

Main Determinants of Profit Sharing Policy in the French Life Insurance Industry

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The views expressed in this paper are those of the authors and do not necessarily reflect those of the ACPR.

- 1 Introduction and Motivation
- 2 French regulatory and contractual framework
- 3 Data
- 4 Methodology
- 5 Empirical results
- 6 Conclusion

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Introduction and context

- Participation strategy for the euro-denominated savings contracts (with profit participation) only seldom studied in France.
- Life insurance markets less "standardized" than P&C markets.
- Large heterogeneity in savings contracts across countries (e.g. minimum guaranteed rates or legal framework).
- In France: very low guaranteed rates relative to other European countries → the participation strategy is all the more important.

General wisdom

For most authors, participation strategies depend not only on present and past performances of the insurer's strategic asset allocation (e.g. Bacinello (2001)), but also:

- on policyholders' expectations: performance and regularity (e.g. Planchet and Thérond (2007); Milhaud *et al.* (2010)),
- on insurance portfolio characteristics,
- on the insurer's ability to smooth its financial results (e.g. Grosen and Løchte Jørgensen (2000), Bauer *et al.* (2006)),
- on other insurers' behavior (see Dutang *et al.* (2013) in P&C),
- and on the set of substitute savings products available on the market.

General wisdom

However, almost all authors address these issues with an *a priori* assumption on the profit sharing management rules (mainly for valuation purposes). Clear lack of empirical literature on participation behaviors both in France and elsewhere.

Interest for the supervisor:

- Crucial to understand participation strategies in order to pin down potential vulnerabilities for insurers which would face too stringent a constraint and could not honor their liabilities or face competition.
- Essential to fulfill the consumer protection mission

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French context: Two types of legal reserves

- The **profit sharing reserve** (*Provision pour participation aux bénéfices* – PPB) where profits can be stored for later release (before 8 years);
- The various **asset reserves**, set to balance the historic value accounting:
 - The *Provision pour risque d'exigibilité* – PRE to deal with unrealized losses at the portfolio level;
 - The *Provision pour dépréciation durable* – PDD to deal with unrealized losses at the individual asset level;
 - The *Réserve de capitalisation* – RC, that stores the gains and losses realized on the various bond selling operations.

French context: Contracts

- Our study focuses on individual euro-denominated contracts with profit participation:
 - Saving products with guaranteed capital,
 - With a legal profit sharing mechanism at the fund level,
 - With (optionally) minimal participation rates guaranteed on an annual basis.

- In the end, insurers have much leeway in the way they allocate participation, both temporally and across the different contracts.

Our paper

- The literature sheds light on potential drivers of participation rates.
- We compile the first panel data set at the entity level to test a formalized set of assumptions drawn from the theory and from practitioners' common wisdom.
- We follow a classical empirical strategy with econometric regressions, robustness checks and time-stability checks.

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Raw data

- We constructed a brand new data set from the annual supervisory reports (*Dossiers Annuels*)
- These prudential reports are composed of:
 - general information on the undertakings,
 - detailed accounting documents,
 - prudential information on various topics: credit, reinsurance, solvency, reserves etc.
- To the best of our knowledge, this is the first database of this kind to be exploited for empirical research on life insurers' profit sharing policies.

Raw data

Raw accounting/prudential data extracted on yearly basis for each reporting undertaking.

- **Time period:** 15 years between 1999 and 2013.
- **Type of undertakings:** medium and big life insurers (Insurance Code and Mutual Insurance Code).
- **Type of products:** individual euro-denominated life insurance products with profit participation in France.
- **Variable of interest:** undertaking's average participation rate r_i computed at aggregated level. Focus on the spread with the French safe asset:

$$r_{i,t} = \frac{\text{Total Revalorization Amount;}}{\text{Yearly Average Mathematical Reserves;}}; \rho_{i,t} = r_{i,t} - r_t^{\text{OAT}}$$

Potential drivers

Aggregated indicators for each insurer regrouped by category.

Category	Variables
Soundness and resilience controls	Coverage ratio
	UCGLs
	Profit Sharing Reserves (level and variation)
Size controls	Log of the mathematical reserves
	Dummy for the smallest undertakings
ALM controls	Asset returns
	Realized capital gains
	Share of equity in total assets
	Financial margin
Reserving controls	PDD (<i>Provision pour risque d'exigibilité</i>)
	PRE (<i>Provision pour dépréciation durable</i>)
Policyholder behavior controls	Collection rates
	Lapse rates

Macroeconomic variables. We examine yields on French govies, EUR/USD exchange rate, unemployment rate, GDP growth, ...

