

M U N I

Evaluating Bank Performance

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Performance Analysis

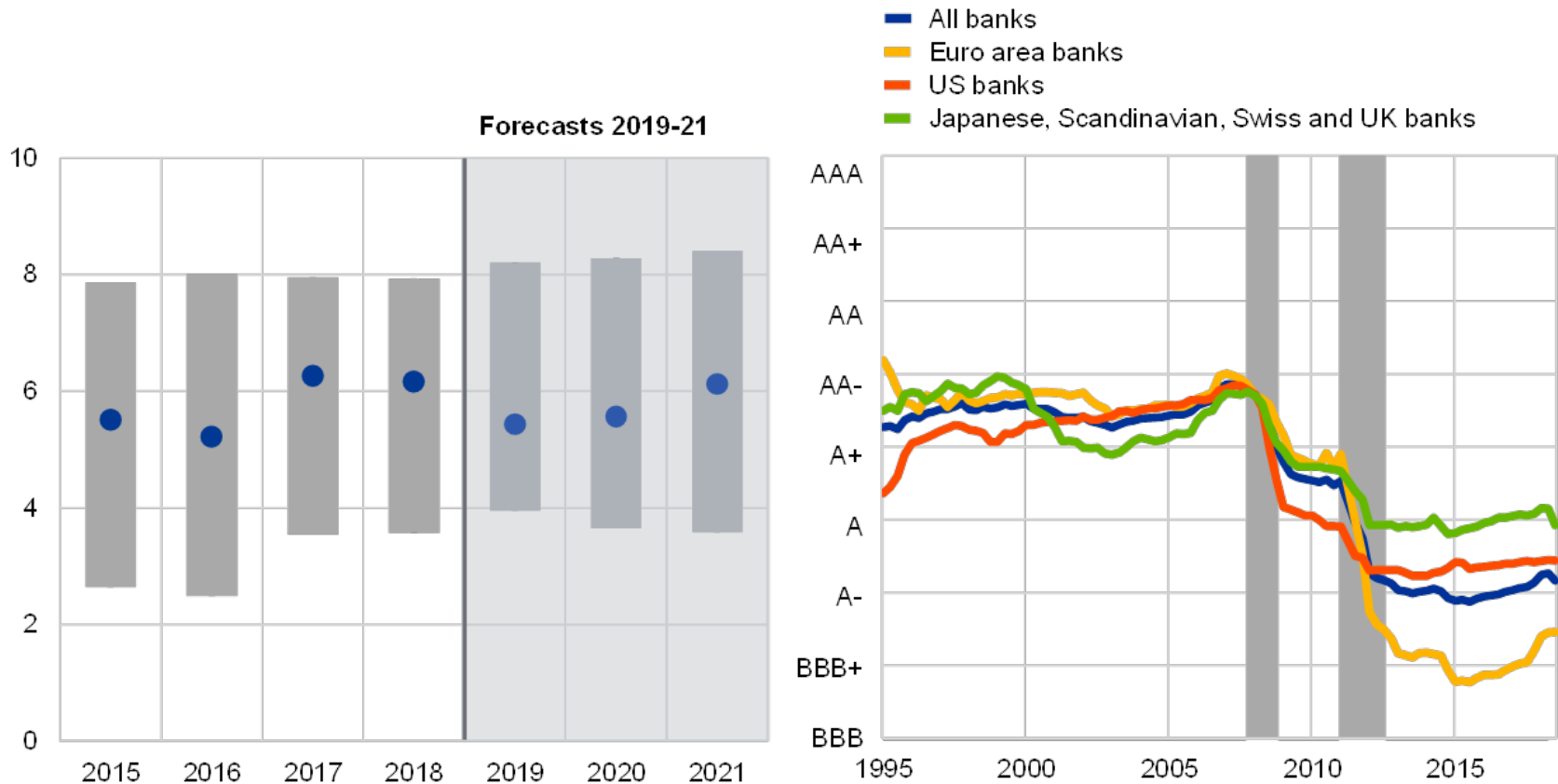
A high-performance firm is one that makes an exceptional return to shareholders while maintaining an acceptable level of risk.

- High performance is more than just high returns.
- Includes the ability to generate high returns while carefully assessing and pricing the level of risk assumed.

