Covered but Exposed: Currency Risk in Collateralized Bank Funding

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Research question

- Trade-off in financial globalization
  - Expanded access to international financial markets increases liquidity and investor pool
  - Makes a small open economy susceptible to the ebb of global financial conditions
  - Trilemma/Dilemma

Research question

- Trade-off in financial globalization
- Expanded access to international financial markets increases liquidity and investor pool
- Makes a small open economy susceptible to the ebb of global financial conditions
- **Can a small open economy alleviate procyclicality while sustaining liquidity?**

The Norwegian experiment of banking globalization

- Starting 2007, domestic banks, previously reliant solely on domestic funding, could suddenly access foreign markets.
- Establishment of credit companies as special-purpose vehicles.
- This policy shift introduced an **exogenous change to the funding structure** of Norwegian banks, enabling them to **increase their investor base** through the issuance of foreign currency-denominated (FX) bonds.

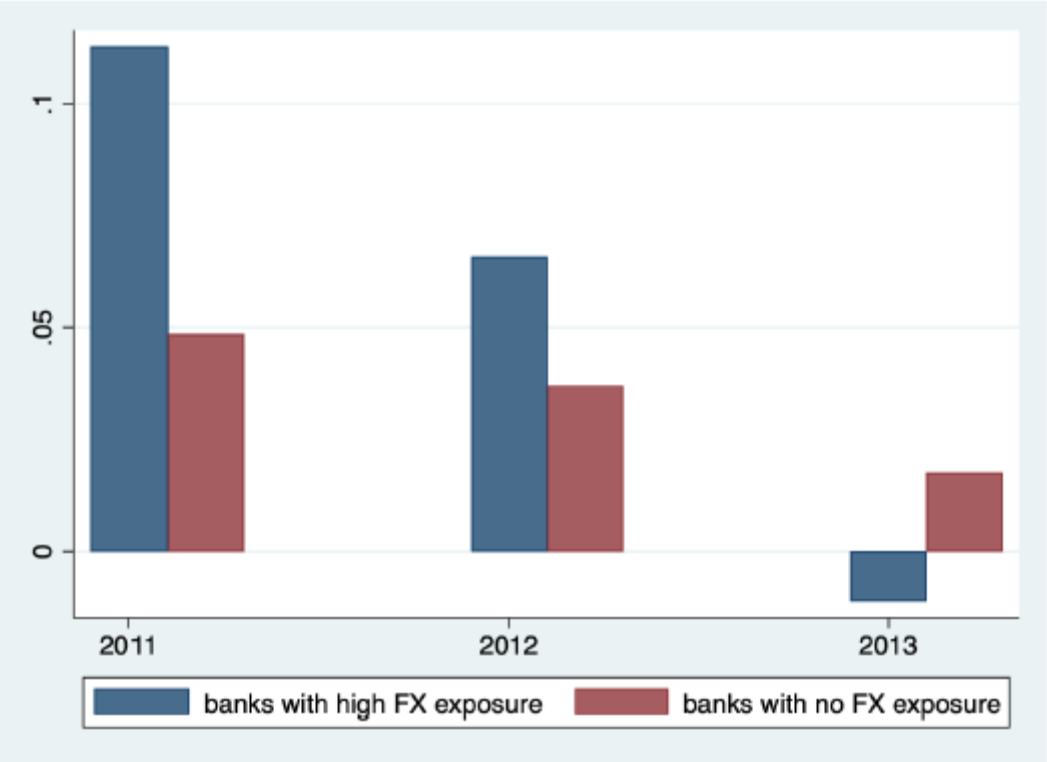
The Norwegian experiment of banking globalization

- Starting 2007, domestic banks, previously reliant solely on domestic funding, could suddenly access foreign markets.

- Establishment of credit companies as special-purpose vehicles.

- **Banks started issuing covered bonds denominated in EUR as a gateway to international capital markets and foreign investors. FX funding:**
  - Expands their funding pool;
  - It simultaneously exposes them to global financial conditions

Bank Lending around the 2012-13 NOK depreciation period



Sneak peek of the findings

- Currency mismatch is not the direct culprit here
- Hedging FX bond funding

Sneak peek of the answer

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- Hedging FX bond funding
(just like Elsa's gloves on)

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- Hedging will prove illusionary
- Hidden fragility in otherwise safe funding models
- There is no escape from global financial conditions

