The Hidden Value of Sticky Deposits: Misalignments Between Internal Pricing and Interest Rate Risk Modeling

An analytical study using a reproducible deposit cohort model

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Abstract

Non-maturity deposits can provide a durable funding advantage, yet the assumptions used to recognize that advantage in funds transfer pricing may differ from those used to measure interest rate risk. A difference in reported maturity is not sufficient to establish an error: pricing, performance measurement, earnings projection, and economic-value measurement serve distinct purposes. This paper develops a reconciliation method that identifies unexplained differences after those purposes and cash-flow boundaries have been made explicit. A deterministic opening-cohort model separates balance retention, deposit-rate pass-through, immediate withdrawal, replacement funding, servicing costs, and internal transfers. All parameters are stipulated; no bank-level observations are presented as model estimates. For an illustrative SAR 1 billion cohort, the five-year present value of net funding savings is SAR 123.15 million in the base case. A 200-basis-point rate rise increases that value to SAR 169.37 million while first-year net interest income declines from SAR 45.00 million to SAR 40.00 million. Joint repricing and retention stress reduces the funding-benefit value to SAR 74.81 million and first-year net interest income to SAR 21.80 million. An exact symmetric decomposition attributes the SAR 94.56 million difference from the rate-only calculation to the retained-balance profile and deposit beta. Separate accounting identities demonstrate that FTP reallocations do not create consolidated profit and that part of the deposit funding benefit may already be embedded in an economic-value calculation. The contribution is an auditable reconciliation procedure, supported by reproducible calculations and explicit limits, rather than a new claim that deposit franchise value exists.

Keywords: funds transfer pricing; non-maturity deposits; deposit beta; deposit franchise; interest rate risk; asset–liability management; model reconciliation.

1 Introduction

A deposit contract can permit withdrawal today while the associated customer relationship persists for years. Banks must give that relationship an internal economic interpretation without turning an observed tendency into a contractual promise. The difficulty becomes acute when the same deposits support several decisions. A business unit seeks recognition for the funding it gathers. Treasury uses the balances to finance assets and may hedge the associated interest margin. Risk measures exposure to changes in rates and customer behavior. Finance reconciles the resulting internal allocations with the bank’s consolidated earnings. Each function can produce a defensible number, yet the numbers may describe different economic objects.

The distinction matters because deposit stickiness has more than one meaning. Persistence of balances concerns how much funding remains. Price stickiness concerns how quickly the bank must change remuneration. A retained customer may move a balance from a current account to a high-yielding product within the same bank, preserving external funding while substantially changing its cost. Conversely, a balance that has historically earned little interest may leave abruptly. The economic advantage of deposits therefore depends jointly on quantity, price, costs, and the circumstances in which customers exercise their withdrawal option.

Research has long recognized this problem. Deposit rents and their sensitivity to rates appear in Hutchison and Pennacchi (1996), while Jarrow and van Deventer (1998) develop an arbitrage-free representation of demand deposits. Dermine (2016) explains why the effective maturity relevant to pricing need not coincide with the maturity relevant to performance evaluation or hedging. Blöchlinger (2021) explicitly presents a framework applicable to both FTP and interest rate risk management. An argument that deposits have hidden economic value, or that pricing should communicate with risk management, is consequently insufficient as a research contribution.

The present paper addresses a narrower implementation problem. How can a bank determine whether different model outputs reflect legitimate differences in purpose or contradictory assumptions about the same deposit cohort? The answer proposed here is to reconcile the cash flows before comparing aggregate tenors or values. The reconciliation begins with a common opening population and distinguishes retained balances, administered deposit rates, replacement funding, and internal transfer entries. It then identifies which changes affect external earnings, which change only their attribution, and which arise because models describe different scenarios or measurement boundaries.

Three research questions organize the analysis. First, under what conditions can the value of a low-cost deposit franchise rise while the bank’s earnings or original-position economic value deteriorate? Second, how much of a conditional difference between two deposit valuations can be attributed to balance retention and how much to repricing behavior without making the answer depend on the order of calculation? Third, how should internal pricing recognize funding benefits without counting the same benefit again in an economic-value or capital narrative?

The study is analytical and computational. It does not estimate regional deposit betas, infer the prevalence of model inconsistency, or demonstrate an improvement in actual bank profitability. Its experiment provides a fully specified mechanism against which production models can be tested. The monetary scale is expressed in Saudi riyals for readability; the assumed rates and withdrawal parameters are not observations of a Saudi bank or prescribed supervisory inputs. The literature and regulatory discussion are current to 7 November 2026.

2 Literature and research gap

2.1 Deposit rents and the distinction between price and quantity

Hutchison and Pennacchi (1996) place deposit rents within a contingent-claims framework and relate their value to imperfect competition. Jarrow and van Deventer (1998) show how demand-deposit cash flows can be represented through a path-dependent interest-rate-swap structure. Their contributions establish that valuation requires more than the contractual withdrawal date. They also set a demanding benchmark: a scenario calculation discounted at an assumed market rate should not be described as a newly derived arbitrage-free price.

The empirical literature adds information about the sources and limits of that value. Driscoll and Judson (2013) document heterogeneous and asymmetric adjustment of deposit rates. Drechsler, Savov, and Schnabl (2017) connect deposit spreads, market power, and monetary-policy transmission. Both support separating the administered rate from the market rate, but neither provides a universal pass-through parameter. A beta estimated for a particular product, market, or interest-rate cycle is not automatically suitable for another bank's deposits.

