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« MACROPRU BEYOND BANKING THE CASE FOR LIFE INSURANCE COMPANIES AND ASSET MANAGERS?"

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

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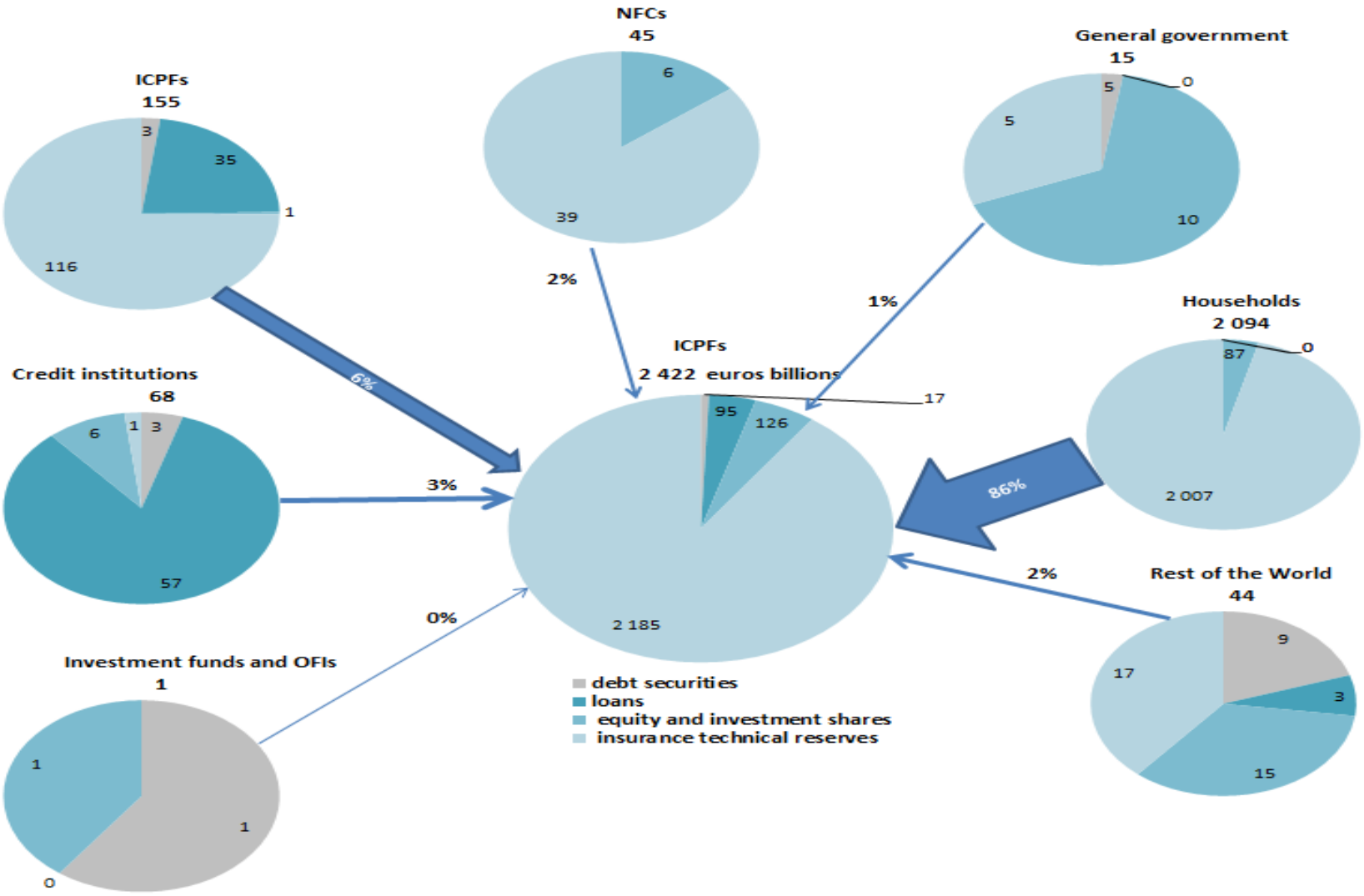
INTRODUCTION – MAIN OBJECTIVES

- Assess the **benefits of the new macroprudential powers** provided to the French macroprudential authority, the HCSF, 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 as well as in the context of the FSB Systemic risk initiative (attempt in particular to factor in all relevant market participants, in particular asset owners – a concern raised by the industry)
- 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

