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# Análisis de Transmisión de la Tasa de Interés de Referencia a las Tasas Pasivas

**D'Amato, Laura Inés**
**Sangiácomo, Máximo**

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# Measuring the pass-through of the reference policy rate to deposit rates in Argentina

L. D'Amato (BCRA-UBA) - M. Sangiacomo (BCRA-UNLP)*

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**Abstract**

Using a panel-time series approach that allows for heterogeneity, we study the pass-through of the policy reference rate to time deposit rates using high frequency data. We also evaluate the impact of the introduction of a new modality of online time deposit contracts in April 2019 on the transmission of the central bank reference policy rate to time deposit rates offered by banks in Argentina. We find that there is an incomplete long run pass-through in both the corporate and household segments of the deposits market. The results also indicate that the implementation of the new modality, aimed at stimulating more competition for funds between banks, led to a significant increase in the responsiveness of bank time deposit rates to movements in the reference policy rate, particularly in the corporate segment of the market.

JEL classification: E43; E52; G21; L11

# 1 Introduction

The aim of this paper is to study the pass-through of the reference policy rate to retail bank deposit rates offered by banks in Argentina. The period under analysis is quite short and corresponds to the introduction of a money base targeting scheme introduced by the Central Bank of Argentina in October 2018. With the aim of enhancing the interest rate channel of monetary policy, the central bank implemented in April 2019 an online modality for bank deposit contracts (with no need to be customers) with the aim stimulating banks competition for funds in the deposits retail market.

Given that the effectiveness of monetary policy in transmitting policy impulses to the real economy and inflation strongly relies on the flexibility of adjustment of bank deposit rates to market rates, there is a strand of literature that has studied interest rate rigidity at the bank level for the US in the case of deposit rates, including early papers by Hannan and Berger (1991), Neuman and Sharpe (1992). More recent research has extended the analysis to loan rate rigidity and/or focused on different European countries, including Hofman and Mizen (2004) for the UK, Gambacorta (2004) for Italy, Wheth (2002) for Germany, Salas-Fums (2005) for Spain and De Graeve et al. (2007) for Belgium. The evidence in this literature indicates that the pass-through of policy rates to deposit rates at the bank level is incomplete. A main explanation for interest rate rigidity is the lack of competition in the deposit market, an issue that has been addressed by Hannan and Berger (1991).

In this paper we closely follow the approach of De Graeve et al. (2007), who measure pass-through using a panel time series cointegration approach that allows for heterogeneity in responses at the bank level. Given that we are interested on tracking the response of bank rates to movements in the reference policy rate over a period of frequent movements in the policy rate and that our focus is also on the impact on interest rate pass-through

of the new online modality introduced in April 2019, we are interested on tracking a dynamic that occurs at a higher than monthly frequency. This implies dealing with significant volatility in our data. We tried to mitigate the problem reducing the frequency of the daily data that we initially processed to a weekly frequency.

It is important to remark that the period we are analyzing corresponds to a non-conventional monetary policy scheme, that imposed a zero target for money base growth with the aim of producing a significant decline of trend inflation. Under such scheme the credit channel of monetary policy was quite limited. For this reason, our analysis focuses on the interest rate channel, and in particular, on the transmission of movements on the reference policy rate determined at weekly auctions of central bank notes on deposit rates offered by commercial banks. The period we are analyzing is at the same time suitable for measuring the interest rate channel because real interest rates on deposits were positive at this time, and thus there was a genuine demand for time deposits. Given the long history of financial repression, macroeconomic instability and inflation of the Argentine economy, real interest rates have been predominantly negative for long periods of time over the last say 70 years.

The paper is organized as follows. In section 2 we describe the methodological approach used to measure pass-through. Section 3 describes the data used for the estimation. Section 4 provides a brief descriptive analysis that motivates our exercise. The results of our estimations are presented in section 5. Finally, section 6 concludes.

