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Smaller Banks Less Able to Withstand Flattening Yield Curve

by Pavel Kapinos and Alex Musatov

ABSTRACT: For the overall U.S. banking system, the effect on profitability of yield-curve flattening—the lowering of the difference between the yields of short- and long-term debt—lasts about a year and is relatively small. After the first year, the impact on large banks' profitability becomes positive; for smaller institutions, it stays negative and becomes larger. Recent yield-curve flattening is likely to more strongly affect smaller banks, reducing their profitability.

An analytical and forecasting mainstay, the yield curve has been routinely used to forecast a variety of economic outcomes, including recessions.[1] The yield curve refers to the rate at which debt interest rates change from shorter to longer maturities. Usually, short-term rates are lower than those of longer maturities.

Low short-term interest rates over a protracted period and a diminishing yield-curve slope—the result of a narrowing "term spread" between short- and long-term rates—have motivated academics, policymakers and analysts to reexamine the yield curve's effect on macroeconomic and financial variables.

An analysis shows that the link between the term spread and banks' profitability is alive and well, though its strength varies by bank size.

Banks and the Yield Curve

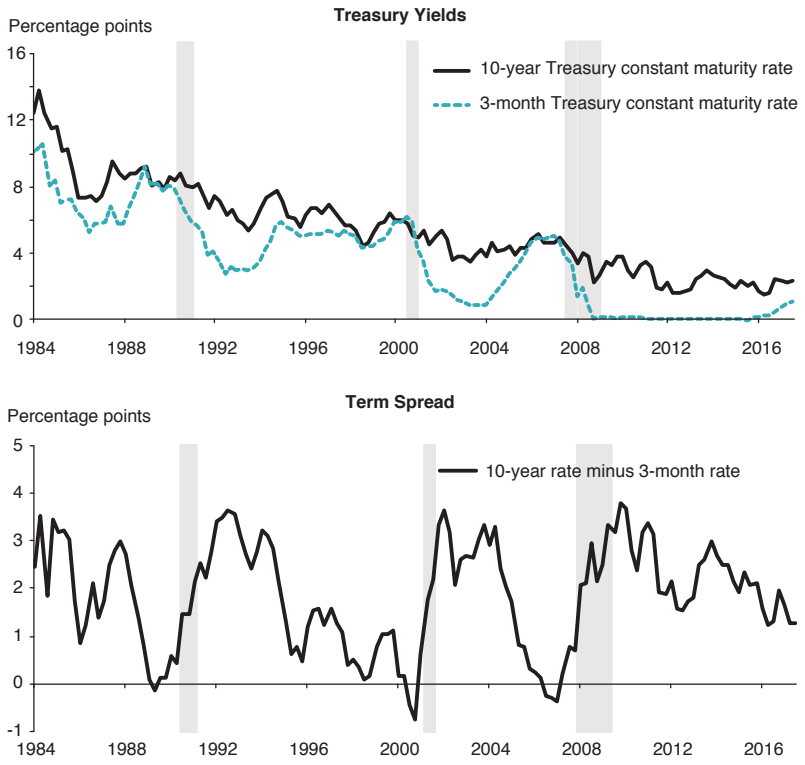
One way banks earn profits involves maturity transformation, taking in deposits and lending funds for longer terms, typically at higher rates. A flattening yield curve may be signaling an impending recession that will complicate a bank's ability to conduct maturity transformation profitably, raising broader concerns about the outlook for U.S. banks' profitability and stability.

Although a yield curve can be constructed for any cash-generating debt instrument available with multiple maturities, the most widely used yield curve relies on Treasury securities' yields because U.S. government debt has virtually no default risk and is actively traded in secondary markets.

A closely monitored characteristic of the yield curve is its slope, or the term spread. Although the term spread can be calculated between any pair of maturities—or even as a weighted average of various pairs—it is conventionally estimated as the difference between the yield on 10-year Treasury notes and three-month Treasury bills. The difference reflects the premium demanded by investors for bearing additional long-term risk, as well as their expectations about the future path of interest rates on short-term Treasuries.

