Pass-through, expectations, and risks.
What affect Chilean banks´ interest rates?

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Abstract

The analysis in this paper is focused on how pass-through of changes in the monetary policy rate (MPR), expectations to MPR changes, and different measures of risks affect banks' interest rates. Several bank rates are considered, nominal as well as real, rates for lending as well as deposit, and nominal rates are separated among different horizons for loans and deposits. A number of measures of risk are constructed and incorporated in the analysis to take into account credit risk, market risk, liquidity risk and interest rate risk

Evidence suggests that for the majority of the nominal rates, the pass-through of MPR changes is symmetric and instantaneous complete, while it is symmetric but generally not instantaneous complete for real rates. Liquidity risks seem to matter somewhat for changes in banks' interest rates, but market risk is more important. Credit risk is essential for explaining changes in interest rates, while the impact of interest rate risk and macroeconomic variables is rather limited. Surprises with respect to policy changes matters for some rates, but generally the impact is limited suggesting that banks do not alter rates based on MPR expectations.

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1. Introduction

Several parameters affect the way retail banks fix interest rates. The present analysis focuses on how risks affect interest rate determination when allowing for possible seasonality, asymmetric pass-through of changes in the policy rate, and that expectations to policy changes may or may not be met. The investigation is made with nominal and real interest rates of loans (consumer and commercial) and deposits, and nominal rates are also analyzed with respect to different lending / deposit horizons. Distinguishing between real and nominal rates and different horizons may reveal information about retail banks' behavior and preferences when confronting different kinds of risks. In this context it is important to note that in Chile real interest rates are applied in a lot of banking operations.

In a nutshell the study seeks answers to numerous questions regarding what affects bank interest rates in Chile: Is the monetary pass-through symmetric? Is it complete? Does risk associated with the interbank market (liquidity risk) affect interest rates? What is the impact of inter-monthly variations (market risk) in the banking rates? How do changes of client risk (credit risk) between months move interest rates? Is there an impact from general global and local risk measures (interest rate risk)? Does it matter if policy expectations are met or not? Are rates affected by seasonality?[1] Do different risk measures affect nominal and real rates? Are rates of different lending / deposit horizons affected differently? In this context, the paper in hand investigates risks related to funding costs as well as those related to the evaluation of customers.

While numerous scholars have addressed the issues of monetary pass-through[2] and policy expectations,[3] few studies are focused on the effect of risk measures on interest rates. An

[1] Murfin and Petersen (2014) argue that commercial lending rates in the US are affected by seasonality.

[2] While several early studies find evidence in favor of asymmetric interest pass-through (e.g. Hannan and Berger (1991) and Lim (2001)), results of investigations applying more recent samples are less conclusive (e.g. Gambacorta and Iannotti (2007)). With Chilean data from 1993 to 2002, Espinosa-Vega and Rebucci (2004) find that pass-through is faster in Chile than in other countries and incomplete in the long run. They find no evidence of asymmetric behavior.

[3] Kuttner (2001) finds that US bond rates react little to expected changes in the Fed funds, while unanticipated movements have large effects.

exception is Becerra et al. (2010) that find that lack of pass-through in Chile in times of financial turbulence can be explained by higher domestic and international risk. To the knowledge of the author, no investigations exist on the effect of changes in client (credit) risk and only few studies distinguish between different lending and deposit horizons.[4] Besides exploring the impact of pass-through and expectations, the present paper contributes to the literature on determination of banks' interest rates by introducing ways to measure related risks, particularly those concerning credit, and evaluating how they affect bank rates. The results show that, with some exceptions, the pass-through of monetary policy rate (MPR) changes to nominal rates in Chile is symmetric and instantaneous complete. For real rates it is also symmetric, but generally not instantaneous complete. Risks related to liquidity (the interbank market) matter somewhat for changes in banks' interest rates, while evidence suggests that market risk (risk related to the bank system) is more important. Credit risk (changes in portfolios of clients) is important for explaining changes in the banks' interest rates, while the significance of interest rate risk and macroeconomic variables is rather limited. The unconventional monetary policy conducted in Chile in 2009-10 had effect on some of the rates included in the study, but the majority seems to be unaffected, when this effect is measured directly. Finally, surprises with respect to policy changes matter for some rates, but generally the impact is limited.

The next section discusses ways to measure different types of risks empirically, which to the knowledge of the author has not been applied in related studies. Section 3 presents the econometric model employed in the empirical analysis and provides a detailed discussion of the data utilized, while section 4 reports the results of the empirical analysis. The last section of the paper offers some concluding remarks.

2. Measuring risks

This section discusses the measures of risk included in the analysis. After a general discussion of the measures included (see Freixas and Rochet, 2008), the first subsection describes risk measures related to the portfolio of clients, the so-called credit risk. The

[4] Luttini and Pedersen (2015) find that Chilean interest rates of short-term commercial loans react quite fast to changes in the policy rate, while those of the long run seem to react more to inflation.

second reveals how other types of risks are measured, i.e. market risk, liquidity risk, and interest rate risks, while the third section presents the correlation of the calculated measures.

Credit risk refers to the fact that banks have to evaluate the probability of default of a client when fixing the price of the loan. A theoretical example is the classical model of Merton (1974), which applies options to price default risk. As described in subsection 2.1 this is evaluated using higher order moments of the distribution of the interest rate. Market risk has to do with the fact that market prices are affected by volatility. Theoretically this has been described in articles such as Markowitz (1952), Lintner (1965) and Sharp (1965) that discuss how to optimally select a portfolio of risky assets. Liquidity risk refers to risks linked to the banks' management of the funds and, hence, the administration of their stock. A theoretical setup for this kind of risk is supplied by e.g. Ho and Sanders (1981), who present a model where the bank acts as intermediary between demanders and suppliers of funds. The main part of banks´ liquidity is provided via the interbank market, and, hence, characteristics of this market are utilized to approximate the liquidity risk facing bank when supplying loans and fixing returns of deposits. Finally, interest rate risk is related to the fact that general fluctuations in the interest rate directly affect the banks' income (and balance sheet) and, hence, has to do with the term structure of interest rates. The classical paper of Cox et al. (1985) supplies a theory of the term structure of interest rates applying an intertemporal general equilibrium model of asset pricing. In the present context, risks related to general interest rate fluctuations are measured by an international measure of financial market risk and a national country risk measure.

2.1. Credit risk

Bank interest rates (i_t) are usually reported as weighted averages where the interest rate of each bank operation is weighted by the amount. Hence, behind each published interest rate there is a distribution of rates and higher moments of this distribution can be utilized to evaluate changes of risk segments. Figure 1 shows an example of how changes in the distribution may affect a given rate and, hence, distort the evaluation of monetary pass-through. The illustration is made with rates of commercial loans the months of December 2003 and January 2004, where the MPR was lowered from 2.25% to 1.75%, while the commercial rate increased from 5.68% to 6.85%. This hike was caused by a change in the distribution to clients with higher credit risk that were charged higher rates.

[Figure 1]

The weighted moments of the distributions are reported in table 1. The change in the distribution was revealed in all moments, higher variance, less positive skewness (movement to the right) and lower kurtosis. The change of the skewness reflects that clients with higher risk obtained loans in January 2004.

[Table 1]

As illustrated in the example, looking at higher moments of the interest rate distribution may help to understand to what extent changes of the interest rate are due to changes of the risk segments of bank customers. In the present analysis the second, third and fourth moments of the distribution are taking into account. The second moment (variance, $\sigma_t^{2w}(i_t)$) tells something about differences of risk segments a given month, the higher the variance the more variation amongst clients. The third moment (skewness, $\sigma_t^{3w}(i_t)$) shows if the distribution leans towards loans with low or high risk costumers, positive (negative) skewness implies a larger part of low-risk (high-risk) clients, while the fourth moment (kurtosis, $\sigma_t^{4w}(i_t)$) indicates if loans or deposits of a particular months are particularly influenced by clients with low and high risk profiles. Kurtosis is normalized to that of the normal distribution such that it is positive (negative) if there are few (many) clients with high and low risks.

