

# Chicago Fed Letter

## What is the impact of a low interest rate environment on bank profitability?

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The economic conditions and low interest rate environment of recent years have been challenging for banks that rely on a wide spread between long- and short-maturity yields to generate earnings. The authors' analysis indicates that a low interest rate environment is associated with decreased profitability for banks, particularly for small institutions. However, the estimated negative effects on bank profits are economically small and are outweighed by the likely positive effects on profits of low interest rates boosting economic activity.

Interest rate changes generally have small effects on bank profits, but changes in economic conditions do matter relatively much more.

One of the core activities of traditional banks is maturity transformation, where a bank borrows funds in the short term and makes long-term loans and investments. Conventional wisdom holds that banks benefit from a steep yield curve,<sup>1</sup> which translates into a wide spread between long- and short-term interest rates. When the yield curve steepens, banks' net interest margins (NIMs)<sup>2</sup> rise. Conversely, when the yield curve flattens, banks' NIMs fall. In addition, low short-term interest rates can compress NIMs if the assets and liabilities of banks turn over or reprice at different times. All else being equal, any changes in banks' net interest income should flow through to their bottom-line profits. That said, if interest rate changes also significantly alter other sources of income or if banks hedge their interest rate risk<sup>3</sup> or alter their operations in other ways, then interest rate changes may have little effect on overall bank profitability.

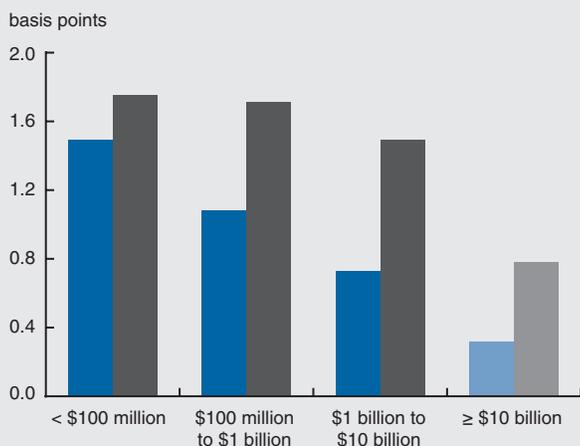
When evaluating the impact of the interest rate environment on bank earnings, it is important to also consider broader economic conditions. Throughout the Great Recession and its aftermath, the Federal Reserve has provided extraordinary levels of monetary policy

accommodation to return the economy to full employment and price stability. The Federal Open Market Committee (FOMC) has maintained the target federal funds rate (its short-term policy rate) near its zero lower bound since December 2008, and has indicated that the target rate would likely remain exceptionally low for a considerable time.<sup>4</sup> Combined with the three rounds of large-scale asset purchases (LSAPs) and the maturity extension program (MEP), these policy actions were aimed at lowering long-term interest rates in order to boost economic activity.<sup>5</sup>

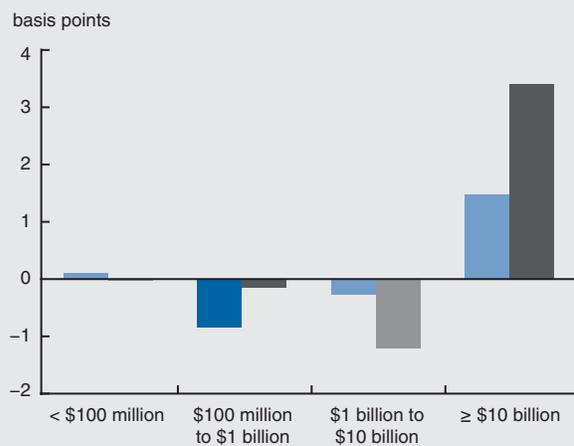
Monetary policy, however, is not set in a vacuum.<sup>6</sup> Interest rates reflect the underlying fundamentals of the economy. The severe recession triggered by the financial crisis and the subsequent slow recovery have led to lower expected real returns from investments. More broadly, the level of equilibrium real interest rates (which equate the supply of saving with the demand for investment) is quite low. Coupled with low inflation, low equilibrium real interest rates have translated into low nominal interest rates. With investors and forecasters expecting only a moderate economic recovery and fairly low inflation in the medium term,

## 1. Estimated effects of a higher short-term interest rate and steeper yield curve on banks' NIMs and ROAs

### A. Estimated effects on NIMs



### B. Estimated effects on ROAs



NOTES: The figure shows the estimated effects of a 1 percentage point increase over one quarter in the three-month Treasury bill interest rate (in blue bars) and, separately, in the spread between the ten-year Treasury note and three-month Treasury bill yields (in gray bars) on the net interest margins, or NIMs (panel A), and returns on assets, or ROAs (panel B), of the commercial banks in the sample, adjusted by the banks' total assets. Banks are separated into size classes based on their total assets as of year-end 2012. Dark blue and gray bars indicate estimated effects that are statistically significant at the 5% level. Light blue and gray bars indicate estimated effects that are statistically indistinguishable from zero. For details on the model estimated, see [www.chicagofed.org/digital\\_assets/others/people/research\\_resources/genay\\_hesna/cfjuly2014\\_324\\_appendix.pdf](http://www.chicagofed.org/digital_assets/others/people/research_resources/genay_hesna/cfjuly2014_324_appendix.pdf).

