
Prudential Liquidity Rules beyond Banking

Evidence from Refundable Deposit Funding for Residential Care Providers

Lingfeng Lyu Michael Sherris Francesco Ungolo Zhiqian Ye

School of Risk & Actuarial Studies, Business School, UNSW Sydney
The UNSW Centre for Population Ageing Research (CEPAR)

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Australian Aged Care: Institutional Background

Major sector reform. The *Aged Care Act 2024* commenced in November 2025 following the Royal Commission: a rights-based framework and a stronger prudential regime for providers.

Two accommodation segments

- **Residential aged care (RACF):** high-care residents; funded by government subsidies, resident fees and refundable accommodation deposits (RADs).
- **Retirement villages (RV):** independent living; funded by refundable entrance contributions.

Why prudential regulation matters

- About 225,000 RACF places and 700 approved providers.
- RADs (approx. A\$42 billion) operate as interest-free loans from residents to providers.
- The government guarantees RAD balances if a provider fails.

Policy concern

How large should liquidity buffers be for deposit-funded aged-care providers, without limiting capital investment?

Motivation: Why Should We Care?

Aged-care providers look surprisingly like deposit-funded financial institutions.

- Residents provide refundable accommodation deposits; providers invest in illiquid real assets.
- Mismatch between demandable liabilities and illiquid assets.
- Refunds are triggered by demographic events (mortality, turnover), not depositor runs: demographic shocks become liquidity shocks.

International context. Several ageing economies finance care infrastructure with refundable resident contributions:

- Australia: Refundable Accommodation Deposits (RADs).
- United States: refundable entrance fees in Continuing Care Retirement Communities (CCRCs).
- Japan: refundable entrance-fee arrangements in for-profit elderly care.

This creates a familiar prudential problem:

Illiquid assets $\longleftrightarrow$ Refundable liabilities

Prudential Regulation Landscape

Sector	Framework	Prudential metric	Stochastic
<i>Australian aged care</i>	ACQSC guidance	dMLA: fixed weights on past outflows and refundable balances	No
Banks (APRA)	APS 210	LCR, NSFR, supervisory stress testing	Hybrid
Health insurers (APRA)	HPS 110, HPS 231	Prescribed Capital Amount, scenario analysis	Yes
Superannuation (APRA)	SPS 530, SPG 530	Multi-horizon liquidity stress testing	Yes
US aged care (CCRCs)	State licensure	Operating reserves tied to operating costs	No
Japan aged care	Escrow and guarantees	Deposit-level safeguards; no prescribed metric	No

Research question

Aged-care liquidity risk stems from **stochastic demographic shocks**, yet the rules remain **deterministic and accounting-based**. Should regulation rest on such a rule, or on a risk-sensitive framework expressed as a transparent, provider-specific formula?

Research Gap and Contribution

Related literature. Bank liquidity and stress testing ([Diamond and Dybvig, 1983](#); [Goldstein and Pauzner, 2005](#); [Acharya et al., 2011](#); [Cornett et al., 2011](#); [Kara and Ozsoy, 2020](#); [Acosta-Smith et al., 2026](#)); risk-based insurance regulation ([Cummings and Durrani, 2016](#)); aged care and retirement housing finance ([Zarem, 2010](#); [Sakurai, 2017](#); [Aveline-Dubach, 2022](#)).

What is missing?

1. No quantitative framework links **demographic risk** to liquidity stress in deposit-funded aged-care providers.
2. Aged-care rules remain **deterministic and accounting-based**, while banking, insurance and pension regulation rely on stress testing and scenario analysis.

This paper

- Develops a tractable stochastic resident-flow and balance-sheet model capturing demographic and macroeconomic shocks to refundable liabilities.
- Maps the outcomes of a multidimensional stress test into a transparent, rule-based liquidity formula: the risk-sensitive MLA (rMLA).
- Shows that the rMLA improves the capital–liquidity tradeoff and reverses the standard banking prescription: tighter requirements for small providers, looser for large ones.

