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Bank Liquidity Management

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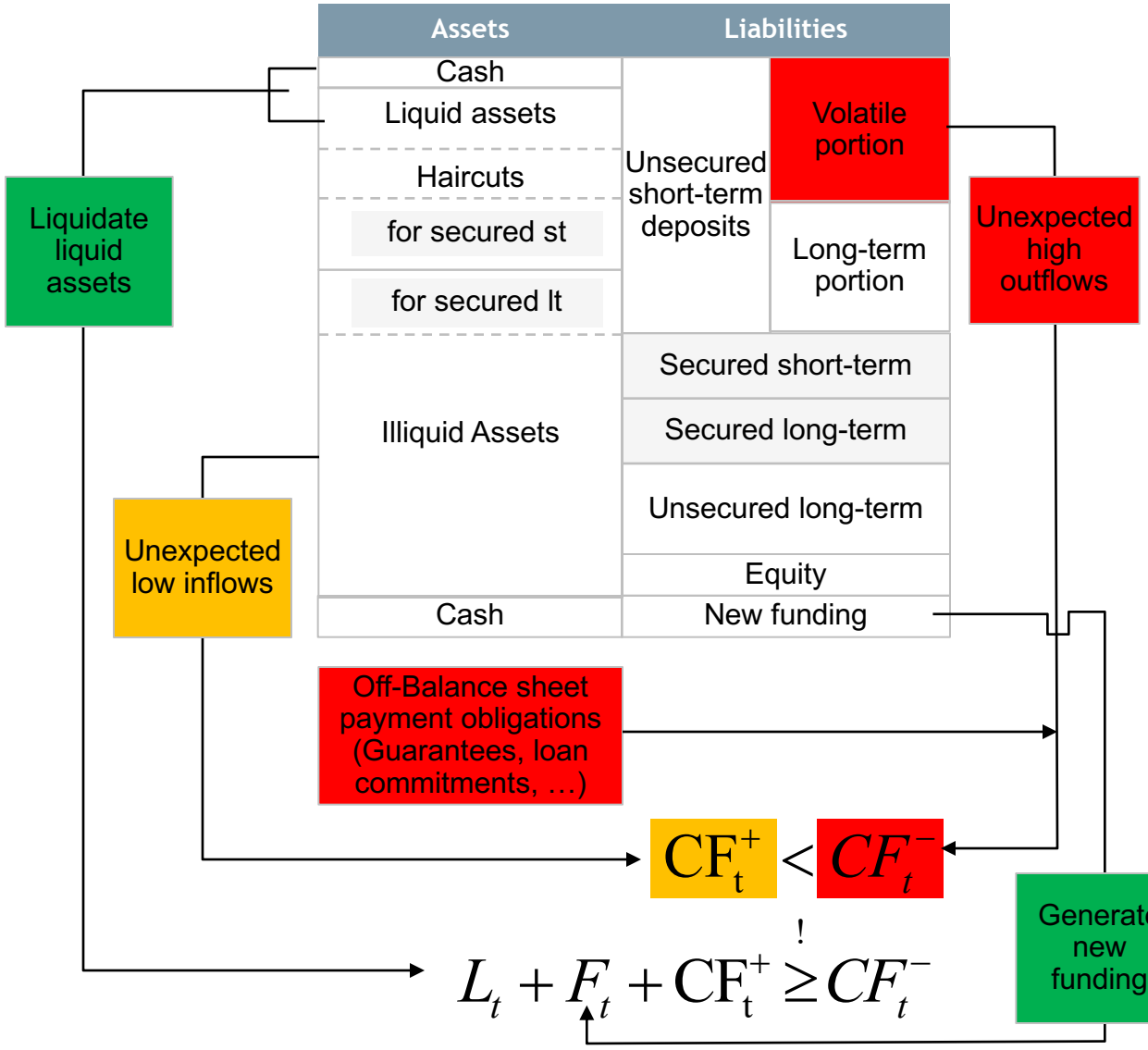
Bank liquidity management



Liquidity management is to ensure that outflows are covered even under very adverse scenarios by (i) inflows or (ii) by liquidity-generating actions, i.e. $L_t + F_t + CF_t^+ \geq CF_t^-$

=> Need to estimate cash flows under many scenarios to determine the size of required liquidity reserve ($L_t + F_t$)

=> Many products have uncertain cash flows (demand deposits) and even simple products have uncertain prolongation at maturity. Finally, new business is always uncertain.

=> Need models

$$\frac{L_t + \cancel{F_t}}{CF_t^- - CF_t^+} \overset{!}{\geq} 100\%$$

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Meeting Liquidity Needs

- Bank liquidity refers to a bank's capacity to acquire immediately available funds at a reasonable price.
  - **Asset liquidity** refers to the ease of converting an asset to cash with a minimum of loss.
  - **Liability liquidity** is an ease which bank can issue debt to acquire clearing balances at reasonable costs.
- Effectiveness of each liquidity source at meeting liquidity needs depends on:
  - Market conditions, evidenced by the market's perception of risk at the institution as well as in the marketplace
  - Market's perception of bank management and strategy
  - The current economic environment

Holding Liquid Assets

- Four basic types of cash assets:
  - Vault cash, demand deposit balances held at the central bank, demand deposits held at private financial institutions and cash items in process of collection
- Cash assets represent a significant opportunity cost for institutions because they earn little or no interest.
- Banks hold cash to satisfy four objectives:
  1. Meet customers' regular transaction needs.
  2. Meet legal reserve requirements.
  3. Assist in the payment system.
  4. Purchase correspondent banking services.

New Borrowings

- Banks can access liquid funds by borrowing.
- Attractive because quick and prices are predictable.
  - Historically banks had an advantage over non-depository institutions through funding with low-cost deposit accounts.
- Use of non-core funding sources adds liquidity risk.
  - When an institution gets in trouble, lenders withdraw from the market or increase collateral requirements.

Required Reserves and Monetary Policy

- Banks hold deposits at the central bank:
  - because the central bank imposes legal reserve requirements and deposit balances qualify as legal reserves;
  - to help process deposit inflows and outflows caused by maturing time deposits and securities, wire transfers and other transactions.
- Purpose of required reserves is to enable the central bank to control money supply.
- The central bank has three distinct monetary policy tools:
  - Open market operations. Sale or purchase of government securities in the open market is the most flexible means of carrying out policy objectives.
  - Discount window borrowing occurs when banks borrow directly from the central bank. Changes in the discount rate directly affect the cost of borrowing.
  - Changes in the reserve requirement impact the amount that banks can lend.

Short-Term Liquidity Planning

Factors increasing reserves	Factors decreasing reserves
Nondicreationary	
Immediate cash letter	Remittances charged
Excess from clearing house	Deficit in clearing house
Deposits from the Ministry of Finance	Taxes paid and loan calls
	Maturing deposits
Discreationary	
Cash shipped to central bank	Cash received from the central bank
Security sales	Security purchases
Borrowing from the central bank	Payment on loans from central bank
Securities sold under repos	Securities purchased under repos
Interest payments on securities	
New deposits	

Liquidity versus Profitability

- Trade-off between liquidity and profitability.
  - The more liquid a bank is, the lower its return on equity and return on assets, all other things being equal.
  - Large holdings of cash assets decrease profits because of the opportunity loss of interest income.
  - Short-term securities normally carry lower yields than comparable longer-term securities.
  - Loans carrying the highest yields generally the least liquid.
- Liquidity planning focuses on guaranteeing that immediately available funds are available at the lowest cost.

