

Appendix for “Commercial Banks under Persistent Negative Rates”

by Remy Beauregard and Mark M. Spiegel

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Our regression analysis extends the large cross-sectional dataset used in Lopez, Rose, and Spiegel (2020, hereafter LRS) to obtain an additional year of annual observations for banks under negative rates. We obtain these data from the Fitch Global database and follow the methodology of LRS (2020) to account for differences in accounting techniques. This extended sample includes annual data for over 5,300 banks from 27 European countries and Japan, from 2010 through 2018. The data set includes banks from four countries—Denmark, Japan, Sweden, and Switzerland—as well as the European Monetary Union that maintain negative domestic policy rates at some point during our sample period. Overall, our analysis examines a large sample of over 39,000 annual observations for profitability and lending activity from more than 5,300 banks. While the dataset utilized by LRS (2020) contained only 116 observations for banks that saw five or more years under negative rates, our new extended sample contains 2,970 such observations, giving us 2,854 additional observations of interest for banks under extended periods of negative rates of five years or more.

Also included in our sample are banks from several European countries that did not experience negative rates during our sample period. The heterogeneity of when banks entered into periods of negative rates allows us to control for global economic conditions with year fixed effects. In addition, we control for time-invariant characteristics of individual banking firms through bank fixed effects. To evaluate the impact of negative rates on bank profitability, we follow the quadratic specification in LRS (2020). Our specification satisfies:

$$Y_{ijt} = \beta_1 NEGI_{jt} + \beta_2 YRSNEGI_{jt} + \beta_3 YRSNEGI_{jt}^2 + \{\delta_i\} + \{\theta_t\} + \varepsilon_{ijt} \quad (1)$$

where:

Y_{ijt} is the dependent variable of interest for bank i in country j for year t ,

$NEGI_{jt}$ is a binary variable which is one if country j had a negative nominal policy interest rate during year t , and zero if the nominal policy interest rate was low and positive, meaning either zero or below 1% (observations with higher nominal rates are dropped),

$YRSNEGI_{jt}$ is the number of whole years for which country j has had a negative nominal policy interest rate at the end of year t , and is zero if the nominal policy interest rate was low and negative,

$YRSNEGI_{jt}^2$ is the square of the preceding term,

$\{\delta_i\}$ and $\{\theta_t\}$ are comprehensive sets of bank- and time-specific fixed effects, and

ε_{ijt} is an i.i.d. residual.

We estimate using least squares, with standard errors clustered by bank. Our dependent variables of interest include total income (Table 1), net interest income (Table 2), and net noninterest income (Table 3). We regress on the full sample of banks, big banks, small banks, high-deposit banks, and low-deposit banks. We define big banks as those with greater than \$10 billion in assets for any year in our sample, and

small banks as those that did not. We define high-deposit banks as those that had a deposit / funding ratio greater than 0.75 during at least one year of our sample, while low-deposit banks are those that did not.

Table 1. Total income

	(1) Base	(2) Big bank	(3) Small bank	(4) High deposit	(5) Low deposit
NEGI	0.039 (0.035)	0.013 (0.047)	0.039 (0.043)	0.029 (0.037)	0.164 (0.143)
YRSNEGI	0.013 (0.041)	0.041 (0.042)	0.001 (0.050)	0.004 (0.045)	0.008 (0.122)
YRSNEGI ²	-0.010 (0.007)	-0.005 (0.006)	-0.010 (0.008)	-0.008 (0.008)	-0.012 (0.019)
Constant	0.009*** (0.000)	0.009*** (0.000)	0.009*** (0.000)	0.009*** (0.000)	0.009*** (0.000)
Observations	39,203	5,212	33,991	32,788	6,274
R-squared	0.020	0.028	0.020	0.024	0.027
Number of banks	5,274	687	4,587	4,316	922
Year FE	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES

All coefficients and standard errors are multiplied by 100 for presentation. Standard errors clustered by bank in parentheses. P-values: *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Net interest income

	(1) Base	(2) Big bank	(3) Small bank	(4) High deposit	(5) Low deposit
NEGI	-0.099*** (0.019)	-0.063** (0.029)	-0.110*** (0.023)	-0.092*** (0.018)	-0.254** (0.126)
YRSNEGI	0.040* (0.021)	0.014 (0.035)	0.046* (0.025)	0.042* (0.022)	0.057 (0.104)
YRSNEGI ²	-0.020*** (0.003)	-0.004 (0.005)	-0.022*** (0.003)	-0.022*** (0.003)	-0.016 (0.017)
Constant	0.021*** (0.000)	0.015*** (0.000)	0.022*** (0.000)	0.021*** (0.000)	0.019*** (0.000)
Observations	39,195	5,214	33,981	32,780	6,265
R-squared	0.204	0.082	0.228	0.254	0.079
Number of banks	5,276	688	4,588	4,318	920
Year FE	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES

All coefficients and standard errors are multiplied by 100 for presentation. Standard errors clustered by bank in parentheses. P-values: *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Net noninterest income

	(1) Base	(2) Big bank	(3) Small bank	(4) High deposit	(5) Low deposit
NEGI	0.099*** (0.017)	0.087*** (0.030)	0.098*** (0.020)	0.075*** (0.017)	0.374*** (0.063)
YRSNEGI	-0.019 (0.018)	-0.008 (0.023)	-0.023 (0.022)	-0.031 (0.019)	-0.070 (0.052)
YRSNEGI^2	0.013*** (0.003)	0.004 (0.004)	0.014*** (0.003)	0.016*** (0.003)	0.014* (0.008)
Constant	-0.012*** (0.000)	-0.007*** (0.000)	-0.013*** (0.000)	-0.013*** (0.000)	-0.010*** (0.000)
Observations	38,549	5,171	33,378	32,296	6,142
R-squared	0.069	0.011	0.081	0.080	0.114
Number of banks	5,226	684	4,542	4,287	909
Year FE	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES

All coefficients and standard errors are multiplied by 100 for presentation. Standard errors clustered by bank in parentheses. P-values: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

We also evaluate the impact of the duration of consecutive annual negative nominal policy rates on lending activity for the banks in our full sample. Our specification satisfies:

$$Y_{ijt} = \sum_{k=1}^7 \beta_k NEGI[k]_{jt} + \{\delta_i\} + \{\theta_t\} + \varepsilon_{ijt} \quad (2)$$

where:

Y_{ijt} is the log growth rate for total loans for bank I in country j for year t ,

$NEGI[k]_{jt}$ is a binary variable which is one if country j has experienced k whole years of consecutive annual negative nominal policy rates in year t , and zero if not,

$\{\delta_i\}$ and $\{\theta_t\}$ are comprehensive sets of bank- and time-specific fixed effects, and

ε_{ijt} is the residual.

The coefficients of interest are the β_k 's, the average effects of a country having negative nominal interest rates consistently for k years in year t on the growth rate of loans from year $t-1$ to t . These results are reported in Table 4 for the full sample of banks. As before, we estimate using least squares, with standard errors clustered by bank.

Table 4: Total loans

	(1) Log growth rate
NEG11	0.043*** (0.008)
NEG12	-0.049*** (0.014)
NEG13	-0.052*** (0.019)
NEG14	-0.010 (0.024)
NEG15	-0.036 (0.027)
NEG16	-0.011 (0.036)
NEG17	-0.044 (0.041)
Constant	0.028*** (0.003)
Observations	33,832
Number of banks	5,082
R-squared	0.116
Year FE	YES
Bank FE	YES

All coefficients and standard errors are multiplied by 100 for presentation. Standard errors clustered by bank in parentheses. P-values: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.