Profitability

**Euro area banks' actual (2015-18) and expected (2019-21) return on equity (left panel);
median ratings for large global listed banks (right panel)**

(left panel: 2015-21, annual percentages, median and interquartile range; right panel: Jan. 1995-Mar. 2019)



Bank Performance Analysis

- Most depository financial institutions own few fixed assets and thus exhibit low operating leverage.
- Many bank liabilities carry short-term maturities.
 - Interest expense changes create significant asset allocation and pricing problems.
- Many commercial bank deposits are government insured and carry below-market interest rates.
- Banks operate with less equity capital than nonfinancial companies which increases financial leverage and volatility of earnings.

Framework for Evaluating Bank Performance

Internal Performance	External Performance
Bank planning (policy formulation) Goals, budgets, strategic planning	Market share
Technology Data management, payments	Regulatory compliance Capital, lending, securities, etc.
Personnel development Challenges (personal selling and geographic expansion) Job satisfaction (training and compensation)	Public confidence Deposit insurance Public image

Balance Sheet: Assets

Bank assets fall into four general categories:

- 1. Loans** are the major asset and generate the greatest amount of income before expenses and taxes.
- 2. Investment securities** are held to earn interest, help meet liquidity needs, speculate on interest rate movements, meet pledging requirements and serve as part of a bank's dealer function.
- 3. Noninterest cash and due from banks** consists of vault cash, deposits held at the Central Bank and other institutions and cash items in the process of collection.
- 4. Other assets** are residual assets of relatively small amounts (including fixed assets).

Balance Sheet: Assets

Accounting for investment securities:

- **Held-to-maturity securities** are recorded at amortized cost reflecting the objective to hold until maturity.
- **Trading account securities** are actively bought and sold and are reported at current market value on the balance sheet. Unrealized gains and losses are reported on the income statement.
- **Available-for-sale securities** are all other securities. They are recorded at market value on the balance sheet with a corresponding change to stockholders' equity as unrealized gains and losses.

Balance Sheet: Assets

Non-Interest Cash and Due From Banks

- **Vault cash** is held to meet customer withdrawals.
- **Deposits held at the Central Bank** are demand balances used to meet legal reserve requirements, assist in check clearing and wire transfers or effect the purchase and sale of Treasury securities.
- **Balances at other financial institutions** are held primarily to purchase services.
- **Cash items in process of collection (CIPC)** are generally the largest component of cash, representing checks that have been presented but not yet credited to accounts.