2.2. Other measures of risk

Market risk is measured by the variability in the bank system, i.e. how much the daily average rate varies over the period. The weighted variance ($\sigma_t^{2w}(i_t^{sys})$) is utilized to measure the variability.

Interbank rates (r_t) are applied to measure liquidity risk. Three measures are calculated: variance over the period ($\sigma_t^2(r_t)$) to quantify the general variability in the market, difference between maximum and minimum rates ($r_t^{max} - r_t^{min}$) to capture the spread of interbank market operations, and transactions (Q_t^r) as a measure of how liquid the interbank market is at a given time.

Interest rate risk is captured by two general measures of market risk. Global risk is approximated by the VIX, while domestic risk is measured by the EMBI. Further details are supplied in the data description section.

2.3. Are risk measures correlated?

One can think of several situations where some measures of risk are correlated. Some relates to the same kind of risk, e.g. correlation of the variance and the max-min measure of the interbank market, but also across measures may there be correlations. An example could be that higher domestic risk could be correlated with less transaction in the interbank market. Such correlations imply multicollinearity in regression. The correlation matrix of the risk measure is (total commercial rates used for credit and market risks):

	Liquidity risk			Market risk	Credit risk			Interest rate risk	
	$\Delta\sigma_t^2(r_t)$	$\Delta(r_t^{max} - r_t^{min})$	$\Delta\ln(Q_t^r)$	$\Delta\sigma_t^{2w}(i_t^{sys})$	$\Delta\sigma_t^{2w}(i_t)$	$\Delta\sigma_t^{3w}(i_t)$	$\Delta\sigma_t^{4w}(i_t) - 3$	$\Delta\ln(EMBI_t)$	$\Delta\ln(VIX_t)$
$\Delta\sigma_t^2(r_t)$	1.00								
$\Delta(r_t^{max} - r_t^{min})$	0.14	1.00							
$\Delta\ln(Q_t^r)$	-0.07	0.12	1.00						
$\Delta\sigma_t^{2w}(i_t^{sys})$	-0.23	-0.04	-0.04	1.00					
$\Delta\sigma_t^{2w}(i_t)$	-0.13	0.03	0.02	0.30	1.00				
$\Delta\sigma_t^{3w}(i_t)$	0.17	-0.05	-0.13	-0.03	-0.19	1.00			
$\Delta\sigma_t^{4w}(i_t) - 3$	0.16	-0.03	-0.13	-0.04	-0.33	0.94	1.00		
$\Delta\ln(EMBI_t)$	-0.07	-0.01	-0.12	0.15	0.02	-0.04	-0.02	1.00	
$\Delta\ln(VIX_t)$	-0.14	0.05	-0.04	0.31	0.08	-0.17	-0.12	0.55	1.00

Generally the correlations among the different risk measures are small, but for the total commercial rates, the coefficient between the skewness and kurtosis is quite large (more than 0.9). This is also the case for short-term commercial loan and the correlation between market risk and the variance measure of credit risk for short-term consumer loans and long-term deposits is also above 0.9.

3. Econometric model and discussion of data

This section describes firstly the econometric model applied in the empirical analysis and, secondly, the data utilized. The second subsection is divided in two parts where the first discusses the interest rate data and related risk measures (liquidity, market, and credit), while the second describes the macroeconomic variables and the measures related to interest rate risk. The interest rate section also includes a brief discussion of the Chilean banking sector.

3.1. The econometric model

The statistical model takes into account several possible characteristics of the pass-through from the MPR to bank rates. Firstly, it may be asymmetric such that hikes in the policy rate affect bank rates with different impact than decreases. Also it is considered that noise in the interbank market may affect bank rates when there are no changes in the policy rate. Secondly, as discussed in section 2, several measures of risks are included in the model to evaluate to what extent banks' rates are affected by them. Thirdly, the model controls for effects of the macroeconomic environment, and finally, expectations to policy changes are taking into account.

The econometric model is:

$$\Delta i_t = \beta_0 \Delta i_{t-1} + \beta_1' I_{1t} \Delta r_t + \beta_2' \Delta x_t + \beta_3' \Delta y_t + \beta_4' \Delta z_t + \beta_5' I_{2t} + \beta_6' c_t + \varepsilon_t, \qquad (1)$$

where i_t is the interest rate (weighted average) fixed by banks of either loans or deposits, r_t is the interbank bank rate (average), x_t includes liquidity risk variables, y_t contains variables associated market and credit risk, z_t has interest rate risk measures and macroeconomic variables, I_{jt} (j = 1,2) includes indicator functions associated with changes in the monetary policy and expectations of changes, while c_t is the constant terms of the model, i.e. a constant, seasonal dummies and dummies for outliers. The error term is normal distributed with mean zero and variance Ω.

The vector I_{1t} includes three indicator functions, which takes the value 1 if the condition in the parenthesis is fulfilled and 0 otherwise:

$$I_{1t} = \begin{bmatrix} I(\Delta MPR_t > 0) \\ I(\Delta MPR_t < 0) \\ I(\Delta MPR_t = 0) \end{bmatrix}.$$

The vectors x_t, y_t, and z_t contain the following variables:

$$x_t = \begin{bmatrix} \sigma_t^2(r_t) \\ r_t^{max} - r_t^{min} \\ \ln(Q_t^r) \end{bmatrix}, y_t = \begin{bmatrix} \sigma_t^{2w}(i_t^{sys}) \\ \sigma_t^{2w}(i_t) \\ \sigma_t^{3w}(i_t) \\ \sigma_t^{4w}(i_t) - 3 \end{bmatrix}, \Delta z_t = \begin{bmatrix} \Delta \ln(EMBI_t) \\ \Delta \ln(VIX_t) \\ Y_t - \bar{Y} \\ \Delta \pi_t \\ \Delta \ln(FLAP_t) \end{bmatrix},$$

i.e. x_t includes monthly variance of daily interbank rates, difference between monthly average of maximum and minimum interbank rates, and logarithm of average daily transactions in the interbank market. The first variable in y_t is the weighted variance of daily bank interest rates (weighted average) measuring general variability a given period of time. The following three variable are weighted variance, weighted skewness and weighted excess kurtosis calculated with daily data from banks which had operations that day. The third vector includes change in national risk, measured by EMBI (Emerging Market Bond Index), change in global risk, measured by VIX (Chicago Board Options Exchange Market Volatility Index), state of the business cycle, change in annual inflation rate, and change in the unconventional monetary policy measure, which is named FLAP for its abbreviation in Spanish.[5]

The vector I_{2t} contains indicator functions with value 1 if the condition in the parenthesis is fulfilled and 0 otherwise. It includes four functions related to MPR expectations: expected change, change different from expected, non-expected change, and no change when expected:

[5] **F**acilidad de **l**iquidez **a** **p**lazo.

$$I_{2t} = \begin{bmatrix} I(E(\Delta MPR_t) = \Delta MPR_t \neq 0) \\ I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0) \\ I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0) \\ I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0) \end{bmatrix}.$$

3.2. Data description

3.2.1. Interest rates and risk measures

The source of the interest rate data utilized is Central Bank of Chile (CBC). Monthly data are constructed with daily observations from each bank that a given month has had operations in a given lending / deposit segment. To avoid possible distortions from the fact that monetary policy meetings (MPM) are not held the same day each month[6], observations are constructed such that they include data for between MPM periods, i.e. the first daily observation used to calculate data for month *t* is the day after the MPM in month *t* and the last observation is the day of the MPM in month *t*+1. To eliminate effects of potential outliers, 2.5% of the tails are trimmed and when available, data from January 2002 to July 2014 are used in the empirical analysis.

