

Useful, usable and used?

Buffer usability during the Covid-19 crisis

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¹Bank of England

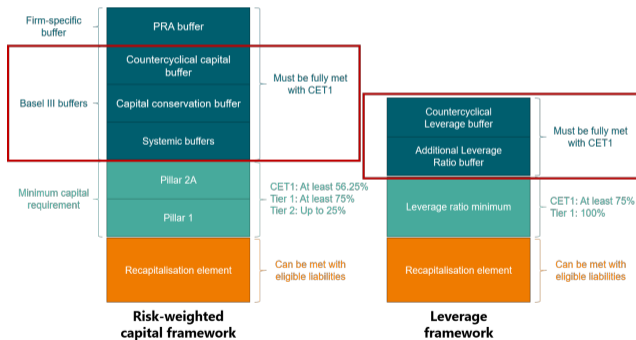
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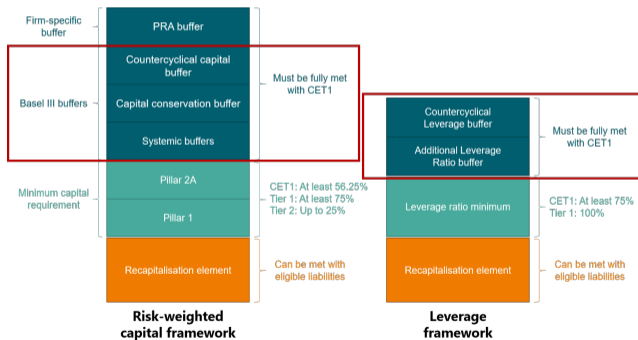
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- ▶ Regulatory capital buffers were introduced after 2008



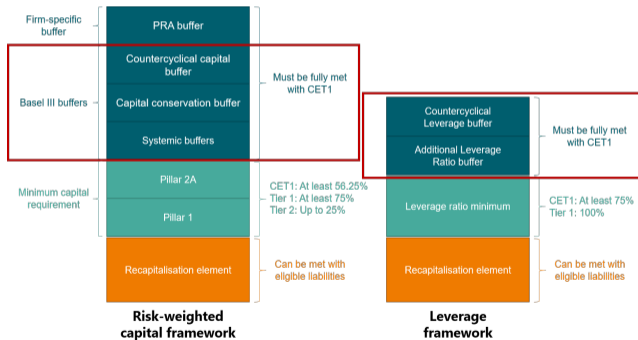
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(Benbouzid et al., '22; Meuleman and Vander Vennet, '20; Altunbas et al., '18; Claessens et al., '13, Galán, '20; Jiménez et al., '17)

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Research question

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- ▶ **pre-pandemic headroom to regulatory buffers** (henceforth, *surpluses*), calculated using regulatory data on capital requirements
- ▶ **bank-specific relief from domestic CCyB release**, calculated using regulatory data on banks' exposures to UK credit risk-weighted assets

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Releasing buffers may be a necessary pre-condition for their usability

- ▶ Banks that received greater capital relief from the CCyB cut maintained **more stable capital ratios, looser lending terms, and lower risk aversion** relative to their peers

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Are regulatory buffers usable?

Approach: Grouping banks based on buffer usability concerns

Approach **Pre-pandemic distance to Basel III regulatory buffers** as indicator of banks' likelihood of drawing down on regulatory buffers during the stress

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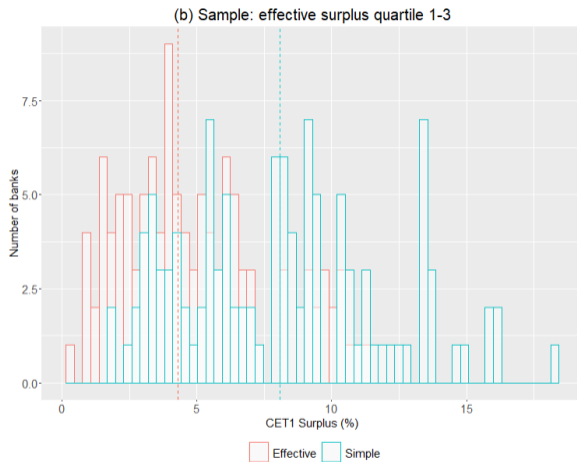
Robustness Use different low surplus definitions (e.g. bottom quartile) or continuous *log* surplus

