BIS 1930 2020 Promoting monetary and financial stability

Uncertain credit-loss phases and bank capital

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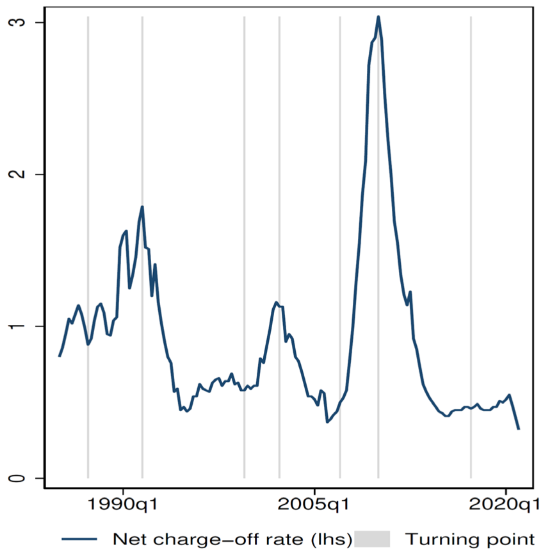
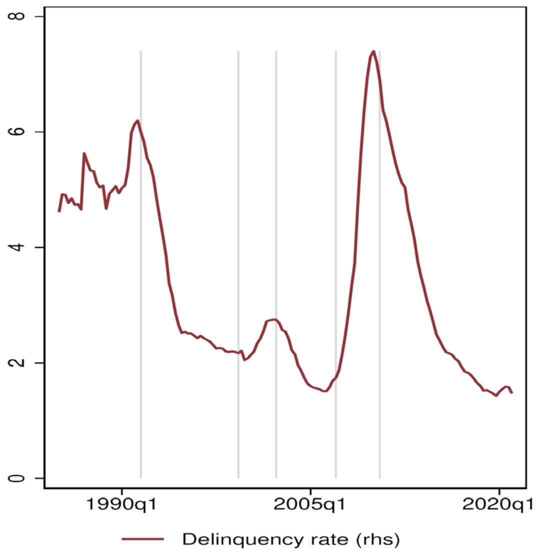
Motivation

- Abrupt turning points in credit losses are tough to anticipate.
  - Scepticism: *Covas and Nelson* (2018), *Abad and Suárez* (2017), *Chae et al.* (2018), *Krüger et al.* (2018), *Goncharenko and Rauf* (2020), and *Loudis and Ranish* (2019)
  - Some progress: *Harris et al.* (2018), *Lu and Nikolaev* (2022) and *Juselius and Tarashev* (2020)





- When do costly prudential safeguards against uncertainty have largest benefits?

The paper in a nutshell

- Model uncertain turning points / phases – extension of the ASRF model
- Decoupling of EL and UL (a high percentile minus EL)
- Ask: how does exposure to within-phase macro risk (ρ) affect …
  - … the failure probability of a bank that ignores phase uncertainty?
  - … the benefit of improving forecasts of turning points?
- Findings:
  - ignoring uncertainty bites more if ρ is *smaller*;
  - same for the impact of improving phase forecasts.
  - unconditional loss distribution helps compare ρ across portfolios

Roadmap

- Stylised risk setup
- From phase uncertainty to EL-UL decoupling
- Shortfall of loss absorbing resources (LAR)
  - due to ignoring uncertainty
  - due to uncertainty
- Method for comparing ρ across portfolios
- Takeaways

