	.						
6	10	Butler, Bleubury &	39632	17	3						
3	10	Thomas Walker	1365	15	4						
6	10	Lombard Banking Company	9200	.	.						
8	12	George Smeed	4763	10	5						
8	11	James Scott & Son	2676	1	.						
1	11	Hawes &	2000	.	.						
14	10	Smith, Fleming &	33279	14	6						
6	10	Vaghan Brothers	2750	.	.						
172	10	Finch & Heath &	137576	5	7						
5	10	B. & J. Phillips &	9109	15	6						
90	10	Storm Brothers	87500	.	5	2	4000	.	.		Withdrawn
29	10	J. Forbes &	1420	4	9						
6	10	E. Lloyd &	1900	.	.						
25	10	Brightman, Gillett &	32196	17	7						
28	10	Brightman, Gillett &	24123	.	11						
85	10	Drake, Kleinwort & Cohen	93799	3	10						
4	10	Nentz & Dowgo	880	.	.						
9	10	Peter Rolt &	2229	8	2						
30	10	Samuel, Montagu &	27000	10	.						
8	10	J. Rolt & Son	4043	1	7						
8	10	Kipling, Chitty &	1131	6	6						

Figure: Discounter ledgers

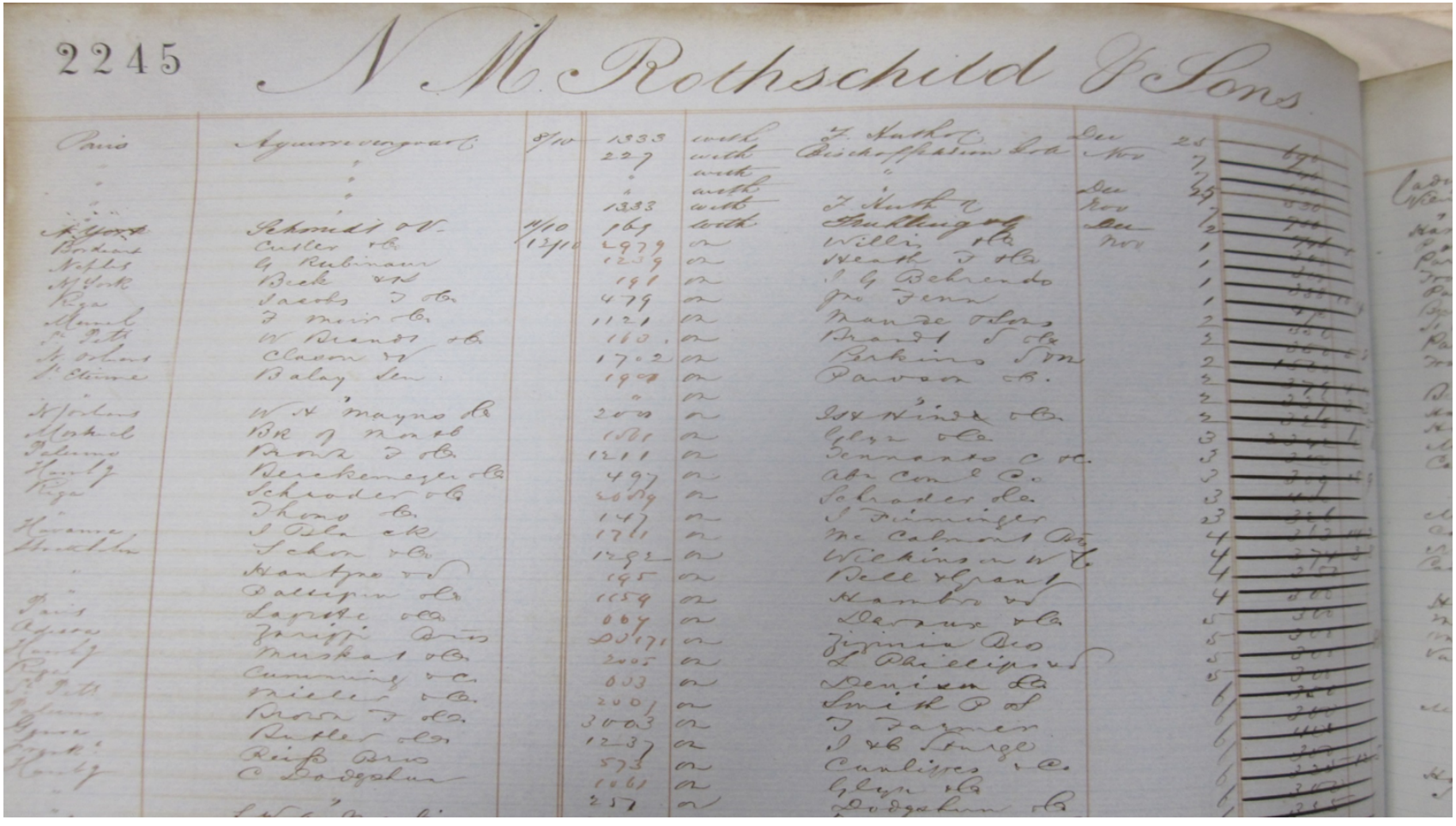
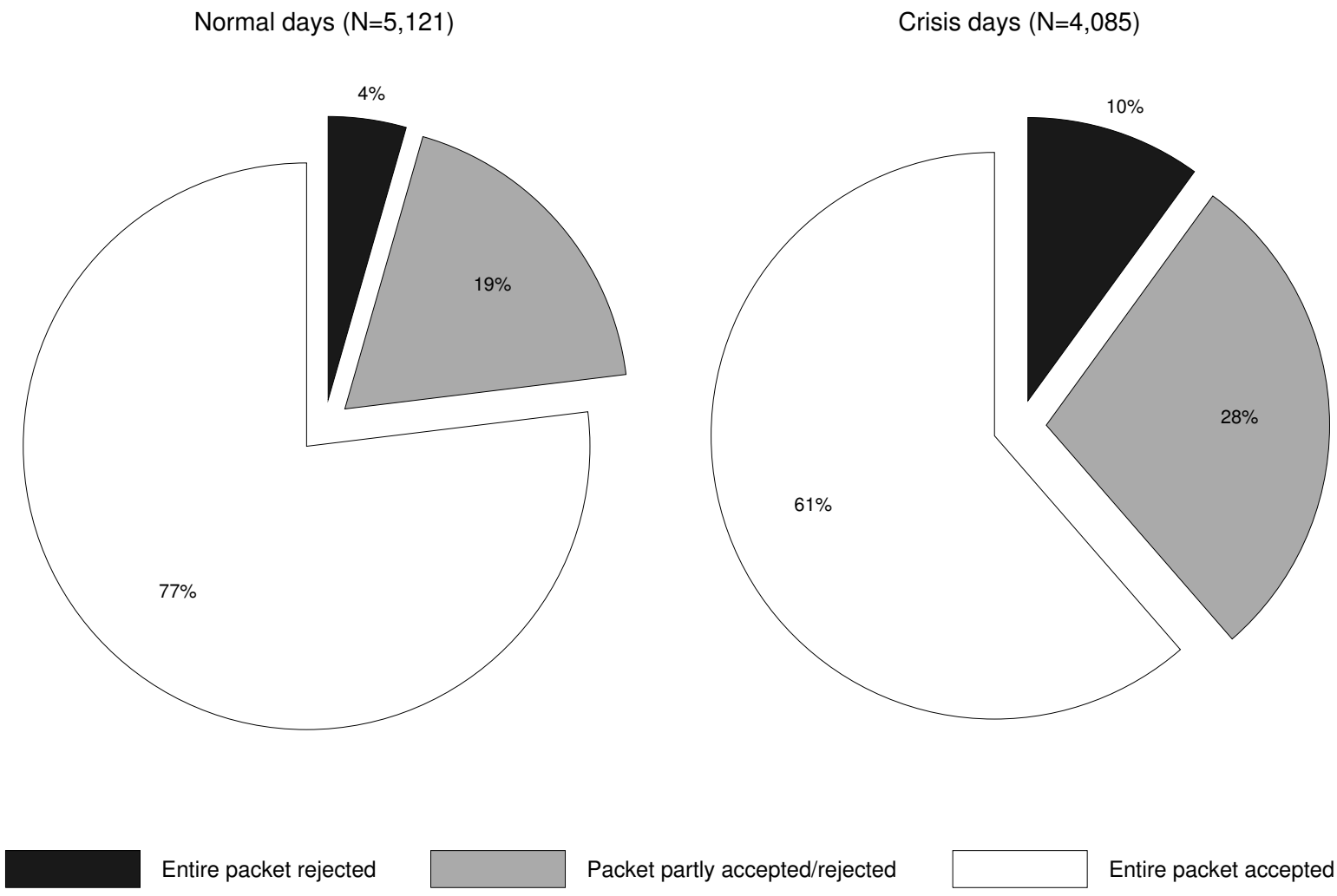


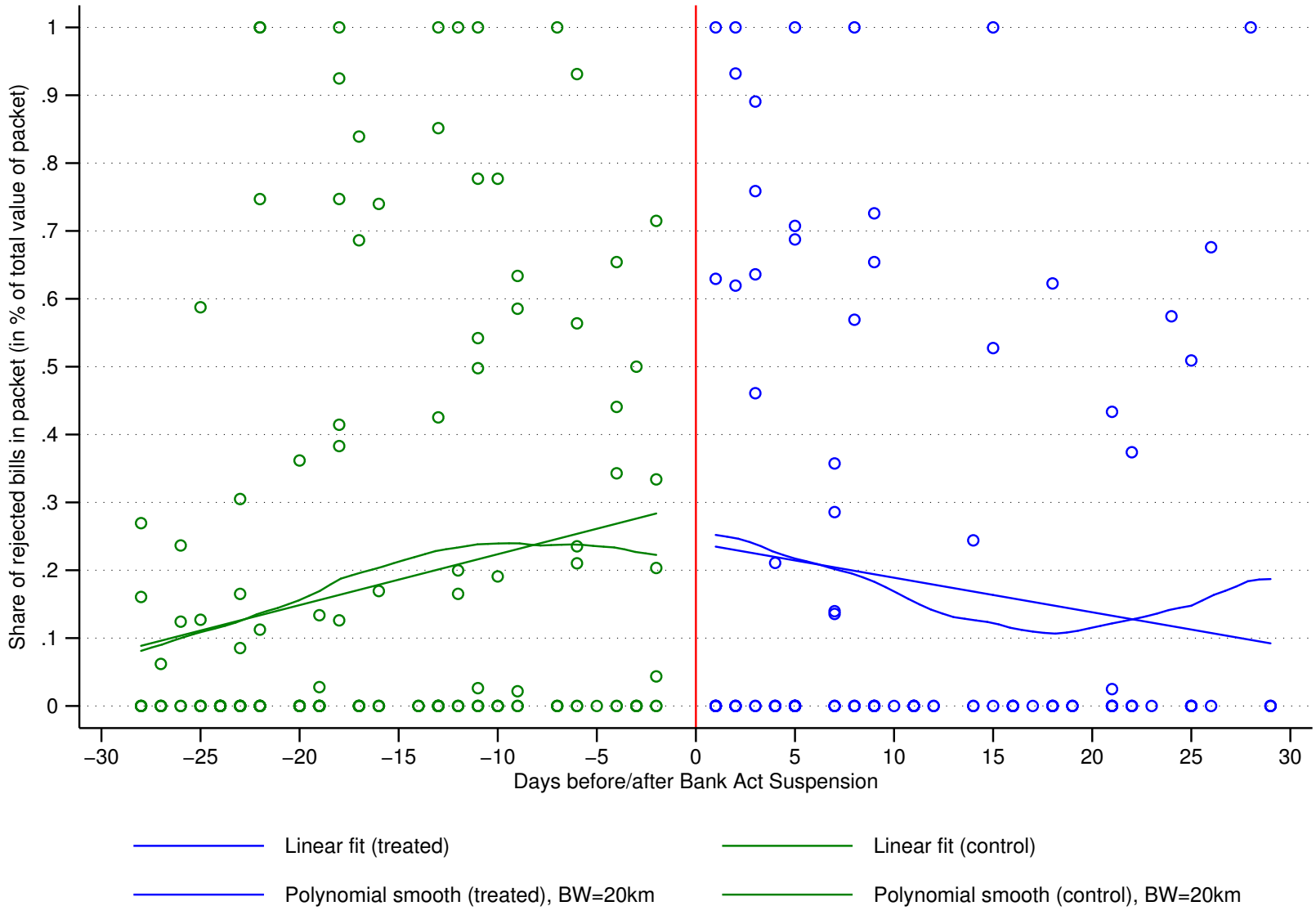
Figure: Packets submitted to BoE discount window in 1847 (119 crisis days out of 310 days)



