# *Macropru beyond banking: the case for life Insurance companies and asset managers?*

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**WORK IN PROGRESS!**

*The views expressed in this paper are those of the authors and do not necessarily reflect the position of the ACPR, the Banque de France or the Eurosystem*

# INTRODUCTION - OBJECTIVES

- Assess the **benefits of the new macroprudential powers** provided to the French macroprudential authority to restrict movements on life-insurance contracts in the event of a "serious threat to the financial situation of insurance organisations or to the stability of the financial system" and activate a range of tools for managing fund liquidity risk ("Sapin 2 Law")
- Develop a **system wide stress-testing** framework that can be regularly used by macroprudential authorities
- Extend the scope of **macroprudential instruments beyond banking**, i.e. to other relevant financial intermediaries and market-based finance
- Assess systemic risks stemming from the **life-insurance** and **asset management** industries through two main channels: **surrender** or **redemption** risks on the funding side; **fire-sales** and both direct and indirect contagion on the asset side
- Provide a **"systemic risk monitor"** that can be used by both macro and micro-prudential authorities and updated in real time pending on data availability
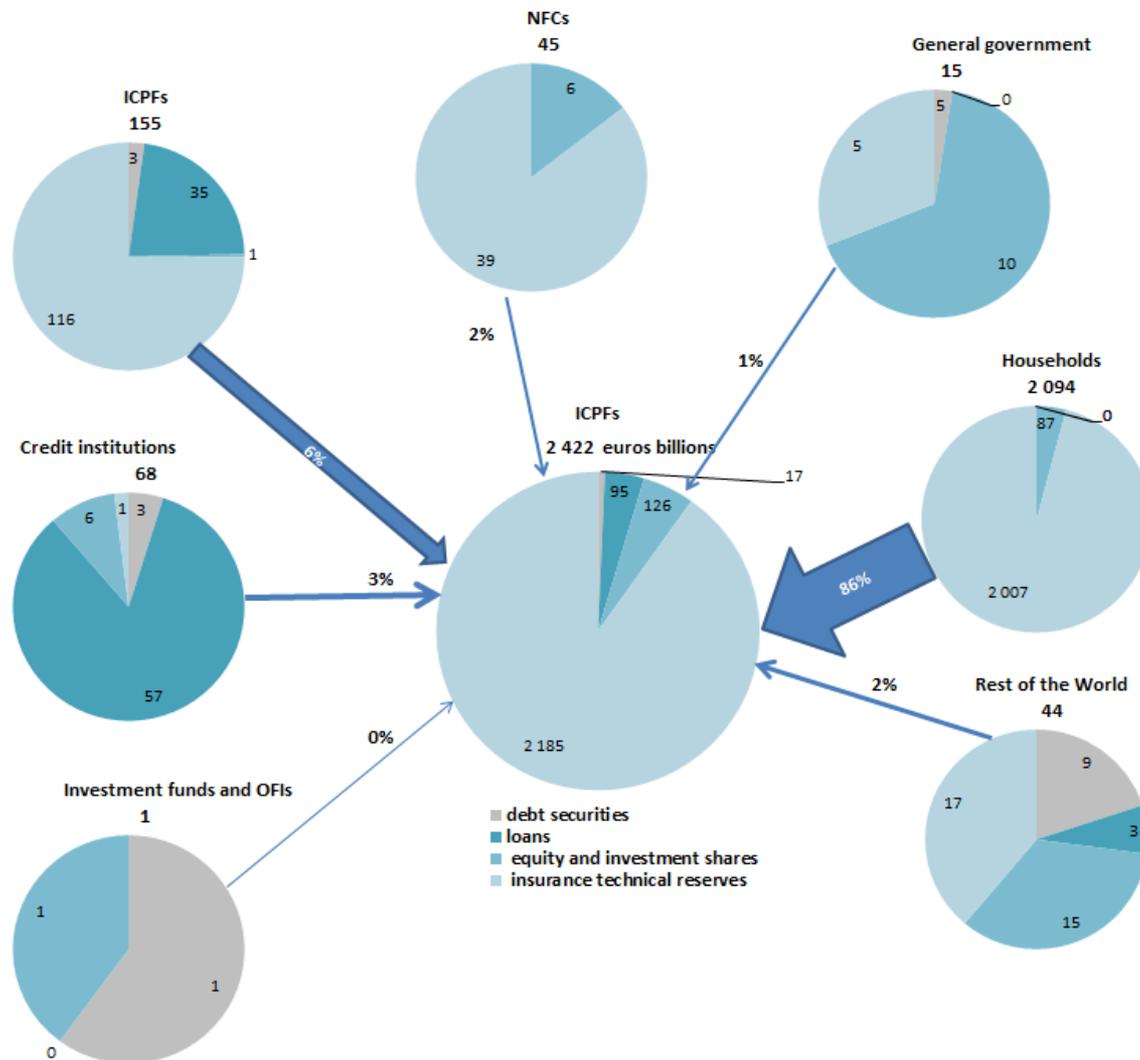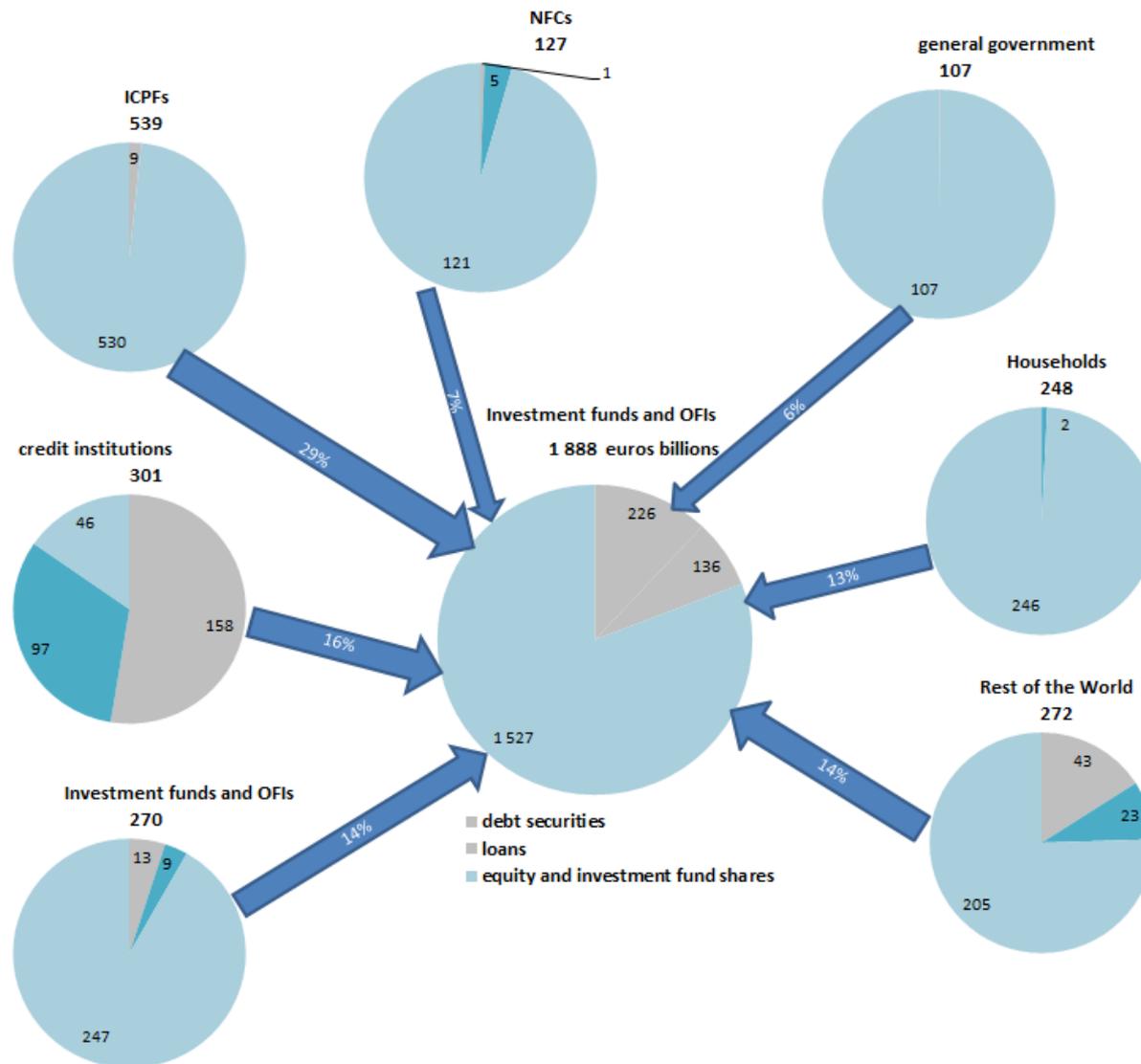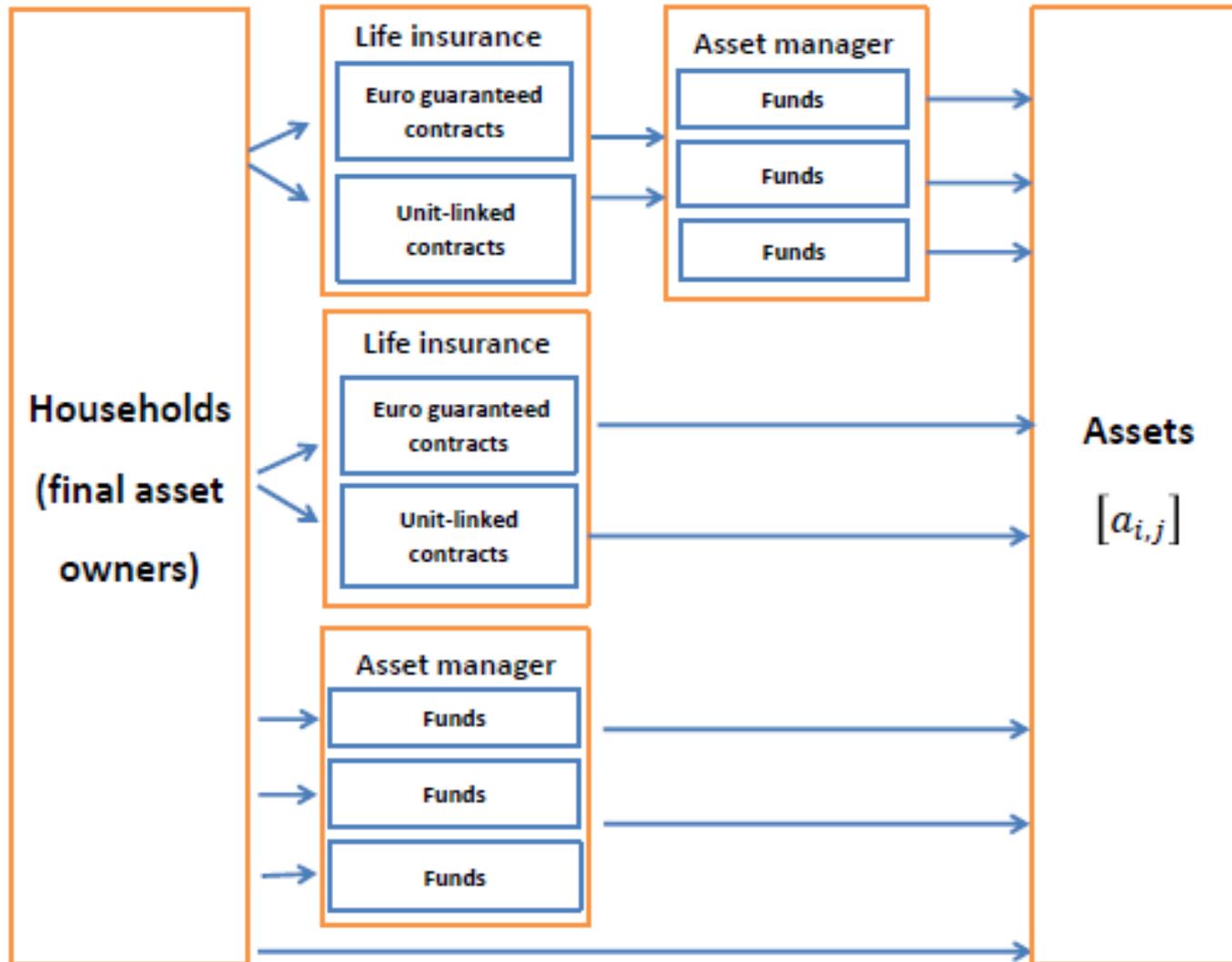
# DATA USED FOR THIS PRESENTATION

