Modelling pension liabilities

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Content

Supplementary table in ESA2010 (1)

- **Goal**
  - **give an overview of pension obligations towards households**
  - **standardized table in 2008 SNA/ESA2010**
  - **includes the PV of pension entitlements arising from already accrued pension rights**
  - **covers every pension type (including old age, survivor's and disability pensions)**
  - **reports relations between stocks and flows in schemes**
  - **includes defined benefit schemes and defined contributory schemes, private and general government pension schemes**

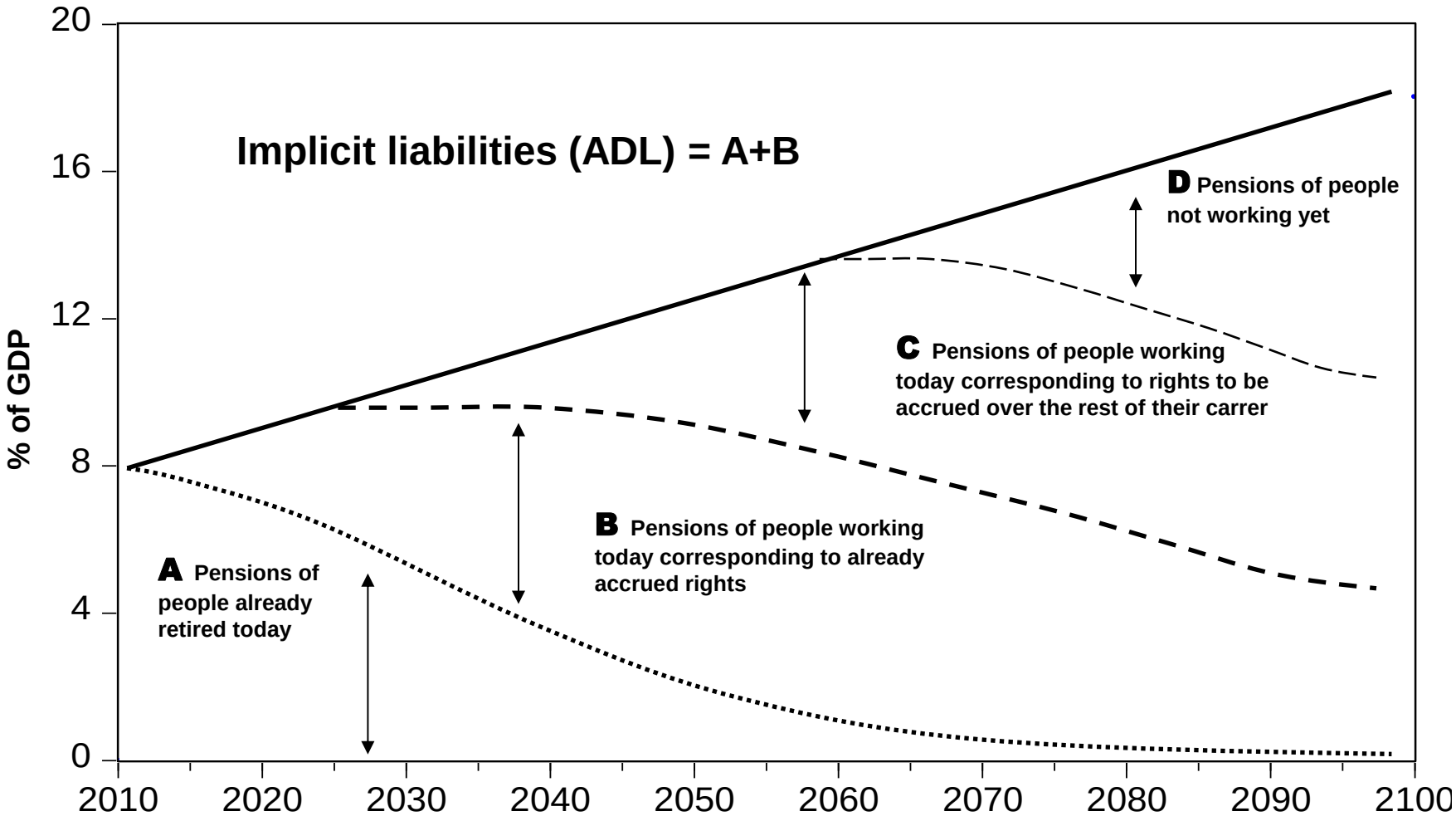
- **The Role of NBS**
  - **modelling pension entitlements (I. pillar - general government, army/police pension schemes)**

Supplementary table in ESA2010 (2)