Liquidity Needs Factors

New Loan Demand	Potential Deposit Losses
• Unused commercial credit lines outstanding	• The composition of liabilities
• Consumer credit available on bank-issued cards	• Insured versus uninsured deposits
• Business activity and growth in the bank's trade area	• Deposit ownership between: money fund traders, trust fund traders, public institutions, commercial banks by size, corporations by size, individuals, foreign investors, and Treasury tax and loan accounts
• The aggressiveness of the bank's loan officer call programs	• Large deposits held by any single entity
	• The sensitivity of deposits to changes in the level of interest rates

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Liquidity Risk Measures

- Liquidity measures for asset types or groups (expressed in percentage terms as a fraction of total assets)
- Liquidity measures for types of liabilities (incl. Reserve for loan losses to loans)
- Loan-to-deposit ratio
- 1W, 1M… liquidity ratio: periodic gap/ cumulated funding gap
- Cumulative liquidity model: daily, available liquidity/ deficit for next 1-12M
- Funding concentration report (10 largest depositors, % of funding from which market)
- Inter-entity lending: % of funding/ lending from/ to intragroup entities
- **Strategic liquidity measures**: introduced by Basel III

Liquidity Risk Measures

- Contractual maturity mismatches
- Available unencumbered assets (can be used in case of default to satisfy any investor)
- Encumbered assets have been separated for the specific obligor (secured funding)
- Funding concentration by time band: no peak maturing positions
- Undrawn commitment report: volume of potentially drawn commitments
- Surplus funding capacity: liquidity capacity after a stress scenario
- Aggregate limits metrics: per market (wholesale funding, retail funding, ...)
- Market-lock out horizon/survival period: number of weekdays that bank can autonomously survive (only using internal liquidity buffer)
  Stress scenarios => survival period ⇔ Liquidity buffer determination

Basel III and the Liquidity Coverage Ratio

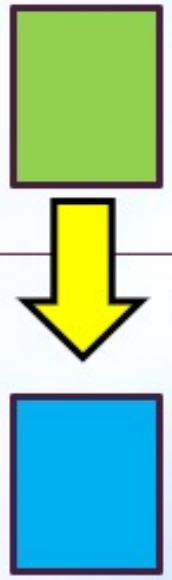
- Objective is to improve large organizations' liquidity risk management.
- Liquidity coverage ratio (LCR) is a ratio of high-quality liquid assets to projected net cash outflows.

$$\frac{\text{Stock of HQLA}}{\text{Total net cash outflows over the next 30 days}} > 100\%$$

- **Total expected outflows** are determined by multiplying the outstanding balances of various categories of liabilities and off-balance sheet commitments by the supervisory rates at which they are expected to run off or be drawn down.
- **Total expected cash inflows** are estimated by applying inflow rates to the outstanding balances of various contractual receivables.
- **HQLA** are cash or assets that can be converted into cash quickly through sales (or by being pledged as collateral) with no significant loss of value. A liquid asset can be included in the stock of HQLA if it is unencumbered, meets minimum liquidity criteria and its operational factors demonstrate that it can be disposed of to generate liquidity when needed (**Levels 1, 2A, 2B**).

LCR – maintain enough liquid assets for 30 days under stress scenario specified by supervisor

Liquid Assets



	Haircut
Level 1 - Cash and Central Bank reserves	0%
Level 2A – Sovereign Assets 20% RWA	15%
Level 2B - Qualifying RMBS and equity shares	25-50%

> or = 100%

Net cash outflows over 30 days

	Run-off factor
Retail and SME deposits	3-10%
Wholesale deposits	
• Financial and others	100%
• Non-financial corporate, sovereigns, central Banks and PSEs (20% if Deposit Protection)	40%
• Operational, inc. custody and clearing (5% if Deposit Protection)	25%
Secured funding	
• By level 1 and level 2 assets	0-50%
• By assets not included in stock of liquid assets	100%
Undrawn commitments	
• Retail and SMEs	5-10%
• Liquidity and FI commitments	100%

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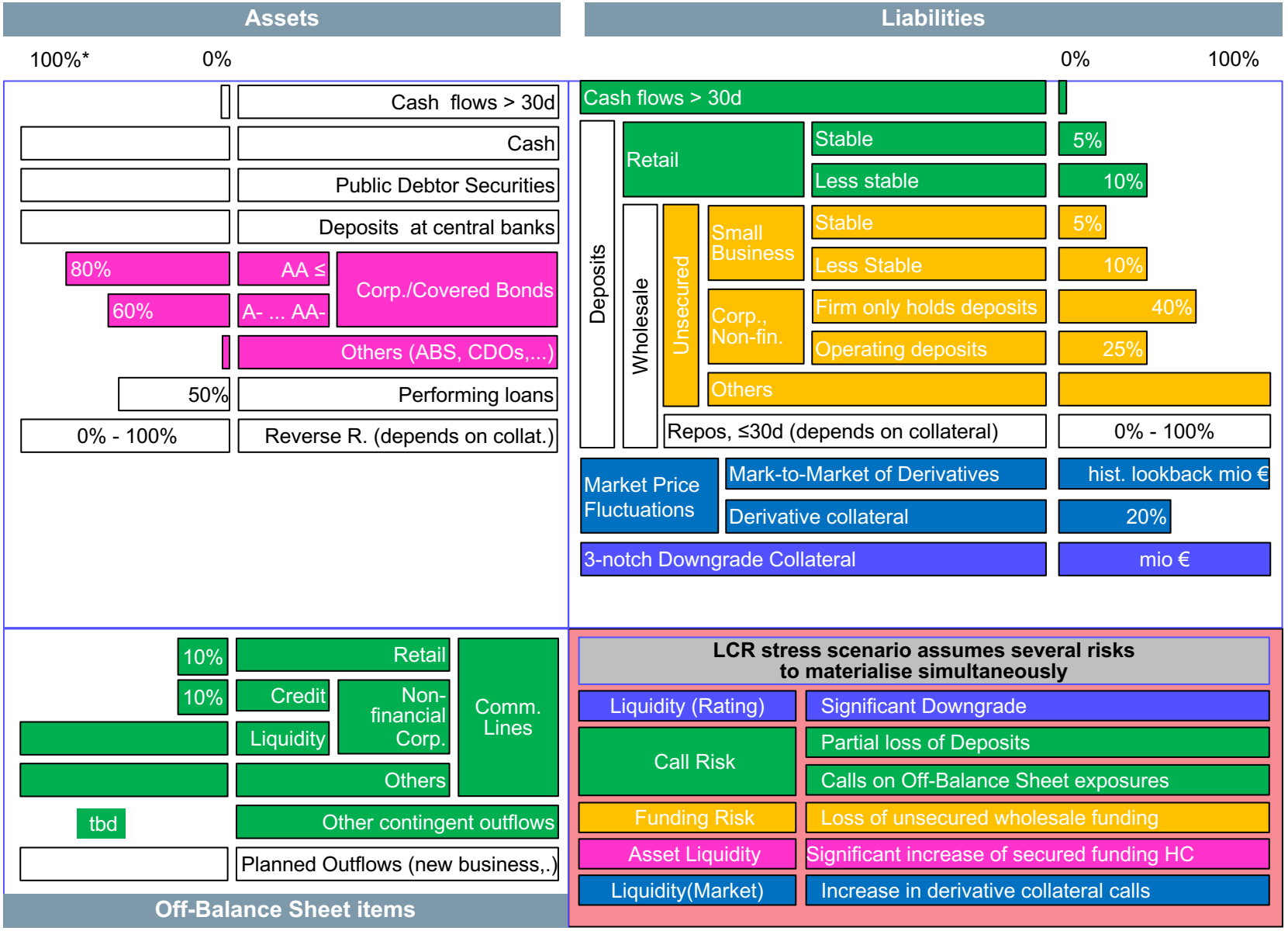
Assets
Liabilities
100%*
0%
0%
100%
Cash flows > 30d
Cash
Public Debtor Securities
Deposits at central banks
80%
AA ≤
Corp./Covered Bonds
60%
A- ... AA-
Others (ABS, CDOs,...)
50%
Performing loans
0% - 100%
Reverse R. (depends on collat.)
Cash flows > 30d
Deposits
Wholesale
Unsecured
Retail
Stable
5%
Less stable
10%
Small Business
Stable
5%
Less Stable
10%
Corp., Non-fin.
Firm only holds deposits
40%
Operating deposits
25%
Others
Repos, ≤30d (depends on collateral)
0% - 100%
Market Price Fluctuations
Mark-to-Market of Derivatives
hist. lookback mio €
Derivative collateral
20%
3-notch Downgrade Collateral
mio €
10%
Retail
10%
Credit
Non-financial Corp.
Liquidity
Others
Comm. Lines
tbd
Other contingent outflows
Planned Outflows (new business,.)
Off-Balance Sheet items
LCR stress scenario assumes several risks to materialise simultaneously
Liquidity (Rating)
Significant Downgrade
Call Risk
Partial loss of Deposits
Calls on Off-Balance Sheet exposures
Funding Risk
Loss of unsecured wholesale funding
Asset Liquidity
Significant increase of secured funding HC
Liquidity(Market)
Increase in derivative collateral calls