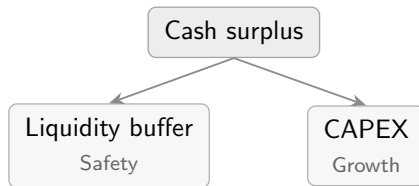
The dMLA and the Capital–Liquidity Tradeoff

Default MLA (dMLA)

$$\text{dMLA} = 0.35 \text{ Outflows} + 0.10 L_{RA} + 0.02 L_{RV}$$

- Outflows: prior-quarter core cash outflows (operating costs and interest on borrowings).
- L_{RA} , L_{RV} : refundable accommodation and retirement-village liabilities.
- Backward-looking; refundable liabilities are the only balance-sheet items used; coefficients are identical across providers; compliance is assessed quarterly.

Capital–Liquidity Tradeoff



A share κ of surplus liquidity goes to CAPEX; shortfalls are met by emergency short-term borrowing.

Research question

Does the dMLA strike the right balance between liquidity protection and capital formation?

Provider Archetypes

Why use archetypes?

- Providers differ substantially in funding structure, scale, leverage and liquidity holdings; a single provider cannot represent the cross-sectional variation relevant for prudential regulation.
- We construct six representative archetypes calibrated from 2024 financial statements, analogous to the stress-testing exercises used in banking and insurance.

Archetype	Defining characteristic
RA Heavy	Highest share of refundable accommodation (RA) liabilities
DA Heavy	Lowest share of RA liabilities; greater use of daily accommodation payments
Large CC	Large corporate chain; largest RACF resident base, high internal receivables
RV Heavy	Largest retirement-village segment
Small Regional	Smallest RACF scale; relatively high share of liquid assets
Expn Heavy	Expansion-oriented; high long-term debt, large capital base, RV exposure

From Resident Dynamics to Liquidity Risk

Resident census process

- Facility capacity V ; admissions arrive as a Poisson process with intensity λ ; each resident departs at rate ν .
- Occupancy $N(t)$ follows a capacity-constrained continuous-time Markov chain (an M/M/V/V queue).

$$0 \leftrightarrow 1 \leftrightarrow \dots \leftrightarrow n \leftrightarrow \dots \leftrightarrow V$$

A systemic shock at $t = 0$ shifts (λ_0, ν_0) to (λ, ν) with $\lambda < \lambda_0$ and $\nu > \nu_0$.

Why does this matter?

- New residents generate refundable accommodation inflows.
- Departures trigger refund payments.
- The refund amount depends on the resident's length of stay.
- Demographic shocks therefore translate directly into liquidity shocks.

Resident flows $\rightarrow$ Cash flows $\rightarrow$ Liquidity risk

Simulation Framework and Stress Testing

Provider balance sheet

$$X = X_l + X_c + X_r, \quad L = L_{RA} + L_{RV} + L_s + L_l$$

- Liquid assets X_l , capital assets X_c , trade receivables X_r .
- Refundable liabilities L_{RA} , L_{RV} ; short- and long-term debt L_s , L_l .
- Inflation and interest rates from a VAR(2); all quantities in real terms.

Liquidity management rule

- Surplus over the requirement $\Rightarrow$ CAPEX at rate κ (quarterly).
- Shortfall $\Rightarrow$ emergency short-term borrowing.

Design and outputs

- Monthly steps over one year; 10^6 paths per provider.
- Probability of a dMLA breach (checked quarterly) and of a liquidity crunch, $X_l < 0$ (checked monthly); capital–liquidity frontier.

Shock scenario (late-pandemic 2021–22)

- Inflation +1.3 p.p. (about three standard deviations).
- $\lambda = 0.85\lambda_0$, $\nu = 1.15\nu_0$: occupancy falls by 7.7%.
- Lower yields on liquid placements; tighter short-term funding.

Limitations of the dMLA Under Stress: Breach Patterns

All six archetypes face identical shocks, yet dMLA breach rates differ substantially.