Retention requires its own explanation. Kalkbrener and Willing (2004) jointly model market rates, deposit rates, and volumes in a framework for non-maturing liabilities. The separate treatment of these processes is consequential: a deposit can remain outstanding while becoming expensive, and a favorable rate spread can disappear when balances run off. An internal pricing rule that uses only a maturity label can conceal both effects. A useful reconciliation must retain enough information to show whether a change arose from the quantity of surviving funding, its price, or a change in the benchmark against which its advantage is measured.

2.2 The deposit franchise and interest rate exposure

Drechsler, Savov, and Schnabl (2021) explain how the deposit franchise can support maturity transformation when the sensitivity of income is aligned with the sensitivity of funding costs. Their findings should not be read as a guarantee that every portfolio of fixed-rate assets financed by low-beta deposits is hedged. The relevant result concerns the joint asset–liability structure. Hoffmann et al. (2019) document substantial variation in banks' interest rate exposures, reinforcing the need to examine the institution's actual balance sheet and derivatives.

Withdrawal risk places an additional condition on franchise value. Egan, Hortaçsu, and Matvos (2017) distinguish insured and uninsured deposit demand in a structural analysis of banking fragility. Drechsler et al. (2026) show how a valuable deposit franchise can be vulnerable to runs, and how responses that reduce run exposure may create other interest-rate exposures. These studies make it inappropriate to treat a high estimated franchise value as proof of readily realizable liquidity or solvency protection. The benefit is conditional on relationships that may not survive the stress in which the benefit is most needed.

The distinction between earnings objectives and economic-value objectives is also developed in the hedging literature. Cherrat and Prigent (2023) consider the hedging of deposit margins in an incomplete-market setting. A hedge that improves one reporting-period result need not stabilize the entire present value of the relationship. The present paper does not solve for an optimal hedge. It instead supplies a reconciliation that must precede a defensible hedge decision: the bank needs to know which cash flows, customer behaviors, and reporting objectives its proposed hedge is intended to address.

2.3 FTP and the interpretation of maturity

Grant (2011) examines liquidity transfer-pricing practice and advocates recognition of the differing funding characteristics of assets and liabilities. The US interagency guidance on FTP places behavioral assumptions, business incentives, and the attribution of funding and contingent-liquidity costs within a documented governance framework (FRB, FDIC, and OCC, 2016). These sources motivate transparent internal allocation. They do not establish that an increase in the credit to a deposit business increases consolidated bank income.

Dermine (2016) is the closest conceptual precursor because he explicitly distinguishes pricing, performance evaluation, and hedging. Blöchlinger (2021) is a close quantitative precursor because his analytical framework spans FTP and interest rate risk management. The present approach is therefore positioned as an implementation diagnostic. It makes the relationship between reported funding benefits, internal transfers, and separately defined value and earnings measures testable through accounting and cash-flow identities.

Current supervisory research further narrows the gap. Coulier et al. (2025), using confidential supervisory data, examine how banks assign behavioral maturities to deposits and relate those assumptions to deposit characteristics. Their findings suggest that risk characteristics generally inform modeled maturities, while the responsiveness of assumptions during tightening deserves scrutiny. The study concerns behavioral maturity modeling; it does not establish the prevalence of FTP mispricing. It nevertheless supports examining whether models are recalibrated coherently when the economic environment changes.

2.4 Supervisory context and the specific contribution

The Basel IRRBB framework distinguishes earnings and economic-value perspectives and requires attention to behavioral assumptions. Its recalibrated shocks took effect in the Basel framework in January 2026, subject to national implementation (BCBS, 2016, 2024). The EBA’s 2022 guidelines and January 2026 heatmap report discuss NMD assumptions, commercial margins, and hedging. The latter adds supervisory observations and recommendations rather than new requirements (EBA, 2022, 2026). The European five-year constraint concerns the weighted-average repricing date of the eligible aggregate of core and non-core NMDs for each currency, with specified exceptions. It is not interchangeable with a

contractual maturity, a maximum life for every account, or the standardized core-deposit caps in Basel.

Regional supervisory material provides relevant applications. CBUAE guidance calls for segmentation and scenario-dependent behavioral assumptions, including migration between deposit types (CBUAE, n.d.). SAMA's disclosure framework distinguishes an existing-position runoff view for economic value from a twelve-month constant-balance-sheet earnings view (SAMA, 2022). These differences in measurement purpose should be preserved in reconciliation. A single common maturity imposed mechanically across all calculations could reduce conceptual accuracy.

The contribution is the combination of three operational tests. An accounting test verifies that internal transfer entries cancel. A valuation test reconciles avoided funding costs with the value already present in the original deposit cash flows. A scenario test attributes a conditional valuation difference to changes in the retained-balance profile and repricing behavior. Each test is simple enough to reproduce and precise enough to expose an implementation inconsistency. The paper makes no claim to discover deposit rents, to replace stochastic valuation, or to establish that all different FTP and IRRBB outputs are misaligned.

3 Methodology and measurement boundaries

3.1 Research design

The research design is a controlled numerical experiment supported by algebraic identities. A fixed opening deposit cohort is followed through annual periods. The bank maintains a fixed nominal asset portfolio for the earnings calculation and replaces departing deposits with wholesale funding. A separate value calculation includes the original asset and deposit cash flows, excluding future replacement liabilities. All balances, rates, timing conventions, and terminal conditions are specified. The different perimeters are intentional and are reconciled explicitly.