# 2 Methodology

We estimate the pass-through of the reference policy rate to time deposits rates based on a cointegration approach in the context of a panel time series analysis that allows for heterogeneity in banks responses, in line with the

approach of De Graeve et al., 2007. This means evaluating the extent to which movements in retail banks deposit rates in response to changes in the reference policy rate lead the former to converge in the long run to the policy rate and also the extent to which this convergence is complete.

Cointegration is tested in a panel time series framework in which both dimensions, "*N*" in our case banks, and "*T*", the number of time periods, are large. Additionally, following the methodology developed by Pedroni (1999) we implement a cointegration test that allows for heterogeneity in the pass-through. The Pedroni test (1999), follows the Engle-Granger approach to cointegration and basically consists on running a Dickey-Fuller test on the residuals of the following static cointegration equation for each individual, in our case, bank

$$i_{i,t} = c_{1i} + \delta_i m_t + u_{i,t} \tag{1}$$

where $i_{i,t}$ is the time deposit rate paid by bank $i$ for up to 36 days time deposit to a household (corporate) client, $m_t$ is the central bank reference policy rate, $\delta_i$ is the long run pass-through for bank $i$ and $c_{1i}$ is the constant for each bank.

We estimate (1) following the Pesaran y Smith (1995) Mean Group estimator (MG), that consists on running individual time series regressions for each cross-section unit and then average the estimated coefficients. The MG is a consistent estimator even when the individual coefficients are not (Burdisso y Sangicomo, 2016).

The Pedroni (1999) test, under the null hypothesis of no cointegration, allows for heterogeneity in both the short ($u_{i,t}$) and long-run ($\delta_i$) under the alternative. A rejection of the null hypothesis implies that the residuals in equation (1) are stationary, and thus the series are cointegrated. If this is the case, it is possible to estimate the relationship between the reference rate and the time deposit rate using an error correction representation of the form:

$$\Delta i_{i,t} = c_{2i} + \sum_{k=1}^{p} \alpha_{ki} \Delta i_{i,t-k} + \sum_{l=0}^{q} \beta_{li} \Delta m_{t-l} + \gamma_i u_{i,t-1} + \varepsilon_{i,t} \qquad (2)$$

Where $\Delta i_{i,t}$ is the change in the time deposit rate paid by bank $i$ for a 36 days time deposit to a household (corporate) client, and $\Delta m_{t-l}$ is the change in the reference policy rate. The term $\gamma_i u_{i,t-1}$ is the error correction term towards equilibrium, were the $u_{i,t-1}$ is the residual of the static equation (1).

Following the methodology developed by Swamy (1970), the aggregate $l$ coeficients $c_1, c_2, \alpha_1, ...., \alpha_p, \beta_0, .., \beta_q, \gamma$ are calculated as a weighted average of bank coefficients with weights that are functions of the respective estimated co-variances.

Although it is possible to allow for heterogeneity in the dynamics of equation (2), using some information criteria to determine the number of lags ($p$, $q$) in (2) for each individual bank, in this preliminary version of the paper we are assuming an homogeneous dynamics between banks. The $\gamma_i u_{i,t-1}$ term captures the adjustment towards equilibrium. The finding of a $\gamma_i$ coefficient that lies within the (-1,0) interval indicates that there is a cointegration relation between the two rates.

Following the methodology developed by Swamy (1970), equation (2) is estimated for each bank in our sample. The average short and long-run pass-through is then computed as a weighted average of the individual coefficients, with weights calculated as a function of the estimated co-variances.

# 3 The Data Base

The central bank of Argentina collects daily information on the interest rates offered by individual banks on time deposits for different maturities. This information is used to construct a weighted average of interest rates for deposits up to a maturity of 36 days to (i) households and (ii) firms. The sample corresponds to the period January 2018 to August 2019. The panel consists of 50 banks of which 37 are private and 13 public. Banks whose main source of funding are not deposits were excluded from the sample.

The reference policy rate is calculated as a weighted average of the interest rate of central bank notes allocated at a weekly auction the monetary authority. From January 2018 to October 2018, this corresponds to the interest rate payed on LEBAC liquidity notes, and since then to August 2019, to Leliq notes. A main difference between these two instruments is that while non-financial sector entities could invest in LEBAC notes, only banks are allowed to invest in Leliq.

