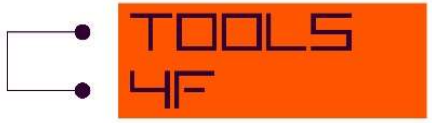
Assets-Liability Management in Insurance Business

Martin Janeček – Tools4F



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Objectives

- ALM Objectives
- ALM Analysis and Techniques
- ALM Organization

Martin Janeček

- Ph.D. in Actuarial Science at MFF UK in Prague
- Certified actuary
- Since 1995 in insurance business
- 2011+ Managing Director of Tools4F actuarial consulting comp.
- 2011+ Regular teacher at Economic University in Prague

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About Tools4F

Tools4F = actuarial consulting team since 2011

- Based in **Czech Rep.**
- **Team**: **actuaries, data and business consultants**
- **Services:**
  - **Actuarial consulting**
  - **Tools**
  - **Education**
- **Operating mainly in CE + Adriatic region** (CZ, SK, HU, SI, HR, RS, BA)

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Agenda

1. Introduction to ALM
2. ALM analysis
   A. Value Management
   B. Cash Flow Management
3. ALM Organization

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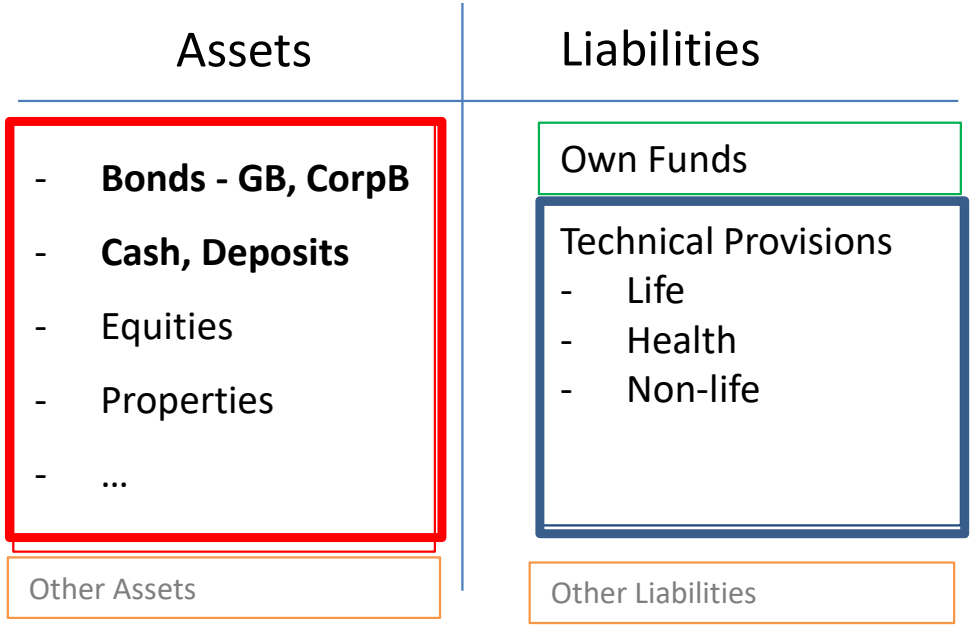
Introduction to ALM (1)

- ALM – what we speak about
  - Liabilities
    - **Technical Provisions**
      - based on sold contracts
      - calculated by actuaries
      - **limited management**
    - Own Funds (= A – L)
    - Others
  - Assets
    - **Investments**
      - Bonds, Depo, Cash > 80%-90%
      - **might be managed** – sold/bought
    - Others



Introduction to ALM (2) – ALM Objectives

- Our goal:
  How to adjust the **investment structure** to meet **defined Assets-Liability characteristics**.
  - What characteristics
  - Why them

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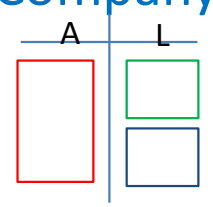
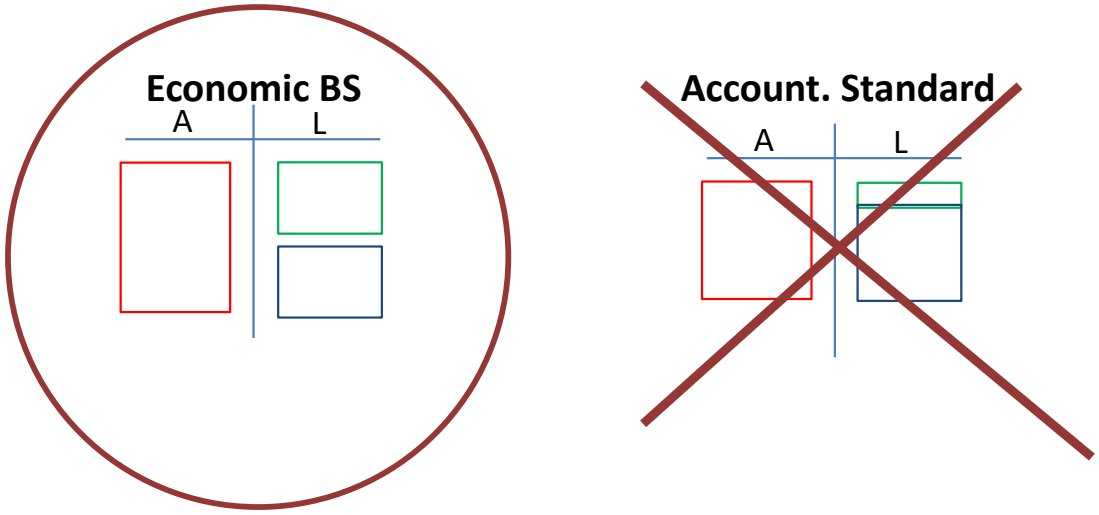
A. Value Management (1)