SOURCES: Authors' calculations based on data from the Federal Financial Institutions Examination Council (FFIEC) 031 reports (*Consolidated Reports of Condition and Income for a Bank with Domestic and Foreign Offices*, or Call Reports) and Haver Analytics.

short-term nominal rates are expected to remain at historically low levels for some time. As a result, long-term nominal interest rates have been at historically low levels, leading to a flat yield curve.

The economic and financial developments in recent years have direct implications for banks' profitability beyond their effects through low interest rates. During the Great Recession, the demand for loans declined in tandem with the demand for investments. At the same time, the decline in asset prices and the sharp increase in unemployment led to more loan delinquencies, charge-offs, and loan-loss provisions, directly reducing banks' profits. During the past three years, as the economic recovery has gained traction, loan demand has strengthened, albeit moderately. At the same time, better economic conditions and balance-sheet repair have improved borrowers' credit quality, allowing banks to release loan reserves and boost earnings.

All told, these developments—and the changes in banks' business operations in response—have had a noticeable effect on bank profits. Despite the rising interest rate environment of 2004–06, banks' NIMs and returns on assets (ROAs)<sup>7</sup> were on a slow but steady decline prior to the financial crisis. NIMs at commercial banks

declined from an average of 3.8% at the beginning of 2004 to 3.2% at the end of 2006. After rising back to an average of 3.8% in 2010, NIMs have resumed their slow decline in the past three years (they averaged around 3.3% at the end of 2013). ROAs have followed a similar, but more volatile, path in the past ten years. After declining from about 1.4% to 1.2% over the 2004–06 period, banks' average ROA declined sharply, even turning negative, during the crisis. Since early 2010, however, banks have posted positive profits (average ROA stood at around 1% at year-end 2013).<sup>8</sup>

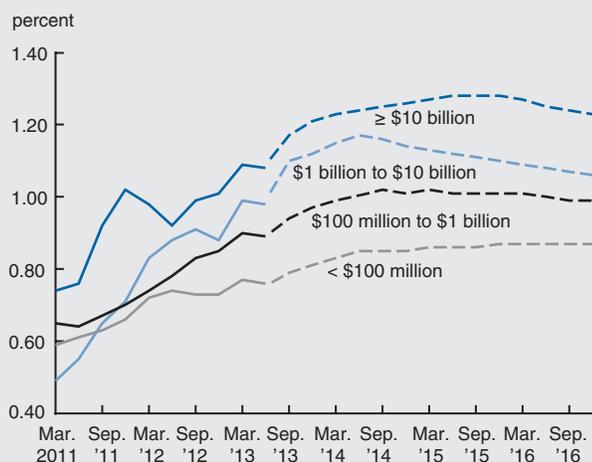
### Higher interest rates, higher bank profits

We estimate the impact of changes in interest rates on commercial banks' profitability, taking into account the underlying economic and financial developments and the differences in banks' business models. Specifically, we relate banks' NIMs and ROAs to changes in the three-month U.S. Treasury bill (T-bill) interest rate, as well as in the spread between ten-year U.S. Treasury note and three-month T-bill yields, during our sample period (2003:Q3–2013:Q2).<sup>9</sup> We account for the state of the economy, financial markets, and investor sentiment by including the growth rate of real gross domestic product (GDP), changes in the

unemployment rate, changes in house and commercial real estate prices, and the Chicago Board Options Exchange (CBOE) Volatility Index (VIX) as control variables. We also account for differences in banks' business operations by estimating the model separately for four bank asset-size classes and by controlling for banks' asset composition, sources of funding, and capitalization.<sup>10</sup>

Panel A of figure 1 shows the estimated impact of a 1 percentage point increase in the three-month T-bill interest rate (our short-term interest rate measure), as well as in the spread between ten-year Treasury note and three-month T-bill yields (our measure for yield curve steepness), on NIM for each of our four asset-size classes for banks. Higher short-term interest rates are associated with higher NIMs, as conventional wisdom would suggest. Moreover, all else being equal, the estimated effects are greater for smaller institutions. A 1 percentage point increase in short-term interest rates is associated with a 1.5 basis point increase in the average NIM of the smallest banks (with assets less than \$100 million), but with only a 0.3 basis point increase in the average NIM of the largest banks (with assets greater than or equal to \$10 billion). The estimated effects of a steeper yield