Source: BoE daily ledger 1847

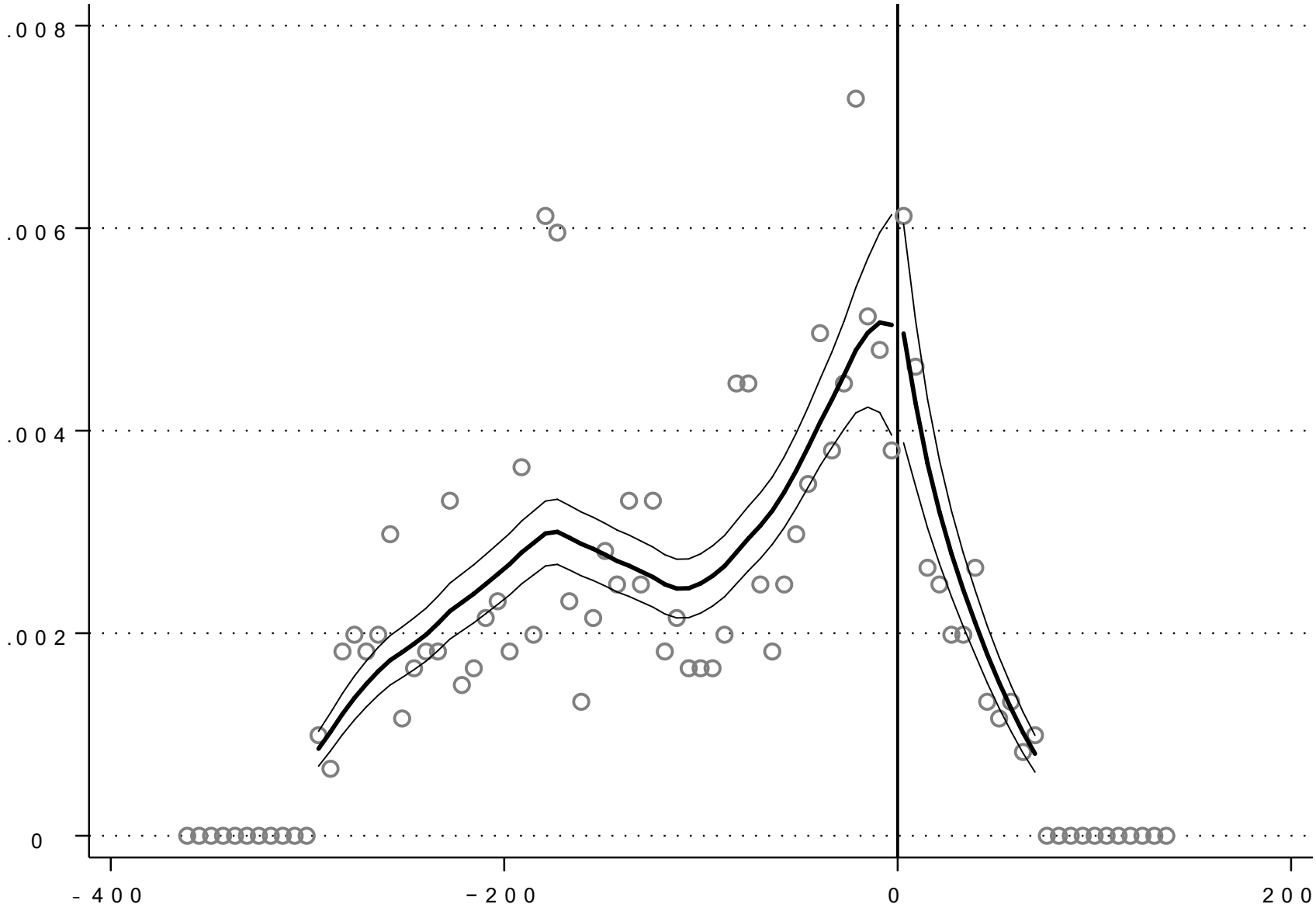
Did suspension matter? A quasi RD approach (I)

Figure: Rejection rates for packets pre- and post suspension on 25 Oct 1847



RD approach validity

Figure: McCrary density test for RD validity



Did suspension matter? A quasi RD approach (II)

$$Y_i = \alpha + \beta Post_i + \gamma(Date_i - c) + \delta(Date_i - c) \ x \ Post_i + ... + u_i \qquad (1)$$

Table: RDD, local linear, quadratic and cubic polynomial regressions

Dependent variable: share of rejected bills in packet (% of total value)						
	<30 days	<25 days	<20 days	<15 days	<10 days	<5 days
Post-suspension (linear)	-0.06	-0.02	0.03	0.05	0.09	0.12
	(0.08)	(0.09)	(0.10)	(0.12)	(0.14)	(0.26)
Post-suspension (quadratic)	0.14	0.17	0.18	0.31	0.27	-0.03
	(0.12)	(0.14)	(0.16)	(0.21)	(0.31)	(0.76)
Post-suspension (cubic)	0.21	0.15	0.10	-0.07	-0.13	-5.21*
	(0.18)	(0.20)	(0.26)	(0.38)	(0.65)	(3.00)
Observations	262	234	182	136	95	54
R-squared (linear)	0.03	0.03	0.02	0.01	0.01	0.01
R-squared (quadratic)	0.05	0.04	0.03	0.02	0.01	0.03
R-squared (cubic)	0.05	0.04	0.03	0.04	0.02	0.09

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table: Testing continuity

Variable	<30 days	<25 days	<20 days	<15 days	<10 days	<5 days
Value of packet	(0.13)*** -0.47 255	((0.14)*** -0.46 223	(0.16)*** -0.46 175	(0.19)** -0.50 133	(0.25) -0.20 88	(0.34)** -0.73 42
Number of bills	(0.13)** -0.29 255	(0.14)* -0.28 223	(0.16) -0.25 175	(0.18) -0.26 133	(0.22) 0.02 88	(0.33) -0.40 42
Discounter = DO customer	(0.40) 0.13 255	(0.43) 0.31 223	(0.47) 0.42 175	(0.53) 0.36 133	(0.00) 0.00 88	(1.16) 1.27 42
Discounter = in rating book	(0.27) -0.07 255	(0.29) -0.13 223	(0.31) -0.22 175	(0.36) 0.06 133	(0.45) -0.06 88	(0.65) -0.72 42
Discounter = bill broker	(0.81) -0.96 255	(0.83) -0.85 223	(0.92) -0.33 175	(1.17) -1.18 133		
Discounter = fails in 1847	(0.59) 0.34 255	(0.66) 0.72 223	(1.09)* 1.93 175	(1.13) 1.38 133	(1.15) 0.87 88	(1.28) 0.22 42
Discounter = top discounter	(1.07)* -1.80 255	(1.07)* -1.85 223	(1.09) -1.76 175			

Per box: (robust) standard errors in parentheses; regression coefficients; N
Coefficients from OLS in row 1 & 2, all other logit
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Econometric analysis: checking for PR, DR and RBR

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1. Packet-level regressions
   - Logit regressions (dep.var. = dummy for rejection in packet)

$$P(R_p|\mathbf{X_p}) = F(\alpha + \mathbf{\Gamma}'\mathbf{X}_p) \tag{2}$$

where $F(u = \alpha + \mathbf{\Gamma}'\mathbf{X}_p) = \frac{exp(u)}{1+exp(u)}$

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   - Tobit regressions (dep.var. = share of rejections)

$$S^*{}_p = \alpha + \mathbf{\Gamma}'\mathbf{X}_p + \varepsilon_p|\mathbf{X}_p \sim Normal(0, \sigma^2) \tag{3}$$