- What is the S/H objective?
  - Company value is:
    - increasing
    - stable (within the risk appeitite of the S/H)
  - Where to find the Company value?
    - OF = A – L





A. Value Management (2) – Δ A,L Sources

- What drives the changes in A and L?

Δ A sources	**Δ L sources**
Δ Interest rates	Δ Interest rates
Δ Credit	Δ Claims
Δ Equity	Δ Expenses
Δ Property	Δ Lapses
Δ FX	Cat
…	Op. Risk
	…

A. Value Management (3) – Non-Financial Risk

Δ A sources	**Δ L sources**
Δ Interest rates	Δ Interest rates
Δ Credit	Δ Claims
Δ Equity	Δ Expenses
Δ Property	Δ Lapses
Δ FX	Cat
…	Op. Risk
	…

Non-Financial risks
(Ins. Risk, Op. Risk, …)
=>
NOT (main) ALM focus
- liquidity limits based on stress scenarios

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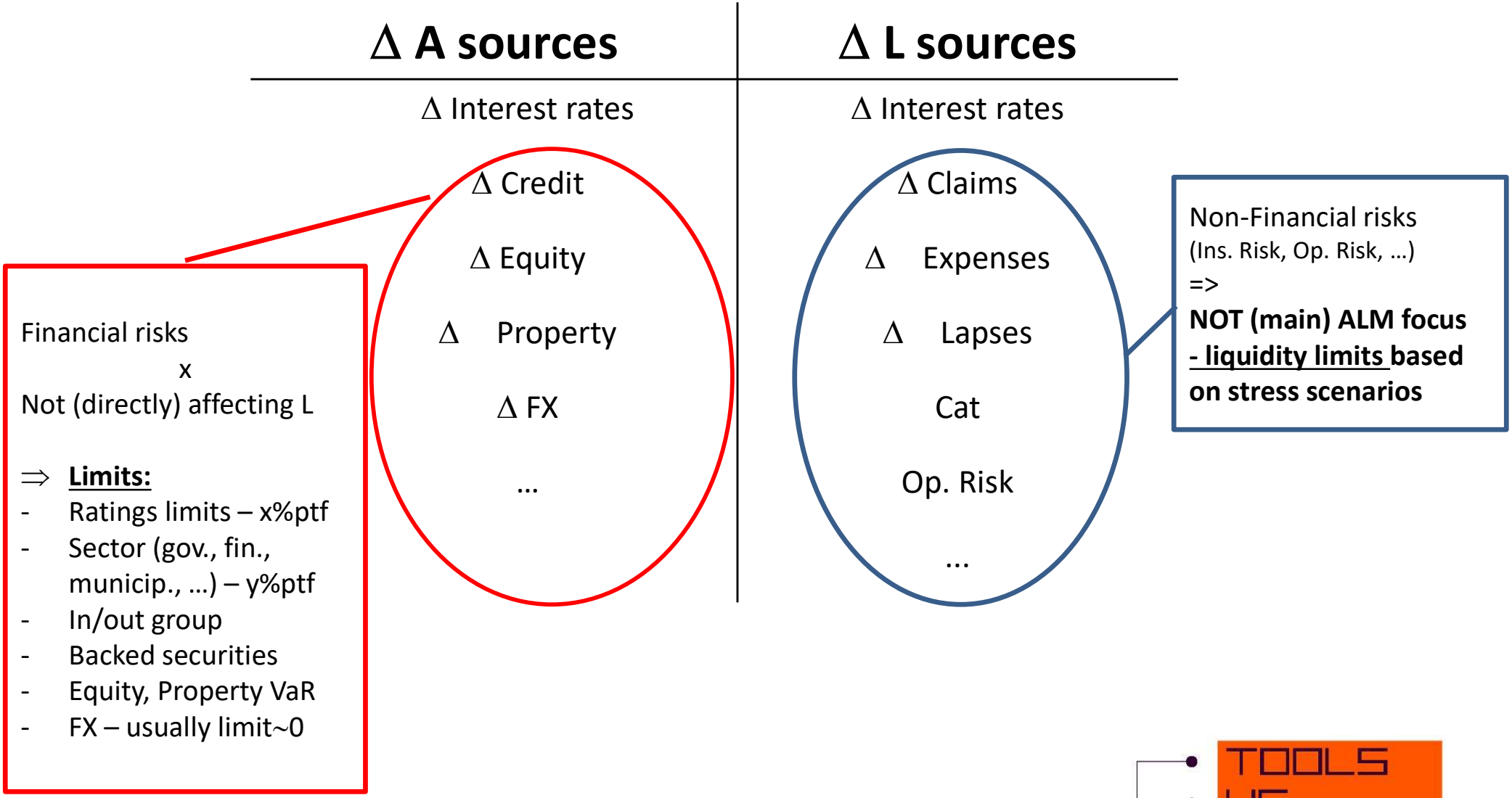
A. Value Management (4) – Financial Risks



