NARODOWY BANK POLSKI

AWG/MPAG workshop – Riga, 1 July 2024

Discussion of *Modèle Actif-Passif* (MAP, 2023) by Gentil, Ray and Toader

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Standard disclaimer applies

Aim of the model

Net interest income (NII) is a key factor of financial stability, since it drives the capacity of banks to absorb losses and to accumulate capital through retained earnings.

In this paper, we present an ALM-like model designed to project the banking sector's aggregate NII under different financial and monetary policy scenarios.

1. Asset-Liabilities accounting perspective

2. Whole (aggregate) euro area banking system

3. Time horizons up to 5Y

4. Multiple scenario variables

Overview

BALANCE SHEET

ASSETS	LIABILITIES AND EQUITY
CASH AND CASH EQUIVALENTS	BORROWINGS
LOANS	DEPOSITS
SECURITIES	DEBT SECURITIES ISSUED
INTANGIBLES	EQUITY

INCOME STATEMENT

NET INCOME =	
+ INTEREST INCOME **II**	= NII
- INTEREST EXPENSE **IE**	
- CREDIT LOSSES **C**	
- OTHER NET COST ITEMS **Q**	

Figure 1: Simplified balance sheet and income statement

Maturity structure

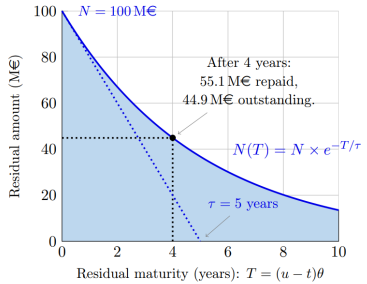


Figure 4: Repayment schedule of the outstanding amounts an exponential account, with $N = 100\,\text{M€}$ and $\tau = 5$ years.

% structure

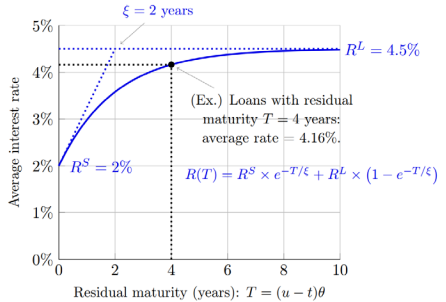


Figure 5: Interest rate structure of an exponential account (portfolio of loans) with $R^S = 2\%$, $R^L = 4.5\%$ and $\xi = 2$ years.

Variables in the model

Fixed

- A set of constant model parameters:
  - β the scaling factor between changes in banknotes on the reference central bank liabilities and changes in the banking sector's customer deposits ($0 \leq \beta \leq 1$),
  - γ the scaling factor governing changes in the reference central bank's "other" liabilities ($0 \leq \gamma < 1$),
  - δ the fraction of the banking sector's customer deposits subjected to minimum reserve requirements ($0 \leq \delta \leq 1$),
  - ϵ the scaling factor between banknotes held by the banking sector and banknotes on the reference central bank liabilities ($0 \leq \epsilon \ll 1$),
  - p the scaling factor corresponding to perimeter mismatches,
  - $\underline{L}^S$ the minimal short-term refinancing amount on the reference central bank assets,
  - $\tilde{L}_0^S = L_0^S - \frac{D_0^E}{1-\gamma}$ the initial theoretical value of short-term refinancing that would result in a zero amount of excess reserve (this value is negative in times of excess liquidity);

Scenario-driven

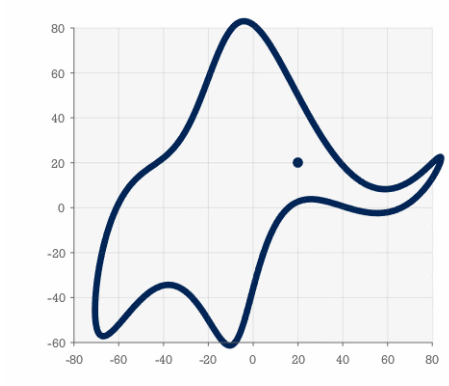
Type of variable	Scenario variables	Value
Interest rates	e_t – €STR	Risk-neutral expectation derived from interest rate curves.
	y_t – 10-year AAA yield	
	f_t – SOFR	
	i_t – French inflation	Banque de France projections.
Central bank volumes	S_t – Eurosystem security holdings	ECB indications.
	L_t^L – TLTRO-III outstanding amounts	Rapid repayment in 2023.
	T_t – net TARGET payment position	Zero (near-closed system).
Bank volumes	ΔN_t^{A3} – loan volumes	Moderate decline, then stagnation.
	ΔN_t^{L3} – customer term deposit volumes	Rapid rise (higher attractiveness).
	$\Delta N_i^{\cdots}$ – other volumes (securities, interbank)	Zero (no change).
	ΔN_a^F – transfers between non-maturing items	Zero (no net transfer).
Technical variables	η_t – deposit remuneration coefficient	Rapid rise (higher attractiveness).
	ρ_t^{A3} – customer loan prepayment rate	1% per quarter.
	$\rho_t^{A4,L4}$ – security prepayment rate	Share of amounts held for trading.
	$\rho_i^{\cdots}$ – other prepayment rates	Zero.
	λ_t^{A3} – customer loan default rate	0.1% per quarter.
	$\lambda_i^{\cdots}$ – other defaults (securities, interbank)	Negligible.
	m_t – reserve requirement ratio	Constant (1%).

