Options and consequences of implementing Discounting, Risk Adjustment and CDA in IFRS 17

Allianz Trade North America

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Introduction

- 2011 – 2017: Masters degree in Financial and Insurance Mathematics from Charles University in Prague
- 2014 – 2015: Allianz Czech republic, part time, L&H
- 2016 – 2019: Allianz Trade, Regional P&C reserving actuary for NEUR & APAC, S2 reporting
- 2019 – now: Allianz Trade, Senior P&C reserving actuary for American region, S2 reporting, IFRS 17 leader for LE

slido

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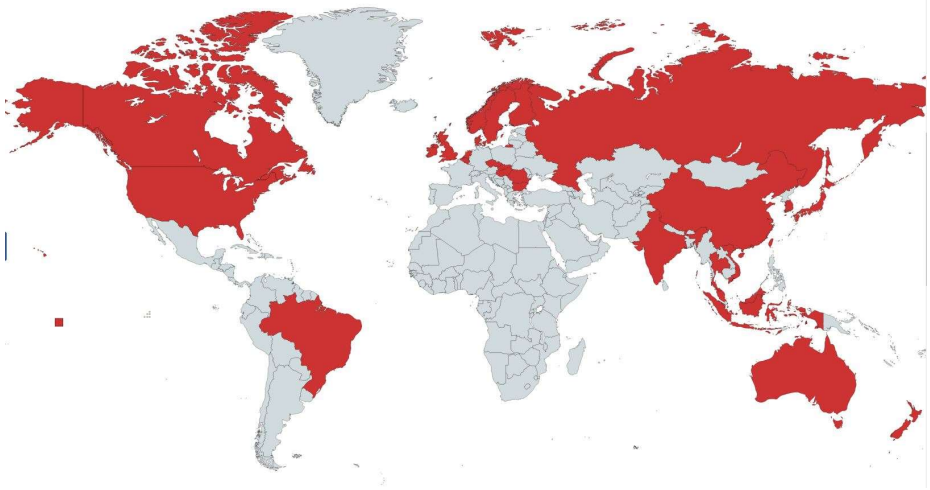

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IFRS17 goals and ideas

The aim of IFRS 17 is to

- **standardise insurance accounting** globally (except the US)
- improve comparability
- increase transparency
- provide users of accounts with the information they need to meaningfully understand the insurer's financial position, performance and risk exposure

IFRS17 is an expansion of IFRS4. It provides more detailed information

Discounting: Introducing time value of money

Risk adjustment: Introducing risk associated with reserves

CDA: Introducing the quality of reinsurance

Challenge: How will IFRS17 deal with the challenges of IFRS4 [prudency, company politics,…]

SLIDO question: How satisfied are you with IFRS 17?

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Discounting: Cash Flow pattern – data selection (1/2)

IFRS 17 options

$$\sum_{t=1}^{\infty} ExpRes_t * v_t$$

Goal is to estimate the pattern according to which the LIC reserves will be released over time

1. Paid claims triangles

- Easy to implement
- Tail management with curves
- LoB segmentation not a problem

- Payment/reserve mismatch threat
- IBNR prudency not reflected
- Low paid frequency LoBs

2. Incurred claims triangles

- Easy to implement
- LoB segmentation not a problem
- Includes Case reserve

- Tail management with curves
- IBNR prudency not reflected
- Low paid frequency LoBs

3. Reserves only triangles

- Considers all reserves directly
- Considers prudency
- Best reflection of reality

- Impossible to implement
- No IBNR data history
- LoB segmentation a problem

Discounting: Cash Flow pattern – data selection (2/2)

4. Ultimates minus paid triangles

- Good reflection of reality
- Considers prudency
- Considers company politics

- Hard to implement
- Salvage reserve treatment
- LoB segmentation a problem

- Pattern is universal for all origin years [huge requirement]
- Focus on increment parts [based on data, Incurred is not viable for company X]
- Tail management is required [paid data seem to be the best solution]

incremental development factor

Dev Month	Paid data	Incurred	Ultimate - Paid
3	0.405	1.527	5.764
6	3.052	10.386	11.876
9	11.372	19.726	16.577
12	17.247	21.670	18.465
15	20.391	23.112	13.788
18	21.095	16.249	9.886
21	12.828	5.561	5.535
24	5.757	1.212	3.124
27	2.255	0.259	1.850
30	1.536	0.109	1.662
33	0.930	-0.113	1.603
36	0.684	0.164	1.568
39	0.857	0.038	1.421
42	0.563	0.151	1.309
45	0.581	0.098	1.303
48	0.215	-0.072	1.268

Percentage developed

After	Paid data	Incurred	Ultimate - Paid
1 year	32%	53%	53%
2 years	92%	99%	85%
3 years	98%	100%	92%
4 years	100%	100%	97%

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Discounting: Cash Flow pattern – math behind (1/2)

Let us assume quarterly development pattern, origin years and the cumulative triangle $C_{i,j}$. Lets further denote

- n … number of the origin years considered in the calculation [15]
- k … latest development quarter considered [40]

Chain ladder ratio (DFM ratio estimator) r_j for development period *j* = 1, … , k can be then calculated as

$$r_j = \sum_{i=1}^{n_j} C_{i,j+1} \Big/ \sum_{i=1}^{n_j} C_{i,j} \qquad \text{for j = 1, … , k-1}$$

$$r_k = 1$$

where n_j is the number of the origin years when there is sufficient development to calculate r_j

Cumulative development factor s_j for each quarterly development period is then equal to

$$s_j = \prod_{j}^{k} r_j \qquad \text{for j = 1, … , k}$$

The percentage of triangle development at dev. quarter J can be can be calculated as $1/s_j$

Discounting: Cash Flow pattern – math behind (2/2)

Incremental part for given quarterly development d_j can be written as

$$d_j = \frac{1}{s_{j+1}} - \frac{1}{s_j} \qquad \text{for j = 1, … , k-1}$$

It needs to be universal for all origin years, they all have different last development quarter [t]

$$D_{j,t} = {d_j}\Big/{\sum_{l=1}^{t} d_l} \qquad \text{for j = t+1, … , k}$$

	Paid data			
After	Initial	t=0	t=1	t=2
1 year	32%	32%		
2 years	92%	60%	88%	
3 years	98%	6%	9%	75%
4 years	100%	2%	3%	25%

	Incurred data			
After	Initial	t=0	t=1	t=2
1 year	53%	53%		
2 years	99%	46%	98%	
3 years	100%	1%	2%	100%
4 years	100%	0%	0%	0%

Here we can see how one pattern defines the evolution across multiple origin years. If we consider the paid data, then 32% of Undiscounted LIC [at time t=0] will be discounted over a year period, 60% over a two year period, 6% over three years and 2% over four years [assuming end of the period parameter]. At the same time, 88% of Undiscounted LIC [at time t=1] will be discounted over a year period, 9% will be discounted over a 2 year period and 3% over three year period [again, assuming end of the period parameter].