The experiment does not generate artificial survey respondents or estimate sampling uncertainty around stipulated parameters. Scenario variation is used to examine mechanisms, not to imitate observed data. Parameter sensitivity therefore describes how the calculation changes when an assumption changes; it is not a statistical confidence interval. The computational supplement supplies input parameters, period cash flows, scenario results, sensitivity grids, and executable code.

3.2 Opening cohort and timing

Let B denote the opening balance, u the fraction withdrawn immediately, s the fraction of the remaining opening cohort retained from one annual period to the next, and T the finite analytical horizon. The balance available during year t is

$$R_t = B(1-u)s^{t-1}, \qquad t = 1, \dots, T. \qquad (1)$$

Interest is paid at year-end on the balance available during that year. Subsequent attrition occurs at year-end. There are no new deposits within the opening cohort, and no return of previously withdrawn funds. The surviving balance is repaid in full at the end of year T. Consequently, immediate repayment is $P_0 = uB$; for $t < T$, $P_t = R_t(1-s)$; and $P_T = R_T$. These rules ensure that principal repayments sum exactly to the opening balance.

The forced terminal repayment is a transparent horizon convention. It is not an estimate of the legal or behavioral maturity of actual deposits. In particular, the principal-weighted repayment time produced by this experiment should not be called the supervisory repricing maturity. Retained balances can reprice while still remaining in the cohort.

3.3 Customer pricing and external funding

The base market rate is r_0, the shocked market rate is r, the initial deposit rate is d_0, and the pass-through coefficient is β. The administered rate and wholesale replacement rate are

$$d = \max\{0, d_0 + \beta(r - r_0)\}, \qquad f = r + \ell. \qquad (2)$$

Here ℓ is a stipulated wholesale funding spread and c is the annual servicing cost per unit of retained deposits. The rate shock is instantaneous and permanent within each scenario. The model has no repricing lag, stochastic term structure, or customer-specific nonlinear demand function. The zero floor is an explicit modeling choice. It creates asymmetric responses when a downward shock would otherwise produce a negative deposit rate.

The funding spread is included once, through the wholesale alternative. No separate term-liquidity premium is added to the same replacement-cost benefit. An additional liquidity or option charge would require a separately specified incremental cost and a demonstration that it is not already captured by this benchmark or the runoff assumption. Servicing cost is treated as an avoidable proportional cost for the numerical exercise; actual fixed and variable costs would need to be separated in application.

3.4 Funding-benefit present value

The net funding advantage of retained deposits, relative to wholesale financing of the same assets, is $R_t(f - d - c)$. Define the discounted retained-balance factor and benefit value as

$$A(r, s, u, T) = (1-u)\sum_{t=1}^{T} \frac{s^{t-1}}{(1+r)^t}, \qquad V = BA(f - d - c). \qquad (3)$$

For $1 + r \neq s$, the sum before multiplication by $(1 - u)$ is

$$a(r, s, T) = \frac{1 - [s/(1 + r)]^T}{1 + r - s}. \qquad (4)$$

If $1 + r = s$, its continuous limit is $T/(1 + r)$. The factor has the interpretation of discounted retained-balance years per unit of the opening cohort. It is not a Macaulay duration or an estimated deposit life.

The value V is a conditional present value of replacement-cost savings after servicing. Discounting at the scenario market rate makes the exercise transparent, but does not convert stipulated retention into risk-neutral probabilities or establish a market-consistent fair value. The experiment does not model deposit insurance, taxes, credit losses, full operating costs, or the bank's cost of equity. Its value measure is neither an accounting asset nor an addition to regulatory capital.

3.5 Consolidated earnings and internal attribution

Let a fixed-rate asset portfolio of principal B earn coupon y. With zero reserves in the main experiment, wholesale replacement funding in year t is $W_t = B - R_t$. Immediate withdrawals require replacement funding throughout the first year; subsequent year-end withdrawals increase replacement funding for the following year. Net interest income and contribution after deposit servicing are

$$NII_t = yB - dR_t - fW_t, \qquad \Pi_t = NII_t - cR_t. \qquad (5)$$

The counterfactual in which the entire asset portfolio is funded wholesale earns $(y - f)B$ before other expenses. Subtracting that counterfactual from Π_t gives $R_t(f - d - c)$ exactly. This identity establishes what the funding-benefit value measures. It is the discounted difference between two specified funding arrangements, not the whole bank's earnings value.

An internal deposit credit k_D and asset charge k_A divide the same external outcome among deposit, lending, and Treasury functions. For the fully deposit-funded base-year balance, the contributions are $B(k_D - d - c)$, $B(y - k_A)$, and $B(k_A - k_D)$. Their sum is $B(y - d - c)$ for every pair of transfer rates. A higher deposit credit raises the deposit unit's reported contribution and lowers the Treasury residual by the same amount. Profit enhancement requires a subsequent change in external pricing, retention, asset composition, hedging, or cost; it cannot be inferred from the transfer entry itself.

3.6 Original-position value and the double-counting test

The present value of the original deposit liability includes immediate withdrawals and all subsequent customer cash flows:

$$L = P_0 + \sum_{t=1}^{T} \frac{P_t + dR_t}{(1 + r)^t}. \qquad (6)$$

The original asset value is the discounted value of its fixed coupons and terminal principal. Denote the difference between that asset value and L by $\mathcal{E}$. This is an EVE-type measure for a deliberately restricted portfolio with commercial margins included. It is not a complete regulatory EVE calculation. It contains no new deposits, future replacement liabilities, derivatives, capital denominator, or prescribed portfolio segmentation.