Data selection

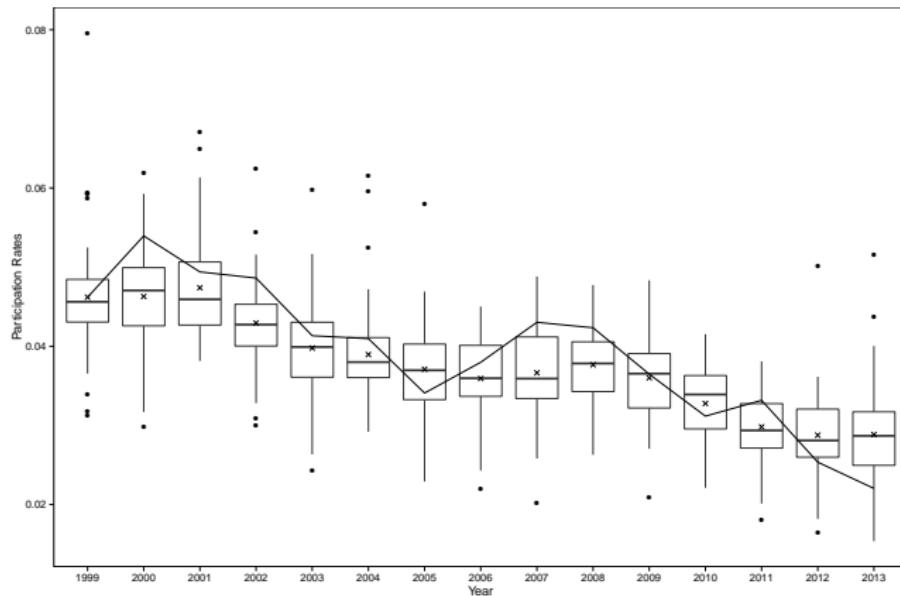
Elimination of undertakings or observations that appeared to be either reporting mistakes or clearly atypical, and correction of multiple obvious sign errors.

- Focus on undertakings ruled by the *Code des Assurances* but a couple of undertakings are ruled by the *Code de la Mutualité*
- Mergers and acquisition.** Split the concerned entities into two (before and after the merge).
- Missing values.** Essential raw information was often missing from the reporting templates.
- Unbalanced panel of 89 insurers over 15 years.** Each year, between 51 and 71 undertakings are observed (936 obs and 31 entities observed over the entire period).

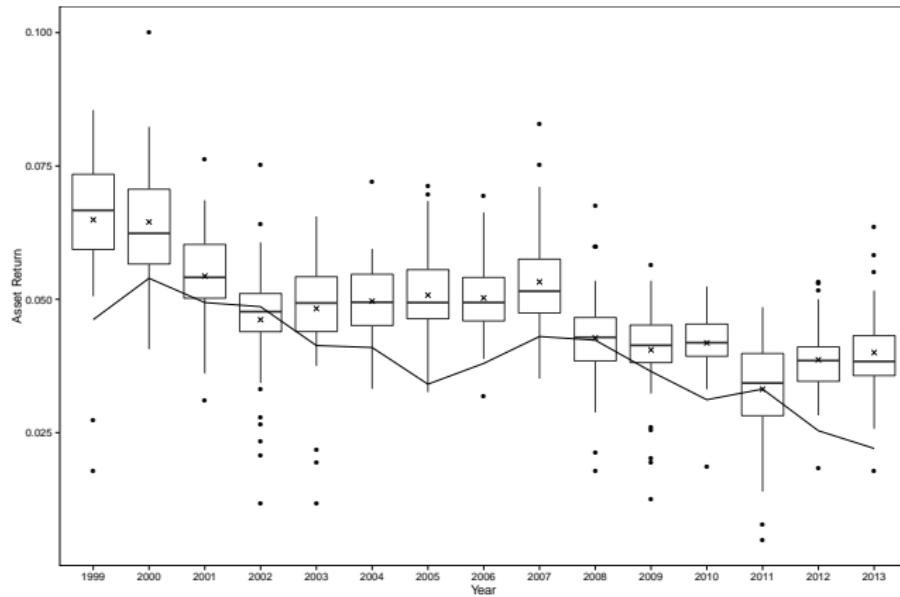
Summary statistics

Year	Number of insurers	Mathematical reserves	Market coverage
1999	51	286,204	75%
2000	53	316,619	78%
2001	58	372,163	81%
2002	61	407,306	81%
2003	65	490,645	90%
2004	66	591,073	94%
2005	71	653,596	94%
2006	67	712,401	95%
2007	65	712,401	87%
2008	66	844,864	96%
2009	64	906,835	96%
2010	64	993,370	97%
2011	62	1,027,407	98%
2012	64	1,056,795	99%
2013	59	1,051,076	96%