▶ Effective surplus calculation details

▶ Evolution of major UK banks' capital ratios

▶ Details on the UK capital framework

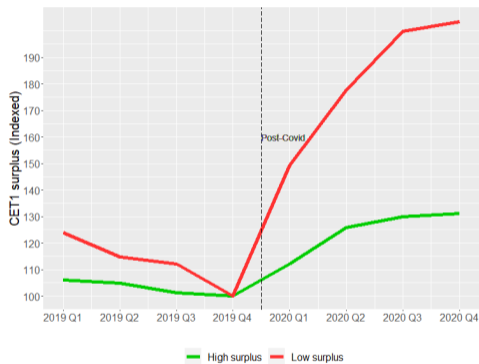
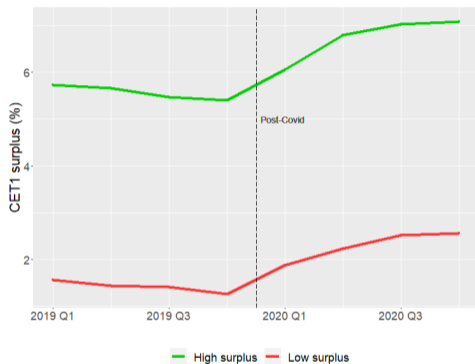
Effective surplus distribution



- ▶ Simple surpluses are an *overestimate* of a bank's *true* voluntary surpluses
- ▶ Effective surplus distribution lies to the left of the simple surplus distribution, with a lower median (4.3% vs. 8.1%)

CET1 surpluses: Unconditional trends in high vs. low surplus banks

Source: BSM/Regulatory returns



- ▶ All banks increased capital surpluses by c.1.5pps over 2020; but this represented a relative increase of 100% for **low surplus** banks & only 30% for **high surplus** banks

Buffer usability: Empirical strategy on capital behaviour

For bank b at time t

$$Y_{b,t} = \beta_1 \text{Low surplus}_b \times \text{Post-Covid}_t + \delta X_{b,t-1} + f_b + f_t + \epsilon_{b,t} \quad (1)$$

- ▶ $Y_{b,t}$: capital surplus, log capital surplus
- ▶ Low Surplus_b : Dummy = 1 if bank is in **low surplus** category in 2019; 0 otherwise
- ▶ Post-Covid_t : Dummy = 1 if time period is between Q1 2020 and Q4 2020; 0 otherwise
- ▶ $X_{b,t-1}$: balance sheet variables that are likely to differ across the two comparison groups, eg. business models, profitability, liquidity resilience, provisioning
- ▶ f_b, f_t : Bank and quarterly time fixed effects

Evidence of buffer usability frictions: $\beta_1 > 0$

Buffer usability: Results on capital behaviour

	CET1 surplus (%)	CET1 surplus (Log)
	(1)	(2)
Post-Covid x Low surplus	-0.14 (0.41)	0.43*** (0.11)
No. of obs	890	886
R ² (within)	0.10	0.08
Bank controls (lagged)	Yes	Yes
Bank FE	Yes	Yes
Time FE	Yes	Yes

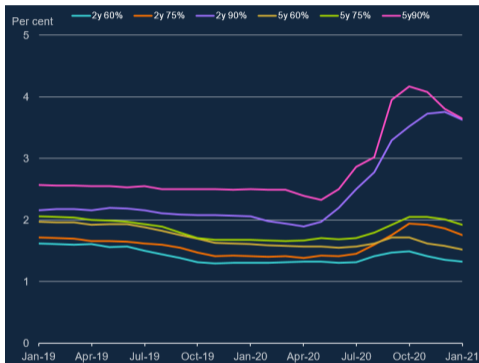
Notes: ***/**/* indicate significance at the 1%, 5%, and 10% level respectively. Robust standard errors clustered at bank level are in brackets.

- ▶ **Low surplus** banks grew their surpluses by approximately 43% more than peers during the pandemic (column 2) ▶ PTH

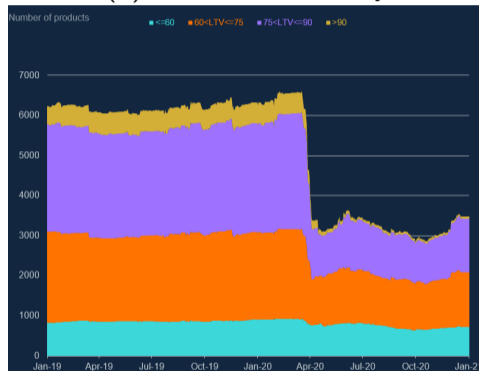
Mortgage pricing and availability

Source: Moneyfacts

(a) Pricing



(b) Product availability



- ▶ There was a general tightening of conditions in the mortgage market, especially in the *riskier* segments

Buffer usability: Empirical strategy on mortgage lending

For loan to individual i in postcode l issued by bank b at time t :

$$Y_{i,l,b,t} = \gamma_1 \text{Low surplus}_b \times \text{Post-Covid}_t \quad (2) \\ + \delta_1 \text{Post-Covid}_t \times X_{i,l,b,t} + \delta_2 X_{b,t-1} + f_{l,t} + f_{l,b} + \epsilon_{i,l,b,t}$$

- ▶ $Y_{i,l,b,t}$: log interest rate (%), log loan value (GBP)
- ▶ $X_{i,t-1}$: lagged bank controls
- ▶ $X_{i,l,b,t}$: loan and borrower risk characteristics
- ▶ $f_{l,t}$: postcode-time FE accounts for time-varying loan demand conditions
- ▶ $f_{l,b}$: postcode-bank FE accounts for differences in bank presence across local areas

