CeRP–Netspar
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'Financial Literacy and Pension-related Communication for Better Retirement and Long-Term Financial Decisions'

Pension Projections and Risk Indicators for Pension Plan Members: Recent Experiences and Policy Issues

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Motivation (Policy Questions)

- Pension projections: do we have to revise our regulation, taking into account the low-yield environment ?
  - ✓ To revise assumptions on expected returns ?
  - ✓ To introduce risk surrounding point estimates ?
- Risk indicators for pension plan investment options
  - ✓ How they should be designed ?

➢ Both as part of the information for pension plan members

Outline of Paper

- Pension Projections (PPs): current regulatory practice
  - ✓ Italy
  - ✓ Relevant experiences in other countries, EU regulation
- LT Expected Returns and the low-yield environment
  - ✓ Historical returns
  - ✓ Surveys of experts' expected returns
    - ➢ Tentative conclusions on whether to revise returns to be used in PPs
- Modelling and Estimating Risk in PPs
  - ✓ Discuss results of simple simulations assuming IID returns
  - ✓ Discuss alternative models to distinguish ST and LT risk
    - ➢ Suggestions for further research
- Risk Indicators for different investment options
  - ✓ Current practice and evolution of discussion in the EU
    - ➢ Suggestions for a template for EU Regulation
- Concluding remarks

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Current regulatory practice in selected OECD countries (1)

Country	Mandatory /voluntary, frequency	Return assumptions		Projection method	Communication of uncertainty about returns	Delivery to members
		Defined by	Rates of return			
UK	mandatory, annually (trust-based & contract-based plans)	pension plans under the guidance of the FRC	depending on the asset allocation; no max rates: (2.5% inflation)	deterministic		paper-based /fund online calculator
	mandatory, at joining (only contract-based plans)	pension plans, guidance of the supervisory authority	depending on the asset allocation. Max rates: nominal 2%, 5%, 7% (2.5% inflation)	deterministic; stochastic PPs are an option	risk warnings about volatility	paper-based /fund's online calculator
Italy	mandatory, at joining and annually	supervisory authority	depending on the asset allocation. Assumed rates: 4% real (equities); 2% real (bonds)	deterministic	warning about volatility	paper-based
	voluntary, at any time,	pension plans under the guidance of the supervisory authority	depending on the asset allocation. Central scenario: 4% real (equities); 2% real (bonds)	deterministic; online stochastic projections are an option	probabilistic scenarios, (in case of stochastic PPs)	fund/online calculators
Sweden	mandatory, annually (funded part of the I pillar)	supervisory authority	3.5% real	deterministic		paper-based
	voluntary, at any moment, (I, II and III pillar)	supervisory authority in cooperation with private pension providers	3.5% real for the funded part of the I pillar	deterministic		online calculator by supervisory authority and pension providers

Current regulatory practice in selected OECD countries (2)

Country	Mandatory /voluntary, frequency	Return assumptions		Projection method	Communication of uncertainty about returns	Delivery to members
		Defined by	Rates of return			
Australia	voluntary, at any time	supervisory authority	six investment options: 2.9% nominal for cash; 4.2% conservative (30% equities) up to 6.6% high-growth (100% equities)	deterministic	warning on the possibility that actual returns vary remarkably over time (in case of equity portfolios)	supervisory authority's online calculator
	voluntary, at any time	fund trustees and calculators providers				paper-based/online calculators
Mexico	mandatory, annually	supervisory authority	5% real	deterministic		paper-based
Chile	mandatory, annually, for those aged > 30	supervisory authority, together with pension funds' association	5% real, regardless of the asset allocation	deterministic		paper-based
	voluntary, at any time	supervisory authority		stochastic	three probabilistic scenarios (5th, 50th, 95th centile)	supervisory authority's online calculator