| Households | Life insurance | Euro guaranteed | Funds (fixed income) | 20 GEUR |
| | | Unit-linked contracts | | |
| | Life insurance | Euro guaranteed | | 1 430 GEUR |
| | | Unit-linked contracts | | |
| | Funds (fixed income) | | | 40 GEUR |

- Detailed portfolios of 131 French life-insurers (10 000 securities)
- Total amount of €1430bn of fixed-income assets out of €2426bn of assets under management

# THE MODEL

**Partial equilibrium framework** based on Greenwood, Landier &Thesmar (2015) and Cetorelli, Duarte and Einsenbach (2016); other existing extensions : Duarte and Einsenbach (2015); Fricke and Fricke (2017); Ellul *et al.* (2018).

Adapted here to the **life-insurance** and **asset management** universe
- Key assumptions regarding the reaction of asset managers to shocks:
- ➤  **risk-budget techniques** rather than leverage targets
- ➤ liquidation policy: **waterfall strategy** rather than proportional selling ;
- ➤  exposure to mark-to-market losses and surrenders/redemption risk

- **Rationales for macroprudential policy interventions:**
- ➤ First mover advantage
- ➤ Principal-agent relationship between life-insurers and some asset managers who manage their assets but which may be captive

We note $l_i$ the stop loss limit of the holder $i$ on its portfolio. $l_i$ might be specific to each market participant, which is a convenient way to introduce heterogeneity. Due to the interest rates shock, the risk budget of holder $i$ is impaired by the following amount:

$$l_i a_i - \sum_{j=1}^{K} a_{ij} \, d_j \Delta r.$$

As a consequence, the asset holder $i$ wants to sell off an amount $x_i$ of assets such that:

$$l_i a_i - \sum_{j=1}^{K} a_{ij} \, d_j \Delta r = l_i \left[ \left( a_i - \sum_{j=1}^{K} a_{ij} \, d_j \Delta r \right) - x_i \right]$$

Which leads to $x_i = \dfrac{(1-l_i)\sum_{j=1}^{K} a_{ij} d_j \Delta r}{l_i}$.

$R_{N \times N}$ is a diagonal matrix with $r_{ii} = \dfrac{(1-l_i)}{l_i} s_i$

**Different possible attitudes with respect to latent losses**

- Hold the portfolio to avoid costly liquidations at depressed market prices;
- Drawing down the cash reserves or activating existing credit lines with other financial institutions
- New subscriptions could restore risk budgets

**In the considered scenario (interest rate shock), the "buy and hold" strategy is vulnerable for 3 reasons:**

- portfolios are not always perfectly matched
- life insurers in particular use long-term interest rate swaps to narrow down duration gaps. As their net position is usually long, a rise in the yield curve may trigger margin calls, which could contribute to rebalancing out assets
- surrenders from policy holders, attracted by more profitable placement alternatives; In addition, the new interest rate environment makes new subscriptions less likely, everything else equals.

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Depends upon the risk scenario: waterall strategy ; proportional selling (slicing); selling illiquid asset first

The liquidation policy is defined as follows. The asset holder $i$ will sell assets, starting by the most liquid until, for a specific asset $\bar{k}$, the amount of redemptions is exhausted:

$$\frac{(1-l_i)s_i\sum_{j=1}^{K}a_{ij}d_j\Delta r}{l_i} - \sum_{j=1}^{\bar{k}}a'_{ij} \leq 0$$

Consequently, the asset holder $i$ will sell the following proportion of its total amount of redemptions using asset $j \leq \bar{k}$:

$$f_{ij} = \frac{a'_{ij}}{\frac{(1-l_i)}{l_i}s_i\sum_{j=1}^{K}a_{ij}d_j\Delta r}$$

Therefore, we use, for $j = 1, \ldots, \bar{k}, f_{ij}$ and set, for $j = \bar{k}+1, \ldots, K, f_{ij} = 0$.

# PRICE IMPACT

Table 1: Sample of price impacts of asset sales from a selection of recent papers: price decline in basis points per $10 billion worth of asset sold

| Asset classes | Greenwood et al. (2015) | Duarte & Eisenbach (2015) | Cetorelli et al. (2016) | Cont and Schaanning (2017) | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | | | Liquidation over 1 day | Liquidation over 20 days | Liquidation over 100 days |
| Gov. bonds | 10 | | 5,7 | (Fra) 76,8 | 17,3 | 7,7 |
| Financial | 10 | | 17,1 | | | |
| Corporates | 10 | 10 | 10 | (US) 9,6 | (US) 2,15 | (US) 0,96 |

Life-insurers sell assets in order to get cash; we assume subsequent cash hoarding (Morris & Shim & Shin, 2016)
At some points, the cascade might stop, when opportunistic investors such as arbitrageurs step in to purchase the fire-sold assets at an attractive discount price (here maximum authorized drop in an asset price= 50% of its initial value)

**The "stress-test" exercise is based on the following sequence:**

1. **Initial shock**: an exogenous permanent and unexpected parallel up-shift of the yield curve of +100 basis points.