Given the high volatility observed in interest at the daily frequency, we decided to move to a weekly frequency constructing a weighted average of daily observations for time deposit rates. [1]

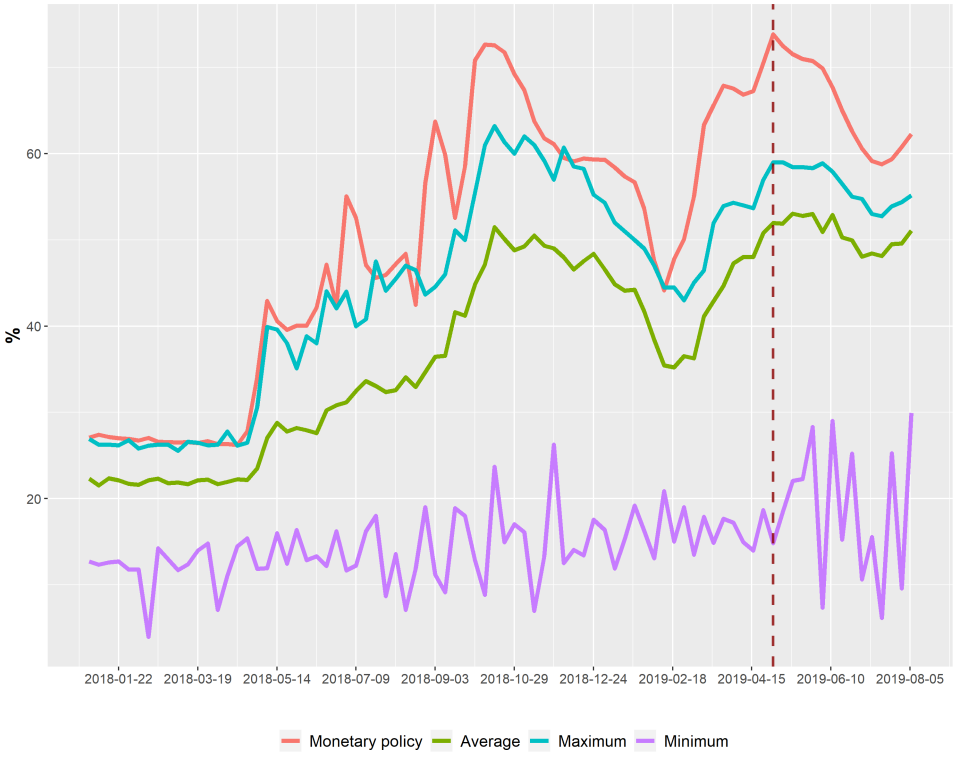
# 4 Descriptive Analysis

The weekly evolution of the reference rate (salmon line) jointly with the weighted average interest rate paid by banks on time deposits held by companies (green line) are depicted in Figure 1. The light green and violet lines depict respectively, the maximum and minimum values observed for time deposit rates. The vertical dotted red line points out the week in which the

[1] Several exercises were conducted using data at the daily frequency and the results do not differ significantly from those obtained at the weekly frequency.