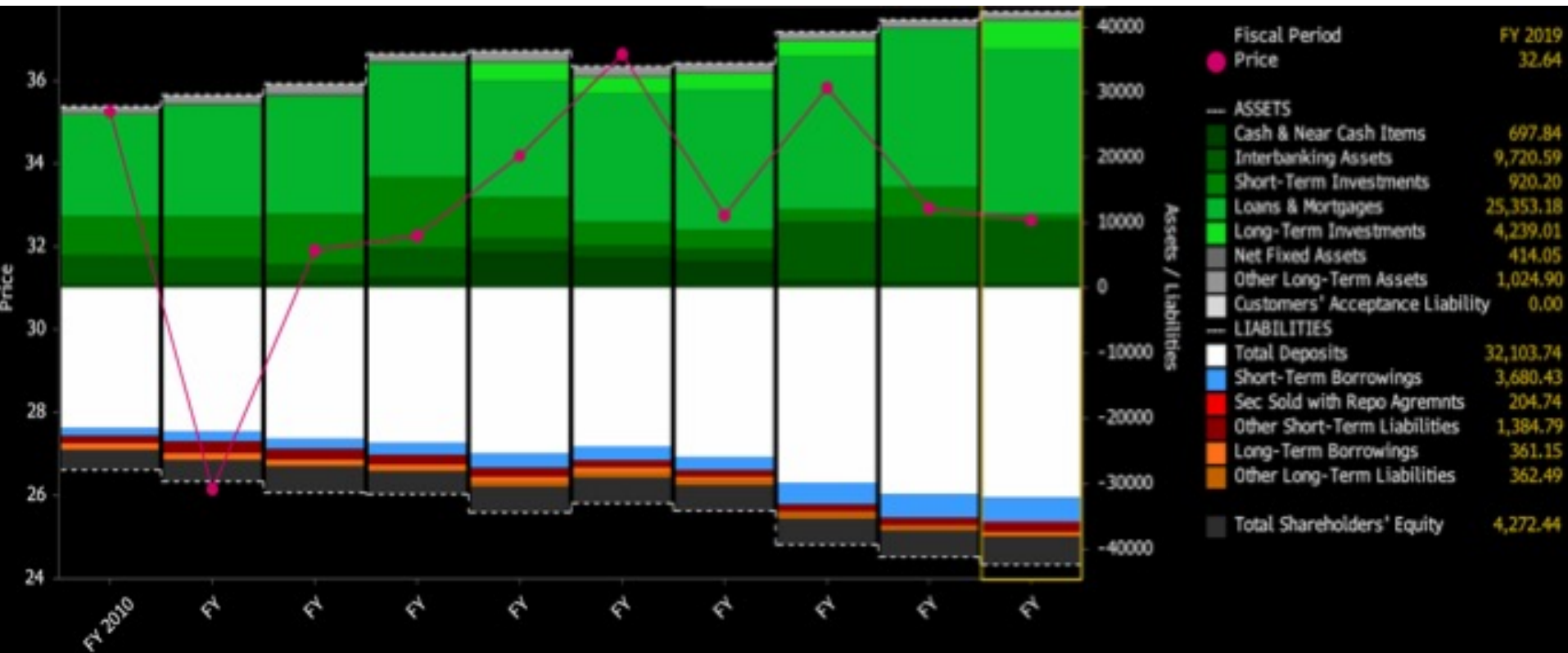
Balance Sheet: Assets

Other assets

Residual assets of small amounts including bank premises and equipment, other real estate owned (OREO), investment in unconsolidated subsidiaries and other assets.

- OREO is substantial for problem banks because it represents collateral on unpaid loans.
- Commercial banks own relatively few fixed assets.
- Banker's acceptances are negotiable instruments guaranteeing payment to the owner that are often used in trading goods.

B/S Analysis on Bloomberg



Constructing a Bank Balance Sheet

The following entries are from the actual balance sheet of a bank:

Cash, including cash items in the process of collection	121
Non-interest-bearing deposits	275
Deposits with the central bank	190
Commercial loans	253
Long-term bonds (issued by the bank)	439
Real estate loans	460
Commercial paper and other short-term borrowing	70
Consumer loans	187
Securities	311
Interest-bearing deposits	717
Buildings and equipment	16
Other assets	685
Other liabilities	491

Note: Values are in billions.

- Use the entries to construct a balance sheet with assets on the left side of the balance sheet and liabilities and bank capital on the right side.
- The bank's capital is what percentage of its assets?

Income Statement

- **Interest income (II)** is the sum of interest and fees earned on all assets.
 - Estimated tax benefit for loan and lease financing and tax-exempt securities income is the estimated dollar tax benefit from not paying taxes on these items.
- **Interest expense (IE)** is the sum of interest paid on all interest bearing liabilities.
 - Gross interest income minus gross interest expense is labeled net interest income (NII).

Income Statement

Non-Interest Income (OI) includes:

- Fiduciary activities
- Deposit service charges
- Trading, venture capital and securitization income
- Investment banking, advisory, brokerage and underwriting fees and commissions
- Insurance commission fees and income
- Net servicing fees
- Net gains (losses) on sales of loans
- Other net gains (losses)