$$\text{where } S_p = max(0, S^*{}_p), min(1, S^*{}_p)$$

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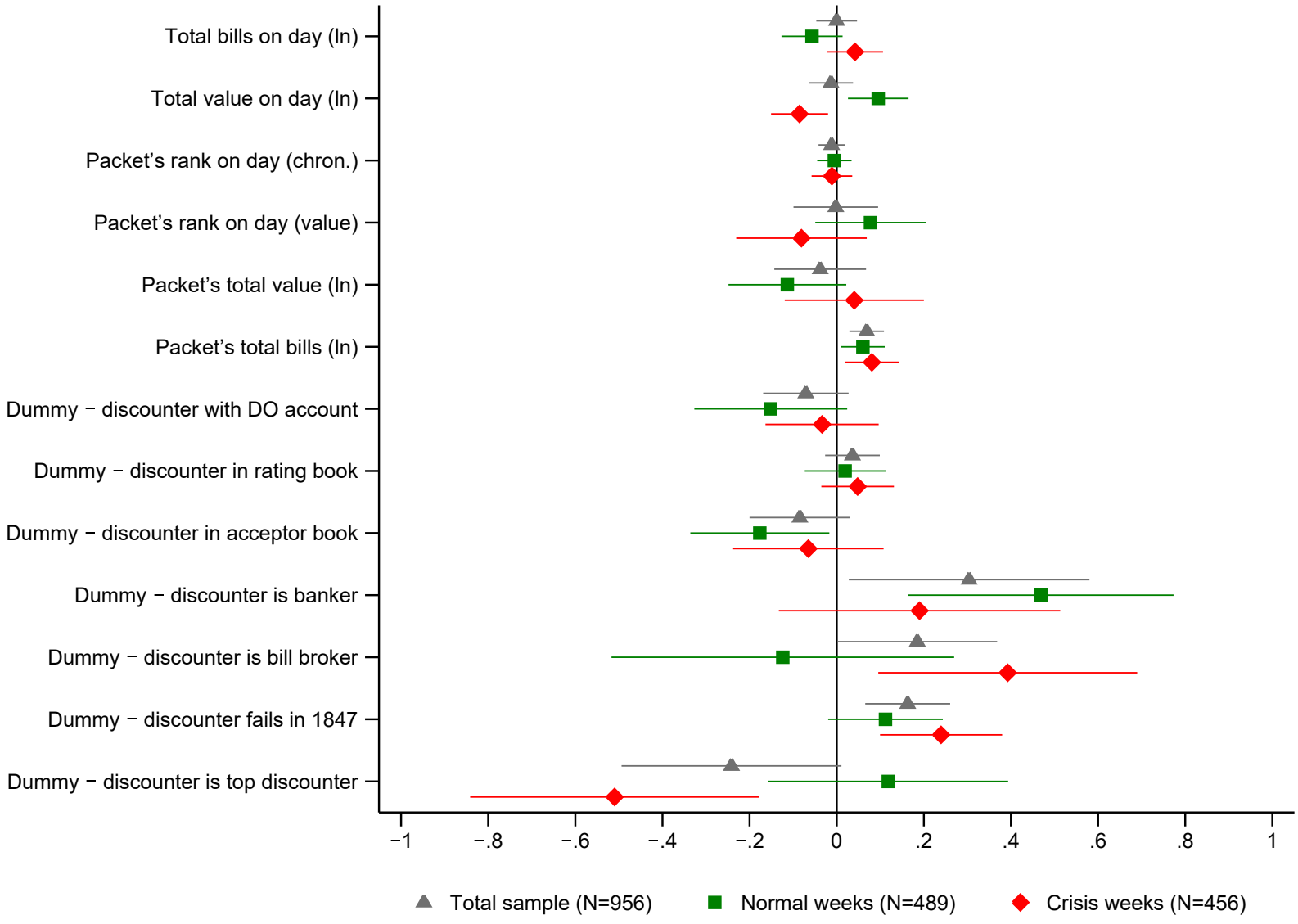
2. Bill-level regressions
   - Conditional logistic regressions (dep.var. = dummy for rejection)
   - Matched case-control approach allows for discounter and date FE

$$P(R_b|\mathbf{X_b}, D_d) = G(\alpha + \mathbf{\Gamma}'\mathbf{X}_b + \delta D_d) \tag{4}$$

$$\text{where } G(z = \alpha + \mathbf{\Gamma}'\mathbf{X}_b + \delta D_d) = \frac{exp(z)}{1+exp(z)}$$

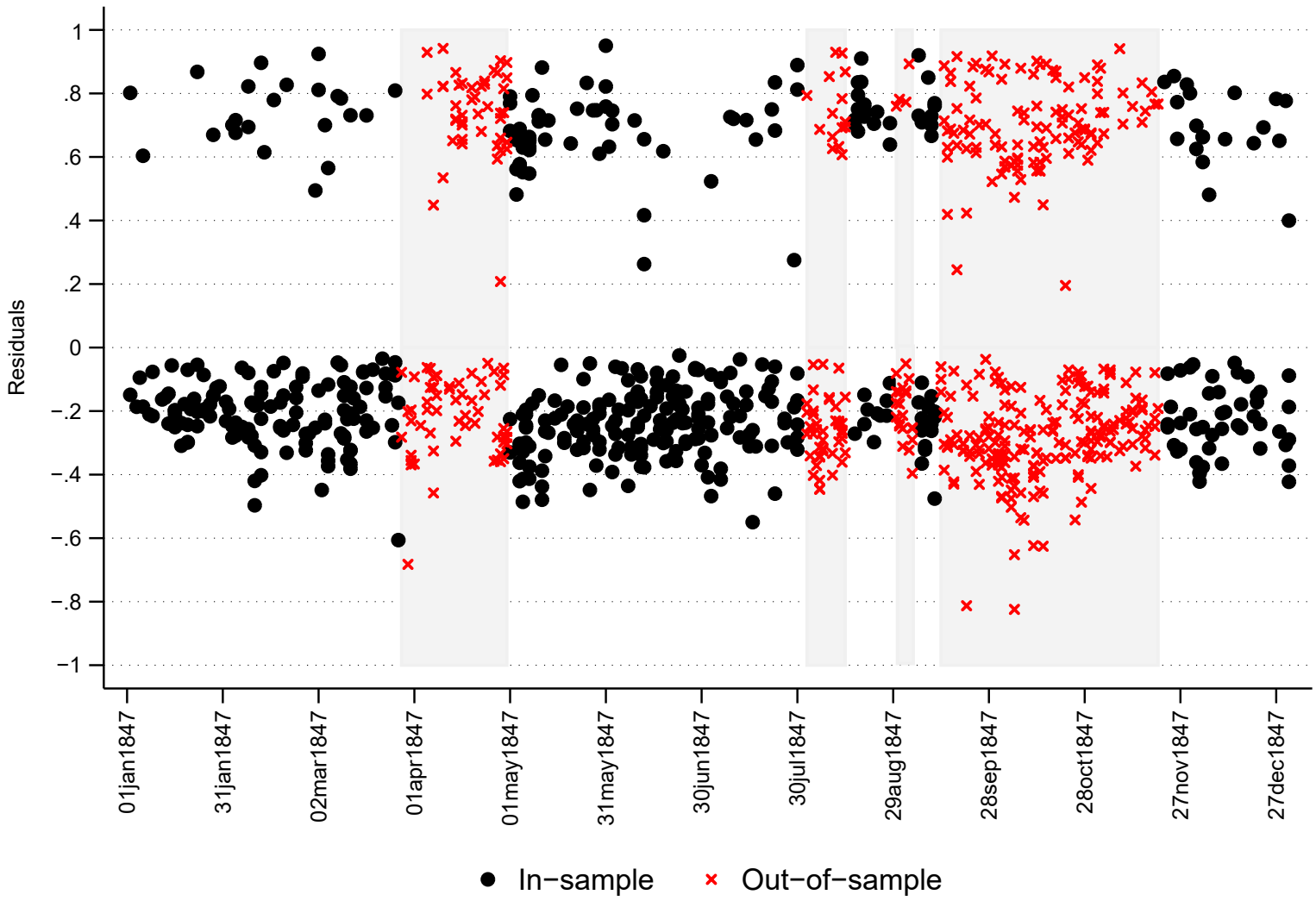
Results: logit regressions on packet-level (I)

Figure: Marginal effects of 1 st.dev. increase or discrete change from 0 to 1



Results: logit regressions on packet-level (II)

Figure: Residuals from in and out-of-sample predictions (packet-level)
(mean equality rejected; t-statistic= -2.89, p-value<0.00)



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Mean equality testing: packet-level

Table: T-tests on packets - normal times vs crisis times

Variable	Normal (Obs)	Normal (Mean)	Crisis (Obs)	Crisis (Mean)	Two-sided p-value
Rejection dummy (at least 1 bill rejected)	500	0.24	500	0.35	0.00***
Total number of bills on day (ln)	500	3.37	500	3.56	0.00***
Total value of bills on day (ln)	500	11.73	500	11.96	0.00***
Packet's total value	500	7.74	500	7.78	0.47
Packet's total bills	500	1.74	500	1.74	0.97
Dummy - discounter with DO account	500	0.09	500	0.11	0.34
Dummy - discounter in rating book	500	0.29	500	0.31	0.41
Dummy - discounter in acceptor book	500	0.08	500	0.07	0.41
Dummy - discounter is banker	500	0.01	500	0.01	0.56
Dummy - discounter is bill broker	500	0.03	500	0.04	0.28
Dummy - discounter fails in 1847	500	0.07	500	0.06	0.53
Dummy - discounter is top discounter	500	0.02	500	0.03	0.25

Packet-level findings

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1. Credit rationing: **not PR (alone), DR most likely**
   - $\mathbf{X}_p$ contains significant predictors
   - Effects of predictors **(radically) different** crisis vs. normal weeks
   - Out-of-sample: **underpredict** crisis rejections
   - Intra-day ranks **do not matter**
   - **No evidence** for lower quality submissions

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   - No real "horse race" yet

Results: conditional logit regressions on bill-level (I)