The supplementary table on pension schemes in social insurance

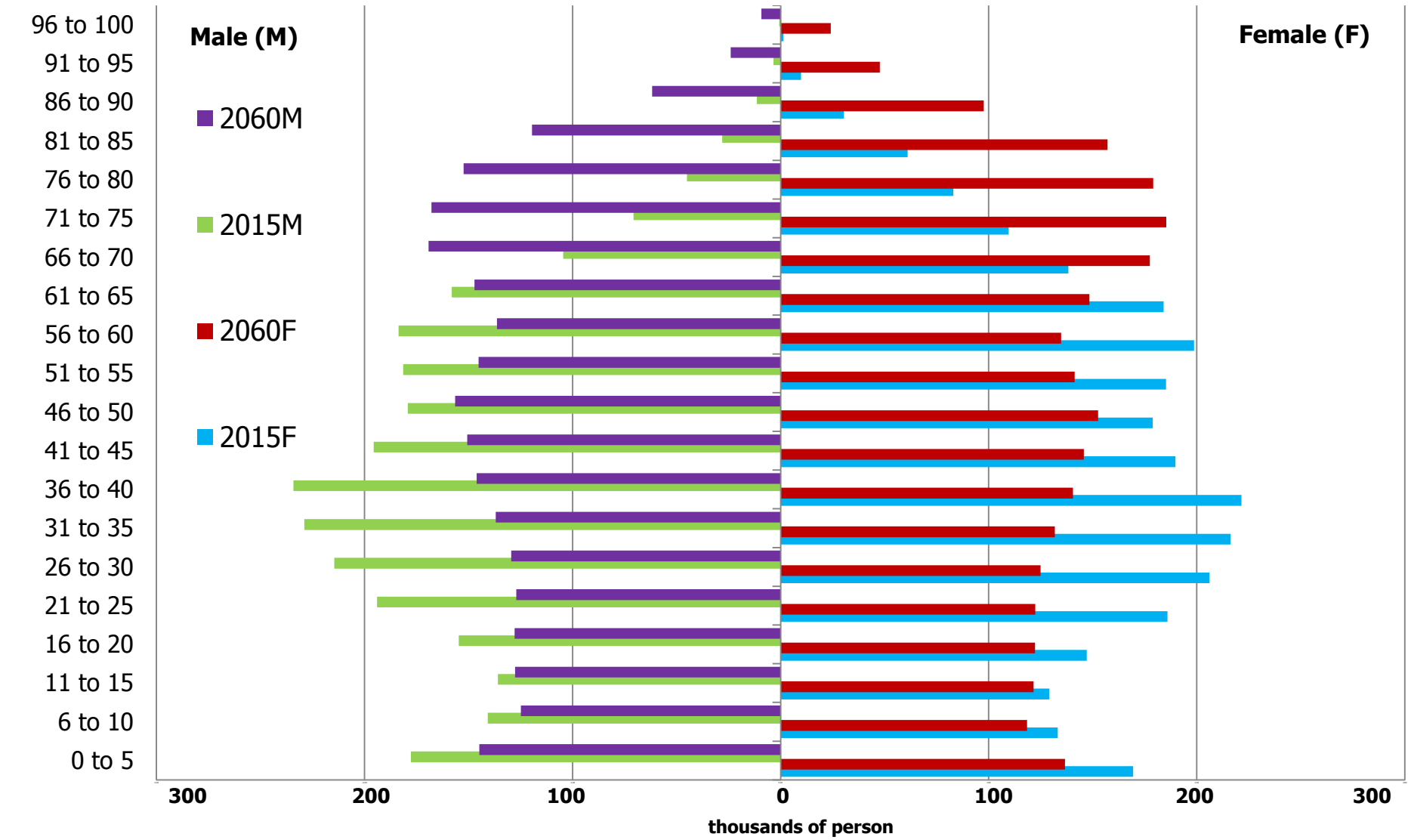
Rela-tions	Row No.	Recording	Core national accounts						Not in the core national accounts		Total pension schemes	Counter-parts: Pension entitle-ments of non-resident house-holds[4)]
		Pension manager	Non-general government			General government						
							Defined benefit schemes for general government employees[2)]			Social security pension schemes		
			Defined con-tribution schemes	Defined benefit schemes and other[1)] non-defined contri-bution schemes	Total	Defined contri-bution schemes	Classi-fied in finan-cial corpora-tions	Classi-fied in general govt 3)	Classi-fied in general govern-ment			
		Column number	A	B	C	D	E	F	G	H	I	J
		Opening balance sheet										
	1	Pension entitlements										
		Changes in pension entitlements due to transactions										
Σ 2.1 to 2.5	2	Increase in pension entitlements due to social contributions										
	2.1	Employer actual social contributions										
	2.2	Employer imputed social contributions										
	2.3	Household actual social contributions										
	2.4	Household social contribution supplements[5)]										
	2.5	Less: Pension scheme service charges										
	3	Other (actuarial) change of pension entitlements in social security pension schemes										

Coverage in ESA2010



(Source: Eurostat, ECB, 2010)

