Pass-through, expectations, and risks
What affects Chilean banks' interest rates?

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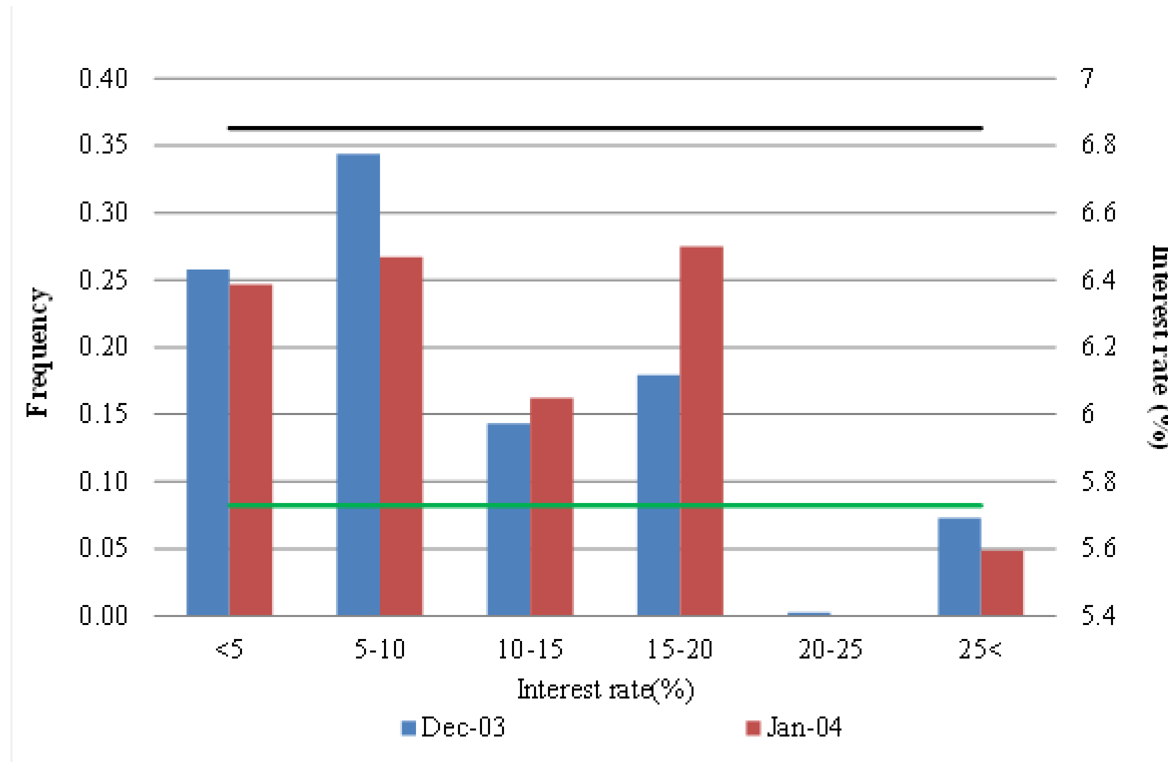
* The views and conclusions presented are my own and do not necessarily represent those of the Central Bank of Chile.

Background

- Several parameters affect the way banks set interest rates
- The literature mainly focuses on pass-through from changes in the policy rate: symmetric or not / complete or not / depends on individual bank characteristics. E.g. Gambacorta & Iannotti (2007).
- Some attention on the role of MPR expectations. E.g. Kuttner (2001), Kleimeier & Sander (2006), and Banerjee et al. (2013).
- Less focus on the effects of risks.
  - No studies on the impact of differences in client risks (related: Jiménez et al., 2014).
  - Important: Interest rates are usually measured as weighted averages -> behind the interest rate is a distribution and changes can be interpreted as changes of the risk of the client portfolio.

An illustrative example: Commercial lending rate

Histogram. Dec-03 and Jan-04



Moments of distribution

	MPR	$\bar{x}^p$	σ^{2p}	σ^{3p}	σ^{4p}
Dec. 2003	2.25	5.68	11.60	4.71	28.92
Jan. 2004	1.75	6.85	19.97	1.77	3.27

Questions of interest

RISKS:
Liquidity
Market
Credit
Interest rate

Monetary policy rate → Bank rate

Pass-through

Expectations

Symmetric?

Complete?