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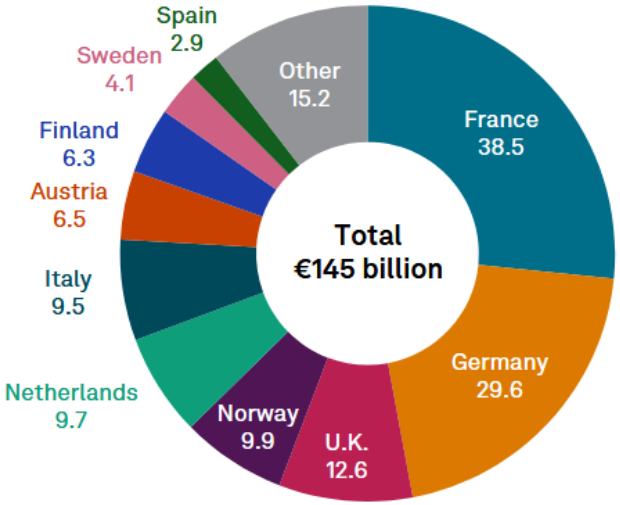
(Elsa's gloves off)

Covered bonds

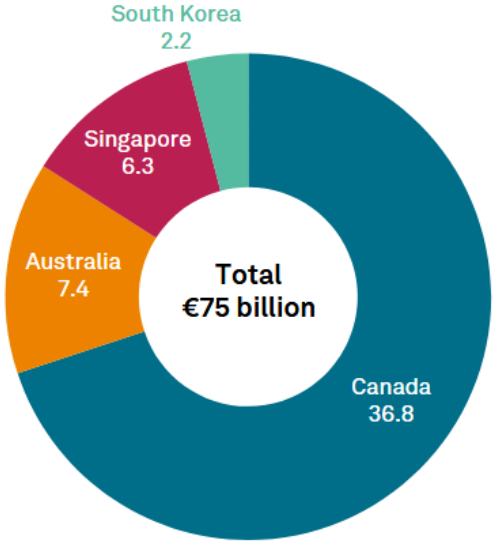
- Debt securities issued by banks or financial institutions, backed by a pool of high-quality assets such as mortgages or public sector loans.
- The collateral pool remains on the issuer's balance sheet and is actively managed to replace non-performing loans.
- Low credit risk (AAA) and shorter intermediation chain than MBS.
- Favorable capital requirements, and considered as HQLA
- Used as collateral for European Central Bank (ECB) operations.

2024 YTD European benchmark issuance, by country
(Bil. €)



YTD--Year to date. Based on 2024 issuance as of Dec. 1, 2024. Source: S&P Global Ratings.

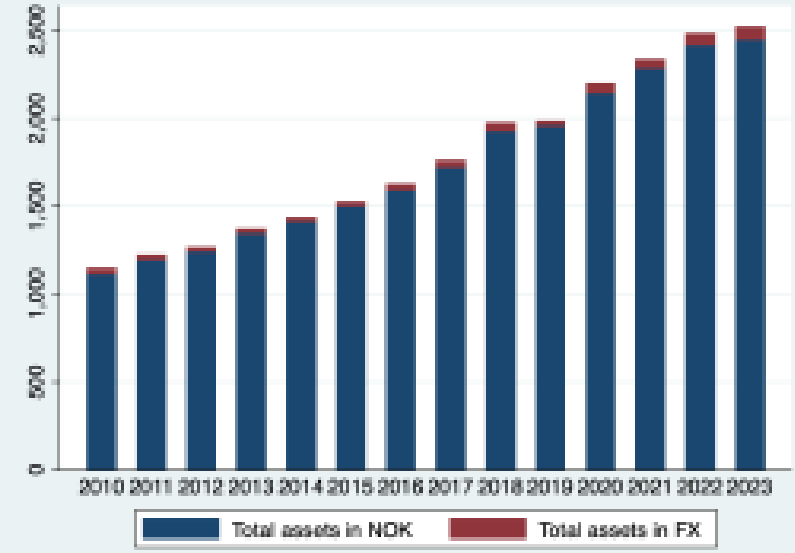
2024 YTD non-European benchmark issuance, by country
(Bil. €)



