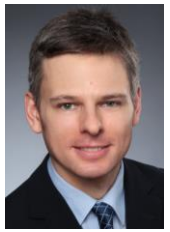
Reserving for Life Insurance in a Low Interest Rate Environment – Additional Interest Provisions

Dr. Wolfgang Siegert,
Allianz Lebensversicherungs-AG

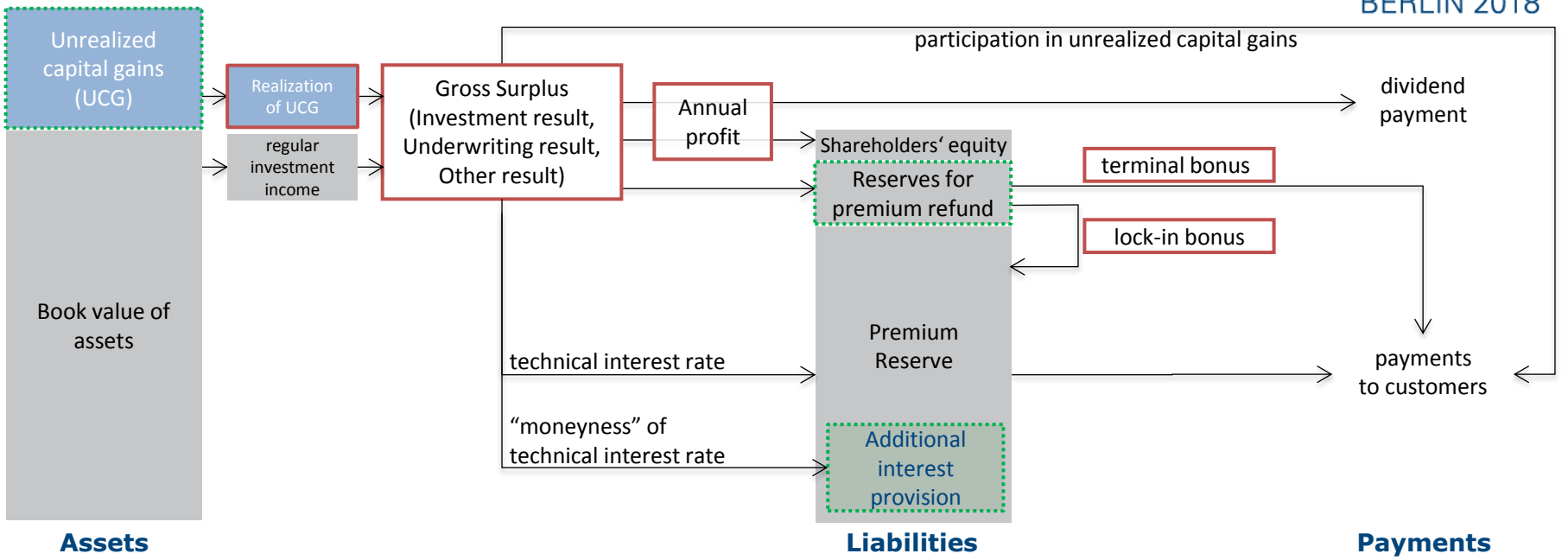
About the speaker



- **Dr. Wolfgang Siegert**
- Member of actuarial research unit at Allianz Lebensversicherungs-AG since 2009
- Member of the German Actuarial Association (DAV) since 2012
- In 2007 joined Allianz Lebensversicherungs-AG (2007-2009: product development);
- Studies in Mathematics, focusing on Stochastic Analysis:
  Ph.D. from Humboldt University Berlin (2007),
  Diploma degree from Regensburg University (2003),
  academic year 2000/2001 at Brandeis University (USA).

- **Allianz Lebensversicherungs-AG**
- German Life entity of Allianz SE
- Market leader in Germany, market share of 20,4% in 2016

Reserves in German life insurance (sketch)