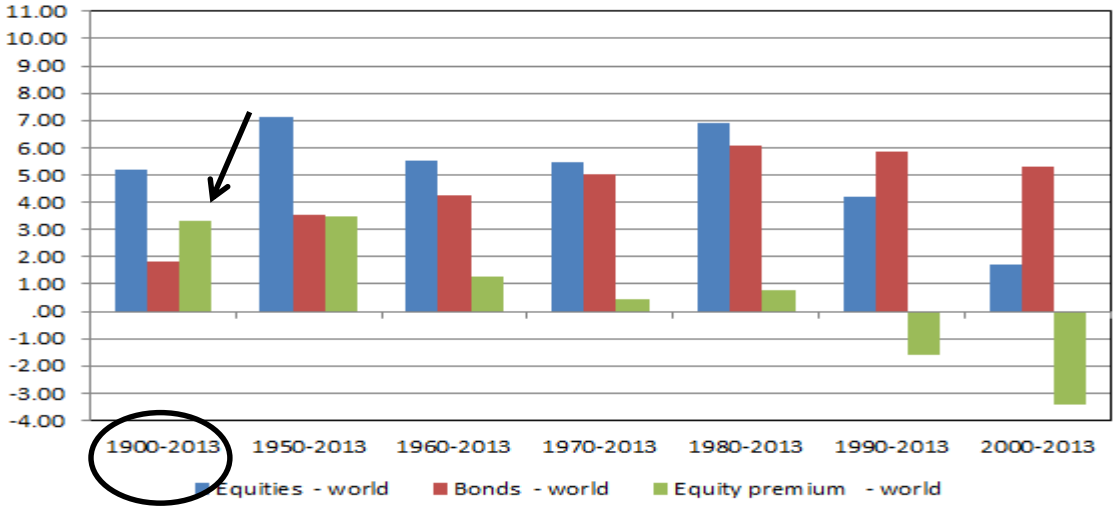
Pension Projections (PPs): EU Regulation

New text of the IORP Directive (to entry into force by 2019 –applies to occupational plans):

- Personalized PPs to be sent annually to pension plan members
- Assumptions on expected returns, etc. left to Member States
- Caveat to be included on uncertainty («PPs may differ from the final value of benefits»)
- If Scenarios are included, a «best estimate» and a «unfavourable» scenario must be included

PPs in Italy. Assumptions on Expected Real Returns (ERRs)

- ERRs to be assumed in PPs vary across investment options:
- Weighted Average based on SAA btw Bonds and Equities:
  - 2% bonds
  - 4% equities
    - 2% equity risk premium (ERP)
      - ➔ lower than long run average for a world portfolio
- Plan-specific costs to be deducted
- In practice, ERR for occupational plans is around 2.5%
- These rates were set in 2008 and have not been changed since then



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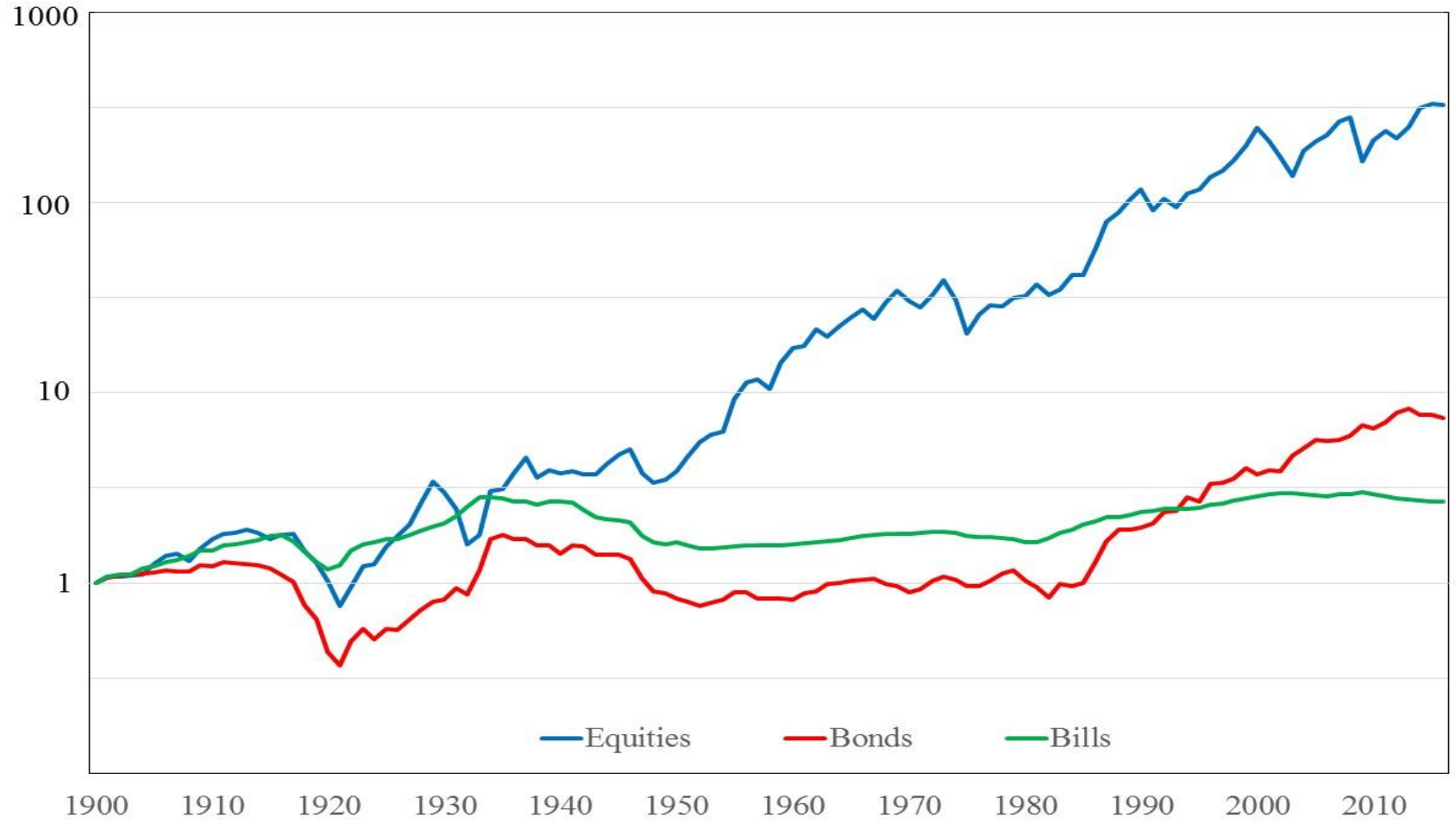
Historical Returns – DMS Database