Principal conservation yields an exact relation:

$$B - L = \sum_{t=1}^{T} \frac{(r-d)R_t}{(1+r)^t}, \qquad V = (B-L) + (\ell - c)BA. \qquad (7)$$

The below-market deposit-rate benefit is therefore already present in the original-position liability valuation under this convention. Adding the full funding-benefit value V to $\mathcal{E}$ would count that component twice. The additional wholesale spread and servicing adjustments have to be reconciled separately. A different treatment of commercial margins would change the bridge and must be documented rather than silently assumed.

A second identity explains the earnings perimeter:

$$\mathcal{E} = \sum_{t=1}^{T} \frac{NII_t + \ell W_t}{(1+r)^t}. \qquad (8)$$

The difference is the wholesale spread on future replacement funding, which appears in the earnings projection but is outside the original-position liability perimeter. These equations make the distinction between dynamic funding and original-position valuation observable in the workings.

3.7 Attribution of a conditional model difference

Consider two calculations for the same rate scenario, opening balance, horizon, funding spread, and servicing cost. One retains the original behavioral assumptions, denoted F; the other adopts a joint-stress target, denoted R. Write $m = f - d - c$. The difference is $\Delta V = B(A_F m_F - A_R m_R)$. Symmetric two-factor attribution gives

$$C_A = \frac{B}{2}(A_F - A_R)(m_F + m_R), \qquad C_m = \frac{B}{2}(m_F - m_R)(A_F + A_R). \qquad (9)$$

These contributions sum exactly to ΔV. The retained-profile component combines the effects of immediate withdrawal and subsequent retention; it should not be described as a survival-only effect. Because only beta changes the margin in this comparison, C_m is the beta contribution. If the funding spread, costs, or discount convention also changed, a broader decomposition would be necessary. The calculation averages the two possible orders of adjustment and avoids assigning the entire interaction to whichever factor is changed last.

4 Numerical experiment and analytical workings

4.1 Assumptions and verification

Table 1 reports the base parameters. The five-year horizon is an analytical choice, independent of any regulatory repricing cap. The 200-basis-point shocks are illustrative. In the current Basel table, the SAR parallel shock is 275 basis points; the illustrative 200-basis-point experiment must not be described as that prescribed shock (BCBS, 2024).

Table 1. Author-defined base assumptions

Parameter	Value	Interpretation
Opening cohort B	SAR 1,000 million	Existing deposit balances only
Horizon T	5 years	Remaining principal repaid at horizon
Market rate r_0	4.00%	Flat deterministic discount and rate benchmark
Wholesale spread ℓ	0.60%	Increment above the market benchmark
Initial deposit rate d_0	1.00%	Rate paid to the opening cohort
Deposit beta β	0.25	Pass-through above the zero floor
Annual retained fraction s	0.90	End-year retention of the opening cohort
Immediate withdrawal u	0.00	No time-zero withdrawal in the base case
Servicing cost c	0.25%	Proportional annual cost of retained balances
Fixed-rate asset coupon y	5.50%	Held unchanged across the main scenarios

Source: Author's numerical assumptions. None is estimated from a bank dataset.

The code verifies principal conservation, agreement between period cash flows and the factorized expression in equation (3), reconciliation with the wholesale-funding counterfactual, additivity of the attribution, and cancellation of FTP entries. Boundary checks cover complete immediate withdrawal, a zero funding margin, and the limiting annuity case. These checks establish computational consistency of the stated model; they do not establish that the assumptions describe a particular bank.

4.2 Base-case calculation

The base funding margin after servicing is $4.60\% - 1.00\% - 0.25\% = 3.35\%$. The discounted retained-balance factor equals 3.676144734. Equation (3) therefore gives

$$V = 1{,}000{,}000{,}000 \times 3.676144734 \times 0.0335 = \text{SAR } 123{,}150{,}849. \qquad (10)$$

The balances available during the five years are SAR 1,000.00, 900.00, 810.00, 729.00, and 656.10 million. The first four year-end principal repayments are SAR 100.00, 90.00, 81.00, and 72.90 million; the remaining SAR 656.10 million is repaid at the end of year five. The principal-weighted repayment time is 4.0951 years under this terminal convention. It is not an empirical estimate of a bank's behavioral maturity.

First-year interest income is SAR 55.00 million and customer interest expense is SAR 10.00 million. With no immediate wholesale replacement, NII is SAR 45.00 million. Servicing reduces contribution to SAR 42.50 million. The present value of the original asset is SAR 1,066.78 million and that of the original deposit liability is SAR 889.72 million, producing $\mathcal{E}$ of SAR 177.06 million. The funding-benefit value and original-position value are different quantities, as equations (7) and (8) require.

The double-counting bridge can be checked numerically. The deposit-rate benefit already represented by $B - L$ is SAR 110.28 million. The net wholesale-spread less servicing adjustment is SAR 12.87 million. Their sum equals the SAR 123.15 million funding-benefit value. Likewise, the discounted NII of SAR 172.41 million plus SAR 4.65 million of replacement-funding spreads equals SAR 177.06 million. These reconciliations prevent a favorable deposit valuation from being presented twice under different labels.

4.3 Rates, repricing, and retention

Table 2 defines the scenario changes. The main joint stress combines a 200-basis-point rate increase, beta of 0.75, immediate withdrawal of 20%, and annual retention of 70%. These assumptions are deliberately severe enough to make interactions visible. They are not estimates of the likelihood or magnitude of a regional banking stress.