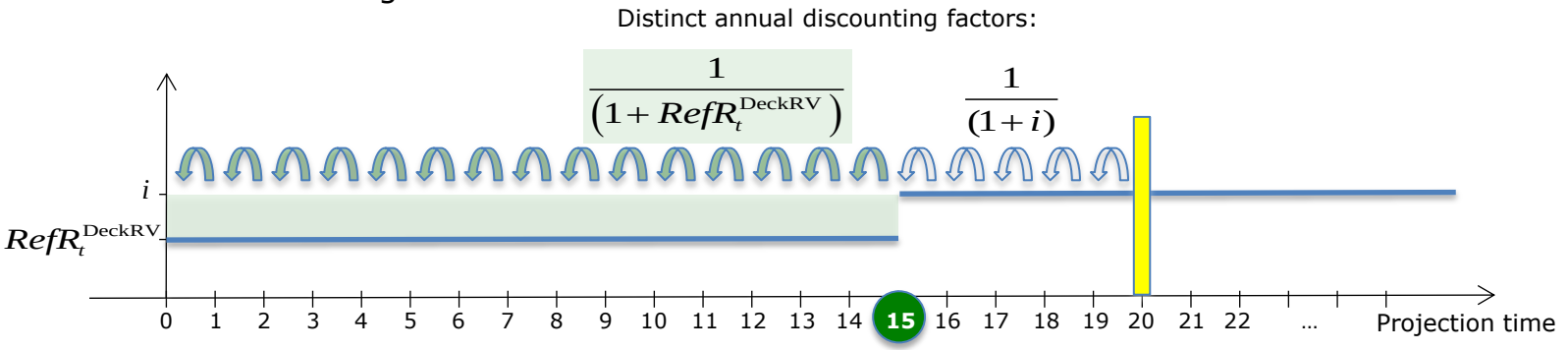


... buffer ... subject to steering

Additional interest provision in Germany (ZZR)

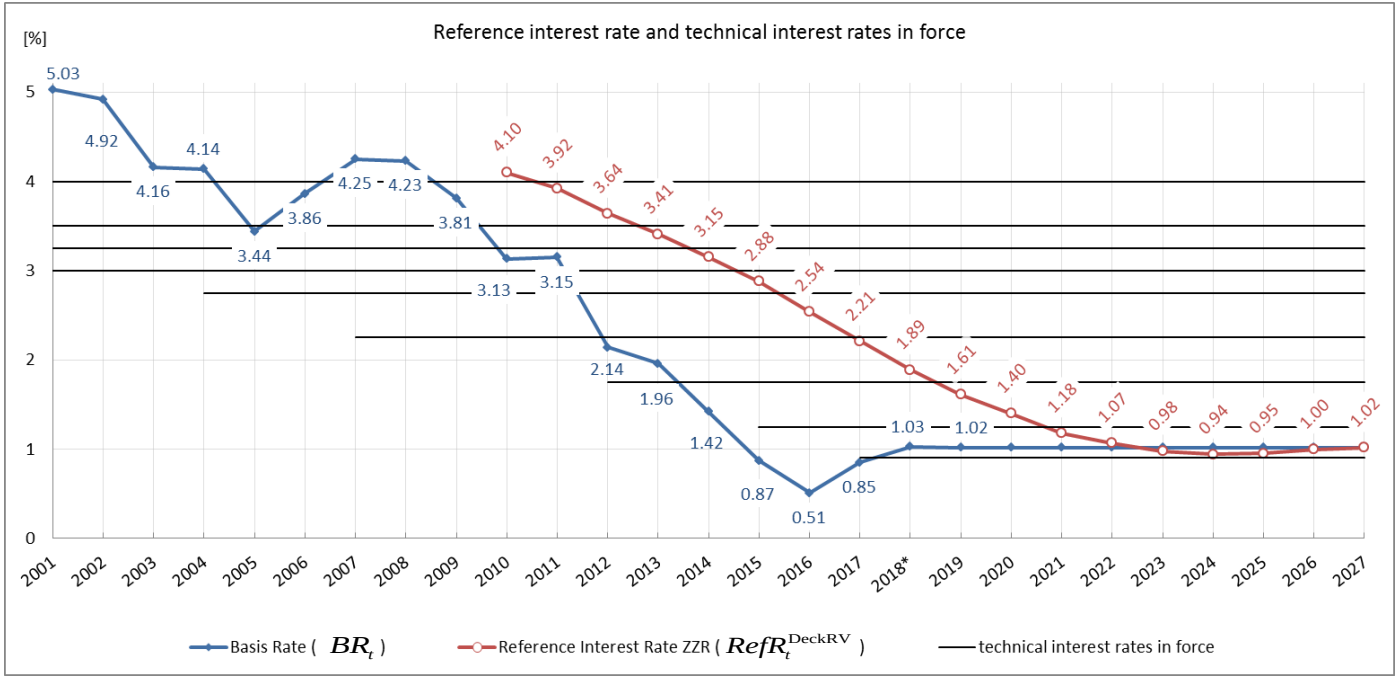
Premium reserve for year t if **expected future earnings** fall short of **interest rate obligations**

- Expected future earnings represented by **reference interest rate** $RefR_t^{\text{DeckRV}}$: 10y-mean of **basis rates** BR_s (annual average of 10y zero-coupon rates).
- Interest rate obligation of given contract represented by its technical interest rate i.
- Vector of rates used for discounting:



