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A practical approach to balance sheet optimisation:

Structure, funding mix and optimisation for a vanilla commercial eurozone bank

Thought Leadership Series #26

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BTRM paper: a case study built with LabBank

Abstract

Most of a bank's interest rate and liquidity risk exposure is given by its balance sheet structure, well before the Treasury function transacts a swap. This paper takes a real-world eurozone commercial bank's actual balance sheet, and its financial plan for the following year, and asks how the plan should look if its balance sheet structure is to be genuinely optimised, and not just larger. The current approved budget pushes the economic value (EVE) interest-rate risk measure beyond the bank's risk appetite, but hedging that with more swaps would only move that risk into net interest income. We review the balance sheet layer by layer and then optimise it as a whole, accepting only structures that stay within limit on today's yield curve and other plausible curves, so that profit is not bought with rate risk today that may be unacceptable if today's curve moves in the wrong direction. We also set Basel LCR and NSFR as hard constraints alongside the bank's EVE and NII limits. The result is a balance sheet exhibiting greater P&L and less delta EVE risk, paid for with part of the NII headroom, and our recommendations read as amendments to the plan, not a new plan. A Monte Carlo analysis on 500 independently simulated curves shows that the proposal breaches the internal limit on fewer curves than the current plan, and also keeps its profit on the worst-outcome curves.

1 The bank, the challenge and the tool

Imagine you have just joined a real-world eurozone commercial bank as its head of Asset Liability Management (ALM). The bank is well capitalised (Tier 1 is 12 % of total assets), and the business wants to use that capital to grow. The risk measures are already under strain: EVE in the parallel up shock is at −10.6 % of Tier 1, outside the −10 % appetite, and the growth plan for next year takes it to −11.6 %. Your job is not to stop the growth but to show how the bank can grow and stay within its appetite.

Some actions are yours alone: the swap programme (its size, its tenor and its floating index), the securities portfolio and the bank's own issuance. Others you share with the business through pricing, FTP and the ALCO: the mix of fixed and floating loans, the deposit products and the pace of growth in each line.

Meet the bank, a regional eurozone bank: €10.0bn of total assets, €1.2bn of Tier 1 capital, a retail and SME franchise and a securities portfolio of government paper (balance sheet at the report date below).

Assets (€10.00bn)

Product	€bn	Rate
Mortgage (fixed)	4.00	3.25%
Mortgage (floating)	0.20	4.16%
Consumer loan (fixed)	0.80	8.61%
Consumer loan (floating)	0.10	9.07%
Credit card	0.30	13.25%
SME investment loan (fixed)	0.60	4.03%
SME investment loan (floating)	0.70	4.22%
Corporate loan (floating)	0.30	4.24%
Government bond (fixed)	1.80	2.62%
T-bill	0.50	2.21%
ECB excess reserves	0.40	2.52%
Cash / minimum reserve	0.10	0.00%
Interbank placement	0.20	2.50%
Total assets	**10.00**	**3.96%**

Liabilities + Equity (€10.00bn)

Product	€bn	Rate
Current account (retail)	3.90	0.00%
Current account (SME)	0.40	0.62%
Current account (corporate)	0.30	0.75%
Savings account	0.90	0.77%
Term deposit (retail)	1.70	1.86%
Covered bond (fixed)	1.20	2.72%
Interbank deposit	0.40	2.50%
Common shares (equity)	0.40	–
Retained earnings (equity)	0.40	–
Risk reserves (equity)	0.40	–
Total L + E	**10.00**	**0.86%**

Off balance sheet	€bn
Pay-fixed IRS (7Y, 3M EURIBOR)	1.67

30 Sep 2026. Rate = balance-weighted client rate (assets: earned, liabilities: paid); totals: asset yield and cost of funding.

Three features define this structure: **72 % of the assets are fixed-rate** for several years (mortgages, fixed consumer and SME loans, government bonds); **almost half of the funding is current accounts** at little or no cost; and a **pay-fixed swap programme** of €1.67bn closes part of the gap between the two.

The Challenge

The business has a financial plan for next year: grow the loan book, run down the securities, fund the growth with term deposits. The objective of this paper is to identify how we arrive at the most optimal balance sheet structure. The challenge is not "how many swaps do we need?" but: *which balance sheet structure should the plan aim for?* We look at the whole structure (assets, funding, securities and swaps), and at how each layer moves the two interest rate measures that matter, EVE and NII, together with liquidity and profit.

Capital is not the constraint. Tier 1 is 31 % of RWA against a floor of 18 %. The bank also maintains a comfortable buffer above its MREL requirements. All 8 credit products generate a Return on Capital that is above the 11 % Cost of Capital approved by the board (Appendix C).

The tool. All calculations in this paper were done with **LabBank**, a balance sheet and ALM model constructed by the Author. LabBank generates a bank contract by contract in a SQL database, projects contractual and behavioural cash flows (prepayments, core and non-core deposits with pass-through rates), and computes the repricing gap, NII and EVE under the EBA supervisory shocks, LCR and NSFR. For this paper two of its newer parts are used: a *one-year roll-forward* that ages the book and adds the new business of the financial plan, and a *balance sheet optimiser* that searches for an optimised product mix under regulatory constraints. The bank is synthetic, but every number comes from the same cash flows, so the measures are consistent with each other.

Two NII measures. *EBA NII* is the 12-month NII from a date on a constant balance sheet: what matures is renewed like for like. It is the basis of the EBA NII test and of every NII limit in this paper. NII_{proj} is the NII earned during the plan year on the plan's moving balance sheet.

2 What the structure does to the risk measures today

Limits used in this paper. The EBA supervisory outlier test (SOT) applies six standard shocks (for EUR: parallel ±200 bp, short rates ±250 bp, steepener, flattener). Three levels are used in the whole paper, always the same:

- **EBA outlier threshold**: EVE −15 %, NII −5 % of Tier 1 (the supervisor's line);
- **internal limit**: EVE −12 %, NII −4.2 %; breaching it is an escalation. It also applies on every curve other than today's, as a stress level, not a steering level;
- **risk appetite**: EVE −10 %, NII −4 % on today's curve, the level the plan and the optimisation steer to. It is a floor, not a target: a balance sheet may end better.

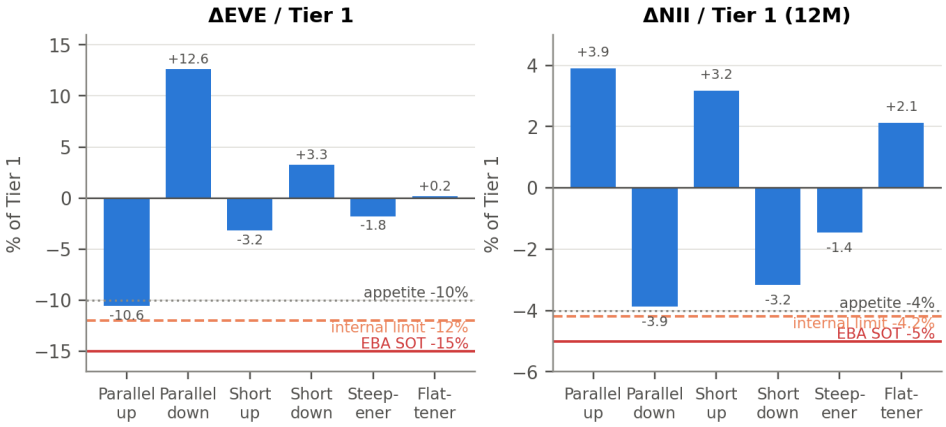


Figure 1. EBA supervisory outlier test, 30 Sep 2026. Solid red: EBA threshold, dashed: internal limit, dotted: risk appetite (the same in all figures).

The bank passes the supervisory test, but not its own appetite: the worst EVE scenario, the parallel up shock, takes −10.6 % of Tier 1, beyond the −10 % appetite, inside the internal limit. The worst NII scenario is the parallel down shock (−3.9 %). Figure 2 shows which layer of the structure produces these numbers.