Table 2. Scenario assumptions

Scenario	Market rate	Beta	Annual retention	Immediate withdrawal
Base	4.00%	0.25	90%	0%
Rate rise	6.00%	0.25	90%	0%
Rate rise with higher beta	6.00%	0.75	90%	0%
Rate rise with weaker retention	6.00%	0.25	70%	20%
Joint behavioral stress	6.00%	0.75	70%	20%
Joint stress with wider funding spread	6.00%	0.75	70%	20%
Rate fall	2.00%	0.25	90%	0%
Rate fall with high beta and floor	2.00%	0.75	90%	0%

Note: The wholesale spread is 60 basis points except in the sixth row, where it is 120 basis points. All other assumptions remain as in Table 1.

Table 3. Calculated outcomes in SAR million

Scenario	Funding-benefit PV V	First-year NII	Change in $\mathcal{E}$ from base
Base	123.15	45.00	0.00
Rate rise	169.37	40.00	−40.97
Rate rise with higher beta	134.45	30.00	−75.90
Rate rise with weaker retention	94.24	29.80	−110.68
Joint behavioral stress	74.81	21.80	−130.11
Joint stress with wider funding spread	86.47	20.60	−130.11
Rate fall	71.71	50.00	46.06
Rate fall with high beta and floor	91.10	55.00	65.44

Source: Author's calculations. $\mathcal{E}$ is the restricted original-position value in section 3.6, not a reported regulatory EVE measure. Values are rounded; calculations use unrounded inputs.

Under the rate-rise scenario, the deposit rate increases to 1.50%, while wholesale funding rises to 6.60%. The net funding margin increases to 4.85%, more than offsetting the lower discount factor. Funding-benefit value rises by SAR 46.22 million. Yet the asset coupon does not change, so the additional customer interest expense reduces first-year NII by SAR 5.00 million. The original-position value also declines. A rising value relative to an increasingly expensive funding alternative is therefore compatible with weaker absolute earnings and lower original-position value.

The joint stress changes the retained-balance factor from 3.492197009 in the rate-only case to 1.943129598. The customer rate rises to 2.50%, reducing the margin to 3.85%. The resulting value is SAR 74.81 million. In the first year, retained deposits are SAR 800.00 million, customer interest is SAR 20.00 million, and replacement funding of SAR 200.00 million costs SAR 13.20 million. Against asset income of SAR 55.00 million, NII is SAR 21.80 million. Servicing of SAR 2.00 million produces contribution of SAR 19.80 million.

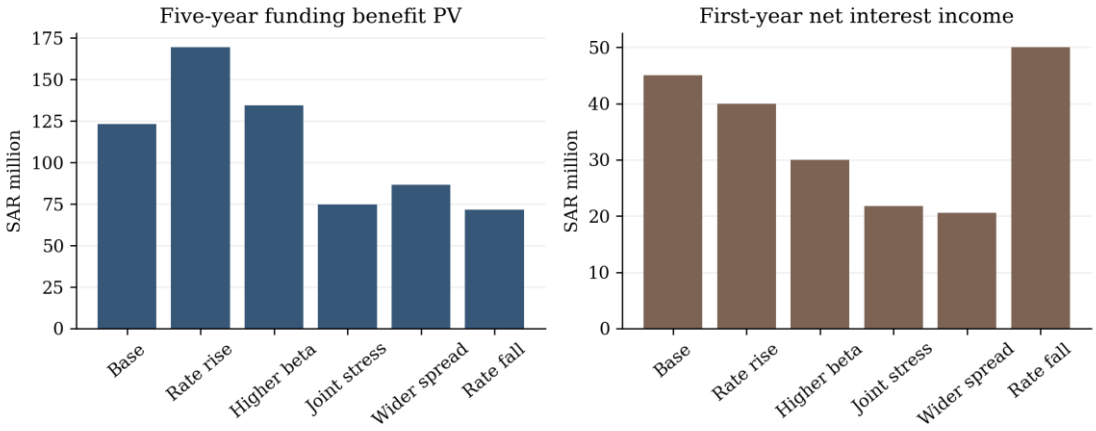


Figure 1. Funding-benefit value and first-year NII under selected illustrative scenarios.

Figure 1 compares two metrics with distinct horizons and economic meanings. The charts should be read as a comparison of direction and scenario response, not as two directly additive measures of value.

4.4 The reconciliation difference

If an FTP-related valuation continues to use the rate-only behavioral assumptions while the agreed joint-stress target is intended, its conditional value difference is SAR 94.56 million. This is 55.83% of the rate-only value, or 126.40% of the joint-stress value. Those percentages use different denominators and should not be substituted for one another. The rate-only calculation is not intrinsically erroneous; it becomes inappropriate when presented as the result for the joint-stress assumptions.

Table 4. Symmetric attribution of the conditional value difference

Component	SAR million
Retained-balance profile contribution	67.38
Deposit-beta contribution	27.18
Total rate-only less joint-stress value	94.56

Source: Equation (9), using unrounded results. Immediate withdrawal and annual retention are grouped in the retained-profile component.

The decomposition has a practical use beyond the chosen example. A reconciliation report can show whether a disputed deposit credit arises primarily from a different balance forecast or a different pricing response. That information directs review toward the relevant data and model owner. It also avoids the unhelpful conclusion that the entire difference is explained by "maturity," when the difference may concern how much of the funding remains and how much it costs.