(2001-2014; index 2007=100)¶



Sources: Bloomberg, SNL and ECB calculations.¶

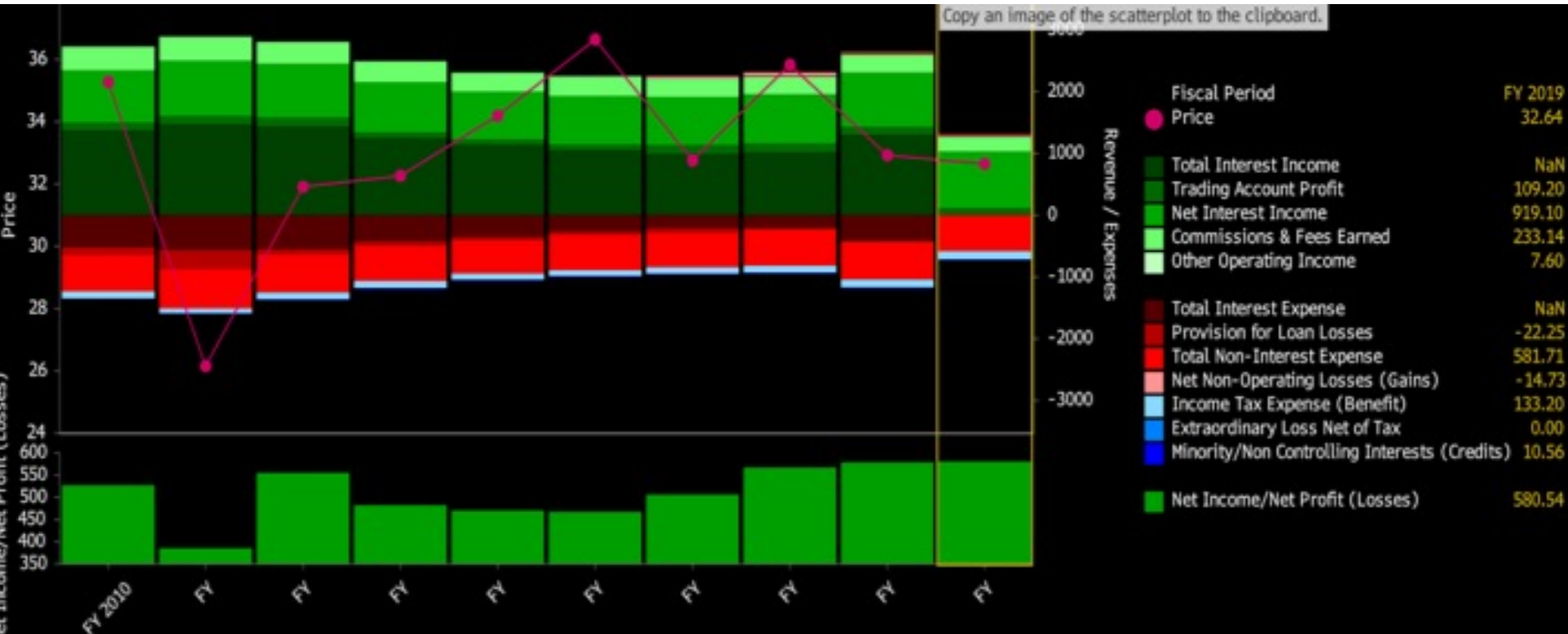
Note: The index is based on the median value for each indicator. ¶

Income Statement

- **Non-Interest Expense (OE)** consists of:
 - Personnel, occupancy and other operating expenses
 - Intangible amortizations and goodwill impairment
- **Provision for loan and lease losses (PLL)**
- **Realized securities gains or losses (SG)**
- **Applicable income taxes (T)**
- **Net income (NI):**
 - Operating profit less all taxes +/- extraordinary items
- **Total Revenue (TR):**
 - Total interest income, noninterest income and realized securities gains (losses)
- **Total Expense (EXP):**
 - Interest expense, noninterest expense and provision for loan losses

$$NI = NII - \text{Burden} - PLL + SG - T$$

I/S Analysis on Bloomberg



Relationship Between the Balance Sheet and Income Statement

$$\sum_{i=1}^n A_i = \sum_{j=1}^m L_j + \text{NW}$$

$$\text{Interest income} = \sum_{i=1}^n y_i A_i \quad \text{Interest expense} = \sum_{j=1}^m c_j L_j$$