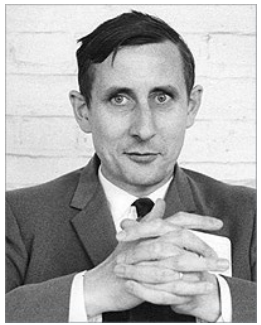
Table 1: Scenario variables

The problem of too many degrees of freedom

"How many arbitrary parameters did you use for your calculations?" (Fermi). I thought for a moment about our cut-off procedures and said, "Four." He said, "I remember my friend Johnny von Neumann used to say, with four parameters I can fit an elephant, and with five I can make him wiggle his trunk."

Freeman Dyson. A meeting with Enrico Fermi. Nature 427, 297 (2004). https://doi.org/10.1038/427297a





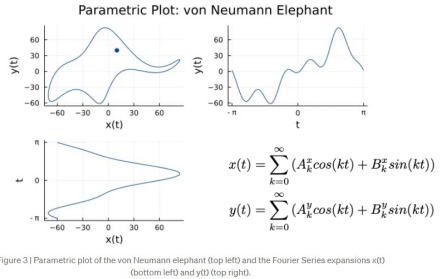
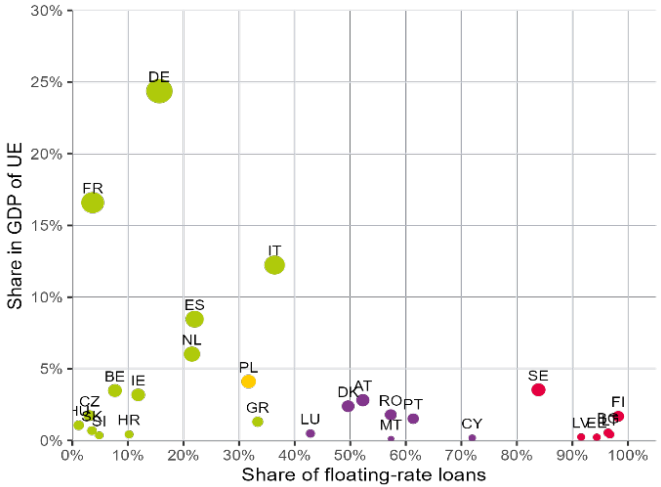


Figure 3 | Parametric plot of the von Neumann elephant (top left) and the Fourier Series expansions x(t) (bottom left) and y(t) (top right).

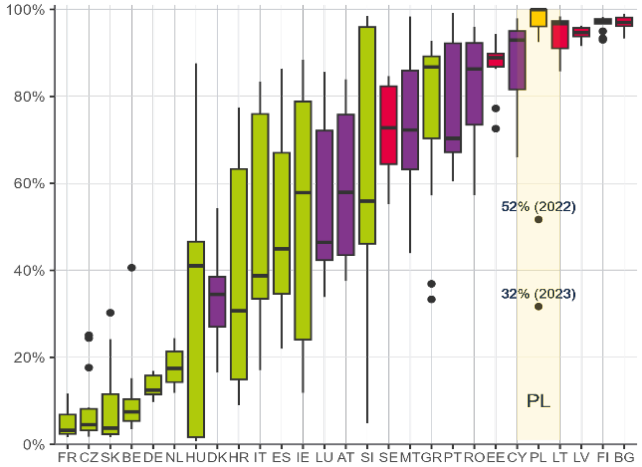
https://towardsdatascience.com/the-noisy-elephant-79e9071536e

Same fixed variables can change

Share of floating-rate loans granted in 2023 (horizontal axis) and share in GDP of the EU, by country (vertical axis)



