Discussion
Modelling Your Stress Away
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Input from **Carola Műller** and **Cosimo Pancaro** (both ECB) is gratefully acknowledged.

What is the paper about?

- Do banks “game” the EBA stress test?
- Via systematic changes to stress test models…
- …to minimise losses under the adverse scenario

How?

- The authors conduct an empirical bank level analysis (à la Philippon et al., 2017)
- Exploiting granular information from the EBA ST disclosures (2014 and 2016)
- Test for whether changes in projected loan losses can be explained by
  - Scenario changes
  - Changes in exposures
  - Changes in stress test models

Main findings

1. Banks smooth their projected losses…through systematic model adjustments
   - Especially for portfolios with IRB approach
2. Stock prices and CDS spreads increased more for banks with larger loan loss reductions due to model changes
   - Investors interpret ST outcome as indication of lower capital requirements rather than a lowering of credit risk

Main assessment

- Paper asks a pertinent question
- Stress testing has become an increasingly important tool for both micro- and macroprudential purposes
  - Capital requirement implications
  - Risk management assessments
  - Transparency and market discipline
- Banks clearly have incentives to "optimise" their ST submissions

Comments

- Do you really estimate the proprietary credit risk model of the banks?
  - No dynamics (see also Covas, 2018)
  - Model does not account for starting values of default rates
  - Model parameter estimates are not independent of scenario changes
- Confounding factors not controlled for
- Final model results coming out of the ST reflects also regulator's view

Comments

- Replication of NS results for euro area banks (EBA + SREP): main result hold

	(1) **Fullsample Baseline**
Dependent Variable : Delta M	2 Ass cl
Delta RWD	0.518
	(1.070)
Delta E	0.037
	(0.384)
Delta S	-0.643**
	(0.317)
Constant	-0.038
	(0.159)
Observations	85
R-squared	0.231
Mean (Delta M)	-0.078
Standard deviation (Delta M)	1.107

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

- Banks that would have incurred higher losses due to the 2016 scenario (when using the 2014 models)
- …show lower differences in losses due to changes in their risk models

- Negative "delta S" coefficient lower for SREP banks compared to EBA banks (not shown)

Comments

- Final ST results incorporate regulator's view (top-down model)
- A cleaner approach: use banks' 1st submission (i.e. before quality assurance / supervisory overlay) [(2)-(5)]
- Focus only on IRB portfolios [(4)-(5)]

	(1)	(2)	(3)	(4)	(5)
	Fullsample	**1st cycle data**			
	Baseline			IRB PFs without BM	
Dependent Variable : Delta M	2 Ass cl	2 Ass cl	6 Ass cl	2 Ass cl	6 Ass cl
Delta RWD	0.518	0.322	0.662	-0.000	0.008
	(1.070)	(1.535)	(2.378)	(0.226)	(0.771)
Delta E	0.037	0.184	0.421**	1.241	0.015
	(0.384)	(0.380)	(0.183)	(1.638)	(0.341)
Delta S	-0.643**	-0.371	-1.007***	-1.585***	-0.282
	(0.317)	(0.445)	(0.235)	(0.243)	(0.663)
Constant	-0.038	-0.039	-0.390	-0.026	-0.046
	(0.159)	(0.174)	(0.296)	(0.125)	(0.112)
Observations	85	68	68	46	26
R-squared	0.231	0.118	0.203	0.451	0.122
Mean (Delta M)	-0.078	-0.119	-0.242	-0.2	-0.029
Standard deviation (Delta M)	1.107	1.195	1.204	1.063	0.478

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

- Results still hold
- Negative (significant) coefficients increase
- As should be expected due to the fact that 1st cycle better reflect banks' proprietary models

Comments

- NS focus on 2014 and 2016 stress tests
- We replicated results for model changes between 2016 and 2018 stress tests
- Big caveat: Introduction of IFRS9!

	(1)	(6)	(7)
	Fullsample Baseline	**ST 2016-2018**	
Dependent Variable : Delta M	2 Ass cl	2 Ass cl	6 Ass cl
Delta RWD	0.518	2.287*	-0.125
	(1.070)	(1.246)	(1.202)
Delta E	0.037	-0.328*	-0.290*
	(0.384)	(0.192)	(0.161)
Delta S	-0.643**	-0.324	-0.722***
	(0.317)	(0.267)	(0.241)
Constant	-0.038	0.699***	0.227
	(0.159)	(0.245)	(0.202)
Observations	85	71	77
R-squared	0.231	0.268	0.209
Mean (Delta M)	-0.078	0.299	0.376
Standard deviation (Delta M)	1.107	0.88	0.97

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

Note: for 2018 the the loss rate which is used to estimate the risk model parameters for 2018 is defined as default flows from any stage into default (GIFX3) over total exposure plus flows from stage 1 into stage 2 (GIF12) over total exposure in stage 1. (We find similar results for different definitions).