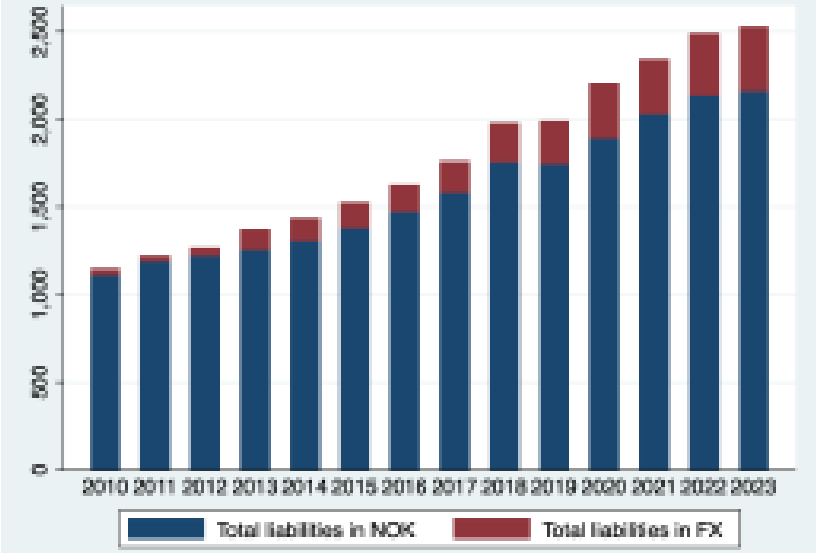
YTD--Year to date. Based on 2024 issuance as of Dec. 1. Source: S&P Global Ratings.