## 2. Potential future paths of banks' ROAs



NOTES: The figure shows the expected paths (dashed lines) for the returns on assets (ROAs) for commercial banks in the sample (separated into four size classes based on their total assets as of year-end 2012) through the end of 2016 using our model (see note 10) if real gross domestic product, the unemployment rate, and the ten-year Treasury yield evolve according to Macroeconomic Advisers' forecasts as of April 4, 2014, and the house and commercial real estate prices, the three-month Treasury bill interest rate, and the Chicago Board Options Exchange (CBOE) Volatility Index (VIX) follow the baseline scenario from the 2014 bank stress tests conducted by the Federal Reserve (details available at [www.federalreserve.gov/bankinfo/reg/bcreg20131101a1.pdf](http://www.federalreserve.gov/bankinfo/reg/bcreg20131101a1.pdf)).

SOURCES: Authors' calculations based on data from Macroeconomic Advisers, Board of Governors of the Federal Reserve System, and Haver Analytics.

curve are slightly larger and exhibit a similar differential impact across bank asset-size classes. A 1 percentage point increase in the spread between the yields on the ten-year and three-month Treasury securities is associated with an increase of about 1.8 basis points in the average NIM of the smallest banks, but with a smaller increase (about 0.8 basis points) in the average NIM of the largest banks.

The estimated effects on banks' ROAs are more mixed, as shown in panel B of figure 1. For the smallest banks and banks with \$1 billion to \$10 billion in assets, higher short-term rates and a steeper yield curve have little effect on ROA. Both are associated with higher ROAs for the largest banks, but with slightly lower ROAs for banks with \$100 million to \$1 billion in assets.

These results suggest that during our sample period banks have been able to cushion the effects of changing interest rates on profits by altering their business practices, perhaps through higher fee income or by adjusting their loan-loss provisions. Indeed, recent issues of the Federal Deposit Insurance Corporation's (FDIC) *Quarterly Banking Profile* indicate that lower loan-loss provisions and higher

fee and trading income have provided significant support for bank earnings in recent years.<sup>11</sup>

### Economically small effects on bank profits from rate changes

While our analysis suggests that higher interest rates and steeper yield curves are associated with statistically higher bank NIMs and ROAs, the magnitudes of the estimated effects are quite small. Increases of 1 percentage point in the three-month T-bill interest rate and in the spread between ten-year Treasury note and three-month T-bill yields over one quarter

are very large changes by historical standards.<sup>12</sup> Our analysis suggests that even such large changes in interest rates have small effects on bank profits. The largest estimated effect from a 1 percentage point increase in the three-month T-bill interest rate is a 1.5 basis point increase in both the average NIM of the smallest banks (figure 1, panel A) and the average ROA of the largest banks (figure 1, panel B). Similarly, a 1 percentage point increase in the spread between yields on the ten-year and three-month Treasury securities is associated with at most a 1.8 basis point increase in the average NIM of the smallest banks (figure 1, panel A) and a 3.4 basis point increase in the average ROA of the largest banks (figure 1, panel B). Not only are these estimated effects small in absolute magnitudes, but they are dwarfed by the quarterly changes in banks' NIMs and ROAs. Over our sample period, the average absolute quarterly change in NIM was over 5 basis points—more than twice the size of the largest estimated effect from a 1 percentage point increase in our measures for the short-term interest rate and the steepness of the yield curve. Similarly, the average absolute quarterly change in ROA over our

sample period was nearly 19 basis points—over five times the largest estimated effect from a 1 percentage point increase in our two measures.

### Economic conditions matter more

Interest rate changes generally have small effects on bank profits, but changes in economic conditions do matter relatively much more. Consider changes in the unemployment rate and house prices that are historically comparable to a 1 percentage point increase in our measures for the short-term interest rate and the steepness of the yield curve.<sup>13</sup> A 1 percentage point decline in the unemployment rate over a quarter is associated with up to a 9 basis point increase in bank ROA—nearly three times the largest estimated effect on ROA of a 1 percentage point increase in our yield curve measure and six times the largest effect of the same increase in our short-term interest rate measure (figure 1, panel B). House price changes also have sizable effects on bank profits. An 8 percentage point quarterly increase in house prices, which is comparable in magnitude and frequency to the changes in interest rates and the unemployment rate we consider, is associated with a 5 basis point increase in ROA.

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## Slow improvement in bank profits

For the next two years, private forecasters expect continued improvement in economic activity and further house price appreciation, even as they expect short-term interest rates to remain at historically low levels. If these expectations are borne out, our model predicts banks' ROAs to gradually improve further (figure 2). By the end of 2016, if economic conditions evolve as private forecasters expect, our model projects that banks'

ROA will range from a bit less than 1% for the smallest banks to about 1.2% for the largest ones.