The analysis is focused on loans and deposits in Chilean pesos (CLP) with nominal and real interest rates, where loans are separated by type: consumer, commercial and mortgage. As shown in table 2, the main part of the lending activity and deposits with nominal interest rates are in private banks, while the state-owned bank accounts for one third of deposits with real interest rate. With respect to the lending market, table 3 shows that the main part of consumer and commercial loans has nominal interest rate, while mortgage loans are with real rates. Real interest rate commercial loans are often real estate, e.g. a building or an office, but if a natural person buys land, this is also characterized as a commercial loan. Three quarters of deposits yield a nominal rate in CLP, while the share with real rate is substantial smaller.

[Table 2]

[Table 3]

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[6] During the period analyzed the earliest MPM was held the 4th day of the month and the latest the 19th.

Loans and deposits with nominal rates are also analyzed for different horizons. For loans this separation may be important as loans with different horizons differ with respect to the components they contain, as shown in table 4. While rates of amortizing loans supposedly are quite flexible as they are negotiated at the time of taking the loan, rates of overdrafts are often fixed by contracts and are typically renegotiated rarely. For this reason, a priori it may be expected that pass-through of MPR is less for short-horizon loans, more so for consumer loans because of the weights and because firms probably have higher negotiation power than natural persons. As reported in table 5, the main part of consumer loans has relatively short horizon, while commercial loans are mainly medium-to-long-termed. Deposits are relatively short-termed.

[Table 4]

[Table 5]

As interest rates are calculated as weighted averages, the second, third and fourth moments, used as measures of changes in credit risks, as explained in section 2, are also weighted with the amounts of the operations. Daily observations from each bank are applied to calculate the moments. As a measure of market risk, the variation of daily bank interest rates is calculated. More precisely, this risk is calculated as the weighted variance of daily interest rates of operations the period between MPMs. Hence, higher variability indicates higher risk a given month.

To estimate pass-through coefficients, interbank rates are utilized as they are quite close to the MPR. To allow for possible asymmetric pass-through, a separation is made between interbank rate changes when MPR increases and when it decreases. Also the situation where MPR is unchanged is included to evaluate to what extend noise in the interbank market affects changes of banks' interest rates. Three liquidity risk measures are included in the analysis: variance of the interbank rate during the period, difference between maximum and minimum rates, and amount of operations in the interbank market.

Measures of MPR expectations are included to analyze if surprises affect how banks fix interest rates. Expectations (median) are extracted from the Economic Expectations Survey published monthly by the CBC. As described in subsection 3.1 four dummy type variables are included in the analysis. As shown in table 6, during the period considered the CBC has changed the MPR 58 times, 35 hikes and 23 reductions. Of the 93 times the CBC maintained the policy rate, the market expected hikes six times. When policy was contractive it was usually expected by the private forecaster, but they were surprised four times and other four times the change was larger than expected. Expansive policy, on the other hand, often surprised the forecasters, ten of the 23 times the policy rate was reduced. About one third of the times it was in line with expectations and five times the policy was more expansive than expected.

[Table 6]

3.2.2. Macroeconomic variables and interest rate risk measures

Two macroeconomic variables are included in the investigation, the business cycle and changes in the inflation rate. Both series are from the CBC and the business cycle is calculated with the monthly indicator of economic activity (IMACEC) applying a Hodrick-Prescott filter with data from January 1986 to September 2014. To account for the unconventional monetary policy conducted in 2009-10, the so-called term liquidity facility (FLAP) is included. This series includes observations from July 2009 to May 2010 and measures outstanding stock in millions of CLP. Daily observations are extracted from CBC and used to calculate between MPM monthly averages of which changes of logarithms are included in the econometric model.

One global risk measure and one local one are also included in the models to account for interest rate risk. The global measure is VIX of the Chicago Board Options Exchange extracted from its web page, while the local measure is EMBI Chile from CBC. Daily observations are utilized and the data included in the estimations are changes of the logarithm of monthly averages for the between MPM periods.

4. Empirical analysis

This section presents the results of the empirical analysis. A general-to-specific approach is applied and only the most parsimonious models are presented. Intermediate results are available upon request. First results for total interest rates are presented followed by a discussion of how these results change if different lending and deposit horizons are taking into account. Subsection 4.3 discusses if the monetary path-through is asymmetric, while the fourth subsection are focused on whether or not expectations to monetary policy matters for changes of banks' interest rates.

Details on specifications of the models estimated are presented in appendix A. The tables show the dummies included in each of the models as well as outcomes of tests on the residuals. Finally the tables reveal tests for inclusions of seasonal dummies in each of the models. Considering the total rates, evidence suggests that all but nominal commercial and mortgage loans are affected by seasonality. When looking at different horizons, however, it appears that medium- and long-term nominal commercial rates do have a seasonal pattern. On the other hand, no strong evidence indicates that short-term consumer rate are affected by seasonality, which is probably because they generally are more rigid, as discussed in subsection 3.2.1. Except for those of the short term, deposit rates seem to have seasonality. In conclusion, generally it cannot be rejected that Chilean interest rates are affected by seasonality.

4.1. Results for overall interest rates

Estimation results for total nominal and real rates are reported in table 7. The general measure of domestic risk does not impact changes in bank rates, while global risk seems to affect consumption rates positively, such that changes are larger when global risk increases. Uncertainty in the interbank market (liquidity risk) affects all rates but those of nominal deposits. The higher the variability, the higher nominal rates on commercial and consumer loans, while changes in real commercial and mortgage rates are affected negatively, which may imply that banks prefer to give loans with real rates when faced by increased liquidity risk. It appears that banks also prefer deposits with real rates as they increase more when there is more variability in interbank market rates. With respect to interbank market transactions, less risk (higher amounts of transactions) increases real rates of commercial loans and deposits.

[Table 7]

Market risk affects rates of commercial loans and deposits positively except in the case of real deposit rates implying that banks prefer to pay nominal rates on deposits when this type of risk increases. Credit risks seem to have impact on lending rates only. When the variability of clients increases, banks prefer to supply loans with real rates, while changes towards less risky client decreases rates on commercial loans (nominal and real) and nominal consumer loans. Higher kurtosis increases rates on commercial loans with nominal rates.[7]

No strong evidence suggests that the state of the business cycle affects neither lending nor deposit rates, while changes in inflation affects real rates of commercial loans and deposits negatively. Hence, banks seem to prefer nominal deposits and real loans when inflation increases. The more the FLAP facility was used, the lower the rate on commercial loans but it was higher for consumer loans. This may reflect the preferences of banks during the period of uncertainty where the FLAP was offered by the CBC.

Real lending rates increase when the central bank does not deliver an expected hike. An interpretation could be that banks expect an even higher increase next time the CBC changes the policy rate or it may be because of higher uncertainty of future policy moves. They role of expectations is explored in greater details in subsection 4.4. When no policy change occurs as expected, mortgage rates tend to increase a bit, which is probably a reflection of the sample employed.

4.2. Results for different lending and deposit horizons

This subsection reports the results for different lending and deposit horizons. First the results for nominal commercial lending rates are supplied followed by consumer rates and, finally, deposit rates. Focus is exclusively on nominal rates.

4.2.1. Commercial lending rates

As shown in table 8, there is some heterogeneity among interest rates of commercial loans with different horizons. Rates of loans with horizons over one month tend to have some

[7] When excluding kurtosis, the coefficient of the correlated skewness measure increases but remains statistically significantly negative. The same happens for the short-term rate in subsection 4.2.1.

negative persistence such that a positive change is followed by a (smaller) negative one and vice versa. With respect to liquidity risk, variability in interbank rates affects medium-term rates positively, while the spread of interbank rates influences long-term rate changes negatively. Higher market risk has negative impact on rates of three of the horizons in contrast with the positive impact found for the total rate.

[Table 8]

Credit risks seem to be important for commercial rates and, in accordance with what were found for the total rate, higher variability of clients and more tail clients (low and high risk clients) imply higher commercial rates for all horizons. As expected, changes towards more risky clients imply higher rates, more so for longer term rates.