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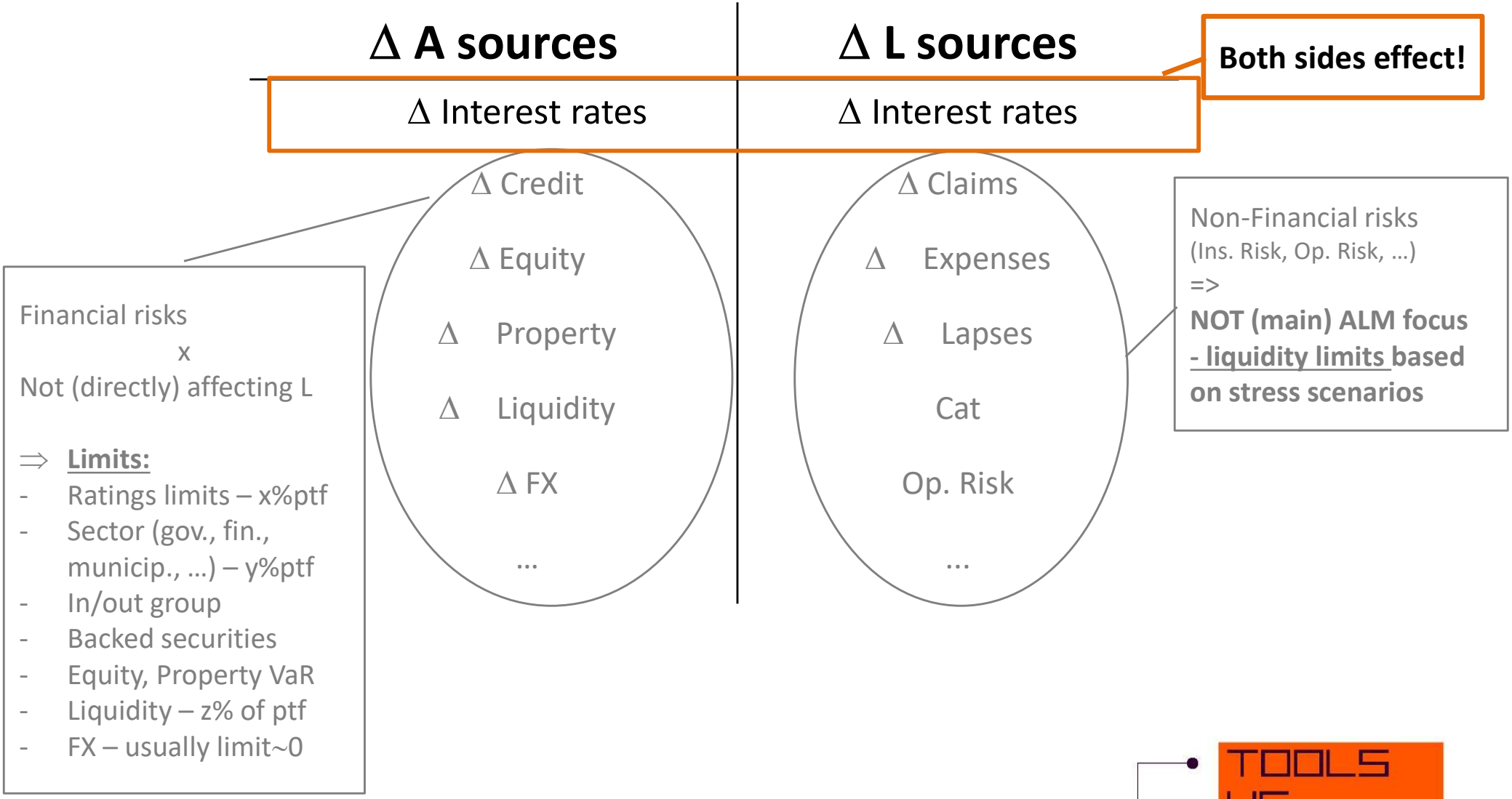
A. Value Management (5) – Interest Rate Risk



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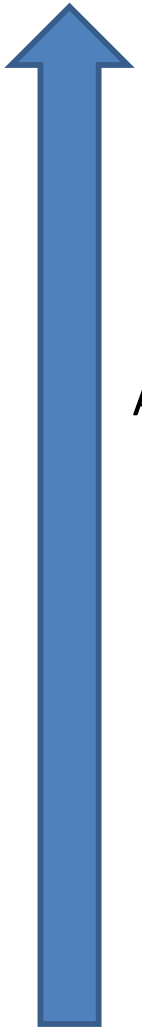
A. Value Management (6) – Interest Rate Risk

