Assessing the cyclical implications of IFRS9: A recursive model

Jorge Abad
CEMFI

Javier Suarez
CEMFI

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Introduction

- IFRS 9 is the new accounting standard for classification & measurement of financial assets, coming into force on 1st January 2018
- Key innovation: shift from incurred loss (IL) approach to expected loss (EL) approach to loan loss provisioning (impairment allowances)

  [Parallel to Current Expected Credit Loss (CECL) of US GAAP, starting in 2021]
- Innovation follows criticism that current standards provisioned "too little, too late," delaying recongnition of trouble & favoring forbearance
- Calls for recognizing credit losses based on unbiased point-in-time EL estimates over horizons of one year or more
- Some of its features suggest high potential reactivity to news on the evolution of the economy

Reseach questions

- Can these features of IFRS 9 contribute to the cyclicality of banks' P/L, CET1 and, through them, credit supply? If so, is it worrying? Would it call for remedial policy action?

- Concern: exacerbating credit contractions at beginning of crises

  $\uparrow$ Provisions $\Rightarrow$ $\downarrow$ P/L $\Rightarrow$ $\downarrow$ CET1 $\Rightarrow$ $\downarrow$ RWAs $\Rightarrow$ Real outcomes

- Key links:

  1. Without offsetting regulatory filters or sufficient extra buffers,

     Accounting capital $\Rightarrow$ $\downarrow$ CET1 $\Rightarrow$ $\downarrow$ Capacity/willingness to support RWAs

  2. If economy wide & w/o fully offsetting demand effects,

     $\downarrow$ Aggregate bank credit supply $\Rightarrow$ Negative feedback effects ($\uparrow$PDs, $\uparrow$LGDs)

- We quantify the most mechanical links on a ceteris paribus basis

IFRS 9 particulars

- IFRS 9 measures expected losses using a mixed-horizon approach:
  - Stage 1 (non-deteriorated) $\rightarrow$ 1y EL (new!)
  - Stage 2 (deteriorated) $\rightarrow$ lifetime EL (new!)
  - Stage 3 (impaired) $\rightarrow$ lifetime EL (same as IAS 39)
- Competing approaches (for performing loans) are simpler:
  - Regulatory expected losses for IRB banks: 1y EL
  - CECL of US GAAP: lifetime EL
- Non-trivial modeling difficulties (for reporting entities & us):
  - Staging based on relative criterion, lifetime projections, keeping track of the contractual loan rate
    Here: recursive ratings-migration model with random maturities
  - Lack of long series of data on bank loan rating migrations
    Here: calibration partly based on global bond migration data

Preview of the results

- Compact, flexible & institutionally-rich model of a complex reality
- Calibration for a portfolio of European corporate loans
- Baseline results (for IRB bank, with aggregate risk):
  - More forward looking impairment measures imply larger on-impact effects of negative shocks (upfront recognition)
  - Under IFRS 9, a typical recession eats up 1/3 of fully loaded CCB (twice as much as under IL)
  - Banks' prob. of needing a recapitalization is several pp higher
- Extensions:
  - Similar results for SA bank
  - Procyclical effects exacerbated if contractions are longer or deeper & mitigated if their arrival is anticipated in advance

Roadmap of this presentation

1. Sketch of the model without aggregate risk
2. Formulas for impairment allowances
3. Review of the IRB bank baseline analysis
4. Discussion of the implications

Sketch of the model without aggregate risk

- Bank with loans with 3 ratings (j =1: standard, 2: substandard, 3: non-performing) and defaults & rating shifts as in typical migration model

