The Exposure of Swiss Banks to Macroeconomic Shocks

An Empirical Investigation

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Goal of the study

1. Identify macroeconomic factors which are linked to banks' profits and losses

2. Simulate present and future P&L of the banking sector

3. Consequences for the capitalization of the banking system

⇒ Additional instrument to assess the resilience of the Swiss banking system

Concept

1. Panel data regression to estimate the sensitivity of banks P&L to macroeconomic conditions

2. Estimated sensitivities of P&L are used to quantify the impact of various scenarios

3. The impact of the scenario on P&L is compared to bank capital

   (i) P&L as a % of excess capital
   (ii) market share of banks falling below the regulatory minimum

Data

- Individual bank accounting data
- All banks located in Switzerland, 345 on average
- 1987-2004, covering roughly two business cycles
- 5800 observations
- Four groups of banks:
  1. Big banks (UBS, Credit Suisse)
  2. Cantonal and regional banks
  3. Private banks
  4. Foreign banks

Methodology I

- Dependent variables (bank earning components)

  1. Provisions
  2. Interest income
  3. Trading income
  4. Commission fee

- Explanatory Variables

  - macroeconomic variables
  - individual bank characteristics

Methodology II

- Linear panel regressions
  - cross sectional components

    profits before provision, loan to value ratio, bank group dummy

    ⇒ allow to control for bank individual characteristics that also affect profits

  - interaction terms between macroeconomic and bank variables

    Δ interest rate x share of short term financing

    ⇒ take into consideration the varying exposure across banks to different shocks

Methodology III

- Serial autocorrelation

  $\Rightarrow$ Two different panel approaches to deal with autocorrelation

  1. Static: GLS model with first order serial correlation

  $y_{it} = \mathbf{x'}_t\boldsymbol{\beta} + \mathbf{z'}_{it}\gamma + u_i + \varepsilon_{it}$, where $\varepsilon_{it} = \rho\varepsilon_{it-1} + \upsilon_{it}$

  2. Dynamic: GMM model with a lagged endogenous variable (Arrelano-Bond)

  $y_{it} = y_{it-1}\varphi + \mathbf{x'}_t\boldsymbol{\beta} + \mathbf{z'}_{it}\gamma + u_i + \varepsilon_{it}$

Regression results: Provisions

	static model		dynamic model	
	sign	signif.	sign	signif.
lagged dependent variable			+	***
Δgdp	-	***	-	***
bondspread	+	***	+	***
interest rate	+	***	+	***
unemployment rate	+	***	+	**
profits before provisions	+	***	+	***
loan to value ratio	+	*	+	
foreign*interest rate	-	*	-	*

Marginal effects on provisions in %

Δgdp (-1%)	ir (+100bp)	ur (+1%)
+15.3%	+21.4%	+23.2%

Simulation I: Macroeconomic Scenarios

	Δ gdp	Δ ir	ir	Δ spi
Basis Scenario	1.7%	+10bp	0.6%	0
Interest rate increase (boom)	4.6%	+190bp	3.2%	0
Recession	-1.6%	-10bp	0.0%	0
Recession + Stock market decline	-1.6%	-10bp	0.0%	-37%

Simulation II: Predicted bank profits

	All banks	Cantonal banks	Big banks	Regional banks	Other banks
Basis Scenario	30%	34%	35%	33%	19%
Interest rate increase (boom)	27% -3%	31% -3%	33% -2%	32% -1%	19% -0%
Recession	22% -8%	24% -10%	24% -11%	22% -11%	15% -4%
Recession + Stock market decline	-25% -55%	7% -27%	-59% -94%	15% -18%	-17% -36%

Conclusions

- Influence of macroeconomic variables on bank earnings is statistically significant …
- … but quantitative impact is rather modest.

⇒ only a combination of recession and stock market crash leads to substantial losses in our simulations

⇒ Swiss banking sector seems to be quite resilient against macroeconomic shocks

Some limitations

- Data limitations (e.g. provision as proxy for credit risk)
- Lack of extreme observation on the macroeconomic variables
  ⇒ potential to estimate impact of **more extreme** shocks is limited
- Nonlinearities
  - proportional to the shock size?
  - symmetric?
  - independent of initial conditions?
- Historic perspective
  ⇒ assume stable relationship between macroeconomy and bank profits

In progress…

- Better consideration of nonlinearities
- Integration of stress tests run by banks
- Integration of interest rate risk statistics

Interest rate risk statistics

- Compute the impact of an interest rate shock on the net present value of the bank
- Source of risk: maturity mismatch between assets and liabilities
- Present value of assets and liabilities react differently to interest rate shock

Example of interest rate risk statistics

Impact of an 200bp interest shock (in % of the capital)		
4th quarter 2005	+ 200 bp	- 200 bp
All banks	-4.29%	4.25%
Cantonal banks	-11.10%	10.65%
Big banks	-3.12%	3.15%
Regional banks	-4.47%	2.70%
Other banks	-5.21%	5.20%

Stress test reporting by big banks to the SNB

- Quarterly reporting
- Based on stress tests run for internal purposes (no standardization with regard to scenarios, definition of exposures or methodology
- Transparency and comparability are limited
- Open issues: standardization

Regression results II: Interest rate margin

	static model		dynamic model	
	sign	signif.	sign	signif.
lagged dependent variable			+	***
Δ interest rate	-	*	-	
interest rate spread	-		+	*
ratio of savings deposits	+	*	+	
private * Δ interest rate	-	***	-	
foreign * Δ interest rate	-	***	-	
private * interest rate spread	-	***	-	***
foreign * interest rate spread	-	***	-	***

Marginal effects on interest margin in %

Δ Int. rate (+100bp): -3.5%

Regression results III: trading income

	static model		dynamic model	
	sign	signif.	sign	signif.
lagged dependent variable			+	***
Δ SPI	-	***	-	*
volatility	-		-	**
Δ interest rate	-		-	*
Δ bondspread	-	*	-	
foreign*Δ SPI	+	**	+	
foreign*volatility	+	***	+	
foreign*Δ interest rate	-	*	-	
foreign*Δ bondspread	-	***	+	

Marginal effects on trading and commission fee income in %

SPI (-10%)	Δ ir (+100bp)
-25.2%	-6.2%