- Δ (Market) Interest Rates
  - Changes every day and may be significant.
  - No management possibility to affect the market
  - Δ i =>
    - Δ A
      - Δ MV bonds (*i* ↑ => MV↓ and vice versa)
    - Δ L
      - Δ Fair Value (FV, MV) liabilities
        - discounting
        - profit share
- Yield curve example

https://www.investing.com/rates-bonds/czech-republic-government-bonds?maturity_from=90&maturity_to=290

A. Value Management (7) – Insurance Liability Ptfs

- Insurance Liability Portfolios:
  - Life With-Profit products:
    - long-term
    - company cannot unilaterally terminate
    - min. investment return guaranteed
    - profit share if invest return > guaranteed rate
  - Life w/o Profit share (risk products):
    - long-term
    - company cannot unilaterally terminate
    - min. investment return guaranteed
    - ~~profit share if invest return > guaranteed rate~~
  - Unit-linked:
    - long-term
    - company cannot unilaterally terminate
    - ~~min. investment return guaranteed~~
    - ~~profit share if invest return > guaranteed rate~~
  - Non-life:
    - ~~long-term~~
    - company cannot unilaterally terminate
    - ~~min. investment return guaranteed~~
    - ~~profit share if invest return > guaranteed rate~~



ALM complexity

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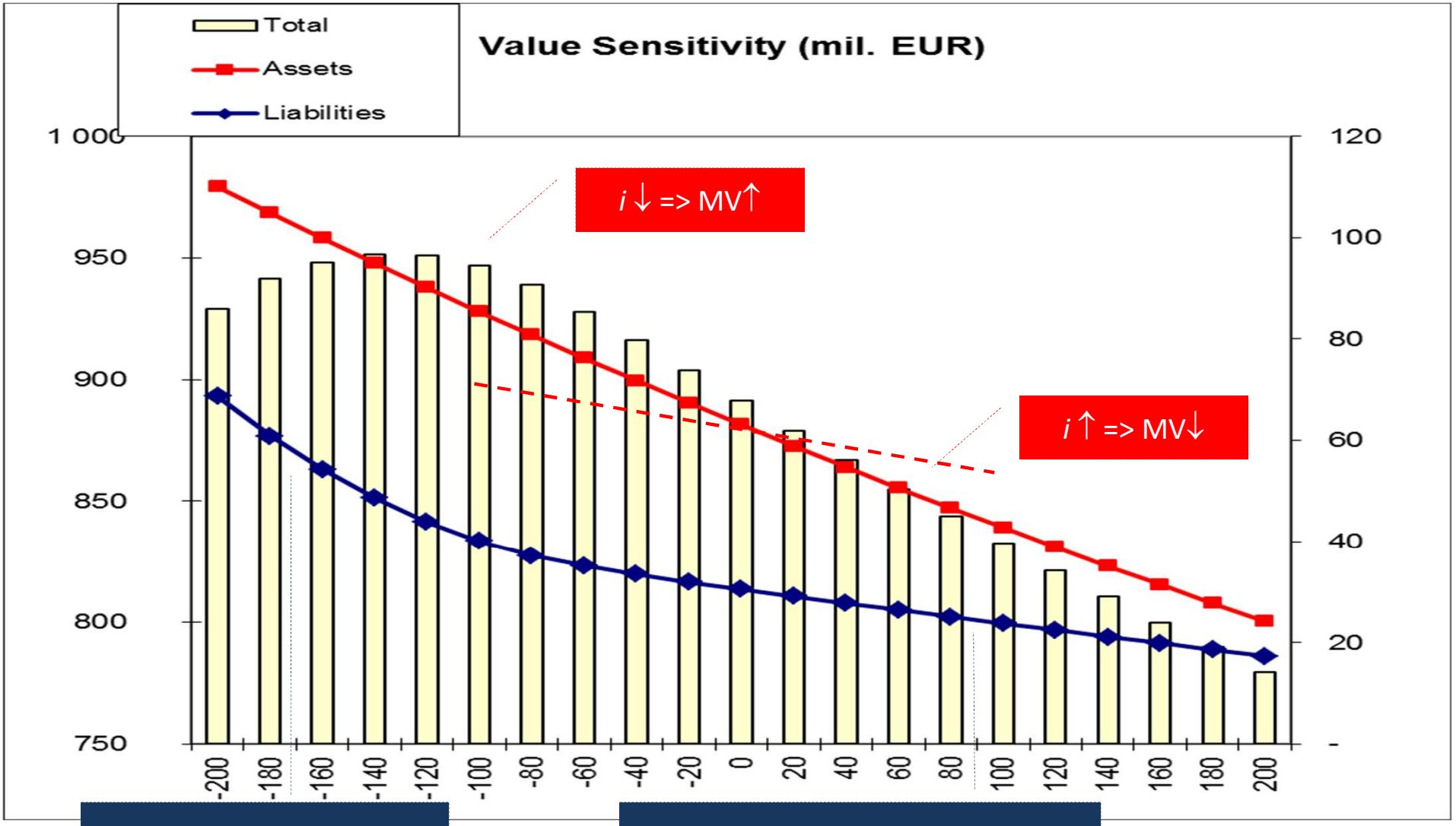
A. Value Management (8) – Life With-Profit products



