Mind the Income Gap – Partial Hedging of Interest Rate Risk within Banks' Business Model

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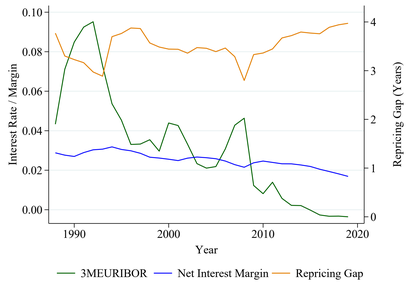
Summary

We implement a recently established approach to investigate the interest rate risk of banks with extensive engagement in maturity transformation. Therefore, we contribute to the emerging literature contradicting modern banking theory's view on interest rate risk as an inevitable consequence of banks' maturity mismatch. For our sample, we confirm an exposure of banks' net interest income to changing market rates. We also find evidence for an alignment of banks' interest income and expense sensitivities which might indicate an implied interest rate risk hedge by their business model. Banks with lower expense sensitivities show significantly higher loan maturities in their balance sheets, especially if their difference between interest expense and income sensitivity is small. Our results shed light on an implicit hedging mechanism within banks' business models, its (in)completeness, the use of interest rate derivatives, and consequences for adequate regulation.

Interest rate risk according to modern banking theory & regulators

- Fluctuating (but steadily declining) **market interest rates** over the past decades
- **High and recently rising levels of maturity transformation**of banks to stabilize returns
- **Rising interest rate risk** according to modern banking theory and regulators



- However, banks show a relatively **stable** net interest margin
- The interest business still accounts for 70% of operating profits (for banks in our sample)

Opposing views on banks' interest rate risk

Banks' intermediation role
- In general, banks lend long and refinance short
- Result: Maturity mismatch of assets and liabilities

Gap Risk (BCBS, 2016)
- Mismatch of assets and liabilities exposes net interest income inevitably to rising interest rates if it is not hedged

Evolving literature
- Maturity transformation even limits interest rate risk (English et al., 2018)
- Market power in deposit business stabilizes funding costs (Drechsler et al., 2017)

Opposing view
- Maturity transformation actually hedges banks' net interest income (Drechsler et al., 2021)

What is the relationship of maturity transformation and interest rate risk?

Understanding of this relationship is important for
1. all banks with high levels of deposits and high levels of maturity transformation
2. financial stability and adequate regulation of interest rate risk

German banking market: prototype of a bank-dominated system

- 2019: German supervisors classified 57% of credit cooperatives and 38% of savings banks as institutions with **increased interest rate risk**
- These banks hold **45% of all customer deposits** and **lend almost half of the total credit volume** within the German banking sector to private households and enterprises

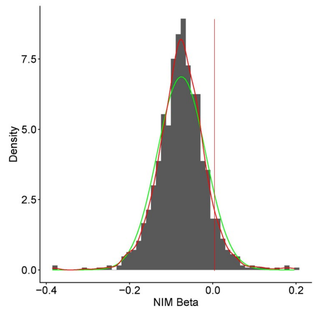
Dataset:
- Yearly balance sheet data for savings banks and credit cooperatives from 1988 until 2019 (source: *Bankscope* and *Fitch*)
- At least 15 yearly obs. per bank
- 1,056 banks and 25,318 bank-year-observations
- Interest rate data from *Deutsche Bundesbank*

Variable	mean	sd	p50
Interest Income / Total Assets	0.0472	0.0058	0.0475
Interest Expense / Total Assets	0.0225	0.0053	0.0229
Loans / Total Assets	0.6026	0.1015	0.6211
Customer Deposits / Total Assets	0.7359	0.0702	0.7391
Total Equity / Total Assets	0.0654	0.0144	0.0637
log(Total Assets)	6.4847	1.1424	6.4570
Repricing Maturity Assets	4.1278	0.4908	4.1290
Repricing Maturity Liabilities	0.6031	0.1738	0.5941