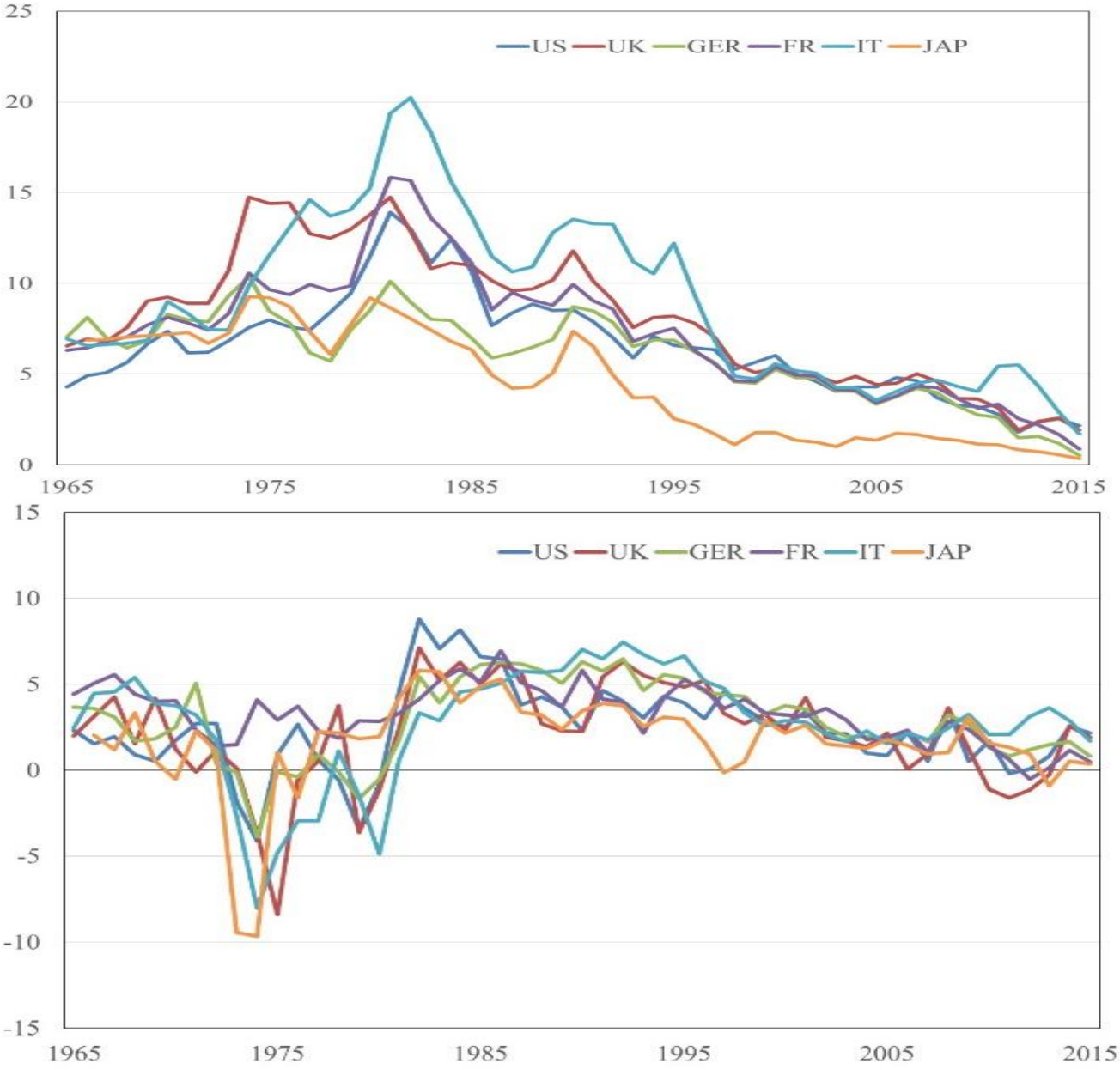
Figure 1. Cumulative world real returns from 1900 to 2015 (%).
(semi-log scale; 1.1.1900=1)



Source: DMS database; Credit Suisse (2016).