CF guar. (no PShare)
i ↓ (discount)=> FVL ↑

i ↑ discount=> FVL ↓
CF with PS=>(*i* ↑=>CF↑)=> FVL↑

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A. Value Management (9) – Possible Solutions Life W/P

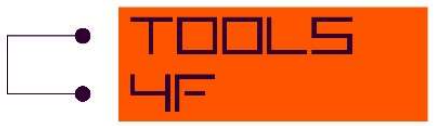
- Buy „similar“ option
  - Buy interest rate option (ptf of IR options)
    - ☺ Best hedge
    - ☹ Illiquid
    - ☹ Expensive
  - Buy the same contract from the other company ☺
- Change in assets duration (dynamically)
  - ☺ Good hedge for smaller IC shifts
  - ☹ Transaction costs
  - ☹ Capital gains realization => (unwanted) PL effect
  - ☹ Future investment returns!
- Limits
  - Duration gap
  - Dollar duration gap or 10bps BPV
  - Other than parallel shifts
    - Partial duration, Key rate sensitivity
    - NY7
    - Internally defined scenarios (crisis, …)

- Duration
  - Modified: $MD = -\frac{1}{MV}\frac{dMV(YtM)}{dYtM}$
  - Fix-coupon bond – can be shown: $MD = \frac{\sum_{t=1}^{TtM}\frac{t \cdot C_t}{(1+YtM)^t}}{\sum_{t=1}^{TtM}\frac{CF_t}{(1+Y)^t}}$ … avg. TtM
- Note (important): With-Profit Insurance Liabilities
  - $CF_t = f(i_1, i_2, \dots, i_t)$
  - **=>** „fix-coupon bond formula**“ cannot be applied!**
  - MD does not have the „average time TtM“ interpretation
- Usually: MD estimation („effective duration“)

$$MD \approx -\frac{1}{MV(0)}\frac{MV(+\Delta \boldsymbol{i}) - MV(-\Delta \boldsymbol{i})}{2 \cdot \Delta i}$$

applied for both A and L

YC shift (bps)	Value Sensitivity				Duration		
	Assets		Liabilities	Total	Assets	Liabilities	Gap
-200	979 220 859	-	888 724 725	**90 496 134**	5,4	8,7	**-3,3**
-180	968 571 564	-	873 276 556	**95 295 007**	5,4	7,3	**-1,9**
-160	958 129 718	-	860 489 253	**97 640 465**	5,3	6,5	**-1,1**
-140	947 890 026	-	849 376 112	**98 513 914**	5,3	5,5	**-0,2**
-120	937 847 357	-	839 995 542	**97 851 815**	5,3	4,4	**0,8**
-100	927 996 735	-	832 521 541	**95 475 194**	5,2	3,4	**1,8**
-80	918 333 335	-	826 913 310	**91 420 025**	5,2	2,3	**2,8**
-60	908 852 479	-	823 031 383	**85 821 096**	5,1	2,1	**3,1**
-40	899 549 630	-	819 638 113	**79 911 516**	5,1	1,8	**3,3**
-20	890 420 385	-	816 727 544	**73 692 841**	5,0	1,6	**3,4**
0	881 460 475	-	814 033 775	**67 426 700**	5,0	1,6	**3,4**
20	872 665 757	-	811 368 748	**61 297 009**	4,9	1,6	**3,3**
40	864 032 210	-	808 731 914	**55 300 296**	4,9	1,6	**3,3**
60	855 555 931	-	806 122 738	**49 433 193**	4,9	1,6	**3,3**
80	847 233 134	-	803 540 702	**43 692 432**	4,8	1,6	**3,2**
100	839 060 141	-	800 985 297	**38 074 844**	4,8	1,6	**3,2**
120	831 033 381	-	798 456 030	**32 577 350**	4,7	1,6	**3,2**
140	823 149 388	-	795 952 422	**27 196 966**	4,7	1,6	**3,1**
160	815 404 794	-	793 474 002	**21 930 792**	4,7	1,5	**3,1**
180	807 796 329	-	791 020 314	**16 776 015**	4,6	1,5	**3,1**
200	800 320 816	-	788 590 913	**11 729 903**	4,6	1,5	**3,1**



A. Value Management (10) – Other Ins. Ptfs

- Life w/o Profit share:
  - No IR option
  - CF is fixed (i.e. not depending on *i*)
  - => similar behavior as bonds => possible to be matched by bonds
  - OF volatility given by the other drivers than interest rates (insurance risk, op. risk, …)
- Unit-linked
  - U-L fund (replicable) - matched perfectly by the investment strategy chosen by the P/H
  - Non-replicable – similar to Life w/o Pshare
- Non-life
  - Similar to Life w/o PShare
  - + short term
  - => short term investments match well

