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 $\chi \rightarrow$ 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 ($\chi^L_0$) would be higher than that for the high-type bank ($\chi^H_0$).
• Yet, without stress-tests, optimal ex-ante regulation on date-0 ($\chi^0$) cannot be bank-specific and $\chi^L_0 > \chi^0 > \chi^H_0$.

Capital Regulation with Stress-Tests

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<tr>
<th>Date-0</th>
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<tr>
<td>$\psi$</td>
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<td>$\chi_0$</td>
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• Stress-tests can $\uparrow$ welfare as they help align capital regulation to individual banks’ risk profiles.
• Stress tests can $\downarrow$ 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 surcharge

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Stress-test accuracy, effort, and optimal surcharge

$\gamma = 1 - \frac{1}{\psi} \left( \frac{\chi_{0}^L}{\chi_{0}^H} + (1 - \psi) \frac{V(\chi_{0}^L + x) + \mu}{\mu} \right) + \frac{\chi_{0}^H}{\chi_{0}^L} \frac{\psi}{\psi}$

$\zeta = \psi \left( 1 - \frac{1}{\psi} \left( \frac{\chi_{0}^L}{\chi_{0}^H} + (1 - \psi) \frac{V(\chi_{0}^L + x) + \mu}{\mu} \right) + \frac{\chi_{0}^H}{\chi_{0}^L} \frac{\psi}{\psi} \right)$

$\psi > N(\mu, \sigma^2)$

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.