Figure: Marginal effects of 1 st.dev. increase or discrete change from 0 to 1

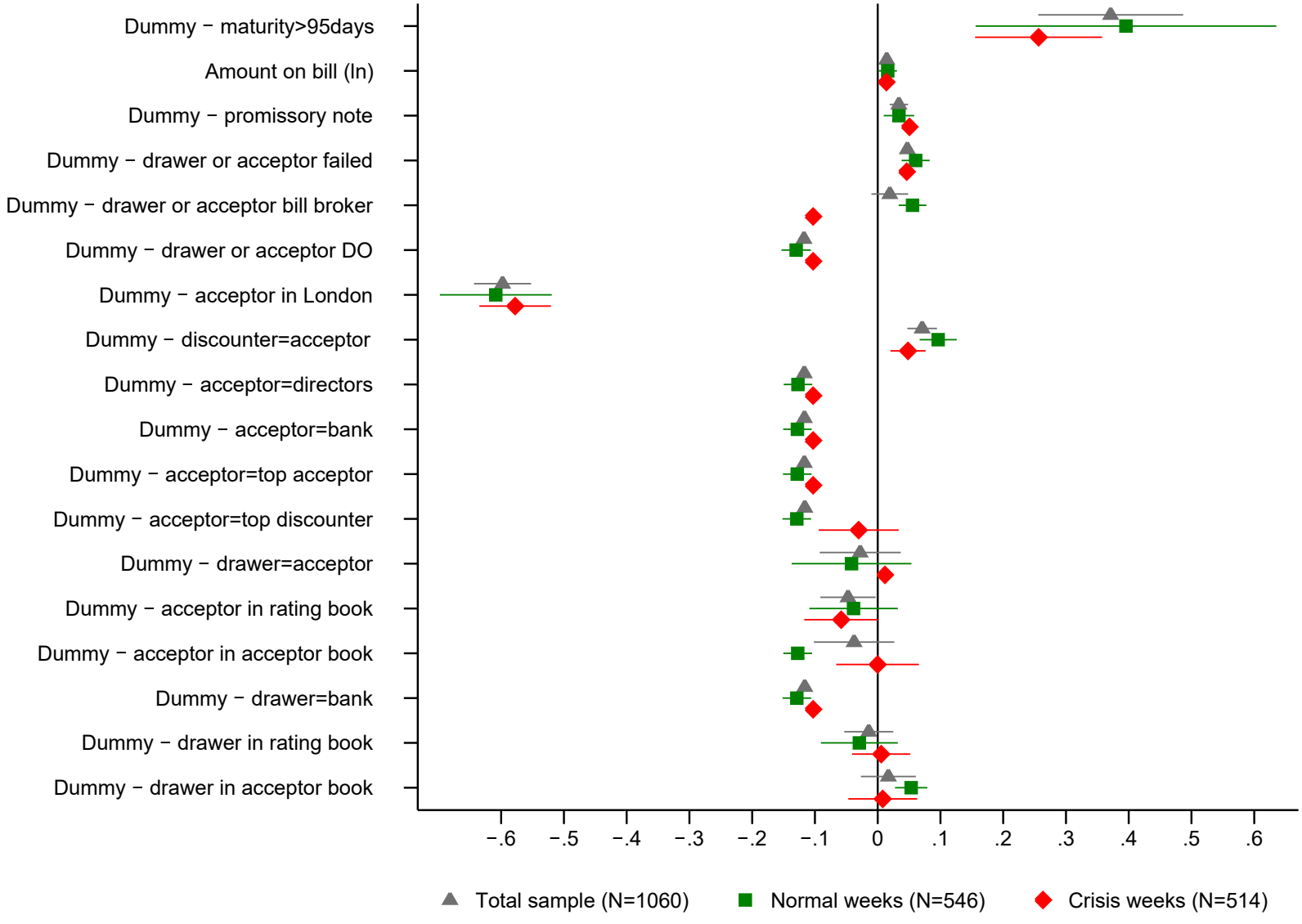

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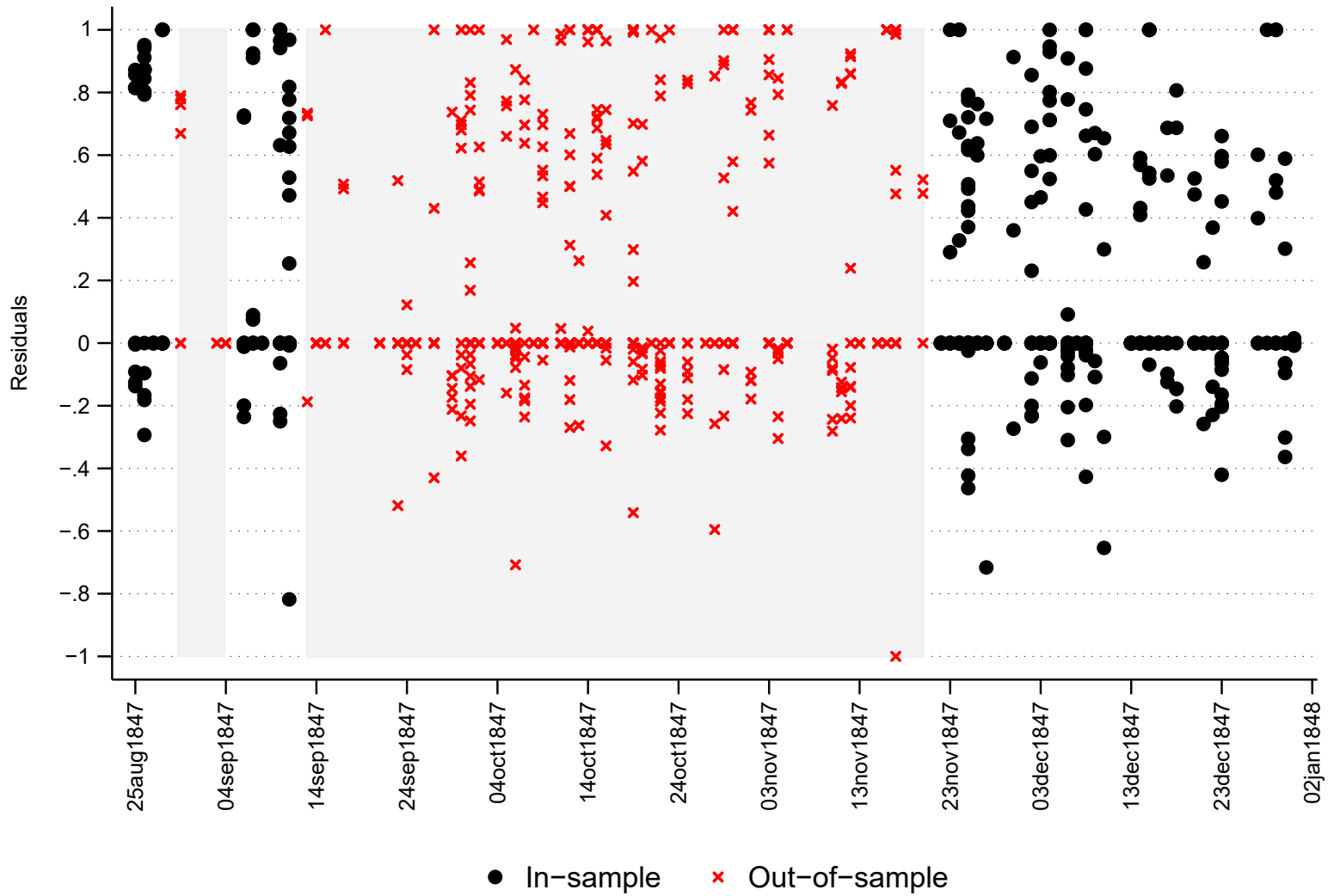
Figure: Residuals from in and out-of-sample predictions (bill-level)
(mean equality not rejected; t-statistic= –0.83, p-value=0.41)



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Mean equality testing: bill-level

Table: T-tests on bills - normal times vs. crisis times

Variable	Normal (Obs)	Normal (Mean)	Crisis (Obs)	Crisis (Mean)	Two-sided p-value
Rejected bill	514	0.34	546	0.35	0.80
Days to maturity (ln)	514	3.96	546	3.91	0.24
Spread from mean maturity of 60 days	514	-1.05	546	1.60	0.12
Dummy - maturity>95days	514	0.01	546	0.01	0.43
Amount on bill (ln)	514	5.36	546	5.55	0.00***
Dummy - promissory note	514	0.05	546	0.01	0.00***
Dummy - drawer or acceptor failed	514	0.00	546	0.01	0.29
Dummy - drawer or acceptor bill broker	514	0.01	546	0.00	0.29
Dummy - drawer or acceptor DO	514	0.01	546	0.01	0.93
Dummy - acceptor in London	514	0.82	546	0.86	0.15
Dummy - discounter=acceptor	514	0.54	546	0.43	0.00***
Dummy - drawer=acceptor	514	0.03	546	0.01	0.14
Dummy - acceptor=directors	514	0.02	546	0.01	0.26
Dummy - acceptor=bank	514	0.08	546	0.09	0.64
Dummy - acceptor=top acceptor	514	0.04	546	0.06	0.11
Dummy - acceptor=top discounter	514	0.01	546	0.01	0.46
Dummy - acceptor in rating book	514	0.09	546	0.13	0.02**
Dummy - acceptor in acceptor book	514	0.05	546	0.05	0.93
Dummy - drawer=bank	514	0.06	546	0.05	0.52
Dummy - drawer in rating book	514	0.29	546	0.23	0.01**
Dummy - drawer in acceptor book	514	0.02	546	0.04	0.14

Bill-level findings

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1. Credit rationing: **not PR (alone), split RBR-DR**
   - $\mathbf{X}_b$ contains significant predictors
   - Effects of predictors **(very) similar** crisis vs. normal weeks
   - Out-of-sample: no (statistical) significant underprediction
   - **Inconclusive** re: lower quality submissions

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   - Out-of-sample: no (statistical) significant underprediction
   - **Inconclusive** re: lower quality submissions

2. "Frosted Glass" and "Raised Eyebrow": **"collateral" matters**

Bill-level findings

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   - $\mathbf{X}_b$ contains significant predictors
   - Effects of predictors **(very) similar** crisis vs. normal weeks
   - Out-of-sample: no (statistical) significant underprediction
   - **Inconclusive** re: lower quality submissions

2. "Frosted Glass" and "Raised Eyebrow": **"collateral" matters**

3. **Caveats:**
   - Horse race: bill characteristics matter
   - But: no explicit estimation of borrower FE yet
   - Second bill-level sample needed

Conclusion

- What drives central bank credit rationing in 19C financial crises?
  - Perhaps surprisingly: **no evidence** for PR à la Stiglitz-Weiss (alone)
  - Results suggest DR happens at **discounter-level**
  - **RBR** most convincing **once discounter-date fixed**

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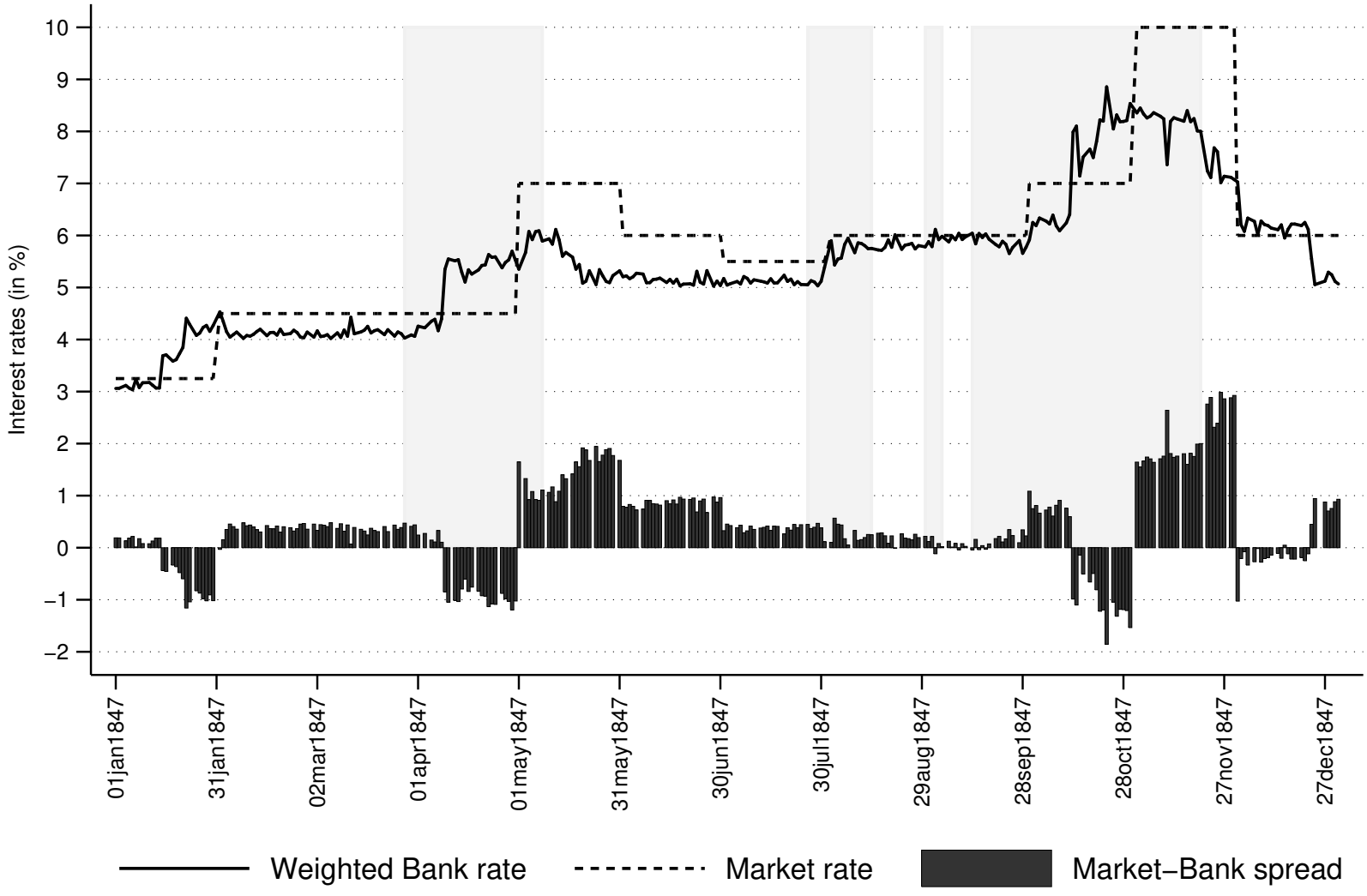
Figure: Big data problem