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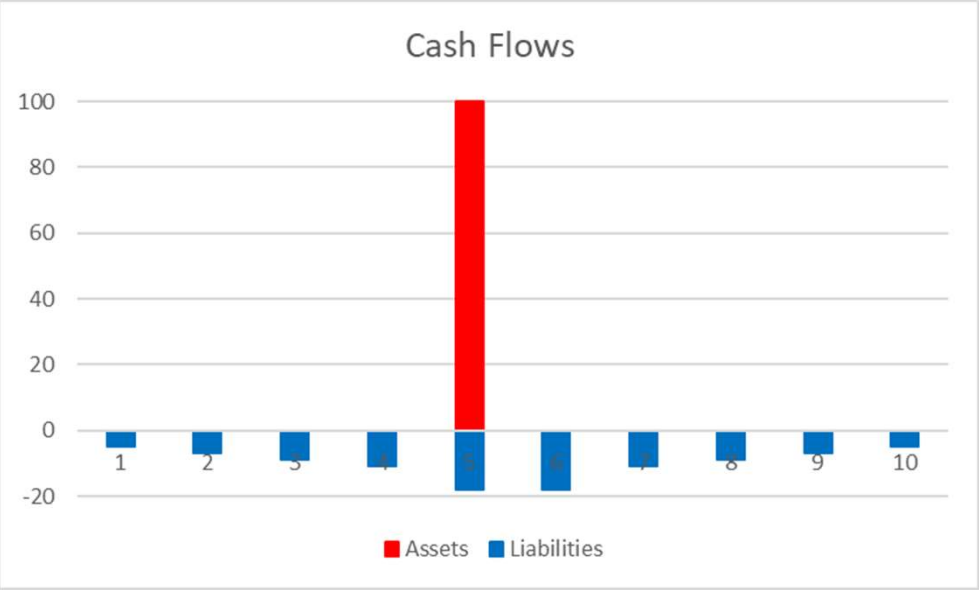
B. Cash flow management (1)

- Up to now – mgt. of immediate ΔA and ΔL
- Illustrative company situation



  - *i* = 0% flat
  - Assets: 100 pcs of ZC Gov. Bond, 1 unit nominal each, TtM=5Y, $D_A = 5$
  - MVA = MVL = 100; $D_A = D_L = 5$ => Duration gap = 0;

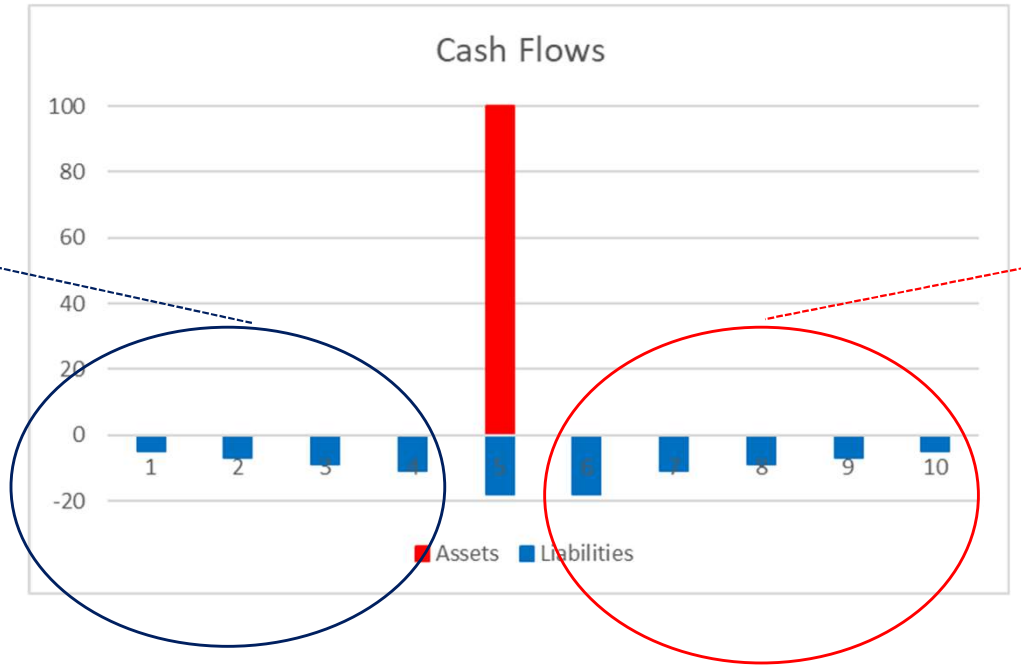
  =>we are OK…

- Are we really OK?

B. Cash flow management (2) – Reinvestment Risk

What is the risk?

- Several pcs of the GBs will have to be **sold** in 1-5Y.
- **Risk:**
  Future MVs will be **low** => **More** than 50 pcs needs to **be sold**.



- Reinvestment of the GB after 5Y.
- **Risk:**
  Future MVs will be **high** => Not **enought value** will be obtained from the reinvestment to cover the remaining liabilities.

