# Limits of Stress-Test based Bank Regulation: Cues from the Covid-19 Crisis

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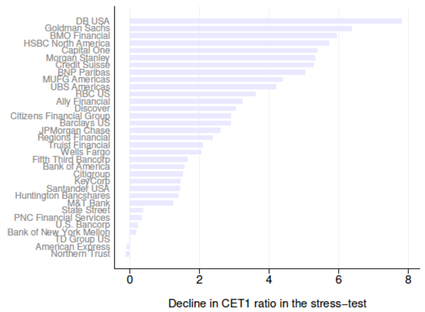
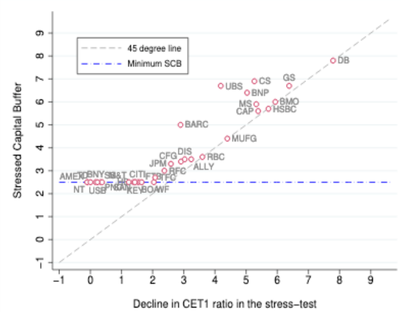
## Abstract

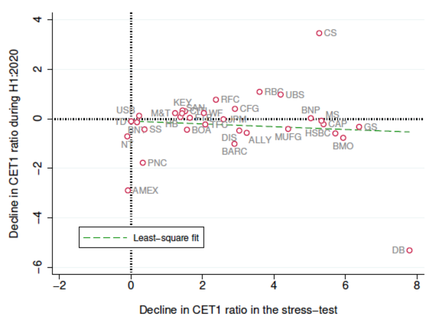
- Stress-tests help regulators better align capital regulation to individual banks' risk profiles, but are not fully accurate.
- We use the Covid-19 crisis to provide suggestive evidence of inaccuracies in stress testing.
- Using a three-period model, we show that the relationship between stress-test accuracy and the optimal capital surcharge for failing banks exhibits a phase shift.
- For test accuracy below a threshold the optimal surcharge is zero, and it increases non-linearly with accuracy thereafter.


## Type-I/II errors in stress-tests?

- In the US, the Fed uses stress-tests to compute a bank-specific capital surcharge: Stressed Capital Buffer (SCB).
- Right before the Covid-19 crisis, the Fed stress-tested 33 banks.
- Beyond a minimum of 2.5%, the surcharges were proportional to the capital shortfall in the test.
- Does a close to zero correlation between change in banks' CET1 ratios during the crisis vis-a-vis during the stress-test scenarios imply that some banks were penalized too harshly?




## Model

- Three-dates: 0, 1, and 2.
- Representative **household** with fixed endowment on dates 1 and 2; decides bank deposit (d) amount on date-1..
- **Bank** combines capital endowment (k) on date-1 with deposit funding (d) to invest in a risky project that pays $\psi g(k+d)$ on date-2. Bank shareholders have limited liability.
- Distribution of $\psi$ depends on bank type which can be high(H) or low(L). The probability of being a high-type bank depends on costly effort (e) exerted on date-0.
- The **Government** runs a mispriced deposit insurance scheme.
- Limited liability and a mispriced deposit insurance leads the bank to over-borrow and leads to inefficient bank failures. and rationalizes the need for capital regulation. **Regulator** announces capital requirement $(\chi)$ on date-0.

## Information environment

- The regulator can't observe banks' types on date-1.
- Thus without stress-tests, capital requirement cannot be bank-specific.
- Stress-tests provide a noisy signal about bank type on date-1, and enable potentially bank-specific capital requirements via a capital surcharge imposed on failing banks.

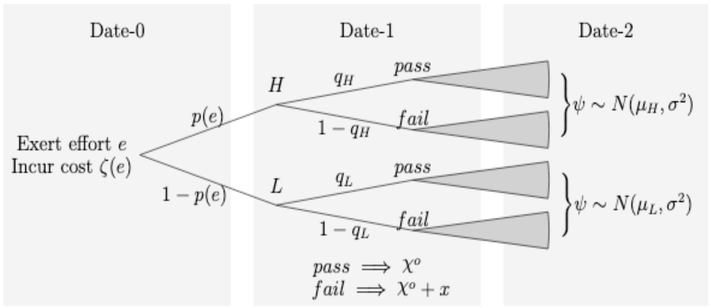
## Regulator's trade-off

- Higher $\chi \rightarrow \downarrow$ d and $\downarrow$failure probability. Welfare improving (smaller bank failure inefficiency).
- Higher $\chi \rightarrow \downarrow$ expected output. Welfare reducing.

## Optimal regulation without stress-tests:

- Counterfactual: If bank type were observable, the optimal capital requirement for a low-type bank $(\chi_L^O)$ would be higher than that for the high-type bank $(\chi_H^O)$.
- Yet, without stress-tests, optimal ex-ante regulation on date-0 $(\chi^O)$ cannot be bank-specific and $\chi_L^O > \chi^O > \chi_H^O$.

## Capital Regulation with Stress-Tests

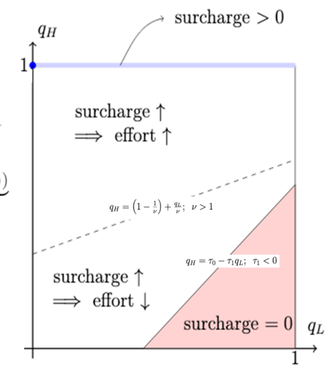



- Stress-tests can ↑ welfare as they help align capital regulation to individual banks' risk profiles.
- Stress tests can ↓ welfare as inaccuracies in stress-test can (i) lead to inefficiently low or high capital requirements for some banks and (ii) hamper banks' ex-ante incentive to exert effort.

## Stress-test accuracy, effort, and optimal surcharges

$$\max_e \; -\zeta(e) + \beta p(e) \underbrace{(q_H V_H(\chi^o) + (1-q_H)V_H(\chi^o + x))}_{EV_H} + \beta(1-p(e)) \underbrace{(q_L V(\chi^o) + (1-q_L)V_L(\chi^o + x))}_{EV_L}$$

$\zeta$ : cost of exerting effort
$V$ : value of the bank
$p$ : probability of being H-type




## Conclusion

- Stress-tests can be useful in principle to tie capital regulation to the risk profile of individual banks.
- In practice, capital regulation based on stress-tests whose accuracy is below threshold can be welfare reducing.
- Cost of higher accuracy for banks and regulators must be weighed against the benefits that more accurate tests and attendant bank-specific capital requirements entail.