Large providers reliant on the RA channel (RA Heavy, Large CC)

- Under stress, RA Heavy breaches with over 80% probability and Large CC with certainty, irrespective of κ ; Large CC breaches even at baseline once $\kappa > 0.5$.
- Breaches concentrate in the first two quarters: near-term financing pressure from amortising emergency borrowing, not persistent weakness.
- Driven by the 10% weight on RA liabilities and the backward-looking treatment of financing outflows.

Small, conservative provider (Small Regional)

- Zero breach probability under stress for $\kappa \leq 0.7$; below 20% even at $\kappa = 1$.
- Compliance reflects a large *ex ante* cash holding rather than the binding force of the rule.

Archetypes with an RV segment are much less sensitive to κ : the RV segment carries only a 2% weight and is more stable under stress.

dMLA Breach versus Liquidity Crunch

To separate non-compliance from economic distress, fix an initial buffer rate $B = \text{retained buffer}/X_I(0) \in [0, 1]$, invest the remainder immediately ($\kappa = 1$ thereafter), and trace the crunch probability against B .

Large RA-reliant providers

- RA Heavy: negligible crunch risk even at $B = 0$; Large CC: moderate risk, removed by a minimal buffer.
- Scale provides inherent shock-absorbing capacity: a dMLA breach does not imply liquidity stress.

Small Regional

- At $B = 0$, the crunch probability exceeds the dMLA breach probability.
- The dMLA understates true liquidity risk by ignoring balance-sheet capacity.

dMLA compliance $\neq$ Liquidity resilience

Implication

The dMLA captures liquidity exposures, not balance-sheet strength or collateral capacity: this motivates a risk-sensitive MLA (rMLA).

Constructing the Risk-Sensitive MLA (rMLA)

1 Generate synthetic providers

5,000 balance sheets spanning size, leverage, capital assets, liquidity and RAD exposure, well beyond the six archetypes.

2 Stress-test each provider

Simulate resident flows, cash flows and balance-sheet dynamics under the shock scenario, at full capital deployment ($\kappa = 1$).

3 Determine the required buffer

B^* : the smallest initial buffer rate that holds the probability of a liquidity crunch below 1% under stress.

4 Estimate a simple rule

Ridge regression of B^* on five balance-sheet ratios (to X_I); reverse the transformation for an implementable formula.

$$\text{rMLA} = f(X_I, X_C, X_R, L_S, L_I, L_{RA})$$

A Risk-Sensitive Minimum Liquidity Amount (rMLA)

The rMLA, calibrated using 5,000 synthetic providers and multidimensional stress tests, is

$$\text{rMLA} = \left(0.358X_I - 0.343X_C + 4.072X_r + 1.419L_s + 0.246L_I + 0.082L_{RA} \right)^+$$

where $(x)^+ = \max(x, 0)$ and all covariates are initial ($t = 0$) balance-sheet values.

Economic interpretation

- $+X_I$: larger providers require larger absolute liquidity buffers.
- $-X_C$: capital assets provide collateral capacity and access to emergency funding.
- $+X_r$: receivables lack cash immediacy (standardised coefficient comparable to the others).
- $+L_s, +L_I$: forward-looking principal and interest burden, not historical interest expense.
- $+L_{RA}$: reduced weight on RA liabilities; the RV coefficient is driven to zero, as the RV segment acts as a stabiliser under stress.

Key difference from the dMLA

The dMLA relies on the RAD balance and historical outflows. The rMLA adds asset-side risk-bearing capacity, is provider-specific and forward-looking, and retains the transparency of a fixed formula.