Evidence of usability frictions: $\gamma_1 > 0$ for interest rates, $\gamma_1 < 0$ for loan values

Buffer usability: Results on mortgage lending

	Interest rate (Log)	Loan value (Log)
	(1)	(2)
Post-Covid x Low surplus	0.037*** (0.009)	-0.022*** (0.004)
No. of obs.	1602650	1602650
R ² (within)	0.207	0.469
Bank controls (lagged)	Yes	Yes
Borrower risk controls	Yes	Yes
Bank x Postcode FE	Yes	Yes
Postcode x Time FE	Yes	Yes

Notes: ***/**/* indicate significance at the 1%, 5%, and 10% level respectively. Robust standard errors clustered at bank and postcode are in brackets

- ▶ **Low surplus** banks maintained **higher interest rates** (by 3.7%) and **lower loan values** (by 2.2%) after the onset of the pandemic compared to peers ▶ PTH - surplus

Is there value to releasing buffers?

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Reason **High PTR** banks are more exposed to UK credit markets & so affected to a greater extent by changes in the UK CCyB

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Approach Use cross-sectional variation in **pre-pandemic bank-specific CCyB pass-through rates**

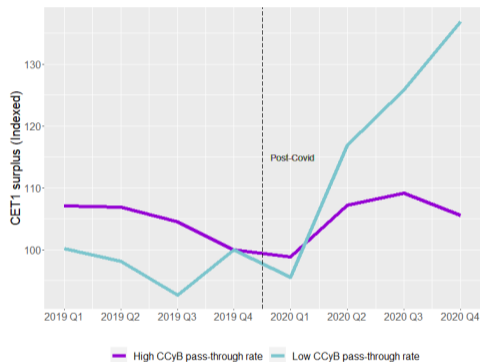
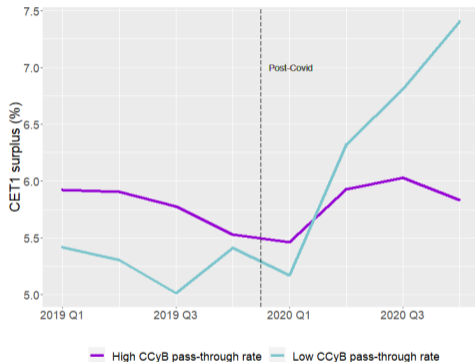
Grouping Define **high PTR** banks as those with more than 50% CCyB pass-through rate in 2019, and **low PTR** banks as those with less

Reason **High PTR** banks are more exposed to UK credit markets & so affected to a greater extent by changes in the UK CCyB

Robustness Use continuous version

CET1 surpluses: Unconditional trends in high vs. low CCyB PTR banks

Source: BSM/Regulatory returns



- ▶ **High PTR** banks increased surpluses by 0.6pp compared to a 2pp increase by **low PTR** banks
- ▶ This was a relative increase of 5% for **high PTR** banks & 37% for **low PTR** banks

Buffer releasability: Results on capital behaviour

	CET1 surplus (%)	CET1 surplus (Log)
	(1)	(2)
Post-Covid x High CCyB PTR	-1.30**	-0.13
	(0.63)	(0.09)
No. of obs	891	887
R ² (within)	0.12	0.04
Bank controls (lagged)	Yes	Yes
Bank FE	Yes	Yes
Time FE	Yes	Yes

Notes: ***/**/* indicate significance at the 1%, 5%, and 10% level respectively. Robust standard errors clustered at bank level are in brackets.

- ▶ **High PTR** banks maintained more stable capital surpluses (around 1.3 percentage points lower than their peers after the onset of Covid-19) ▶ PTH

Buffer releasability: Results on mortgage lending

	Interest rate (Log)	Loan value (Log)
	(1)	(2)
Post-Covid x High CCyB PTR	-0.037*** (0.013)	0.023*** (0.005)
No. of obs.	1602650	1602650
R ² (within)	0.207	0.469
Bank controls (lagged)	Yes	Yes
Borrower risk controls	Yes	Yes
Bank x Postcode FE	Yes	Yes
Postcode x Time FE	Yes	Yes

Notes: ***/**/* indicate significance at the 1%, 5%, and 10% level respectively. Robust standard errors clustered at bank and postcode are in brackets

- ▶ **High PTR** banks maintained **lower interest rates** (by 3.7%) and **higher loan values** (by 2.3%) after the onset of the pandemic compared to peers ▶ PTH - CCyB
- ▶ Having **high PTR** **partially offsets the impact of buffer usability frictions** on deleveraging

Did usability and releasability impact risk-taking?