4.5 FTP allocation without profit creation

The base-year external contribution is SAR 42.50 million. Table 5 holds the asset transfer charge at 4.60% and changes only the deposit credit. The lending contribution is unchanged. The deposit unit and Treasury absorb equal and opposite reallocations.

Table 5. Internal allocation with unchanged external cash flows in SAR million

Deposit FTP credit	Lending contribution	Deposit contribution	Treasury residual	Total
3.00%	9.00	17.50	16.00	42.50
4.60%	9.00	33.50	0.00	42.50
5.00%	9.00	37.50	−4.00	42.50

Source: Author’s calculations. Deposit contribution includes proportional servicing cost. Credit losses, tax, other operating costs, and capital charges are excluded and unchanged.

The accounting identity does not make FTP economically irrelevant. Internal measures may influence customer pricing, product strategy, remuneration, and decisions about which balances to retain. Those behavioral responses can change future earnings. They require separate evidence. The table establishes only that relabeling the same receipts and payments cannot itself create profit.

4.6 Sensitivity and boundary cases

The experiment varies annual retention between 50% and 99% and beta between zero and one, holding the rate rise at 200 basis points and immediate withdrawal at 20%. Figure 2 reports the resulting values. Higher retention increases value when the retained funding margin is positive; higher beta reduces it under the upward-rate shock. The surface describes the stipulated mechanism, not an estimated joint probability distribution. A credible production application must consider whether the chosen beta and retention combinations can occur together.

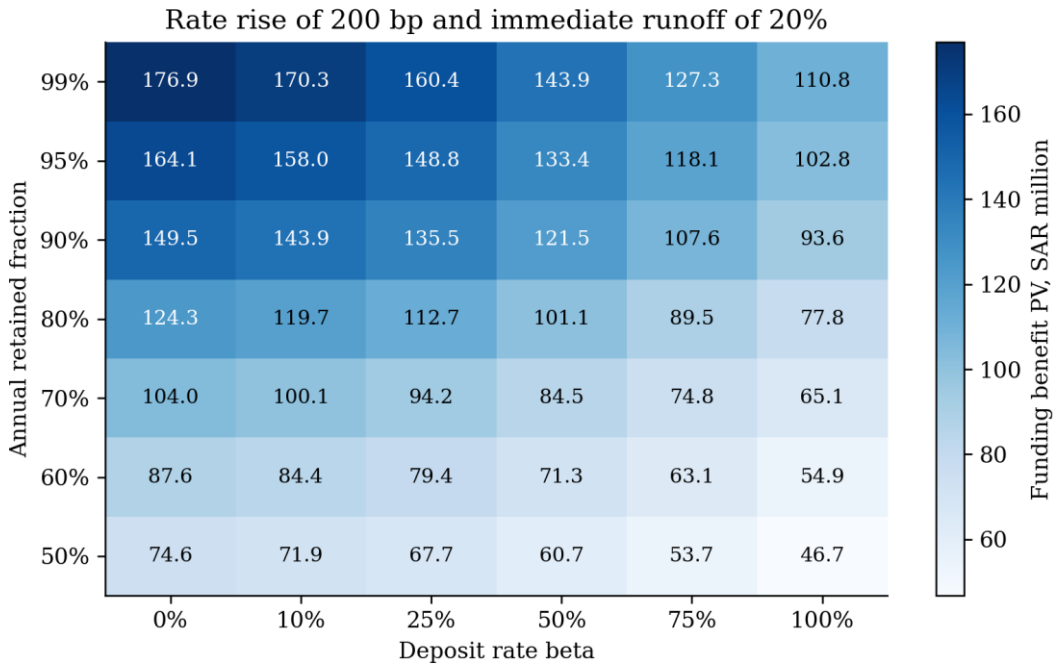


Figure 2. Funding-benefit sensitivity to retention and deposit beta.

Horizon choice has a material effect. At 90% annual retention and base rates, funding-benefit value is SAR 32.21 million over one year, SAR 60.09 million over two years, SAR 123.15 million over five years, and SAR 182.92 million over ten years. Extending the horizon recognizes more conditional savings; it does not validate a longer regulatory repricing tenor. The principal-weighted timing also changes because the terminal repayment moves. Comparisons across models must therefore reconcile terminal conventions before attributing differences to economic disagreement.

An additional sensitivity introduces reserves remunerated at 2.00%, with a reserve fraction of zero, 5%, or 10%. The effective funding benchmark becomes $(1-q)f + qr_{res}$. Funding-benefit values are respectively SAR 123.15, 118.37, and 113.59 million. The corresponding balance-sheet identity is $W_t = B - (1-q)R_t$: retained deposits and wholesale funding finance the fixed-rate asset book and reserves of qR_t. Including reserve income gives $NII_t = yB + qr_{res}R_t - dR_t - fW_t$, preserving the funding-counterfactual reconciliation. These reserve fractions are hypothetical; no national reserve requirement is being asserted. The original-position value table remains confined to the zero-reserve experiment.

The model also clarifies several limiting cases. Complete immediate withdrawal makes the remaining funding benefit zero. A zero net funding margin makes value zero regardless of retention. If the margin becomes negative, greater persistence preserves an expensive funding source and reduces value. Deposit stickiness is therefore not sufficient for positive value. In the downward-rate, high-beta case, the customer rate reaches zero and further pass-through is constrained. The floor explains why an apparently symmetric change in the market rate can produce asymmetric outcomes.