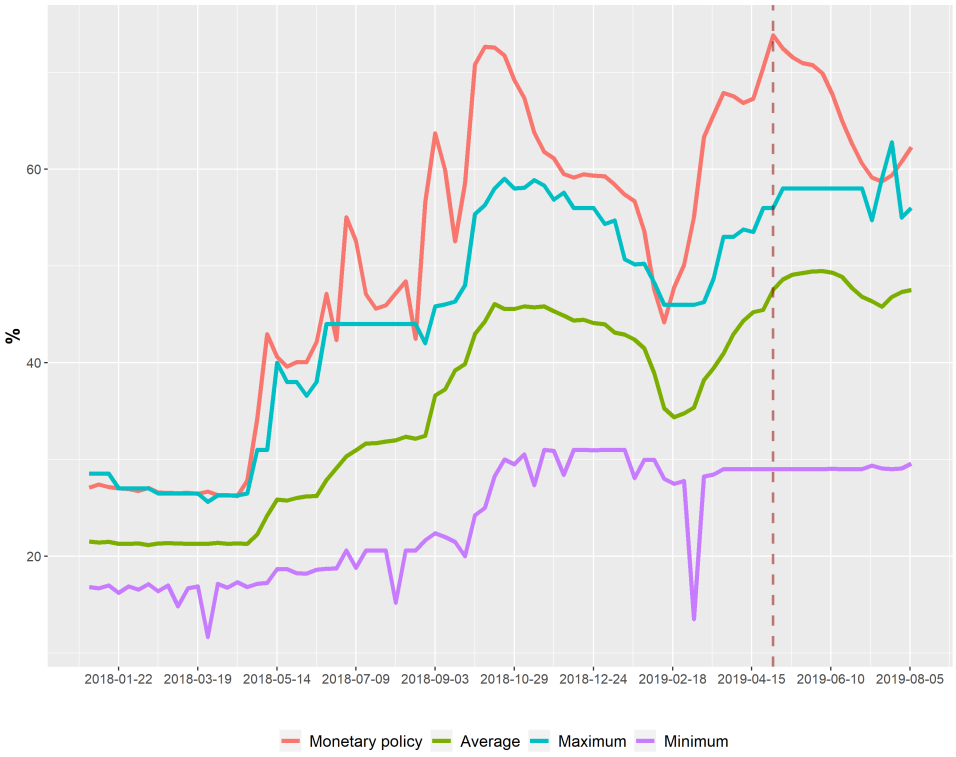
new online modality for time deposit contracts was introduced by the Central Bank. While the weighted average deposit rate strongly co-moves with the reference rate (the correlation coefficient is 0.94), it can be noticed from Figure 1 that deposit rates paid by individual banks in the corporate segment vary over a very wide range reaching a maximum range of 54 percentage points in the 48th week of 2018.

**Figure 1.** Weekly evolution of the reference policy rate (**Monetary Policy**) and the time deposit interest rate paid by bank at the corporate segment (**Average, Maximum, Minimum**)




Deposit interest rates in the household segment are depicted in Figure 2, jointly with the reference rate. Again, the co-movement of the weighted average deposit rate with the policy reference rate is also strong (a correlation coefficient of 0.94), although individual bank rates are less heterogeneous.

**Figure 2.** Weekly evolution of the reference policy rate (**Monetary Policy**) and the time deposit interest rate paid by bank at the household segment (**Average, Maximum, Minimum**)




# 5 Econometric results

As mentioned above, the 5th. of April 2019 the Central Bank of Argentina allowed a new online modality for time deposit contracts. This new modality provides transparent online information on deposit rates offered by banks to investors and allows them to easily write online time deposit contracts with different banks, independently of having with them an established re-

lationship. [2] The new modality aims at deepening the interest rate channel of monetary policy by means of enhancing competition for funds between banks.[3]

With the aim of evaluating the impact of this new modality on the transmission of the policy rate to bank deposit rates, we estimate the pass-through of the reference rate to time deposit rates at the bank level for both, the corporate and household segments of the deposits market using the panel cointegration methodology described in section 2. We conduct this exercise for the 50 banks included in our sample. The sample period covers a total of 84 weeks between January 2008 and August 2019.

Taking into account that the period over which the new modality has been in force is quite short (14 weeks), we are not able to conduct estimation for two sub-periods, pre and post-measure. Thus, we use multiplicative dummies to identify the presence of changes in the long and short-run pass-through of the reference policy rate to time deposit rates. The multiplicative dummies take the value of 1 for observations corresponding to the post measure period and 0 otherwise.

The first step in the estimation process is to evaluate the presence of a cointegration relationship between the reference policy rate and deposit rates in both segments, corporate and household, by estimating equation (1) to calculate the cointegration Pedroni (1999) test. Table 1 presents the results of the test for the corporate sector. They indicate that the null of no cointegration can be rejected at the 1 percent level. Thus, we confirm that the reference policy rate and deposit rates at the corporate segment are cointegrated in both cases, for the complete set of banks and for private banks.