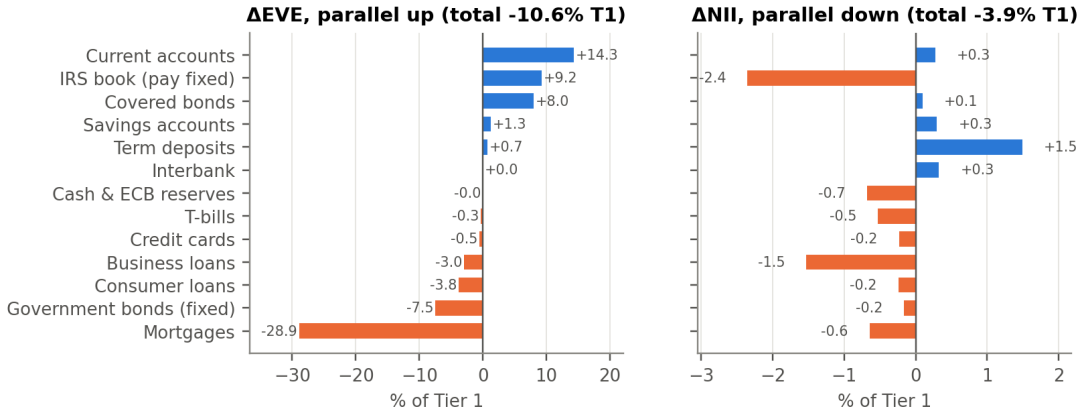


Figure 2. Contribution of each product group to the two worst scenarios, % of Tier 1.

- **Assets:** fixed mortgages alone lose 29 % of Tier 1 in the up shock, government bonds another 7.5 %.
- **Funding:** current accounts (+14 %) and the covered bond (+8 %) are the natural hedge. Term deposits and savings add almost nothing to EVE.
- **Swaps:** the swap book adds +9 % to EVE and is the largest single source of NII risk (−2.4 %). Without swaps EVE would be −19.8 % (a breach) and NII only −1.5 %.

In volumes (Figure 3), fixed assets leave large positive gaps between one and five years and between seven and ten years; the swaps move about €1.1bn of this into the 1–3 month bucket.

The result shows that the EVE risk comes from the fixed-rate structure: the swaps keep it inside the EBA threshold, but carry part of it over into NII. More swaps can restore EVE today, but use NII headroom; as the plan grows, the structure itself has to change, and swaps should cover only what is left.

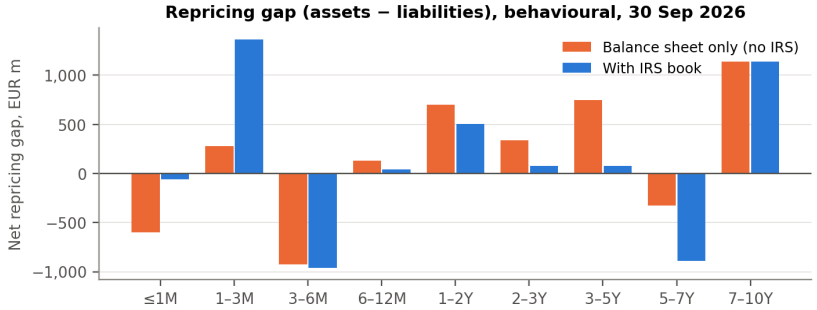


Figure 3. Net repricing gap by tenor, EUR m. Positive = more assets than liabilities reprice in the bucket.

3 The financial plan for next year

The Board-approved corporate plan calls for a growth in total assets of 7.2 % (€720m, to €10.72bn) and gives every product a target share of the balance sheet; products without their own target keep today's share and grow by 7.2 %. The government bond book shrinks from €1.80bn to €1.72bn and its share falls from 18 % to 16 % of assets: €125m mature and the bank buys only €40m of new bonds. The main changes (Figure 4):

- **more loans**: fixed mortgages +€449m (+11 %), fixed consumer loans +€111m, SME loans +€147m, credit cards +€48m;
- **securities**: government bonds −€85m, T-bills −€44m (−9 %);
- **funding from term deposits**: +€283m (+17 %), savings +€118m, while retail current

accounts grow by €66m;

- **swaps**: the programme continues with 4 new 7-year payers on 3M EURIBOR (€167m at 3.61 %) replacing the €125m that mature.

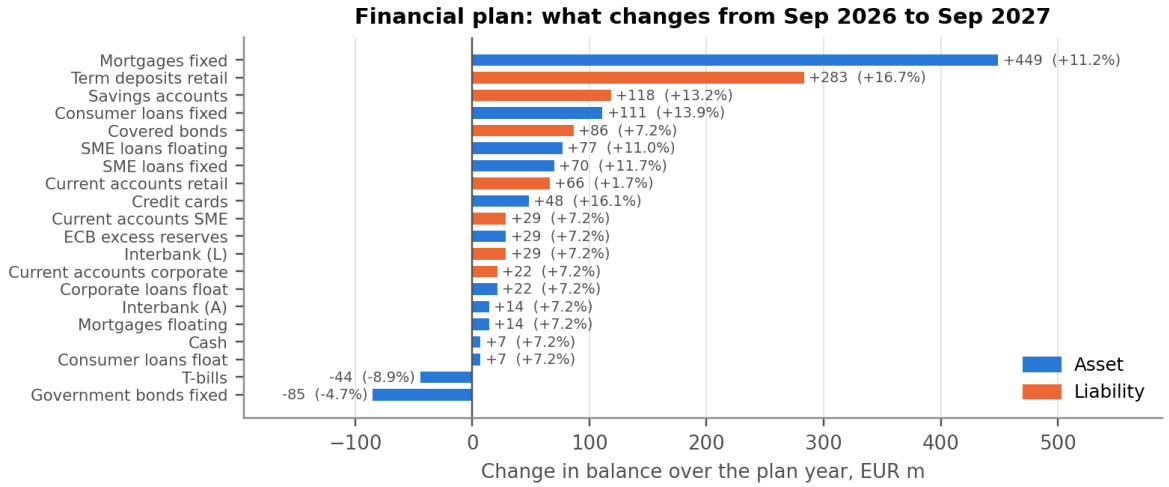


Figure 4. The financial plan: change in each product's balance over the year, EUR m (and %).

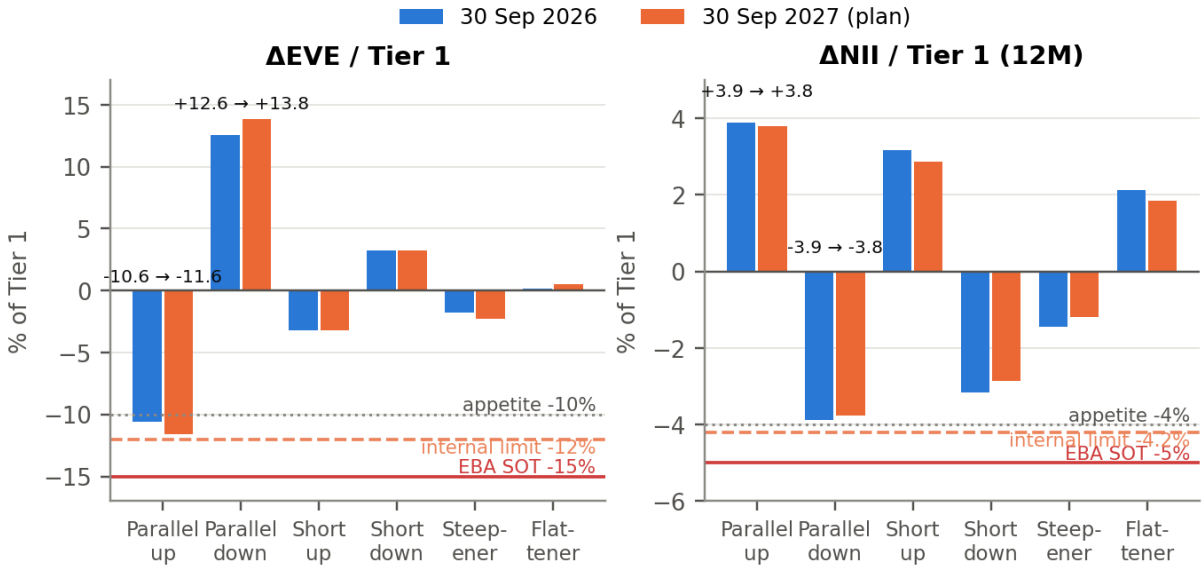


Figure 5. Supervisory outlier test today and after the plan year. Lines as in Figure 1.

Table 1. Key measures today and after the plan year.