5 Implications for ALCO and model governance

5.1 A common economic description

Reconciliation should begin with identification of the balance population. FTP and IRRBB outputs cannot be compared meaningfully when one includes newly acquired deposits, another follows only existing accounts, and a third nets internal product migration against external withdrawals. The opening cohort, currency, customer segment, valuation date, and treatment of accrued interest should be recorded together. Differences in product mapping can be economically more important than a small difference in a stated average tenor.

The next step is to separate shared assumptions from purpose-specific transformations. The empirical evidence on retention, repricing, and customer migration should be traceable across uses. A conservative stress survival curve may legitimately differ from a central business forecast. An earnings calculation may renew funding that an original-position value calculation allows to run off. A hedge portfolio may have a maturity that differs from either. These differences need reasons and reconciliation, rather than enforced numerical equality.

For each material difference, the model record should identify its purpose, the evidence supporting it, the resulting cash-flow effect, and the function that accepts the residual risk. A strategic deposit subsidy should remain distinguishable from an economic funding credit. Likewise, Treasury's retained contribution should not conceal an unallocated behavioral option merely because the business unit's transfer rate appears stable.

5.2 Quantifying an unexplained difference

The proposed diagnostic produces three items for review: the cash-flow difference, its value under a common discount convention, and its allocation among specified assumptions. A mismatch is "unexplained" when it remains after differences in cohort, purpose, horizon, costs, scenario severity, and risk transfer have been accounted for. A different scalar tenor is only a prompt for investigation.

Materiality should follow the economic use of the output. A bank can assess whether an unexplained difference changes business-unit contribution, moves an exposure toward a limit, or reverses a pricing decision. The present paper supplies no universal acceptable percentage. A small aggregate difference can conceal offsetting errors across products, and a large deliberate difference may be justified by a documented stress convention. Review should retain the direction and source of the difference rather than compressing everything into a single score.

5.3 Connecting attribution to an actual pricing decision

Better measurement can inform profitable action, but the action has to be specified. Suppose retained funding R responds to the customer rate d, while the asset portfolio and wholesale benchmark are held fixed. The marginal change in contribution is

$$\frac{\partial \Pi}{\partial d} = -R + (f - d - c)\frac{\partial R}{\partial d}. \qquad (11)$$

The first term is the additional remuneration paid on retained balances. The second is the funding advantage preserved through the additional retention. A rate concession is beneficial under this simplified comparison only if the retention response is large enough to outweigh the cost. The paper does not estimate that response. It explains why an enhanced FTP credit cannot, on its own, establish the profitability of a deposit campaign.

In application, pricing analysis would also distinguish new balances from retained balances, migration from external inflows, and marginal costs from already committed expenses. A campaign can attract apparent deposit growth while merely moving customers from a cheaper product within the institution. Such migration may improve a product's reported performance without improving consolidated funding economics. A shared cohort and migration ledger makes that possibility visible.

6 Discussion

The numerical results answer the first research question by separating relative funding value from absolute earnings. In the rate-rise example, deposits become more valuable relative to wholesale funding because their remuneration increases less than the wholesale alternative. The fixed-rate asset portfolio nevertheless earns the same coupons, while the bank pays more interest to depositors. The franchise comparison improves and first-year NII deteriorates. There is no contradiction once the counterfactual and cash-flow boundary are stated.

The joint stress answers the second question. Assuming favorable retention and a low beta throughout a scenario can materially overstate the value assigned to that scenario when a different behavioral target is intended. The attribution identifies the contribution of the retained-balance profile and repricing rather than leaving the entire difference in an undifferentiated model-risk residual. The example does not imply that the chosen stress is the correct forecast. It shows what has to be reconciled if that stress is the approved scenario.

The third question concerns interpretation of hidden value. Under a commercial-margin-inclusive, original-position liability valuation, part of the deposit-rate advantage is already embedded in the liability's present value. A second presentation of franchise value may be useful for management, but it requires a bridge. Without one, the same economic benefit can appear in both a favorable liability value and an additional franchise-value claim. Equations (7) and (8) give a directly testable reconciliation for the stated model.

The wider-spread scenario provides a further caution. Increasing the wholesale spread from 60 to 120 basis points raises the relative value of the surviving deposits from SAR 74.81 million to SAR 86.47 million, yet reduces first-year NII from SAR 21.80 million to SAR 20.60 million because replacement funding is more expensive. The original-position value is unchanged because that funding spread is not a cash flow of the existing deposit liability. A benchmark that becomes more expensive can increase the calculated value of avoiding it without improving the bank's condition.

These results complement the literature rather than displacing it. Stochastic valuation and dynamic hedging remain necessary for applications involving uncertain rates, incomplete markets, and endogenous customer behavior. The contribution here is a common reporting discipline that can be applied before and after more sophisticated modeling. Complexity does not remove the need for internal transfers to cancel, principal to reconcile, and valuation differences to have an explicit economic explanation.

7 Limitations and empirical validation

The principal limitation is the absence of bank-level calibration. Annual survival, beta, and immediate withdrawal are stipulated independently, although customer behavior can link them. The model cannot estimate a regional funding benefit, a bank's actual sensitivity, or the probability of a run. It contains no causal identification of how FTP governance changes decisions. An empirical claim about the frequency or cost of misalignment would require observations from banks' pricing and risk systems for the same populations and dates.