Empirical strategy: Risk-taking analysis

For loan to individual i in postcode l issued by bank b at time t :

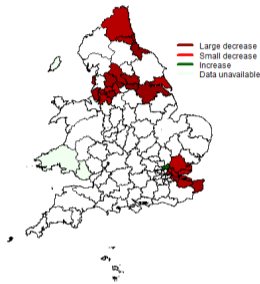
$$\begin{aligned} Y_{i,l,b,t} = & \phi_1 \text{Low surplus}_b \times \text{Post-Covid}_t \times \text{Risky loan}_{l,t} \\ & + \phi_2 \text{High PTR}_b \times \text{Post-Covid}_t \times \text{Risky loan}_{l,t} \\ & + \delta_1 \text{Post-Covid}_t \times X_{i,l,b,t} + \delta_2 X_{b,t-1} + f_{l,t} + f_{l,b} + f_{b,t} + \epsilon_{i,l,b,t} \end{aligned} \quad (3)$$

- ▶ Two types of **risky loan** definition: **Covid-specific** and **Conventional**
- ▶ Same controls as before but now also with *bank-time* fixed effects, $f_{b,t}$
- ▶ **Evidence of buffer usability frictions:** $\phi_1 > 0$ for interest rates, $\phi_1 < 0$ for loan values
- ▶ **Evidence of releasable buffer benefits:** $\phi_2 < 0$ for interest rates, $\phi_2 > 0$ for loan values

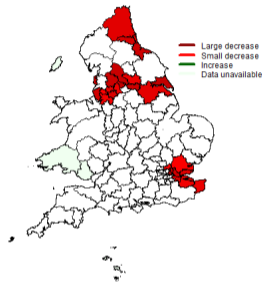
I. Risk-taking: Exploiting Covid specific shocks to borrower risk

Source: Covid-19 case rate dashboard <https://coronavirus.data.gov.uk/>

Panel (a): Change in volume of mortgages by low surplus banks



Panel (b): Change in volume of mortgages by high surplus banks



- ▶ **High case rate**, l,t : local areas above the 75th percentile of the cross-sectional distribution of case rates (per 100,000 people)
- ▶ Case rates correlated with govt. pandemic policies and adverse macro outcomes
(Temesvary and Wei, 2021)
- ▶ Cash flow constraints + likelihood of negative house equity = Higher default probabilities
(Ganong and Noel, 2022; Goldberg and Capone, 1998; Riddiough, 1991; Foster and Van Order 1984)

I. Risk-taking: Exploiting Covid specific shocks to borrower risk

High case rate = 1 if postcode > 75th percentile of 2020 average

	Interest rate (Log)	Loan value (Log)
	(1)	(2)
Post-Covid x Low surplus x High case rate	0.002 (0.002)	-0.014*** (0.003)
Post-Covid x High CCyB PTR x High case rate	-0.015*** (0.002)	0.006* (0.003)
No. of obs.	1368512	1368512
R ² (within)	0.161	0.462
Borrower risk controls	Yes	Yes
Bank x postcode	Yes	Yes
Bank x Time	Yes	Yes
Postcode x Time FE	Yes	Yes

Notes: ***/**/* indicate significance at the 1%, 5%, and 10% level respectively. Robust standard errors clustered at bank and postcode are in brackets

- ▶ **Low surplus** banks maintained lower loan values in areas that were particularly struck by Covid, but interest rates did not vary.
- ▶ **High PTR** continued to support lending in these areas. [▶ PTH - interest rate](#) [▶ PTH - loan value](#)

II. Risk-taking: Exploiting conventional measures of borrower risk

Risky loan is $LTI > 4.5$ & $LTV > 90$ vs $LTI < 4.5$ & $LTV < 90$

1. First, based on “high” LTIs and LTVs because they:

- ▶ Attract **riskier borrowers**, have higher **default probabilities** & expected **losses**, and should be considered in conjunction

(Corbae and Quintin, 2015; Benetton et al., 2018; Lazarov and Hinterschweiger, 2018)

- ▶ Are **costlier in capital** terms and subject to **regulatory limits**

(eg. Campbell and Cocco, 2015; PRA, 2021; Peydró et al., 2020)

- ▶ Are sensitive to material **cash-flow shocks** (eg. Covid-19)

2. Second, zooming in on **first-time buyers** as a particularly risky category of borrowers

- ▶ Higher default risk

Kelly, 2015

II. Risk-taking: Exploiting conventional measures of borrower risk

Risky loan is $LTI > 4.5$ & $LTV > 90$ vs $LTI < 4.5$ & $LTV < 90$

	Interest rate (Log)		Loan value (Log)	
	(1)	(2)	(3)	(4)
Post-Covid x Low surplus x High LTV, LTI	0.071** (0.030)	0.117*** (0.021)	-0.020 (0.021)	-0.062*** (0.013)
Post-Covid x High CCyB pass-through x High LTV, LTI	-0.087*** (0.029)	-0.092*** (0.014)	0.086*** (0.018)	0.051*** (0.012)
No. of observations	1272317	319075	1272317	319075
R ² (within)	0.121	0.083	0.552	0.672
Borrower type	All	First-time buyers	All	First-time buyers
Borrower risk controls	Yes	Yes	Yes	Yes
Bank x Postcode FE	Yes	Yes	Yes	Yes
Bank x Time	Yes	Yes	Yes	Yes
Postcode x Time FE	Yes	Yes	Yes	Yes