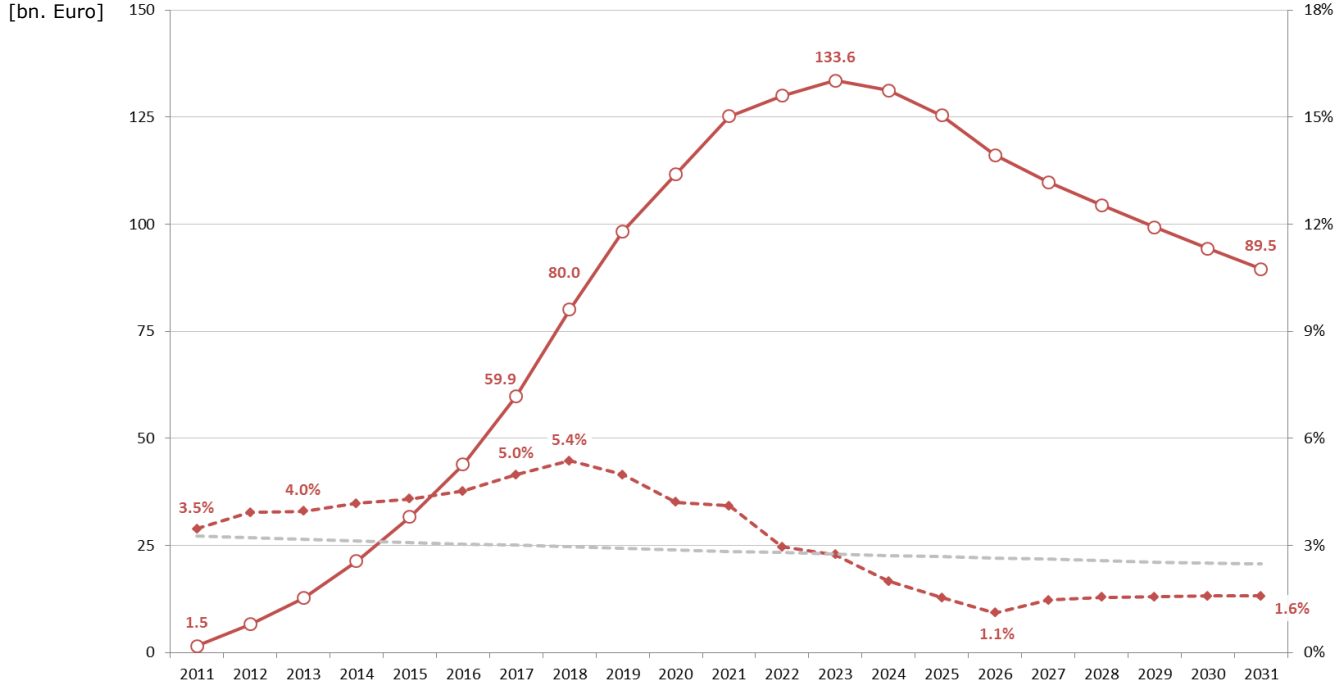
- **Additional interest provision (ZZR):** Part of premium reserve induced by

Development of reference interest rate (DeckRV): Unanticipated decrease of basis rate after 2011



* Years 2018 ff.: Extrapolation based on the assumption that the 10y interest rate as of April 30th 2018 persists (1.011%).

Additional reserve stabilizes German life business - at the expense of unrealized capital gains



left-hand scale:

Additional Interest Provision (ZZR Status Quo)

right-hand scale:

mean interest expense (ZZR Status Quo) *

mean guaranteed rate (excluding ZZR)

* mean interest expense: expenses for technical interest rate and change of additional provision in relation to premium reserve

Sources: : GDV 2018; and : Own approximations jointly with Michael Dahmen (HDI).

Additional reserve needs recalibration

Working group[1] of the German Actuarial Association (DAV):

- Long-term reference rate is not to be altered.
- Pace at which additional reserve ZZR moves needs to be adjusted.

⇒ Proposal for new conceptual design of the Additional interest reserve „**Corridor Method**" (CM):

CM 1 Corridor dampens movements (increase) of ZZR

CM 2 Reference rate cannot decrease if exceeded by current basis rate and vice versa

[1] Members: Dr. Uwe Schrader [head], Werner Faigle, Dr. Maximilian Happacher, Gerd-Michael Hartmann, Dr. Johannes Lörper, Dr. Normann Pankratz, Dr. Michael Pannenberg, Carsten Pröhl, Dr. Michael Renz, Dr. Hans Schlierf, Dr. Bodo Schmithals, Dr. Marco Schnurr, Klaus Trautmann, Josef Wagner

Es ist weder erforderlich noch ratsam, die Zinszusatzreserve weiterhin im bisherigen Tempo aufzubauen."

BaFin-Präsident Felix Hufeld

„It is neither necessary nor advisable to continue setting up this – basically very reasonable – reserve in the current pace."

Felix Hufeld, President of German Federal Financial Supervisory Authority (BaFin).