Demographic projection by age groups in Slovakia



source: Europop 2015

Key changes in pension system in Slovakia

- **Introduction of funded II. pillar scheme**
  - **has impact on implicit debt in general SS pension scheme**
  - **2005-3q2012 social contribution divided between I. (PAYG) and II. pillar, old-age contribution (18% of wage base) divided equally between pillars (9%/9%)**
  - **4q2012 -2016 contributions divided into 14%/ 4%**
  - **gradually in 2017-2024 change of 0,25 points a year to ratio 12%/6%**
  - **participation in the II. pillar is not mandatory**
- **Changes in pension indexation**
  - **shift from Wage/Inflation indexation towards Inflation**
  - **Minimum pension**
- **Change in retirement age**
  - **generally 62 years (both men and women)**
  - **after 2017 linked to changes in life expectancy**
- **Extended minimum years of service in army/police**
  - **from 15 to 25 years (2013)**

Model (1) – composition

- **Liabilities to:**
  - **current contributor**
  - **current pensioner**

- **Entitlements by type:**
  - **old age pensions**
  - **early-old age pensions**
  - **disability pension**
  - **survivor's pension**

- **Pension schemes:**
  - **general government pension scheme**
  - **army social security pension scheme (VUSZ)**
  - **police social security pension scheme (MV SR)**

Model (2) – estimating pension entitlements

- **Beneficiaries – calculation:**
  - **in the year t_0**
  - **for cohort group of age x**
  - **gender g**

$$TL^B_{[g,x]t_0} = \sum_{t=1}^{100-x} S^B_{[g,x],t_0}\ p_{[g,x]t}\ \frac{\prod_{i=1}^{t}(1+v_i)}{(1+r)^t}, \qquad x \in \langle x_0, 100\rangle$$

  - $S^B_{[g,x],t_0}$ **- sum of pensions paid to [g, x] in the year t_0**
  - $p_{[g,x]t}$ **- survival rate of the year x+t**
  - v_i **- valorization rate**
  - r **- discount rate**

- **Beneficiaries – total liabilities:**

$$TL^B_{t_0} = \sum_{x=x_0}^{100-1} TL^B_{[male,x]t_0} + \sum_{x=x_0}^{100-1} TL^B_{[female,x]t_0}$$

Model (3) – estimating pension entitlements

- **Contributors, I. pillar – calculation:**
  - **in the year t_0**
  - **for cohort group of age x**
  - **gender g**

$$TL^{C,I}_{[g,x]t_0} = n_{[g,x]t_0}\ \lambda_x\ \alpha_{[g,x]t_0} \sum_{t=1}^{100-x} S^{C}_{[g,x],t_0}\ p^{O}_{[g,x]t} \sum_{s=0}^{100-x-t+1} p_{[g,x]t+s} \frac{\prod_{i=t+1}^{t+s}(1+v_i)}{(1+r)^{t+s}}$$

  - $n_{[g,x]t_0}$ **- number of contributors [g, x] in the year t_0**
  - λ_x **= (Actual age – Start contribution)/(Retirement age – Start contr.)**
  - $\alpha_{[g,x]t_0}$ **- I. pillar contributor's share**
  - $S^{C}_{[g,x],t_0}$ **- annual amount of future pension in cohort [g, x]**
  - $p^{O}_{[g,x]t}$ **- probability of insurance event**
  - $p_{[g,x]t+s}$ **- survival rate of the year x+t**
  - v_i **- valorization rate,** r **– discount rate**

Model (4) – estimating pension entitlements

- **Contributors, II. pillar – calculation:**
  - **in the year t_0**
  - **for cohort group of age x**
  - **gender g**

$$TL^{C,II}_{[g,x]t_0} = n_{[g,x]t_0}\ \lambda_x\ (1-\alpha_{[g,x]t_0})\ (1-\beta_x) \sum_{t=1}^{100-x} S^{C}_{[g,x],t_0}\ p^{O}_{[g,x]t} \sum_{s=0}^{100-x-t+1} p_{[g,x]t+s} \frac{\prod_{i=t+1}^{t+s}(1+v_i)}{(1+r)^{t+s}}$$