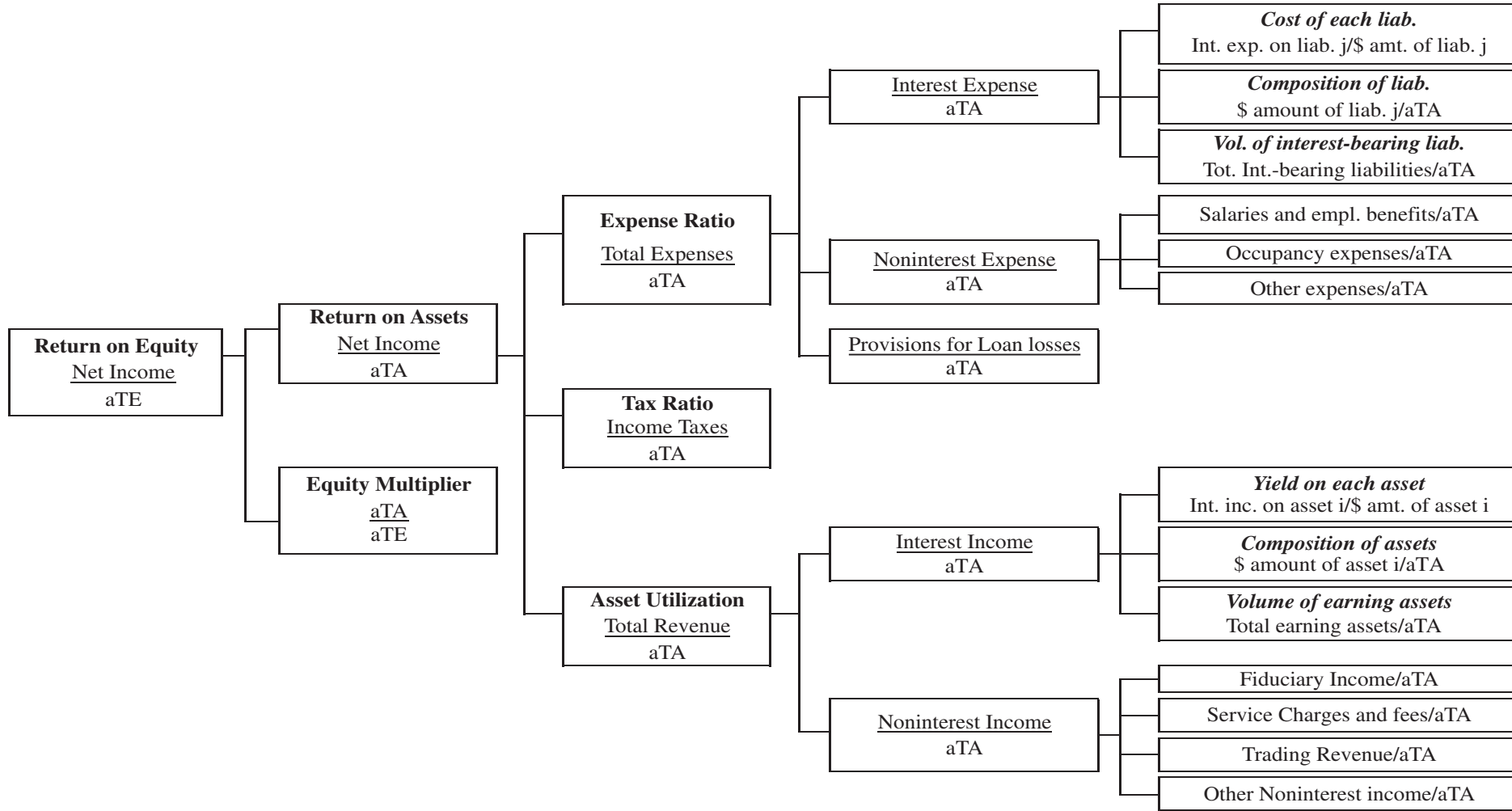
$$\text{NII} = \sum_{i=1}^n y_i A_i - \sum_{j=1}^m c_j L_j$$

Relationship Between the Balance Sheet and Income Statement

- Net interest income changes when the:
 - composition or mix of assets change.
 - rate earned on assets or paid on liabilities changes.
 - volume of interest earning assets or interest bearing liabilities change.
- Net income varies with the magnitude of assets and liabilities and the associated cash flows:

$$NI = \sum_{i=1}^n y_i A_i - \sum_{j=1}^m c_j L_j - \text{Burden} - \text{PLL} + \text{SG} - T$$

Return on Equity Model



Profitability Analysis

- Return on Equity (ROE)
 - Net income/Average total equity
- Return on Assets (ROA)
 - Net income/Average total assets
- ROE is linked to ROA by an equity multiplier (EM)

$$\begin{aligned} \text{ROE} &= \frac{\text{Net income}}{\text{Average total assets}} \times \frac{\text{Average total assets}}{\text{Average total equity}} \\ &= \text{ROA} \times \text{EM} \end{aligned}$$

Rule 1: Use Average Balance Sheet Data when Comparing Income Statement Data with Balance Sheet Data

Rule 2: Compare Individual Ratios over Time

Rule 3: Accounting Data May Not Reflect Accepted Accounting Procedures and May Be Manipulated

Expense Ratio and Asset Utilization

- Net Income = Total Revenue – Total Operating Expenses – Taxes

$$\text{ROA} = \frac{\text{NI}}{\text{aTA}} = \frac{\text{TR}}{\text{aTA}} - \frac{\text{EXP}}{\text{aTA}} - \frac{\text{Taxes}}{\text{aTA}}$$

$$\text{ROA} = \text{AU} - \text{ER} - \text{TAX}$$

- Asset Utilization (AU) = Total Revenue/Average Total Assets
- Expense Ratio (ER) = Total Operating Expenses/Average Total Assets
- Tax Ratio (TAX) = Taxes/Average Total Assets

The greater the AU and the lower the ER and TAX, the higher the ROA.