Appendix

Figure: Credit rationing during the crisis of 1847



Source: Bank of England Archives, The Economist

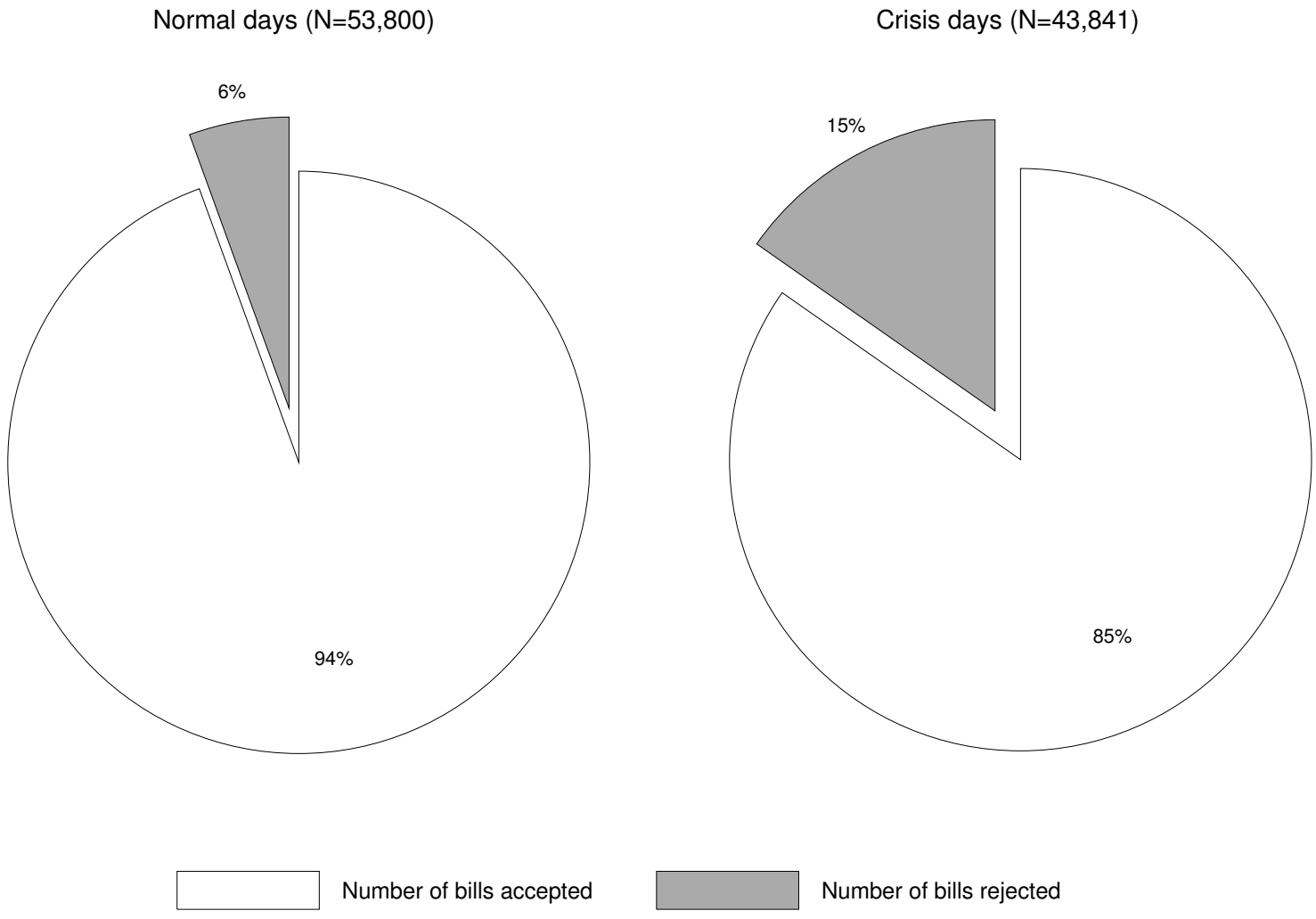
Table: T-tests: rejections of packets, bills and amount during crisis days vs. normal days in 1847

Period	**Total days/obs.**	**Total packet rejected**	**Part of packet rejected**	**Bills rejected**	**Amount rejected**
	Days	Count	Count	Count	Sum (in £)
Normal days	191	229	956	3,052	1,452,458
Crisis days	119	414	1,160	6,713	3,285,804
	Observations	Mean (share of total packets)	Mean (share of total packets)	Mean (rejected to total submitted)	Mean (rejected to total submitted)
Normal days	5,121	0.04	0.19	0.10	0.11
Crisis days	4,085	0.10	0.28	0.20	0.21
t-statistic		-10.65***	-11.09***	-15.74***	-15.63***

*** p<0.01, ** p<0.05, * p<0.1 (null of equal means)

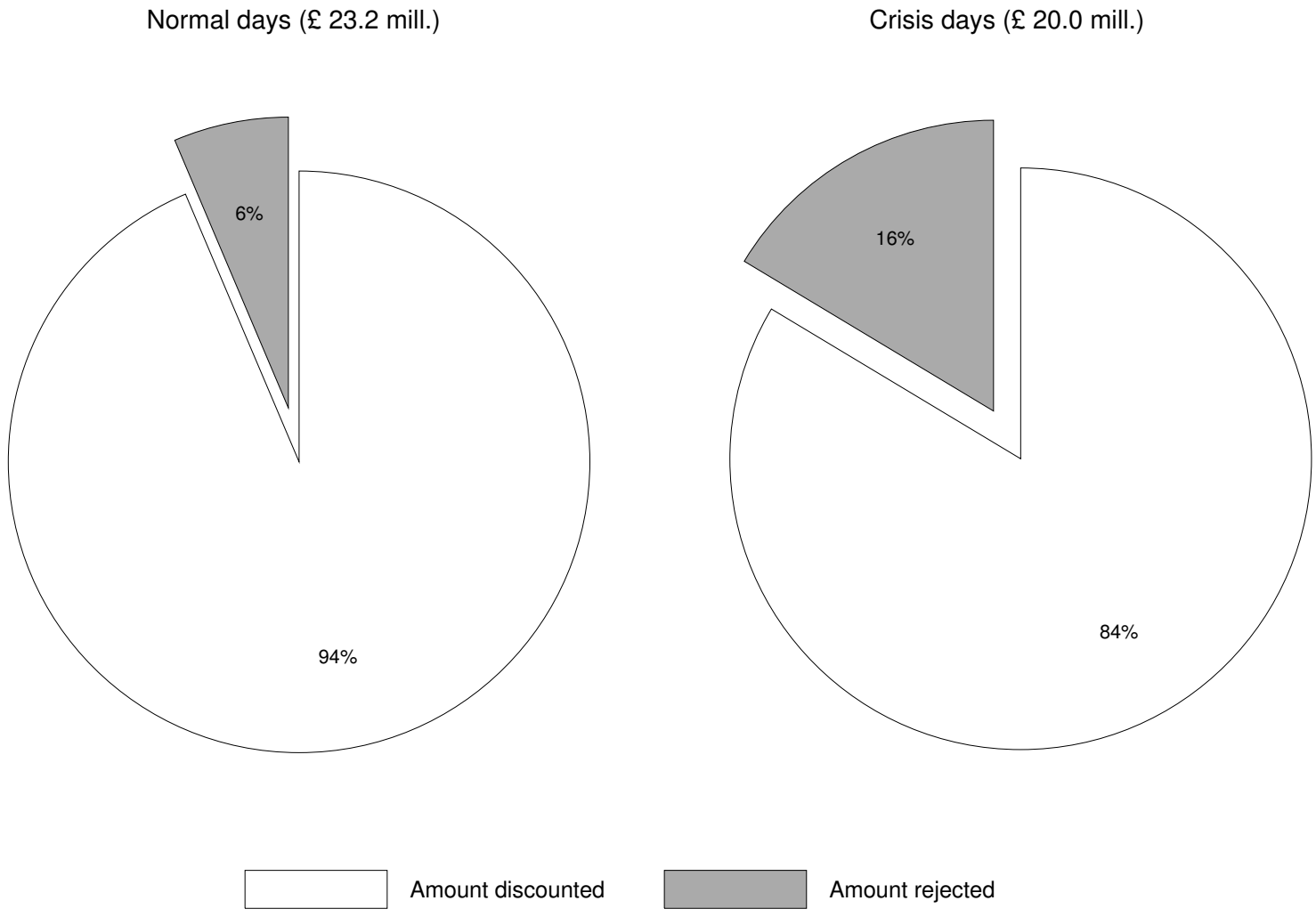
Source: BoE daily ledger 1847

Figure: Number of bills in 1847 (N=97,637; 119 crisis days out of 310 days)