FX assets and liabilities

Assets of non-global banks in Norway in billion NOK

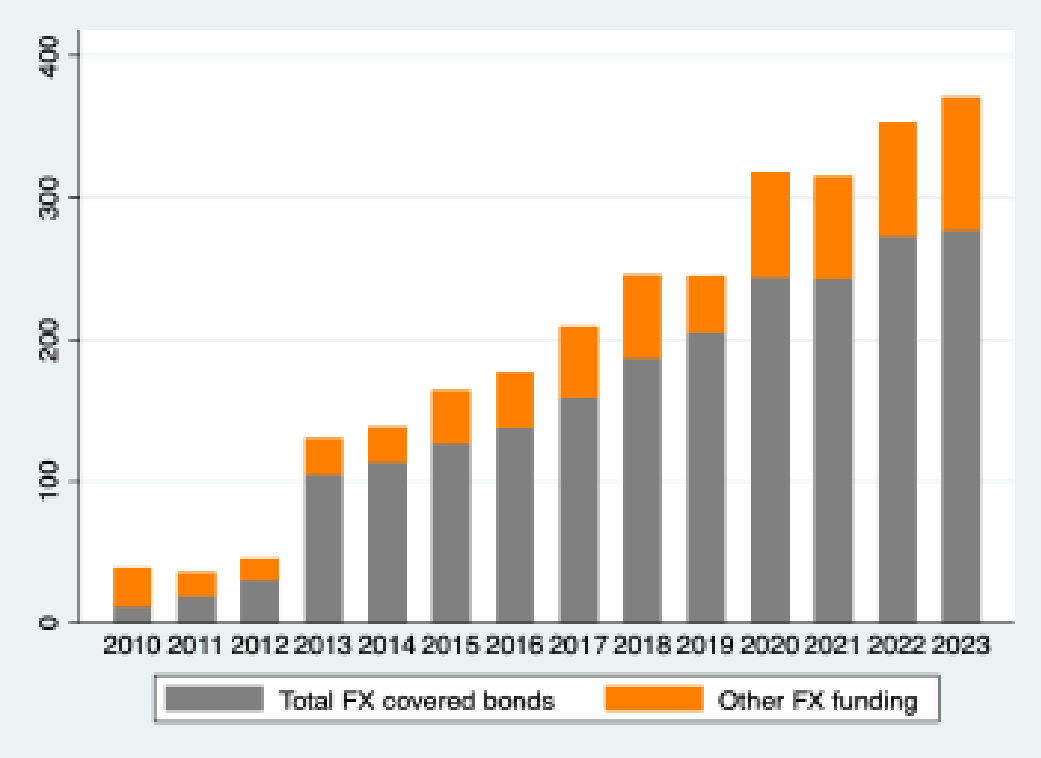


Liabilities of non-global banks in Norway in billion NOK



FX liabilities: covered bonds vs other FX funding

FX liabilities of non-global banks in Norway in million NOK



Mechanism

Bank

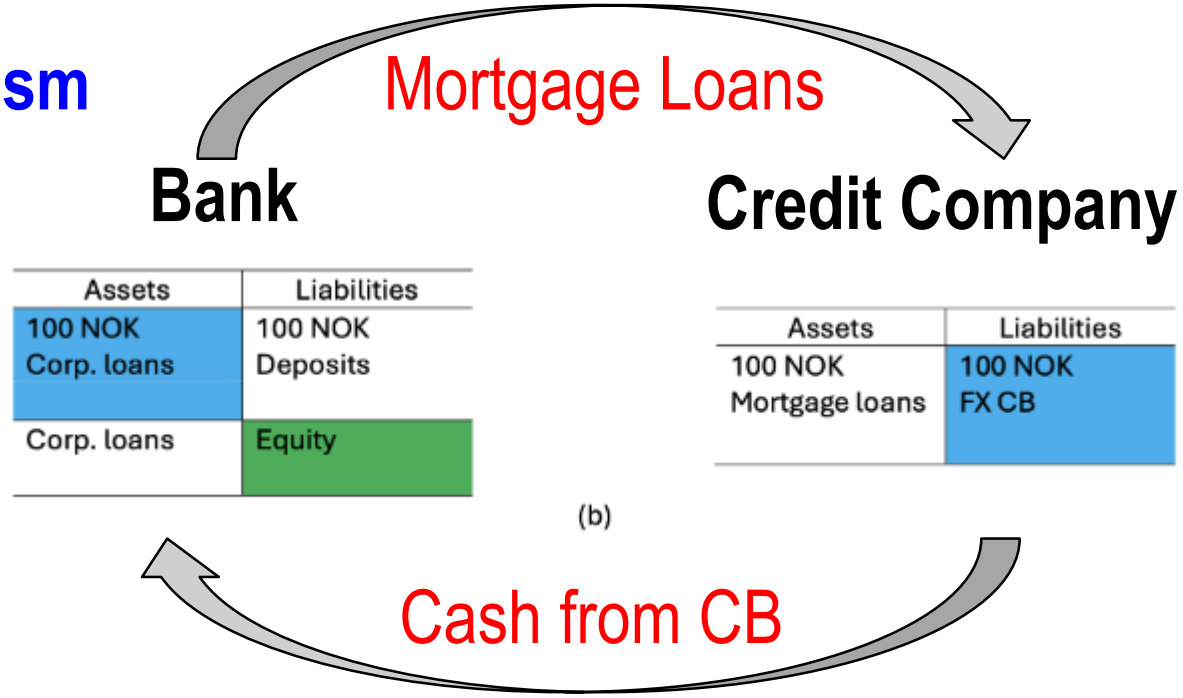
Assets	Liabilities
100 NOK Mortgage loans	100 NOK Deposits
Corp. loans	Equity

(a)

Initial Balance Sheet

- A bank holds 100 NOK mortgage loans that are funded by 100 NOK deposits

Mechanism

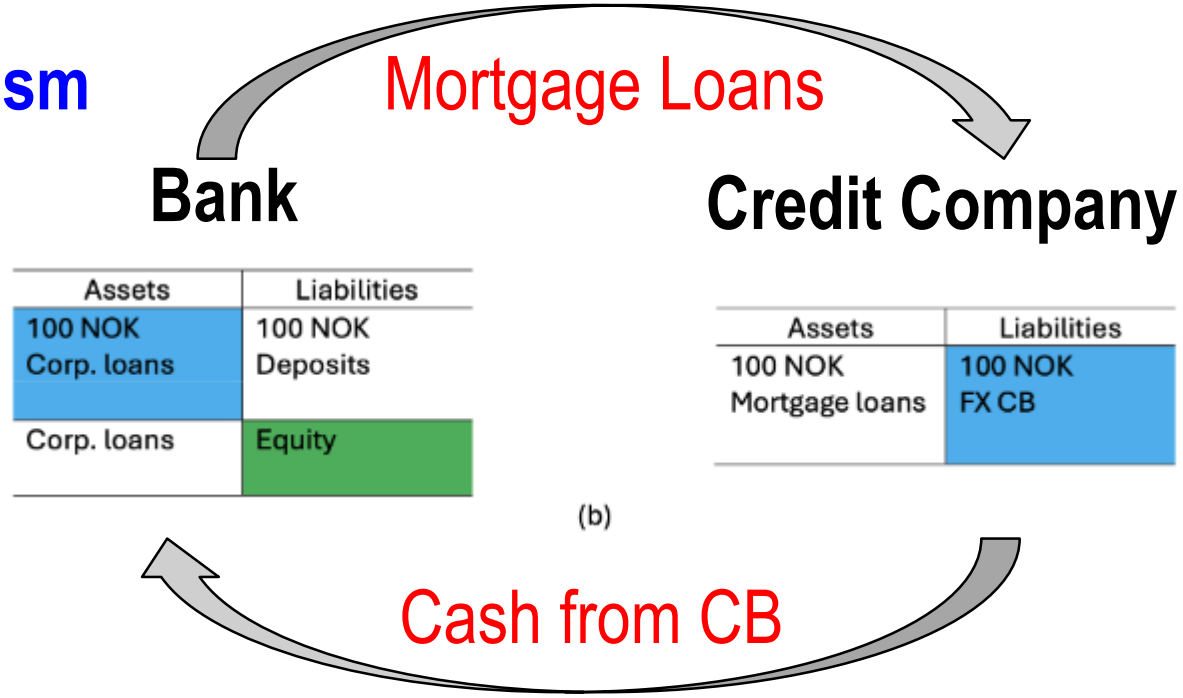


The bank decides to issue covered bonds.