Regarding interest rate risk, changes in the general level of domestic risk (the EMBI) implies higher rates for lending horizons less than three months, inflation changes impact medium-term rates positively, while the FLAP facility resulted in lower medium-to-long-term rates. Generally, commercial rates are not affected by fulfilment of expectation even though one-to-three years rates are affected negatively when the policy change is stronger than anticipated and three-to-twelve month rates are influenced positively by an unexpected hike.

4.2.2. Consumer rates

The estimations for rates of consumer loans divided by lending horizons are shown in table 9. Higher uncertainty at the interbank market (liquidity risk) has positive impact on medium-term rates, while an increase in transactions have positive impact on one-to-three month rates. Contrary to the results for the total consumer rate, market risk affects rates of four of the five horizons evaluated. Uncertainty in bank rates affects those for lending horizons less than three months negatively and rates for horizons between three and 36 months positively.

[Table 9]

Particularly changes in credit risk related to the skewness of the distribution influence consumer rates, the only exception is those of the short run. The signs of the coefficients are negative as expected, except for long-term loan, where the coefficient is positive but small. Variance and kurtosis changes have positive impact on one-to-three year rates, while the latter also affects long-term rates, although negatively.

Increases in global and domestic risks affect rates of some of the horizons positively and, as in the case of the total consumer rate, the state of the business cycle does not impact consumer rates and neither did the FLAP facility, even though a positive impact was found for the total rate. Inflation changes have positive impact on rates of loans with maturity longer than one year.

Whether or not MPR expectations are met seems to have some impact on consumer rates. There is a positive impact for horizons less than three months, while policy surprises when no change is expected or an expected change is not fulfilled have positive impact on medium- and long-term lending rates.

4.2.3. Deposit rates

Table 10 reports the results for deposit rates with different horizons. Risks related to liquidity markets seem to affect rates of deposits with horizons longer than a year positively, while the variability of interbank rates has negative impact on rates of the three-to-twelve month horizon. Market risk affects rates of deposits with horizons between one and twelve months, while (negative) credit risks seem to have limited effect on deposit rates, though changes in risk segments have positive (negative) impact on rates with horizon less than one month (between three and twelve months) and kurtosis affects long-term rates positively, but with a very small coefficient.

[Table 10]

State of the business cycle has negative impact on short-term deposit rates, while inflation changes have positive impact on deposits for more than three months. MPR expectations seem to have limited impact on deposit rate, though some surprises have negative influence on rates with horizons longer than three months.

4.3. Characterizing the pass-through

This subsection takes a closer look at the pass-through of changes of the MPR. The first question asked is if pass-through is instantaneous complete and symmetric. Using the model (1), the hypothesis is formulated as H_0: $\beta_{1,1} = \beta_{1,2} = 1$, where $\beta_{1,i}$ is the *i*'th element of the vector β_1. If this hypothesis is rejected, it is investigated if (i) pass-through is symmetric (H_0: $\beta_{1,1} = \beta_{1,2}$), (ii) if pass-through is instantaneous complete when the MPR increases (H_0: $\beta_{1,1} = 1$), and (iii) if pass-through is instantaneous complete when the MPR decreases (H_0: $\beta_{1,2} = 1$). Results are presented in tables 11 to 14.

[Table 11]

[Table 12]

[Table 13]

[Table 14]

For nominal commercial rates it cannot be rejected that pass-through is instantaneous complete and symmetric for neither for the total rate nor for any of the horizons. Total nominal consumer rates may have symmetric pass-through, but it cannot be rejected that it is more than complete when the MPR decreases. The same results are obtained for the one-to-three year horizon whereas it seems that pass-through is symmetric and complete for the other horizons. No strong evidence suggests that the pass-through to total nominal deposit rates is symmetric and it seems to be complete when policy is contractionary. It appears to be symmetric for short- and long-term deposits, but more than complete in the first case and less than complete in the latter. For the two last horizons the estimated coefficients indicate that pass-through it is more than complete when MPR increases and less so when it decreases.

Pass-through to real rates seems to be symmetric but not instantaneous complete except in the case of MPR hikes and deposit rates. Hence, the conclusion from this analysis is that pass-through seems to be symmetric and instantaneous complete for the main part of the nominal lending rates, symmetric but not complete for short- and long-term deposit rates as well as for the real rates included in the analysis.

4.4. Do policy expectations matter?

No strong evidence from the baseline analysis suggested that expectations to monetary policy are important for interest rate changes. In this subsection this issues is studied in greater details as expectations are interacted directly with changes of the interbank rate. As shown in table 6 this implies in some cases very few available observations and, thus, a small sample caveat is in place for this analysis.

The general econometric model applied for this analysis is

$$\Delta i_t = \beta_0 \Delta i_{t-1} + \beta_1' vec(I_{2t} I_{1t}') \Delta r_t + \beta_2' \Delta x_t + \beta_3' \Delta y_t + \beta_4' \Delta z_t + \beta_5' c_t + \varepsilon_t, \qquad (2)$$

where some of the elements in $vec(I_{2t} I_{1t}')$ by construction are zero. Hence, model (2) includes eight different situations: (i) expected MPR increase, (ii) higher than expected increase, (iii) unexpected increase, (iv) expected MPR decrease, (v) higher than expected decrease, (vi) unexpected decrease, (vii) expected maintenance, and (viii) maintenance where an increase was expected. Thus, all the situations which have occurred during the period analyzed, according to table 6, are included in the analysis.

Results for total rates are presented in table 15, while tables 16 to 18 report results for different horizons. For the total rates, only in one case is the hypothesis of equal pass-through rejected: changes in interbank rates have higher pass-through to nominal commercial rates when the central bank does not meet an expected expansive movement. This indicates that Chilean banks usually do not change rates due to expectations but rather wait until the central bank moves the policy rate.

[Table 15]

[Table 16]

[Table 17]

[Table 18]

When looking at different horizons it is interesting to note that in the main part of the cases expectations do not matter, but there are some exceptions. Long-term commercial rates react strongly when the central bank increases the rate unexpectedly. Medium-to-long term rates react when the MPR is lowered unexpectedly or when an expected lowering is not met. In the latter case also the medium-term rates react.

For consumer rates the picture is different. When MPR is lowered, short-term rates react statistically significantly only when it is expected, while medium-term rates react significantly in all but one case, i.e. when the decrease is lower than expected. When MPR rises, medium term rates react significantly only when the hike is larger than expected.

Short-term deposit rates react differently when monetary policy is expansive, while one-to-three month rates change more when an expected easing is not fulfilled. The overall conclusion is that while some nominal commercial lending rates react quite strongly to surprises, generally the impact of unexpected policy moves is limited.

5. Conclusion

The present paper presented an analysis applying intra-policy-meting observations computed with daily data. Based on theoretical contributions, several empirical measures of risk were introduced and constructed for use in the analysis. Hence, liquidity, market, credit, and interest rate risks were considered as potential important variables for banks when they fix interest rates. Finally, possible asymmetric monetary policy rate pass-through and the role of policy expectation were also considered as possibly essential parameters for banks when setting their rates. Both nominal and real rates were analyzed and the first mentioned were also investigated with respect to different lending and deposit horizons.

The main results of the empirical analysis are presented in table 19. While there are some exceptions, for the majority of the nominal rates considered pass-through of the MPR is symmetric and instantaneous complete. To real rates the pass-through is symmetric, but commonly not complete. Generally speaking, liquidity risk matters somewhat for changes in banks' interest rates, but market risk seems to be more important. Credit risk is important parameters explaining changes in interest rates, while the importance of interest rate risk and macroeconomic variables is rather limited. The unconventional monetary policy conducted in 2009-10 affected some rates directly, but the majority of the ones considered in the present study seem to be were unaffected. Finally, surprises with respect to policy changes matters for some rates, but generally the impact is limited, suggesting that banks do not alter rates because of MPR expectations.