Measure	30 Sep 2026	30 Sep 2027 (plan)	
Total assets (EUR bn)	10.00	10.72	growth
NII, 12M from the date (EUR m)*	343	390	better
Static margin (pp)	3.10	3.32	better
Cost of funding	0.86 %	1.11 %	worse
ΔEVE worst, parallel up (% T1)	−10.6	−11.6	worse
ΔNII worst, parallel down (% T1)	−3.9	−3.8	better
LCR / NSFR	381 / 155 %	355 / 150 %	lower, still far above 100 %

* EBA NII, measured from each date, before pricing concessions; Table D.2 shows the plan's 12-month NII after them.

Part of the higher income comes from the market, not the plan. The roll-forward moves rates along the forward curve for two years and keeps them unchanged from five years (Figure 6): the short end rises, the long end stays.

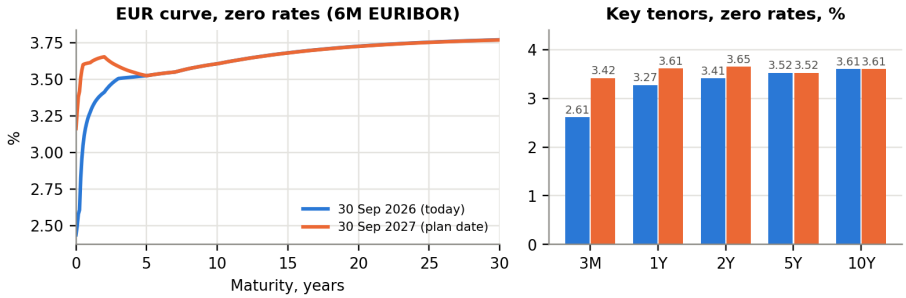


Figure 6. The EUR curve today and at the plan date.

With a higher short end, floating assets and the swap book reprice up faster than deposits, whose rates follow the market only partly. Over the plan year the asset yield rises from 4.06 % to 4.53 % and the cost of funding from 0.91 % to 1.10 % (Figure 7). NII_{proj} over the plan year is €359m, against an EBA NII of €343m for today's bank.

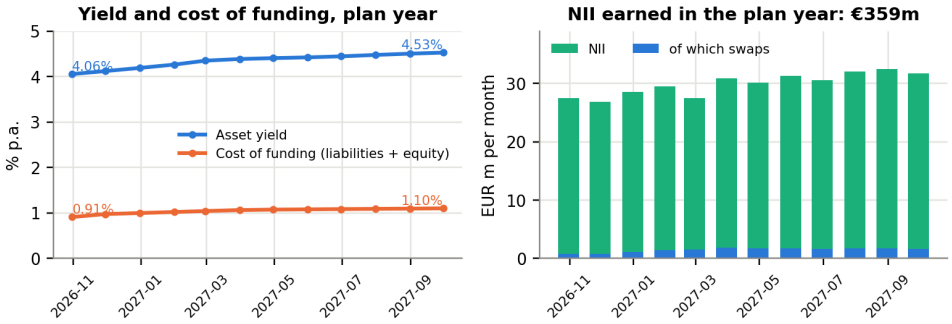


Figure 7. Asset yield, cost of funding and NII_{proj}, month by month over the plan year (moving balance sheet).

What we do next. The board has approved growth of 7.2 %, and naturally the ALM desk has no authority to challenge it (indeed in some banks its opinion is not even considered). ALM's role is to propose actions that keep this pace of growth with an optimised balance sheet structure.

Here is the challenge: EVE moves further *beyond* the −10 % appetite, to −11.6 % (still inside the internal limit). Ageing alone would reduce the EVE risk, but the plan's new business (mostly fixed mortgages) adds almost all of it back, and the ageing swap book loses more protection than the four new swaps restore.

4 Layer by layer: where the structure can be optimised

This section looks at one action at a time: what moving a euro from one product to another does to EVE, NII and profit. Section 5 tests the actions together, and the best mix is not always the one the single actions suggest (Section 5.4).

4.1 Funding: core deposits versus term deposits

Not all deposits are equal. Figure 8 shows, per €1bn of balance, what each funding product does for EVE and NII and what it costs; Table 2 adds its liquidity weights.

- **Retail current accounts** pay 0 % and do not follow market rates; their stable core behaves like a long fixed liability and is the strongest deposit hedge.
- **Savings accounts** follow market rates in part and protect much less.
- **Term deposits** reprice within months, protect almost nothing and are the most expensive deposit.
- The **covered bond** is the strongest fixed liability but also the most expensive funding, and, being secured funding, it is collateralised by the bank's own mortgages. This raises the bank's asset encumbrance ratio, which rating agencies look at, so it needs to be monitored.

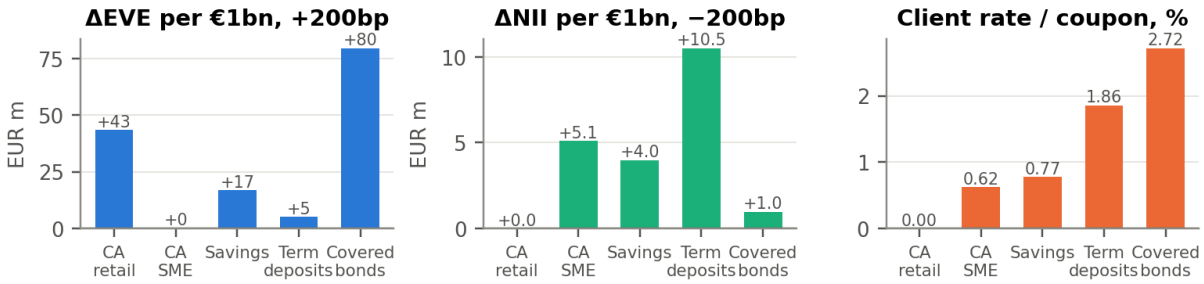


Figure 8. Funding products per €1bn: EVE gained (parallel up), NII gained (parallel down) and client rate.

Table 2. LCR outflow and NSFR available stable funding (ASF) weights of the funding products, as used in the model (CA: current account).

	CA retail	CA SME	CA corporate	Savings	Term deposits	Covered bond
LCR outflow	5 %	5 %	40 %	10 %	5 %	0 %
NSFR ASF	80 %	95 %	50 %	90 %	90 %	100 %

We conclude that the plan grows the product with the weakest hedge and the highest cost. For instance, raising the €283m of new term deposits half as current accounts and half as savings would improve both EVE and the interest bill (Table 3), before the cost of winning those balances. Whether that is possible is a commercial question: core deposits are won with service, packages and new-money offers, not by paying more on the whole savings book. Money attracted by an offer also tends to be less stable than the book whose core share and pass-through the model gives it, so this should be checked against new vintages.

SME current accounts: stable funding not yet modelled. The bank treats its SME current accounts (€0.4bn) as overnight money, although many are operating balances. Counting about a third of them as core would improve EVE in the parallel up shock by about 0.3 pp of Tier 1; this belongs in the next review of the deposit models.

4.2 Assets: the fixed-rate share and the mortgage product

Per euro, a fixed mortgage loses about ten times as much value in the up shock as a floating one, and the plan grows almost only fixed mortgages. Redirecting half the planned net increase into a floating or short-reset mortgage is the largest single structural action in this balance sheet (Table 3), but it moves rate risk to the customer, which needs care in conduct and credit terms.

The same choice is easier in SME lending, where floating is the market standard and clients can hedge or take a cap. Written as floating, the plan's €70m growth of fixed SME investment loans costs a little margin (lower income) and loses most of its EVE risk (Table 3). **We conclude that the fixed share of new lending is the largest structural action, and that SME lending is the easiest place to start.**

4.3 Securities: liquidity and investment portfolio

The securities portfolio serves both liquidity (the HQLA buffer) and investment. It is the easiest layer to change: no client relationship, and the tenor is the bank's own choice (Figure 9).

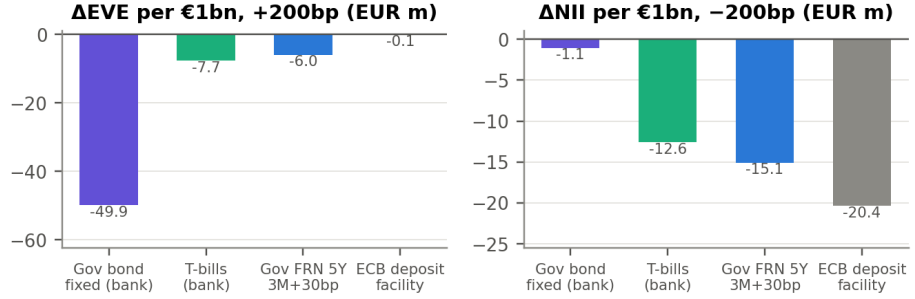


Figure 9. Per €1bn: EVE in the parallel up shock and NII in the parallel down shock.