Notes:

***/**/* indicate significance at the 1%, 5%, and 10% level respectively. Robust standard errors clustered at bank and postcode are reported in brackets

- ▶ **Low surplus** banks tightened terms on riskier mortgage lending to a greater extent than peers

▶ PTH: 1&2

▶ PTH: 3&4

- ▶ In contrast **high PTR** banks maintained looser lending terms

▶ PTH: 1&2

▶ PTH: 3&4

Conclusions and policy implications

Conclusions

Buffer usability frictions impacted bank behavior during the Covid-19 crisis

- ▶ All UK banks **increased capital ratios** but the *relative* increase was **larger for low surplus** banks
- ▶ Low surplus banks maintained **tighter lending terms** and exhibited **higher risk aversion** relative to their peers

Releasing buffers may be a necessary pre-condition for their usability

- ▶ Banks that benefitted more from the CCyB cut maintained **more stable capital ratios, looser lending terms,** and **lower risk aversion** relative to their peers

Policy implications

- ▶ Our results highlight **potential unintended consequences** of new Basel III regulatory buffers on banks' lending and capital behaviour in systemic shocks
 - ▶ This is striking, as it is ***despite banking sector resilience during Covid-19***
 - ▶ Buffer usability issues may become even more acute in the absence of support measures (eg. Drehmann et al., 2020)
- ▶ But they also **support releasability of regulatory capital buffers** as a means of dampening these unintended consequences
 - ▶ *Releasability* may be a necessary pre-condition for practical capital buffer *usability* (Woods, 2022; Saporta, 2021, 2022; Restoy, 2021; Drehmann et al., 2020)

Thank you.

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Appendix

Related literature

1. **Unwillingness to use regulatory buffers has impacted banks' lending during Covid-19**

- ▶ to SME borrowers in the US (Berrospide et al., 2021); to non-financial corporates in EU, with real economic impacts (Couaillier et al., 2022); BCBS (2021)
- ▶ Links more broadly to the literature on bank capital and lending

2. **Releasable buffers may offer a possible solution in crises**

- ▶ CCyB releases supported lending during Covid-19 (Couaillier et al., 2022 & Avezum et al., 2021 for EU; BCBS, 2021)
- ▶ But instances of CCyB releases limited, so insights also extrapolated from GFC (Jimenez et al., 2017; Chen et al., 2019)
- ▶ Evidence on effectiveness of macro-prudential capital tools in downturns mixed (eg. Cerutti et al., 2017 vs Galán, 2020) and calls for further analysis (Bergant and Forbes, 2021; Drehmann et al., 2020; Restoy 2021; Lewrick et al., 2020; Galati and Moessner, 2018)

Data description

Coverage Depends on data availability; at highest consolidation level:

- ▶ Bank balance sheet data (aggregate): 159 banks, Source: PRA regulatory returns
- ▶ Mortgage lending (loan-level): 75 banks, Source: PSD001
 - ▶ 78% of mortgage market; repeated cross-section of borrowers

Time period Q1 2019 to Q4 2020

Covid dummy = 1 for Q1 2020 - Q4 2020 (inclusive)

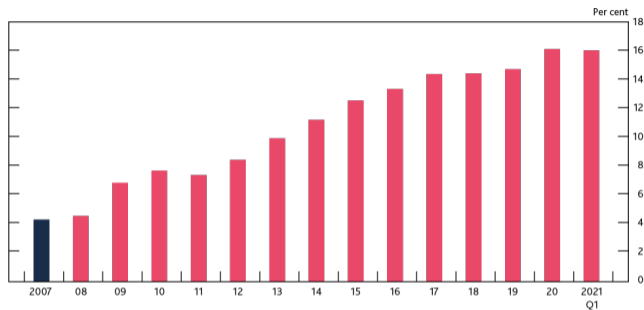
▶ Aggregate data: Summary statistics

▶ Systematic differences between banks

▶ Loan-level data: Summary statistics

▶ Loan-level data: Dataset details

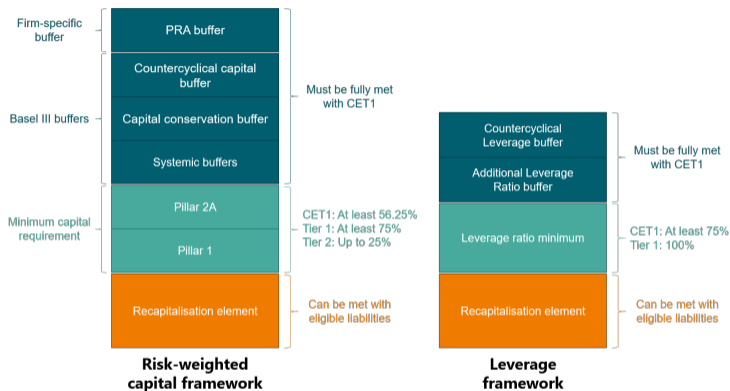
Evolution of major UK banks' capital ratios