[Table 19]

Understanding how banks set interest rates is important for understanding the functioning of the monetary transmission mechanism. This study shed some light on this issue and introduced variables which should be taking into account when evaluating the interest rate pass-through. In this sense, the results presented may be of interest to policy makers when evaluating the impact of policy rate changes as well as changes in different measures of risk.

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Appendix A: Model Specifications

[Table A1]

[Table A2]

[Table A3]

[Table A4]

Tables

Table 1. Changes in interest rate distribution

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

Source: Author´s elaboration with data from Central Bank of Chile.
Note: Total commercial interest rate. The third to sixth column show the first four weighted moments of the distribution.

Table 2. Structure of the Chilean financial system (2013)

		Nominal interest rate		Real interest rate	
	Number	% loans	% deposits	% loans	% deposits
Foreign Banks	14	44.6	49.9	37.9	30.6
Local private Banks	10	50.7	43.1	53.0	35.2
State-owned bank	1	4.7	7.0	9.2	34.2

Source: Author´s elaboration with data from Central Bank of Chile.

Table 3. Structures of the Chilean lending and deposit markets (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

Source: Author´s elaboration with data from Central Bank of Chile.
Notes: Com: Commercial loans, Cons: Consumer loans, Mort: Mortgage loans, Dep: Deposits. Nominal (Real): Loans and deposits in CLP with nominal (real) interest rate. USD: Loans and deposits in USD.

Table 4. Distribution of commercial and consumption interest rates (%)

Commercial rates

Chile	IFRS		< 1M	1-3M	3-12M	1-3Y	>3Y
1105	1302.1.01	Amortizing loan	68.1	53.1	40.5	38.2	59.8
1145	1302.3	Approved overdraft current account	9.4	4.8	55.3	60.2	32.1
1150	1302.9.02	Approved overdraft other accounts and credit cards	3.6	0.0	3.8	0.1	0.0
1155	1302.9.01	Non-approved overdraft current account	18.9	41.9	0.0	0.0	0.0
1160	1302.9.11	Credit card purchases paid in fees	0.0	0.1	0.3	0.1	0.1
1165	1302.9.12	Revolving credit card debt	0.0	0.1	0.0	1.4	8.0

Consumption rates

Chile	IFRS		< 1M	1-3M	3-12M	1-3Y	>3Y
1205	1305.1	Amortizing loan	2.1	11.0	7.7	25.7	37.8
1210	1305.9.81	Credit paid in fees via paycheck	0.0	0.0	0.2	1.5	3.3
1220	1305.3	Approved overdraft current account	6.1	14.8	52.3	26.1	8.5
1225	1305.9.01	Approved overdraft other accounts and credit cards	21.9	0.1	5.1	1.8	0.0
1230	1305.9.01	Non-approved overdraft current account	69.8	20.3	0.0	0.0	0.0
1235	1305.4.01	Credit card purchases paid in fees	0.0	53.8	34.2	8.2	2.2
1240	1305.4.02	Revolving credit card debt	0.0	0.0	0.6	36.6	48.2

Source: Central Bank of Chile and International Financial Reporting Standards (IFRS).
Notes: Chile (IFRS): Classification in Chile and IFRS. <1M: Lending horizon less than one month, 1-3M: between one and three months, 3-12M: between three and twelve month, 1-3Y: between one and three years, >3Y: more than three years.

Table 5. Distribution between lending / deposit horizons (%)

	Com.	Cons.	Dep.
< 30 days	4.4	23.2	30.4
30 - 89 days	5.0	29.4	49.4
90 days - 1 year	29.9	36.8	16.0
1 - 3 years	26.2	3.8	4.2
> 3 years	34.4	6.7	

Source: Central Bank of Chile and IFRS.
Note: See table 3.

Table 6. Monetary policy decisions and expectations (Jan.02 – Jul.14)
(numbers of meetings, percentage)

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

Source: Author´s elaboration with data from Central Bank of Chile.

Table 7. Estimation results. Dependent variable: Change in interest rate

	Nominal rates			Real rates		
	Com.	Cons.	Dep.	Com.	Mort.	Dep.
Δi_{t-1}	-0.07	-0.05	-0.15*	0.06	0.30***	0.06
	(0.06)	(0.07)	(0.08)	(0.06)	(0.05)	(0.04)
$\Delta r_t \times I(\Delta MPR_t > 0)$	1.23***	1.18**	1.18***	0.10	-0.01	0.65***
	(0.15)	(0.51)	(0.13)	(0.19)	(0.08)	(0.24)
$\Delta r_t \times I(\Delta MPR_t < 0)$	0.96***	1.54***	0.76***	0.39***	0.16***	0.56***
	(0.12)	(0.20)	(0.09)	(0.13)	(0.04)	(0.11)
$\Delta r_t \times I(\Delta MPR_t = 0)$			0.52**		0.48***	
			(0.24)		(0.13)	
$\Delta\sigma_t^2(r_t)$	1.78**	4.00***		-3.46***	-0.74***	10.19***
	(0.69)	(1.33)		(0.80)	(0.15)	(1.28)
$\Delta(r_t^{max} - r_t^{min})$						
$\Delta\ln(Q_t^r)$				0.44***		0.30***
				(0.15)		(0.10)
$\Delta\sigma_t^{2w}(i_t^{sys})$	0.01**		0.03***	0.08***		-0.36***
	(0.00)		(0.01)	(0.01)		(0.06)
$\Delta\sigma_t^{2w}(i_t)$	0.08***	0.02**		-0.20***	-0.18***	
	(0.01)	(0.01)		(0.06)	(0.06)	
$\Delta\sigma_t^{3w}(i_t)$	-1.20***	-4.35***		-0.16***		
	(0.28)	(0.53)		(0.05)		
$\Delta\sigma_t^{4w}(i_t) - 3$	0.10***					
	(0.03)					
$\Delta\ln(EMBI_t)$						
$\Delta\ln(VIX_t)$		1.62**				
		(0.63)				
$Y_t - \bar{Y}_t$						
$\Delta\pi_t$				-16.94**		-29.54***
				(7.17)		(6.78)
$\Delta\ln(FLAP_t)$		0.95**		-0.89***		
		(0.44)		(0.32)		
$I(E(\Delta MPR_t) = \Delta MPR_t \neq 0)$					0.08**	
					(0.04)	
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$						
$I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$				0.14**	0.07**	
				(0.06)	(0.04)	
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0)$						
Obs.	150	150	150	150	149	150
$\bar{R}^2$	0.74	0.75	0.82	0.64	0.78	0.70

Source: Author´s elaboration.
Note: See table 3. Numbers in parentheses are HAC robust standard errors. */**/***: Statistical significant when applying a 10%/5%/1% confidence level.

Table 8. Estimations results. Dependent variable: Change in commercial interest rate