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Discounting: Cash Flow pattern – example AY 2022

IFRS 17 options

Note: Origin years are called Attachment years in company X. MBE denotes Management Best Estimate. The following examples illustrate the true evolution observed for AY 2022 and AY 2021 vs the evolution based on patterns

MBE	25 362	19 500	10 800	9 300	9 300
LL	12 052	7 631	6 242	5 689	5 812
AY2022	2023 expectations				
Method	YE 2022	Q1	Q2	Q3	Q4
Paid	198 876	158 604	110 991	61 735	31 782
Incurred	198 876	135 835	68 599	21 328	5 151
Ultimate	198 876	143 052	101 369	71 481	54 748
Reality	198 876	159 279	102 868	67 381	36 383

MBE	25 362	25 362	25 362	25 362	25 362
LL	12 052	7 631	6 242	5 689	5 812
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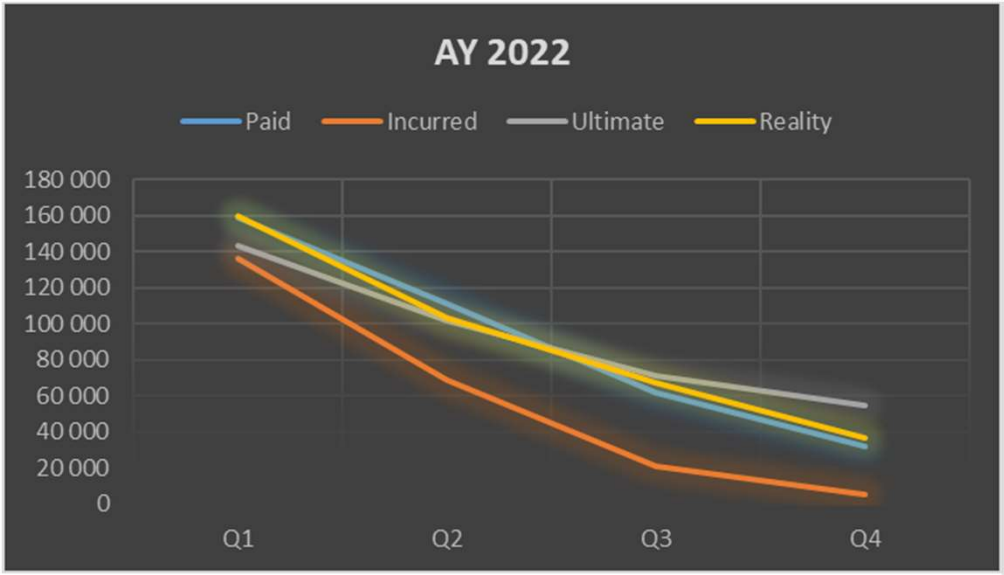
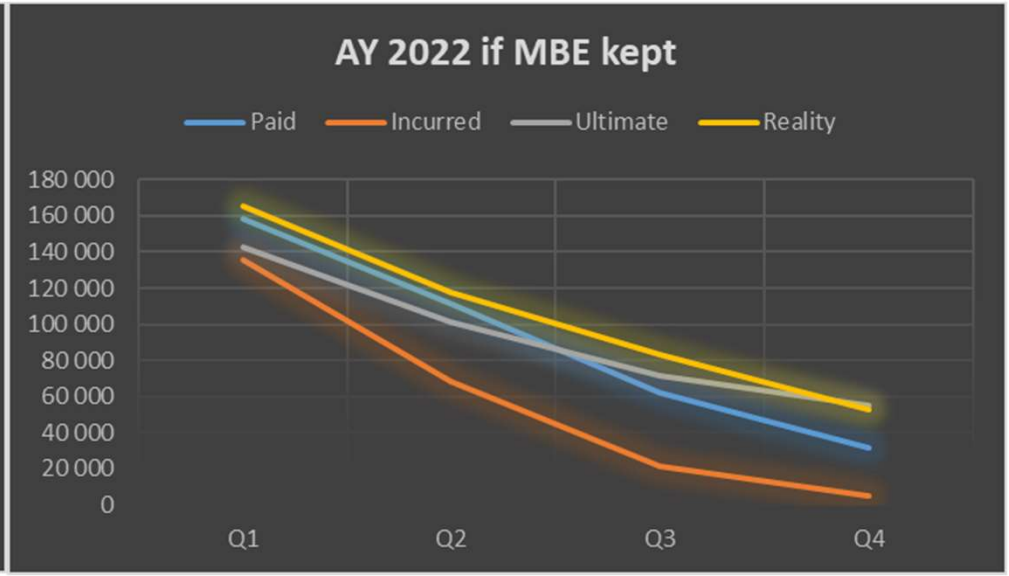
Ultimate	198 876	143 052	101 369	71 481	54 748
Reality	198 876	165 141	117 430	83 443	52 445





Paid data provide a good fit for the evolution. Incurred claims do not [the mixing of payments and reserves along with a delayed payment procedure (payments usually occur 3 months after case reserve set up/approval)]. Ultimates method is reasonable, shows how conservatism in your reserves might not be the best option as it could lead to poor pattern fits for the discounting.

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Discounting: Cash Flow pattern – example AY 2021

IFRS 17 options

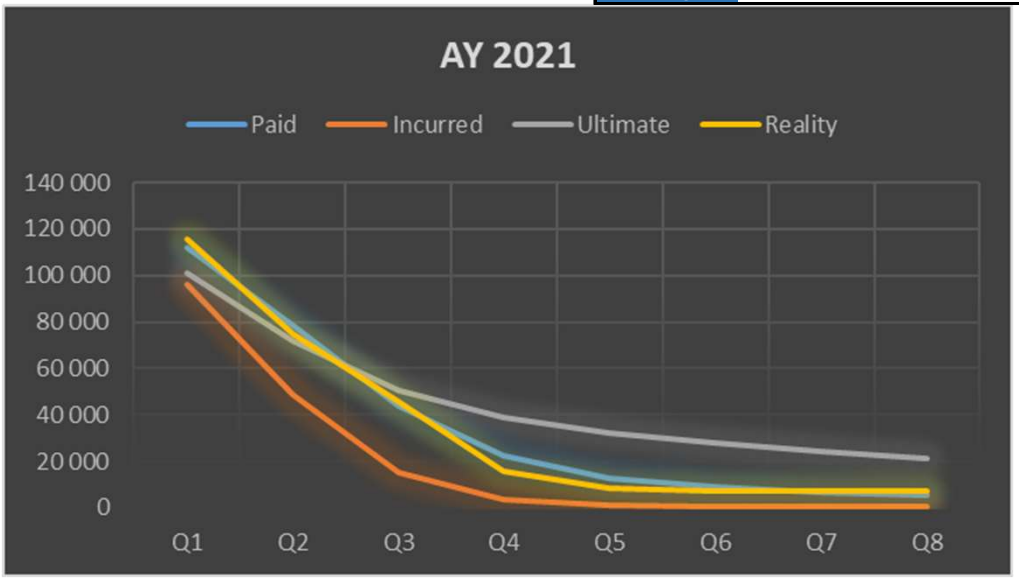
MBE	1 644	1 644	1 644	2 144	2 144	0	0	0	0
LL			1 883	1 883	1 883	1 883	1 883	1 883	1 883
AY2021	2022 expectations					2023 expectations			
Method	YE 2021	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Paid	140 325	111 910	78 315	43 560	22 425	12 940	9 225	6 694	5 162
Incurred	140 325	95 844	48 403	15 049	3 635	1 146	615	391	623
Ultimate	140 325	100 936	71 525	50 436	38 630	31 965	28 019	24 473	21 053
Reality	140 325	115 438	75 104	45 580	15 778	8 698	7 201	7 162	7 218