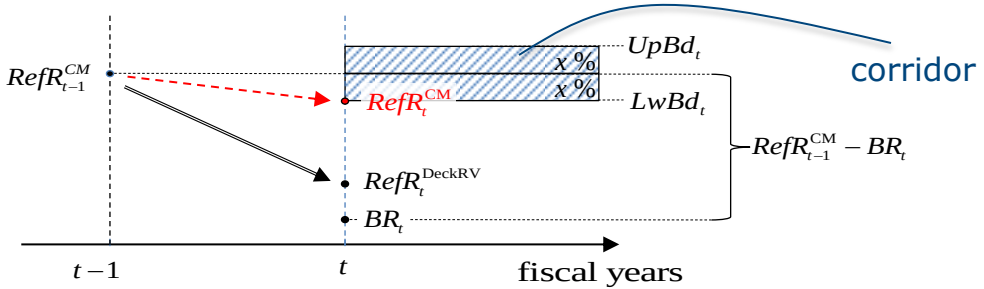
Sources: Schrader 2015, Pannenberg / Dahmen / Tiemann 2016, BaFin-Journal Feb. 2018 (p.28), www.aktuar.de

CM 1 Corridor dampens movements (increase) of ZZR

Initial condition: $RefR_{\tau}^{CM} := RefR_{\tau}^{DeckRV}$ for fiscal year τ (e.g. τ := 2017). For $t > \tau$, recursively:

$$UpBd_t := RefR_{t-1}^{CM} + x\% \cdot \left| RefR_{t-1}^{CM} - BR_t \right| \quad \text{(upper bound of corridor)}$$

$$LwBd_t := RefR_{t-1}^{CM} - x\% \cdot \left| RefR_{t-1}^{CM} - BR_t \right| \quad \text{(lower bound of corridor)}$$



(depiction for decreasing rates; increasing rates analogously)

▷ Substituting $RefR_t^{DeckRV}$ by $RefR_t^{CM}$ as the decisive reference interest rate dampens the movement of the additional interest provision (ZZR)

Reminder of notation:

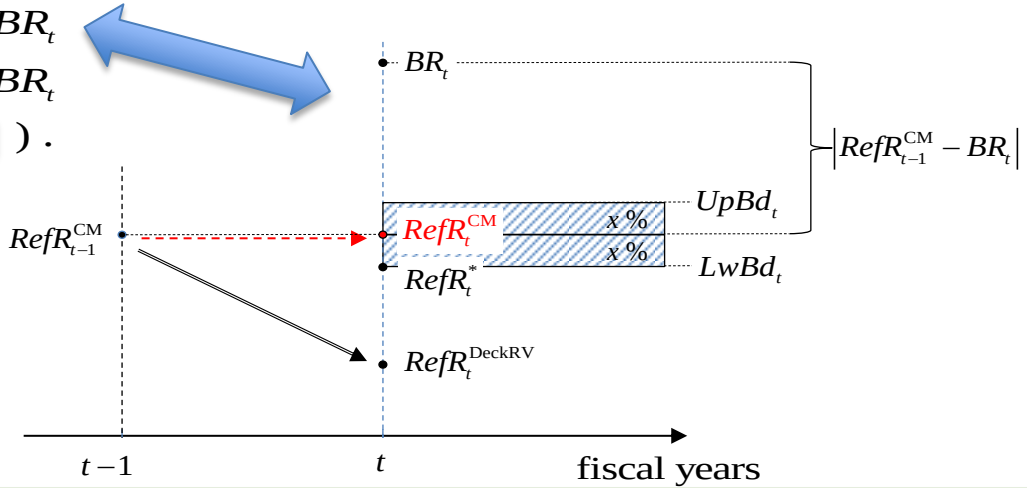
- $RefR_t^{DeckRV}$
  reference interest rate for fiscal year t according to current regulation
- BR_t
  arithmetic mean of interest rates Jan.-Sept. in fiscal year t (Basis Rate)

Sources: Schrader 2015, Pannenberg / Dahmen / Tiemann 2016

CM 2 Reference rate cannot decrease if exceeded by current basis rate and vice versa