Expense Ratio and Asset Utilization

- Interest expense ratio = Interest Expense/Average Total Assets
- Noninterest expense ratio = Noninterest Expense/Average Total Assets
- PLL ratio = Provision for Loan Losses/Average Total Assets

$$ER = \left(\frac{EXP}{aTA} \right) = \frac{IE}{aTA} + \frac{OE}{aTA} + \frac{PLL}{aTA}$$

Expense Ratio and Asset Utilization

Interest expense may vary for three reasons:

1. Rate effects means interest costs differ between banks.
 - Banks pay different risk premiums indicating how the market perceives their asset quality and overall risk.
 - Banks time their borrowings differently which impacts rates.
 - Banks use different maturities which impacts rates.
2. Composite effects because the mix of liabilities differ.
3. Volume effects recognizes that interest expense is based on the amount of liabilities.

Expense Ratio and Asset Utilization

Noninterest Expense

- Measures of personnel, occupancy and other operating expenses as a percentage of total overhead indicate cost efficiencies or comparative disadvantages.
 - Ratios are constructed to allow comparisons between different sized banks.
 - May also vary based on composition of liabilities
 - Banks with large amounts of transaction deposits have greater relative overhead costs.

Expense Ratio and Asset Utilization

- **Asset utilization (AU)** is a measure of the institution's ability to generate total revenue.
 - The greater the AU, the greater the bank's ability to generate income from the assets it owns.

$$AU = \left(\frac{TR}{aTA} \right) = \frac{II}{aTA} + \frac{OI}{aTA} + \frac{SG}{aTA}$$

- Interest income differs between banks for the same three reasons as interest expense: rate, composition and volume.
- **Noninterest Income (OI)**
 - Fees, fiduciary activities, service charges, trading revenues and other noninterest income.
 - May be skewed by substantial nonrecurring items.
 - Tax payments also impact ROA.

Aggregate Profitability Measures

- **Net Interest Margin (NIM)** is a summary measure of the net interest return on income-producing assets:
 - Net Interest Income / Average Earning Assets
- **Spread (SPRD)** is a measure of the rate spread or funding differential on balance sheet items that earn or pay interest.
 - Interest Income/Average Earning Assets - Interest Expense / Average Interest-Bearing Liabilities
- **Burden ratio** measure the amount of noninterest expense covered by fees, service charges, securities gains and other income as a fraction of total assets.
 - (Non-Interest Expense – Non-Interest Income) / Average Earning Assets
- **Cost-income ratio**
- **Efficiency ratio** measures a bank's ability to control noninterest expense relative to total revenue net of interest expense.
 - Non-Interest Expense/(Net Interest Income + Non-Interest Income)

Stylized B/S and I/S

ASSETS		LIABILITIES	
Cash	100	Demand Deposits	3000
Loans	6000	Time Deposits	2500
Fixed Assets	200	Bonds	1000
Liquid Assets	1000	Equity	800
	7300		7300

Interest Income	700
+ Fee income	600
- interest expenses	600
- op. expenses	500
= gross profit	200
Tax = 20%	
Net profit =	160

Stylized B/S and I/S

ASSETS		LIABILITIES	
Loans	1200	Deposits	1080
		Equity	100
		Retained profits	20

Interest Income	700
Fees and services	65
Interest expense	90
Op. expenses	60
Loss provisions	12
Taxes	4.6
Profit after tax	18.4

Leverage and Bank Profits

- A high ratio of assets to capital (**high leverage**) is a two-edged sword: *Leverage can magnify relatively small ROAs into large ROEs, but it can do the same for losses.*
- Moral hazard can contribute to high bank leverage.
- If managers are compensated for a high ROE, they may take on more risk than shareholders would prefer.
- Deposit insurance has increased moral hazard by reducing the incentive depositors have to monitor the behavior of bank managers.
- To deal with this risk, government regulations called capital requirements have placed limits on the value of the assets commercial banks can acquire relative to their capital.

Performance Characteristics of Banks by Size

Commercial banks of different sizes exhibit sharply different operating characteristics:

- Some reflect government regulations.
- Some are associated with differences in markets served.
- Larger banks hold a larger % of assets in loans relative to deposits but a smaller % of earning assets.
- Smaller banks operate with proportionately more core deposits and fewer volatile liabilities.
- Lower earnings base of largest banks reflect de-emphasis of lending and increased emphasis on products and services and the generation of fee income.