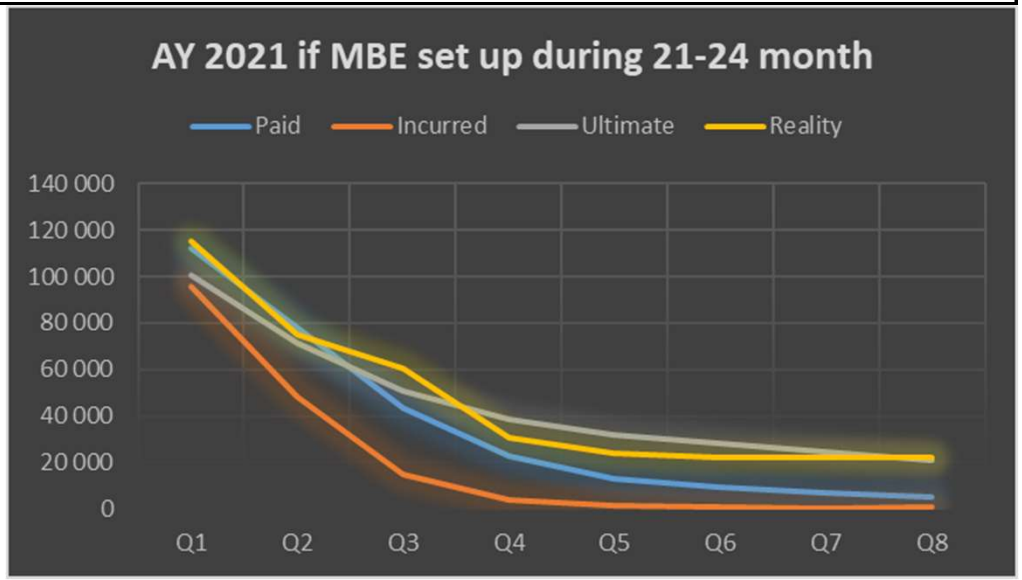
Manual injections to postpone run off

$22M MBE AY2019

$18M MBE AY2020

MBE	1 644	1 644	1 644	17 144	17 144	15000	15000	15000	15000
LL			1 883	1 883	1 883	1 883	1 883	1 883	1 883
AY2021	2022 expectations					2023 expectations			
Method	YE 2021	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Paid	140 325	111 910	78 315	43 560	22 425	12 940	9 225	6 694	5 162
Incurred	140 325	95 844	48 403	15 049	3 635	1 146	615	391	623
Ultimate	140 325	100 936	71 525	50 436	38 630	31 965	28 019	24 473	21 053
Reality	140 325	115 438	75 104	60 580	30 778	23 698	22 201	22 162	22 218





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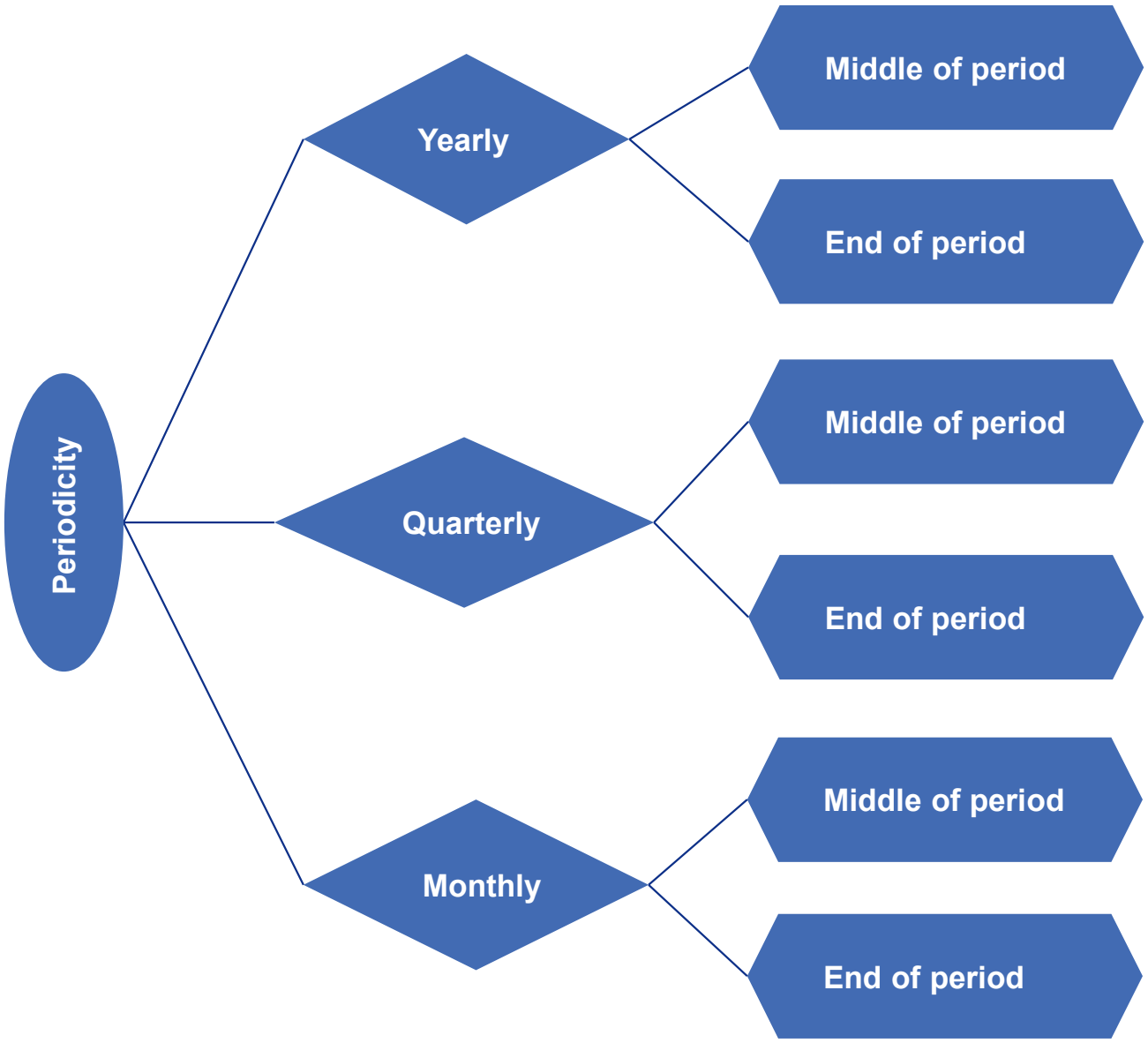
This graph illustrates the effect of manual adjustments on the quality of pattern estimates.