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Comm. Lines
Others
tbd
Other contingent outflows
Planned Outflows (new business,.)
Off-Balance Sheet items
LCR =
-

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Assets	€		Liabilities	€
Cash	50		Equity Capital	80
Government Securities	100		Tier 2 Capital maturing in 5 months	20
Covered Bonds rated AA-	50		Retail Deposits - Stable	100
Retail Credit Cards	200		Retail Deposits - Less Stable	300
Residential Mortgage Loans maturing in less than 1 year	100		Wholesale Deposits from Financial Institutions maturing in 30 days	175
Residential Mortgage Loans maturing in more than 1 year	400			
Wholesale loans maturing in 30 days	100		Subordinated debt maturing between 30 days and 6 months	325
	1,000			1,000

Liquid Assets	€	Factor to be applied	€
Cash	50		
Government Securities	100		
Covered Bonds rated AA-	50		

Cash Outflows	€	Factor to be applied	€
Retail Deposits - Stable	100		
Retail Deposits - Less Stable	300		
Wholesale Deposits from Financial Institutions maturing in 30 days	175		
Undrawn credit card facilities	200		

Off B/S

Cash Inflows	€	Factor to be applied	€
Wholesale Loans maturing in 30 days	100		
Scheduled repayments on Residential Mortgage Loans	500		

$$LCR = \frac{\text{Liquid Assets}}{\text{Cash Outflows - Cash Inflows}} = \frac{\quad}{\quad}$$

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NSFR – maintain stable sources of funding relative to illiquid assets and off balance sheet contingent calls over one year

Available Stable Funding

> or = 100%

	Factor
Capital	100%
Preferred stock with over 1 year maturity	100%
Other liabilities with over 1 year maturity	100%
Stable deposits from retail and small business customers (residual maturity < 1 year)	95%
Less stable deposits (residual maturity < 1 year)	90%
Unsecured wholesale funding with less than 1 year maturity from Non-Financial Corporates	50%
All other liabilities	0%

Required Stable Funding

	Factor
Cash, FI loans < 6 months, Unencumbered Level 1 and 2A securities	0 – 15%
Unencumbered Level 2B securities and Retail and SME loans (residual maturity < 1 year)	50%
Unencumbered Residential Mortgages maturity > 1 year, 35% RWA	65%
Other Unencumbered performing loans, maturity > 1 year, RWA >35%	85%
All other assets	100%
Undrawn commitments	5%

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Assets	€		Liabilities	€
Cash	50		Equity Capital	80
Government Securities	100		Tier 2 Capital maturing in 5 months	20
Covered Bonds rated AA-	50		Retail Deposits - Stable	100
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Available Stable Funding	€	Factor to be applied	€
Equity capital	80		
Retail Deposits - Stable	100		
Retail Deposits - Less Stable	300		

Off B/S

Required Stable Funding	€	Factor to be applied	€
Undrawn commitments	200		
Covered Bonds	50		
Residential Mortgages (80%>1 year 35% RWA, 20%<1 year 35% RWA)	500		
Retail Credit Cards (< 1 year)	200		

$$NSFR = \frac{\text{Available Stable Funding}}{\text{Required Stable Funding}} = \frac{\quad}{\quad}$$

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Longer-Term Liquidity Planning

- Involves projecting cash inflows and outflows over 90 days, 180 days, one year and beyond if needed.
  - Objective is to ensure bank does not face an unanticipated liquidity crisis.
  - Forecasts in deposit growth and loan demand required.
  - Projections are separated into categories, e.g. base trend, short-term seasonal, and cyclical values.
  - Analysis assesses a bank's liquidity gap, measured as the difference between potential uses of funds and anticipated sources of funds, over monthly intervals.
- Bank's monthly liquidity needs estimated as forecasted change in loans plus required reserves minus forecast change in deposits

Considerations in the Selection of Liquidity Sources

- Costs should be evaluated in present value terms as interest income and expense may arise over time.
- Choice of one source over another often involves an implicit interest rate forecast.

Asset Sales	New Borrowings
1. Brokerage fees	1. Brokerage fees
2. Securities gains or losses	2. Required reserves
3. Foregone interest income	3. FDIC insurance premiums
4. Any increase or decrease in taxes	4. Promotion costs
5. Any increase or decrease in interest receipts	5. Interest expense
6. Ease of use as collateral against future borrowings	

Contingency Planning

- Financial institutions must have carefully designed contingency plans that:
  - Address strategies for handling unexpected liquidity crises.
  - Outline appropriate procedures for dealing with liquidity shortfalls occurring under abnormal conditions.
- Narrative section addressing senior officers responsible for dealing with external constituencies, internal and external reporting requirements, and events that trigger specific funding needs.
- Quantitative section assessing the impact of potential adverse events on bank's balance sheet:
  - Should incorporate timing of events by assigning run-off rates, identify potential sources of new funds and forecast associated cash flows across numerous short and long term scenarios and time intervals, including a wide range of potential internal crises

Contingency Planning

- Should prioritize which assets would have to be sold in the event a crisis intensifies.
- Relationship with liability holders should be factored into contingency strategy.
- Should provide for back-up liquidity.
- Must have specific action steps and establish lines of decision-making authority.
- Should be approved by board of directors.
- Difficult because when plan is being made because probability of needing it seems remote.

Liquidity Governance

Risk appetite	Risk tolerance
▪ Define ‘benchmarks’ to set a target level of liquidity risk ▪ Positive/negative deviations of the benchmark will be tolerated ▪ No linkage to Contingency Funding Plan (CFP) ▪ Measure for global benchmarks: Net Liquidity Position Target (NLPT) for various time buckets ▪ Global benchmarks should be de-cascaded into business units and products ▪ Responsibility: Treasury	▪ Define ‘limits’ to set maximum level of liquidity risk ▪ Negative deviations of limit will be not tolerated ▪ Linkage to Contingency Funding Plan (CFP) ▪ Measures for global limits: Minimum Survival Period (MSP), Minimum Net Liquidity Position (MNLP) for various time buckets ▪ Global limits are sufficient, but for operational purpose in Treasury units global limits should be de-cascaded into business units and products ▪ Responsibility: Risk controlling

Quantitative framework

The liquidity condition: the capability to fulfill all obligations as and when they come due in each currency & period:

$$ELE_t - LaR_t^{\alpha} + CBC_t > 0$$

- ELE_t is the expected liquidity exposure in time t, the difference between expected negative and positive cash flow:
- LaR_t^{α} is the liquidity-at-risk, the deviations of in- and out-flows due to specific circumstances in period *t*, which like *value-at-risk* focuses on the downside (i.e., danger of outflows exceeding inflows at some high confidence level *1-α*)
- CBC_t is the counter-balancing capacity containing asset buffers which can be readily converted to liquidity (e.g., security sales, repos, collateralizations, etc.) or capability to renew existing contracts or new funds from other 3rd parties