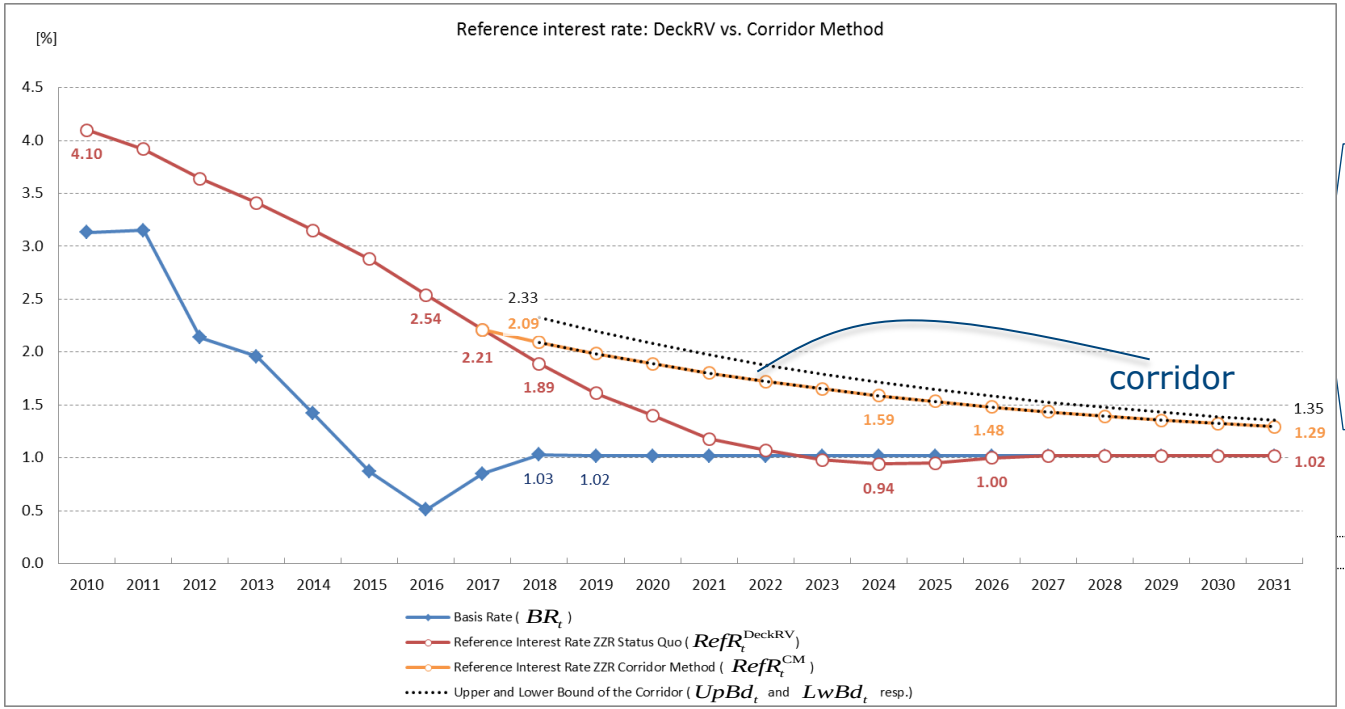
$$RefR_t^* := \left\{ \begin{array}{ll} UpBd_t & , \text{ if } UpBd_t < RefR_t^{\text{DeckRV}} \\ RefR_t^{\text{DeckRV}} & , \text{ if } LwBd_t \le RefR_t^{\text{DeckRV}} \le UpBd_t \\ LwBd_t & , \text{ if } RefR_t^{\text{DeckRV}} < LwBd_t \end{array} \right\} = \min\left[\max\left(RefR_t^{\text{DeckRV}}; LwBd_t \right); UpBd_t \right]$$

$$RefR_t^{\text{CM}} := \left\{ \begin{array}{ll} RefR_{t-1}^{\text{CM}} & , \text{ if } RefR_t^* < RefR_{t-1}^{\text{CM}} < BR_t \\ & \text{or } RefR_t^* > RefR_{t-1}^{\text{CM}} > BR_t \\ RefR_t^* & , \text{ otherwise (see CM 1) .} \end{array} \right.$$



Sources: Schrader 2015 (did not mention second exceptional case yet), Pannenberg / Dahmen / Tiemann 2016

CM: Possible scenario of interest rates



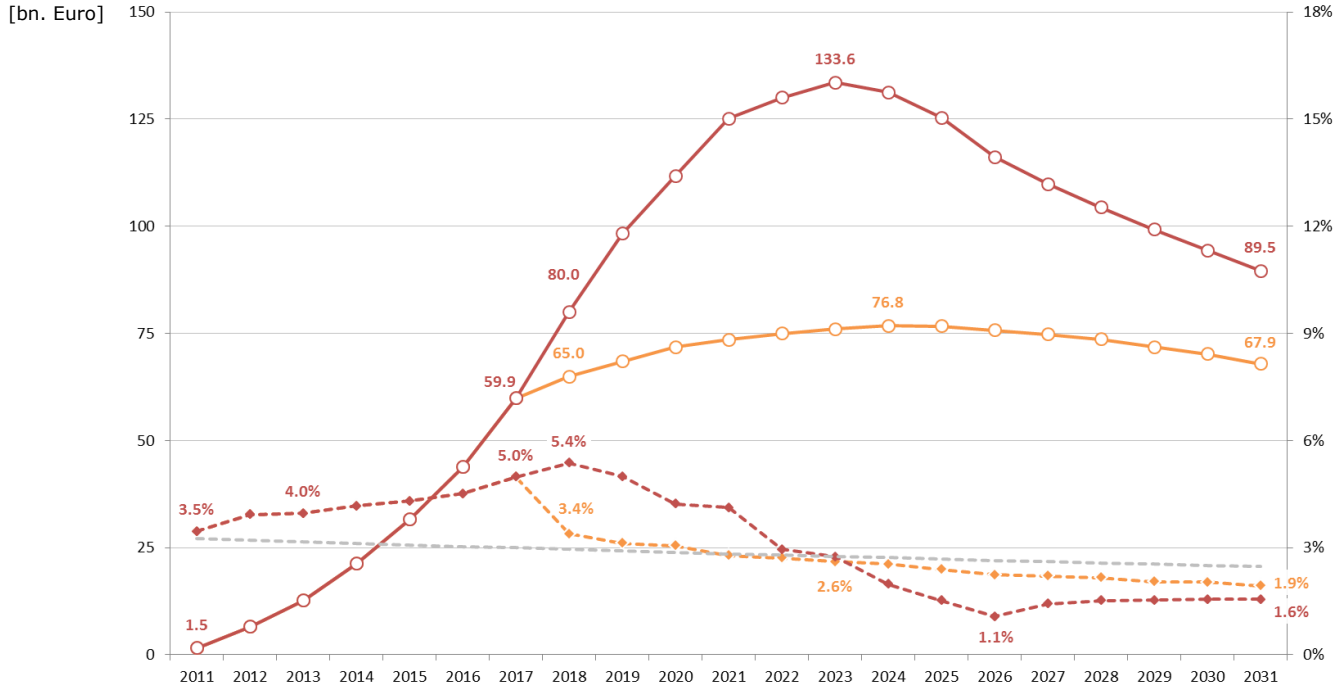
Assumptions:

- CM enacted in 2018 ($\rightarrow \tau = 2017$).
- 10y interest rate as of April 30th 2018 persists (1.011%)
- $x := 10$

e.g. upper and lower bound in 2018:

$$2.21\% \pm 10\% \cdot \left| 2.21\% - 1.03\% \right|$$

CM can save resources for possible surplus participation of recent business adding to inter-generation fairness



left-hand scale:

- Additional Interest Provision (ZZR Status Quo)
- Additional Interest Provision (ZZR Corridor Method)

right-hand scale:

- mean interest expense (ZZR Status Quo) *
- mean interest expense (ZZR Corridor Method) *
- mean guaranteed rate (excluding ZZR)

* mean interest expense: expenses for technical interest rate and change of additional provision in relation to premium reserve

Sources: and : GDV 2018; , and : Own approximations jointly with Michael Dahmen (HDI).

What this talk has omitted

- Austria
- Belgium (knipperlichten)
- Historic development in Germany before 2011
- Additional Interest Provision and the German Regulation on the Minimum Surplus Participation („MindZV“)
- Considerations on lapses, lump sum option by policyholders, costs
- Valuation reserves vs. customers‘ participation in unrealized capital gains („Sicherungsbedarf“)
- …

Summary

- Additional Interest Provision is a valuable tool for stabilizing the German life insurance business in the low interest rate environment
- It needs recalibration to smooth the annual burden for the companies (sustainable speed of build-up)
- DAV working group has tackled the downsides of the current mechanism by proposing the alternative Corridor Method
- Corridor Method needs to be enacted into regulation (DeckRV)

References & Acknowledgments

- Aktuar aktuell [Notes of the German Actuarial Association (DAV)] Nr. 39, September 2017, pp. 6-7: „Im Interesse der Kunden: Zinszusatzreserve muss neu kalibriert werden“ („In the interest of customers: Additional interest provision needs recalibration“).
- G. Bader 2012: „Die Zinszusatzreserve in der deutschen Lebensversicherung“ („The Additional Interest Provision ZZR in German life insurance“), slides, Zurich 2012/11/15
- BaFin-Journal [Notes of the German Federal Financial Supervisory Authority] November 2017 (p.32): „Zinszusatzreserve: Tempo drosseln“ („Additional Interest Provision: Reduce pace“)
- BaFin-Journal [Notes of the German Federal Financial Supervisory Authority] February 2018 (p.28) on Additional Interest Provision
- J. Bierbaum 2017: „Reservierung langfristiger Garantien“ („Reserving long-term guarantees“), slides, Stuttgart, 2017/11/22
- W. Faigle 2011: „Zinszusatzreserve in der Lebensversicherung“ („ The Additional Interest Provision in life insurance“), slides, 2011/04/05
- GDV [Association of German Insurers] 2018: Position Paper („Die Positionen der deutschen Versicherer“), April 2018
- A. Neumann 2013: Allianz Capital Markets Day (Part D on life insurance), 2013/06/25
- K.-U. Schaumlöffel 2018: „Was bringt 2018 aus der Sicht der Versicherungsaufsicht?“(„What will happen in 2018 from the insurance supervision‘s point of view?“), slides, Cologne 2018/04/25
- U. Schrader 2015: „Bericht aus der AG ZZR des Ausschusses LV“ („Report form the DAV working group of the DAV life committee on the Additional Interest Provision ZZR“), Slides, DAV Autumn meeting 2015/11/16
- M. Pannenberg / M. Dahmen / K. Tiemann 2016: „ZZR – Zeit Zu Renovieren?!“ („Additional Interest Provision - A tIme to Perform a renovation!?“), slides, Cologne 2016/3/1

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Thank you very much for your attention!