	< 1M	1-3M	3-12M	1-3Y	>3Y
Δi_{t-1}	-0.06	-0.16**	-0.14**	-0.14***	-0.18***
	(0.05)	(0.07)	(0.06)	(0.03)	(0.05)
$\Delta r_t \times I(\Delta MPR_t > 0)$	1.10***	1.41***	1.15***	0.43	1.71***
	(0.14)	(0.36)	(0.27)	(0.43)	(0.58)
$\Delta r_t \times I(\Delta MPR_t < 0)$	0.99***	1.31***	0.82***	1.38***	1.36**
	(0.12)	(0.16)	(0.12)	(0.21)	(0.38)
$\Delta r_t \times I(\Delta MPR_t = 0)$	0.84***				
	(0.31)				
$\Delta\sigma_t^2(r_t)$			2.76***		
			(0.71)		
$\Delta(r_t^{max} - r_t^{min})$					-4.38***
					(1.61)
$\Delta\ln(Q_t^r)$					
$\Delta\sigma_t^{2w}(i_t^{sys})$		-0.31***		-0.05***	-0.10***
		(0.06)		(0.02)	(0.01)
$\Delta\sigma_t^{2w}(i_t)$	0.03***	0.21***	0.08***	0.08***	0.07***
	(0.01)	(0.05)	(0.01)	(0.01)	(0.01)
$\Delta\sigma_t^{3w}(i_t)$	-1.31***	-0.50***	-1.51***	-5.12***	-3.39***
	(0.25)	(0.14)	(0.30)	(0.70)	(0.37)
$\Delta\sigma_t^{4w}(i_t) - 3$	0.10***	0.04**	0.21***	0.70***	0.29***
	(0.03)	(0.02)	(0.05)	(0.13)	(0.08)
$\Delta\ln(EMBI_t)$	0.80**	1.33***			
	(0.37)	(0.51)			
$\Delta\ln(VIX_t)$					
$Y_t - \bar{Y}_t$					
$\Delta\pi_t$			14.39**		
			(6.96)		
$\Delta\ln(FLAP_t)$				-1.58***	
				(0.44)	
$I(E(\Delta MPR_t) = \Delta MPR_t \neq 0)$					
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$				-0.78***	
				(0.26)	
$I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$					
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0)$			0.59***		
			(0.19)		
Obs.	150	150	150	150	150
$\bar{R}^2$	0.80	0.75	0.62	0.86	0.75

Source: Author´s elaboration.

Note: See table 7.

Table 9. Estimations results. Dependent variable: Change in consumer interest rate

	< 1M	1-3M	3-12M	1-3Y	>3Y
Δi_{t-1}	0.02	-0.18**	-0.13*	-0.07	-0.01
	(0.05)	(0.07)	(0.07)	(0.06)	(0.04)
$\Delta r_t \times I(\Delta MPR_t > 0)$	-0.45	-0.72	1.66***	1.53***	0.54
	(0.71)	(1.36)	(0.53)	(0.40)	(0.61)
$\Delta r_t \times I(\Delta MPR_t < 0)$	1.58***	0.95*	0.96**	1.60***	0.82***
	(0.41)	(0.51)	(0.43)	(0.22)	(0.31)
$\Delta r_t \times I(\Delta MPR_t = 0)$	5.90***			2.74**	
	(2.09)			(1.34)	
$\Delta\sigma_t^2(r_t)$			5.60**		
			(2.54)		
$\Delta(r_t^{max} - r_t^{min})$					
$\Delta\ln(Q_t^r)$		0.81**			
		(0.34)			
$\Delta\sigma_t^{2w}(i_t^{sys})$	-0.09***	-0.04***	0.03***	0.03**	
	(0.01)	(0.01)	(0.01)	(0.01)	
$\Delta\sigma_t^{2w}(i_t)$				0.05***	
				(0.01)	
$\Delta\sigma_t^{3w}(i_t)$		-0.81***	-1.42***	-4.21***	0.06***
		(0.27)	(0.24)	(0.31)	(0.01)
$\Delta\sigma_t^{4w}(i_t) - 3$				0.83**	-4.46***
				(0.34)	(0.42)
$\Delta\ln(EMBI_t)$		4.31***			1.05***
		(1.65)			(0.28)
$\Delta\ln(VIX_t)$			1.36**		
			(0.57)		
$Y_t - \bar{Y}_t$					
$\Delta\pi_t$				26.11**	30.34**
				(12.23)	(12.17)
$\Delta\ln(FLAP_t)$					
$I(E(\Delta MPR_t) = \Delta MPR_t \neq 0)$					
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$	2.08***	1.31**			
	(0.60)	(0.63)			
$I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$					0.36**
					(0.16)
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0)$			0.68**		0.77***
			(0.31)		(0.28)
Obs.	150	150	150	150	150
$\bar{R}^2$	0.77	0.52	0.34	0.85	0.84

Source: Author´s elaboration.
Note: See table 7.

Table 10. Estimations results. Dependent variable: Change in deposit interest rate

	< 1M	1-3M	3-12M	> 1Y
Δi_{t-1}	-0.46***	-0.15	-0.05	0.20
	(0.17)	(0.10)	(0.08)	(0.17)
$\Delta r_t \times I(\Delta MPR_t > 0)$	1.53***	1.26***	1.07***	0.47
	(0.16)	(0.16)	(0.19)	(0.31)
$\Delta r_t \times I(\Delta MPR_t < 0)$	1.45***	0.81***	0.48***	0.27
	(0.18)	(0.10)	(0.12)	(0.24)
$\Delta r_t \times I(\Delta MPR_t = 0)$	1.35**	0.82***	0.56**	
	(0.59)	(0.27)	(0.27)	
$\Delta \sigma_t^2(r_t)$			-2.02***	3.29**
			(0.43)	(1.41)
$\Delta(r_t^{max} - r_t^{min})$				2.07***
				(0.60)
$\Delta \ln(Q_t^r)$				
$\Delta \sigma_t^{2w}(i_t^{sys})$		0.90***	0.71***	
		(0.15)	(0.27)	
$\Delta \sigma_t^{2w}(i_t)$				
$\Delta \sigma_t^{3w}(i_t)$	0.03***		-0.05**	
	(0.01)		(0.02)	
$\Delta \sigma_t^{4w}(i_t) - 3$				0.0005***
				(0.00001)
$\Delta \ln(EMBI_t)$				
$\Delta \ln(VIX_t)$				
$Y_t - \bar{Y}_t$	-8.41**			
	(4.13)			
$\Delta \pi_t$			7.65**	25.03***
			(3.50)	(8.83)
$\Delta \ln(FLAP_t)$				
$I(E(\Delta MPR_t) = \Delta MPR_t \neq 0)$				
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$				
$I(0 = E(\Delta MPR_t) \neq \Delta MPR_t \neq 0)$			-0.18**	
			(0.09)	
$I(0 \neq E(\Delta MPR_t) \neq \Delta MPR_t = 0)$				-0.28**
				(0.13)
Obs.	76	150	150	144
$\bar{R}^2$	0.83	0.81	0.74	0.40

Source: Author´s elaboration.
Note: See table 7.

Table 11. *p*-values of coefficient tests. Total rates

	Nominal rates			Real rates		
	Com.	Cons.	Dep.	Com.	Mort.	Dep.
H_0: $\beta_{1,1} = \beta_{1,2} = 1$	0.32	0.02	0.03	0.00	0.00	0.00
H_0: $\beta_{1,1} = \beta_{1,2}$		0.54	0.02	0.24	0.15	0.74
H_0: $\beta_{1,1} = 1$		0.72	0.17	0.00	0.00	0.14
H_0: $\beta_{1,2} = 1$		0.01	0.01	0.00	0.00	0.00

Source: Author´s elaboration.
Note: See table 3.

Table 12. *p*-values of coefficient tests. Commercial rates

	< 1M	1-3M	3-12M	1-3Y	>3Y
H_0: $\beta_{1,1} = \beta_{1,2} = 1$	0.76	0.06	0.29	0.08	0.24
H_0: $\beta_{1,1} = \beta_{1,2}$					
H_0: $\beta_{1,1} = 1$					
H_0: $\beta_{1,2} = 1$					

Source: Author´s elaboration.

Table 13. *p*-values of coefficient tests. Consumer rates

	< 1M	1-3M	3-12M	1-3Y	>3Y
H_0: $\beta_{1,1} = \beta_{1,2} = 1$	0.06	0.41	0.47	0.01	0.60
H_0: $\beta_{1,1} = \beta_{1,2}$				0.87	
H_0: $\beta_{1,1} = 1$				0.19	
H_0: $\beta_{1,2} = 1$				0.01	

Source: Author´s elaboration.

Table 14. *p*-values of coefficient tests. Deposit rates

	< 1M	1-3M	3-12M	> 1Y
H_0: $\beta_{1,1} = \beta_{1,2} = 1$	0.00	0.00	0.00	0.01
H_0: $\beta_{1,1} = \beta_{1,2}$	0.59	0.00	0.00	0.48
H_0: $\beta_{1,1} = 1$	0.00	0.06	0.69	0.09
H_0: $\beta_{1,2} = 1$	0.01	0.11	0.00	0.00

Source: Author´s elaboration.