Discounting: Cash Flow pattern periodicity & EoP/MoP

IFRS 17 options



Assumes uniform release of the reserves over a year. Central symmetry over half a year time

Assumes reserves are released at the end of the year. More of a theoretical option in NL

Assumes uniform release of the reserves over a quarter. Central symmetry over half a quarter

Assumes reserves are released at the end of the quarter. True for smaller LoB with specific reserve releases

Assumes uniform release of the reserves over a month. Theoretical option

Assumes reserves are released at the end of the month. Generally true in most “monthly closed” companies

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Remark: Option to use spot or forward rates, discrete or continuous approach

Discounting: Cash Flow periodicity – math behind

Usually yearly risk-free rates ($y_1, y_2, y_3 \ldots$) are given, we need to calculate discount factors for monthly periods j = $^1/_{12}, ^2/_{12}, \ldots, 1, ^{13}/_{12}, \ldots. ^{23}/_{12}, 2, ^{25}/_{12}, \ldots$ Example for spot discrete case

$$df_j = 1/(1 + s_j)^j$$

where s_j is spot rate at time j

$$s_j = y_1$$

for j <= 1

$$s_j = \left(1 - (tm_j - \underbrace{tm_j}_{}) \right) * y_{\underbrace{j-1/12}_{}} + (tm_j - \underbrace{tm_j}_{}) * y_{\underbrace{j-1/12}_{}+1}$$

for j > 1, where tm_j is ….

$$te_j = j$$

End of period monthly term

$$tm_j = j - 0.5/12$$

Middle of period monthly term

Analogically, we can recreate the discount factors for quarterly periods q = $^1/_4, ^2/_4, \ldots$

$$te_q = q$$

End of period quarterly term

$$tm_q = q - 0.5/4$$

Middle of period quarterly term

Remark: $\underbrace{\quad}$ represents quotient/floor/round down function

Discounting: Case study: Quarterly vs Yearly periodicity

IFRS 17 options

- Case study has been performed during 2023Q3 closing
- Group desire to look at the possibility to decrease discounting impact
- Loss recovery IBNR denotes salvage reserve [company X specific], Other outflows is Bonus reserve [not discounted], rest of the reserves are under Loss IBNR
- Middle of period comparison

Country	LoB	Claim type	Undiscounted	Discounting quarterly	Discounting yearly	Delta
US0025	50	Loss IBNR	-332 943 774	8 323 806	9 412 182	13.1%
US0025	50	Loss recovery IBNR	37 859 420	-1 654 239	-1 863 134	12.6%
US0025	50	Other outflows	-12 302 353	0	0	
US0025	52	Loss IBNR	-42 406 947	1 560 452	1 589 241	1.8%
US0025	55	Loss IBNR	-28 956 051	774 595	1 030 730	33.1%
US0025	55	Other outflows	-4 718 761	0	0	
US0025	58	Loss IBNR	-12 932 566	281 644	297 801	5.7%
US0025	59	Loss IBNR	-14 533 594	469 190	468 448	-0.2%
US0025	61	Loss IBNR	-38 756 317	1 157 083	1 201 302	3.8%
Total (all in kEUR)			**-449 690 942**	**10 912 531**	**12 136 570**	**11.2%**

Country	LoB	Claim type	Undiscounted	Discounting quarterly	Discounting yearly	Delta
BR0040	50	Loss IBNR	-17 022 364	1 334 289	1 527 497	14.5%
BR0040	52	Loss IBNR	-4 539 966	381 655	382 571	0.2%
BR0040	55	Loss IBNR	-6 432 460	560 620	667 210	19.0%
Total (all in kEUR)			**-27 994 790**	**2 276 564**	**2 577 278**	**13.2%**

LoBs 50 (TCI), 55 (WP) and 61 (XoL) are short tailed businesses
LoBs 52 (Bonding), 58 (TCU) and 59 (XoL WA) are long term businesses

The difference proved to be moderate. Quarterly discounting logic was adopted.

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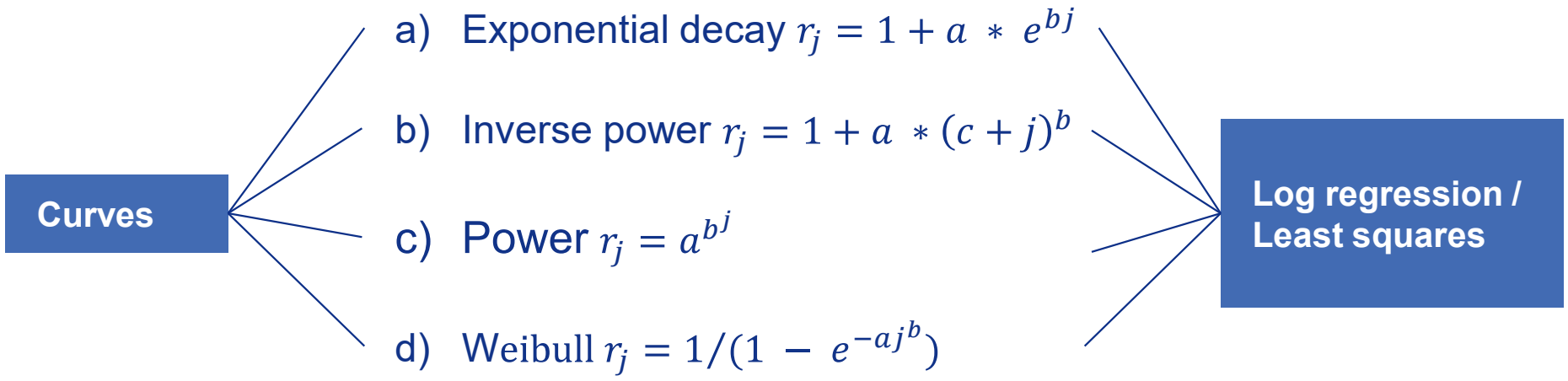
Discounting: Tail management

IFRS 17 options

It is necessary to perform some form of fitting at the tails due to volatility and incremental nature of the pattern. Linked to data decision: Paid vs reserve mismatch problem



Exponentially bounded curves may not provide sufficient tail width

The Log Regression fitting method uses linear regression to logarithms of the data to estimate the parameters. Ratios less than 1 cannot be included in the fitting algorithm, e.g.

Inverse Power: regress $\log(r_t - 1)$ against $\log(c + t)$

Ratios close to 1 can be taken with too much weight. It is advisable to stay above 1.001

While e.g. least squares method can be heavily shifted by outliers

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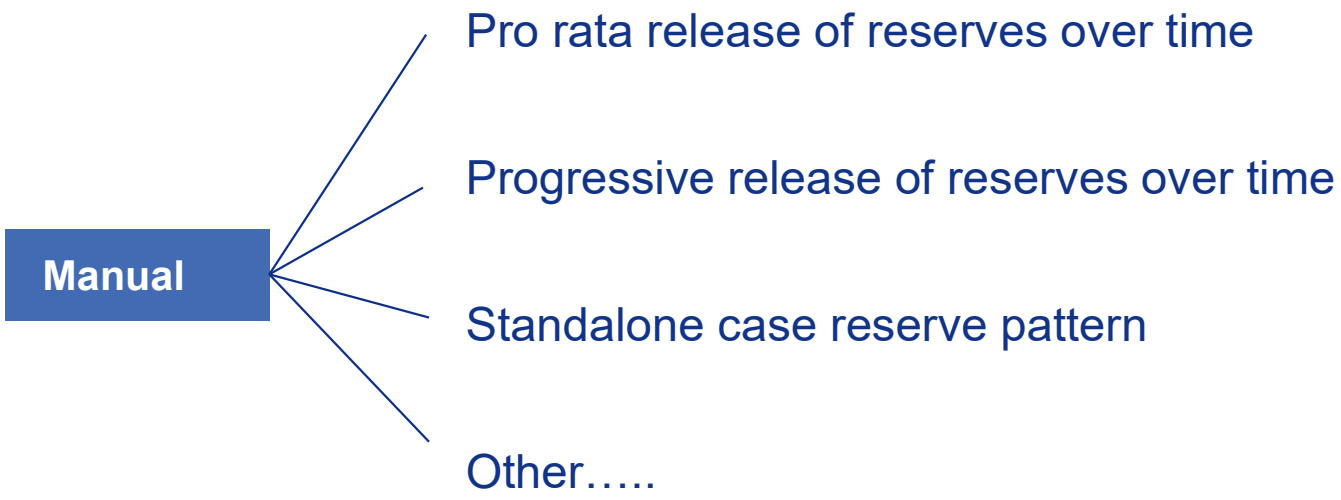
Discounting: Tail management, US case