Note: Sourced from BoE FSR July 2021

- ▶ Banking sector remained resilient during the Covid-19 stress
- ▶ No direct way to analyse potentially pro-cyclical behaviour that could be caused by a change in behaviour due to buffer uses
- ▶ ∴ We study banks' **willingness to defend their capital ratios** where **voluntary surpluses** were small ahead of the pandemic

UK capital framework: Risk-based, leverage, and MREL

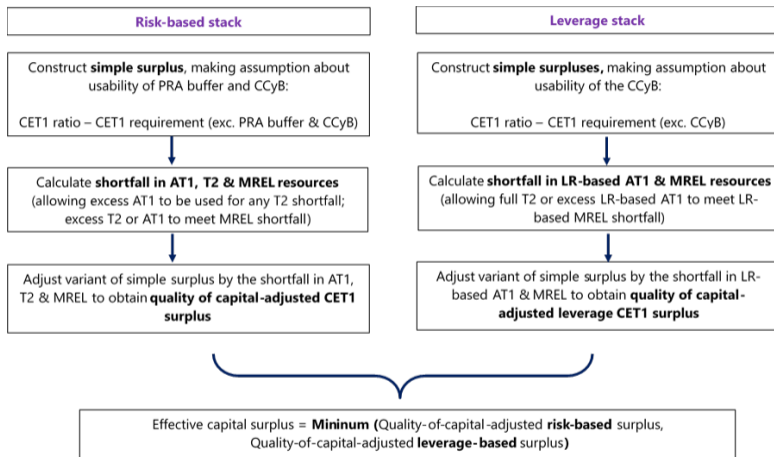


Note: Sourced from PRA Supervisory Statement SS45/15, "The UK leverage ratio framework"

Comprised of Basel minimum standards as well as a number of UK-specific additions

▶ Back

Effective surplus calculation details



Why we drop the top quartile (1/2)

- ▶ Long right tail in the surplus distribution (in 2019: $\mu_{Q1} = 1.8\%$, $\mu_{Q2-4} = 6.7\%$, $\mu_{Q4} = 43.8\%$)
 - ▶ Show
- ▶ Excluding the top quartile ensures that the results are based on comparisons between more similar banks.

▶ Back to grouping slide

▶ Back to histogram slide

Why we drop the top quartile (2/2)

Statistic	Low surplus banks		High surplus banks		Top quartile(Excl.)	
	2019	2020	2019	2020	2019	2020
CET1 ratio (% RWAs)	13.48	13.60	18.63	19.19	51.97	52.78
CET1 effective requirement (excl. PRA buffer, % RWAs)	12.12	11.30	13.08	12.45	15.43	15.12
CET1 simple surplus (excl. PRA buffer, % RWAs)	0.04	0.05	0.09	0.10	0.42	0.43
CET1 effective surplus (excl. PRA buffer, % RWAs)	1.42	2.30	5.57	6.74	37.72	37.66
CCyB pass-through rate	0.72	0.73	0.72	0.73	0.60	0.54
log Total assets (%)	22.58	22.66	21.70	21.76	20.08	20.22
Cash/ assets (%)	10.27	10.76	14.91	15.82	30.28	27.74
Deposits/ assets (%)	72.62	73.21	79.80	80.77	65.61	67.24
Provisions/ assets (%)	0.14	0.13	0.50	0.23	0.15	0.13
Retained profits/ assets (%)	3.51	3.44	3.74	3.56	2.21	2.60
Loans/ assets (%)	67.09	65.45	67.62	67.65	51.68	51.88

▶ Back to previous slide

▶ Back to main slide

Aggregate data: Summary statistics

Statistic	N	Mean	σ	Min	25%	50%	75%	Max
CET1 ratio (% RWAs)	1,257	26.93	24.76	4.35	15.35	26.47	241.18	
CET1 effective requirement (excl. PRA buffer, % RWAs)	1,249	13.28	3.09	7.81	11.19	14.92	26.51	
CET1 simple surplus (excl. PRA buffer, % RWAs)	1,257	0.17	0.24	-0.05	0.06	0.17	2.29	
CET1 effective surplus (excl. PRA buffer, % RWAs)	1,249	13.76	23.47	-2.88	3.41	13.01	222.34	
CCyB pass-through rate	1,257	0.69	0.38	0.00	0.29	1.00	1.00	
log Total assets (%)	1,240	21.42	2.30	16.61	19.74	22.76	28.46	
Cash/ assets (%)	1,232	18.37	17.93	0.00	7.30	21.77	96.17	
Deposits/ assets (%)	1,240	75.72	21.65	0.00	72.30	90.62	96.71	
Provisions/ assets (%)	1,054	0.28	1.49	0.00	0.005	0.20	22.47	
Retained profits/ assets (%)	1,231	3.30	7.37	-40.24	0.52	6.19	64.07	
Loans/ assets (%)	1,240	63.30	23.40	0.06	49.48	81.56	97.39	