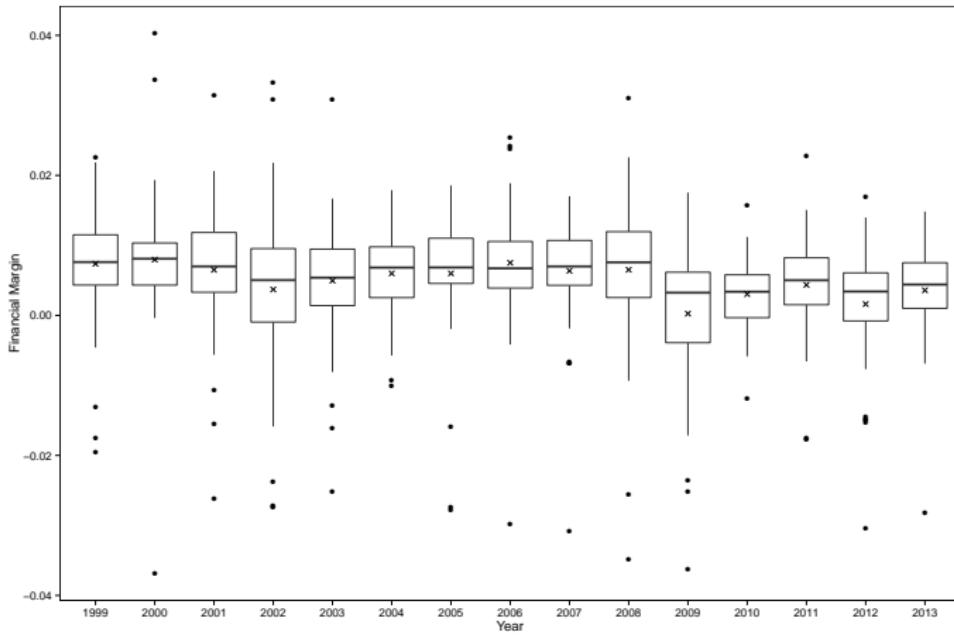
Participation rate and 10Y-French govies



Return on assets and 10Y-French govies



Financial margin



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Rationale

- Insurers aim at maximizing their future profits over a specific time-horizon, under solvency and regulatory constraints (standard optimization problem).
- Life insurers can
 - ① use the PPB reserves to smooth future incomes
 - ② and be encouraged to keep the more profitable contracts within the portfolio.
- Using this simple statement, we should assume that:
 - ① their participation rate acts as an aggregate control variable,
 - ② a trade-off nevertheless exists between giving participation immediately and endowing the PPB.

To challenge this analysis we used two models:

- a baseline model with a target participation rate.
- and a dynamic model assuming time-dependent target rates.

Baseline models

Graphical analysis and practitioners' common wisdom

→ We assume a common reference (OAT-10Y) for all insurers i .

$$\rho_{i,t} = \beta^\top \mathbf{x}_{i,t} + \mu_i + \varepsilon_{i,t}, \quad (1)$$

- $\rho_{i,t} = r_{i,t} - r_t^{OAT}$: participation rate spread;
 - $r_{i,t}$: participation rate at the end of year t for insurer i
 - r_t^{OAT} : OAT-10Y rate
- $\mathbf{x}_{i,t}$: vector of specific control variables
- μ_i : the insurer's fixed effect.
- $\varepsilon_{i,t}$: a random disturbance term of mean 0.

A **dynamic panel model** can also be specified:

$$\rho_{i,t} = \gamma \rho_{i,t-1} + \delta^\top \mathbf{x}_{i,t} + \nu_i + \epsilon_{i,t}. \quad (2)$$

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Estimation with the baseline model