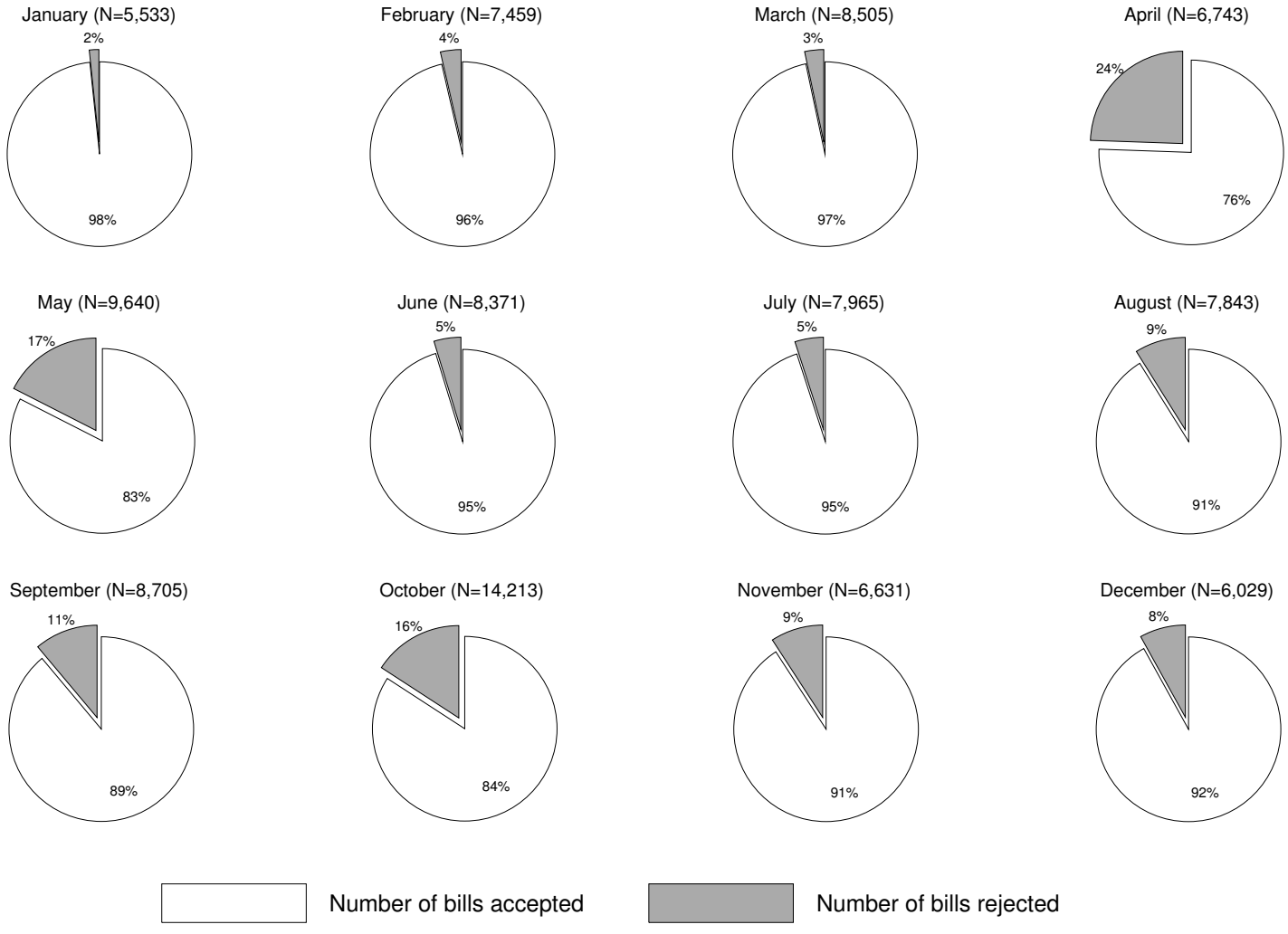
Source: BoE daily ledger 1847

Figure: Monetary value on bills in 1847 (total of £ 43.1 mill.; 119 crisis days out of 310 days)



Source: BoE daily ledger 1847

Figure: Bills submitted to the Bank of England's discount window in 1847 (N=97,637; by month)



Source: BoE daily ledger 1847

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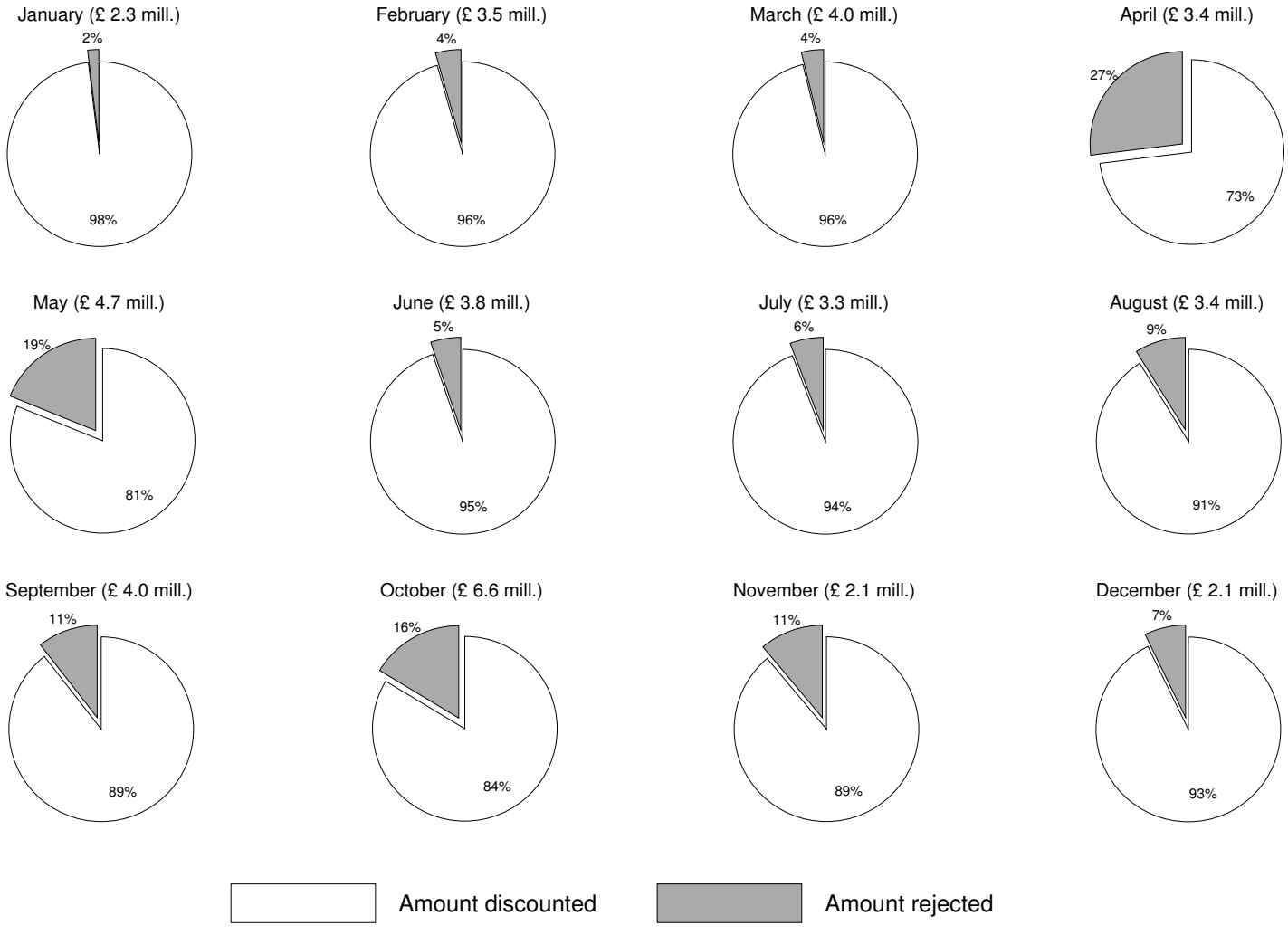

Source: BoE daily ledger 1847

Did suspension matter? A quasi-RD approach II

Figure: Rejection rates for packets pre and post suspension on 25 Oct 1847

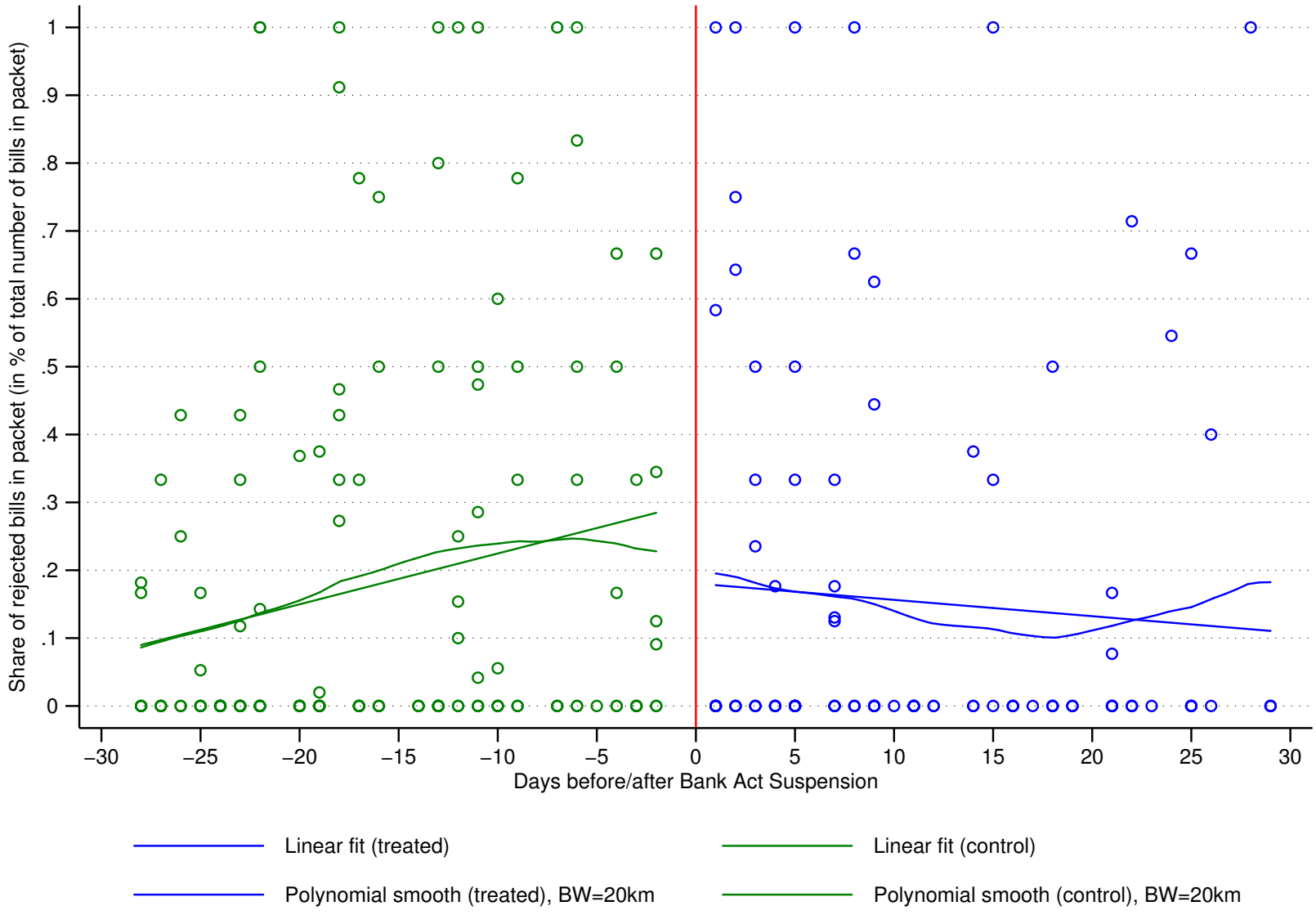

Table: Logit regressions (packet-level)