Quantitative framework

- CBC_t may be decomposed into the sum of asset (or funding) liquidity *A*, sale liquidity *S* and repo liquidity *R* (the latter two comprising balance sheet liquidity):

$$CBC_t = A + (S + R)$$

- We may state this equivalently as that *CBC* needs to exceed the sum of future exposures:

$$CBC_t > -(ELE_t - LaR_t^{\alpha})$$

- We can adjust the formula for nostro balances kept for payment purposes, which at day end if positive (negative) we will invest (borrow):

$$CBC_t > -(FLE_t - LaR_t^{\alpha}) = -(ELE_t + FLE_{t-1} - LaR_t^{\alpha})$$

  where FLE_t is forward liquidity exposure in period *t*

- Further adjustments to these are made to make this dynamic (in an option pricing fashion) with the decomposition of ELE_t into deterministic and random components

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Capital Requirements Regulation

CRR – weight (given)					Bank A			CRR - weights	
NSFR	LCR	Leverage	RWA	EUR	Assets	Liabilities	EUR	LCR	NSFR
50%	0%	100%	75%*8%	100	Retail loans, Maturity: between 31 days and 1Y	Retail, stable, Maturity: ≤ 30d & on demand	100	5%	95%
0%	100%	100%	0%	5	Cash reserve	Core Equity Tier 1	5	0%	100%
				105 Σ			Σ 105		

(here) CET1-ratio = Tier 1 - ratio = Total Capital ratio

$$\text{Capital R's} = \frac{\text{Core Equity Tier 1}}{\text{Risk-weighted Assets}} = \frac{5}{12.5*(75\%*8\%*100 + 0\%*5)} = \frac{5}{75} = 6.67\% \ (> 4.5\%/6\%/8\%)$$

Leverage ratio

$$LR = \frac{T1}{\text{Total Assets}} = \frac{5}{100\%*100 + 100\%*5} = \frac{5}{105} = 4.76\% \ (> 3\%)$$

LCR

$$LCR = \frac{\text{Liquidity reserve}}{CF_t^- - CF_t^+} = \frac{100\% * 5}{5\% * 100 + 0\%*5 - 0\%*100} = \frac{5}{5 - 0} = 100\% \ (> 60\%)$$

NSFR

$$NSFR = \frac{\text{Available stable funding}}{\text{Required stable funding}} = \frac{95\% * 100 + 100\%*5}{50\% * 100 + 0\%*5} = \frac{100}{50} = 200\% \ (>100\%)$$

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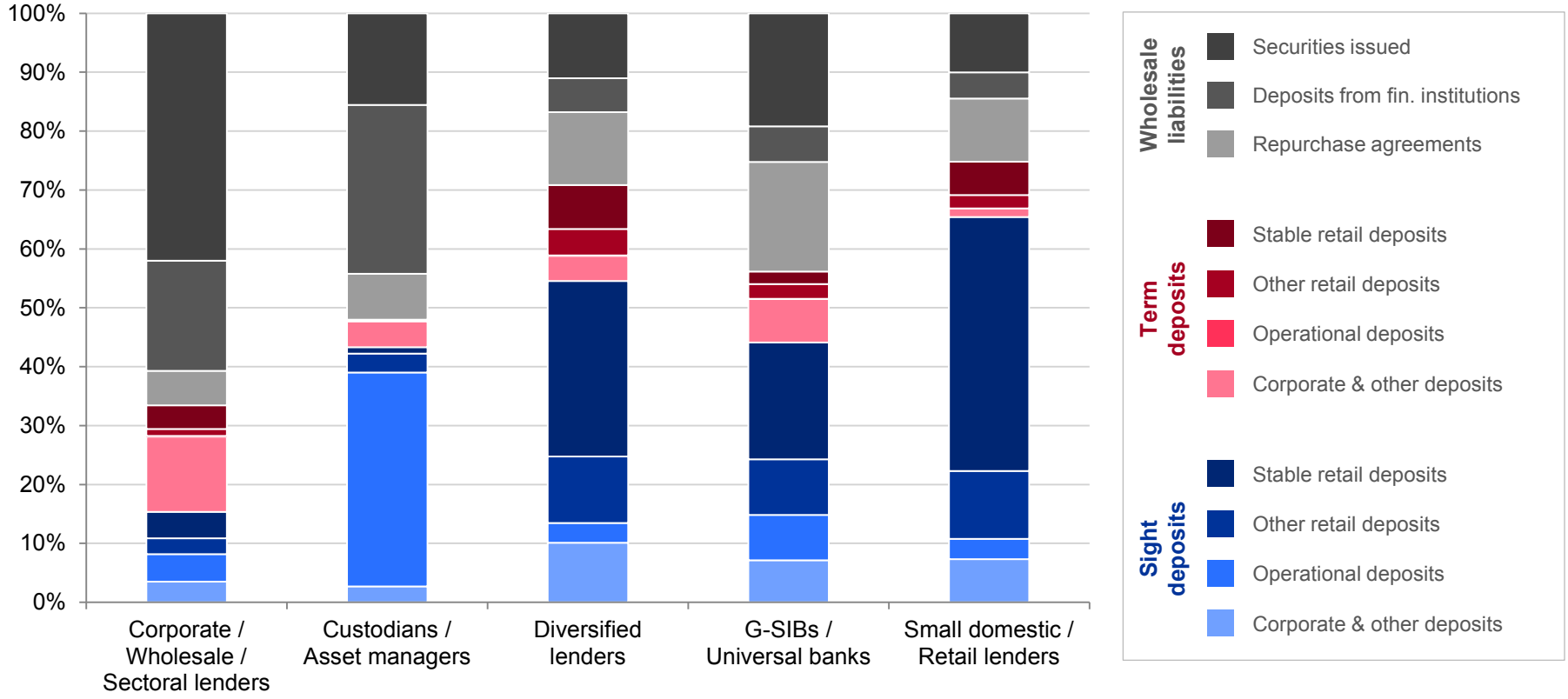
ECB Liquidity Risk Stress Tests

			Baseline	Adverse shock	Extreme shock	Business view
1	Contractual maturity items	Securities issued & secured market funding	**100%** outflow rate	**100%** outflow rate	**100%** outflow rate	**Based on banks' own business plans and assumptions**
		Secured market lending	**100%** outflow rate	**100%** outflow rate	**100%** outflow rate	
		Term deposits (commercial counterparties)	**Constant stock**	**18%-52%** outflow rate[(a)]	**27%-76%** outflow rate[(a)]	
		Term deposits (financial counterparties)	**100%** outflow rate	**100%** outflow rate	**100%** outflow rate	
		Derivatives & FX swaps (inflow/outflow)	**100%** in/outflow rate	**100%** in/outflow rate	**100%** in/outflow rate	
		Loans (commercial counterparties)	**Constant stock**	**Constant stock**	**Constant stock**	'Constant stock' implies no liquidity inflow from these loans
		Loans (financial counterparties)	**100%** inflow rate	**100%** inflow rate	**100%** inflow rate	
		Own portfolio investments	**100%** inflow rate	**100%** inflow rate	**100%** inflow rate	
		Others (inflow/outflow)	**100%** in/outflow rate	**100%** in/outflow rate	**100%** in/outflow rate	
2	Open maturity items	Sight deposits (commercial clients)	**Constant stock**	**12%-58%** outflow[(a)]	**18%-74%** outflow[(a)]	
		Sight deposits (financial counterparties)	**100%** outflow	**100%** outflow	**100%** outflow	
		Sight loans	**Constant stock**	**Constant stock**	**Constant stock**	
		Open repos & reverse repos	**100%** in/outflow	**100%** in/outflow	**100%** in/outflow	
3	CBC	Coins banknotes and CB reserves	**Nominal** value	**Nominal** value	**Nominal** value	
		HQLA (L1 & L2) and non tradable assets eligible for CB	**Post-haircut** value	**Post-haircut** value	**Post-haircut** value	
		Other tradable assets	**Post-haircut** value	**Post-haircut** value	**Post-haircut** value	Haircuts based on current monetary policy frameworks
		Undrawn committed facilities received	**Nominal** value	**Nominal** value	**Nominal** value	
4	Contingencies	Outflows from committed facilities	Not relevant (**excl. from NLP**)	**12%/60%** outflow rate[(b)]	**15%/75%** outflow rate[(b)]	
		Impact from own rating downgrade		**1-notch** ↓	**3-notch** ↓	
		Net liquidity position computed as:	1 + 2 + 3	1 + 2 + 3 + 4	1 + 2 + 3 + 4	1 + 2 + 3 + 4