- Paid data for LoB ABC are developed at 99.88% after 5 years
- Case reserves after 5 years amount to 1-2% of Earned premium, 2-4% of Loss Ratio
- The longest LoB to be developed ends after 10 years
- Allowed to do a cut/release the reserves after 10 years
- No reasonable way to fit in a curve [0.11% data]



The progressive release of reserve over the time was chosen (50% of the remaining reserve gets released after 5 years [uniformly over the year], 60% of the remaining reserve gets released after 6 years [uniformly over the year], …)

Idea: Choose the best option for reserves vs improve the reserving process

Discounting summary, P&L

IFRS 17 options

- **Well implemented as it allows us to meet technical excellence in many areas**
- **Provides good feedback through P&L**

Start date 31.12.2022 End date 31.12.2023

IFRS 4 requirements Date: 31.12.2022	
BS IBNR	100 USD
can be by AY, UWY, Lob, Trading partner, ...	

IFRS 17 requirements (adding time) Date: 31.12.2022			
Pattern		60 30	10
"=>"	BS	31.12.2023	40
		31.12.2024	10
		31.12.2025	0

Each of the following step (2., 3., 4., and note) is separately visible in Total comprehensive P&L view

1. Step

31.12.2022 Discounting	
Interest rate	5%
BS amount	100
Simple discounting applied	
60 over half a year	58.5
30 over year and a half	27.9
10 over two year and a half	8.9
Discounted BS amount	95.3
Discounted BS effect	-4.7

2. Step

31.12.2023 Disc (stable inputs)	
Interest rate	5%
BS amount	40
Simple discounting applied	
60 is released	0.0
30 over half a year	29.3
10 over year and a half	9.3
Discounted BS amount	38.6
Discounted BS effect	-1.4
Interest accretion	3.2
Amount of interest you lost over the time	

3. Step

31.12.2023 Disc (BS amount real)	
Interest rate	5%
BS amount	60
Simple discounting applied	
40 is released	0.0
45 over half a year	43.9
15 over year and a half	14.0
Discounted BS amount	57.9
Discounted BS effect	-2.1
Change NonFinancial ass	-0.7
BS reserves evolution vs expectation	

Remark: Pattern can also change

4. Step

31.12.2023 Disc (BS amount, FX real)	
Interest rate	7%
BS amount	60
Simple discounting applied	
40 is released	0.0
45 over half a year	43.5
15 over year and a half	13.6
Discounted BS amount	57.1
Discounted BS effect	-2.9
Change Interest	-0.8
How did the rates change	

Note: In IFRS 17 world, there exists the **Change in Financial assumptions** as well. We have multiple currencies reserves. If we would be doing these calculations only in USD, it would show up. However, our SAP data granularity and ARGO allows us to do calculation by transaction currency, thus this amount **equals to zero for AZ Trade**

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SLIDO question: What IFRS 17 options have you examined?

Counterparty Default Adjustment: formulae

Discounting options and selections cover majority of options you have for CDA

Let us denote:
ExpRes reserve amount ceded to given counterparty and exposed to its default [assume its run off is *m* years], $\boldsymbol{ExpRes_j}$ cash-flow element of the *ExpRes* in year *l* = *(1, …, m)*
PD probability of default for given counterparty within one-year time: constant over *m* years

Then the amount lost in case of counterparty default in year *j equals*

$$\sum_{l=j}^{m} \boldsymbol{ExpRes_l}$$

Total expected loss in case of counterparty default in any one year during the entire *m* years

$$\sum_{j=1}^{m} \boldsymbol{PD} * (\boldsymbol{1-PD})^{j-1} \sum_{l=j}^{m} \boldsymbol{ExpRes_l}$$

By switching sums, summing geometric series and simplifying:

$$\sum_{j=1}^{m} \boldsymbol{PD} * (\boldsymbol{1-PD})^{j-1} \sum_{l=j}^{m} \boldsymbol{ExpRes_l} = \sum_{j=1}^{m} \sum_{l=j}^{m} \boldsymbol{PD} * (\boldsymbol{1-PD})^{j-1} \boldsymbol{ExpRes_l} = \sum_{l=1}^{m} \sum_{j=1}^{l} \boldsymbol{PD} * (\boldsymbol{1-PD})^{j-1} * \boldsymbol{ExpRes_l} =$$

$$\sum_{l=1}^{m} \boldsymbol{PD} * \boldsymbol{ExpRes_l} \sum_{j=1}^{l} (\boldsymbol{1-PD})^{j-1} = \sum_{l=1}^{m} \boldsymbol{PD} * \boldsymbol{ExpRes_l} * \frac{\boldsymbol{1-(1-PD)^l}}{\boldsymbol{1-(1-PD)}} = \sum_{l=1}^{m} \boldsymbol{(1-(1-PD)^l} * \boldsymbol{ExpRes_l}$$

Counterparty Default Adjustment: options and summary

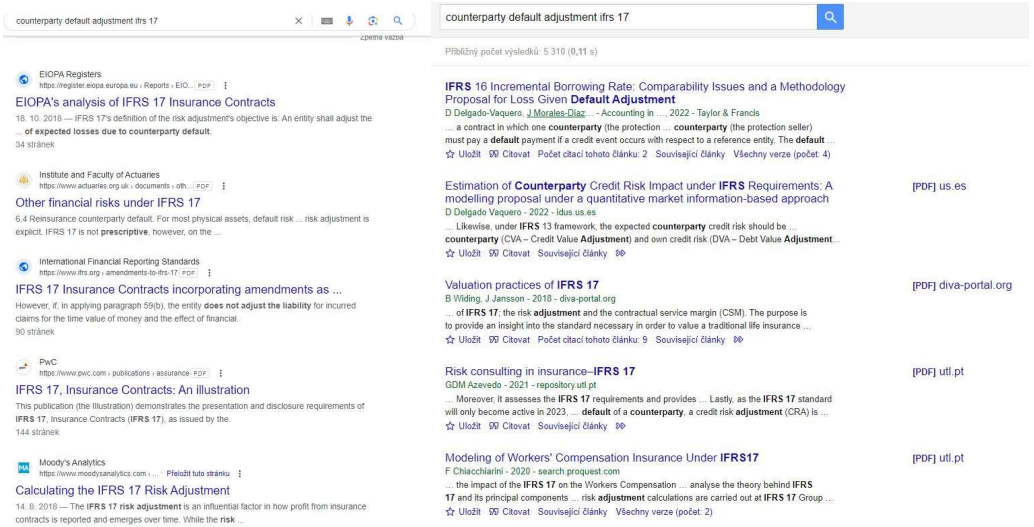
IFRS 17 options

- The formula provides a natural split of the total expected loss to the individual years during the *m* years of run-off, it allows for a cash-flow view
- The exposed reserve amount is derived from the ceded reserve amount by applying an exposure rate [reflecting that a deposit can be used to mitigate the impact of default]
- The loss-given-default is derived by applying a further recovery rate [assuming it is possible]

$$\sum_{l=1}^{m} (1-(1-PD)^{l} * Res_{l} * ExpRate * (1-RecRate)$$

*Note that simplifications using the modified duration of the ceded reserve amounts are based on the approximation of the first above formula with the assumption that the sums run to infinity, while company Y implementation does not use this simplification but rather the above precise formula allowing the cash-flow view