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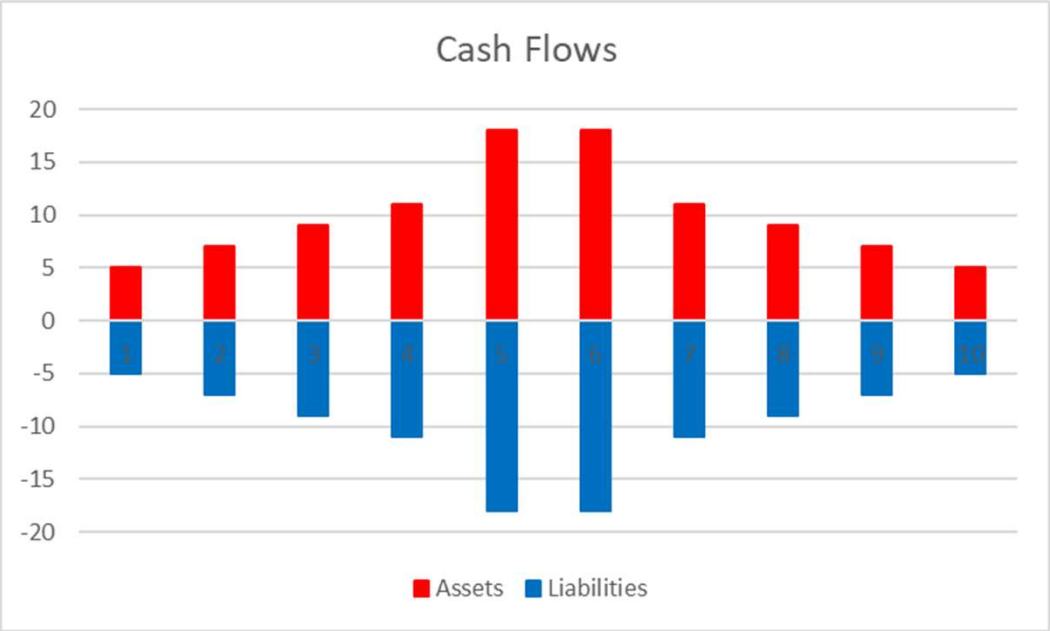
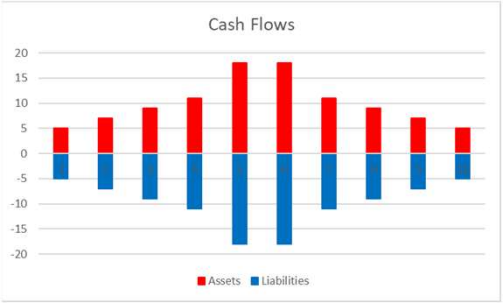
B. Cash flow management (3) – Objective

- Objective:



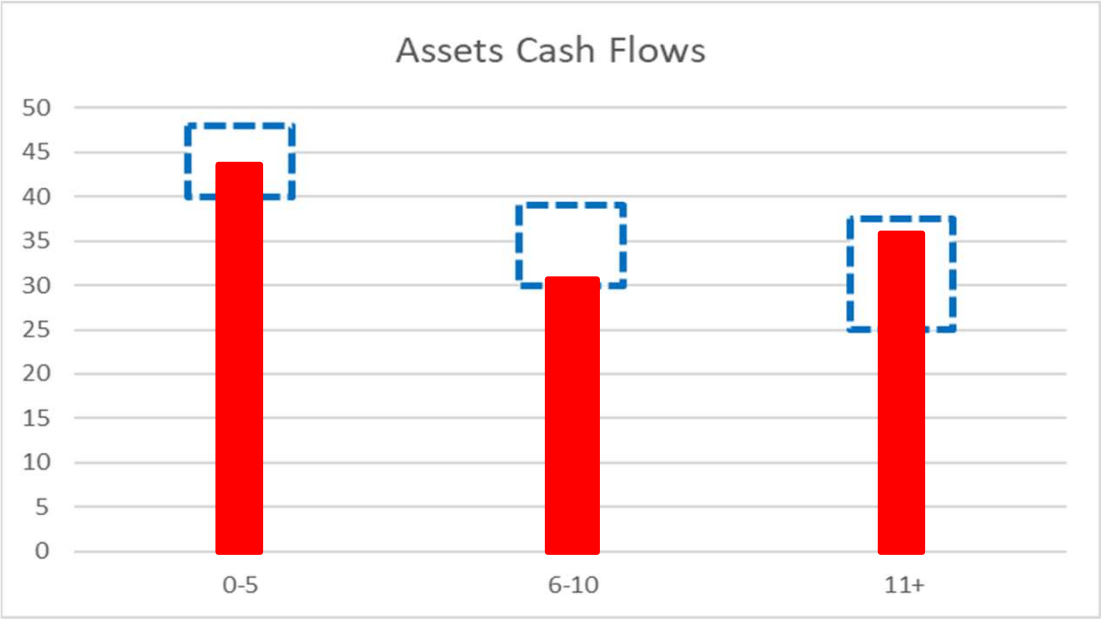
B. Cash flow management (4) – Practical Limitation



- Practical Limitations:
  - Availability of relevant financial instruments
    - Every year
    - Long-term
    - Státní ČR - Patria.cz
  - Insurance liability cash flow volatility
    - Insurance risk
    - Op. risk
    - Profit share
    - …

B. Cash flow management (5) – Solutions

- Usual Solutions - limits:
  - Cash flow gaps
    - Usually in buckets (e.g. 0-5, 6-10, 11+)
    - Stricter on short end