- Results still hold
- Negative coefficient increases
- The mean is now positive (i.e. on average losses due to changes in the risk model increased) possibly reflecting increasing provisions due to IFRS 9

Comments

- Default rates are path dependent (i.e. starting values of default rates determine their dynamics over the prediction years) => credit risk model should be dynamic
- NS estimation does not account for dynamics, but in principle bank fixed effects should capture differences in starting values by demeaning for each stress test
- Problem: Bank fixed effects are used to construct the counterfactual credit losses which are used to define the main regression variables, incl. Delta M
- Changes in bank fixed effects might reflect changes to the risk models "other than strategic adjustments"

Comments

- If we assume that sensitivities towards macro economic factors of a certain portfolio should not change over time…
- …strategic behaviour should be detected in adjustment of bank-specific sensitivity parameters (betas), and not fixed effects (alphas)
- We redefine Delta M as the change in predicted losses resulting from adjusting the sensitivities towards the macro factors within the risk model but not the fixed effects

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
	NS macro	**changing 1 macro variable**			**selecting based on R2**	
Delta M	GDP UNE	GDP UNE	GDP UNE	GDP UNE	GDP UNE	GDP UNE
(using Beta)	HICP	CRE	RRE	BOND	RRE BOND	HICP BONDSPREAD
Delta RWD	0.015	0.174	-0.043	0.195	0.249	0.066
	(1.506)	(2.177)	(1.426)	(4.232)	(2.917)	(1.723)
Delta E	0.323	-0.164	-0.155	-0.235	-0.991	-0.381
	(0.335)	(0.394)	(0.373)	(0.784)	(1.155)	(0.488)
Delta S	-0.473*	-0.856	1.049	0.763*	1.842***	-0.486
	(0.257)	(0.728)	(0.679)	(0.410)	(0.453)	(0.504)
Constant	0.135	1.167***	0.286	1.699***	2.453***	0.170
	(0.204)	(0.244)	(0.227)	(0.414)	(0.380)	(0.191)
Observations	85	85	85	85	85	85
R2	0.040	0.031	0.047	0.044	0.132	0.034
R2 1st stage	0.715	0.717	0.715	0.717	0.718	0.719
R2 within 1st stage	0.344	0.347	0.341	0.346	0.349	0.351

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

- Results highly sensitive to choice of macro factors
- "Gaming" effect disappears for other model specifications [(2)-(6)]

Impact of the Stress Test on risk taking

- EU bank Stress Test process:
  - Internal bank risk models are challenged by the regulator in the Quality Assurance process
  - Bank internal ST model results compared to regulator's top-down benchmarks and the results of bank's peers
  - Banks can comply and explain
  - Banks learn about best practice and/or regulator's stance

- Hypothesis: participating in the stress test affects banks' risk management

- Two possible channels:
  1. Risk model assimilation => assimilation of portfolio choice => increased risk taking
  2. Best practice and awareness => higher resilience and decrease of risk

Impact of the Stress Test on risk taking

- Joint work with Carola Műller and Cosimo Pancaro

- Empirical strategy:
  - Dependent variable is bank(-country)-level risk measures (e.g. default rate, risk weight exposures, PD, LGD)
  - Diff-in-Diff regression
    - Treatment group: banks being stress tested (i.e. Significant Institutions)
    - Control group: banks not being stress tested (e.g. Less Significant Institutions, or banks stress tested in 2014 but not in 2016)
    - Continuous treatment variable: # of "QA flags" raised on banks' 1st submission / CET1 depletion between 1st and final submission (QA impact)
    - Post ST dummy: Q4 2016 – Q4 2017

$$y_{i,(c,)t} = Bank_i + Treated_i * Post - shock_{(c,)t} + Bank\ controls_{i,t} + Country_c * time_t + \varepsilon_{i,c,t}$$

Impact of the Stress Test on risk taking

- Preliminary results:
  - ❖ Scrutiny of banks' models in ST is helpful
  - ❖ Banks which are stress-tested on average reduce their risk taking at the country-level following the ST

	(1)	(2)	(3)	(4)	(5)	(6)
	Control group: non-stress-tested banks					
	New defaults (ratio)	New defaults (log-level)	RWE	Defaulted Exp	LGD	PD
Post x Treatment	-0.039***	-1.007***	-0.027***	-0.102***	0.036**	-0.024**
	(0.008)	(0.217)	(0.006)	(0.023)	(0.017)	(0.011)
Observations	13,801	10,358	37,533	21,519	10,545	17,266
R-squared	0.048	0.354	0.292	0.088	0.331	0.219

Standard errors in parentheses are clustered at the bank-level.
*** p<0.01, ** p<0.05, * p<0.1

	(7)	(8)	(9)	(10)	(11)	(12)
	Control group: 2014 stress-tested banks that were not tested in 2016					
	New defaults (ratio)	New defaults (log-level)	RWE	Defaulted Exp	LGD	PD
Post x Treatment	-0.032***	-1.373***	-0.015	-0.105***	0.033	-0.025
	(0.003)	(0.353)	(0.009)	(0.012)	(0.024)	(0.015)
Observations	8,320	6,435	18,432	12,221	7,348	12,141
R-squared	0.097	0.315	0.272	0.242	0.357	0.248

Standard errors in parentheses are clustered at the bank-level.
*** p<0.01, ** p<0.05, * p<0.1

Conclusion

- Great paper!
- Relevant question and careful empirical analysis
- I have sympathy for the findings of strategic behaviour
- …but some doubts about whether current version allows for drawing strong conclusions