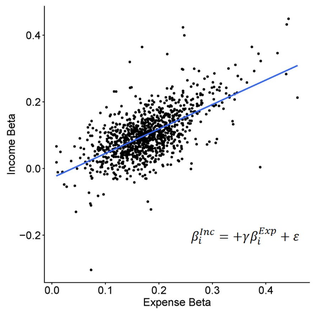
Approach: Following the model of Drechsler et al. (2021), we
1. estimate a bank's income and expense sensitivities
2. test, if banks might align their sensitivities
3. If they do, test for implementation

Results: Individual beta regressions & sensitivity matching

Average coefficients	mean	sd	p50	regression
Expense Beta	0.1781	0.0608	0.1752	$\Delta IntExp_t = \alpha + \beta^{Exp}\Delta InterestRate_t + \epsilon_t$
Income Beta	0.1028	0.0714	0.0969	$\Delta IntInc_t = \alpha + \beta^{Inc}\Delta InterestRate_t + \epsilon_t$
NIM Beta	-0.0753	0.0578	-0.0747	$\Delta NIM_t = \alpha + \beta^{NIM}\Delta InterestRate_t + \epsilon_t$
ROA Beta	-0.0407	0.1012	-0.0414	$\Delta ROA_t = \alpha + \beta^{ROA}\Delta InterestRate_t + \epsilon_t$



- ⌀ Expense Beta > ⌀ Income Beta
- Difference highly robust and significant
- NIM and ROA are on average exposed to rising interest rates
- No "perfect match" – traditional "income gap"



- Strong indication for alignment of expense and income sensitivities (betas) in the cross-section: 0.734***
- The larger the absolute difference in sensitivities, the lower (more negative) the ROA beta (regression coef. -0.360***)

Test for implementation of sensitivity matching

Expectation: Alignment through repricing maturities of assets

$$RepricingMaturity_i = \alpha + \delta\beta_i^{Exp} + \gamma X_i + \epsilon_i$$

- Lower expense sensitivities
- ↓
- Higher repricing maturities
- ↓
- Lower income sensitivities

⌀ *Loan maturities: 3.47 years*

	Loan repricing maturity		
	All Banks	Low gap	High gap
Exp Beta	-1.877***	-2.869***	-1.356***
	(0.272)	(0.389)	(0.394)
Controls	Yes	Yes	Yes
Banks	1,056	528	528
R^2	0.161	0.186	0.188

** p <0.10, ** p <0.05, *** p <0.01*

⇒ For all assets: we find a significant, but relatively small relationship of -0.821***
⇒ For loans: substantial and significant relationship for maturities and expense beta (see table), especially for banks with low differences between expense and income betas *(low gap banks)*
⇒ For securities: positive and significant (1%) relationship, but only marginal economic relevance

Expectation: Alignment through share of securities

$$ShareSecurities_i = \alpha + \delta\beta_i^{Exp} + \gamma X_i + \epsilon_i$$

- Lower expense sensitivities
- ↓
- Higher share of securities (on average higher repricing maturities)
- ↓
- Lower income sensitivities

⌀ *Securities maturities: 6.55 years*

	Share of securities		
	All Banks	Low gap	High gap
Exp Beta	0.133***	0.0626	0.168**
	(0.0409)	(0.0577)	(0.061)
Controls	Yes	Yes	Yes
Banks	1,056	528	528
R^2	0.0487	0.0597	0.0530

** p <0.10, ** p <0.05, *** p <0.01*

⇒ We do not find the expected, negative relationship
⇒ Banks with high income gaps: share of securities increases with expense sensitivity
⇒ Liquidity aspect of securities: easier to sell (in line with literature)

Implications of usage of derivatives and current developments

Usage of interest rate derivatives
- We check banks' annual statements for usage of derivatives to manage their banking books
- Only 212 of our 1,056 banks does not use any derivatives at any time
- Matching coefficient of expense and income sensitivities for these 212 banks: 0.494***
- We find no evidence for similar implementation of sensitivity matching for these banks

⇒ We cannot exclude that the implementation of alignment is driven by usage of derivatives

Low interest rate and high loan demand
- German regulators report rising demand for (long-term) bank loans since the end of 2007
- To meet customers' demands, banks may have fewer opportunities to manage the maturities of new loans
- We rerun the analysis with sample split between 2007 and 2008
- The relationship of loan maturities and expense betas declines for late period

⇒ Less evidence for alignment through loan maturities