- **Mathematically well implemented, satisfying the goals of IFRS17**
  - **Due to its size, negligible, no big players care, hard to find some materials**



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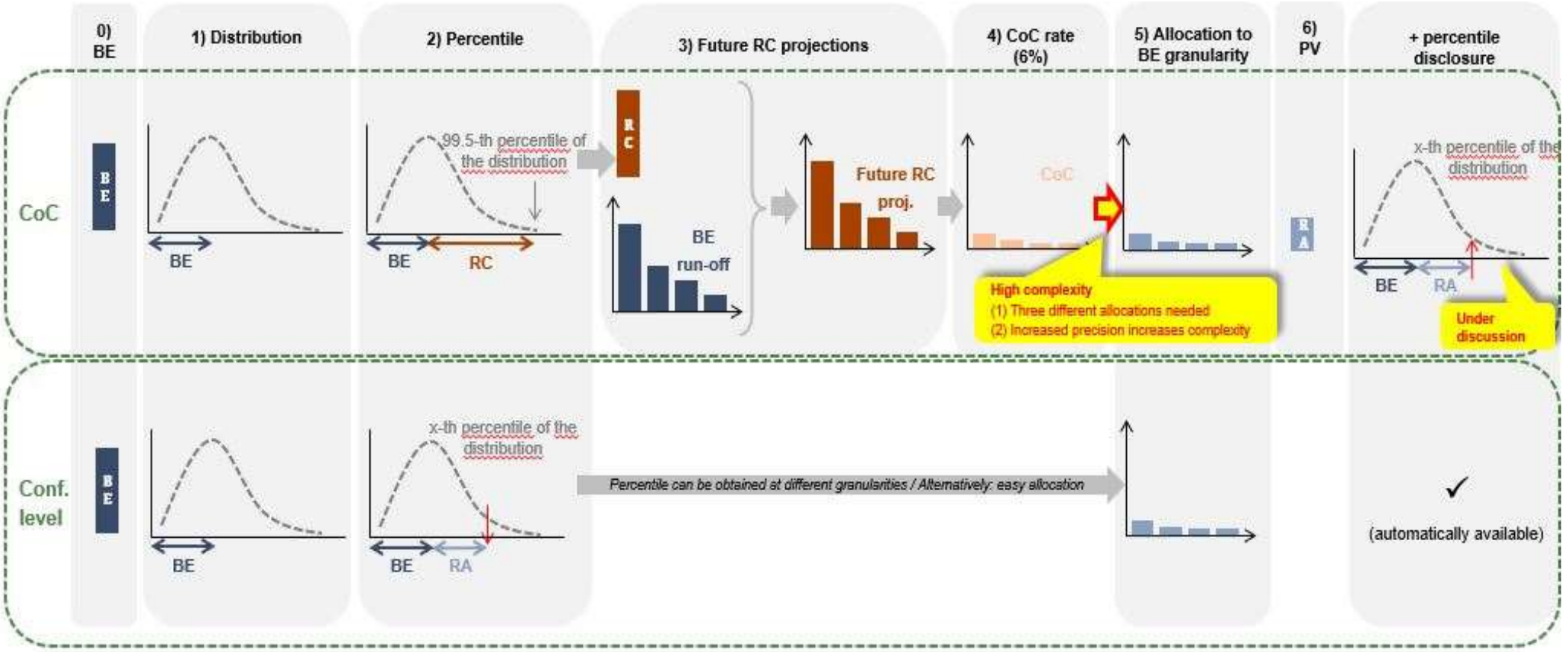
Risk adjustment: Cost of capital vs confidence level methods

IFRS 17 options

For IFRS 17 Risk adjustment, no approach is prescribed, option to choose the method: besides cost of capital method other approaches can be utilized, most notably the percentile – based approach (confidence level approach)



Credit: Tamas Falukozy

Conf. level

- Directly linked to reserves, easier interpretation
- Allows more “best-estimate” reserving
- Requirement of confidence level disclosure
- P&C market preference [used directly in some local GAAPs: Australia, Asia]
- Steering possibilities are flexible
- Stochastic modelling under actuarial department

- New concept, implementation
- Changes the way of thinking
- More complex calculation
- Puts pressure on percentile selection
- New business modelling

Presentation by Jakub Filka

Risk adjustment: Cost of capital vs confidence level methods

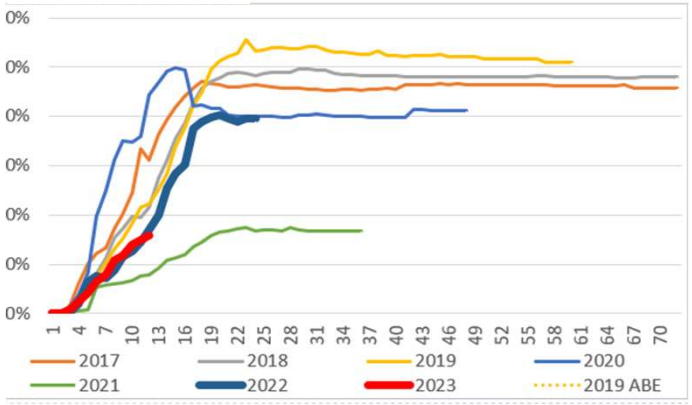
IFRS 17 options

CoC

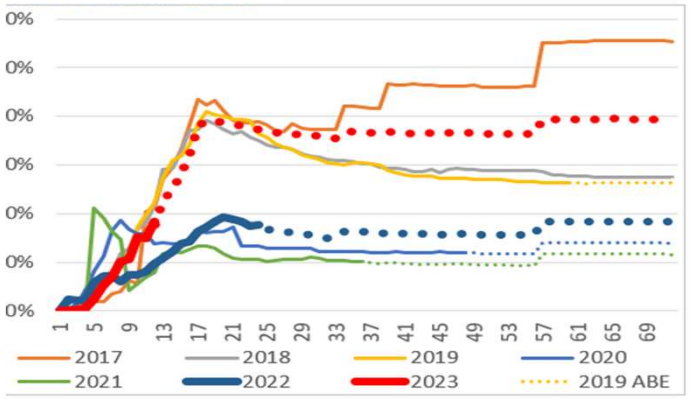
- Familiar with it from Solvency II
- Bridge between SII and IFRS17 [same risks measurement (can technically differ)]
- Desirable for L/H and reinsurance market [reinsurance underwriting is risk capital based]
- Stability options [averaging RC over periods]
- Internal consistency L/H and P&C
- New business modelling

- Weak connection to reserves
- Requirement of confidence level disclosure
- Allocation procedure is needed to determine Gross and (or) Ceded RA, split to regions
- Sensitive to CoC rate calibration
- Comparison effect within the company is limited [low frequency high severity region LIC RA KPI* is smaller than high frequency low severity region by roughly 1%]
- Comparison effect with other insurance companies is very limited, highly subjective to the approaches a company chooses
- Transparency is lost among the multiple assumptions needed
- Future RC projections [existence of salvage reserve]
- Inputs can be prepared by risk controllers

Region A



Region B



Picture demonstrates censored loss ratios for region A [frequency driven] and region B [severity driven].