- Per euro, fixed government bonds carry about 6.5 times the EVE risk of T-bills and eight times that of a floating-rate note.
- If the bank reduces securities to fund loans, the share of *long fixed bonds* should fall first: same liquidity, less duration. Most of this happens without selling: maturing bonds simply do not need to be reinvested at the same tenor.
- **Floating-rate notes instead of part of the fixed book.** The cleanest floaters are public-sector investment-grade (IG) floating-rate bonds (sub-sovereign, agency and supranational issues) that qualify as Level 1 HQLA (the optimiser can choose a five-year public-sector floater); a second route is an *asset swap* of a fixed bond. The costs are CSRBB, concentration limits and, for the asset swap, a derivative and its collateral.

Corporate bonds are not in the model; for the investment part of the portfolio they may be worth adding later, with their own credit risk and capital cost. **We conclude that the cheapest change comes at maturity: long fixed bonds are not reinvested at the same tenor, which keeps the liquidity and cuts the duration.**

4.4 Swaps

Swaps traded in 2019–early 2022 pay negative or near-zero fixed rates, which is why the book still earns money (Figure 10); they mature by 2029 and will be replaced at today's much higher rates.

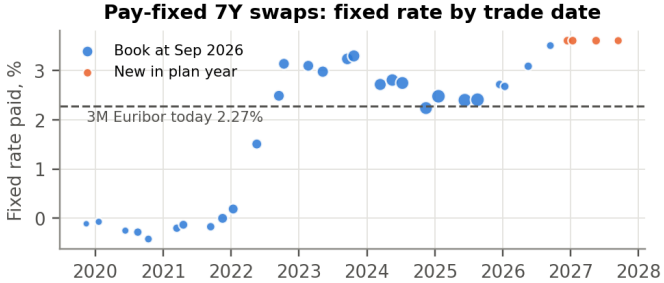


Figure 10. Fixed rate of each pay-fixed swap by trade date (dot size = notional); orange: swaps added in the plan year.

The **tenor** sets most of a swap programme's EVE effect, the **floating leg** most of its NII effect. Figure 11 compares, at the same live notional, the current 7Y maturity ladder, a 10Y ladder (one 10-year payer every quarter since 2016) on 3M and on 6M EURIBOR, and no swaps.

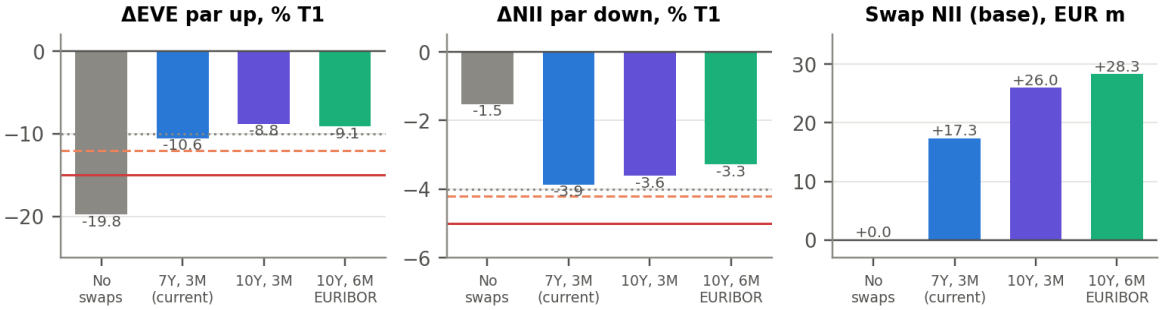


Figure 11. Same live notional, three swap programmes and no swaps: EVE (parallel up), NII (parallel down) and the swaps' base-case NII over 12 months.

We conclude that, among these maturity ladders, the 10Y ladder on 6M EURIBOR is the best combination: better EVE, less NII risk and more base NII than today's 7Y ladder (partly luck: it locked in the low 2016–2021 rates for longer). The longer tenor gives more duration per euro; on a new trade, the 6M leg keeps about 96 % of a 3M leg's EVE protection with a third less NII risk, because more of the 12-month income is already fixed when the shock hits. The first change the new head of ALM can make is therefore to trade the plan's new 7-year payers on 3M as 10-year payers on 6M, at the same notional. A swap converts risk rather than removing it: a new €500m 7-year payer at par earns about nothing on the forward curve, but loses about €10m a year if rates fall 200 bp and stay there.

5 An optimised plan

5.1 Three structural changes to the plan

Table 3 puts the three structural changes from Section 4 into the plan.
Green: better for the bank, red: worse.

Table 3. Amending the plan, 30 Sep 2027. Changes against the plan as it stands; sensitivities per product from the plan balance sheet, added linearly.

Change to the plan	ΔEVE up (pp T1)	ΔNII down (pp T1)	Base NII (EUR m/yr)
Fund the TD growth (€283m) half with current accounts, half with savings	+0.55	−0.19	+5.6
Write the planned growth of fixed SME loans (€70m) as floating	+0.26	−0.09	−0.1
Redirect €224m (half the net increase) of fixed mortgages to floating	+1.36	−0.28	+0.3
All three changes in full	+2.17	−0.56	+5.9

The result shows that one limit is traded for the other. All three experts' changes (by hand) together bring EVE to about −9.4 % of Tier 1, inside the appetite, but NII in the down shock falls from −3.8 % to about −4.3 %, beyond the −4 % appetite. Taken in part and combined with 10-year payers on 6M EURIBOR, they can meet both appetites; the optimiser in the next section looks for that mix over the whole balance sheet.

5.2 Optimisation: a long-term target and the ALM proposal

Table 3 changes three things by hand. LabBank's optimiser changes every product and the swaps at once. Its objective is the business lines' economic profit (EP): margin over FTP + fees − expected loss − cost of capital − operating cost − acquisition cost − pricing concessions.

It produces three balance sheets:

- **Long-term target**: the structure to steer towards, about three years ahead: what is left of today's contracts and swaps after run-off, with the rest filled by new business at today's terms. Each business line may move by up to 5 % of total assets. It is a direction, not a forecast, and is compared with today's structure *renewed like for like* (same products, same swap programme).
- **ALM proposal**: next year's first step, built from the plan balance sheet at 30 September 2027. Each business line may move by up to 2.5 % of total assets (about €270m).
- **Long-term target built from the plan**: the long-term run started from the plan instead of today. It shows where the ALM proposal is heading.

The rules:

- **Risk appetite on today's curve**: EVE no worse than −10 % and NII no worse than −4 % of Tier 1 in the six EBA scenarios and the bank's internal scenario.
- **Internal limit on other curves**: the same scenarios on other starting curves must stay inside the internal limit (EVE −12 %, NII −4.2 %). The curves are described below.
- **Liquidity**: LCR at least 215 %, NSFR at least 125 %. The bank is comfortably above these floors, so they are not a binding constraint. In other words, the bank is already sufficiently optimised with regard to liquidity risk management (see *Liquidity* below).
- **Capital**: Tier 1/RWA at least 18 %. The bank is far above this floor, so it does not bind.
- **How far each line can move**: each business line (mortgages, securities, current accounts, etc.) moves by at most 5 % (long term) of total assets (2.5 % in the one year horizon ALM proposal). A client product grows by at most half of its balance (a fifth in one year), because clients have to be won. A small or new product may always grow by 1 % of assets.
- **New business is a product of its own**: a twin of each product, signed at today's rates

and margins, takes all additional volume; existing contracts only run off. Loans and the covered bond cannot fall below the balance left after run-off, deposits can. Government bonds and T-bills may be sold early, at the market-value result plus 5 bp.

- **Products the bank does not offer yet**: term deposits of 1 to 24 months; loans with other maturities and fixings (among them 20- and 30-year mortgages, floating loans on 1M, 3M or 6M, and one-year working-capital loans to SMEs and corporates); and a five-year public-sector floater on 6M EURIBOR. A variant differs from its parent only in term and fixing (Appendix E).
- **The ALM proposal moves towards the long-term target**: every client product family lies between the plan and the target built from the plan, within 0.2 % of assets. This year the rule does not change the solution.
- **Swaps**: new pay-fixed swaps, 2 to 10 years, on 3M or 6M EURIBOR, at par plus 12 bp a year (a model assumption for bid-offer, operating cost and early close-out). Their first-year carry counts in the objective. Next year the proposal may replace the plan's new 7-year payers on 3M with payers on 6M.
- **Growth has a price** (values in Table A.1, Appendix A). Additional volume carries a yearly acquisition cost, so even an additional current account costs money; replacing run-off does not. Half of the plan's growth is organic; above that, volume costs a further 50 bp a year (a pricing concession). The plan has used this allowance, so growth above the plan pays from the first euro.