(a) Outflow rates relate to particular types of deposits which are assumed to differ in terms of stability. Lowest outflow rates are attributed to 'stable deposits', whereas the highest outflow rates relate to 'deposits from non-financial corporates'.
(b) The lower rate shall be applied to committed credit facilities whereas the higher rates apply to committed liquidity facilities.

ECB Liquidity Risk Stress Tests

Breakdown of funding sources by business model



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ECB Liquidity Risk Stress Tests

The '**net liquidity position**' **(NLP)** at a given point in time is equal to the difference of the bank's available liquidity (i.e. its counterbalancing capacity) and the expected net outflows since the reference date

The '**survival period**' **(SP)** corresponds to the first day in which the NLP turns negative (i.e. when a bank would have no further available liquidity to counter the simulated net outflows)

The **'cliff effect'** indicates potential Liquidity Coverage Ratio (LCR) 'optimisation' strategies as it measures the difference between the NLP at day 35 and the NLP at day 30 (scaled by total assets)

- Key maturity ladder output metrics are computed at a **consolidated level**, as well as '**by currency**' and '**intragroup**' for internationally active institutions
- Availability of **additional collateral** and **collateral management** practices assessed by means of ad-hoc 'deep-dive' analyses

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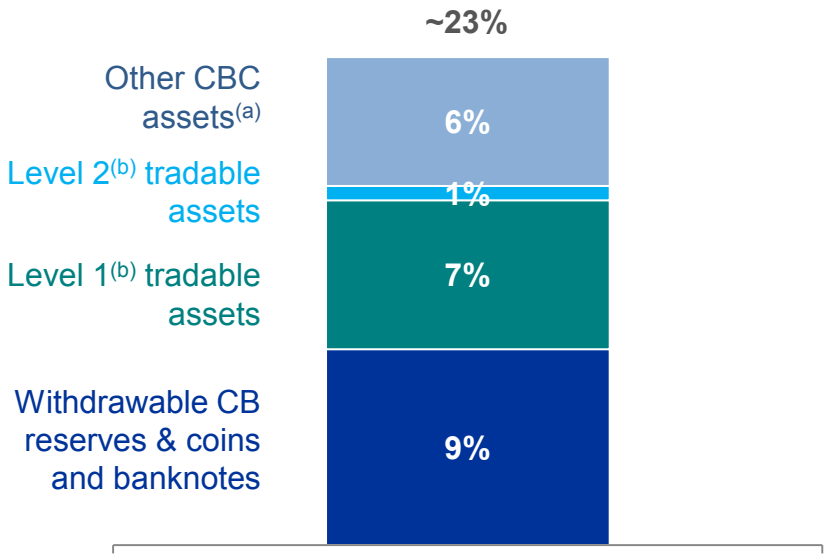
ECB Liquidity Risk Stress Tests

Composition of the initial stock of counterbalancing capacity (CBC) in % of total assets



*Note: Simple average within the full sample. '**Liquidity value**' (i.e. post haircut) components of the CBC shown in % of total assets. Weighted average figure by total assets: ~20%.*

(a) Includes: other tradable assets, non-tradable assets eligible for central banks and undrawn committed facilities received.

(b) Level 1 and Level 2 categories refer to the Liquidity Coverage Ratio classification of High Quality Liquid Assets (HQLAs). The categories are not related to the IFRS Fair Value hierarchy.

- The average sample bank's initial stock of **counterbalancing capacity is 23% of total assets**
  - Withdrawable central bank reserves and Level 1 tradable assets account for the majority of the collateral buffer
- Within the sample, **collateral management strategies differ**
  - Smaller banks mostly adopt a 'buy-and-hold' strategy for their collateral buffers
  - Larger banks report a much more active collateral management as they engage in repo trading and other types of securities financing transactions

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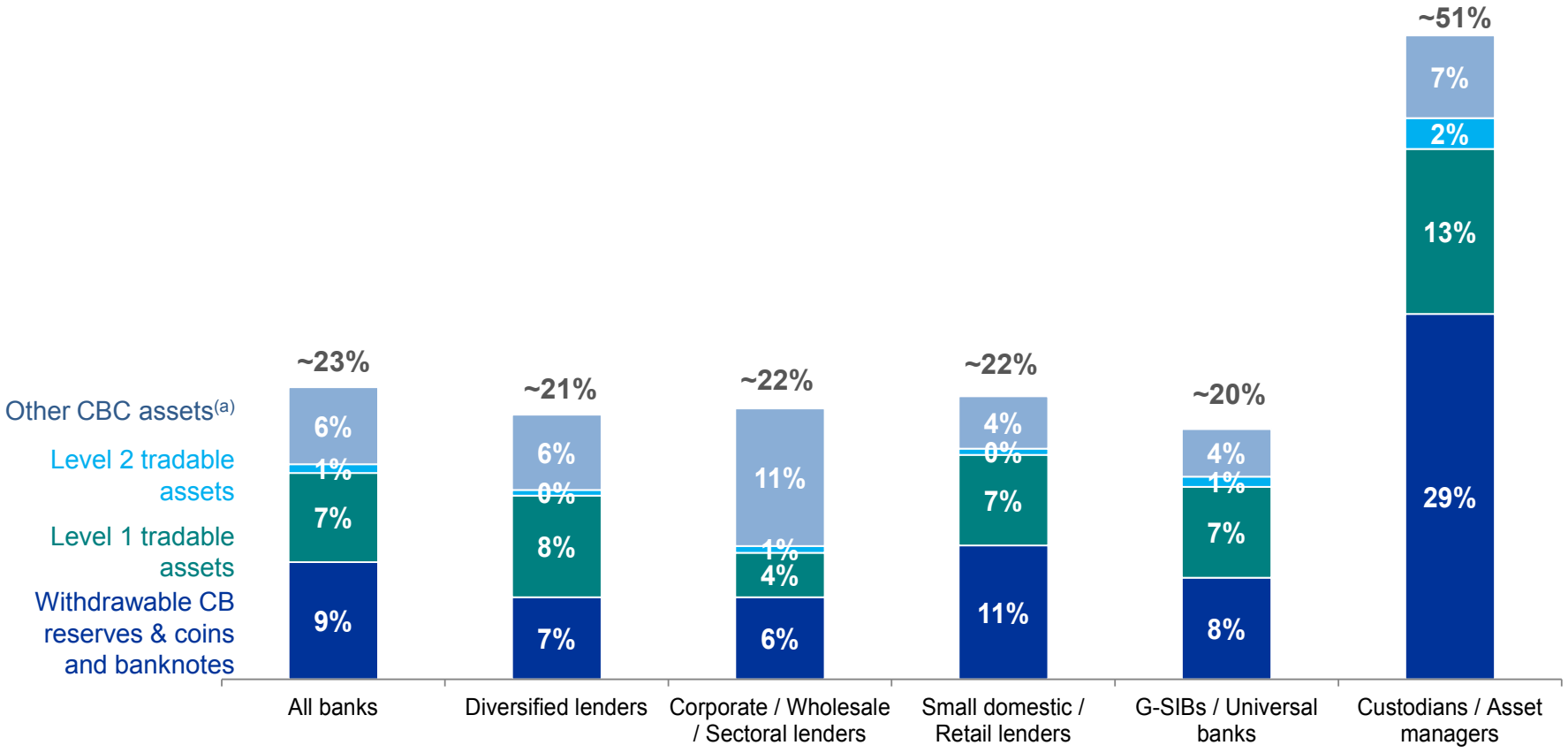
ECB Liquidity Risk Stress Tests