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Backup

Additional interest provision in Germany

- Technical interest rate: Basically constant over time. → Resulting reserve: $Res_t^{original}$
- "Moneyness" of technical interest rate:
  - If **Reference interest rate** for fiscal year t falls short of technical interest rate, resulting gap additionally needs to be taken into account in premium reserve at t .
  - Definition of Reference interest rate: $$RefR_t^{\text{DeckRV}} := \sum_{s=t-9}^{t} BR_s \,/\, 10 \;,$$

    where „Basis Rate" $$BR_s := \begin{cases} \text{average of rates Jan. to Sept.}, & s = t \ (t: \text{current fiscal year}) \\ \text{annual avg. (Jan. to Dec.)}, & s < t \ (\text{past fiscal years}) \end{cases}$$

    for underlying rates: 10y term, 0-coupon, Euro swap, end of month, published by German Bundesbank.
- Replace technical interest rate by **vector of rates**

$$\begin{cases} \min\{\text{technical interest rate};\ RefR_t^{\text{DeckRV}}\}, & \text{for projection years 1 to 15} \\ \text{technical interest rate} & \text{for projection years 16,...} \end{cases}$$

→ Resulting premium reserve on balance sheet: Res_t^{total} ($\geq Res_t^{original}$ in generic cases)

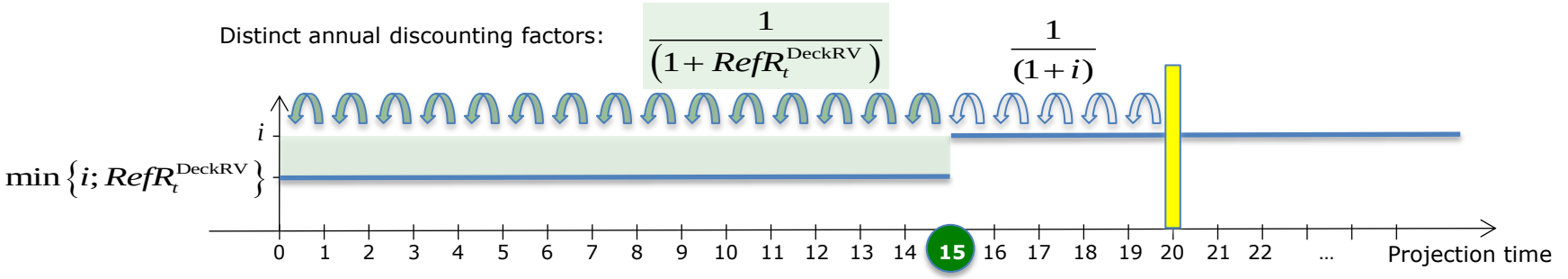
→ **Additional interest provision ("Zinszusatzreserve, ZZR)":** $$\max\{0;\ Res_t^{total} - Res_t^{original}\}$$

legal framework: German Commercial Code („HGB"), German Regulation on the Principles Underlying the Calculation of the Premium Reserve („DeckRV"), BaFin circular letter 2016/10/05

Additional interest provision in Germany (ZZR): Conceptual example

Consider a guaranteed payment of 1 [€] to the customer at time T, costs etc. ignored.
Then the following general formula holds:

$$ZZR_t = \underbrace{\frac{1}{\left(1+\min\left\{i; RefR_t^{\text{DeckRV}}\right\}\right)^{\min[T-t;15]}} \cdot \frac{1}{(1+i)^{\max[0;(T-t)-15]}}}_{\text{total premium reserve on balance sheet}} - \underbrace{\frac{1}{(1+i)^{T-t}}}_{\text{“original” reserve}}$$

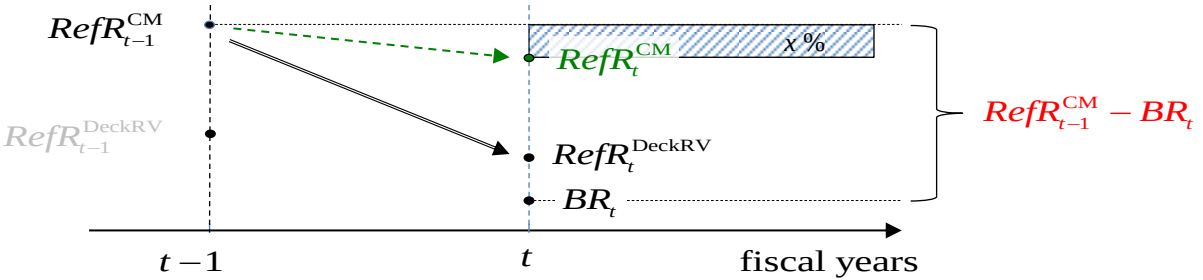


CM: Equivalent version (case 1)