▶ Back

Loan-level mortgage data: Summary statistics

Statistic	N	Mean	σ	Min	25%	50%	75%	Max
Loan-to-income (ratio)	1,734,984	3.200	1.074	0.114	2.447	3.317	4.066	14.637
Loan-to-value (pp)	1,734,984	67.354	21.442	2	53.6	73.9	85	100
Property value (GBP'000)	1,734,984	313,592.900	267,628.900	19,000	170,000	250,000	375,000	26,250,000
Loan value (GBP'000)	1,734,984	197,261.700	155,691.100	4,331	106,800	161,995	244,335	15,275,000
Gross income (GBP'000)	1,734,984	65,445.000	82,842.500	1,782	37,000	52,086	75,000	28,693,979
Interest rate (pp)	1,734,984	2.068	0.571	0.740	1.690	1.970	2.290	19.400
Age (years)	1,734,984	37.818	9.655	18	30	37	45	85
First-time buyer	1,734,984	0.318	0.466	0	0	0	1	1
Self-employed	1,734,984	0.109	0.311	0	0	0	0	1
Impaired borrower	1,734,984	0.002	0.048	0	0	0	0	1
Income verification	1,734,984	1.851	0.357	1	2	2	2	2
Interest only mortgage	1,734,984	0.019	0.135	0	0	0	0	1

▶ Back

Loan-level mortgage data: Dataset details

- ▶ Data on universe of newly issued residential mortgages from the Product Sales Database (PSD001), updated quarterly by the Financial Conduct Authority.
- ▶ Includes info on product and borrower characteristics
- ▶ There are a few key advantages of using this dataset:
 - ▶ Mortgages are one of the largest asset classes on UK banks' balance sheets and also crucially the largest liability on the household sector balance sheet. Lending to households accounts half of all credit to private non-financial sector by UK banks (Peydró et al., 2020)
 - ▶ Mortgage lending was not subject to government guarantees during the pandemic
 - ▶ Allows us to control for changes in loan demand during the pandemic, such as through the use of postcode-and-time level fixed effects (Rajan and Willison, 2018)
 - ▶ Allows deeper investigation into risk-taking behaviour of banks during the stress which is difficult to explore convincingly with aggregate data

Systematic differences between low and high surplus banks

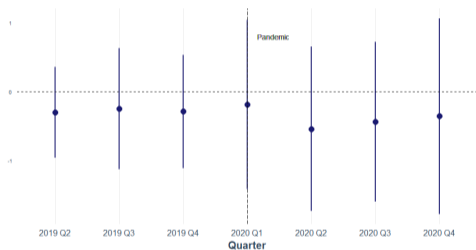
Based on 2019 averages

Variable	Low surplus banks	High surplus banks	t-statistic
CET1 ratio (%)	14	20	-19***
CET1 effective surplus (%)	1.9	6.65	-23***
CET1 effective requirement	12.17	13.25	-5***
Size	22.75	21.43	5***
Deposits/Assets	74.44	79.72	-2.3**
Cash/Assets	10.24	15.24	-6***
Deposits/Assets	74.44	79.72	-2.3**
Retained profits/Assets	3.10	3.9	-1.8*
Loans/Assets	66.32	68.03	-0.8
Provisions/Assets	0.14	0.54	-2.8***
Mortgage loans/Assets	6.6	32.73	-7***
Total PNFC loans/Assets	15	13.3	0.5

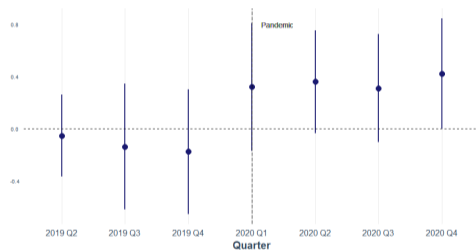
▶ Back

Conditional parallel trends chart: Capital: Surplus

Panel (a): CET1 surplus regression



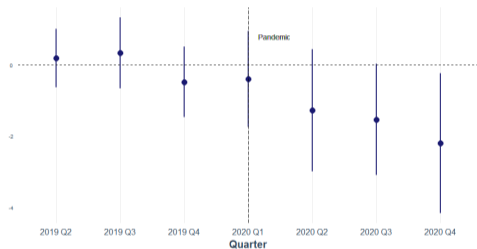
Panel (b): log CET1 surplus regression



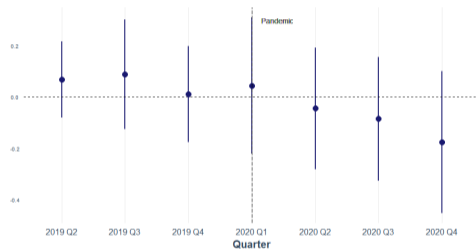
▶ [Back to usability](#)