Composition of the initial stock of counterbalancing capacity (CBC) in % of total assets



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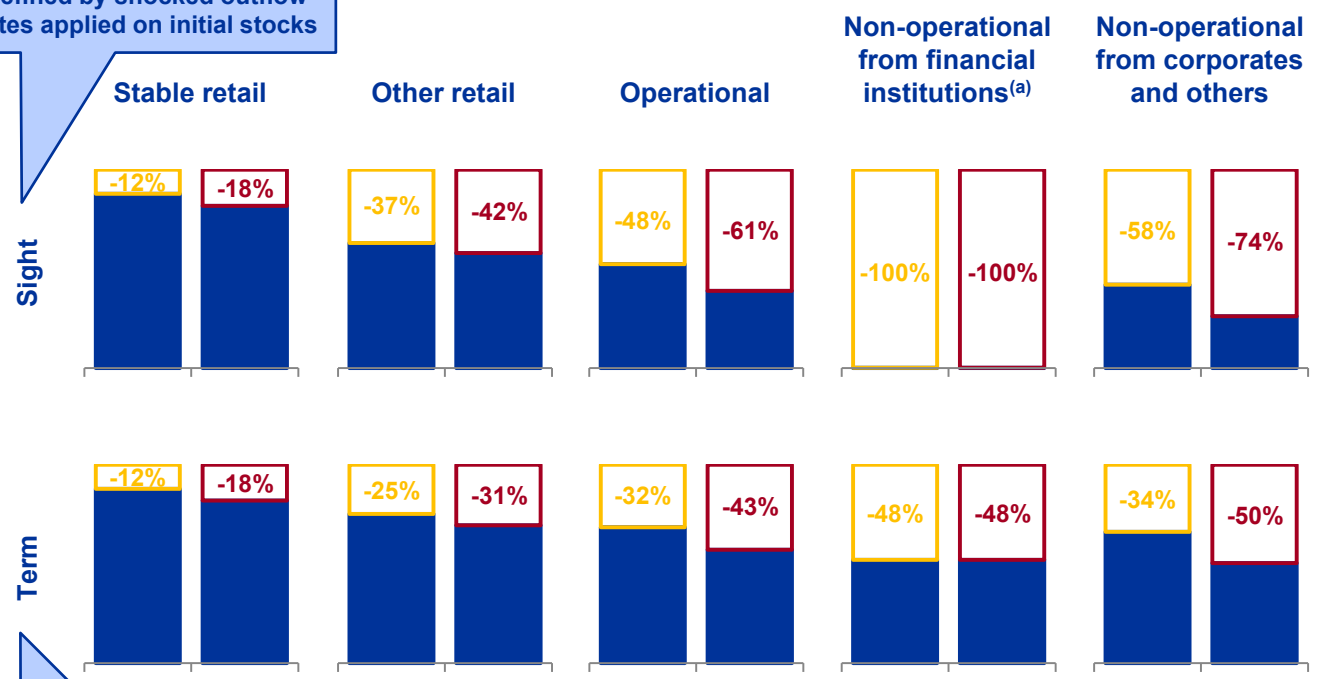
ECB Liquidity Risk Stress Tests

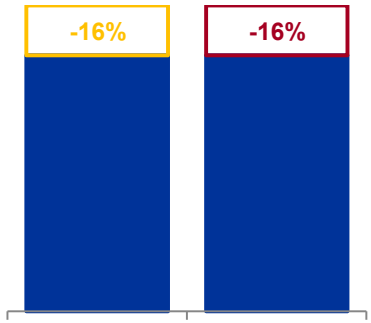
Overall depletion fully defined by shocked outflow rates applied on initial stocks

Deposits



Debt securities issued

All securities maturing within 6 months assumed not to be rolled-over



Overall depletion depends both on shocked roll-over rates and maturity profile

Adverse shock: cumulated 6m outflows in % of initial stock

Extreme shock: cumulated 6m outflows in % of initial stock

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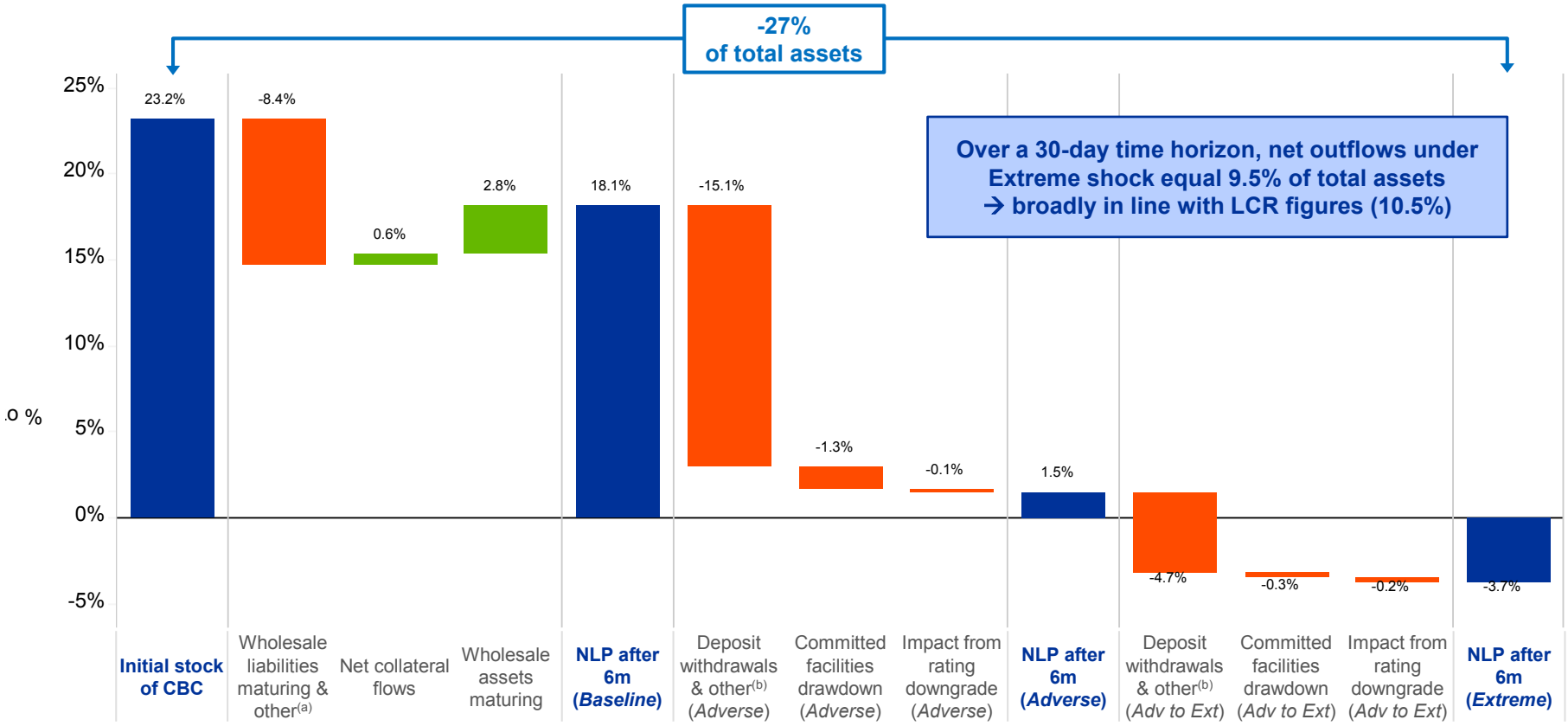
ECB Liquidity Risk Stress Tests