Distribution of the share of floating-rate loans in EU countries, 2010-2023



Notes: Groups of countries by the share of floating-rate loans granted in 2023 are marked in: green, i.e. low share of <0;40%), purple, i.e. medium share of <40%;75%) and red, i.e. high share of <75%; 100%>. Poland is marked in yellow. Loans with the interest rate fixation period below 1 year are classified as floating-rate loans. Fixed-rate or periodically fixed-rate loans include loans with a possible fixation period in the following range: from 1 year to 5 years; from 5 to 10 years and above 10 years. Dot plot (left-hand side): GDP data in nominal prices for 2022; data on average share of new floating-rate loans apply to loans granted in 2023 (up to and including September 2023). Box plot (right-hand side): The fig-ure shows the variability of the share of floating-rate loans over the years 2010-2023 in individual countries. “Long” boxes mean that a given country has shown a high variability of the feature under analysis in successive years. Observations consid-ered as outliers, i.e. above the value of 1.5*IQR, where IQR is the interquartile range, are marked with dots.
Source: Eurostat, ECB Warehouse and NBP

Same variables are linked due to banks' strategic actions

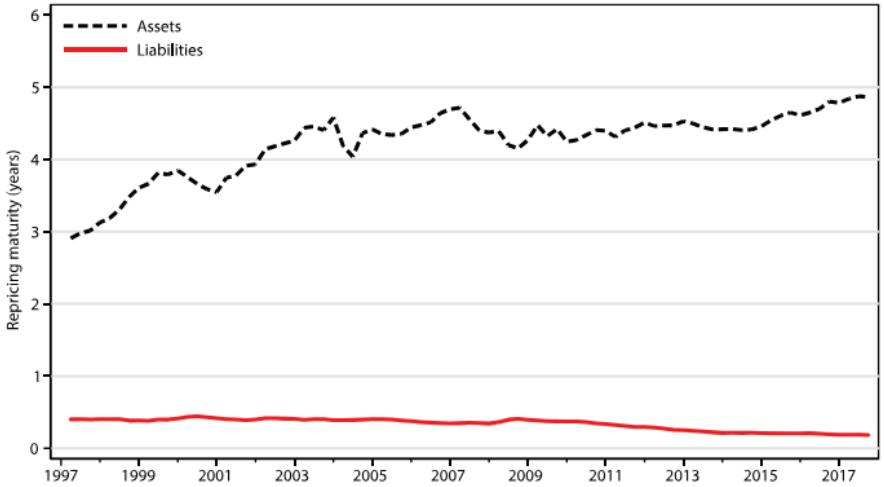
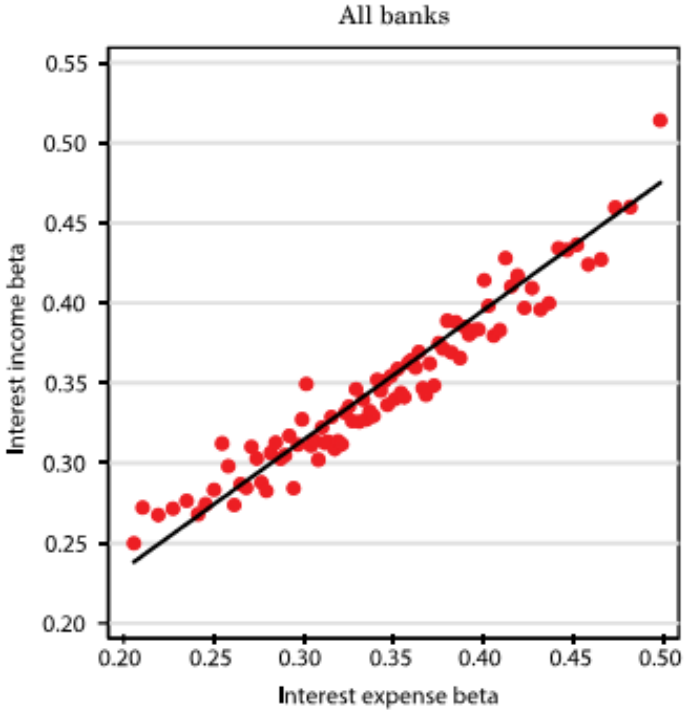


Figure 1. Repricing maturity of aggregate bank assets and liabilities. The figure plots the repricing maturity, a rough proxy for duration, of the assets and liabilities of the aggregate banking sector. The repricing maturity of assets is estimated by calculating the repricing maturity of loans and securities using the available data and assigning zero repricing maturity to cash and Fed funds sold. The repricing maturity of liabilities is calculated by assigning zero repricing maturity to transaction deposits, savings deposits, and Fed funds purchased, by assigning repricing maturity of five to subordinated debt, and by calculating the repricing maturity of time deposits using the available data. All other asset and liabilities categories (e.g., trading assets, other borrowed money), for which repricing maturity is not given, are left out of the calculation. The sample period is 1997 (when repricing maturity data become available) to 2017. (Color figure can be viewed at wileyonlinelibrary.com)