Historical Returns. Nominal and Real Bond Interest yields

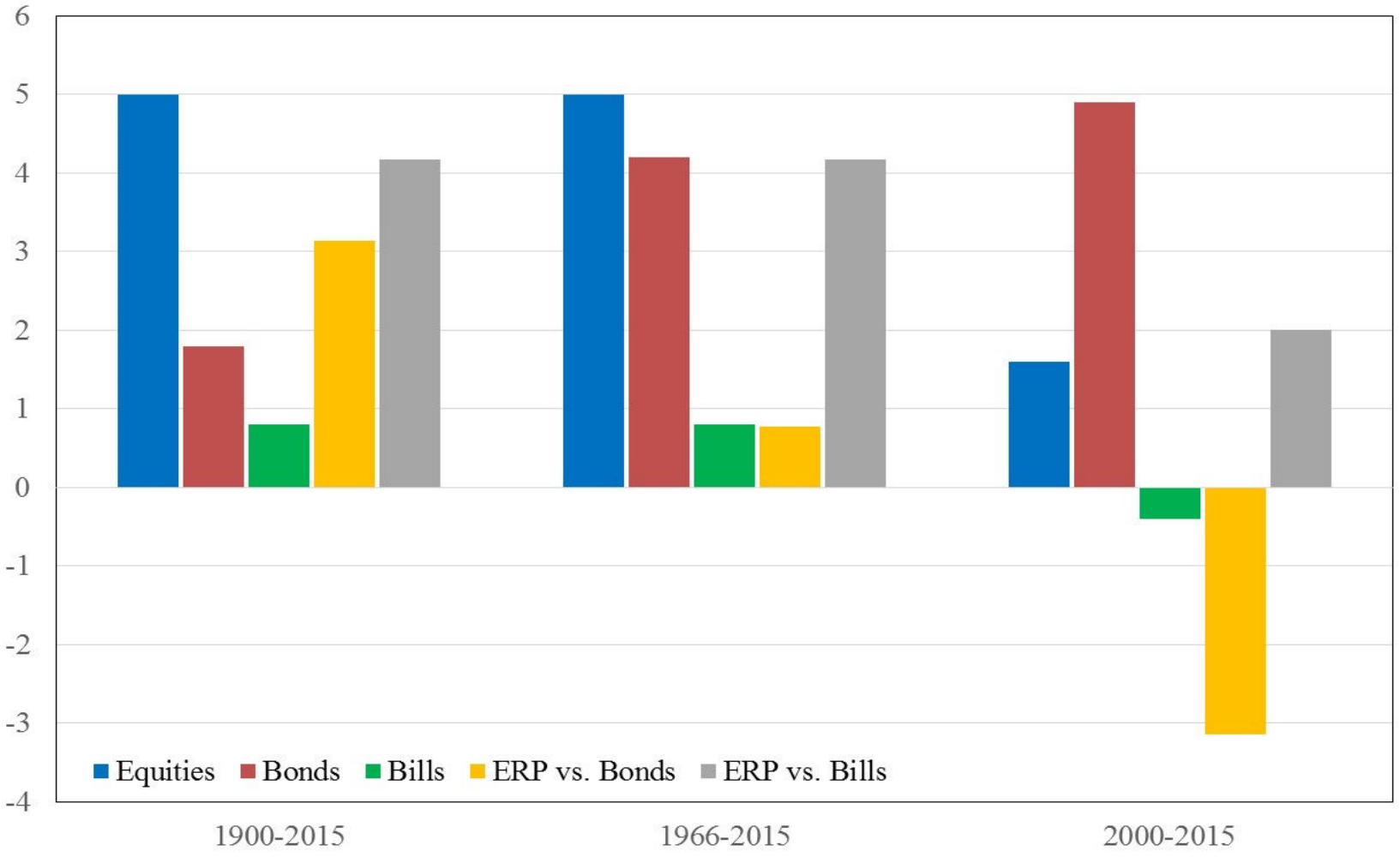
Figure 3. Nominal (figure above) and real (figure below) yields on long-term bonds *(in %)*



Source: Thomson Reuters.

Historical Returns and the Equity Risk Premium (ERP)

Figure 2. World annualized real returns on major asset classes and ERP.
(in %)



Source: DMS database; Credit Suisse (2016).