  - β_x **- II. pillar participation share of contributor's cohort [g, x]**

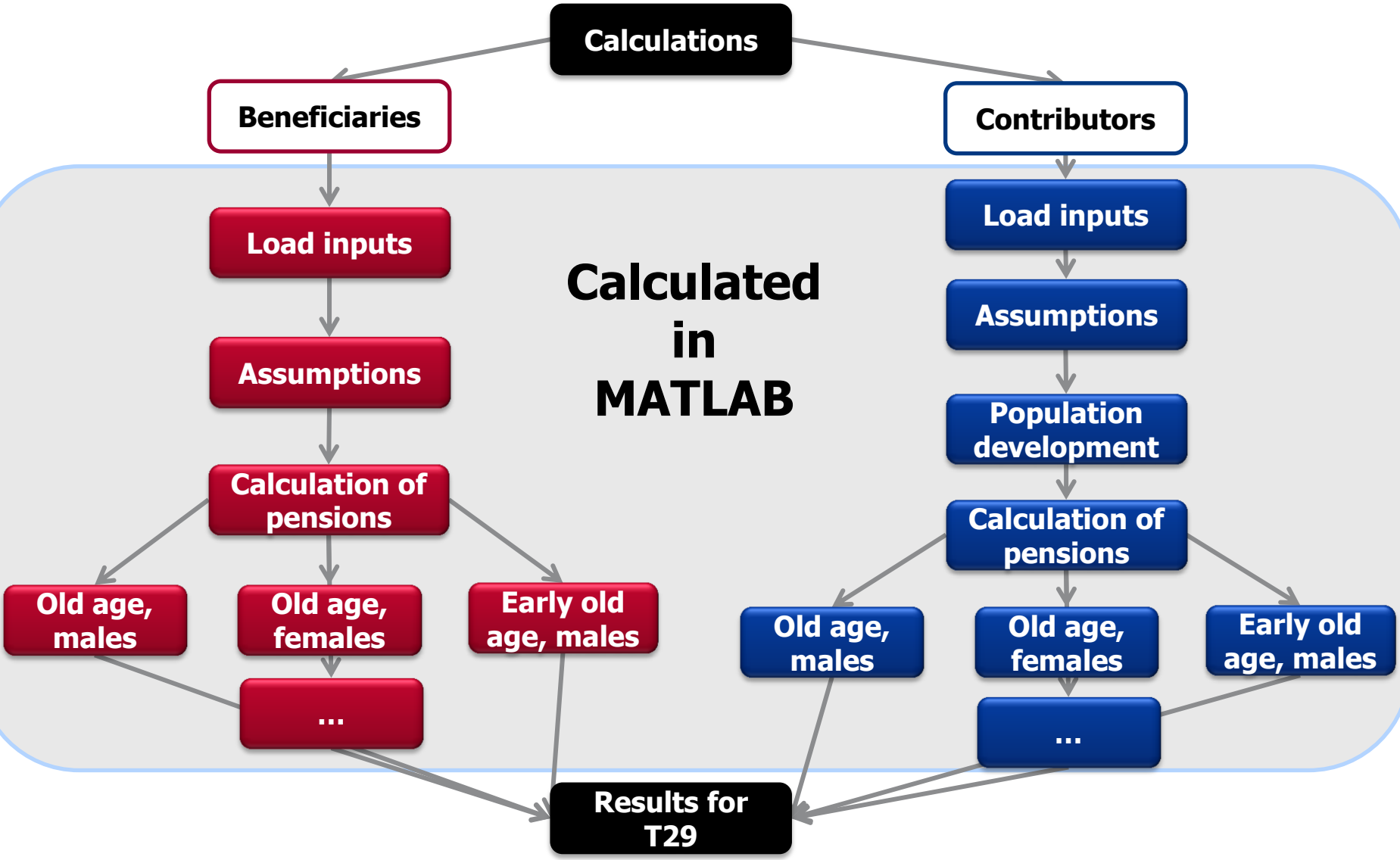
- **Contributors – total liabilities:**

$$TL^{C}_{t_0} = \sum_{g\in\{M,F\}} \sum_{x=x_0}^{100-1} TL^{C,I}_{[g,x]t_0} + \sum_{g\in\{M,F\}} \sum_{x=x_0}^{100-1} TL^{C,II}_{[g,x]t_0}$$