Conditional parallel trends chart: Capital: CCyB

Panel (a): CET1 surplus regression



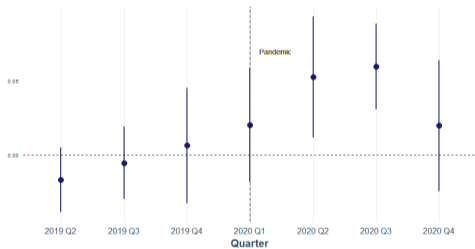
Panel (b): log CET1 surplus regression



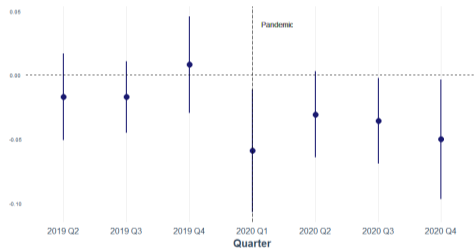
► [Back to releasability](#)

Conditional parallel trends chart: Mortgage lending: Baseline, Interest Rate

Panel (a): Low surplus



Panel (B): High CCyB pass-through rate

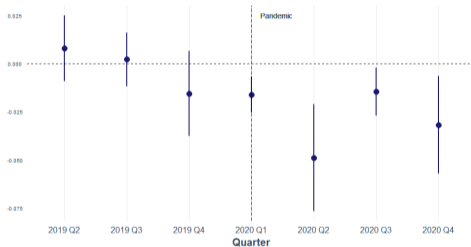


▶ Back to usability

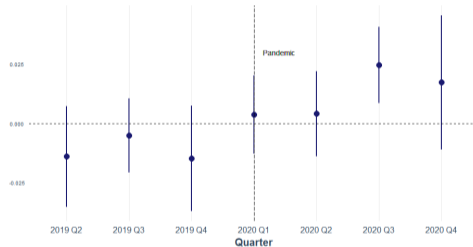
▶ Back to releasability

Conditional parallel trends chart: Mortgage lending: Baseline, Loan Value

Panel (a): Low surplus



Panel (B): High CCyB pass-through rate

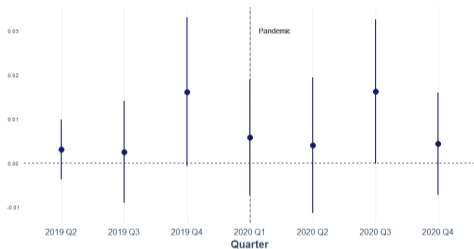


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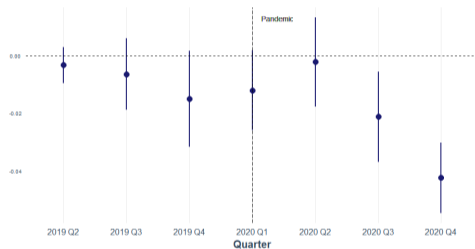
▶ Back to releasability

Conditional parallel trends chart: Mortgage lending: Spatial, Interest Rate

Panel (a): Low surplus



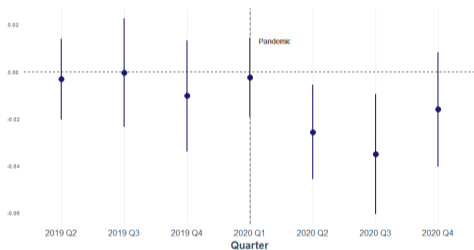
Panel (B): High CCyB pass-through rate



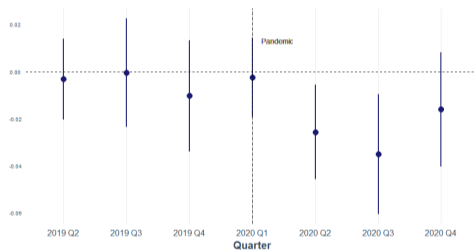
▶ Back

Conditional parallel trends chart: Mortgage lending: Spatial, Loan Value

Panel (a): Low surplus



Panel (B): High CCyB pass-through rate



▶ Back

Results: Extensive margins of mortgage lending

	Log number of loans	Log volume of loans
	(1)	(2)
Post-Covid x Low surplus	0.258 (0.329)	0.323 (0.372)
Post-Covid x High PTR	-0.099 (0.219)	-0.102 (0.188)
No. of obs.	1871	1871
R ² (within)	0.159	0.234
Bank & Borrower Risk controls	Yes	Yes
Bank x Region & Region x Time FE	Yes	Yes

Notes: ***/**/* indicate significance at the 1%, 5%, and 10% level respectively. Robust standard errors clustered at bank level in brackets

- ▶ Neither **Low surplus** banks or **High PTR** banks exhibited significant differences in the number or volume of loans they provided during the pandemic relative to their peers