Source: DRECHSLER, SAVOV and SCHNABL (2021)

Backtesting

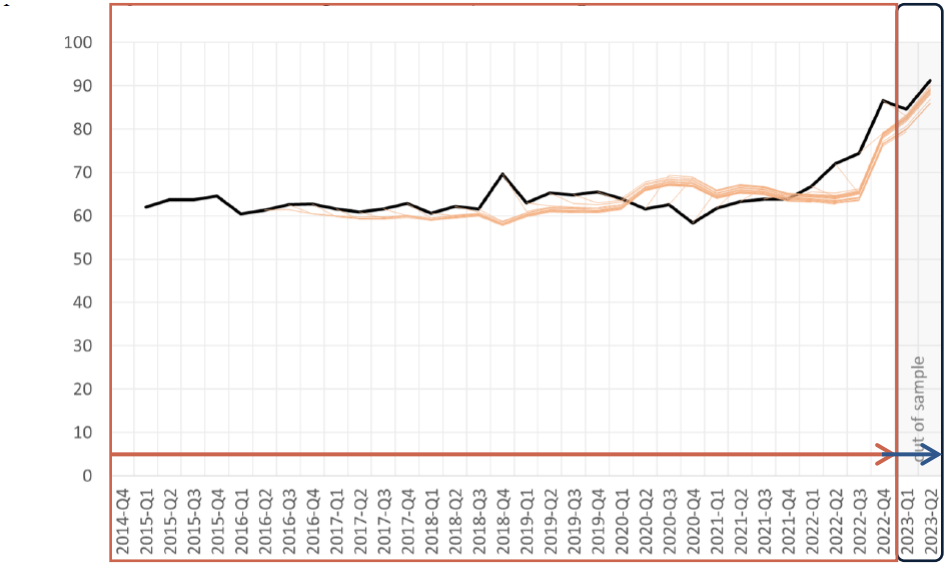


Figure 21: Back-testing of the aggregate NII of the euro area banking sector (quarterly values, billion euros).

[36] A fully "out-of-sample" back-testing would necessitate a re-estimation of all model parameters at each past date using only data available at that date, which would avoid the classical risk of parameter over-fitting, but would require a considerably more complex process. As things stand, this mostly "in-sample" back-testing already provides useful information on the reliability of model assumptions over a 7-year period.

Source: Gentil, Ray and Toader (2023)

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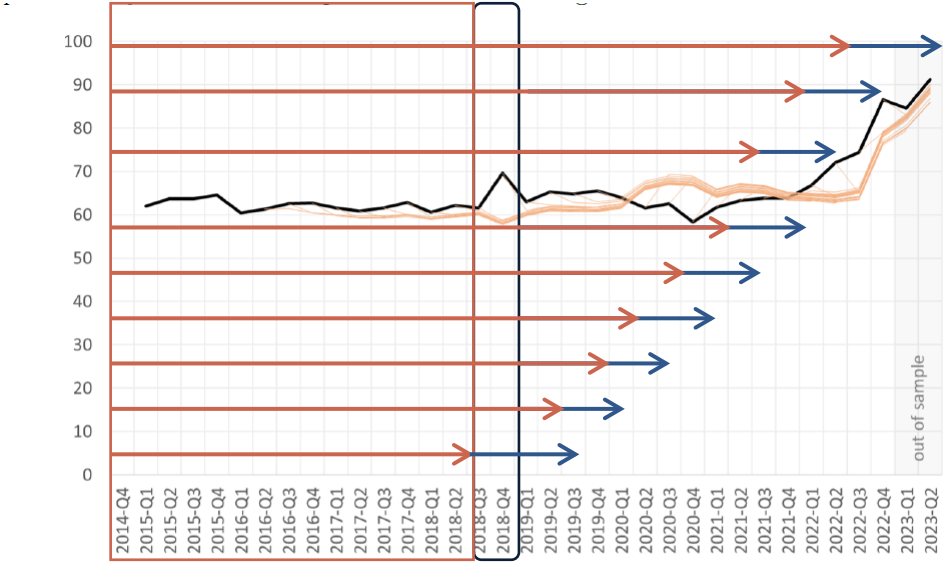

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Conclusions

Valuble insight into what can drive banks' NIM

Go for full-backtesting: how does it perform over various horizons?

How a convincing scenario can be devised for longer horizons?

For financial stability distributions can matter and more granual data is better: individual countries, individual banks