Database - data sources

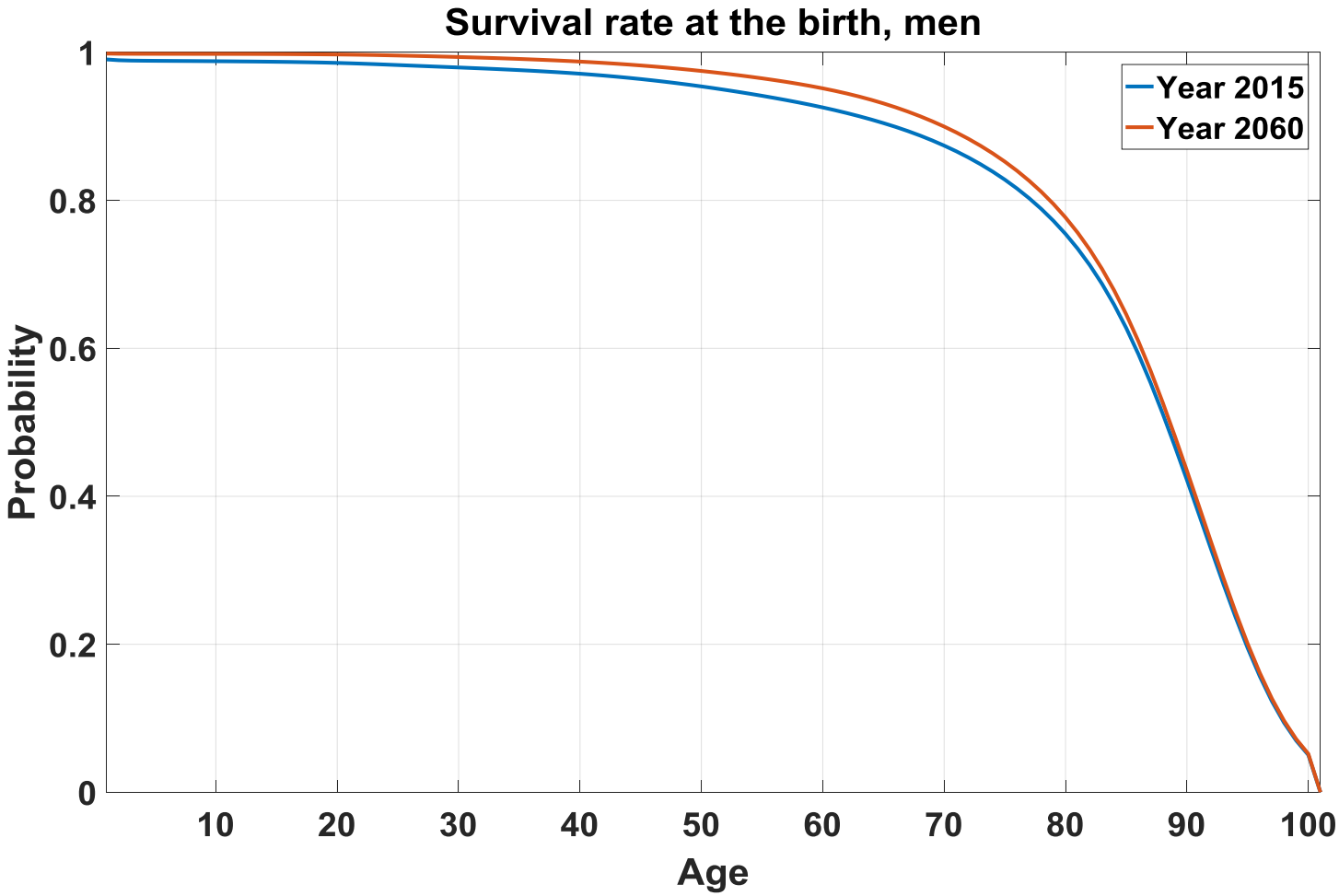
- **Social Insurance Agency in Slovakia**
  - **data of current pensioners (numbers, average pensions)**
  - **pension expenditures**
  - **current workers (numbers, average wages)**
  - **II. pillar contributors**
- **Military/Police Social Security Office**
  - **data of current pensioners (numbers, average pensions)**
  - **current military/police forces (numbers, average wages)**
- **Database**
  - **all data in cohorts – divide to the age groups, gender (type of pension – for pensioners)**

Programming scheme



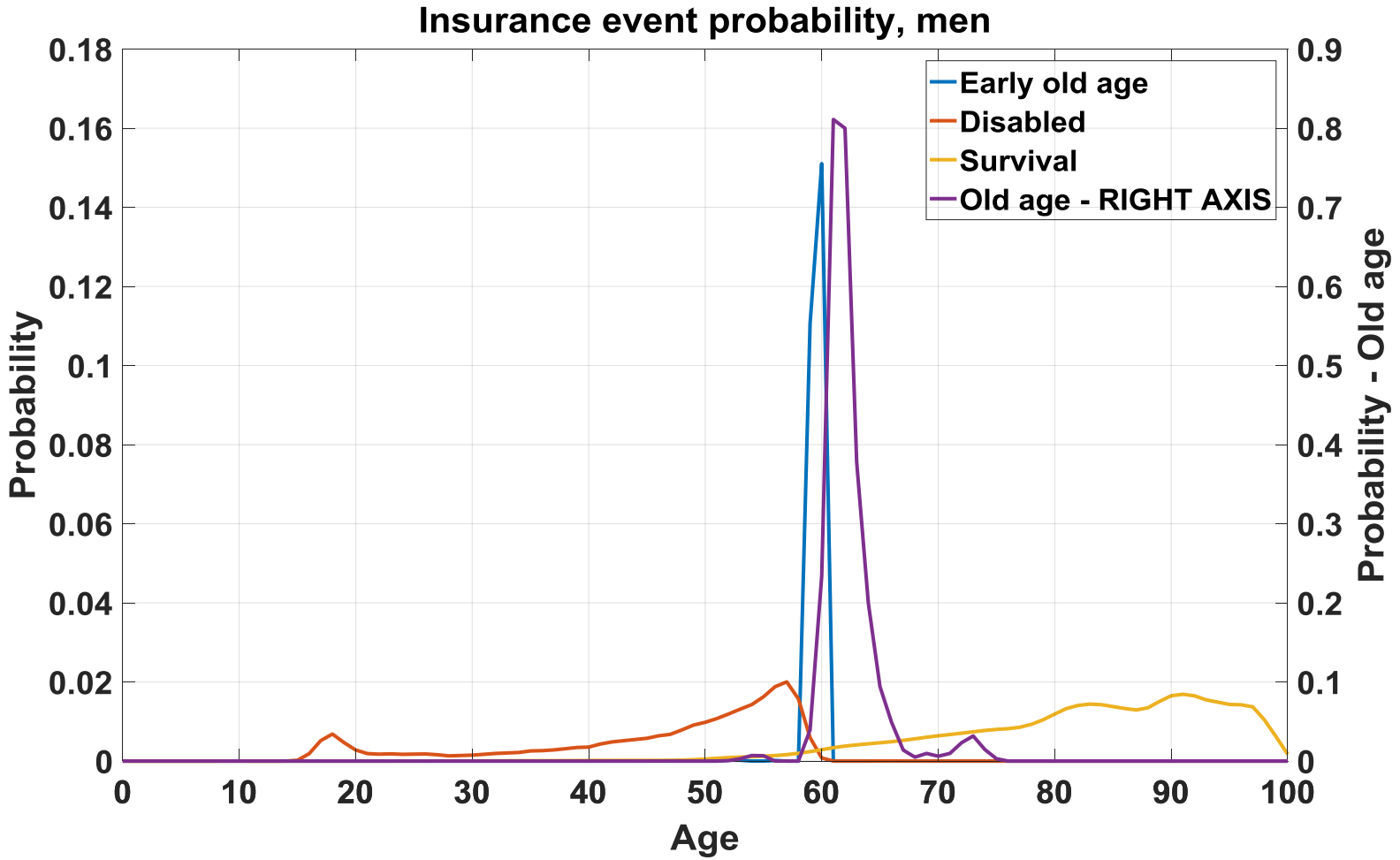
Main assumptions (1)