	<i>Participation Rate Spread $\rho_{i,t}$</i>							
	Model 1		Model 2		Model 3		Model 4	
	OLS	FE	OLS	FE	OLS	FE	OLS	FE
Asset Return – OAT-10Y	0.205*** (0.025)	0.205*** (0.027)	0.168*** (0.023)	0.136*** (0.023)	0.194*** (0.023)	0.133*** (0.022)	0.193*** (0.023)	0.129*** (0.022)
OAT-10Y			-0.337*** (0.026)	-0.365*** (0.026)	-0.343*** (0.025)	-0.389*** (0.025)	-0.349*** (0.025)	-0.421*** (0.024)
Lapse Rate					-0.070*** (0.007)	-0.083*** (0.009)	-0.069*** (0.007)	-0.089*** (0.009)
PPB Ratio (BoY)							0.011 (0.008)	0.063*** (0.020)
Constant	-0.003*** (0.000)	-0.003*** (0.000)	0.010*** (0.001)	0.011*** (0.001)	0.014*** (0.001)	0.017*** (0.001)	0.014*** (0.001)	0.017*** (0.001)
Nobs	936	936	936	936	936	936	936	936
F statistic	66	59	118	155	121	135	91	125
R ²	0.13	0.45	0.26	0.57	0.33	0.61	0.33	0.62
Adjusted R ²	0.13	0.39	0.26	0.53	0.33	0.57	0.33	0.58

Note: This table contains the estimated parameters and their robust standard errors in parentheses (White) for the static models, with both pooled-OLS and fixed effects (FE) specifications. The constants correspond to the mean of fixed effects for FE models. *p<0.1; **p<0.05; ***p<0.01.

Main findings of the parsimonious static model

- The phenomenon is rather well described by a parsimonious fixed effect model that includes:
 - insurers' financial out-performances (low level of pass-through)
 - level of the OAT-10Y (negative impact, cf. definition of ρ .)
 - lapse rates (negative and quantitatively small!)
 - levels of the profit sharing reserves (marginally positive)
- Discussion on timing and endogeneity:
 - participation is determined at the end of the year
 - the PPB is observed at the beginning of the year
 - lapses, financial performances and the level of the OAT are averaged over the year.
- Little room for an omitted variable bias, yet a few complementary variables come out as statistically significant under FE (UCGL, RC, Share of equity).

Estimation with the dynamic model

	<i>Participation Rate Spread $\rho_{1,t}$</i>											
	Autocorrelation		Model 9		Model 10		Model 11		Model 12		Model 4	
	OLS	FE	OLS	FE	OLS	FE	OLS	FE	OLS	FE	OLS	FE
Lag of Participation Rate Spread	0.581*** (0.041)	0.343*** (0.053)	0.508*** (0.038)	0.250*** (0.050)	0.469*** (0.035)	0.179*** (0.046)	0.424*** (0.036)	0.157*** (0.046)	0.426*** (0.036)	0.161*** (0.044)		
Asset Return – OAT-10Y			0.139*** (0.020)	0.208*** (0.029)	0.093*** (0.018)	0.117*** (0.025)	0.121*** (0.019)	0.116*** (0.024)	0.120*** (0.019)	0.110*** (0.024)	0.193*** (0.023)	0.129*** (0.022)
OAT-10Y					-0.295*** (0.022)	-0.346*** (0.023)	-0.301*** (0.021)	-0.368*** (0.023)	-0.310*** (0.022)	-0.403*** (0.023)	-0.349*** (0.025)	-0.421*** (0.024)
Lapse Rate						-0.047*** (0.006)	-0.068*** (0.009)	-0.045*** (0.006)	-0.045*** (0.009)	-0.074*** (0.007)	-0.069*** (0.007)	-0.089*** (0.009)
PPB Ratio (BoY)							0.018** (0.008)	0.064*** (0.021)	0.011 (0.011)		0.063*** (0.020)	
Constant	-0.000* (0.000)	-0.001 (0.000)	-0.002*** (0.000)	-0.003*** (0.000)	0.010*** (0.001)	0.011*** (0.001)	0.013*** (0.001)	0.016*** (0.001)	0.012*** (0.001)	0.016*** (0.001)	0.014*** (0.001)	0.017*** (0.001)
Nobs	842	842	842	842	842	842	842	842	842	842	936	936
F statistic	203	42	135	45	169	119	152	103	124	111	91	125
R ²	0.34	0.46	0.39	0.53	0.49	0.63	0.52	0.65	0.53	0.67	0.33	0.62
Adjusted R ²	0.34	0.39	0.39	0.47	0.49	0.59	0.52	0.61	0.52	0.62	0.33	0.58

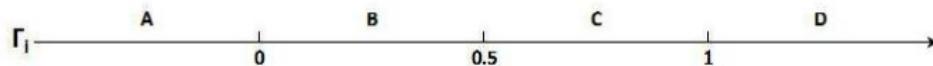
Note: This table contains the estimated parameters and their robust standard errors in parentheses (White) for the dynamic models, with both pooled-OLS and fixed effects (FE) specifications. Model 9 captures the participation rate spread dynamic and Models 10-12 consider the effect of additional variables. The results obtained with Model 4 are displayed for comparison purpose. The constants correspond to the mean of fixed effects for FE models. *p<0.1; **p<0.05; ***p<0.01.