Existing book and new business. The same product has a different margin, profit and EVE risk in the existing book and as new business (Table A.2, Appendix A).

Other curves. The optimisation scores a structure on a curve-weighted result, and the internal limit must hold on each curve. This reflects the different rate conditions the structure may meet:

- **Long-term target: four rate regimes from history.** The EUR history since 2005 is split by the level of the 3M rate into *negative* (40 % of the history), *low*, *normal* and *high* (20 % each); each regime curve is the average curve of its period.
- **ALM proposal: the plan's curve 25 bp lower and 25 bp higher**, 50 % each.

Results are reported on **whole-bank EP**, on the whole balance sheet and the swaps (Figure 12), not on the business lines' EP: between the two dates the latter rises by €54m because FTP rates move up, while the bank's NII rises by only €47m. The balance sheets product family by product family are in Tables D.1 and D.2 in Appendix D.

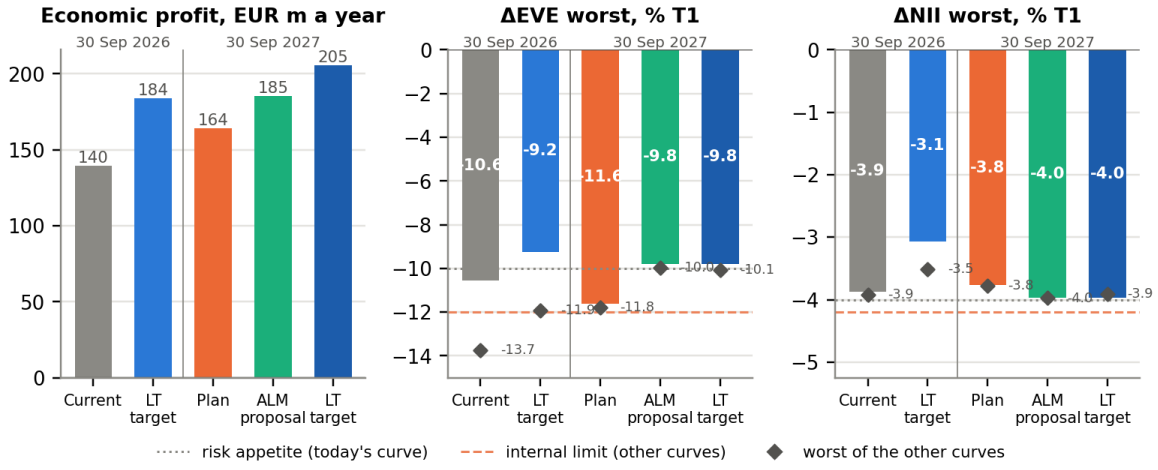


Figure 12. Whole-bank EP and the worst EVE and NII scenario. Bars: today's curve; diamonds: worst other curve (left, 30 Sep 2026: historical regimes; right, 30 Sep 2027: plan curve ±25 bp).

Today's structure renewed like for like breaks the EVE appetite. Rebuilt from new contracts, it earns more but brings back the full duration of a new book, and EVE falls far beyond

the appetite and the internal limit. Getting back to the appetite takes €973m of new payers (€44m today), which also puts NII at its own appetite, so this is about as far as swaps can go. The long-term target needs only 58 % of those swaps and earns more. It does not shrink the fixed mortgage book: it moves the risk elsewhere (shorter securities, deposits that replace interbank funding) and closes the rest with swaps.

What the long-term target and the ALM proposal change. Both move in the same direction:

- **Securities**: shorter. Maturing government bonds are replaced by T-bills and floaters, not by new long bonds, and next year the proposal also sells €0.27bn of bonds and keeps the cash at the ECB. A new five-year bond carries nearly twice the EVE risk of the existing ones.
- **Lending**: consumer loans and cards grow from 12 % to 17 % of assets in the long-term target; this follows from the model's margins, losses and capital weights, and demand is outside the model, so growth is capped. Business loans grow almost only as one-year working-capital loans: full margin, almost no EVE risk. Fewer new fixed mortgages are written, more of them over 20 instead of 25 years; over three years the fixed mortgage book keeps its size.
- **Funding**: current accounts and savings grow, term deposits fall and shorten, interbank funding runs down. The proposal issues a little less covered bond, the structural EVE hedge.
- **Swaps**: the proposal replaces the plan's new 7-year payers on 3M with the same notional of 10Y payers on 6M: longer protection, less NII risk.

Results: profit, EVE and NII. EP rises from €140m today to €184m in the long-term target (on the same total assets of €10.0bn) and from €164m to €185m next year (on the plan's €10.7bn). **The result shows that most of the gain comes from the structure, not from using the appetite**: with EVE and NII only held no worse than at the start, the long-term target does not change and next year's EP is €186m, at EVE −11.4 %. Bringing EVE to the appetite then costs about €0.7m of EP and part of the NII headroom. These are run-rates at each date; during the plan year the changes build up month by month, so the gain in that year is smaller (Table D.2). The proposal keeps EVE and NII inside the appetite on today's curve; the long-term target, held back by the other curves, ends better than the appetite.

Liquidity. Liquidity is part of every run, not a check made afterwards: each product carries its LCR outflow or HQLA value and its NSFR weights (Table 2), and LCR and NSFR are hard constraints on the same footing as EVE and NII. Today the bank holds an LCR of 381 % and an NSFR of 155 %; the plan ends at 355 % and 150 %, the ALM proposal at 365 % and 152 % (the NSFR gap depends on the weights). For this bank the floors leave ample headroom and do not bind; in a bank with a thinner liquidity buffer they would, and the optimiser would then trade profit against liquidity in the same way as it trades profit against EVE and NII.

Balance sheet versus swaps. We conclude that, at the plan's swap notional, the new mix and longer 6M swaps together move EVE from −11.6 % to −9.8 %. Free to choose, the optimiser keeps about the plan's notional: a swap costs little, while the structural actions cost NII risk, and NII is the binding limit. The target built from the plan spends its extra room on income, not on replacing swaps.

5.3 Monte Carlo test on simulated curves

We apply a Monte Carlo simulation to make sure that the optimised balance sheet structure also holds on other possible rate paths, not only on the few curves of the optimisation. The optimiser never sees these curves. They are simulated 24 months ahead by LabBank's generator, a mean-reverting model fitted to the history of the EUR curve, in two sets (Figure A.1):

- **Historical set, 500 curves:** the model pulls rates back towards their history, so the curves are mostly *lower* than today's. This is the main stress test.
- **Forward set, 100 curves:** the same model re-centred on today's forward curve, so the

curves stay *close to today's* levels. This tests how sensitive the result is to the level of rates.

The results show that the ranking holds, as Appendix B shows: a structure optimised against several curves keeps its advantage on curves it was not built for.

5.4 Actions expected and actions chosen

Table 4. Actions of Section 4: the experts' expectation (Table 3) against the optimiser's choice (ALM proposal against the plan), EUR m. Forced in as far as the capacity rules allow (TD −250, floating mortgages +107, floating SME +70), each action changes EP by at most €1.0m.

Action	Experts' expectation	Optimiser's choice
Fund the TD growth with current accounts and savings	TD −283	TD −142, CA +268, savings +204
Floating instead of fixed mortgages	floating +224	floating −7, fixed −224
Floating instead of fixed SME loans	floating +70	floating −39, fixed +117
10-year payers on 6M instead of 7-year on 3M	swaps 167	swaps 167

Of the experts' actions the optimiser takes the swap in full and part of the deposit action, but not floating mortgages or floating SME loans (Table 4), which cut EVE risk but also income in the down shock, and NII is the binding limit; instead it adds ECB deposits, retail current accounts and savings and takes out government bonds, interbank funding and fixed mortgages.

How the ALCO should read the optimiser's answer. The ALCO should run four checks on the result: compare product families, not a product and its new-business twin; list what binds, since these are the constraints the business should challenge; force each expected action and measure its cost (Table 4): a small cost is a tie for the business to decide, a large one needs a reason the model does not see; and check that the answer survives other curves (Figure B.1). An optimiser is a way to ask the right questions about a plan, not a replacement for the people who answer them.