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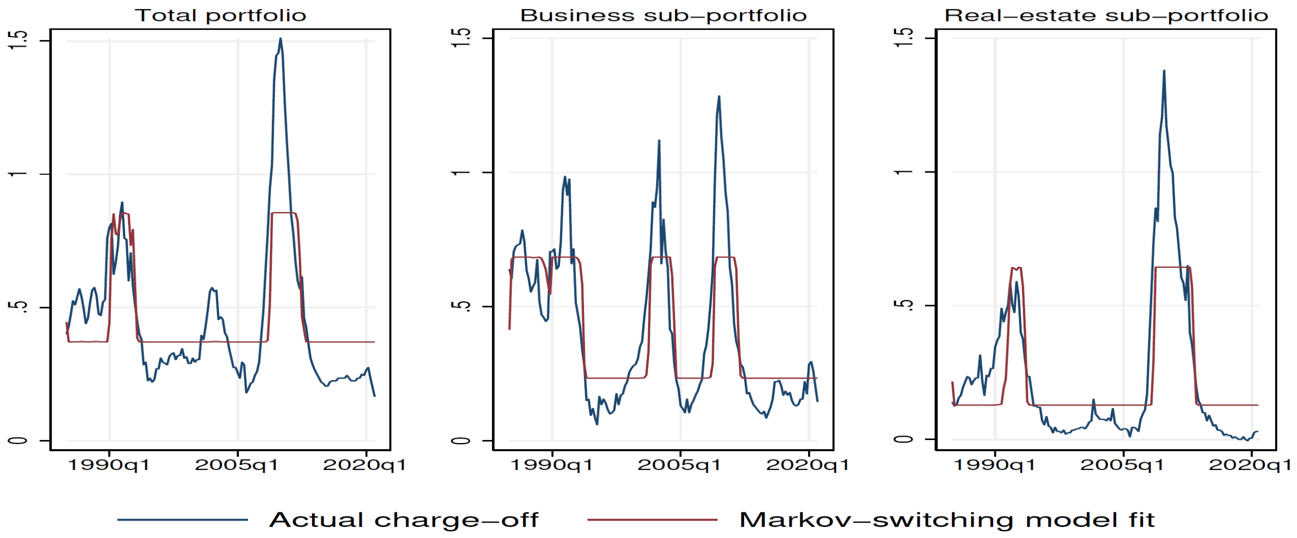
Setup: uncertain phase switches and 3 banks

Extending the regulatory ASRF model

- Asymptotic single risk factor

$$Loss\left(G_t, PD_t; \rho_t\right) = \Phi\left(\frac{\Phi^{-1}\left(PD_t\right) - \rho_t G_t}{\sqrt{1-\rho_t^2}}\right)$$

- Uncertain phase ≡ uncertain PD
  2-state Markov process captures phase switches in business and real-estate loan loss rates (US banks)



- Parameter restrictions: $(0.1\% =)\, \alpha < PD_t^l < PD_t^h < 1 - \pi_t^l < 50\%$

Setting loss absorbing resources (LAR)

- LAR ensure that the one-year failure probability is α.
- LAR are equal to expected losses (EL) + unexpected losses (UL).

- Informed bank's LAR:

$$\Lambda^I\left(PD_t, \rho_t; \alpha\right) = \Phi\left(\frac{\Phi^{-1}\left(PD_t\right) - \rho_t \Phi^{-1}\left(\alpha\right)}{\sqrt{1-\rho_t^2}}\right)$$

$$EL_t^I = PD_t$$

$$UL_t^I = \Lambda^I\left(PD_t, \rho_t; \alpha\right) - PD_t$$

Uninformed bank's LAR

- This bank faces uncertainty about the PD and knows it.
- Its LAR is an implicit solution of:

$$\pi_t^x \Phi\left(\frac{\Phi^{-1}\left(PD_t^x\right) - \sqrt{1-\rho_t^2}\Phi^{-1}\left(\Lambda\right)}{\rho_t}\right) + \left(1-\pi_t^x\right)\Phi\left(\frac{\Phi^{-1}\left(PD_t^{\tilde{x}}\right) - \sqrt{1-\rho_t^2}\Phi^{-1}\left(\Lambda\right)}{\rho_t}\right) = \alpha$$

where $x = \{l, h\}$ and $\tilde{x} = \{h, l\}$

- LAR is broken down into:

$$EL_t^U = \pi_t^x PD_t^x + \left(1-\pi_t^x\right) PD_t^{\tilde{x}}$$

$$UL_t^U = \Lambda_t^U - EL_t^U$$

Naive bank's LAR

- Same information set as the uninformed bank, but acts as if informed
- Its LAR is equal to:

$$\Lambda_t^N = \Phi\left(\frac{\Phi^{-1}\left(PD_t^N\right) - \rho_t \Phi^{-1}\left(\alpha\right)}{\sqrt{1-\rho_t^2}}\right)$$

- … where:

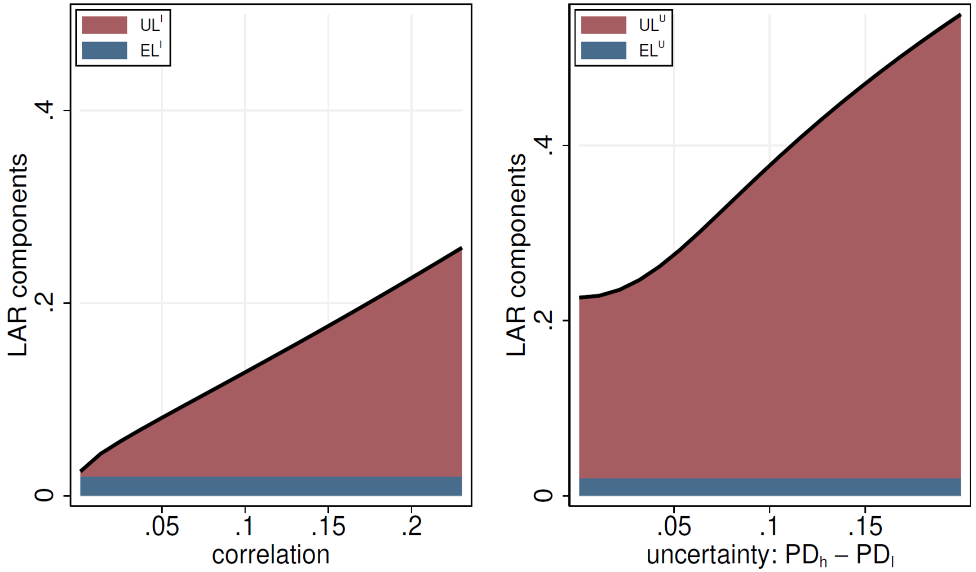
$$EL_t^N \quad = \quad PD_t^N \quad = \pi_t^x PD_t^x + \left(1-\pi_t^x\right) PD_t^{\tilde{x}}$$

$$UL_t^N = \Lambda_t^N - EL_t^N$$

Phase uncertainty → decoupling of EL and UL

Decoupling: two sources, one outcome

- When the portfolio is less diversified (left-hand panel)
- When there is uncertainty about the loss phase (right-hand panel)

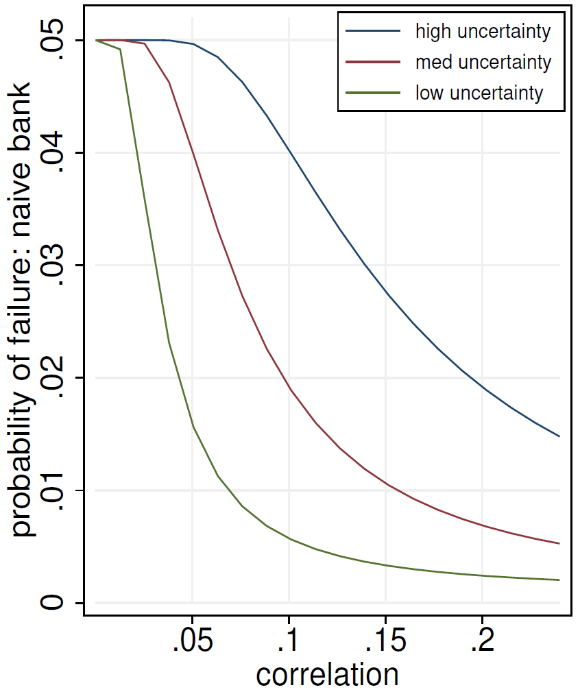


Proposition 1 ***Effect of uncertainty on UL.*** *Suppose that each of the following two switch-to-uncertainty scenarios maintains* $EL^U_t = EL^U_{t-1}$*: (i)* $\pi^l_{t-1} = \pi^l_t$ *and* $PD^l_t < PD^l_{t-1} = PD^h_{t-1} < PD^h_t$ *or (ii)* $\pi^l_{t-1} = 1 > \pi^l_t$*,* $PD^l_t < PD^l_{t-1}$ *and* $PD^h_t = PD^h_{t-1}$*. Under either scenario,* $UL^U_{t-1} < UL^U_t$*.*

LAR shortfalls

LAR shortfall due to ignoring uncertainty

- Naive vs uninformed bank
- From the perspective of the uninformed bank, the naïve bank has a LAR shortfall (Proposition 1)
- Greater portfolio diversification (smaller correlation, ρ) → probability of naive bank's failure (from the uninformed bank's perspective) converges to the probability of a switch to the high-loss phase