Outline of presentation

- Measuring risk
- The econometric model
- Data utilized in empirical analysis
  - Interest rates
  - MPR expectations
- Results of baseline analyses
- If time:
  - Characterizing the pass-through
  - The role of MPR expectations
- Summery of general results

Risk measures included in the analysis

- Liquidity risk: Risks related to the interbank market: Calculated with daily observations:
  - Variability (simple variance), diversion (max-min), and liquidity (transactions).
- Market risk: Bank system risk: Calculated with daily weighted averages:
  - Variability over the period (weighted variance).
- Credit risk: Risks related to the portfolio of clients: Calculated with daily observations from the individual banks:
  - Variability (weighted variance)
  - Client risks (weighted skewness)
  - Many clients with high / low risk (weighted kurtosis).
- Interest rate risk: General risk measures: Calculated with daily observations
  - Global: VIX (Chicago Board Options Exchange)
  - Domestic: EMBI

Econometric model: SUR

$$\underbrace{\begin{bmatrix} \Delta i_{1t} \\ \Delta i_{2t} \\ \vdots \\ \Delta i_{nt} \end{bmatrix}}_{Y_t} = \underbrace{\begin{bmatrix} (\beta_1' \quad \gamma_1') & 0 & \cdots & 0 \\ 0 & (\beta_2' \quad \gamma_2') & & \vdots \\ \vdots & & \ddots & 0 \\ 0 & \cdots & 0 & (\beta_n' \quad \gamma_n') \end{bmatrix}}_{(\beta' \quad \gamma')} \underbrace{\begin{bmatrix} (\Delta x_{1t} \quad \Delta z_t)' \\ (\Delta x_{2t} \quad \Delta z_t)' \\ \vdots \\ (\Delta x_{nt} \quad \Delta z_t)' \end{bmatrix}}_{(X_t \quad Z_t)'} + \underbrace{\begin{bmatrix} \phi_1' D_t \\ \phi_2' D_t \\ \vdots \\ \phi_n' D_t \end{bmatrix}}_{\phi' D_t} + \underbrace{\begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \vdots \\ \varepsilon_{nt} \end{bmatrix}}_{\varepsilon_t},$$

$$E\left(\varepsilon_{jt}\varepsilon_{js} \middle| X_t, Z_t\right) = 0, t \neq s \qquad E\left(\varepsilon_{jt}\varepsilon_{kt} \middle| X_t, Z_t\right) = \sigma_{jk}$$

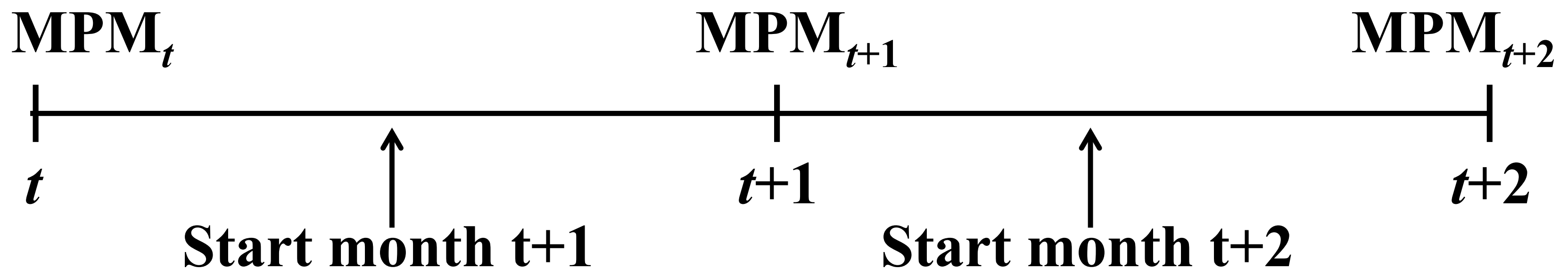
Econometric model: Variables

$$x_{jt} = \begin{bmatrix} i_{jt-1} \\ \sigma_{jt}^{2w}\left(i_{jt}^{sys}\right) \\ \sigma_{jt}^{2w}\left(i_{jt}\right) \\ \sigma_{jt}^{3w}\left(i_{jt}\right) \\ \sigma_{jt}^{4w}\left(i_{jt}\right) - 3 \end{bmatrix}, \Delta z_t = \begin{bmatrix} \Delta r_t \times I_t^1 \\ \Delta \sigma_t^2(r_t) \\ \Delta(r_t^{max} - r_t^{min}) \\ \Delta \ln(Q_t^r) \\ \Delta \ln(EMBI_t) \\ \Delta \ln(VIX_t) \\ Y_t - \bar{Y} \\ \Delta \pi_t \\ \Delta E(\pi_t) \\ \Delta \ln(FLAP_t) \\ I_t^2 \end{bmatrix}$$