* by LIC RA KPI we mean the ratio of PAA booked risk adjustment divided by booked undiscounted reserves

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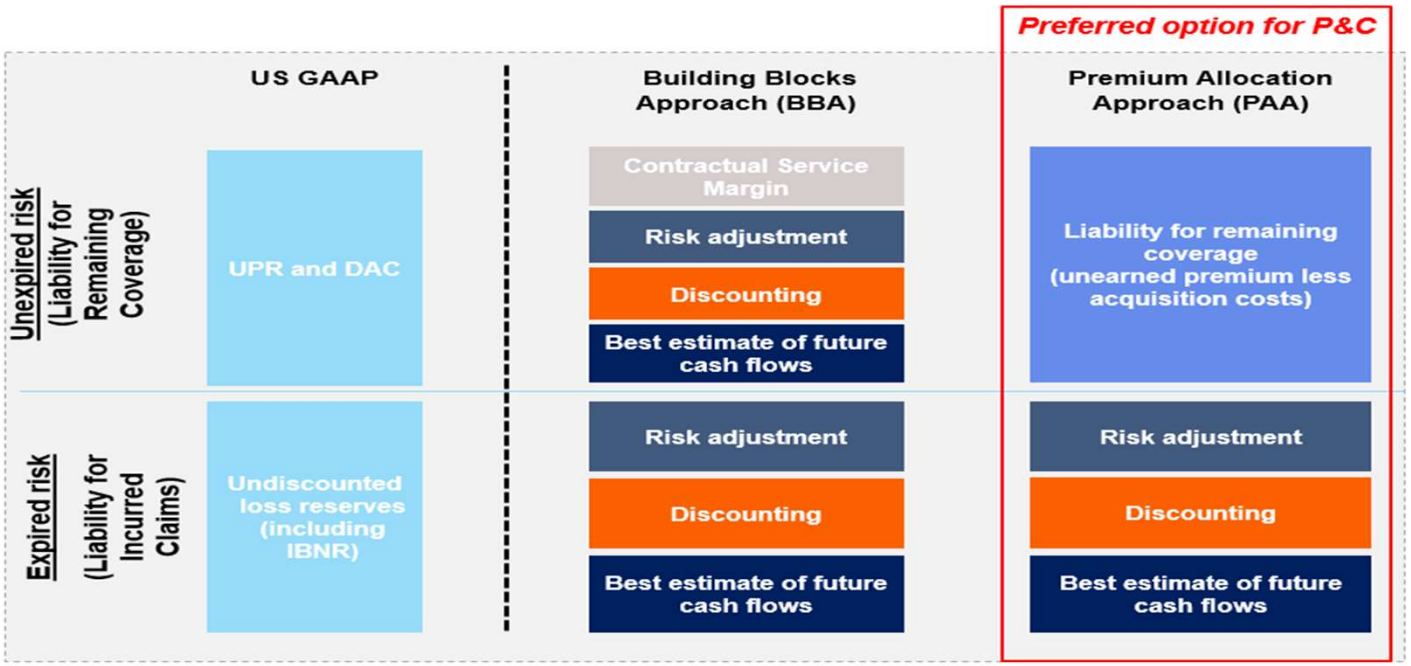
BBA vs PAA reminder, company X decision tree

IFRS 17 options



YE 2023 in kUSD	Gross	Ceded
Undiscounted	-503,243	174,740
Discounting	16,782	-6,637
Risk adjustment	-12,865	5,229
CDA		-20
IFRS 17 effect	-0.8%	-0.8%

Three steps decision tree:

1. Qualitative (norms - wise): if coverage period is less than one year => default PAA eligibility [met by most LoBs in company Y universe]

2. Qualitative (company Y – wise): If a group of insurance contracts does NOT have critical features
   a) Material volatility of financial variables
   b) Embedded derivatives
   c) Time between premium and service over a year
   d) Claims settlement period of 3 years
   e) Premium release pattern is non-linear

3. Quantitative criterium (norms - wise): maximum difference between LRCs measured under PAA and BBA over all measurement periods is higher than 5% (or nominally 15M EUR)

Presentation by
Jakub Filka

PAA eligibility testing

Isssurance year	Base Case	Claims ratio up	Claims ratio down	Base Case Interest scenario up	Claims ratio up Interest scenario up	Claims ratio down Interest scenario up	Base Case Interest scenario down	Claims ratio up Interest scenario down	Claims ratio down Interest scenario down
2017	1.1%	2.0%	0.8%	0.7%	1.4%	0.3%	1.9%	2.6%	1.9%
2018	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2019	0.5%	0.6%	0.5%	0.1%	0.5%	0.2%	1.0%	1.0%	1.0%
2020	0.2%	0.9%	0.5%	0.7%	0.7%	0.9%	1.1%	1.3%	1.1%
2021	0.2%	0.3%	0.2%	0.1%	0.2%	0.1%	0.5%	0.5%	0.5%

Results (Abs Values)	Max Δ LRC	Max ABS Δ LRC [kUSD]
Base case	1.13%	49
Interest scenario up	0.72%	48
Interest scenario down	1.92%	127
Base case + Claim up	1.96%	69
Interest scenario up + Claim up	1.37%	48
Interest scenario down + Claim up	2.56%	127
Base case + Claim down	0.83%	49
Interest scenario up + Claim down	0.89%	59
Interest scenario down + Claim down	1.92%	127
Maximum	**2.56%**	**127**

A PAA eligibility testing for Bonding [long term line of business that does not satisfy criteria 1.] along with the measured KPIs.

Stress testing for interest rates is equal to +/- 100bps while claims are tested for +/- 5%

While CSM and Risk adjustment increase the LRC component (in a Group of profitable contracts), discounting decreases it. With the current curve evolution and risk adjustment stability (2.5%), the results with claims ratio up by 5% and interest rates being down by 100bps differ the most.

Assumptions: Loss ratio is positioned at 62%, admin cost ratio at 10% and premium is paid upfront. Straight-line PAA release pattern, constant CSM release pattern.

Presentation by Jakub Filka

SLIDO question: How satisfied are your CFOs with IFRS 17?

Key takeaway

- Use the detailed financial reporting (to improve the reserving)