## Conclusion

By necessity, our model is parsimonious and does not include many factors that can potentially affect banks' profits or the effects of interest rate changes on various business segments. More-granular analyses that take all these factors into account, such as those carried out by

bank management and regulators, are likely to produce more-precise estimates of the interest rate sensitivity of bank profits. These caveats aside, our analysis suggests that while low short-term interest rates and a flat yield curve can compress bank earnings, if history is a guide to the future and low rates result in better economic outcomes—i.e., a lower unemployment rate, higher house prices, and faster GDP growth—their net effect on bank profits might be positive.

<sup>1</sup> A yield curve is the line plotting the yields or interest rates of assets of the same credit quality but with differing maturity dates at a certain point in time. These assets, such as U.S. Treasury securities, typically yield incrementally more at longer maturities.

<sup>2</sup> NIM equals interest income generated by a bank minus the interest paid on its borrowed funds, divided by the average value of the assets on which it earned income.

<sup>3</sup> Interest rate risk is the risk that an asset's value will be altered because of a change in market interest rates. In addition to yield curve risk (the risk that changes in the yield curve shape can affect banks' assets and liabilities differentially), interest rate risk comprises repricing risk (the risk that assets and liabilities of banks might have different sensitivities to changes in interest rates), basis risk (differences in the base rates used to price banks' various assets and liabilities and potentially disparate moves in the base rates), and options risk (the impact of interest rate changes on bank customers' behavior, such as early withdrawal of funds or prepayment of loans). In this article, we primarily focus on yield curve risk, but we also address other components of interest rate risk to a certain extent by examining the effects of changes in short-term interest rates on bank profits.

<sup>4</sup> In addition, in March 2014 the FOMC stated that it anticipates that economic conditions may warrant keeping the target rate below its long-run normal level for some time after the economy returns to full employment and inflation is near the 2% target; see [www.federalreserve.gov/newsevents/press/monetary/20140319a.htm](http://www.federalreserve.gov/newsevents/press/monetary/20140319a.htm).

<sup>5</sup> For details on LSAPs and MEP, see [www.federalreserve.gov/faqs/what-are-the-federal-reserves-large-scale-asset-purchases.htm](http://www.federalreserve.gov/faqs/what-are-the-federal-reserves-large-scale-asset-purchases.htm) and [www.federalreserve.gov/faqs/money\\_15070.htm](http://www.federalreserve.gov/faqs/money_15070.htm).

<sup>6</sup> For more detailed discussions of the factors contributing to the recent low interest rate environment in the U.S. and abroad, see [www.federalreserve.gov/newsevents/speech/bernanke20130301a.htm](http://www.federalreserve.gov/newsevents/speech/bernanke20130301a.htm) and [www.imf.org/external/pubs/ft/weo/2014/01/pdf/text.pdf](http://www.imf.org/external/pubs/ft/weo/2014/01/pdf/text.pdf).

<sup>7</sup> ROA equals net income after taxes and extraordinary items divided by average total assets.

<sup>8</sup> See figure A1 in our online appendix: [www.chicagofed.org/digital\\_assets/others/people/research\\_resources/genay\\_hesna/cfljuly2014\\_324\\_appendix.pdf](http://www.chicagofed.org/digital_assets/others/people/research_resources/genay_hesna/cfljuly2014_324_appendix.pdf).

<sup>9</sup> While most assets and liabilities of banks are not priced based on Treasury yields, there is a high correlation between movements

in Treasury yields and other market interest rates (such as the prime rate and London interbank offered rate).

<sup>10</sup> For details on our model, see [www.chicagofed.org/digital\\_assets/others/people/research\\_resources/genay\\_hesna/cfljuly2014\\_324\\_appendix.pdf](http://www.chicagofed.org/digital_assets/others/people/research_resources/genay_hesna/cfljuly2014_324_appendix.pdf). We also estimated alternative specifications of our baseline model, and the results were qualitatively similar to those reported here.

<sup>11</sup> See <http://www2.fdic.gov/qbp/qbpSelect.asp?menuItem=QBP>.

<sup>12</sup> During our sample period, the standard deviation of changes in the three-month T-bill rate and this yield spread were 38 basis points and 42 basis points, respectively. While there were rapid and large interest rate declines during the unusual period of the financial crisis, the last time short-term interest rates rose by 1 percentage point over a quarter was in 1982. Similarly, a 1 percentage point increase in this yield spread over one quarter was last observed in 1984.

<sup>13</sup> During our sample period, the standard deviations of quarterly changes in the three-month T-bill rate, the spread between the ten-year and three-month Treasury yields, the unemployment rate, and the CoreLogic Home Price Index were 0.38, 0.42, 0.37, and 3.19 percentage points, respectively.