- **Survival rate**
  - **consistent with demographic Europop assumptions**



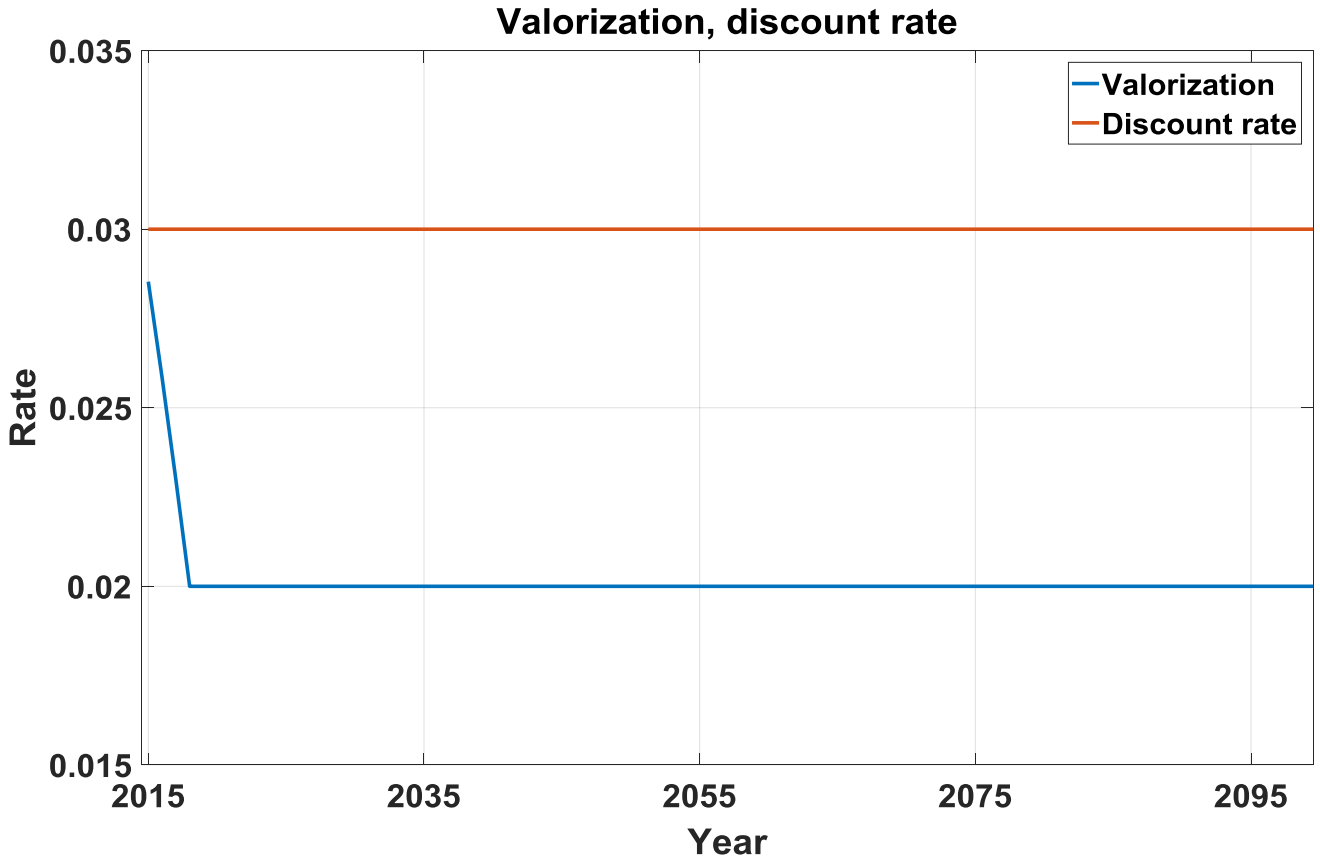
Main assumptions (2)