Heterogeneity of undertakings: Clustering

We use the following statistic:

$$\Gamma_i = \bar{\rho}_i - \frac{\sigma_i^\rho}{\sqrt{N_i}}$$

And we define 4 groups based on the value of Γ_i



	Panel A	Panel B	Panel C	Panel D
Mean	-0.00492*** (0.00074)	-0.00140*** (0.00042)	-0.00194*** (0.00046)	-0.000153 (0.00046)

Note: This table contains the estimated average participation rate spread for each performance subgroups (Panels A-D) with their robust standard errors in parentheses (White). *p<0.1; **p<0.05;
***p<0.01.

Heterogeneity of undertakings: Clustering

	Participation Rate Spread $\rho_{i,t}$											
	Model 4 - Entire set		Model 4 - Panel A		Model 4 - Panel B		Model 4 - Panel C		Model 4 - Panel B&C		Model 4 - Panel D	
	OLS	FE	OLS	FE	OLS	FE	OLS	FE	OLS	FE	OLS	FE
Asset Return and OAT-10Y	0.193 (0.023)***	0.129 (0.022)***	0.226 (0.054)***	0.152 (0.054)***	0.236 (0.055)***	0.213 (0.048)***	0.066 (0.037)*	0.056 (0.033)*	0.116*** (0.031)	0.116*** (0.029)	0.078 (0.047)	0.093 (0.043)**
OAT-10Y	-0.349 (0.025)***	-0.421 (0.024)***	-0.327 (0.075)***	-0.521 (0.073)***	-0.344 (0.048)***	-0.370 (0.046)***	-0.449 (0.046)***	-0.438 (0.043)***	-0.414*** (0.032)	-0.426*** (0.031)	-0.281 (0.048)***	-0.362 (0.050)***
Lapse Rate	-0.069 (0.007)***	-0.089 (0.009)***	-0.024 (0.030)	-0.041 (0.039)	-0.088 (0.014)***	-0.132 (0.016)***	-0.076 (0.012)***	-0.037 (0.020)*	-0.085*** (0.009)	-0.084*** (0.013)	-0.085 (0.012)***	-0.097 (0.014)***
PPB Ratio	0.011 (0.008)	0.063 (0.020)***	0.035 (0.012)***	0.071 (0.041)*	0.014 (0.014)	0.056 (0.030)*	0.022 (0.019)	0.033 (0.042)	0.016 (0.012)	0.054** (0.027)	-0.015 (0.018)	0.073 (0.038)*
Constant	0.014 (0.001)***	0.017 (0.001)***	0.009 (0.003)***	0.016 (0.003)***	0.015 (0.002)***	0.018 (0.002)***	0.019 (0.002)***	0.016 (0.001)	0.018*** (0.002)	0.018*** (0.002)***	0.015 (0.002)***	0.017 (0.002)***
Nobs	936	936	160	160	285	285	252	252	537	537	239	239
F statistic	91	125	13	27	48	64	36	33	79	88	22	26
R ²	0.33	0.62	0.36	0.70	0.40	0.64	0.30	0.49	0.34	0.55	0.33	0.65
Adjusted R ²	0.33	0.58	0.34	0.65	0.40	0.60	0.29	0.43	0.33	0.50	0.32	0.61

Note: This table contains the estimated parameters and their robust standard errors in parentheses (White) for Model 4, with both pooled-OLS and fixed effects (FE) specifications over the performance subgroups. The constant correspond to the mean of fixed effects for FE models. *p<0.1; **p<0.05; ***p<0.01.



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Conclusion

Our econometric analyses show interesting results:

- Driving role of the French govies,
 - Low pass-through from financial performances to participation,
 - On average over the period, even the group of out-performers distributed less than the OAT-10Y,
 - Lapses surprisingly do not come out as a strong driver of participation, which raises questions on the micro-level management of lapses, heterogeneity of contracts and French financial literacy,
 - Riskier portfolios associated with lower participation,
- + Graphical exemplification of margin smoothing rather than participation smoothing for several firms.

Conclusion

Other angles could be used in a near future:

We need more granular data to investigate some points further
(profit sharing within the portfolio of the undertaking, competitive aspects of participation).

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