The bank transfers the mortgage loans to its credit company and issues 100 NOK covered bonds in foreign currency.

With the cash from the covered bond issuance, the bank invest in 100 NOK corporate loans.

Mechanism



In order to obtain AAA rating, banks hedge the full currency and interest rate exposures using a combination of cross currency basis swap and interest rate swap.

No currency mismatch

Mechanism

Mortgage Loans

Bank

Assets	Liabilities
100 NOK Corp. loans	100 NOK Deposits
Corp. loans	Equity

Credit Company

Assets	Liabilities
100 NOK Mortgage loans	100 NOK FX CB

(b)

Cash from CB

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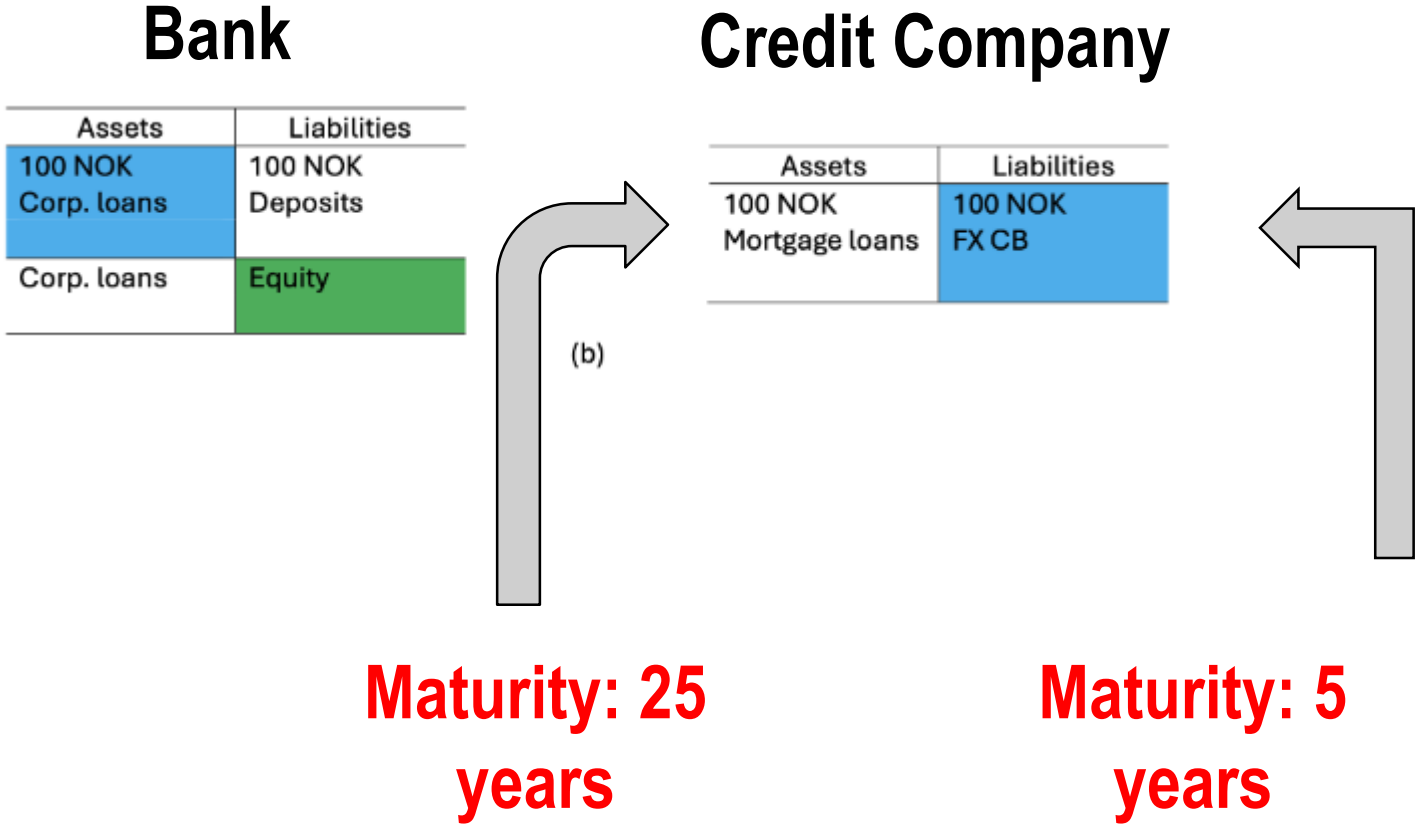
Mechanism