Rendimenti nominali dei fondi pensione negoziali e rivalutazione del TFR

Anni	Fondi pensione negoziali	TFR	Inflazione
2006	3,8	2,4	2,1
2007	2,1	3,1	1,7
2008	-6,3	2,7	3,4
2009	8,5	2	0,7
2010	3	2,6	1,6
2011	0,1	3,5	2,8
2012	8,2	2,9	3,1
2013	5,4	1,7	1,1
2014	7,3	1,3	0,2
2015	2,7	1,2	0,0
Rendimento medio annuo	***3,4***	***2,3***	***1,7***

Survey Estimates of the ERP

Table 2. Selected survey estimates of the US (Europe) equity risk premium

Survey	Year of the survey	ERP average estimate	ERP standard deviation	Respondents	Survey method
Fernandez et al. (2016)	2016	5.3%	1.3%	Professors, analysts and companies	Email questionnaire
Fernandez (2009)	2009	6.3% (5.3%)	1.5% (1.3%)	Professors	150 finance textbooks from 1979 to 2009
Graham and Harvey	2015	4.5%	3.5%	CFOs	questionnaire
Welch (2008)	2007	5.0%	1.8%	Academic financial economists	e-mail questionnaire
BoA-Merrill Lynch (2012)	2012	4.1%	na	Institutional investors	Panel interviews
Graham and Harvey	2000-2015	3.5%	2.8%	CFOs	questionnaire
Welch (2000)	1997-1998	7.2%	2.0%	Academic financial economists	Website and paper-based questionnaire

Expected Returns for PPs to be revised? Tentative conclusions

- ✓ «mark-to-market» approach not appropriate for PPs addressed to plan members
- ✓ No consensus on whether causes of currrent Low-Interest Rate Environment (LIRE) are mainly temporary or permanent
  - ➢ Anyway, LIRE is going to stay for some years to come
- ✓ Effect of LIRE on Equities (ERP) is more complex
  - ✓ Financial Crisis of 2008 raised risk aversion and requested ERP
  - ✓ Indeed, recovery of equity mkts in 2009-2015 fulfilled this request
  - ✓ Rel. high valuations of today have probably driven ERP back to normal
    - ➢ No compelling reason to reduce ERP
- ✓ Reaction function of pension plans has to be taken into account. Some search-for-yield (SfY) will take place (for fixed-income as well). SfY will contribute to increase both expected returns and risk exposure
  - ➢ Reduction of expected interest rates is not really warranted, perhaps should be assumed only temporary
  - ➢ More attention to risk is needed in the prevailing future context

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Risk in PPs

In 2013 COVIP issued a discussion paper (DP) aimed at addressing two main issues: **a**) Are risk-adjusted PPs really worthwhile? **b**) How risk could be measured and communicated to members? The DP was put up for public consultation

In the DP, stochastic Monte Carlo simulations were carried out to measure investment risks based on the following inputs/outputs):

- historical time series of world equity and bond returns and equity risk premiums (mean and standard deviation - DMS dataset)
- log-normal distribution of returns - 100,000 simulations
- for each simulation path, the accumulated capital at different holding periods was computed, for different asset allocations

Major issues:

- log-normal (normal) distribution vs. other distributions of returns
- mean reversion effect (equity risk ⇩ in the long run)?
- financial markets' shocks, prolonged low yield environment
- what about other risks (human capital risk, payout phase risk, …, see OECD)

⇨ modelling model risk: one model does not fit all!

Risk in PPs

- ✓ In 2013 COVIP already issued a discussion paper (DP) on the issue of whether and how to introduce risk in PPs for pension plan members.
  - ✓ Besides a general and comprehensive discussion, a simple stochastic model of returns was estimated
  - ✓ DMS dataset 1900-2011 index of world real returns in US dollars for bonds and equities
  - ✓ log-normal model w. IID returns
  - ✓ 100.000 Monte Carlo simulations