Cost Management Strategies

- Expense Reduction
 - Employee reduction, temporary workers and outsourcing
- Operating Efficiencies
 - Reduce costs while maintaining the existing level of products and services
 - Increase output but maintain current expenses
 - Improve workflow
- Economies of scale exist when average costs decrease as output increases.

Revenue Enhancement

- Involves changing the pricing of specific products and services but maintaining a sufficiently high volume of business so that total revenue increases.
 - Closely linked to the concept of price elasticity.
- Identify products with price-inelastic demand.
 - Price increase lowers demand but the decrease in demand is less than the increase in price.
- Contribution growth allocates resources to best improve overall long-term profitability.

Credit Risk

- Potential variation in net income from loan nonpayment or deferred payment.
- Net losses = gross losses (charge-offs) – recoveries (loans that were previously written off and collected).
- Expected future losses:
 - **Past-due loans** are still accruing interest.
 - **Nonperforming loans** are more than 90 days past due.
 - **Nonaccrual loans** are not currently accruing interest.
 - **Restructured loans** have modified payments or interest.
 - **Classified loans** have reserves for recognized losses.

Liquidity Risk

- Risk to earnings and equity from the bank's inability to timely meet payments or obligations.
 - Funding liquidity risk is the inability to liquidate assets or raise required funding.
 - Market liquidity risk is the inability of the institution to easily unwind or offset specific exposures without significant losses from inadequate market depth or market disturbances.
- Liquid assets are costly to hold because they pay very low rates of interest.
 - consist of unpledged, marketable short-term securities classified as available for sale plus federal funds sold and securities purchased under agreement to resell.

Market Risk

- Risk to earnings and equity from adverse movements in market rates or prices.
- Interest rate risk is the potential variability in an institution's net interest income and market value of equity due to changes in market interest rates.
 - Analyzed using GAP and earnings sensitivity analysis.
 - More comprehensive approach uses duration gap and economic value of equity sensitivity analysis.
 - An asset or liability is rate sensitive if management expects it to be repriced (rate change) within a certain time period.

Market Risk

- Equity and security price risk is the potential risk of loss associated with trading account portfolios.
 - Large banks often conduct value-at-risk analyses to assess risk. Small banks conduct sensitivity analysis.
- Foreign exchange risk is the risk to an institution from adverse movements in foreign exchange rates.
 - Most banks measure this risk by calculating measures of net exposure by each currency.
 - Net exposure is the amount of assets minus the amount of liabilities denominated in the same currency.

Operational Risk

- Possibility that operating expenses might vary significantly from what was expected.
- May occur as the result of:
 - Business interruptions
 - Transaction processing
 - Inadequate information systems
 - Breaches in internal controls
 - Client liability
- **Reputation risk:**
 - Risk that negative publicity, true or untrue, can adversely affect a bank's customer base or bring forth costly litigation that negatively affects profitability.