6 Recommendations for the ALCO

1. **Fund growth with core deposits where they cost less all-in.** Set a target for current accounts and savings in the plan and price new-money offers for it; use term deposits for the rest. Core deposits are the cheapest EVE hedge the bank has. Next year: win about €0.27bn more current accounts and €0.20bn more savings, raise €0.14bn less in term deposits with shorter and two-year terms; issue €62m less covered bond than planned and run down interbank funding.
2. **Steer the lending mix, not only the volume.** Price new long fixed mortgages for their rate risk and offer shorter fixations and floating or short-reset mortgages next to them. Next year: write about €0.22bn less new fixed mortgages than the plan, grow consumer lending and cards by about €0.27bn where demand allows, and offer one-year working-capital loans to SME and corporate clients (€517m in the proposal).
3. **Shorten the securities portfolio as it matures.** Do not reinvest maturing long bonds at the same tenor: replace them with T-bills and public-sector IG floaters within CSRBB and concentration limits. Next year: sell €0.27bn of government bonds and hold €0.27bn more ECB deposits instead of interbank placements; over the following years, let the long bond book run down instead of reinvesting it at the same tenor.
4. **Use swaps for what the balance sheet cannot do, on 10-year swaps.** Next year trade 10Y payers on 6M EURIBOR (€167m) instead of the plan's 7-year payers on 3M. As today's swaps mature, replace part of them with 10-year payers, sized on EVE and NII together: a 6M leg where NII binds, a 3M leg where it has room.
5. **Approve the plan on its structure.** Judge each plan on EVE, NII in the EBA and internal scenarios, LCR/NSFR and whole-bank economic profit at the same time, with an optimiser run as a reference point and the commercial assumptions behind it made explicit.

7 Conclusions

- The Board-approved budget grows the bank but takes EVE further beyond the appetite, to −11.6 % of Tier 1. Our optimised ALM proposal changes the structure, not the size of the plan, and brings EVE back inside the appetite (−9.8 %). NII stays inside its own appetite (−4.0 %), and economic profit rises from €164m to €185m a year. The result is also more stable: on 500 simulated curves the proposal breaches the internal limit on 42, the plan on 393, and the proposal earns more than the plan on every one of them. Over three years the long-term target points the same way: EVE from −10.6 % today to −9.2 %, economic profit from €140m to €184m. What changes, product by product, is in Appendix D (Tables D.1 and D.2).
- New business has to be valued as new business. A contract signed today earns and risks something different from the average of the existing book, so additional volume is judged on today's terms and a target is compared with today's structure renewed at today's prices, not with today's balance sheet of older contracts.
- A structure has to be checked at more than today's rate level: on other curves the same balance sheet can show different EVE and NII. Optimising against a few other curves costs little profit and keeps the structure within the limits on those curves.
- Tools like LabBank make this kind of question cheap to ask: change the plan, rerun the bank, compare every measure on the same cash flows. An optimiser's answer raises new questions from ALM, the business, finance and risk, and the software has to answer them while the decision is still open.
- The balance sheet is synthetic but realistic: it is generated contract by contract, with market rates and behavioural models based on public data, because no bank publishes its contract-level data. The product set is limited (no corporate bonds, for example), but still relevant. The steps used in this analysis may be applied in exactly the same way to most other bank balance sheet structures, and the Author plans to apply them to specific banks, based on their published financial statements or on more detailed regulatory reports such as Pillar 3 disclosures or the US FR Y-9C.
- The constraints and the approximated costs, both the running cost of each product and the cost of winning new clients, are crucial: without limits on how far a product may move, or with a cost set too low, the optimiser shifts volume to the edge of what the model allows. The result is only as good as these inputs.

Appendices

Appendix A Data and method

LabBank. A synthetic bank generated contract by contract (loans, deposits, securities, swaps, equity) in SQL Server, with a cash-flow engine, behavioural models (prepayment, core and non-core deposits with pass-through), EBA IRRBB (EVE and NII), LCR and NSFR. The EUR bank uses the EUR swap and EURIBOR curves at 30 Sep 2026. The code is public on GitHub: `https://github.com/dzimius/LabBank`.

Plan year. The 30 Sep 2027 bank is a roll-forward: the existing book is aged by one year, new business is added from the growth plan, and the market moves along the forward curve at the short end and stays unchanged at the long end.

Optimisation. A single-period linear programme over product volumes and new swap notionals, solved exactly. It maximises the FTP-based contribution (margin over FTP, fees, expected loss, cost of capital, operating cost, acquisition cost and pricing concessions) subject to the risk appetite, liquidity floors and limits on how far each product may move. Every result is then checked with the full engine. The optimiser keeps NII 0.1 pp inside the appetite, because new-business variants with no balance yet are checked on their family's cash-flow profile.

FTP. Deliberately simple, with two components only: market (interest rate) risk, priced at the market rate of the period the client rate is fixed for, and liquidity risk, a spread that rises with the term of the funding. Non-maturity deposits are priced as a replicating portfolio from their behavioural models. It is a convention for an example bank, not a calibrated FTP system.

NSFR weights. Some weights are simplified on the conservative side. The short interbank placement carries a high RSF, while under the CRR a placement with a financial customer of less than six months needs little stable funding (least when it is secured, a little more when unsecured), and retail current accounts get a lower ASF than retail deposits usually do. NSFR would be somewhat higher with the exact weights; it does not bind either way.

Existing book and new business. The existing contracts and new business are treated separately: existing contracts keep the rates they were signed at and run off, while additional volume is new business at today's rates and margins (Table A.2). The optimiser can shrink the existing book but never enlarges it.

Other curves. Besides today's curve, every product is repriced with the full engine on a few other base curves: historical rate regimes for today, and the plan's curve 25 bp lower and higher for next year. The optimiser keeps the internal limits on all of them.

Monte Carlo. 500 curves from LabBank's simulator, a mean-reverting model fitted to the history of the EUR curve. The optimiser never sees them: they are an independent test. Every portfolio is repriced on every curve with the full engine under the EBA shocks, and economic profit is measured on each curve.

Cost of growth. The acquisition cost and the pricing concession that the optimiser charges on additional volume (Section 5.2) are listed in Table A.1. The concessions show in the new-sales rates: in the proposal the average rate falls on new fixed consumer loans from 9.02 % in the plan to 8.87 %, on cards from 13.39 % to 13.22 % and on fixed SME loans from 5.09 % to 4.93 %, while fixed mortgages, of which the proposal sells fewer, are back at 4.83 % (4.68 % in the plan).

Table A.1. Cost of additional volume in the first year, % a year on the additional balance. All-in: client rate minus (loans) or plus (deposits) the acquisition cost and the concession; the concession applies only above the organic allowance.

	Client rate (plan date)	Acquisition cost	Concession above allowance	All-in
Loans (the bank earns)				
Mortgages fixed	4.83 %	−0.10	−0.50	4.23 %
Mortgages floating	4.97 %	−0.10	−0.50	4.37 %
Consumer loans fixed	9.12 %	−0.40	−0.50	8.22 %
Credit cards	13.64 %	−1.00	−0.50	12.14 %
Deposits (the bank pays)				
Current accounts retail	0.00 %	+1.00*	–	1.00 %
Savings accounts	1.05 %	+0.10	+0.50	1.65 %
Term deposits	2.50 %	+0.15	+0.50	3.15 %

* Current accounts pay no interest, so the concession is a higher acquisition cost (0.50 + 0.50), not a higher client rate.

Table A.2. Existing book and new business per €1bn, 30 Sep 2026: margin (%), economic profit (EUR m a year) and ΔEVE in the parallel up shock (pp of Tier 1).