PPs and the low-yield environment

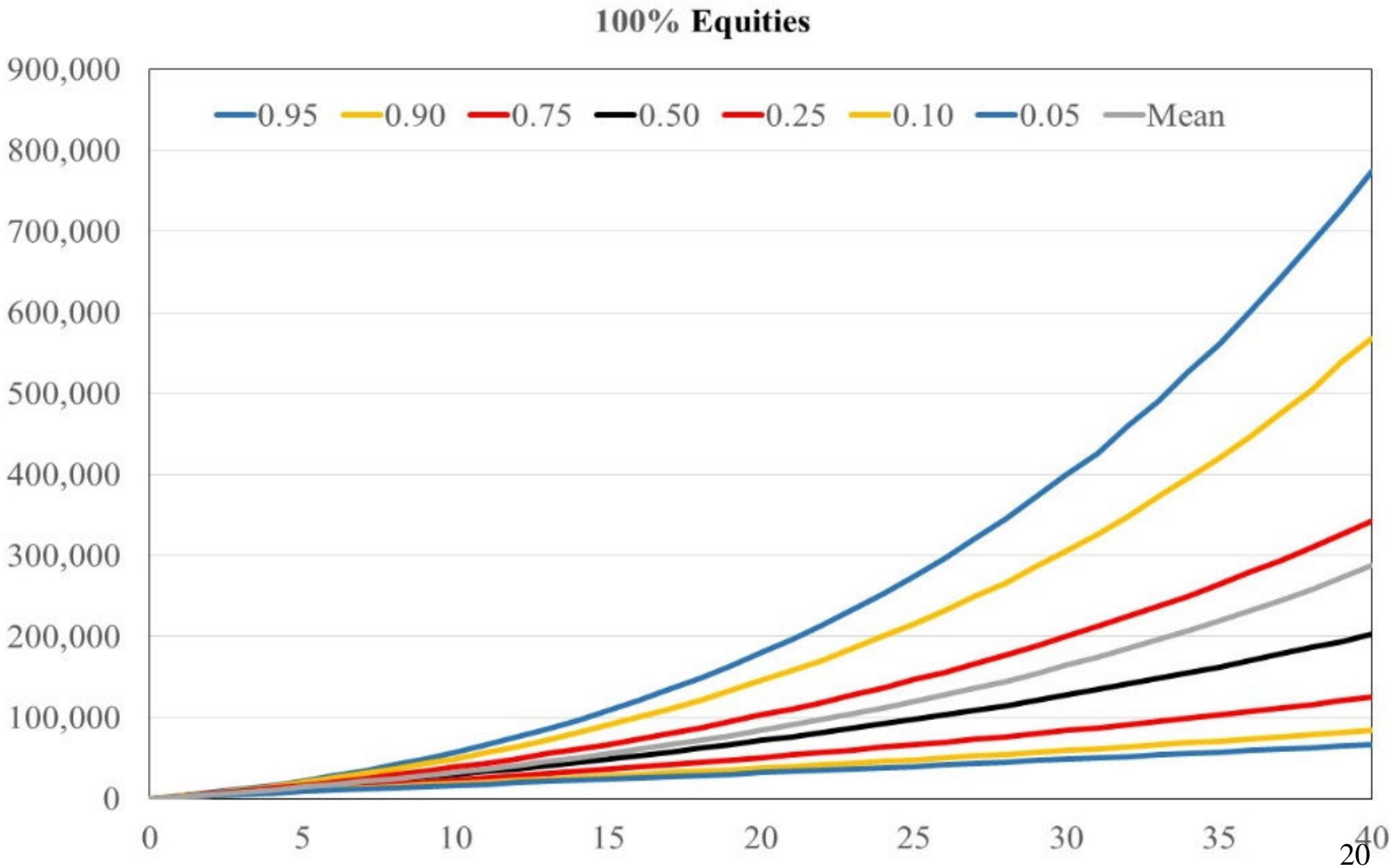
Table 3. Stochastic projected assets for selected probabilistic scenarios
(in €)

Years	Total contributions	100% Bonds			100% Equities		
		5th percentile	Mean	95th percentile	5th percentile	Mean	95th percentile
1	2,500	2,160	2,550	2,984	1,863	2,600	3,493
5	12,753	10,554	13,533	17,062	8,713	14,356	22,178
10	26,156	20,938	29,165	39,556	16,542	32,554	57,261
20	55,048	42,750	67,768	101,990	32,138	84,148	178,256
30	86,962	66,903	118,196	193,862	48,683	164,281	399,213
40	122,216	94,680	183,390	323,046	67,118	287,054	769,450

Source: COVIP (2013)