The annual timing convention is coarse. Actual pricing changes and withdrawals can occur within days, and runoff may be concentrated around confidence events rather than spread proportionally through time. Terminal liquidation excludes future customer acquisition and any continuation value beyond the horizon. The fixed asset coupon and unchanged asset principal deliberately isolate the liability mechanism, but do not describe a general bank. New lending, credit losses, hedges, basis risk, market-value realizations, taxes, and capital costs can materially alter the result.

The valuation convention is equally consequential. The deterministic discounting of conditional savings is not a market-consistent fair valuation of a non-traded franchise. Uncertain savings require an appropriate treatment of risk and dependence. The experiment does not treat its wholesale spread as a clean measure of liquidity alone: in a real institution, liquidity, own-credit, collateral, and market-access components would need to be distinguished. Any additional premium or haircut should be introduced through a documented cash-flow or valuation adjustment, with an explicit check against double counting.

An empirical extension should assemble account- or segment-level histories spanning different rate conditions, with stable identifiers for opening cohorts, daily or monthly balances, paid rates,

product migrations, and external withdrawals. Stock changes must be separated from new inflows. Deposit beta should allow for lags, floors, product differences, and regime changes. Retention models should distinguish customer exit from balance reduction and account for censoring. The same dated cohort should then be processed through the production FTP, earnings, and value systems.

Validation should compare predictions with later observations and quantify the effects of model revisions on cash flows, contribution, and risk measures. Temporal holdouts are especially important when the parameters were estimated during a low-rate period. A model that fits historical balance persistence can still misrepresent customer response to a competitive repricing cycle. Documentary evidence should establish which assumptions were approved, which risks were transferred to Treasury, and whether deliberate differences were understood by business and control functions.

8 Conclusions

Sticky deposits have a conditional economic value that depends on how much funding remains, what it costs, and which alternative it replaces. The same deposits also create earnings and valuation exposures that depend on the assets financed and the measurement perimeter. An internal pricing credit, a funding-benefit present value, and an EVE-type output therefore cannot be treated as interchangeable measures.

The paper develops a reproducible method for reconciling these quantities. In the illustrative cohort, a rate rise increases the relative funding benefit while reducing NII and original-position value. Joint repricing and retention stress produces a substantially lower benefit than the rate-only calculation. A symmetric attribution identifies the retained-profile and beta contributions to that conditional difference. Accounting identities confirm both the cancellation of internal FTP entries and the overlap between deposit funding benefits and value already represented in the liability cash flows.

The practical implication is to judge consistency through traceable assumptions and cash flows. Equal reported tenors can conceal different populations or behaviors; different tenors can be appropriate for different purposes. An unexplained difference should be investigated where it enters the economic calculation, with its effect and risk owner made explicit. The analytical findings justify that reconciliation discipline. They do not establish the size of any real bank’s hidden value or a guaranteed increase in profitability.

Research transparency and reproducibility

All numerical inputs in this study are author-defined assumptions. No confidential bank balances, respondent records, customer identifiers, or estimated regional parameters are used in the numerical experiment. The accompanying code reproduces the scenario tables, complete annual cash flows, attribution, horizon and reserve sensitivities, and figures. The model’s

identities are checked programmatically. Literature references distinguish published research, working papers, and supervisory material; their use does not imply local adoption of foreign rules. Source-access and research date: 7 November 2026.

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Appendix A Algebraic reconciliation and reproduction

A1 Principal conservation

With no new balances, $R_{t+1} = R_t - P_t$ before the final period. Discounting the principal-and-market-interest cash flows of the cohort gives $P_0 + \sum_t (P_t + rR_t)/(1+r)^t = B$. Subtracting equation (6) from this identity gives $B - L = \sum_t (r-d)\, R_t/(1+r)^t$. Adding the wholesale spread and subtracting servicing proves equation (7). The proof is conditional on the timing and discount conventions stated in section 3.

A2 Earnings reconciliation

For the fixed-rate asset, present value equals $B + \sum_t (y-r)\, B/(1+r)^t$. Subtract the deposit-liability expression from A1. The resulting annual difference is $(y-r)B + (r-d)R_t = yB - dR_t - rW_t$. Replacing rW_t with $fW_t - \ell W_t$ proves equation (8). Subtracting servicing from earnings requires adding back its present value on the right-hand side. In the base case this gives SAR 163.22 million of discounted contribution, SAR 9.19 million of servicing, and SAR 4.65 million of replacement spread, totaling SAR 177.06 million.

A3 Attribution and comparative statics

Expanding equation (9) cancels the two cross terms and gives $C_A + C_m = B(A_F m_F - A_R m_R)$. For an upward shock away from the deposit-rate floor, $\partial V / \partial \beta = -BA(r - r_0)$. At fixed positive margin, value increases with the retained fraction and decreases with immediate withdrawal. The sign of the interest-rate response is not determined by beta alone because discounting, retention, and withdrawal can also change. At a fixed rate below r_0, the local beta derivative is zero wherever $d_0 + \beta(r - r_0) < 0$; at the floor's kink, the two-sided derivative generally does not exist.

A4 Reproduction sequence

The file sticky_model.py contains the parameter definitions and numerical implementation. Running it creates sticky_outputs/results.json, scenario and cash-flow CSV files, the beta-retention grid, horizon and reserve sensitivities, and the FTP allocation table. Figure generation uses Matplotlib and NumPy; the numerical tables use Python's standard library. The output directory is created relative to the script, so the calculations can be reproduced without the author's original workspace. All displayed monetary results are obtained from unrounded cash flows and rounded only for presentation.