VARIABLES	(1)	(2)	(3)	(4)
Total number of bills on day (ln)	0.05**	-0.00	0.04	-0.06
	(0.02)	(0.02)	(0.03)	(0.04)
Total value of bills on day (ln)	-0.01	-0.01	-0.08**	0.10***
	(0.02)	(0.03)	(0.03)	(0.04)
Packet's rank on day (chronological)	-0.01	-0.01	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Packet's rank on day (value)	0.01	-0.00	-0.08	0.08
	(0.05)	(0.05)	(0.08)	(0.06)
Packet's total value (ln)	-0.05	-0.04	0.04	-0.11*
	(0.05)	(0.05)	(0.08)	(0.07))
Packet's total bills (ln)	0.06***	0.07***	0.08**	0.06**
	(0.02)	(0.02)	(0.03)	(0.03)
Dummy - discounter with DO account	-0.10**	-0.07	-0.03	-0.15*
	(0.04)	(0.05)	(0.07)	(0.09)
Dummy - discounter in rating book	0.04	0.04	0.05	0.02
	(0.03)	(0.03)	(0.04)	(0.05)
Dummy - discounter in acceptor book	-0.09**	-0.08	-0.07	-0.18**
	(0.05)	(0.06)	(0.09)	(0.08)
Dummy - discounter is banker	0.29**	0.30**	**0.19**	**0.47*** **
	(0.14)	(0.14)	(0.16)	(0.16)
Dummy - discounter is bill broker	0.10	0.19**	**0.39*** **	**-0.12**
	(0.10)	(0.09)	(0.15)	(0.20)
Dummy - discounter fails in 1847	0.21***	0.16***	0.24***	0.11*
	(0.06)	(0.05)	(0.07)	(0.07)
Dummy - discounter is top discounter	-0.14*	-0.24*	**-0.51*** **	**0.12**
	(0.08)	(0.13)	(0.17)	(0.14)
Observations	1,000	956	489	456
Sample	Total	Total	Crisis	Normal
Week FE	No	Yes	Yes	Yes
Clustered SE	Day	Day	Day	Day
Pseudo R-squared	0.04	0.13	0.12	0.18
AUC	0.63	0.74	0.70	0.66

(Robust) standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table: Logit regressions (packet-level): (partially) rejected packets vs accepted packets

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total number of bills on day (ln)	0.05**	0.05**	0.05**	-0.00	0.05	0.03	0.04	-0.06
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.03)	(0.03)	(0.04)
Total value of bills on day (ln)	-0.01	-0.01	-0.01	-0.01	-0.04	0.04	-0.08**	0.10***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)
Packet's rank on day (chronological)	-0.01	-0.01	-0.01	-0.01	-0.00	-0.01	-0.01	-0.01
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Packet's rank on day (value)	0.01	0.01	0.01	-0.00	-0.07	0.10	-0.08	0.08
	(0.05)	(0.04)	(0.05)	((0.05)	(0.07)	(0.07)	(0.08)	(0.06)
Packet's total value (ln)	-0.05	-0.05	-0.05	-0.04	0.02	-0.13*	0.04	-0.11*
	(0.05)	(0.05)	(0.05)	((0.05)	(0.08)	(0.07)	(0.08)	(0.07))
Packet's total bills (ln)	0.06***	0.06***	0.06***	0.07***	0.07**	0.05**	0.08**	0.06**
	(0.02)	(0.02)	(0.02)	((0.02)	(0.03)	(0.02)	(0.03)	(0.03)
Dummy - discounter with DO account	-0.10**	-0.10**	-0.10**	-0.07	-0.05	-0.16***	-0.03	-0.15*
	(0.05)	(0.05)	(0.04)	(0.05)	(0.07)	(0.05)	(0.07)	(0.09)
Dummy - discounter in rating book	0.04	0.04	0.04	0.04	0.07	0.02	0.05	0.02
	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.04)	(0.05)
Dummy - discounter in acceptor book	-0.09*	-0.09**	-0.09**	-0.08	-0.05	-0.13***	-0.07	-0.18**
	(0.05)	(0.04)	(0.05)	(0.06)	(0.08)	(0.05)	(0.09)	(0.08)
Dummy - discounter is banker	0.29**	0.29**	0.29**	0.30**	0.20	0.45**	**0.19**	**0.47*** **
	(0.15)	(0.13)	(0.14)	(0.14)	(0.19)	(0.18)	(0.16)	(0.16)
Dummy - discounter is bill broker	0.10	0.10	0.10	0.19**	0.34**	-0.17**	**0.39*** **	**-0.12**
	(0.11)	(0.09)	(0.10)	(0.09)	(0.14)	(0.07)	(0.15)	(0.20)
Dummy - discounter fails in 1847	0.21***	0.21***	0.21***	0.16***	0.27***	0.14*	0.24***	0.11*
	(0.07)	(0.06)	(0.06)	(0.05)	(0.08)	(0.08)	(0.07)	(0.07)
Dummy - discounter is top discounter	-0.14*	-0.14*	-0.14*	-0.24*	-0.29***	0.10	**-0.51*** **	**0.12**
	(0.08)	(0.08)	(0.08)	(0.13)	(0.06)	(0.21)	(0.17)	(0.14)
Observations	1,000	1,000	1,000	956	500	500	489	456
Sample	Total	Total	Total	Total	Crisis	Normal	Crisis	Normal
Week FE	No	No	No	Yes	No	No	Yes	Yes
Clustered SE	No	Week	Day	Day	Day	Day	Day	Day
Pseudo R-squared	0.04	0.04	0.04	0.13	0.04	0.06	0.12	0.18
AUC	0.63	0.63	0.63	0.74	0.62	0.60	0.70	0.66

Dependent variable: probability of (partial) rejection; (robust) standard errors in parentheses
Marginal effects for one stand. dev. increase in covariate (except for discrete variables, when change from 0 to 1)
*** p<0.01, ** p<0.05, * p<0.1

Table: Tobit regressions (packet-level): share of rejected bills per packet (number)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total number of bills on day (ln)	0.12**	0.12**	0.12*	-0.01	0.07	0.08	0.09	-0.14
	(0.06)	(0.06)	(0.06)	(0.06)	(0.09)	(0.08)	(0.10)	(0.09)
Total value of bills on day (ln)	-0.01	-0.01	-0.01	-0.02	-0.09	0.11	-0.20**	0.25**
	(0.06)	(0.06)	(0.06)	(0.06)	(0.08)	(0.10)	(0.10)	(0.10)
Packet's rank on day (chronological)	-0.01	-0.01	-0.01	-0.01	-0.02	-0.00	-0.03	0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.05)	(0.05))
Packet's rank on day (value)	-0.00	-0.00	-0.00	-0.05	-0.23	0.26	-0.28	0.19
	(0.13)	(0.12)	(0.14)	(0.14)	(0.20)	(0.19)	(0.23)	(0.19)
Packet's total value (ln)	-0.06	-0.06	-0.06	-0.01	0.20	-0.33	0.24	-0.26
	(0.14)	(0.15)	(0.16)	(0.16)	(0.23)	(0.21)	(0.26)	(0.21)
Packet's total bills (ln)	0.01	0.01	0.01	0.04	0.01	0.02	0.04	0.04
	(0.05)	(0.06)	(0.05)	(0.05)	(0.08)	(0.07)	(0.08)	(0.07)
Dummy - discounter with DO account	-0.33**	-0.33**	-0.33**	-0.27*	-0.14	-0.69***	-0.13	-0.53**
	(0.15)	(0.17)	(0.15)	(0.14)	(0.19)	(0.25)	(0.19)	(0.23)
Dummy - discounter in rating book	0.13	0.13*	0.13	0.12	0.18	0.07	0.14	0.08
	(0.09)	(0.08)	(0.09)	(0.08)	(0.11)	(0.12)	(0.10)	(0.12)
Dummy - discounter in acceptor book	-0.26	-0.26	-0.26	-0.21	-0.13	-0.42**	-0.16	-0.44**
	(0.16)	(0.16)	(0.16)	(0.16)	(0.23)	(0.21)	(0.25)	(0.21)
Dummy - discounter is banker	0.38	0.38*	0.38*	0.40*	0.19	0.69***	0.11	0.89***
	(0.31)	(0.19)	(0.21)	(0.22)	(0.28)	(0.25)	(0.92)	(0.28)
Dummy - discounter is bill broker	0.21	0.21	0.21	0.36	0.63**	-0.72	0.80**	-0.40
	(0.24)	(0.18)	(0.23)	(0.22)	(0.29)	(0.47)	(0.41)	(0.38)
Dummy - discounter fails in 1847	0.42***	0.42***	0.42***	0.35***	0.45***	0.36*	0.41**	0.34*
	(0.15)	(0.13)	(0.12)	(0.12)	(0.16)	(0.18)	(0.20)	(0.18)
Dummy - discounter is top discounter	-0.37	-0.37	-0.37	-0.50	-0.89**	0.10	-1.09**	0.11
	(0.30)	(0.27)	(0.30)	(0.31)	(0.42)	(0.37)	(0.51)	(0.31)
Constant	-0.55***	-0.55***	-0.55***	-0.59**	-0.44***	-0.57***	-6.04***	-0.72**
	(0.07)	(0.07)	(0.07)	(0.26)	(0.09)	(0.11)	(0.64)	(0.29)
Observations	1,000	1,000	1,000	1,000	500	500	500	500
Sample	Total	Total	Total	Total	Crisis	Normal	Crisis	Normal
Week FE	No	No	No	Yes	No	No	Yes	Yes
Clustered SE	No	Week	Day	Day	Day	Day	Day	Day
Pseudo R-squared	0.02	0.02	0.02	0.12	0.02	0.04	0.10	0.17
Log pseudo-likelihood	-732.57	-732.57	-732.57	-656.02	-407.62	-310.12	-373.57	-267.76

Dependent variable: share of rejected bills in packet ([0,1]); (robust) standard errors in parentheses
Marginal effects for one stand. dev. increase in covariate (except for discrete variables, when change from 0 to 1)
*** p<0.01, ** p<0.05, * p<0.1