Bridge between net liquidity position starting point Baseline to net liquidity position 6-month Extreme



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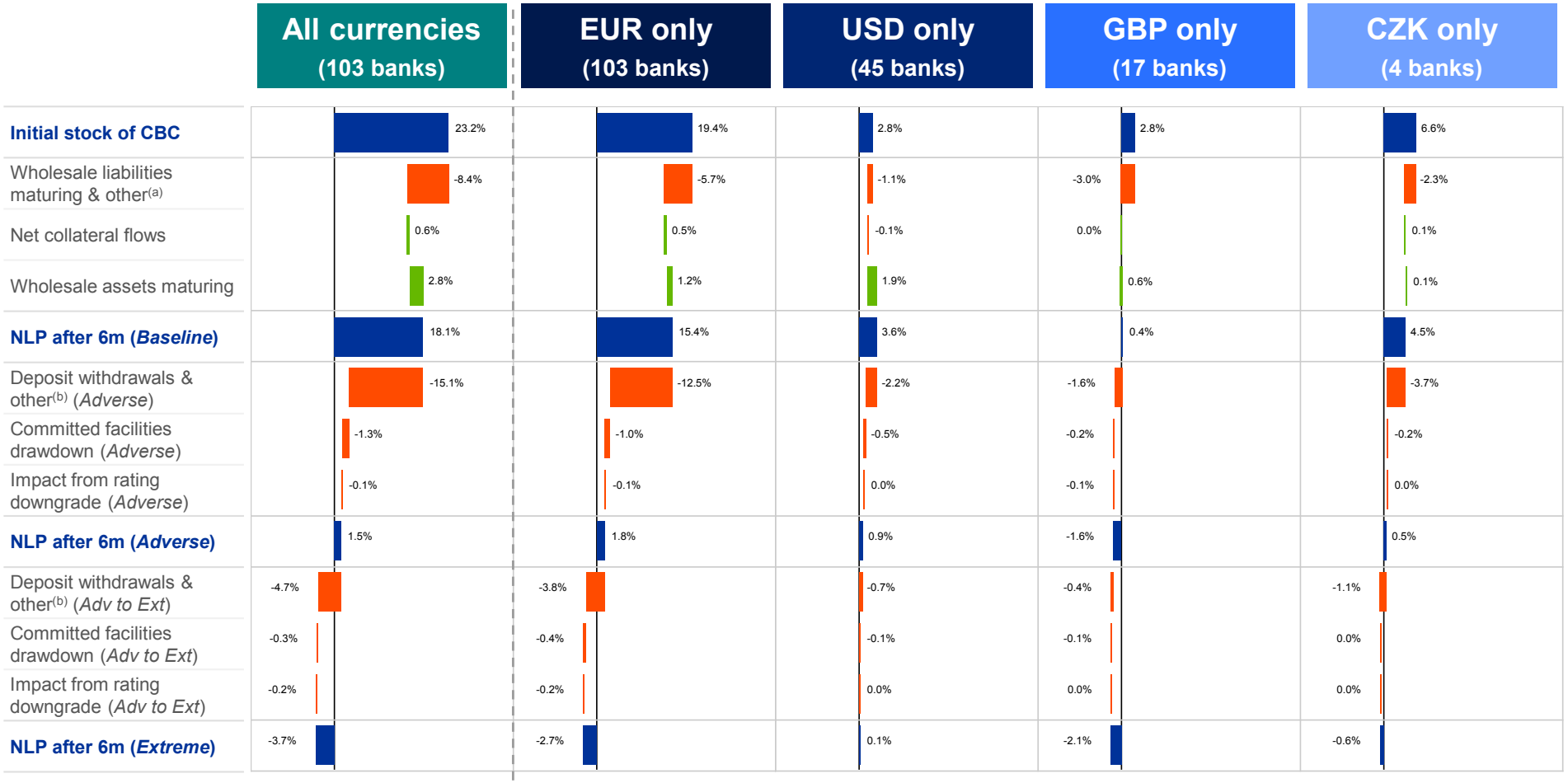
ECB Liquidity Risk Stress Tests



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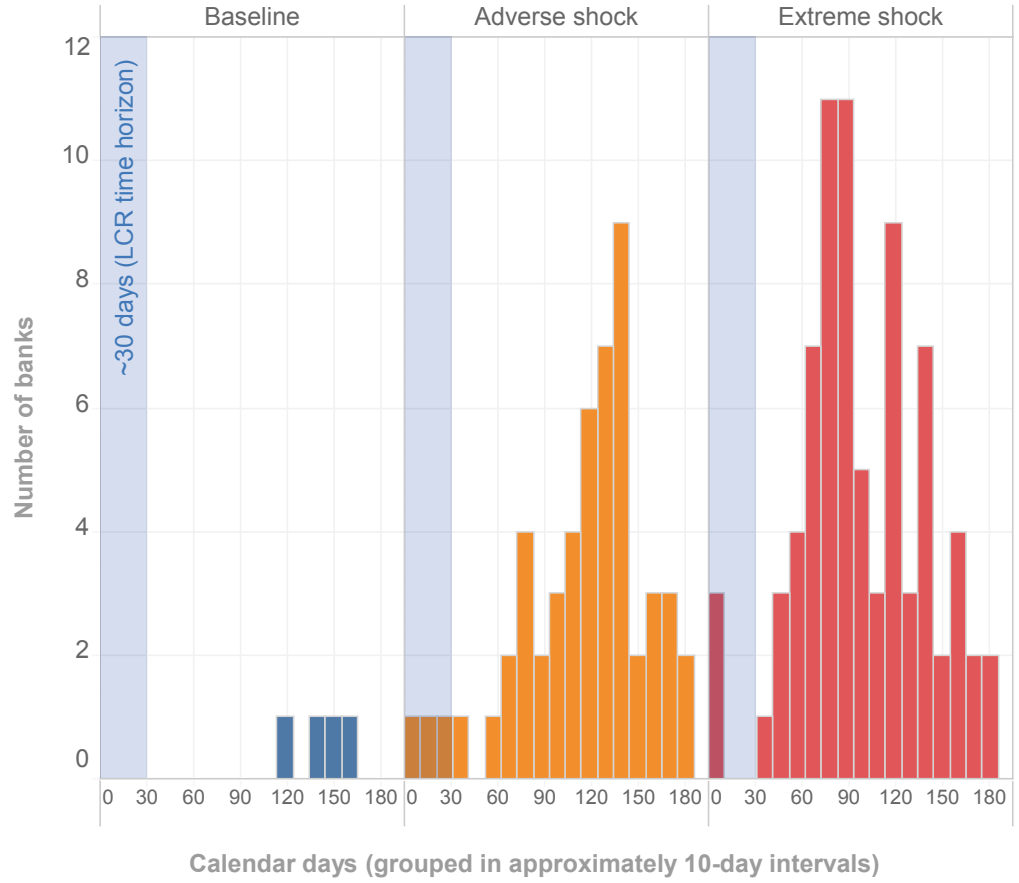
ECB Liquidity Risk Stress Tests

Distribution of banks with a survival period <6m



- **4 banks** from different jurisdictions and business models report a **survival period** shorter than the exercise time-horizon of **6 months** in the **Baseline** (which includes a freeze in wholesale markets)
- **Only 11 banks** report a **survival period** shorter than **2 months** under the **Extreme shock**