- **Insurance event probability**
  - **computed from data from previous years**
  - **approximation**



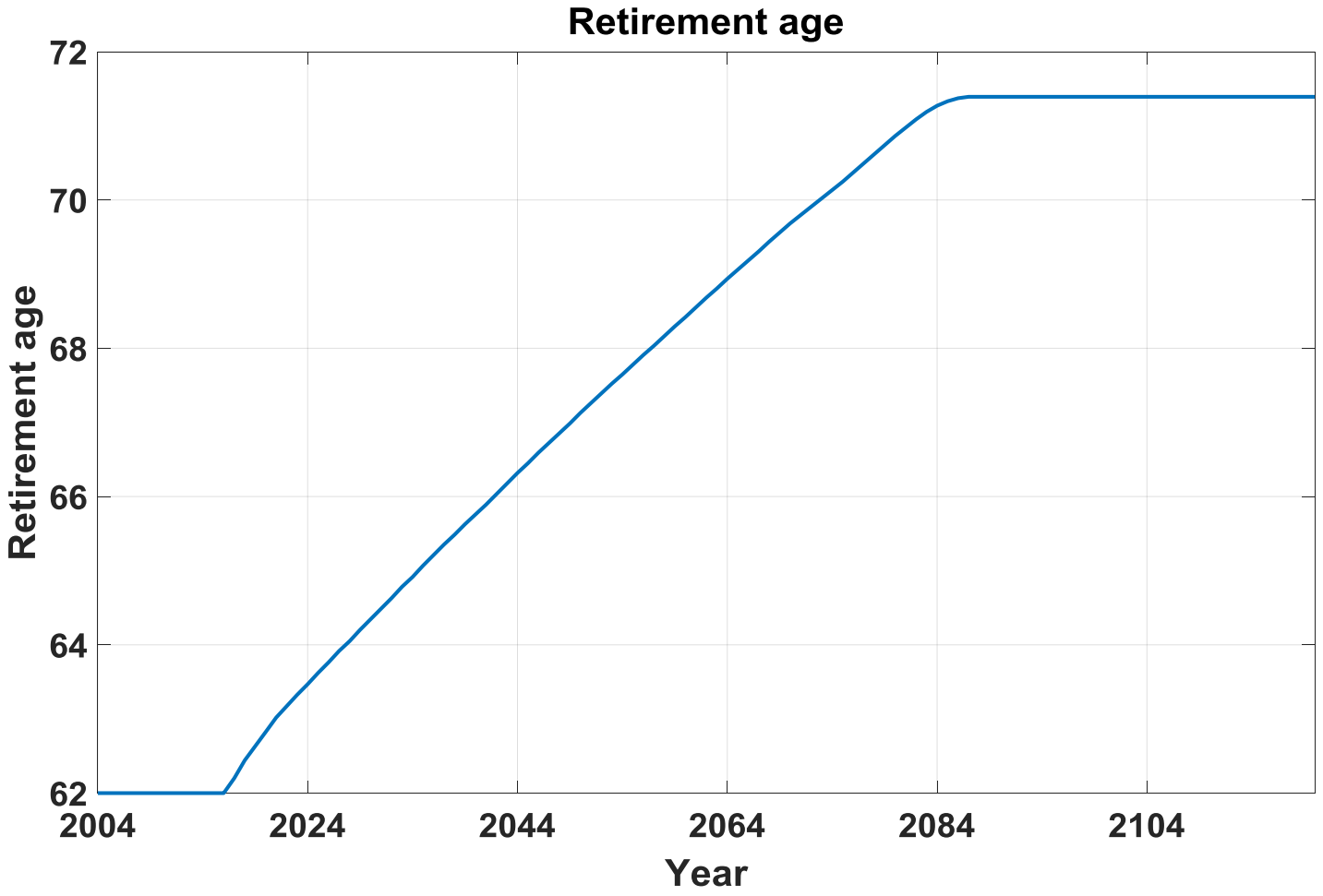
Main assumptions (3)