Table: Tobit regressions (packet-level): share of rejected bills per packet (value)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total number of bills on day (ln)	0.14**	0.14**	0.14**	0.01	0.09	0.09	0.12	-0.15
	(0.06)	(0.06)	(0.07)	(0.06)	(0.09)	(0.08)	(0.10)	(0.10)
Total value of bills on day (ln)	-0.03	-0.03	-0.03	-0.04	-0.12	0.11	-0.23**	0.27**
	(0.06)	(0.07)	(0.07)	(0.07)	(0.08)	(0.10)	(0.10)	(0.11)
Packet's rank on day (chronological)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.00	-0.02	0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.05)	(0.06)
Packet's rank on day (value)	0.01	0.01	0.01	-0.04	-0.22	0.29	-0.28	0.21
	(0.13)	(0.13)	(0.15)	(0.15)	(0.20)	(0.21)	(0.25)	(0.20)
Packet's total value (ln)	-0.09	-0.09	-0.09	-0.04	0.17	-0.38*	0.23	-0.30
	(0.14)	(0.15)	(0.17)	(0.17)	(0.23)	(0.23)	(0.28)	(0.22)
Packet's total bills (ln)	0.02	0.02	0.02	0.05	0.02	0.03	0.05	0.05
	(0.05)	(0.06)	(0.06)	(0.06)	(0.08)	(0.07)	(0.09)	(0.07)
Dummy - discounter with DO account	-0.34**	-0.34*	-0.34**	-0.28*	-0.15	-0.73***	-0.13	-0.55**
	(0.16)	(0.19)	(0.15)	(0.14)	(0.19)	(0.27)	(0.19)	(0.25)
Dummy - discounter in rating book	0.13	0.13*	0.13	0.11	0.19	0.07	0.13	0.08
	(0.10)	(0.08)	(0.09)	(0.08)	(0.11)	(0.13)	(0.10)	(0.12)
Dummy - discounter in acceptor book	-0.21	-0.21	-0.21	-0.16	-0.03	-0.45**	-0.07	-0.46**
	(0.17)	(0.15)	(0.17)	(0.16)	(0.24)	(0.22)	(0.27)	(0.22)
Dummy - discounter is banker	0.42	0.42**	0.42*	0.45*	0.26	0.71***	0.18	0.93***
	(0.32)	(0.21)	(0.22)	(0.23)	(0.30)	(0.27)	(0.76)	(0.31)
Dummy - discounter is bill broker	0.22	0.22	0.22	0.36	0.66**	-0.77	0.81**	-0.41
	(0.25)	(0.19)	(0.24)	(0.23)	(0.30)	(0.50)	(0.36)	(0.43)
Dummy - discounter fails in 1847	0.45***	0.45***	0.45***	0.38***	0.49***	0.39**	0.45**	0.38*
	(0.15)	(0.14)	(0.13)	(0.13)	(0.16)	(0.19)	(0.18)	(0.19)
Dummy - discounter is top discounter	-0.38	-0.38	-0.38	-0.53	-0.93**	0.12	-1.14***	0.09
	(0.31)	(0.28)	(0.31)	(0.32)	(0.43)	(0.39)	(0.40)	(0.34)
Constant	-0.57***	-0.57***	-0.57***	-0.53*	-0.46***	-0.60***	-6.14***	-0.70**
	(0.07)	(0.07)	(0.07)	(0.30)	(0.09)	(0.12)	(0.49)	(0.33)
Observations	1,000	1,000	1,000	1,000	500	500	500	500
Sample	Total	Total	Total	Total	Crisis	Normal	Crisis	Normal
Week FE	No	No	No	Yes	No	No	Yes	Yes
Clustered SE	No	Week	Day	Day	Day	Day	Day	Day
Pseudo R-squared	0.02	0.02	0.02	0.12	0.02	0.04	0.10	0.17
Log pseudo-likelihood	-741.02	-741.02	-741.02	-656.52	-410.31	-315.97	-376.72	-274.05

Dependent variable: share of rejected bills in packet ([0,1]); (robust) standard errors in parentheses

Marginal effects for one stand. dev. increase in covariate (except for discrete variables, when change from 0 to 1)

*** p<0.01, ** p<0.05, * p<0.1

Mean equality testing: packet-level

Table: T-tests on packets - rejected vs accepted (in normal weeks)

Variable	Packets with rejections (Obs)	Packets with rejections (Mean)	All accepted (Obs)	All accepted (Mean)	Two-sided p-value
Total number of bills on day (ln)	122	3.43	378	3.35	0.02**
Total value of bills on day (ln)	122	11.79	378	11.71	0.14
Packet's rank on day (chronological)	122	0.48	378	0.51	0.34
Packet's rank on day (value)	122	0.55	378	0.51	0.27
Packet's total value	122	7.81	378	7.71	0.43
Packet's total bills	122	1.94	378	1.68	0.03**
Dummy - discounter with DO account	122	0.03	378	0.11	0.01**
Dummy - discounter in rating book	122	0.30	378	0.29	0.84
Dummy - discounter in acceptor book	122	0.05	378	0.10	0.11
Dummy - discounter is banker	122	0.02	378	0.01	0.06*
Dummy - discounter is bill broker	122	0.01	378	0.03	0.16
Dummy - discounter fails in 1847	122	0.11	378	0.06	0.04**
Dummy - discounter is top discounter	122	0.02	378	0.02	0.63

Table: T-tests on packets - rejected vs accepted (in crisis weeks)

Variable	Packets with rejections (Obs)	Packets with rejections (Mean)	All accepted (Obs)	All accepted (Mean)	Two-sided p-value
Total number of bills on day (ln)	177	3.58	323	3.56	0.46
Total value of bills on day (ln)	177	11.97	323	11.95	0.83
Packet's rank on day (chronological)	177	0.51	323	0.51	0.96
Packet's rank on day (value)	177	0.53	323	0.54	0.90
Packet's total value	177	7.79	323	7.79	0.99
Packet's total bills	177	1.85	323	1.69	0.11
Dummy - discounter with DO account	177	0.08	323	0.12	0.25
Dummy - discounter in rating book	177	0.33	323	0.30	0.45
Dummy - discounter in acceptor book	177	0.06	323	0.07	0.61
Dummy - discounter is banker	177	0.02	323	0.01	0.23
Dummy - discounter is bill broker	177	0.06	323	0.03	0.11
Dummy - discounter fails in 1847	177	0.10	323	0.04	0.02**
Dummy - discounter is top discounter	177	0.02	323	0.04	0.30

Conditional logistic regressions (bill-level): rejected bills vs accepted bills

VARIABLES	(1)	(2)	(3)	(4)	(5)
Days to maturity (ln)	-0.00				
	(0.00)				
Spread from mean maturity of 60 days		0.01			
		(0.00)			
Dummy - maturity>95days			0.37***	0.26***	0.40***
			(0.06)	(0.05)	(0.12)
Amount on bill (ln)	0.01***	0.02***	0.01***	0.01***	0.02**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Dummy - promissory note	0.03***	0.03***	0.03***	0.05***	0.03***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)
Dummy - drawer or acceptor failed	0.04***	0.04***	0.05***	0.05***	0.06***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Dummy - drawer or acceptor bill broker	0.02	0.01	0.02	-0.10***	0.06***
	(0.02)	(0.02)	(0.01)	(0.00)	(0.01)
Dummy - drawer or acceptor DO	-0.12***	-0.12***	-0.12***	-0.10***	-0.13***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Dummy - acceptor in London	-0.60***	-0.60***	-0.60***	-0.58***	-0.61***
	(0.02)	(0.03)	(0.02)	(0.03)	(0.05)
Dummy - discounter=acceptor (strict)	0.07***	0.07***	0.07***	0.05***	0.10***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Dummy - drawer=acceptor	-0.03	-0.03	-0.03	0.01*	-0.04
	(0.03)	(0.03)	(0.03)	(0.01)	(0.05)
Dummy - acceptor=directors	-0.12***	-0.12***	-0.12***	-0.10***	-0.13***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Dummy - acceptor=bank	-0.12***	-0.12***	-0.12***	-0.10***	-0.13***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Dummy - acceptor=top acceptor	-0.12***	-0.12***	-0.12***	-0.10***	-0.13***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Dummy - acceptor=top discounter	-0.12***	-0.12***	-0.12***	-0.03	-0.13***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.01)
Dummy - acceptor in rating book	-0.05**	-0.05**	-0.05**	-0.06*	-0.04
	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
Dummy - acceptor in acceptor book	-0.03	-0.03	-0.04	-0.00	-0.13***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)
Dummy - drawer=bank	-0.12***	-0.12***	-0.12***	-0.10***	-0.13***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Dummy - drawer in rating book	-0.01	-0.02	-0.01	0.01	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Dummy - drawer in acceptor book	0.02	0.02	0.02	0.01	0.05***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)
Bills	1,053	1,060	1,060	546	514
Packets	200	200	200	100	100
Sample	Total	Total	Total	Crisis	Normal
Discounter-date FE	Yes	Yes	Yes	Yes	Yes
Clustered SE	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.67	0.67	0.67	0.63	0.72

Mean equality testing: bill-level (I)

Table: T-tests on bills - rejected vs accepted (in normal weeks)

Variable	Rejected bills (Obs)	Rejected bills (Mean)	Accepted bills (Obs)	Accepted bills (Mean)	Two-sided p-value
Days to maturity (ln)	176	4.15	336	3.87	0.00***
Spread from mean maturity of 60 days	177	-9.08	337	3.17	0.00***
Dummy - maturity>95days	177	0.01	377	0.01	0.80
Amount on bill (ln)	177	5.47	377	5.30	0.06*
Dummy - promissory note	177	0.08	377	0.04	0.02**
Dummy - drawer or acceptor failed	177	0.01	377	0.00	0.64
Dummy - drawer or acceptor bill broker	177	0.01	377	0.01	0.97
Dummy - drawer or acceptor DO	177	0.01	337	0.01	0.69
Dummy - acceptor in London	177	0.49	337	1.00	0.00***
Dummy - discounter=acceptor	177	0.68	337	0.47	0.00***
Dummy - drawer=acceptor	177	0.01	337	0.03	0.14
Dummy - acceptor=directors	177	0.00	377	0.03	0.02**
Dummy - acceptor=bank	177	0.00	377	0.12	0.00***
Dummy - acceptor=top acceptor	177	0.00	377	0.06	0.00***
Dummy - acceptor=top discounter	177	0.00	337	0.02	0.07*
Dummy - acceptor in rating book	177	0.01	337	0.13	0.00***
Dummy - acceptor in acceptor book	177	0.00	377	0.08	0.00***
Dummy - drawer=bank	177	0.00	377	0.10	0.00***
Dummy - drawer in rating book	177	0.34	377	0.27	0.09*
Dummy - drawer in acceptor book	177	0.03	377	0.02	0.44

Mean equality testing: bill-level (II)

Table: T-tests on bills - rejected vs accepted (in crisis weeks)

Variable	Rejected bills (Obs)	Rejected bills (Mean)	Accepted bills (Obs)	Accepted bills (Mean)	Two-sided p-value
Days to maturity (ln)	191	4.00	354	3.87	0.03**
Spread from mean maturity of 60 days	192	-0.47	354	2.74	0.16
Dummy - maturity>95days	192	0.01	354	0.01	0.95
Amount on bill (ln)	192	5.71	354	5.47	0.01***
Dummy - promissory note	192	0.02	354	0.00	0.02**
Dummy - drawer or acceptor failed	192	0.02	354	0.01	0.24
Dummy - drawer or acceptor bill broker	192	0.00	354	0.00	0.46
Dummy - drawer or acceptor DO	192	0.01	354	0.01	0.67
Dummy - acceptor in London	192	0.59	354	1.00	0.00***
Dummy - discounter=acceptor	192	0.58	354	0.35	0.00***
Dummy - drawer=acceptor	192	0.02	354	0.01	0.67
Dummy - acceptor=directors	192	0.00	354	0.17	0.07*
Dummy - acceptor=bank	192	0.00	354	0.14	0.00***
Dummy - acceptor=top acceptor	192	0.00	354	0.09	0.00***
Dummy - acceptor=top discounter	192	0.00	354	0.11	0.14
Dummy - acceptor in rating book	192	0.03	354	0.19	0.00***
Dummy - acceptor in acceptor book	192	0.01	354	0.08	0.00***
Dummy - drawer=bank	192	0.00	377	0.08	0.00***
Dummy - drawer in rating book	192	0.31	354	0.18	0.00***
Dummy - drawer in acceptor book	192	0.06	354	0.03	0.06*