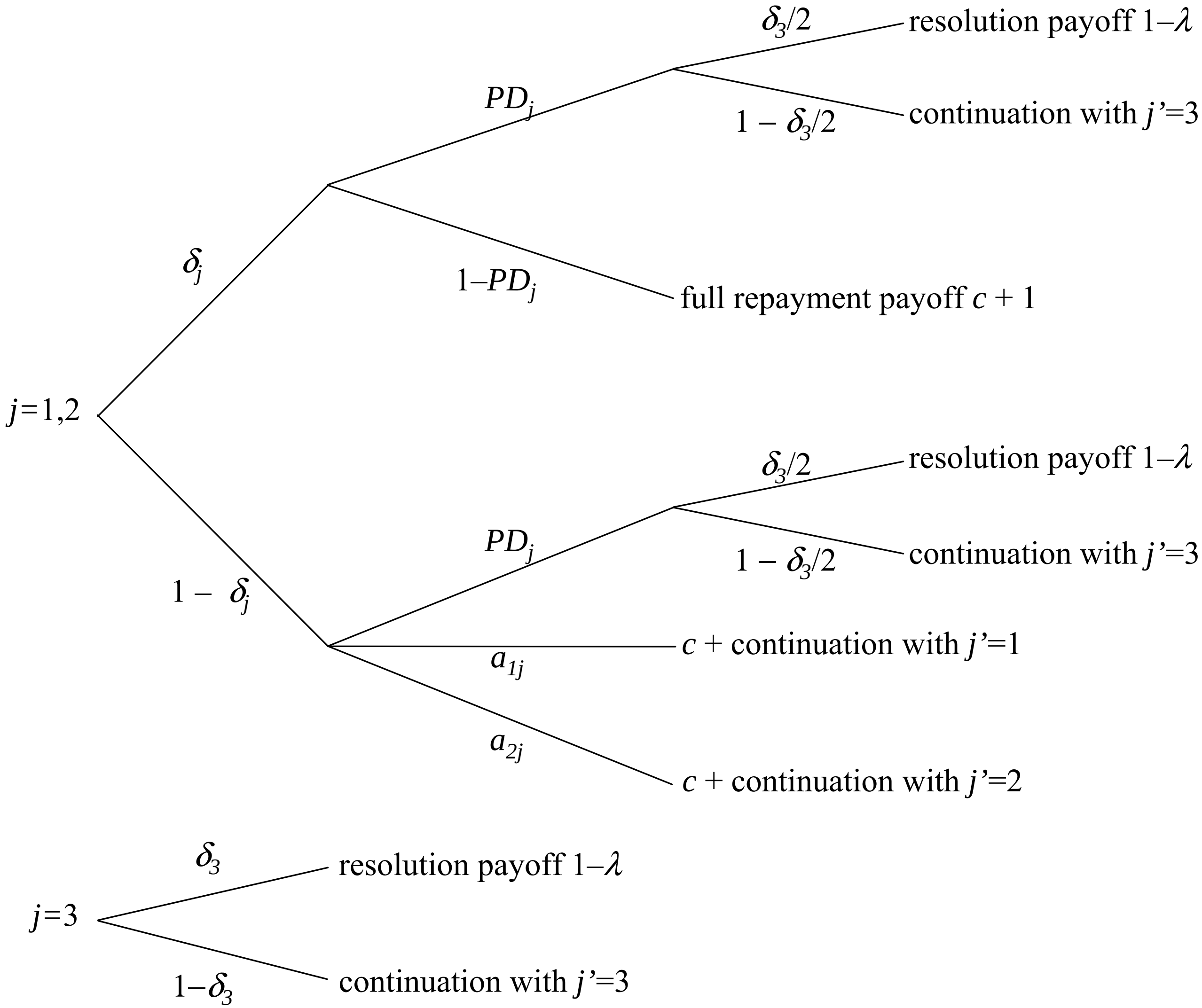
- Loans with fixed principal of one, interest rate c & random maturity/resolution at rate δ_j

- New loans originated with j=1 (e_{1t}>0), priced competitively under risk-neutrality

- Defaulted loans pay $1 - \lambda$ when resolved

- Conventions:
  - One period = one year (period t *ends* at date t)
  - Being j=2 means "significant increase in credit risk"

F1. Possible transitions of a loan rated j



Formulas for impairment allowances

- *Incurred losses* (∼IAS 39)

$$IL_t = \lambda x_{3t}$$

- *Discounted one-year ELs* (∼IRB approach)

$$EL_t^{1Y} = \lambda \left[\beta(PD_1 x_{1t} + PD_2 x_{2t}) + x_{3t}\right] = \lambda \left(\beta b x_t + x_{3t}\right),$$

where $\beta = 1/(1+c)$ & $b = (PD_1, PD_2, 0)$

- *Discounted lifetime ELs* (∼CECLs under US GAAP update)

$$\begin{aligned} EL_t^{LT} &= \lambda b(\beta x_t + \beta^2 M x_t + \beta^3 M^2 x_t + \beta^4 M^3 x_t + \ldots) + \lambda x_{3t} \\ &= \lambda \left(\beta b B x_t + x_{3t}\right), \text{ where } B = (I - \beta M)^{-1} \end{aligned}$$