- **Pension valorization**
  - **legislation based**
  - **in Slovakia – wage → inflation growth dependent**
  - **inflation – 2% - according to Eurostat Technical guide**
- **Discount rate**
  - **3% - according to Eurostat Technical guide**

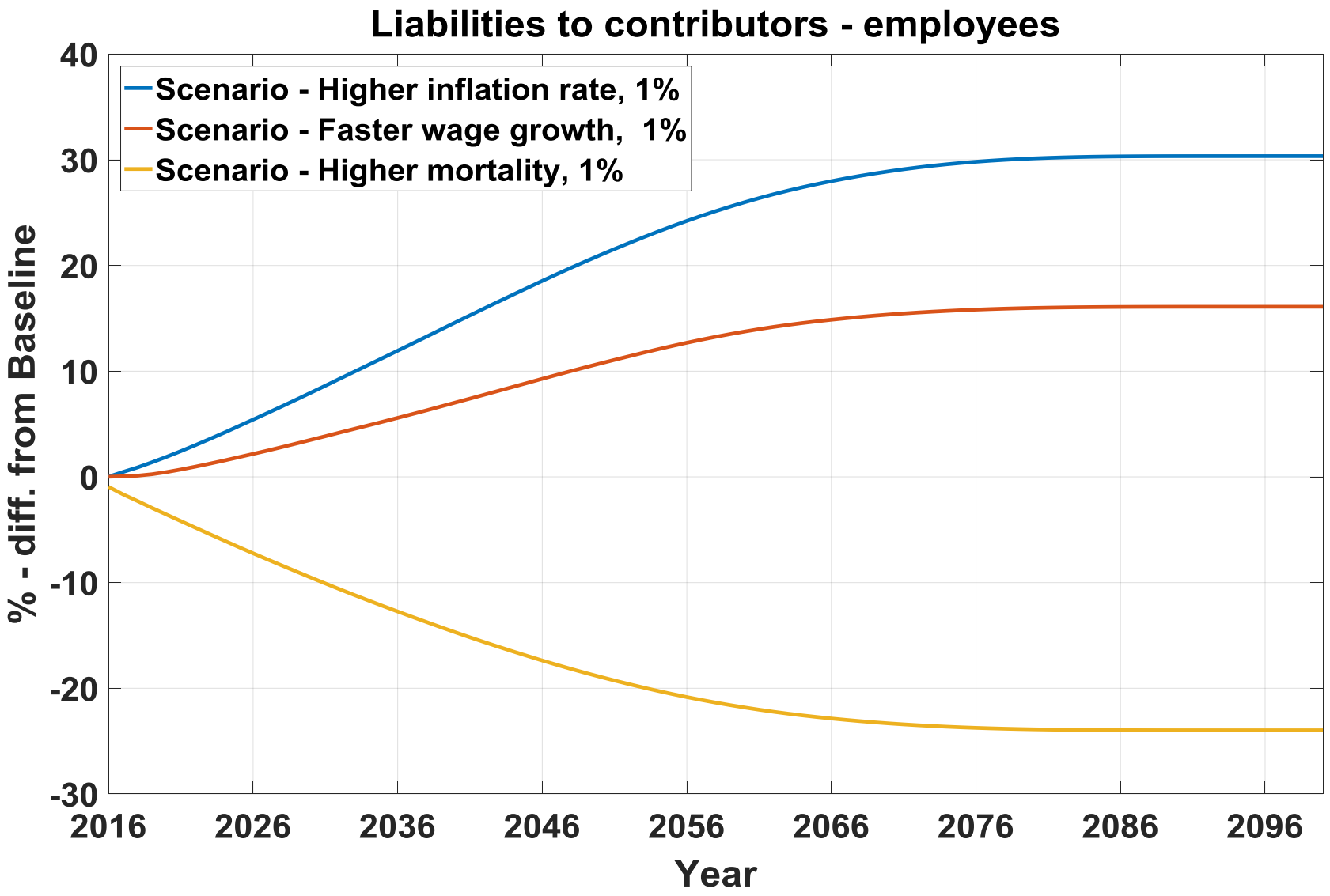


Main assumptions (6)

- **Retirement age**
  - **legislation based**
  - **fixed to the life expectancy at retirement age**



Simulation results



Conclusion

- **Done (small improvements to be added)**
  - **calculation for general government pension scheme**
  - **evaluation scenarios**
- **In progress**
  - **Evaluation calculation liabilities for army social security system**
  - **Evaluation calculation liabilities for police social security system**
- **Next**
  - **Discuss possible scenarios of main assumptions (mainly about insurance event probability)**
  - **Compare results with other countries**

Thank you

References

- **European Commision,** The 2015 Ageing Report: Underlying Assumptions and Projection Methodologies, 2014, Brussels
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- **Statistics Netherlands,** Constructing the Supplementary Pension Table for the Netherlands, 2015/07