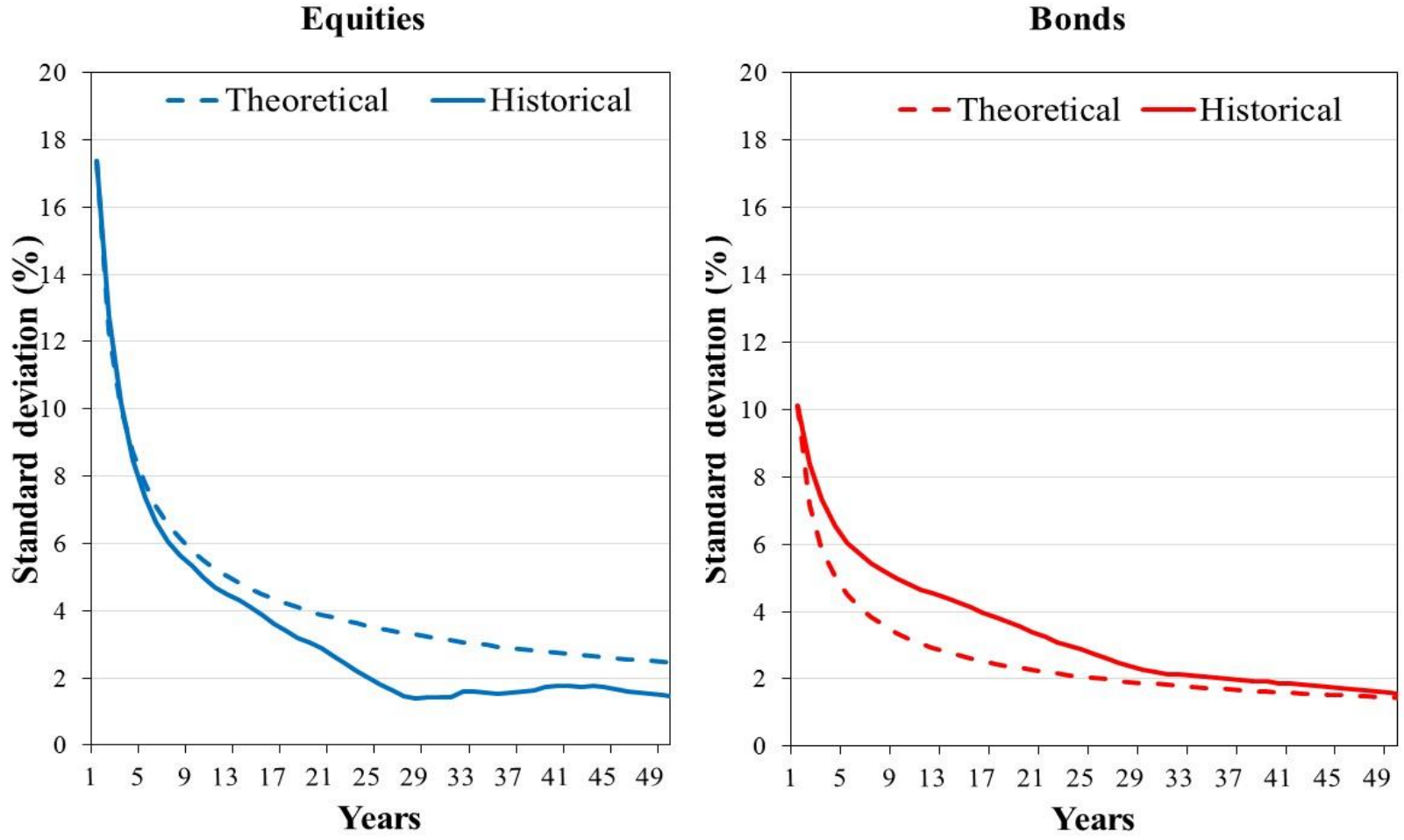
PPs and the low-yield environment

Figure 4. Stochastic projected assets for multiple probabilistic scenarios
(in €)



PPs and the low-yield environment

Figure 5. Theoretical vs. historical annualized standard deviation of world average real returns



Source: own calculations from DMS database.

Policy issues in Modelling Risk for PPs

- ✓ Simple models used for estimating Short-Term Risk (IID returns) are not appropriate for modelling Long-Term (LT) risk, especially for PPs addressed to pension plan members
  - ✓ LT data on returns of equities do show mean-reversion-like features
  - ✓ With Time SqRR, LT Projections exhibit very large 5-95 range
  - ✓ Unclear whether a narrower range would help (e.g. quartiles)

  - ➢ Need to work with models where returns are not IID
    - ✓ Models w. autoressive components (mean reversion)
    - ✓ Models w. a «rare events», catastrophe-like component

Exploring the use of“rare events” models for PPs

- ✓ In the context of Finance Theory, rare events have been used to solve the «ERP puzzle» of Mehra-Prescott (1985)
  - ✓ Rietz (1988), Barro (2006…)

  …very rare events that usually do not occur in the sample (ex-post) but must be rewarded ex-ante in every period

- ✓ What about specifying a model as follows:
  - ✓ Equity returns generated by a st. process w. two additive components:
    - ✓ a simple log-normal term w. IID distribution
    - ✓ A negative event that has a small (but not too small) probability to occur in every period

Exploring the use of“rare events” models for PPs (2)

…in other words, we think about a world where the time horizon of the participation to a pension plan (say 40 years), some (say 3-5) financial crises do occur with almost certainty, while for much shorter time horizons (say 5 years) they may or may not.