- Problem: Maturity mismatch

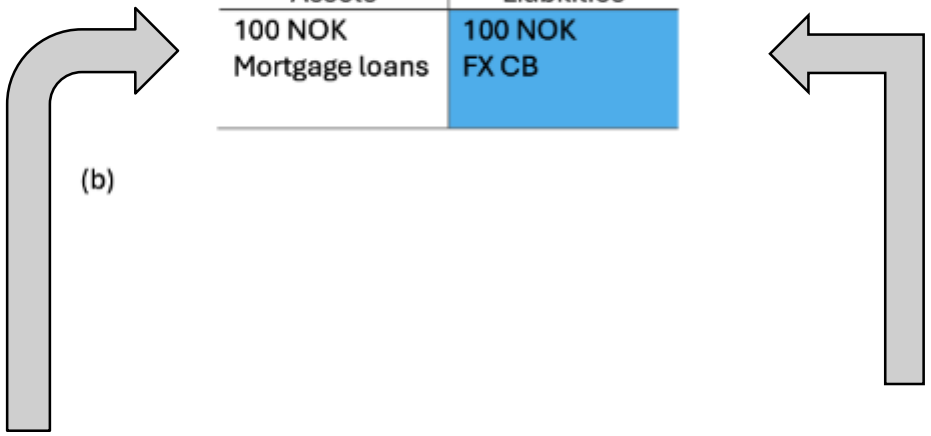
Mechanism After 5 years

Bank

Assets	Liabilities
100 NOK Corp. loans	100 NOK Deposits
Corp. loans	Equity

Credit Company

Assets	Liabilities
100 NOK Mortgage loans	100 NOK FX CB



Remaining Maturity: 20 years

Maturity: 0 years

- **Need to issue new covered bonds!**

Mechanism After 5 years

Bank

Assets	Liabilities
90 NOK Corp. loans	100 NOK Deposits
- 10 NOK	
Corp. loans	Equity
	-10 NOK

(c)

Credit Company

Assets	Liabilities
100 NOK Mortgage loans	100 NOK FX CB

When covered bonds mature, banks roll over funding by issuing new bonds (for 100NOK).

Suppose that NOK depreciates/ hedging costs rise by 10 NOK.

This leads to 10 NOK loss in bank equity, and the bank cuts its corporate lending by 10 NOK.

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Data

- Financial reports of all Norwegian banks and their covered bond SPVs (credit companies)
- Financial reports of all Norwegian firms
- All firm-bank credit relations
- We focus on domestic banks (mostly)
- Period: 2010-2023

Exchange rate, hedging costs, and bank lending

- Identification challenge: we need to disentangle credit demand from credit supply effects!

- We use two approaches.

  A. We control for firm credit demand by industry*region*time fixed effects (Degryse et al, 2019)

  B. We control for firm credit demand by firm*time fixed effects (Khwaja and Mian, 2008)

Exchange rate, hedging costs, and bank lending

$$L_{bft} = \alpha + \beta_1 \cdot bank\ with\ cc_{bt} + \beta_2 \cdot bank\ with\ cc_{bt} \cdot FX_t + \delta \cdot controls_{bt} + \theta_{RIT} + \epsilon_{bft}$$

- ***Bank with CC*** *==1* is the domestic bank that accesses foreign funding through the special purpose vehicle (credit company)
- ***L*** = bank-firm credit exposure (log of total volume of outstanding loans by bank b to firm f in year t)