- *IFRS 9*

Applies EL_t^{1Y} to x_{1t}, EL_t^{LT} to x_{2t} & same as all to x_{3t}, so

$$IL_t \leq EL_t^{1Y} \leq EL_t^{IFRS9} \leq EL_t^{LT}$$

Review of the IRB bank baseline analysis

- Aggregate risk represented as binary state variable which affects key migration and default rates:
  - Expansion state (s=1)
  - Contraction state (s=2)
- Calibration for European portfolio of corporate loans

  (with cyclicality reflecting evidence on the impact of US business cycles on corporate rating migrations & default)
- Tables with conditional & unconditional means & std. dev.
- Figures showing response to arrival of s=2 after long in s=1 (in % of avg exposures)

  [Tables & figures below numbered as in the paper]

T3. Calibration with aggregate risk

Parameters without variation with s'		
Banks' discount rate	r	1.8%
Persistence of the expansion state (s=1) (6.75y)	p_{11}	0.852
Persistence of the contraction state (s=2) (2y)	p_{22}	0.5

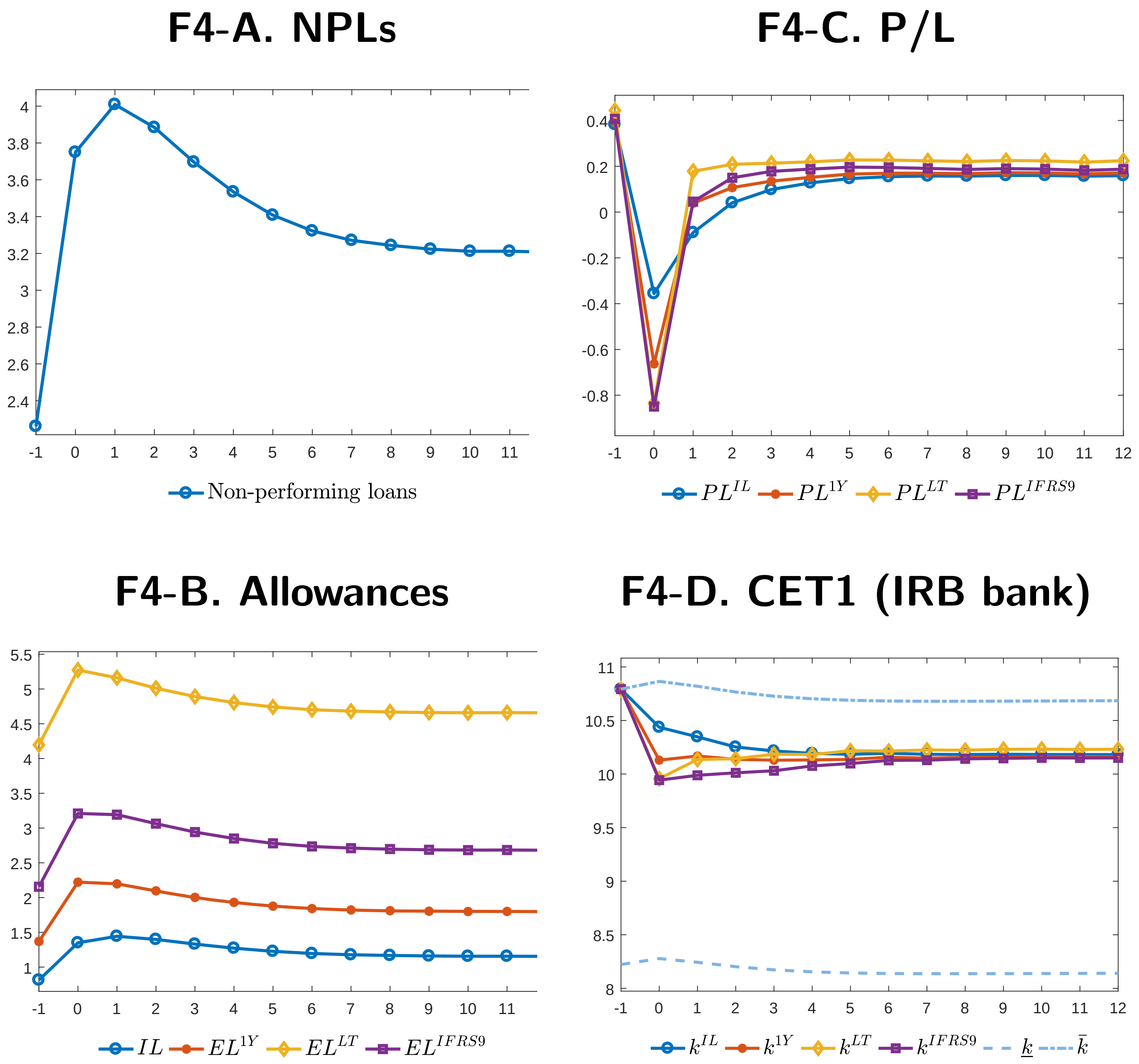
Parameters that may possibly vary with s'		If $s' = 1$	If $s' = 2$
Yearly probability of migration $1 \to 2$ if not maturing	a_{21}	6.16%	*11.44%*
Yearly probability of migration $2 \to 1$ if not maturing	a_{12}	6.82%	*4.47%*
Yearly probability of default if rated j=1	PD_1	0.54%	*1.91%*
Yearly probability of default if rated j=2	PD_2	6.05%	*11.50%*
Loss given default conditional on s'	$\lambda(s')$	36%	36%
Average time to maturity if rated j=1	$1/\delta_1$	5 years	5 years
Average time to maturity if rated j=2	$1/\delta_2$	5 years	5 years
Yearly probability of resolution of NPLs	δ_3	44.6%	44.6%
Newly originated loans per period (all rated j=1)	e_1	1	1