Table 15. Importance of expectations. Total rates

	Nominal rates			Real rates		
	Com.	Cons.	Dep.	Com.	Mort.	Dep.
$\boldsymbol{I(\Delta MPR_t > 0)}$						
$\Delta MPR_t = E(\Delta MPR_t)$	1.30***	0.99	1.22***	0.04	0.17***	0.77**
	(0.20)	(0.75)	(0.12)	(0.24)	(0.07)	(0.32)
$\Delta MPR_t > E(\Delta MPR_t) > 0$	1.06***	2.10***	0.90***	0.37	0.00	0.50
	(0.22)	(0.53)	(0.24)	(0.41)	(0.16)	(0.50)
$\Delta MPR_t > E(\Delta MPR_t) = 0$	1.84	0.21	1.53***	0.29	0.47	-1.03
	(1.18)	(1.56)	(0.52)	(0.50)	(0.32)	(1.59)
$H_0: \beta_{1,1} = \beta_{1,2} = \beta_{1,4}$	0.66	0.39	0.23	0.73	0.35	0.54
$\boldsymbol{I(\Delta MPR_t < 0)}$						
$\Delta MPR_t = E(\Delta MPR_t)$	0.93***	1.94***	0.66***	0.60***	0.01	0.51***
	(0.13)	(0.44)	(0.13)	(0.14)	(0.05)	(0.17)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	0.99***	1.40***	0.77***	0.33**	0.17***	0.59***
	(0.13)	(0.13)	(0.09)	(0.17)	(0.05)	(0.12)
$\Delta MPR_t < E(\Delta MPR_t) = 0$	0.83**	2.28*	1.00***	0.02	0.06	0.57
	(0.34)	(1.38)	(0.22)	(0.25)	(0.07)	(0.52)
$H_0: \beta_{1,5} = \beta_{1,6} = \beta_{1,8}$	0.84	0.33	0.31	0.12	0.05	0.90
$\boldsymbol{I(\Delta MPR_t = 0)}$						
$\Delta MPR_t = E(\Delta MPR_t)$	-0.05	1.53	0.38*	-0.03	0.45***	0.63
	(0.20)	(1.55)	(0.22)	(0.79)	(0.16)	(0.63)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	2.88**	2.01	1.32**	0.33	0.60*	1.43
	(1.33)	(2.87)	(0.53)	(1.13)	(0.31)	(1.47)
$H_0: \beta_{1,9} = \beta_{1,12}$	0.04	0.88	0.05	0.79	0.68	0.60

Source: Author´s elaboration.

Notes: See table 7. Numbers in the lines stating the null hypotheses are *p*-values.

Table 16. Importance of expectations. Commercial rates

	< 1M	1-3M	3-12M	1-3Y	>3Y
$\boldsymbol{I(\Delta MPR_t > 0)}$					
$\Delta MPR_t = E(\Delta MPR_t)$	1.10***	1.60***	1.12***	0.58	1.88***
	(0.17)	(0.46)	(0.37)	(0.47)	(0.68)
$\Delta MPR_t > E(\Delta MPR_t) > 0$	1.09***	1.18***	1.52***	0.15	1.41**
	(0.34)	(0.41)	(0.37)	(0.75)	(0.70)
$\Delta MPR_t > E(\Delta MPR_t) = 0$	2.04	0.50	0.83	-1.46	13.91***
	(1.24)	(0.59)	(0.67)	(1.75)	(3.33)
$H_0: \beta_{1,1} = \beta_{1,2} = \beta_{1,4}$	0.75	0.26	0.60	0.46	0.00
$\boldsymbol{I(\Delta MPR_t < 0)}$					
$\Delta MPR_t = E(\Delta MPR_t)$	0.75***	0.74*	0.68***	0.60**	0.38
	(0.20)	(0.39)	(0.15)	(0.29)	(0.44)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	1.04***	1.48***	0.85***	1.42***	1.18***
	(0.11)	(0.16)	(0.14)	(0.17)	(0.25)
$\Delta MPR_t < E(\Delta MPR_t) = 0$	0.85	1.24***	1.00**	2.60***	1.73
	(0.60)	(0.30)	(0.45)	(0.81)	(1.27)
$H_0: \beta_{1,5} = \beta_{1,6} = \beta_{1,8}$	0.42	0.25	0.67	0.01	0.26
$\boldsymbol{I(\Delta MPR_t = 0)}$					
$\Delta MPR_t = E(\Delta MPR_t)$	0.69**	0.67	0.46	-0.45	0.18
	(0.34)	(0.53)	(0.64)	(1.55)	(1.80)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	1.60	2.21**	3.38***	9.45**	-6.17
	(1.21)	(0.89)	(1.19)	(4.55)	(8.24)
$H_0: \beta_{1,9} = \beta_{1,12}$	0.48	0.10	0.02	0.04	0.44

Source: Author´s elaboration.
Note: See table 15.

Table 17. Importance of expectations. Consumer rates

	< 1M	1-3M	3-12M	1-3Y	>3Y
$\boldsymbol{I(\Delta MPR_t > 0)}$					
$\Delta MPR_t = E(\Delta MPR_t)$	-0.37	-0.39	0.96	1.75***	0.45
	(0.80)	(1.20)	(0.89)	(0.51)	(0.78)
$\Delta MPR_t > E(\Delta MPR_t) > 0$	3.16**	2.32	4.46***	0.48	1.02**
	(1.53)	(1.99)	(0.93)	(1.02)	(0.47)
$\Delta MPR_t > E(\Delta MPR_t) = 0$	-1.07	-11.95	-0.07	1.09	-0.73
	(3.59)	(12.07)	(1.43)	(1.84)	(1.06)
$H_0: \beta_{1,1} = \beta_{1,2} = \beta_{1,4}$	0.10	0.27	0.01	0.56	0.28
$\boldsymbol{I(\Delta MPR_t < 0)}$					
$\Delta MPR_t = E(\Delta MPR_t)$	3.29***	0.99	2.36***	1.25**	0.65
	(0.44)	(0.90)	(0.52)	(0.51)	(0.46)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	-0.07	0.10	0.53	1.65***	0.87***
	(0.19)	(0.30)	(0.38)	(0.24)	(0.33)
$\Delta MPR_t < E(\Delta MPR_t) = 0$	3.30	2.43	2.16**	2.04***	-0.20
	(2.38)	(1.55)	(1.06)	(0.69)	(0.56)
$H_0: \beta_{1,5} = \beta_{1,6} = \beta_{1,8}$	0.00	0.26	0.00	0.55	0.25
$\boldsymbol{I(\Delta MPR_t = 0)}$					
$\Delta MPR_t = E(\Delta MPR_t)$	6.66***	4.03	1.65	2.64*	1.85
	(2.42)	(3.57)	(1.90)	(1.47)	(1.44)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	1.94	-2.27	4.31	3.02	2.82
	(5.08)	(4.42)	(2.74)	(4.40)	(2.46)
$H_0: \beta_{1,9} = \beta_{1,12}$	0.42	0.26	0.39	0.94	0.74

Source: Author´s elaboration.
Note: See table 15.