Exchange rate, hedging costs, and bank lending

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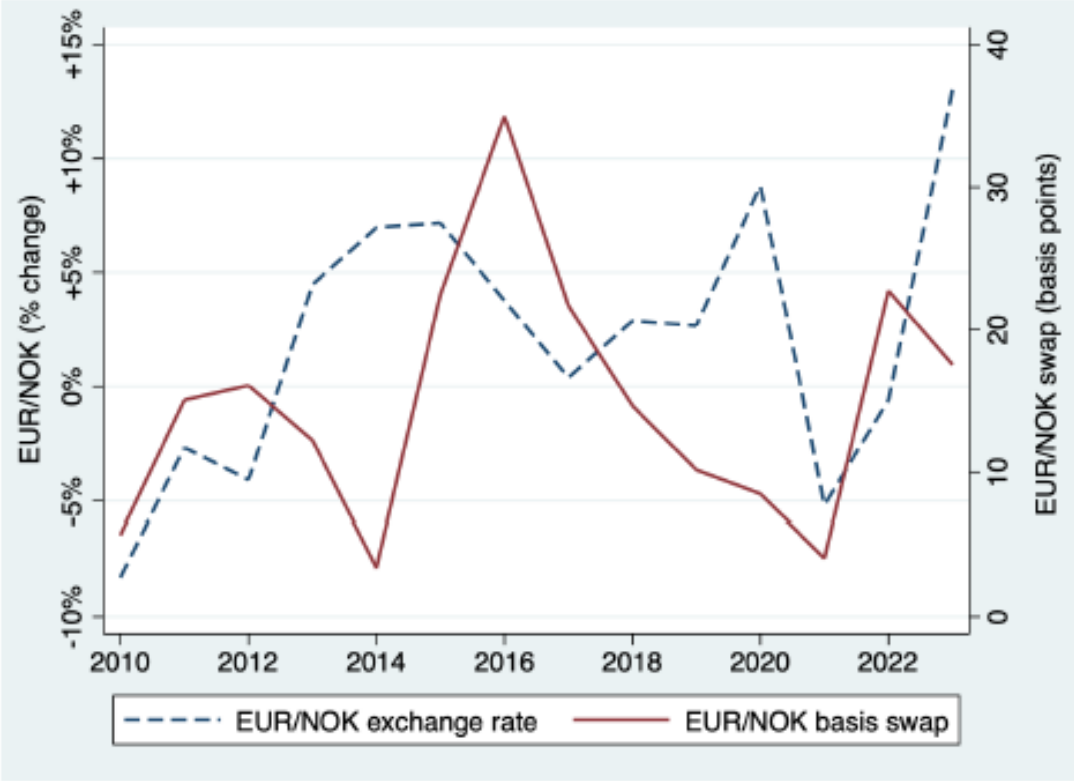
- **FX=EUR/NOK** exchange rate captures global financial conditions broadly.
  - When domestic currency depreciates, financial conditions tighten and credit supply drops
- **FX=EUR/NOK basis spread** (5-year swap) captures hedging costs.
- (USD and Oil will come later…)

The costs of hedging



Foreign institutions (like Nordea) dominate NOK FX swap activity

Banks with access to FX funding vs. Domestic funded banks

	(1)	(2)	(3)	(4)	(5)	(6)
Bank with cc×Exchange rate	-3.488***		-3.088***		-2.828***	
	(0.211)		(0.290)		(0.526)	
Bank with cc×Hedging cost		-0.707***		-0.612***		-1.504***
		(0.136)		(0.198)		(0.415)
Exchange rate	1.894***					
	(0.190)					
Hedging cost		-0.139				
		(0.125)				
Bank with cc	2.393***	2.419***	2.851***	2.871***	3.471***	3.596***
	(0.038)	(0.041)	(0.048)	(0.051)	(0.098)	(0.103)
_constant	8.620***	8.651***	7.567****	7.566***	4.719***	4.772***
	(0.154)	(0.152)	(0.181)	(0.184)	(0.519)	(0.525)
N	277,858	277,858	254,511	254,511	34,312	34,312
Region×industry FE	yes	yes	no	no	no	no
Region×industry×year FE	no	no	yes	yes	no	no
Firm×year FE	no	no	no	no	yes	yes
R^2	0.266	0.266	0.306	0.306	0.577	0.577

For banks that access FX funding through credit companies, a 1% appreciation of the Euro is associated with a decrease in lending of approximately 3%

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For banks that access FX funding through credit companies, as the basis spread increases by 1 bp, credit supply decreases by 0.7%

FX funding exposure heterogeneity

$$L_{bft} = \alpha + \beta_1 \cdot bank\ with\ cc_{bt} + \beta_2 \cdot bank\ with\ cc_{bt} \cdot FX_t + \delta \cdot controls_{bt} + \theta_{RIT} + \epsilon_{bft}$$

Replace *bank with CC* with

- ***FX Exposure*** (FX covered bonds/Total liabilities)
- ***Maturity Mismatch*** (Mortgage loans wavg maturity/Covered bonds wavg maturity)