T4. Endogenous variables (% of avg. exposures)

	Mean	St. Dev.	Conditional means: Expansion	Conditional means: Contraction
Yearly contractual loan rate, c (%)			2.52	2.62
Share of standard loans (%)	81.35	3.48	82.68	76.85
Share of sub-standard loans (%)	15.47	1.90	14.59	18.42
Share of non-performing loans (%)	3.19	1.05	2.73	4.73
Realized default rate (% of performing loans)	1.89	0.90	1.36	3.43
Impairment allowances:				
Incurred losses	1.15	0.38	0.98	1.70
One-year expected losses	*1.79*	*0.50*	*1.55*	*2.60*
Lifetime expected losses	4.65	0.59	4.36	5.63
IFRS 9 allowances	*2.67*	*0.62*	*2.38*	*3.66*
Stage 1 allowances	0.24	0.05	0.22	0.33
Stage 2 allowances	1.28	0.21	1.18	1.63
Stage 3 allowances	1.15	0.38	0.98	1.70
IRB min. capital requirement (CR)	8.15	0.07	8.14	8.19
IRB min. capital requirement (CR) + CCB	10.69	0.09	10.68	10.74

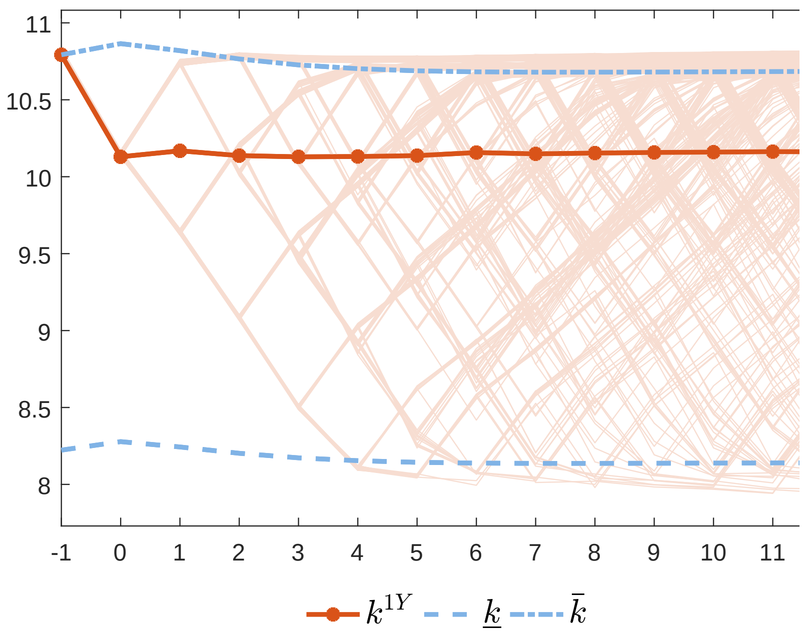
T5. P/L, CET1, dividends & recaps (% of avg exposures)