	Margin		EP per €1bn		ΔEVE up	
	existing	new	existing	new	existing	new
Mortgage, fixed	1.10	1.17	−1.3	+0.5	−7.2	−12.2
Mortgage, floating	0.98	0.70	−2.3	−5.1	−0.8	−0.4
Consumer loan, fixed	5.65	5.43	+35.5	+34.1	−4.7	−6.6
Government bond	-0.39	-0.42	−10.7	−10.9	−4.2	−7.5
SME loan, fixed	1.23	1.08	−5.3	−5.8	−4.5	−7.7
SME loan, floating	1.29	1.05	−5.9	−6.6	−0.3	−0.4
Covered bond	-0.09	-0.16	−7.6	−8.1	+6.6	+10.1

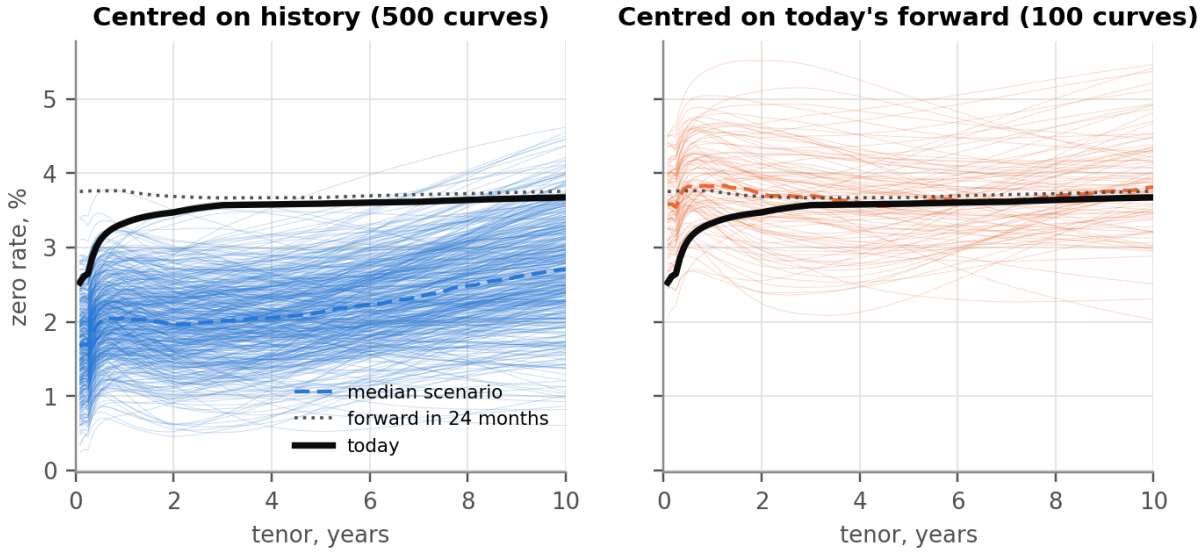


Figure A.1. Today's EUR zero curve (bold) against the simulated curves 24 months ahead (thin): left, the test sample of the mean-reverting model, which pulls every curve towards its history since 2005; right, the same model re-centred on today's forward curve. Dotted: today's forward curve 24 months ahead. Neither is a forecast. Over a long horizon the history matters: rates do revert, and the low-rate decade happened, so the historical sample stays the main stress test; the forward-centred sample shows how the same balance sheets fare if the market's own expectation comes true.

Appendix B Monte Carlo results

Only the curve moves: each balance sheet is repriced unchanged on every curve under the six EBA shocks; where it breaches the internal limit, we solve the minimum additional swaps that bring it back.

- **Risk.** The ALM proposal breaches the internal limit on 42 of the 500 historical curves against 393 for the plan, and on 1 % of the forward curves against 17 %; the long-term target on fewer curves

than today's balance sheet.

- **Repair.** Where a curve breaches the limit, the repair is small: under €100m of additional swaps on average.
- **Profit.** Holding each balance sheet fixed, the proposal earns more than the plan on all of the 500 curves, and the long-term target more than today's balance sheet in the median.

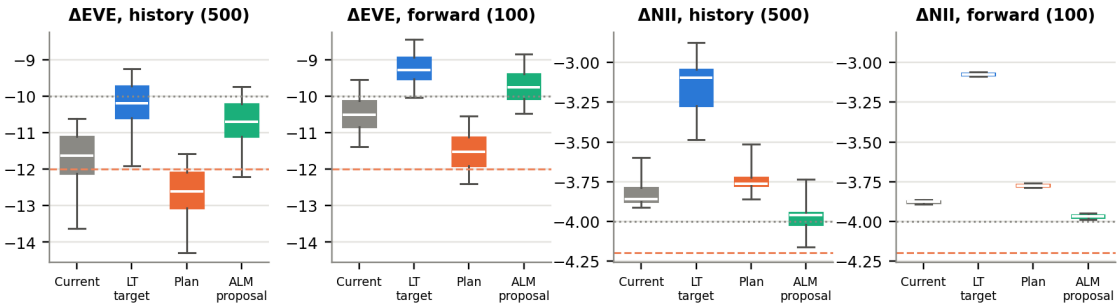


Figure B.1. Worst EVE and NII scenario, % of Tier 1 (box 25–75 %, whiskers 5–95 %).

Table B.1. Monte Carlo results: median worst scenario (% of Tier 1), share of curves breaching the internal limit, and on the historical curves the average additional swaps on breaching curves and EP (EUR m).

	EVE worst		NII worst		Breaching, %		Additional	EP		
	history	forward	history	forward	history	forward	swaps	today	median	5 % worst
Current	−11.6	−10.5	−3.9	−3.9	31	3	55	140	109	91
LT target	−10.2	−9.3	−3.1	−3.1	4	1	48	184	157	141
Plan	−12.6	−11.5	−3.8	−3.8	79	17	74	164	132	114
ALM proposal	−10.7	−9.7	−4.0	−4.0	8	1	60	185	151	130

Appendix C Return on capital by credit product

The return on capital of a product is its client rate plus fees, less expected loss, operating cost (0.65 % of the balance) and the bank's average cost of funding (0.86 %), divided by its allocated capital (risk weight times 12 %), before tax. The breakeven rate is the client rate at which the return equals the 11 % cost of capital. Securities, ECB and interbank balances are not included.

Table C.1. Credit products at 30 Sep 2026: return on allocated capital against the 11 % cost of capital, and the breakeven client rate on the average cost of funding. Last column: the same return with funding charged at FTP on the 12-month income.

	Balance (EUR m)	Client rate	Risk weight	Allocated capital	Expected loss	Fees	Return on capital	Breakeven rate	Return on capital, FTP
Mortgage (fixed)	4,000	3.25 %	35 %	4.2 %	0.20 %	0.05 %	38 %	2.12 %	9 %
Mortgage (floating)	200	4.16 %	35 %	4.2 %	0.30 %	0.05 %	57 %	2.22 %	6 %
Consumer loan (fixed)	800	8.61 %	75 %	9.0 %	0.90 %	0.20 %	71 %	3.20 %	51 %
Consumer loan (floating)	100	9.07 %	75 %	9.0 %	1.13 %	0.20 %	74 %	3.43 %	43 %
Credit card	300	13.25 %	120 %	14.4 %	4.16 %	1.00 %	60 %	6.25 %	49 %
SME investment loan (fixed)	600	4.03 %	75 %	9.0 %	0.53 %	0.15 %	24 %	2.88 %	5 %
SME investment loan (floating)	700	4.22 %	85 %	10.2 %	0.60 %	0.15 %	22 %	3.08 %	5 %
Corporate loan (floating)	300	4.24 %	100 %	12.0 %	0.48 %	0.10 %	20 %	3.21 %	6 %
Credit book	**7,000**			**6.6 %**			**41 %**		**19 %**

The average cost of funding gives every loan the benefit of the bank's cheap current accounts, whatever its term. FTP charges each loan the market rate of its fixing period and a liquidity spread instead, and on that basis 5 of the 8 products (mortgages, SME and corporate loans) return 5–9 %, below the hurdle; only consumer loans and cards clear it on both measures. The hurdle is met because of the deposit franchise, not by each loan on its own.

Appendix D Balance sheets compared

Table D.1. Today: current balance sheet and the robust long-term target, % of total assets (change in percentage points in brackets).