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ALM Organization(1) – Investment Strategy example

- Investment Objectives
  - *Objectives*
    - *Max inv. performance to maximize long-term PL and Life Pshare*
    - *Stay within all the defined risk limits*
  - *Global company risk appetite statement*
    - *Retain A- rating*
    - *SII ratio > 200%*
    - *Worst case loss < 1Y profit*
    - *…*
- Portfolios Definition
  - *Portfolios:*
    - *A: Life&Hth W/P*
    - *B: U-L;*
    - *C: NL*
    - *D: Own funds*
    - *…*
  - *Each ptf has assigned assets and is steered individually*
  - *Rules for transfers between ptfs*
  - *…*

ALM Organization(2) – Investment Strategy ex. – Risk Limits

- Risk Limits
  - Interest rate risk
    - *Portfolio A:*
      - ***BPV gap: 10BPV$_A$ - 10BPV$_L$ < a% of invested assets***
      - *Duration gap: $MD_A - MD_L < b$*
      - *Key Rate Sensitivity < c% of invested assets for key rates (1, 3, 5, 7, 10, 15, 20)*
      - *$\Delta A - \Delta L < d$ [EUR] for each NY7 scenario*
      - *…*
    - *Portfolio B*
      - *…*
  - Reinvestment Risk
    - *Portfolio A:*
      - *0-5: Cumulative CF = +-e% from the base scenario*
      - *6-10: Cumulative CF = +-f% from the base scenario*
      - *11: Cumulative CF = +-g% from the base scenario*
    - *Portfolio B*
      - *…*

ALM Organization(3) – Investment Strategy ex. – Risk Limits

- Risk Limits (cont.)
  - Bonds limits:
    - *Rating*
      - *A rated and higher < h% of the invested assets*
      - *BBB < i% of the invested assets*
      - *…*
    - *Sectors:*
      - *GB <100%*
      - *Municipality < j% of the invested assets*
      - *Financial sector < k% of the invested assets*
      - *…*
    - *Countries:*
      - *…*
  - Equities
    - *VaR (1Y, 99%) < i % of the invested assets*
    - *Ratings*
    - *Sectors*
    - *…*
  - Properties
    - *VaR (1Y, 99%) < m% of the invested assets*

ALM Organization(4) – Investment Strategy ex. – Risk Limits

- FX
  - *No risk allowed*
- Derivatives
  - *Purely for FX risk mitigating*
- Liquidity
  - *n% of invested assets with immediate liquidity*
  - *…*
- Concentration
  - Intra-Group
  - Out of the Group

- Key terms definitions

ALM Organization(5) – Investment Strategy ex. – Organization

- ALM organization:
  - Roles:
    - *CF0 (BoD) + CRO (Risk Function)*
      - *Investment Strategy definition*
    - *CFO*
      - *Assets Manager performance monitoring (benchmarking)*
      - *Comparison with the budget*
      - *Accounting recording of values of assets and liabilities*
      - *Head of A-L Committee*
    - *CRO*
      - *Risk limits monitoring and reporting*
    - *Assets manager:*
      - *Market trading*
      - *Maximal performance within the IS limits*
    - *Actuarial Function*
      - *Actuarial figures calculated properly*
    - *…*
  - A-L Committee
    - *Monitoring, reporting, decisions rules and escalation procedures*
    - *…*

ALM Organization(6) – ALM Report

- Comments on the market development – asset manager
  - political and financial situation, …
  - interest rates, equities, ... development
  - market expectations
- Buy/sell operations realized – CFO (AM)
  - What has been bought/sold – what investment return realized
- Investment returns – CFO
  - market x accounting x plan x AM benchmark
- Risk position – CRO
  - Each limit check - ☺ x 😐 x ☹
- Buy/sell operations planned – CF0 (AM)
  - Current and expected free cash investments

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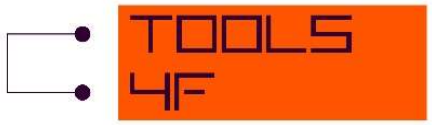
C. Other ALM Topics (1) – Other Investments

- Other investments (except GB):
  - CorpB
    - MV modelling incl. the credit risk
  - Equities/properties
    - Speculative purposes X Strategic positions
    - Strat. pos. - possibly assuming to cover the longest liability cash flows
  - Derivatives
    - Mostly just for hedging purposes – e.g. FX risk
  - FX
    - Usually close to not allowed

C. Other ALM Topics (2) – Other „hints“

- Steer the accounting PL results as well
  - Not only long-term but also the current PL (i.e. accounting) results
  - => selected realization of capital gains
- Existing Business vs. Future New Business included
  - + longer term investments possible => higher yields potential
  - ? How many years of FNB?
  - ? What probability of the FNB?
  - - open SII position – Own Funds
  - + Appraisal Value (EV + Goodwill) matched
- ALM starts with new product definition!
- Stochastic analysis for the risk mng.
  - Mng. of other A-L characteristics
    - VaR (1Y, high quantile), TVaR, …
  - Proper actuarial skills and models necessary
  - + more accurate if done well
  - - difficult interpretation to senior management

Thank you for your attention!



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