The rMLA Expands Capital Investment Capacity

κ	MLA	RA Heavy	DA Heavy	Large CC	RV Heavy	Small Regional	Expn Heavy
0.75	rMLA	601.858	380.302	629.815	429.942	7.157	1,053.252
	dMLA	432.346	322.450	482.158	357.776	8.402	829.260
	Diff.	+169.512	+57.852	+147.657	+72.166	-1.245	+223.992
		(+39.21%)	(+17.94%)	(+30.62%)	(+20.17%)	(-14.82%)	(+27.01%)
1.00	rMLA	664.818	419.008	718.579	469.428	7.483	1,152.376
	dMLA	495.104	360.851	572.745	396.837	8.753	931.234
	Diff.	+169.714	+58.157	+145.834	+72.591	-1.270	+221.142
		(+34.28%)	(+16.12%)	(+25.46%)	(+18.29%)	(-14.51%)	(+23.75%)

Notes: Present value of incremental capital assets, baseline scenario, A\$ million. Diff. is rMLA minus dMLA (relative change in parentheses); $\kappa = 0.25$ and 0.50 show the same pattern.

- The rMLA frees additional investment capacity for five of six archetypes, up to A\$223 million (+27%) for Expn Heavy, reflecting the negative coefficient on the capital base X_c . Small Regional is the exception: the rMLA tightens its requirement.

Does the Expanded Capacity Compromise Resilience?

Archetype	Baseline		Shock	
	rMLA	dMLA	rMLA	dMLA
RA Heavy	< 0.01%	< 0.01%	< 0.01%	< 0.01%
DA Heavy	< 0.01%	< 0.01%	0.02%	< 0.01%
Large CC	< 0.01%	< 0.01%	< 0.01%	< 0.01%
RV Heavy	< 0.01%	< 0.01%	0.06%	< 0.01%
Small Regional	< 0.01%	1.02%	< 0.01%	2.24%
Expn Heavy	< 0.01%	< 0.01%	0.14%	< 0.01%

Notes: Simulated probability of a liquidity crunch by archetype under the maximum CAPEX investment rate, $\kappa = 1$, for the baseline and shock scenarios under the rMLA and dMLA requirements.

- rMLA: crunch probability below 1% for every archetype and scenario, even with all surplus liquidity invested.
- dMLA: Small Regional faces a crunch probability above 1% at baseline and 2.24% under stress; the backward-looking rule under-protects the smallest, least diversified provider.

Policy Implications

- **Opportunity cost of liquidity regulation.** Rigid fixed-coefficient rules such as the dMLA crowd out capital formation. The rMLA unlocks up to A\$223 million for a single large provider while holding the crunch probability below 1%.
- **A reversal of the banking prescription.** The rMLA tightens requirements for small providers and relaxes them for large ones, the opposite of the usual case for lighter treatment of small banks. Systemic risk in aged care arises from exogenous demographic shocks, not interbank contagion, so balance-sheet scale is a source of resilience.
- **The design lag is structural, not technological.** US operating reserves and Japanese escrow safeguards share the dMLA's accounting-based architecture, while APRA-regulated health insurers and superannuation funds already use probabilistic stress testing.
- **Alignment with the trajectory of prudential regulation.** The dMLA sits at the Basel I stage (fixed coefficients). The rMLA mirrors the Basel III/IV hybrid: stochastic stress-test foundations mapped into a standardised linear formula, without bespoke internal models.

Conclusions

Main findings

- The dMLA creates a dual distortion: large, well-capitalised providers hold excessive buffers and breach the rule despite negligible liquidity risk, while the smallest provider complies yet remains exposed to liquidity shortfalls.
- Compliance with the dMLA does not imply resilience: the rule measures exposure to refundable liabilities, not collateral capacity, debt repayment profile or stress-tested outcomes.
- The rMLA reallocates liquidity rather than uniformly loosening regulation: it releases trapped buffers for well-capitalised providers (up to A\$223 million, +27%) and tightens requirements where fragility exists, holding crunch probabilities below 1% under severe stress.

Limitations and extensions

- One-year horizon with exogenous CAPEX; multi-period funding and investment planning left for future work.
- Stress anchored to a single post-pandemic regime shift; indirect spillovers not modelled.

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Discussion and Questions

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