$$I_t^1 = \begin{bmatrix} I(\Delta MPR_t > 0) \\ I(\Delta MPR_t < 0) \\ I(\Delta MPR_t = 0) \end{bmatrix} \quad I_t^2 = \begin{bmatrix} I(E(\Delta MPR_t) = \Delta MPR_t \neq 0) \\ I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0) \\ I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0) \\ I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0) \end{bmatrix}$$

Construction of the data set

- Data are constructed with daily observations such that the timing of the monetary policy meetings (MPM) does not matter:



- Generally, Chilean interest rates are affected by seasonality. Exceptions: Some nominal commercial rates, short-term nominal consumer and deposit rates and real mortgage rates.

Interest rates analyzed in the study (i_t)

- Real and nominal deposit and lending rates
- Nominal rates are divided among different lending horizons.

Distributions of lending and deposit rates, 2013 (%)

	Com.	Cons.	Mort.	Dep.
Nominal	78.8	99.1	0.0	74.7
Real	10.0	0.9	100.0	6.0
USD	11.1	0.1	0.0	19.2

Distribution of nominal rates amongst horizons, 2013 (%)

	Com.	Cons.
< 30 days	4.4	23.2
30 - 89 days	5.0	29.4
90 days - 1 year	29.9	36.8
1 - 3 years	26.2	3.8
> 3 years	34.4	6.7

MPR changes and expectations

Meetings and expectations (Jan-02 – Jul-14)

ΔMPR = 0	**93 (61.6%)**	
$E(\Delta MPR) = \Delta MPR$		87 (93.5%)
$E(\Delta MPR) > 0$		6 (6.5%)
ΔMPR > 0	**35 (23.2%)**	
$E(\Delta MPR) = \Delta MPR$		27 (77.1%)
$E(\Delta MPR) = 0$		4 (11.4%)
$0 < E(\Delta MPR) < \Delta MPR$		4 (11.4%)
ΔMPR < 0	**23 (15.2%)**	
$E(\Delta MPR) = \Delta MPR$		8 (34.8%)
$E(\Delta MPR) = 0$		10 (43.5%)
$0 > E(\Delta MPR) > \Delta MPR$		5 (21.7%)

Estimation Results

Dependent variable: Change in interest rate, nominal rates.

		Nominal rates		
		Com.	Cons.	Dep.
	Δi_{t-1}	-0.09**	-0.06	-0.16***
Pass-through	$\Delta r_t \times I(\Delta MPR_t > 0)$	1.28***	1.17**	1.17***
	$\Delta r_t \times I(\Delta MPR_t < 0)$	1.01***	1.63***	0.73***
	$\Delta r_t \times I(\Delta MPR_t = 0)$			0.50**
Liquidity risk	$\Delta \sigma_t^2(r_t)$			-1.71***
	$\Delta(r_t^{max} - r_t^{min})$			
	$\Delta \ln(Q_t^r)$			
Market risk	$\Delta \sigma_t^{2w}(i_t^{sys})$	0.005***		0.03***
Credit risk	$\Delta \sigma_t^{2w}(i_t)$	0.07***	0.02***	
	$\Delta \sigma_t^{3w}(i_t)$	-1.20***	-4.23***	
	$\Delta \sigma_t^{4w}(i_t) - 3$	0.10***		
	Obs.	150	150	150
	$\bar{R}^2$	0.74	0.74	0.85

Estimation Results

Dependent variable: Change in interest rate, nominal rates (cont.)