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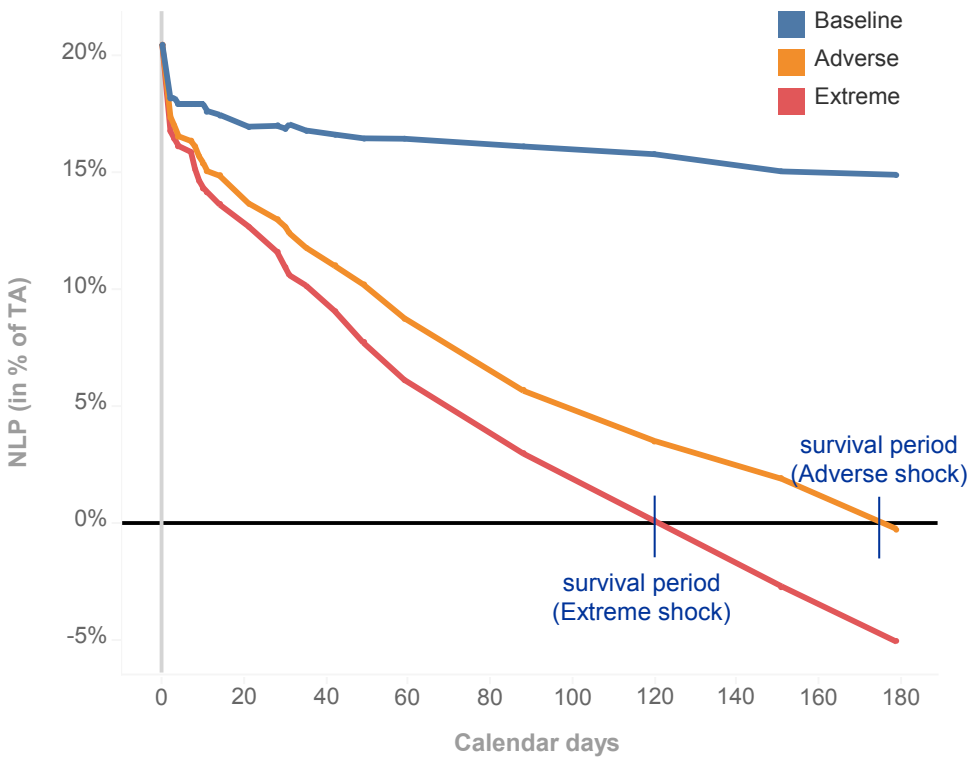
ECB Liquidity Risk Stress Tests

Median NLP in % of total assets



Note: NLP lines reflect linear interpolation of values reported in the template's maturity buckets.
(a) Banks reported the exact dates (among all calendar days except those when TARGET2 was closed. i.e. the LiST 2019-relevant days) corresponding to the survival periods in the 3 scenarios. In case the sample median did not correspond to a relevant day (e.g. in case it fell on a weekend day), the next relevant day would be shown.

- **Median survival period as reported by banks[(a)]** (full sample):
  - **Baseline: > 6 months**
  - **Adverse shock: 176 days** (51 banks report a survival period longer than 6 months)
  - **Extreme shock: 122 days** (26 banks report a survival period longer than 6 months)

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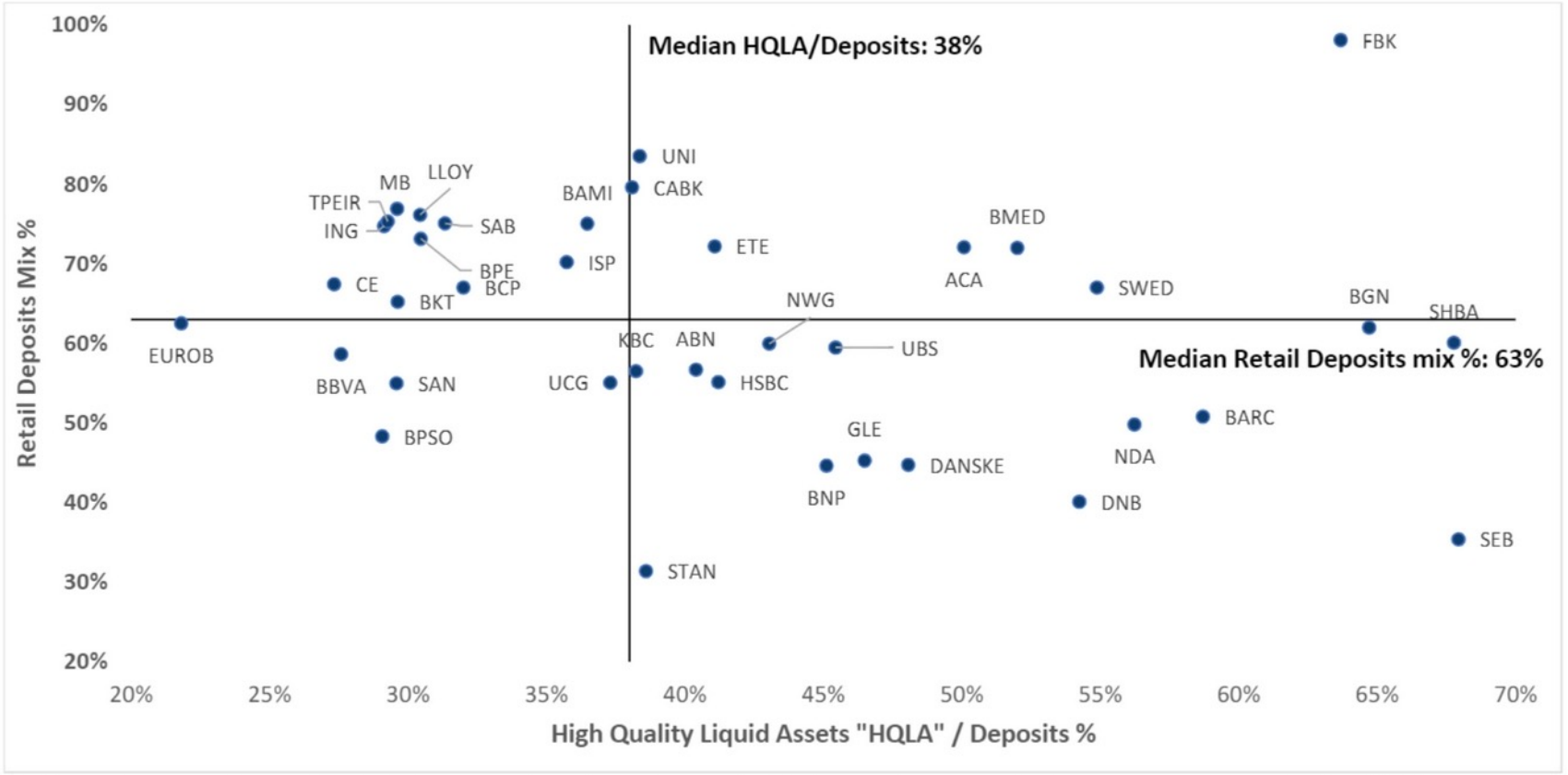
Europe banks can lose 38% of deposits before having to sell assets at a loss – research Reuters 2023

Exhibit 1 - Liquidity analysis of EMEA Banks: HQLA relative to deposits vs Retail Deposit mix %



High Quality Liquid Assets "HQLA" / Deposit mix calculted from the "LIQ1 : Disclosure on the liqudiity coverage ratio (LCR)" Pillar 3 Disclosure; Retail Deposit mix % calcuated from "LIQ2 : Net Stable Funding Ratio" Pilar 3 Disclosure. Amounts are sourced from the latest available Pillar 3 disclosures (typically 31-Dec-2022 reports).

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Literature

- CHOUDRY M. (2022). The Principles of Banking, 2nd ed. – Chapters 11-13
- KOCH, T.W. and S.S. MacDONALD (2015). Bank Management. Chapter 11.
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- Sensitivity Analysis of Liquidity Risk - Stress Test 2019 (LiST 2019) by the European Central Bank

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