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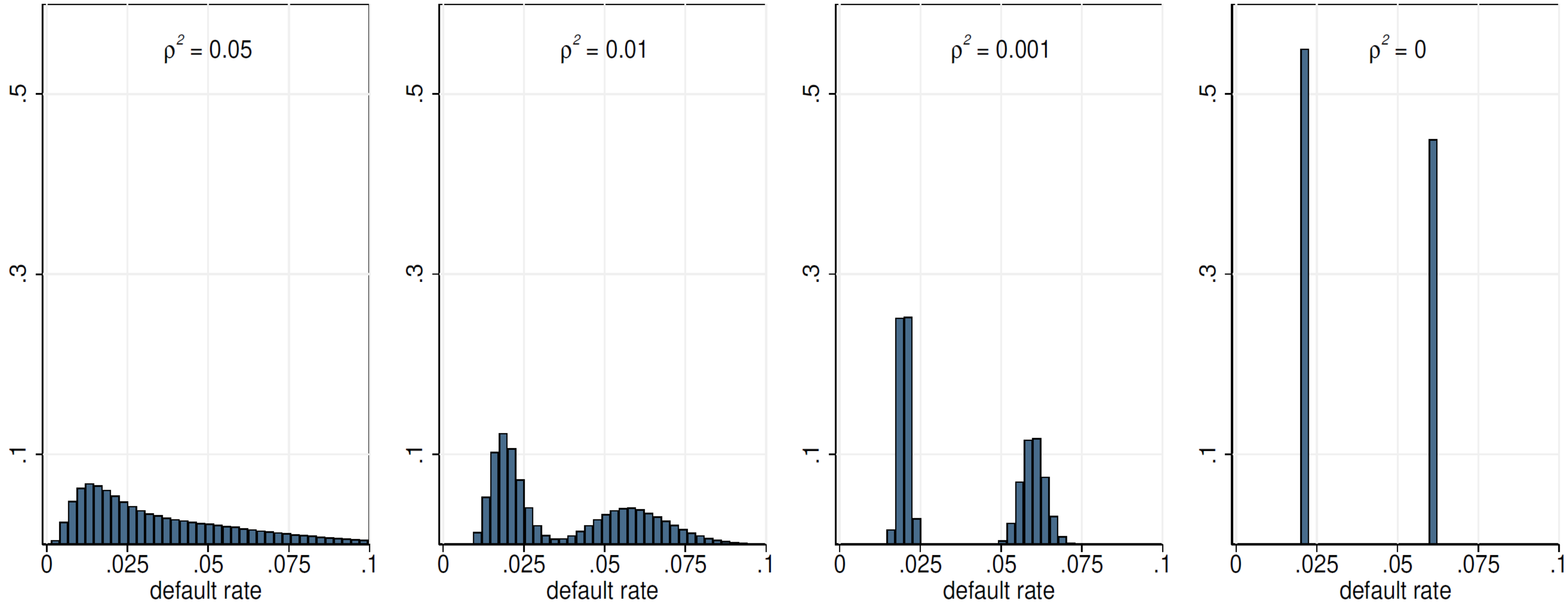

LAR shortfall due to uncertainty

- Uninformed vs informed bank
- Greater portfolio diversification (smaller ρ) → worse to miss a phase

Proposition 3 ***Failure probability and exposure to default clustering.*** *Suppose that the phase sequence delivers PD^l_{t-1} and PD^h_t. When the uninformed bank sets its loss-absorbing resources according to (5), its probability of failure decreases with ρ.*

Comparing diversification across portfolios

Comparison methodology

- Bi-modality of unconditional loss distribution: stronger for a lower p
- Battery of tests reject uni-modality for business but not for real-estate loans

	Total portfolio		Business sub-portfolio		Real-estate sub-portfolio	
test	stat	p	stat	p	stat	p
CH	0.05	0.29	0.07**	0.01	0.04	0.63
HY	0.36*	0.08	0.26**	0.03	0.25	0.37
ACR	0.06*	0.09	0.06*	0.05	0.04	0.40

- Monte Carlo simulations, using Markov-switching parameter estimates, indicate that the conclusion is not due to small sample.
- Upshot: business loan portfolio more diversified

Takeaways

Takeaways

- In forecasting credit losses, essential to target several aspects of the distribution
  - Reason: uncertainty about abrupt turning points decouples EL and UL
  - Thus: multiple forecast variables needed

- Accept that predictions of turning points will never be perfect

- Prudential safeguards against the implications of imperfect forecasts
  - Costly
  - Benefits higher when portfolio more diversified (less exposed to macro risk within a phase).