  - ❑ Discounting: Cash Flow pattern – data selection

    Any MBE should consider the time component

  - ❑ Discounting: Quarterly vs Yearly approach

    Pro rata run off is the least we can give

  - ❑ Discounting: Tail management

    Clean up the case reserves on old origin (attachment) years

  - ❑ Risk adjustment

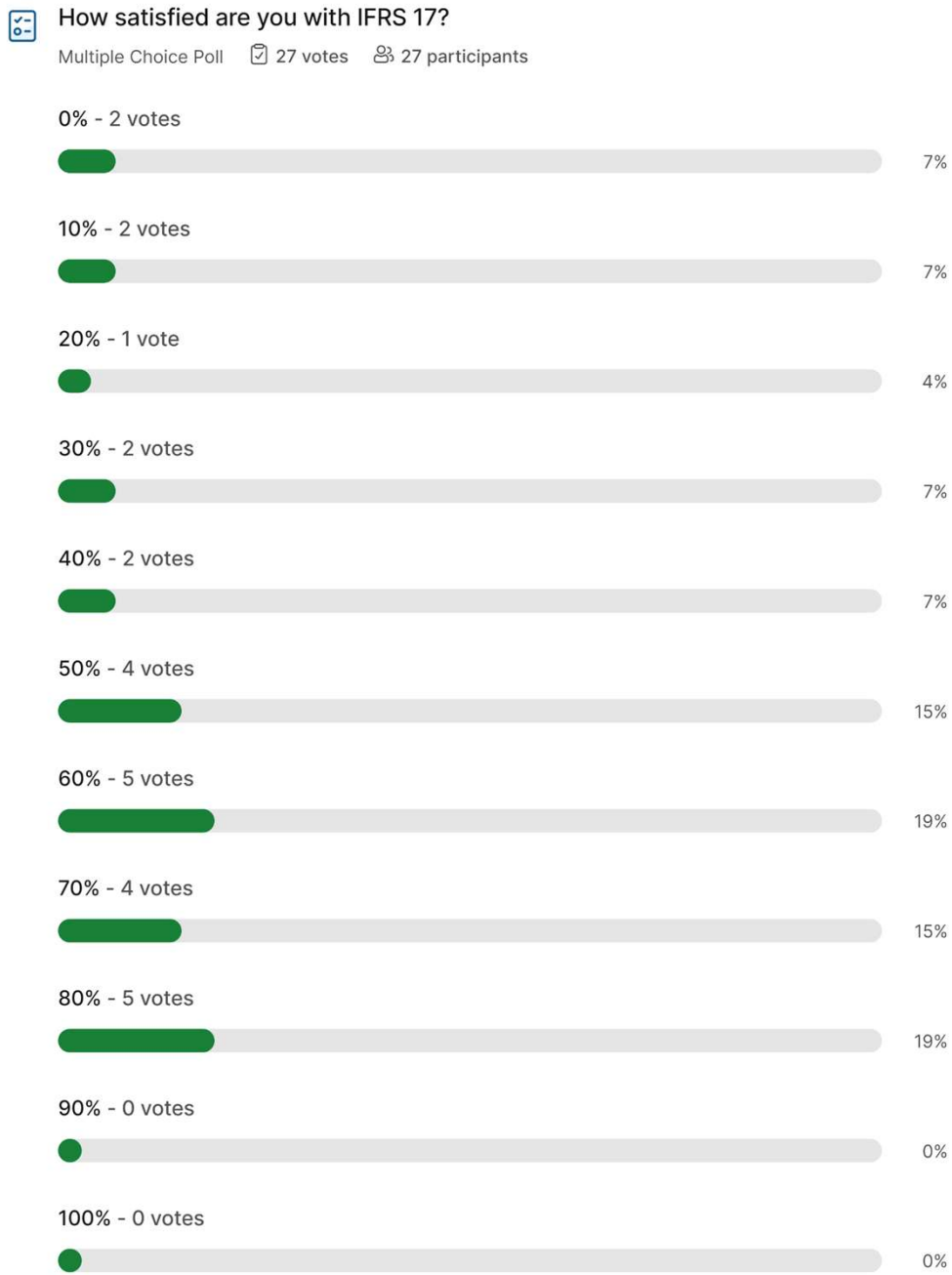
    Gross allocation, existence of RA can be viewed as a part of prudency margin

Thank you!

Q&A

Presentation by
Jakub Filka

IFRS 17 options



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slido

What discounting/IFRS17 options have you examined?

Open text poll · 3 responses · 3 participants

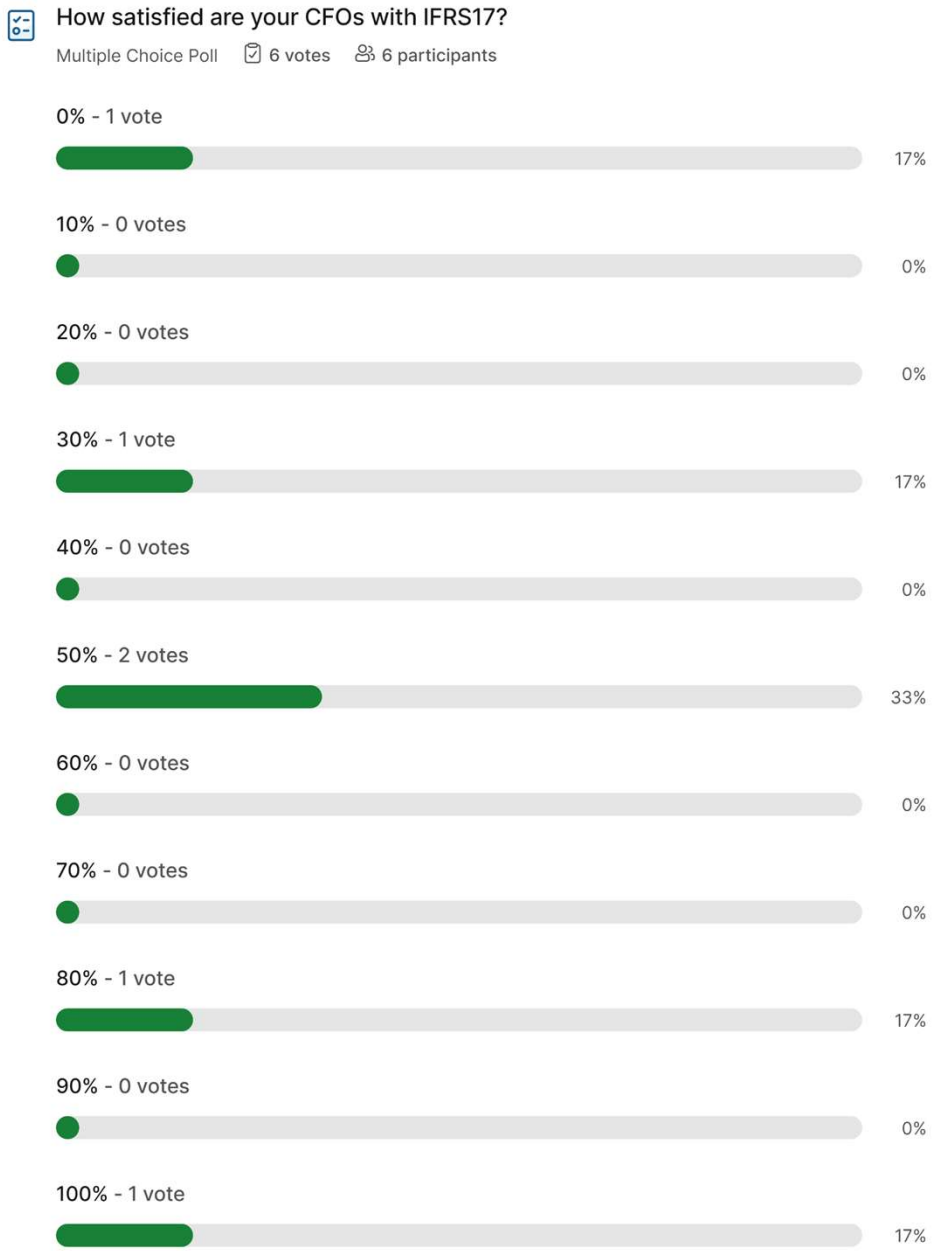
Anonymous
Various periodicities and middle/end period, discrete/continuous, to have feeling od the impacts.

Anonymous
I dont know

Anonymous
No options, group decided 🙂

slido

IFRS 17 options



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