- ✓ Ex-post, this implies that multi-period returns for long time horizons exhibit a significantly lower variance than in the case of a stand-alone IID process.
- ✓ Ex-ante risk has to be remunerated. So, in the additive model (log-normal IID + Rare Event) the drift of the IID component has to be high enough to compensate p(RE) in every period.

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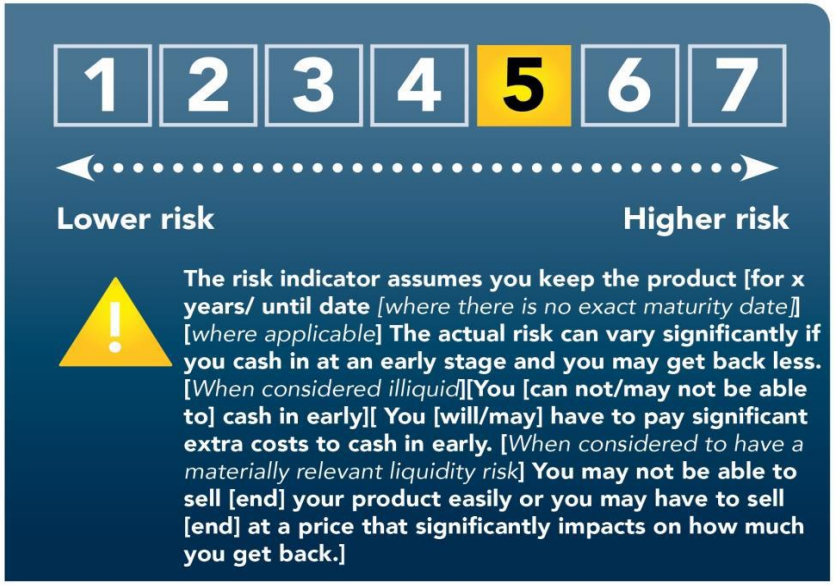
Risk indicators for pension plan investment options

- ✓ Risk indicators have been part of EU regulation for investor protection for many years already (UCITS Directive)
- ✓ Recently, PRIIPS Regulation was issued requiring a standardized KID to be prepared and given to investors of all PRIIPS (including UCITS)
- ✓ Discussions in place whether to extend the requirement to pension plans

Risk indicators for pension plan investment options

Figure 6: Summary Risk Indicator for PRIIPS as defined by the EU Regulation



Source: ESAs (2016)

- ✓ We argue that such an indicator is not appropriate for pension plans, because risk level depends on time horizon to retirement
  - ➢ We suggest a two-dimensional risk indicator

Risk indicators for pension plan investment options

Fig. 7. Two dimensional risk indicators for various investment options

Time to retirement	Risk indicator for Investment Option "Long-Term Growth" (SAA: 70% Equities)						
>30 Y			3				
20-30 Y			3				
15-20 Y				4			
10-15 Y					5		
5-10 Y						6	
2-5 Y							7
<2 Y							7

→ *risk increasing* →

Time to retirement	Risk indicator for Investment Option "High Liquidity" (SAA: 100% Short-Term Bonds)						
>30 Y						6	
20-30 Y					5		
15-20 Y				4			
10-15 Y			3				
5-10 Y		2					
2-5 Y	1						
<2 Y	1						

→ *risk increasing* →

Time to retirement	Risk indicator for Investment Option "Long-Term Income" (SAA: 100% Long—Term Bonds)						
>30 Y					5		
20-30 Y				4			
15-20 Y			3				
10-15 Y		2					
5-10 Y		2					
2-5 Y			3				
<2 Y				4			

→ *risk increasing* →

Time to retirement	Risk indicator for Investment Option "Targeting 2060" (SAA: variable approaching the target date)						
>30 Y			3				
20-30 Y			3				
15-20 Y			3				
10-15 Y			3				
5-10 Y			3				
2-5 Y		2					
<2 Y	1						

→ *risk increasing* →

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Concluding Remarks

- Pension Projections and Risk Indicators play an important role in the information to be delivered to pension plan members
  - The challenge is to keep information simple, but still correct and not misleading

- On the need to revise downwards expected returns in PPs (taking into account the low-yield environment), one may end-up with mixed conclusions
  - Anyway, an increased attention to the uncertainty surrounding the point estimates is warranted

- Investment risk in PPs should not be modelled by looking at ST Risk and extrapolating it by square root rule of time.
  - We suggest using jump processes to take into account recurrent financial crises and distinguish ST and LT Risk

- Risk Indicators (RIs) as well have to distinguish the different time horizons before retirement available to each individual
  - We propose two-dimensional Risk Indicators

- In principle, PPs and RIs should be based on consistent measures of ST and LT Risk

Thank you!

questions / comments are welcome

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