		IL	EL^{1Y}	EL^{LT}	EL^{IFRS9}
P/L	Unconditional mean	0.16	0.17	0.23	0.19
	Conditional mean, expansions	0.35	0.41	0.49	**0.46**
	Conditional mean, contractions	-0.46	-0.61	-0.66	**-0.71**
	Standard deviation	0.34	0.43	0.51	0.50
CET1	Unconditional mean	10.20	10.19	10.25	10.17
	Conditional mean, expansions	10.38	10.43	10.53	**10.46**
	Conditional mean, contractions	9.55	9.32	9.28	**9.16**
	Standard deviation	0.76	0.76	0.71	0.77
Prob(div_t>0)	Unconditional	49.53	51.79	56.38	**53.93**
	Conditional, expansions	64.20	67.11	73.07	69.89
Div, if >0	Conditional mean, expansions	0.35	0.36	0.42	0.38
Prob(recap_t>0)	Unconditional	2.34	2.86	2.34	**3.41**
	Conditional, contractions	10.26	12.50	10.22	**14.94**
Recap, if >0	Conditional mean , contractions	0.42	0.40	0.34	0.38

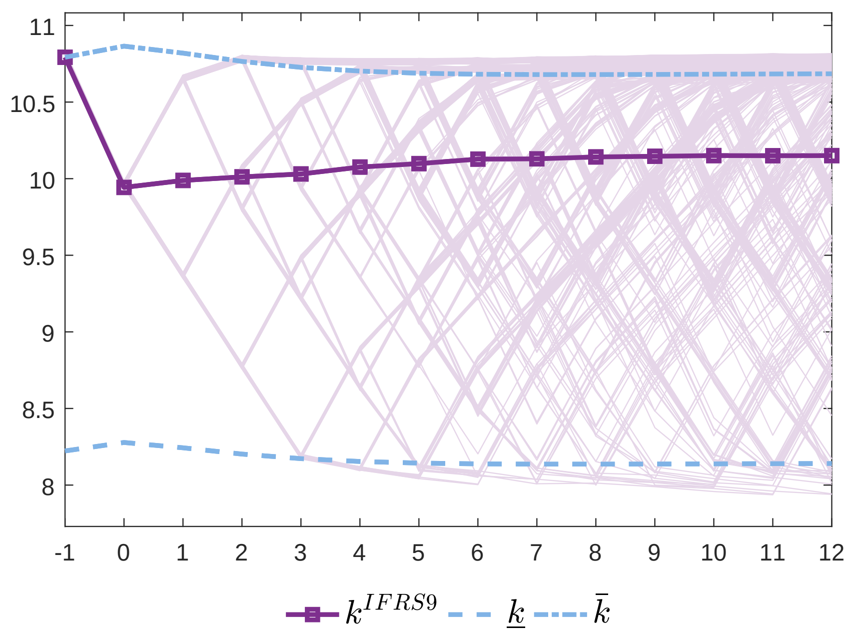

F4-A. NPLs
Non-performing loans
F4-C. P/L
PL^{IL} PL^{1Y} PL^{LT} PL^{IFRS9}
F4-B. Allowances
IL EL^{1Y} EL^{LT} EL^{IFRS9}
F4-D. CET1 (IRB bank)
k^{IL} k^{1Y} k^{LT} k^{IFRS9} $\underline{k}$ $\bar{k}$

F5. 500 simulated trajectories (IRB bank)

A. CET1 under EL^{1Y}



B. CET1 under EL^{IFRS9}



Response to the arrival of a contraction after long a long expansion period
(in % of average exposures)

Wrapping up

- Main findings for the baseline case (IRB banks):
  - Significant day-one effects
  - More forward looking provisions imply larger on-impact effects of negative shocks (upfront recognition)
  - A typical recession eats up 1/3 of fully loaded CCB (twice as much as under IL)
  - Banks' prob. of needing a recapitalization is several pp higher
- Extensions further show:
  - Similar impact on SA banks
  - Higher impact when crises are longer / more severe
  - Lower impact if crises are foreseen further in advance