Initial condition: $RefR_{\tau}^{CM} := RefR_{\tau}^{DeckRV}$ for fiscal year τ (e.g. $\tau := 2017$). For $t > \tau$, recursively:

Case 1: If $RefR_{t-1}^{CM} > RefR_{t}^{DeckRV}$, then

$$RefR_{t}^{CM} := \max\left\{ RefR_{t}^{DeckRV} \;;\; RefR_{t-1}^{CM} - x\% \cdot \max\left(0 \;;\; RefR_{t-1}^{CM} - BR_{t}\right) \right\} .$$



▷ In comparison with the absolute value funktion | …| of the algorithm's previous version, the maximizations in blue color, max(0; ...), now causes **CM 2** .

Reminder of notation:

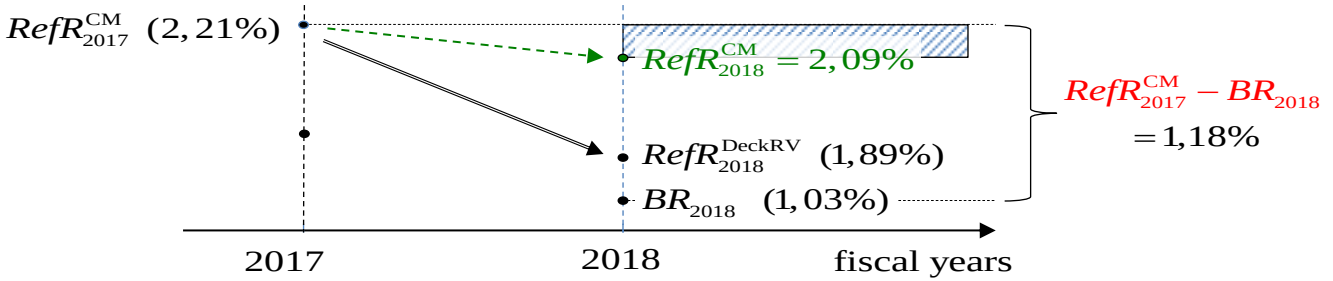
- $RefR_{t}^{DeckRV}$ reference interest rate for fiscal year t according to current regulation
- BR_{t} arithmetic mean of interest rates Jan.-Sept. in fiscal year t (Basis Rate)

Source: DAV working group

CM: Equivalent version (example: 2018)

E.g. t = 2018 ($\rightarrow \tau = t - 1$ = 2017).
Assume that interest rates as of April 30th 2018 stay unchanged and x := 10. Then:

$$2,21\% = RefR_{2017}^{\text{DeckRV}} \overset{I.C.}{=} RefR_{2017}^{\text{CM}} > RefR_{2018}^{\text{DeckRV}} = 1,89\% \quad (\Rightarrow \text{Case 1})$$



$$RefR_{2018}^{\text{CM}} := \max\left\{ 1,89\% \;;\; 2,21\% - \underbrace{10\,\% \cdot \max\left(0 \;;\; 2,21\% - 1,03\%\right)}_{0,118\%} \right\} = 2,09\%\,.$$

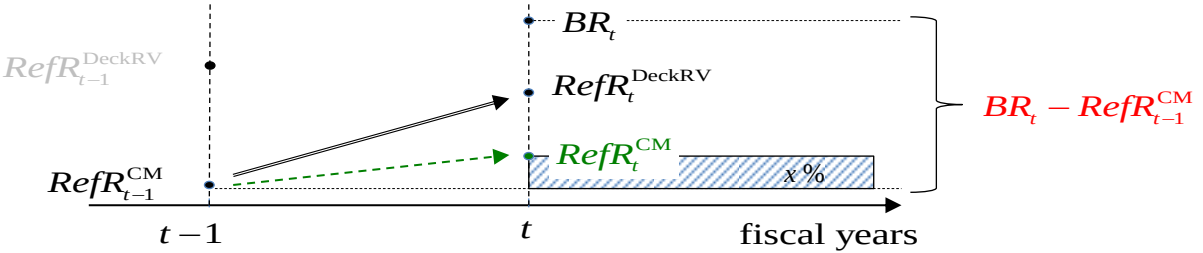
(rounding to 2nd decimal place)

CM: Equivalent version (case 2)

Initial condition: $RefR_{\tau}^{CM} := RefR_{\tau}^{DeckRV}$ for fiscal year τ (e.g. $\tau := 2017$). For $t > \tau$, recursively:

Case 2: If $RefR_{t-1}^{CM} \le RefR_{t}^{DeckRV}$, then

$$RefR_t^{CM} := \min\left\{ RefR_t^{DeckRV} \;;\; RefR_{t-1}^{CM} + x\% \cdot \max\left(0 \;;\; BR_t - RefR_{t-1}^{CM}\right) \right\} ,$$



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