[2] Comunicacion A 6667, BCRA.

[3] See the *Apartado 5 Informe de Poltica Monetaria Julio de 2019.*

**Table 1.** Cointegration test Corporate

| | ADF | p-value |
|---|---|---|
| All banks | -15.8 | 0.000 |
| Private banks | -13.8 | 0.000 |

Table 2 presents the result of the same exercise for the household sector. Again, the results indicate that the null hypothesis of no cointegration can be rejected.

**Table 2.** Cointegration test Households

| | ADF | p-value |
|---|---|---|
| All banks | -6.7 | 0.000 |
| Private banks | -6.6 | 0.000 |

Given these results, the short and long run pass-through for both segments of the time deposit market can be estimated using an error correction representation. To obtain measures of the long and short-run pass-trough, we estimate a modified version of equations (1) and (2) that incorporates multiplicative dummy variables to evaluate the presence of a change in long and short-run pass-through after the introduction of the online modality for deposit contracts after the first week of April 2019 according to

$$i_{i,t} = c_{1i} + \delta_i m_t + \delta_i m_t * dum\mathbf{post}_t + u_{i,t} \tag{3}$$

$$\Delta i_{i,t} = c_{2i} + \sum_{k=1}^{p} \alpha_{ki} \Delta i_{i,t-k} + \sum_{l=0}^{q} \beta_{li} \Delta m_{t-l} +$$

$$\sum_{l=0}^{q} \beta_{li} \Delta m_{t-l} * dum\mathbf{post}_{t-l} + \gamma_i u_{i,t-1} + \gamma_i u_{i,t-1} * dum\mathbf{post}_{t-1} + \varepsilon_{i,t}$$

(4)

Were *dum***post** in equations (3) and (4) is a dummy variable that takes the value one for observations after the first week April and zero otherwise.

Table 3 shows the results of estimating equation (3) to obtain the long-run pass-trough. First, it can be seen from the table that according to the value of the $\delta$ coefficient in the static equation (3), the long run pass-through is incomplete in both segments of the deposit market, corporate and household. Second, comparing the results for the corporate and household sectors we find a slightly higher pass-through in the corporate sector, what could be an indication of more competition between banks in this segment. Third, if we compare private banks relative to all banks in the sample, private banks are slightly more responsive in the long-run to movements in the reference policy rate. Finally, when controlling for the impact of the new modality on the long-run pass-trough, we find an statistically significant increase in the long-run response of deposit rates to movements in the reference policy rate.[4].

[4]The value of the dummy coefficient was considered for the calculation of the pass-through only when they were statistically significant

**Table 3.** Estimation results Long-run pass-through

| | | Corporate | | Households | |
|---|---|---|---|---|---|
| | | **All banks** | **Private banks** | **All banks** | **Private banks** |
| | | *i* | *i* | *i* | *i* |
| $m_t$ | (1) | **0.599*** ** | **0.624*** ** | **0.539*** ** | **0.544*** ** |
| | | [0.0149] | [0.0139] | [0.0130] | [0.0161] |
| $m_t$ * *dum* **post** | (2) | 0.0662*** | 0.0588*** | 0.0779*** | 0.0768*** |
| | | [0.00393] | [0.00318] | [0.00436] | [0.00477] |
| Constant | | 0.0629*** | 0.0594*** | 0.0695*** | 0.0720*** |
| | | [0.00409] | [0.00310] | [0.00617] | [0.00795] |
| **New modality effects** | | | | | |
| **Long-run pass-through [ (1) + (2) ]** | | **0.665** | **0.683** | **0.617** | **0.621** |
| Observations | | 4002 | 2970 | 4146 | 3138 |

Standard errors in brackets
* p<0.10, ** p<0.05, *** p<0.01

In Table 4 the results of estimating equation (4) are presented. First, it provides information on the error correction mechanism. It can be seen from the table that for both, the corporate and the household segment, the error correction term is negative and lower that 1, indicating that there exists a long-run error correction mechanism in the relationship between the reference policy rate and the time deposit rates in both segments of the market. Second, regarding the short-run pass-through, the results indicate that it is higher for the corporate segment compared to the household segment. Third, the introduction of the new modality led to a strengthening in the transmission mechanism of the reference policy rate to time deposit rates, particularly in the case of the corporate sector, where the pass-through almost doubles, what again suggest a more competitive environment in this segment. Finally, private banks seem to be more responsive to movements in the reference policy rate.