2. **Direct mark-to-market latent losses** : financial assets suffer direct mark-to market losses;

3. **Asset sales**: In response to the market losses, life insurance companies sell part of their portfolios based on a waterfall strategy (sell assets in decreasing order of market liquidity).

4. **Price impact:** the asset sales have a price impact that depends on each asset's liquidity –the market depth- and the amount sold.

5. **Spillover (indirect) losses:** financial institutions or households holding the assets sold suffer in turn indirect spillover losses, which will in turn trigger other rounds of asset sales

# STRESS SCENARIO

**Step 1: interest rate shock :** M-t-M losses: $AD\Delta r$

**Step 2: reaction to market to market losses:** $RAD\Delta r$

**Step 3 a: liquidation policy:** $F'RAD\Delta r$

      **3b: price impact:** $LF'RAD\Delta r$

**Step 4 - Spillover (indirect losses):** $A_2 LF'RAD\Delta r$

These losses may trigger a new round of asset sales (back to step 2)

# « SYSTEMIC RISKS MONITOR »

| Systemic risk indicators | measure |
|---|---|
| Aggregate vulnerability | $$AV = \frac{\mathbb{1}_N{}' A_2 LF' RAD\Delta r}{E}$$ |
| Individual contribution to aggregate vulnerability | $$S(i) = \frac{\mathbb{1}_N{}' A_2 LF' R\delta_i \delta_i' AD\Delta r}{E}$$ |
| Direct individual vulnerability | $$DV(i) = \frac{\delta_i' AD\Delta r}{E_i}$$ |
| Indirect individual vulnerability | $$IV(i) = \frac{\delta_i' A_2 LF' RAD\Delta r}{E_i}$$ |
| indirect vulnerability of one institution to another | $$IV(i,m) = \alpha \frac{\delta_i' A_2 LF' R\delta_m \delta_m' A}{E_i}$$ |
| Portfolio similarity index | $$Overlap_{i,j} = \frac{\sum_{k=1}^{K} M_{i,k} M_{j,k}}{\sqrt{\sum_{k=1}^{K} (M_{i,k})^2} \times \sqrt{\sum_{k=1}^{K} (M_{j,k})^2}}$$ |
| Systemic assets: assets' contributions to aggregate vulnerability | $$SA(k) = \frac{\mathbb{1}_N{}' A_2 \delta_k' \delta_k LF' RAD\Delta r}{E}$$ |

# AGGREGATE RESULTS (TENTATIVE)

- Under the assumption of a risk budget of 34%, portfolio rebalancing might be important (about 170bn euros) while second round effects are limited.

- The scope for contagion seems limited for life insurance as usually the cascade stops after a couple of iterations ; but doesn't factor in feedback effects on households' behaviour (scope for herding or panic with respect to sales and losses)

- At a more granular level, stress scenarios can trigger the default of some institutions ("too-many-to fail") and/or contagion to less liquid asset markets; action really starts for significant interest rate shocks (3% and above)

- Might eventually be sufficiently significant to motivate the activation of gates or redemption periods by a macroprudential authority

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# CONCLUSION

**Next steps:**

- We just get a more comprehensive data set of both direct and indirect exposures of top 20 French life insurers (over 28,000 securities)

- A better characterization of optimizing behaviours -accounting for regulatory constraints- is also needed to account for the diversity of strategies developed by market players

- In our model, the net outflows from funds or life insurers is currently exogenous but shall be made endogenous as the demand for redemptions or surrenders may be influenced by the price impact of market sales and may vary amongst asset holders or owners.

- Our results are highly sensitive to the assumptions made on the price impacts of asset sales. So far, we have relied on estimates found in the literature and mostly based on US evidence. Some recent works have been carried out at the ACPR & BdF which should improve the calibration of the model

- We still need to perform sensitivity analysis with respect to the choices of some key parameters and robustness checks