	Today (current)	**Long-term target**
Assets		
Mortgages fixed	40.0	39.8 (-0.2)
Mortgages floating	2.0	2.2 (+0.2)
Consumer loans fixed	8.0	11.4 (+3.4)
Consumer loans floating	1.0	1.1 (+0.1)
Credit cards	3.0	4.5 (+1.5)
SME loans fixed	6.0	8.2 (+2.2)
SME loans floating	7.0	7.0
Corporate loans	3.0	1.7 (-1.3)
Government bonds fixed	18.0	9.0 (-9.0)
Government bonds floating	0.0	4.0 (+4.0)
T-bills	5.0	10.0 (+5.0)
ECB reserves and cash	5.0	1.0 (-4.0)
Interbank placements	2.0	0.0 (-2.0)
Total	**100.0**	**100.0**
Liabilities and equity		
Current accounts retail	39.0	44.0 (+5.0)
Current accounts SME / corporate	7.0	7.0
Savings accounts	9.0	10.8 (+1.8)
Term deposits	17.0	16.3 (-0.7)
Covered bond	12.0	9.9 (-2.1)
Interbank deposits	4.0	0.0 (-4.0)
Equity	12.0	12.0
Total	**100.0**	**100.0**
Measures		
Pay-fixed swap book (EUR m)	1,670	1,720
today's swaps maturing within 3 years	–	−515
new swaps for EVE at the appetite	44 (10Y)[e]	565 (10Y/3M)
EBA NII, 12M (EUR m)	343	407
Economic profit, whole bank (EUR m)	**140**	**184**
FTP-based economic profit (EUR m)[a]	125	152
ΔEVE worst (% T1)[b]	−10.6 par up	−9.2 par up
ΔNII worst (% T1)[b]	−3.9 par down	−3.1 par down
ΔEVE worst, other curves (% T1)[c]	−13.7 negative	−11.9 negative
ΔNII worst, other curves (% T1)[c]	−3.9 low	−3.5 low
Economic profit, curve-weighted (EUR m)[d]	99	148
LCR / NSFR (%)	381 / 155	416 / 150

[a] Business lines' economic profit on FTP basis, including the incremental carry of the new swaps. [b] Today's curve; full-engine check: each product's full cash-flow results rescaled to its new volume. [c] The same scenarios on the other curves (rate regimes today, the plan's curve ±25 bp next year), full-engine repricing. [d] Average EP over the other curves, with their weights. [e] Minimum new pay-fixed notional that brings EVE to the −10 % appetite on today's curve; the three-year comparison is in Section 5.2.

Table D.2. Next year, 30 Sep 2027: the financial plan as it stands, the ALM proposal (next year's first step, moves up to 2.5 % of assets) and the long-term target built from the plan (moves up to 5 %), EUR bn (change against the plan in brackets). Footnotes as in Table D.1; the other curves are the plan's curve −25 and +25 bp. New swaps: notional, tenor/floating leg (10Y/6M = 10-year pay-fixed against 6M EURIBOR). Economic profit at 30 Sep 2027 is the run-rate of the balance sheet at that date (its next twelve months, constant balance sheet), as in the optimisation. [f] Earned from 30 Sep 2026 to 30 Sep 2027 on the moving balance sheet: the plan follows the roll-forward month by month; the proposal and the target add their difference to the plan in equal monthly steps, priced at the plan year's new-sales and market rates.

	Financial plan	**ALM proposal**	**Long-term target**
Assets			
Mortgages fixed	4.45	4.22 (-0.22)	4.22 (-0.22)
Mortgages floating	0.21	0.21 (-0.01)	0.21 (-0.01)
Consumer loans fixed	0.91	1.07 (+0.16)	1.28 (+0.37)
Consumer loans floating	0.11	0.11	0.10
Credit cards	0.35	0.46 (+0.11)	0.52 (+0.17)
SME loans fixed	0.67	0.79 (+0.12)	0.99 (+0.32)
SME loans floating	0.78	0.74 (-0.04)	0.74 (-0.04)
Corporate loans	0.32	0.42 (+0.10)	0.34 (+0.02)
Government bonds fixed	1.72	1.45 (-0.27)	1.18 (-0.54)
T-bills	0.46	0.46	0.46
ECB reserves and cash	0.54	0.80 (+0.27)	0.68 (+0.14)
Interbank placements	0.21	0.00 (-0.21)	0.00 (-0.21)
Total	**10.72**	**10.72**	**10.72**
Liabilities and equity			
Current accounts retail	3.97	4.23 (+0.27)	4.50 (+0.54)
Current accounts SME / corporate	0.75	0.75	0.75
Savings accounts	1.02	1.22 (+0.20)	1.53 (+0.51)
Term deposits	1.98	1.84 (-0.14)	1.52 (-0.47)
Covered bond	1.29	1.22 (-0.06)	1.14 (-0.15)
Interbank deposits	0.43	0.16 (-0.27)	0.00 (-0.43)
Equity	1.29	1.29	1.29
Total	**10.72**	**10.72**	**10.72**
Measures			
Pay-fixed swap book (EUR m)	1,712	1,712	1,775
of which the plan's new 7Y/3M payers	167	0	0
new swaps instead	–	167 (10Y/6M)	230 (10Y/6M)
NII earned in the plan year (EUR m)[f]	359	377	396
EBA NII, 12M from 30 Sep 2027 (EUR m)	387	421	453
Economic profit in the plan year (EUR m)[f]	145	155	165
Economic profit at 30 Sep 2027 (EUR m)	**164**	**185**	**205**
FTP-based economic profit (EUR m)[a]	179	201	221
ΔEVE worst (% T1)[b]	−11.6 par up	−9.8 par up	−9.8 par up
ΔNII worst (% T1)[b]	−3.8 par down	−4.0 par down	−4.0 par down
ΔEVE worst, other curves (% T1)[c]	−11.8 down	−10.0 down	−10.1 down
ΔNII worst, other curves (% T1)[c]	−3.8 up	−4.0 up	−3.9 up
Economic profit, curve-weighted (EUR m)[d]	164	185	205
LCR / NSFR (%)	355 / 150	365 / 152	374 / 146

Appendix E Product-level results

Table E.1. Every product in the five balance sheets, EUR m: today and the long-term target from today (30 Sep 2026, target after three years), the plan, the ALM proposal and the long-term target built from the plan (30 Sep 2027). Maturity: contractual maturity of a new contract. Fixing: rate fixing period (fixed = fixed to maturity; admin. = administered rate). Variants carry the parent's name; existing book and new business of a product are shown together in one row. Equity and derivatives are not shown.

				30 Sep 2026		30 Sep 2027		
Product	Code	Maturity	Fixing	Today	LT target	Plan	ALM prop.	LT target
Assets								
Mortgage, fixed	1000	25Y	fixed 10Y	4,000	3,485	4,449	3,956	3,710
Mortgage, fixed	1001	20Y	fixed 10Y	–	500	–	268	514
Mortgage, floating	1100	30Y	3M	200	149	214	207	207
Mortgage, floating	1103	20Y	6M	–	73	–	–	–
Consumer loan, fixed	2000	7Y	fixed	800	1,139	911	1,072	1,277
Consumer loan, floating	2100	5Y	6M	100	111	107	107	104
Credit card	2200	10Y	1M	300	450	348	456	523
Government bond	3000	5Y	fixed	1,800	900	1,715	1,447	1,179
bond float public sector 6m	3001	5Y	6M	–	400	–	–	–
T-bill	3200	12M	fixed	500	1,000	456	459	456
Cash and minimum reserve	3500	–	–	100	100	107	107	107
ECB deposit facility	3510	–	1D	400	–	429	697	571
SME loan, fixed	4000	5Y	fixed	600	319	670	519	519
SME working capital, fixed	4001	1Y	fixed	–	500	–	268	475
SME loan, floating	4100	5Y	3M	700	394	777	597	597
SME loan, floating	4102	5Y	6M	–	306	–	–	–
SME working capital, floating	4103	1Y	3M	–	–	–	142	142
Corporate loan, floating	4200	5Y	3M	300	75	322	311	233
Corporate working capital, fixed	4301	1Y	fixed	–	100	–	107	107
Interbank placement	7900	1M	1M	200	–	214	–	–
Liabilities								
Covered bond	5000	7Y	fixed	1,200	994	1,286	1,224	1,138
Current account, retail	6000	–	admin.	3,900	4,400	3,966	4,234	4,502
Current account, SME	6300	–	admin.	400	400	429	429	429
Current account, corporate	6350	–	admin.	300	300	322	322	322
Term deposit, retail	7060	6M	fixed	1,700	850	1,983	1,388	992
Term deposit, retail	7061	1M	fixed	–	500	–	268	523
Term deposit, retail	7062	3M	fixed	–	278	–	62	–
Term deposit, retail	7064	24M	fixed	–	–	–	124	–
Interbank deposit	7900	1M	1M	400	–	429	161	–
Savings account	8000	–	admin., 2M	900	1,078	1,018	1,222	1,528

Disclaimer

This paper has been prepared solely for educational and professional knowledge-sharing purposes. It is based on a hypothetical banking institution and synthetic data. All balance sheet figures, financial projections, product parameters, risk limits, risk appetite levels, business assumptions, and optimisation results are illustrative and do not represent actual data, internal policies, strategies, plans, or positions of any specific bank or financial institution.

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