**Table 4.** Estimation results Short-run pass-through

| | | Corporate | | Households | |
|---|---|---|---|---|---|
| | | All banks | Private banks | All banks | Private banks |
| | | *i* | *i* | *i* | *i* |
| $\Delta\, i_{t-1}$ | | -0.153*** | -0.142*** | -0.0354 | -0.0675** |
| | | [0.0271] | [0.0320] | [0.0290] | [0.0343] |
| **$\Delta\, m_t$** | (1) | **0.168*** ** | **0.182*** ** | **0.120*** ** | **0.135*** ** |
| | | [0.0193] | [0.0203] | [0.0121] | [0.0145] |
| **$\upsilon_{t-1}$** | (2) | **-0.363*** ** | **-0.370*** ** | **-0.249*** ** | **-0.266*** ** |
| | | [0.0270] | [0.0263] | [0.0150] | [0.0179] |
| $\Delta\, i_{t-1}$ * *dum* **post** | | -0.0665 | -0.0522 | 0.0101 | 0.0196 |
| | | [0.0541] | [0.0640] | [0.0506] | [0.0569] |
| $\Delta\, m_t$ * *dum* **post** | (3) | 0.158** | 0.204*** | 0.0818* | 0.112** |
| | | [0.0769] | [0.0767] | [0.0440] | [0.0535] |
| $\upsilon_{t-1}$ * *dum* **post** | (4) | 0.162*** | 0.174*** | 0.156*** | 0.170*** |
| | | [0.0384] | [0.0469] | [0.0290] | [0.0368] |
| Constant | | 0.00247*** | 0.00260*** | 0.00182*** | 0.00184*** |
| | | [0.000403] | [0.000379] | [0.000292] | [0.000369] |
| **New modality effects** | | | | | |
| **Short-run pass-through [ (1) + (3) ]** | | **0.326** | **0.386** | **0.198** | **0.247** |
| **Error correction term [ (2) + (4) ]** | | **-0.201** | **-0.196** | **-0.093** | **-0.096** |
| Observations | | 3902 | 2896 | 4044 | 3060 |

Standard errors in brackets
* p<0.10, ** p<0.05, *** p<0.01

Summing up, we find an incomplete long-run pass-through of the reference policy rates to bank time deposit rates for both corporate and household deposits. The introduction of a new modality of online time deposits, aiming and strengthening the interest rate channel of monetary policy, seems to have increased the short-run pass-through of the policy rate to time deposit rates offered by individual banks, particularly at the corporate segment of the market, as well as the long-run pass-through, although to a less extent.

# 6 Conclusions

We study the transmission of changes in the monetary policy reference rate to banks time deposit rates in Argentina. In particular, we investigate if the introduction of a new modality of online time deposit contracts enhanced the interest rate channel of monetary policy by stimulating more competition between banks for funds in the deposit market.

To measure pass-through, we rely on a panel time series approach that allows for heterogeneity in the response between banks and estimate the pass-through at a weekly frequency.

In line with the evidence in the literature, we find an incomplete long-run pass-through of the reference policy rate to banks time deposit rate. The introduction of online time deposit was effective in significantly increasing the pass-through of the reference policy rate to deposit rates, particularly in the short-run. We find some evidence that the corporate segment is more responsive to movements in the reference rate, according to both, the long and short-run pass through. Also the corporate segment seems to have responded more strongly to the new on-line modality for time deposit contracts, what can be an indication of more competition in this segment of the deposits market.

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