		Nominal rates		
		Com.	Cons.	Dep.
Interest rate risk	$\Delta \ln(EMBI_t)$			0.29^{**}
	$\Delta \ln(VIX_t)$		1.27^{***}	-0.22^{**}
Macro	$Y_t - \bar{Y}_t$			
	$\Delta \pi_t$			
	$\Delta E(\pi_t)$			
Unc. Monetary policy	$\Delta \ln(FLAP_t)$			
Expectations	$I(E(\Delta MPR_t) = \Delta MPR_t \neq 0)$			
	$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$			
	$I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$			-0.11^{**}
	$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0)$	0.30^{***}		
	Obs.	150	150	150
	$\bar{R}^2$	0.74	0.74	0.85

Estimation Results

Dependent variable: Change in interest rate, real rates.

		Real rates		
		Com.	Cons.	Dep.
	Δi_{t-1}	-0.02	0.28***	0.39**
Pass-through	$\Delta r_t \times I(\Delta MPR_t > 0)$	0.29	-0.06	0.35
	$\Delta r_t \times I(\Delta MPR_t < 0)$	0.49***	0.25***	0.24
	$\Delta r_t \times I(\Delta MPR_t = 0)$		0.54***	
Liquidity risk	$\Delta \sigma_t^2(r_t)$	-3.77***		10.37***
	$\Delta(r_t^{max} - r_t^{min})$		-0.37**	
	$\Delta \ln(Q_t^r)$	0.37***		0.29***
Market risk	$\Delta \sigma_t^{2w}(i_t^{sys})$	0.08***		0.36***
Credit risk	$\Delta \sigma_t^{2w}(i_t)$	-0.13***	-0.15***	
	$\Delta \sigma_t^{3w}(i_t)$	-0.16***	-0.02**	
	$\Delta \sigma_t^{4w}(i_t) - 3$			
	Obs.	150	149	150
	$\bar{R}^2$	0.69	0.83	0.75

Estimation Results

Dependent variable: Change in interest rate, real rates (cont.).

		Real rates		
		Com.	Cons.	Dep.
Interest rate risk	$\Delta \ln(EMBI_t)$			
	$\Delta \ln(VIX_t)$			
Macro	$Y_t - \bar{Y}_t$			
	$\Delta \pi_t$	-0.13**		-0.32***
	$\Delta E(\pi_t)$	-0.48***	0.10**	
Unc. Monetary Policy	$\Delta \ln(FLAP_t)$	-0.89***		
Expectations	$I(E(\Delta MPR_t) = \Delta MPR_t \neq 0)$		0.09***	
	$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$		0.13**	
	$I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$		0.09***	
	$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0)$			
	Obs.	150	149	150
	$\bar{R}^2$	0.67	0.83	0.75

Nominal lending rates with different maturities

- Commercial rates:
  - Increased liquidity and market risks: Banks prefer loans with long horizon.
  - Credit risk: Higher impact on loans with long maturities.
- Consumer rates:
  - Liquidity risk: Affects rates of long-term loans.
  - Increased market risk: Preferences towards short-term loans.
  - Credit risk: Higher impact on loans with long maturities.
  - Higher inflation affects long-term rates positively.
  - MPR expectations affect rates of long-term loans.

Characterizing the pass-through (PT)

- Nominal rates:
  - Commercial: PT symmetric and instantaneous complete for all loans of all but one horizon (1-3M).
  - Consumer: PT symmetric and instantaneous complete for loans with maturities shorter than one year.
  - Deposits: MPR hikes have higher impact than decreases.
- Real rates:
  - Commercial loans and deposits: PT symmetric.
  - Mortgage loans: MPR decreases have higher impact than increases.

Do MPR expectations matter?

- Generally expectations do *not* matter. Important exceptions:
  - Mortgage rates: MPR increases have higher impact when larger than expected.
  - Nominal commercial loans:
    - 1-3Y: Effect of a MPR decrease larger when it is a surprise.
    - 3M – 1Y: Expected increases which are not met affect rates.
  - Consumer loans:
    - Up till 1Y: Higher than expected MPR decreases do not affect rates (effect of MP during the financial crises).

Summary: What affects Chilean bank´s interest rates?

- MPR changes: Symmetric and often instantaneous complete pass-through to nominal lending rates
- Market risk and to some extent liquidity risk. The impact of interest rate risk seems to be rather limited.
- Credit risk seems to be quite important.
- Changes in inflation rates affect real rates of commercial loans and deposits as well as nominal rates of consumer loans with long maturities. Inflation expectations affect mainly real lending rates.
- With some exceptions, MPR expectations have no strong impact on bank rates.