Table 18. Importance of expectations. Deposit rates

	< 1M	1-3M	3-12M	> 1Y
$\boldsymbol{I(\Delta MPR_t > 0)}$				
$\Delta MPR_t = E(\Delta MPR_t)$	1.52***	1.24***	1.03***	0.55**
	(0.15)	(0.18)	(0.17)	(0.25)
$\Delta MPR_t > E(\Delta MPR_t) > 0$	1.31***	1.25***	0.84**	-0.08
	(0.28)	(0.20)	(0.33)	(0.66)
$\Delta MPR_t > E(\Delta MPR_t) = 0$		1.61***	2.05	2.05***
		(0.45)	(1.32)	(0.63)
$H_0: \beta_{1,1} = \beta_{1,2} = \beta_{1,4}$	0.40	0.71	0.60	0.06
$\boldsymbol{I(\Delta MPR_t < 0)}$				
$\Delta MPR_t = E(\Delta MPR_t)$	1.08***	0.63***	0.55***	0.00
	(0.16)	(0.16)	(0.12)	(0.19)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	1.44***	0.83***	0.40***	0.34
	(0.15)	(0.10)	(0.12)	(0.26)
$\Delta MPR_t < E(\Delta MPR_t) = 0$	1.84**	1.02***	0.71	0.33
	(0.82)	(0.21)	(0.59)	(0.55)
$H_0: \beta_{1,5} = \beta_{1,6} = \beta_{1,8}$	0.01	0.16	0.27	0.24
$\boldsymbol{I(\Delta MPR_t = 0)}$				
$\Delta MPR_t = E(\Delta MPR_t)$	1.28**	0.65***	0.50**	0.04
	(0.55)	(0.24)	(0.23)	(0.61)
$\Delta MPR_t < E(\Delta MPR_t) < 0$	0.34	1.74***	0.84	-0.01
	(1.52)	(0.48)	(1.10)	(2.06)
$H_0: \beta_{1,9} = \beta_{1,12}$	0.57	0.00	0.74	0.98

Source: Author´s elaboration.
Note: See table 15.

Table 19. Summary of results

	Nominal rates						Real rates	
	Com.		Cons.		Dep.		Loans	Dep.
	<1Y	>1Y	<1Y	>1Y	<3M	>3M		
Symmetric PT	+	+	+	+	(+)	(+)	+	+
Complete PT	+	+	+	(+)	(+)	(+)	-	(+)
Liquidity risk	(-)	(+)	(+)	-	-	+	+	+
Market risk	(-)	+	+	(+)	(+)	(+)	(+)	+
Credit risk	+	+	(+)	+	(+)	+	+	-
Interest rate risk	(+)	-	(+)	(+)	-	-	-	-
Macroecon.	(-)	-	-	+	(+)	+	(+)	+
Unconv. MP	-	(+)	-	-	-	-	(+)	-
Expectations	(-)	+	(+)	-	+	-	(+)	-

Source: Author's elaboration.
Notes: +/(+)/(-)/-: Rates of all / all but one / all but two / none of the horizons are affected by at least one of the variables related to the topic. Expectations: If expectations are statically significant in at least one of the three situations outlined in tables 15-18. PT: Pass-through. MP: Monetary policy.

Table A1. Model specifications. Total interest rates

	Nominal rate			Real rates		
	Com.	Cons.	Dep.	Com.	Mort.	Dep.
Dummies	-	2014m6	2009m2	-	2003m1 2003m2 2003m4 2003m5 2004m4 2008m10	2013m5
Jarque-Bera	0.19	0.20	0.56	0.62	0.06	0.26
D-W	2.40	2.33	2.45	2.15	1.83	2.27
Seas. Dum.						
Min(t)	0.31	0.00	0.02	0.00	0.05	0.02
$\chi^2(11)$	0.73	0.00	0.00	0.00	0.52	0.00

Source: Author´s elaboration.
Notes: See table 3. Jarque-Bera: *p*-values of the Jarque-Bera statistics of normal distributed errors. D-W: Durbin-Watson statistics. Min(t): Minimum *p*-value of the t-statistics of each of the seasonal dummies. $\chi^2(11)$: *p*-value of the Wald test for exclusion of the seasonal dummies.

Table A2. Model specifications. Commercial loans with nominal rate

	< 1M	1-3M	3-12M	1-3Y	>3Y
Dummies	-	-	-	2014m7	
Jarque-Bera	0.48	0.17	0.55	0.49	0.08
D-W	2.43	2.05	2.23	2.45	2.28
Seas. Dum.					
Min(t)	0.09	0.19	0.00	0.17	0.03
$\chi^2(11)$	0.44	0.45	0.01	0.33	0.01

Source: Author's elaboration.
Note: See table A1.

Table A3. Model specifications. Consumer loans with nominal rate

	< 1M	1-3M	3-12M	1-3Y	>3Y
Dummies	2004m1 2004m3	2004m4 2014m4 2014m6 2014m7	-	-	2008m7
Jarque-Bera	0.22	0.07	0.10	0.84	0.10
D-W	1.98	2.15	2.27	2.21	2.31
Seas. Dum.					
Min(t)	0.07	0.03	0.04	0.00	0.02
$\chi^2(11)$	0.25	0.06	0.00	0.00	0.00

Source: Author's elaboration.
Note: See table A1.

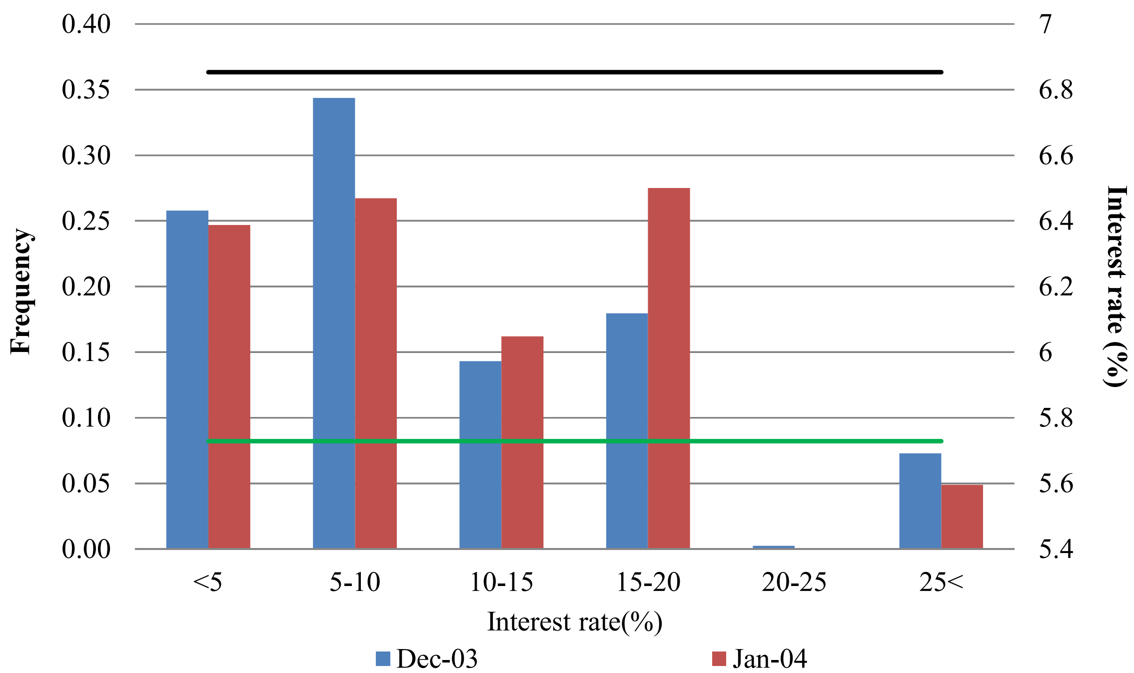
Table A4. Model specifications. Deposits with nominal rate

	< 1M	1-3M	3-12M	> 1Y
Dummies	-	2009m2	2009m1 2009m2	-
Jarque-Bera	0.08	0.78	0.92	0.80
D-W	2.16	1.71	1.71	1.94
Seas. Dum.				
Min(t)	0.16	0.01	0.01	0.03
$\chi^2(11)$	0.41	0.02	0.05	0.08

Source: Author's elaboration.
Note: See table A1.

Figures

Figure 1. Histrograms of comercial rates, Dec.-03 and Jan.-04



Source: Author's elaboration with data from Central Bank of Chile.
Notes: Horizontal lines are weighted averages of the interest rate shown at the right axis.