INTERCONNECTIONS IN THE FRENCH FINANCIAL SYSTEM : INSURANCE



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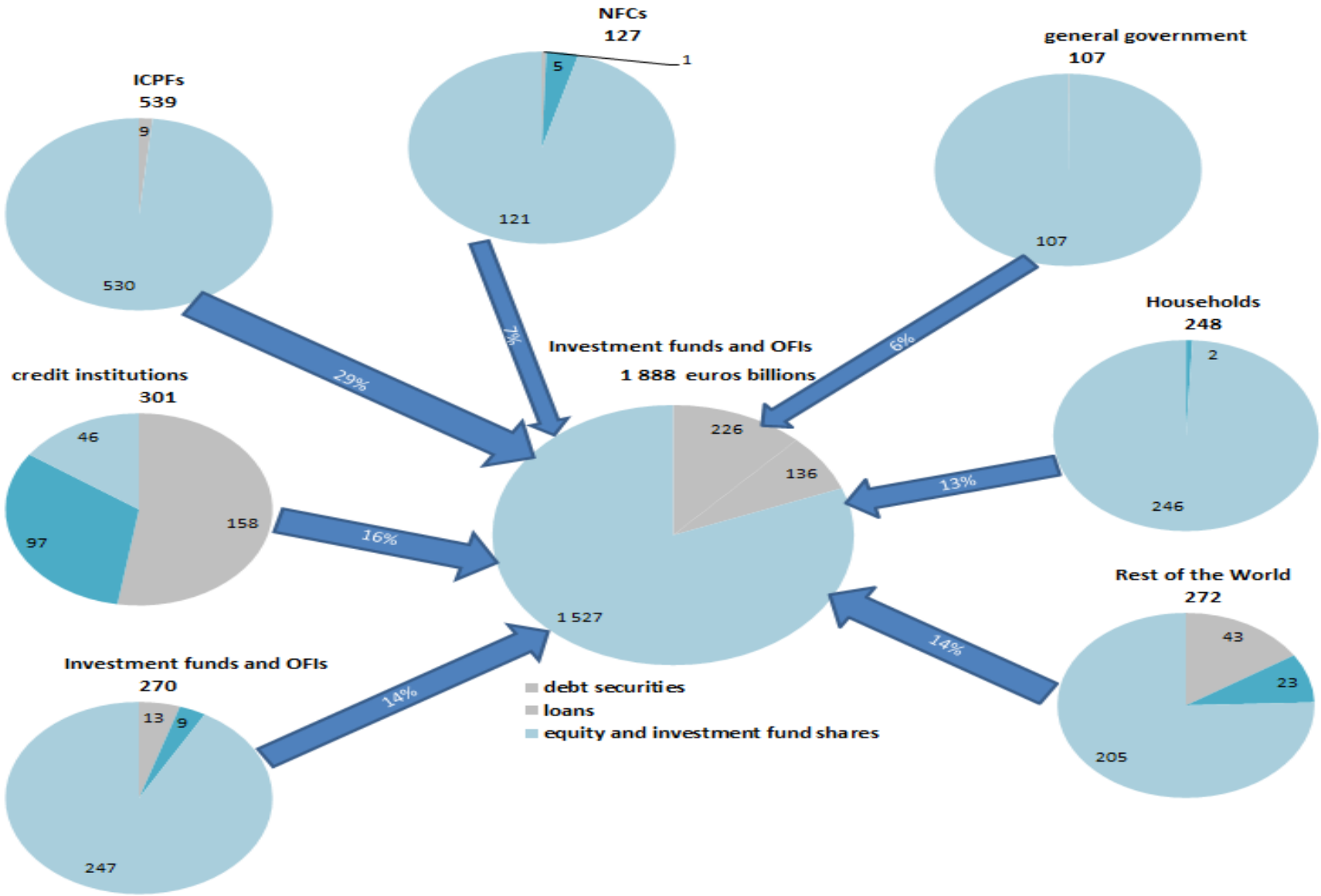
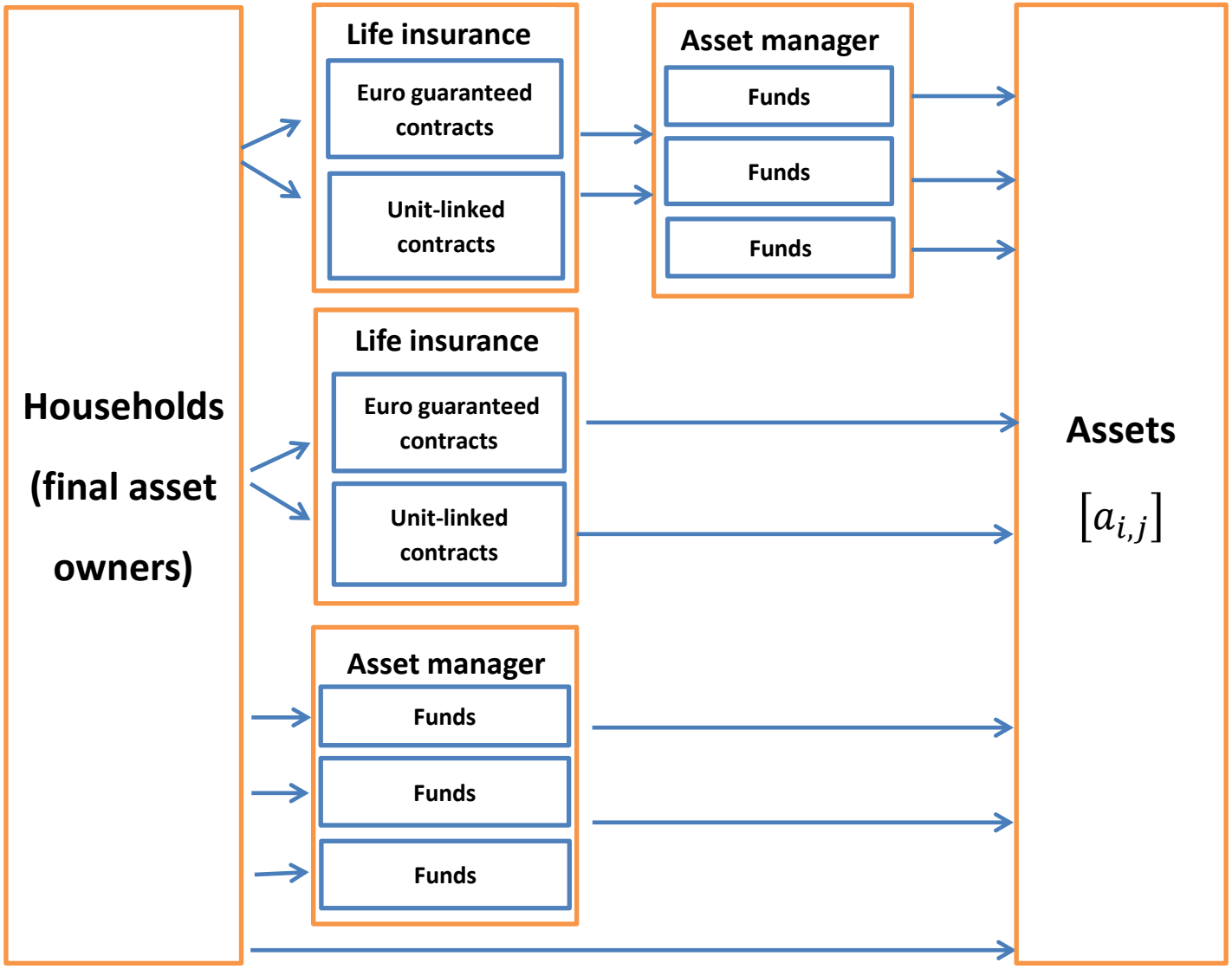
INTERCONNECTIONS IN THE FRENCH FINANCIAL SYSTEM : ASSET MANAGEMENT