Implications: Difficulty of the assessment

Assessment involves difficulties similar to those in literature on real effects of capital requirements

[Kashyap-Stein'04, Repullo-Suarez'13 + growing empirical literature]

- Final effects (on credit supply / fire sales) highly depend on:
  - banks' ex ante precautions (voluntary buffers?)
  - banks' capacity/willingness to reduce buffers / raise equity
  - existence or not of offsetting loan demand conditions
  - existence or not of substitutes to the constrained banks

  [Evidence: capital shocks impact on credit, esp. in bad times]

- Yet, potential negative welfare effects of earlier or more abrupt credit contraction may be counterbalanced by micro&macro-prudential advantages of an earlier & wider recognition of loan losses

Implications: Policy considerations

- Is a loss of about 1pp of capital upon the arrival of an average contraction worrying?
  - Manageable if CCB is fully loaded CCB
  - Possibly enough to warrant macroprudential attention

- Range of policy options

0. Focusing on *implementation* & being confident on banks' own precautions
1. Relying on existing *regulatory buffers*: CCB & CCyB (may call for a revision of guidance regarding the CCyB)
2. Relying on *stress testing* (yet ST is more focused on solvency that on preservation of credit function)
3. Keeping or updating adjustments of *regulatory capital* based on a regulatory definition of ELs

Concluding remarks

- IFRS 9 introduces a challenging shift of paradigm in the accounting of credit loss provisions
- Banking scholars should not ignore its implications (talking about provisions is akin to talking about capital)
- Results from recursive model developed to assess the cyclical implications of loan loss provisions under IFRS 9:
  - IFRS 9 will imply more sudden rises in provisions when the economy switches to contraction
  - P/L and (w/o filtering) CET1 will decline more severely at start of contractions
  - On-impact loss of CET1 is equivalent to 1/3 of fully-loaded CCB
- Not a killer but large enough to warrant macroprudential attention

Complementary materials

Portfolio dynamics

- Difference equation:

$$x_t = Mx_{t-1} + e_t \tag{1}$$

where

$$M = \begin{pmatrix} (1-\delta_1)a_{11} & (1-\delta_2)a_{12} & 0 \\ (1-\delta_1)a_{21} & (1-\delta_2)a_{22} & 0 \\ (1-\delta_3/2)PD_1 & (1-\delta_3/2)PD_2 & (1-\delta_3) \end{pmatrix}, \tag{2}$$

$$x_t = \begin{pmatrix} x_{1t} \\ x_{2t} \\ x_{3t} \end{pmatrix}, \quad \text{and} \quad e_t = \begin{pmatrix} e_{1t} \\ 0 \\ 0 \end{pmatrix} \tag{3}$$

- Steady state portfolio:

$$x = Mx + e \Leftrightarrow (I - M)x = e \Rightarrow x^* = (I - M)^{-1}e \tag{4}$$

Loan pricing

- Loan rate c makes the NPV from originating the loan equal to zero
- Details:

1. Let v_j denote the ex-coupon value of loans rated j. Then:

$$v_j = \mu[(1-PD_j)c + (1-PD_j)\delta_j + PD_j \frac{\delta_3}{2}(1-\lambda) + m_{1j}v_1 + m_{2j}v_2 + m_{3j}v_3]$$

for $j = 1, 2$, and

$$v_3 = \mu\left[\delta_3(1-\lambda) + (1-\delta_3)v_3\right]$$

(system of Bellman-type equations, with $\mu = 1/(1+r)$)