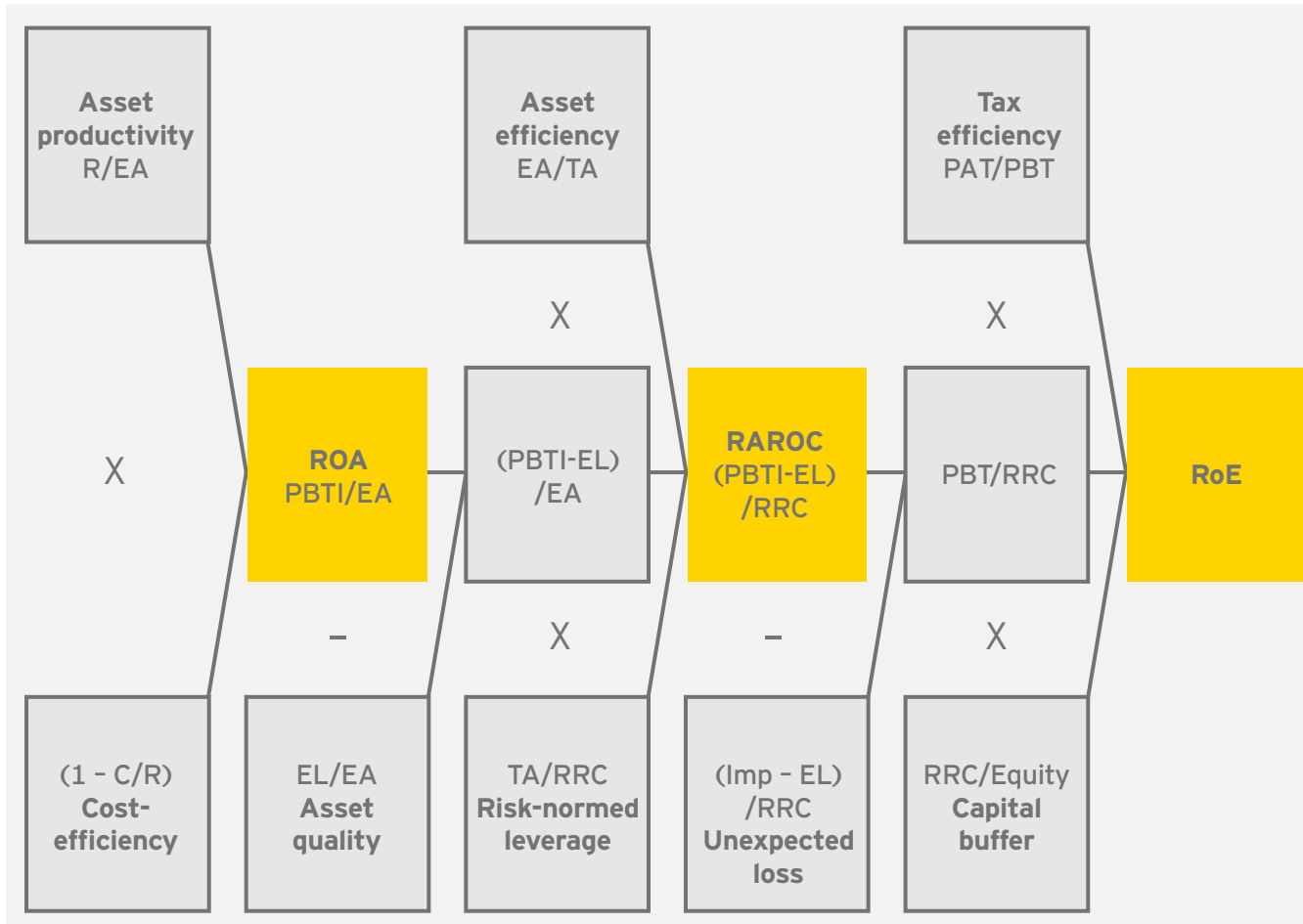
Risk-adjusted performance analysis

- Banks have to increase their capital at the same time as they aim to improve their returns on capital
- RoE might be boosted by taking more risk
- **Risk-adjusted return on capital (RAROC)** takes risk into account

$$\text{RAROC} = \frac{\text{Revenues} - \text{Operating costs} - \text{Expected loss}}{\text{Risk based required capital}}$$

1. incorporates the expected loss associated with lending, rather than the actual loan impairments that are included in the income statement of the bank (calculated on the basis of long-term average default rates and recovery rates associated with the bank's actual loan portfolio)
2. relates the adjusted income to risk-based required capital (available regulatory capital)

Risk-adjusted performance analysis



R (revenues)
 C (costs)
 EA (earning assets)
 PBTI (profit before taxes and interest (= $R - C$))
 EL (expected loss)
 TA (total assets)
 RRC (risk- required capital), Imp (impairment)
 UL (unexpected loss (= $Imp - EL$))
 PBT (profit before tax)
 PAT (profit after tax)

Risk-adjusted performance analysis

1. Calculation of RoA

$$\text{RoA} = \frac{R - C}{EA} = \frac{R}{EA} \left(1 - \frac{C}{R}\right)$$

2. Derivation of RAROC from RoA

$$\text{RAROC} = \frac{R - C - EL}{RRC} = \left(\text{RoA} - \frac{EL}{EA}\right) \frac{EA}{TA} \cdot \frac{TA}{RRC}$$

3. Derivation of RoE from RAROC

$$\text{RoE} = \left(\text{RAROC} - \frac{UL}{RRC}\right) \frac{RRC}{\text{Equity}} \cdot \frac{\text{PAT}}{\text{PBT}}$$

Loan valuation

ASSET		LIABILITY	
Loan	100	Deposit	90
		Equity	10

Loan maturity = 2 years (annual interest)

Customer deposit pay rate = 5% (fixed for two years)

Target ROE = 10%

Corporate tax rate = 20%

Loan default probability (Year 1) = 0%

Loan default probability (Year 2) = 5%

Recovery rate = 40%

Loan interest rate X%

$$Equity_0 = \sum_{i=1}^n \frac{E[CF_t]}{(1 + ROE)^t}$$

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