ANALYTICAL FRAMEWORK



DATA COLLECTED SO FAR

Households	Life insurance (delegating the management of assets to funds – fixed income)	Euro guaranteed	77 GEUR
		Unit-linked contracts	23 GEUR
	Life insurance (1360 GEUR)	Euro guaranteed	1244 GEUR
		Unit-linked contracts	16 GEUR
	Funds (fixed income)		40 GEUR

- Detailed portfolios of 55 French life-insurers (10 000 securities)
- Total amount of €1360bn of fixed-income assets out of €2422bn of assets under management

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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

GENERAL ASSUMPTION: RISK BUDGETING

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

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

LIQUIDATION STRATEGY: SOME SPECIFIC CONSIDERATION FOR LIFE INSURERS

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

- **Hold the portfolio** to avoid costly liquidations at depressed market prices;
- Drawing down the cash reserves, activating existing credit lines with other financial institutions, borrow cash from repos and post bonds for collateral
- New subscriptions could restore risk budgets

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

1/ portfolios are not always perfectly matched: assets with shorter duration have to be rolled

2/ life insurers in particular use long-term interest rate swaps to narrow down duration gaps. As their unhedged net position is usually short, a rise in the yield curve may trigger margin calls due to losses on hedges, which could contribute to sell assets for cash need

3/ 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.

WATERFALL STRATEGY

Depends upon the risk scenario: waterfall strategy; proportional selling (slicing); selling illiquid asset first; Here we consider a waterfall strategy.

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 $j = 1, \dots, \bar{k}, f_{ij}$ and set, for $j = \bar{k}+1, \dots, K, f_{ij} = 0$.

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)

STRESS SCENARIO

Our "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 (direct) 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 - Spill over (indirect losses): $A_1LF'RAD\Delta r$

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

THE "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	$Overlap_{i,j} = \frac{\sum_{k=1}^{K} M_{ik} M_{j,k}}{\sqrt{\sum_{k=1}^{K} (M_{ik})^2} \times \sqrt{\sum_{k=1}^{K} (M_{jk})^2}}$
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)
- Sufficient to motivate the activation of gates or redemption periods by a macroprudential authority

CONCLUSION

Next steps:

- We are currently completing our data set in order to get a more comprehensive view of total exposures in the financial system
- A better characterization of optimizing behaviours -accounting for regulatory constraints- is also needed to account for the diversity of strategies developed by market players, relying in particular on recent FSB surveys
- 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. Further work is therefore needed to estimate these price impacts on French financial markets (on-going @ BdF Financial stability directorate).
- We need to perform sensitivity analysis with respect to the choices of some key parameters and robustness checks