2. Find c such that $v_1 = 1$ [Adding a mark-up would be trivial]

Implications for P/L and CET1

- Assume simple balance sheet given by

$$
\begin{array}{c|c}
\hline
x_{1t} & d_t \\
x_{2t} & a_t \\
x_{3t} & k_t
\end{array}
$$

with risless debt d_t (paying r), provisions a_t & CET1

$$k_t = k_{t-1} + PL_t - \mathrm{div}_t + \text{recap}_t$$

- P/L can be written as

$$PL_t = \{\Sigma_{j=1,2}[c(1–PD_j) - (\delta_3/2)PD_j\lambda]x_{jt-1} - \delta_3\lambda x_{3t-1}\}$$

$$-r(\Sigma_{j=1,2,3}x_{jt-1} - a_{t-1} - k_{t-1}) - \Delta a_t,$$

- Dynamics of k_t: the bank manages its CET1 using a sS-rule entirely determined by Basel III capital regulation
  - Recapitalizing to avoid violating minimum capital requirement

$$\text{IRB: } \underline{k}_t = \Sigma_{j=1,2}\gamma_j x_{jt} \quad \text{SA: } \underline{k}_t = 0.08\left(\Sigma_{j=1,2,3} x_{jt} - a_t\right)$$

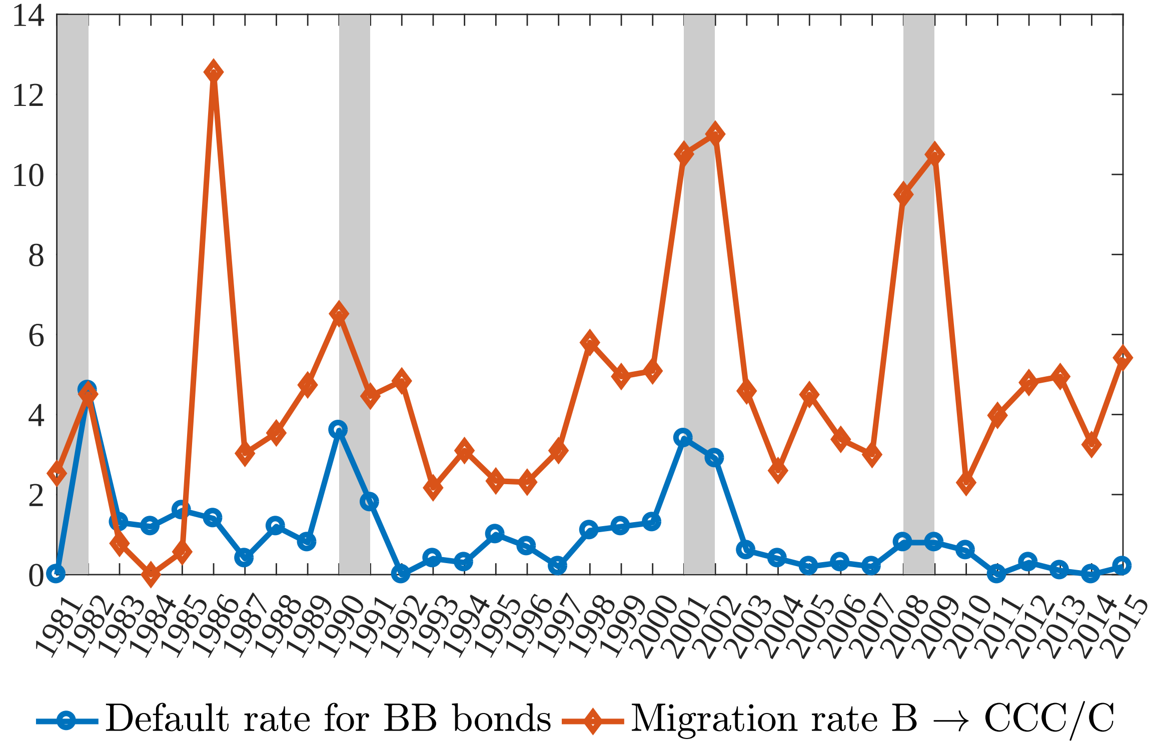
  - Paying dividends once the CCB is fully loaded

$$\overline{k}_t = \left(1 + \frac{0.025}{0.08}\right)\underline{k}_t = 1.3125\underline{k}_t \quad \text{(buffer=2.5\% of RWAs)}$$

$$\Rightarrow \mathrm{div}_t = \mathsf{max}[(k_{t-1} + PL_t) - \overline{k}_t, 0]$$

$$\mathsf{recap}_t = \mathsf{max}[\underline{k}_t - (k_{t-1} + PL_t), 0]$$

FA1. Sensitivity of default & migrations to aggregate states



Selected yearly S&P default & downgrading rates. Grey bars identify 2-year periods following the start of NBER recessions