Higher ratios >>> Higher FX Exposure, Maturity Mismatch

FX-denominated covered bonds share of total bank liabilities

Panel A: FX covered bonds exposure of the bank

	(1)	(2)	(3)	(4)	(5)	(6)
FX exposure×Exchange rate	0.893		-18.635***		-48.820**	
	(1.351)		(2.060)		(6.965)	
FX exposure×Hedging cost		-0.002		-6.800***		-38.939***
		(0.898)		(1.350)		(4.458)
Exchange rate	[illegible]					
	(0.133)					
Hedging cost		-0.221**				
		(0.087)				
FX exposure	3.475***	3.364***	5.606***	6.026***	15.266***	19.608***
	(0.169)	(0.208)	(0.272)	(0.343)	(0.875)	(1.088)
_cons	11.625***	11.669***	11.795****	11.822***	8.214***	8.438***
	(0.149)	(0.148)	(0.162)	(0.163)	(0.591)	(0.593)
N	277,858	277,858	254,511	254,511	32,380	32,380
Region×industry FE	yes	yes	no	no	no	no
Region×industry×year FE	no	no	yes	yes	no	no
Firm×year FE	no	no	no	no	yes	yes
R^2	0.230	0.230	0.265	0.265	0.513	0.514

A 1% depreciation of the Krone or a 1 bp increase in basis spread are associated with a 0.7%/0.3% higher decline in credit supply from banks with a FX exposure of 4% (the sample mean) than banks with FX exposure equal to zero

Assets-Liability maturity mismatch

Panel B: Maturity mismatch

Maturity mismatch×Exchange rate	-1.782***		-7.338***		-22.781***	
	(0.451)		(0.671)		(2.505)	
Maturity mismatch×Hedging cost		-0.103		-1.773***		-14.290***
		(0.353)		(0.520)		(1.806)
Exchange rate	-0.466***					
	(0.132)					
Hedging cost		-0.127				
		(0.087)				
Maturity mismatch	1.252***	1.153***	1.805***	1.786***	5.525***	6.742***
	(0.063)	(0.078)	(0.095)	(0.122)	(0.333)	(0.419)
_cons	11.689***	11.719***	11.874****	11.907***	8.416***	8.674***
	(0.149)	(0.148)	(0.162)	(0.163)	(0.587)	(0.589)
N	277,858	277,858	254,511	254,511	32,380	32,380
Region×industry FE	yes	yes	no	no	no	no
Region×industry×year FE	no	no	yes	yes	no	no
Firm×year FE	no	no	no	no	yes	yes
R^2	0.230	0.230	0.264	0.264	0.512	0.512

A 1% depreciation of the Krone or 1bp increase in basis swap is associated with a 0.9% (0.2%) higher decline in credit supply from banks with a Maturity Mismatch ratio of 0.13 (the sample mean) than banks with Maturity Mismatch equal to zero.

Firm- Level Real Effects

$$REAL_{ft} = \alpha + \beta \cdot CSI_{ft-1} + \gamma \cdot FX_t + \delta \cdot CSI_{ft-1} \cdot FX_t + \sigma_f \cdot F_{ft} + \epsilon_f + \theta_{it}$$

CSI: is a firm-level index that captures the share of loans that a bank receives from domestic banks with a certain exposure to FX funding or Maturity Mismatch, filtering out demand effects.

REAL: firms' investments, labor costs, growth in sales

Modest or no real effects

- For the entire sample of firms, $CSI_{ft-1} \cdot FX_t$ are negative and significant (broadly) but with a small economic magnitude (firms more exposed to bank's procyclical lending are modestly affected in terms of investments, labor costs and sales)

- For the subset of risky firms, not significant effects

"Credit for credit's sake" pattern: funding expansions amplify balance-sheet quantities without investments

How to tighten the identification?

Are global funding conditions behind the decision to issue FX bonds?

- **No! (Exchange rate, Interest rate differentials, or Hedging costs)**

Exchange rates might not be exogenous:

- **Focus on periods with exogenous exchange rate/hedging costs variation ("Whatever it takes"; oil shock; Russian aggression of Ukraine shock)**

Wrapping-up

- Elsa's gloves represent FX hedging instruments used by small open economies like Norway to "control" the destabilizing effects of global financial conditions
- Hedging does not fully remove the FX risk – asset/liabilities maturity mismatch
    - Elsa gloves ON and gloves OFF
- Illusion of hedging, currency risk does not disappear, and the trilemma/dilemma stays.
- Hidden fragility in otherwise safe funding models