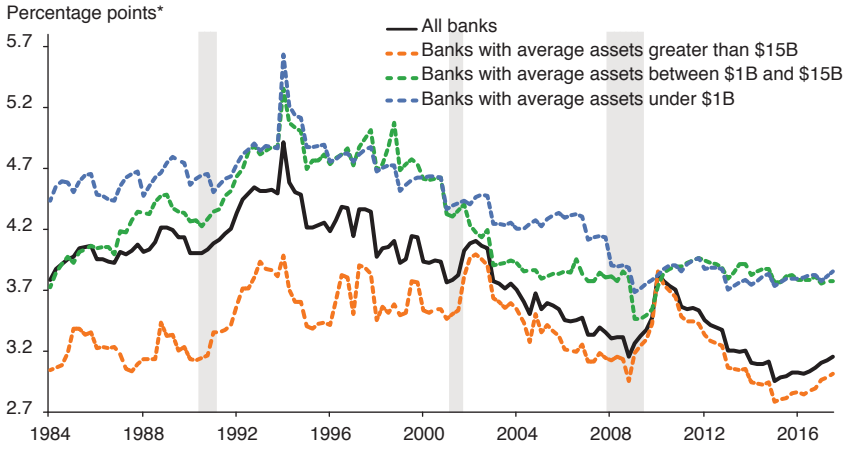
Long-term interest rates are normally higher than short-term rates, in part due to the liquidity premium associated with holding securities of longer maturities. The yield curve, therefore, typically slopes upward and the term spread is positive. A flat curve indicates that short- and long-term Treasuries offer the same rates. A downward-sloping, "inverted" curve almost always portends a recession—investors expect future short-term rates to decrease relative to current levels in

CHART 1 Short-Term Rates Generally Drive Term Spread



NOTE: Shaded areas denote National Bureau of Economic Research-defined recessions.
SOURCE: Federal Reserve Bank of St. Louis FRED database.

CHART 2 Net Interest Margin Tends to Move in Unison for Banks of Differing Sizes



*Quarterly data, annualized; not seasonally adjusted.
NOTES: Shaded areas denote National Bureau of Economic Research-defined recessions.
SOURCE: Federal Reserve Bank of St. Louis FRED database.

response to Federal Reserve rate-cutting aimed at averting a downturn.

Nominal, or stated, yields on Treasuries have generally declined for more than three decades while the slope of the curve has fluctuated, reflecting investors' changing perceptions of future macroeconomic conditions (*Chart 1*). Although the yields for 10-year and three-month instruments generally move in tandem, the shorter end of the yield curve is normally more volatile because the Federal Reserve typically affects economic activity through short-term rates. Hence, shifts in the slope are more likely driven by changes in three-month yields.

One exception to this rule occurred when short-term rates reached the zero lower bound following the Great Recession of 2007–09. During subsequent years, the Federal Reserve was widely perceived as conducting monetary policy through longer-term rates by purchasing longer-term Treasuries and mortgage-backed debt and issuing forward guidance regarding the future conduct of monetary policy. The term spread, thus, reflected the unconventional monetary policy during that period.

The term spread has plunged multiple times since the 1980s, but it dipped into negative territory in only three instances—each time accurately presaging a recession. As the macroeconomic outlook improved, the yield curve steepened. More recently, the term spread has gradually declined but remained positive.[2]

Term Spread, Bank Profitability

Maturity transformation is banks' principal economic activity.[3] Given that banks pay short-term rates on deposits and receive long-term rates on loans, their profitability is sensitive to the difference between the two. A wider term spread (or a steeper yield curve) should benefit banks' bottom lines.

The best measure of bank profits linked to yield-curve movement is the net interest margin (NIM). It is calculated as the difference between a bank's interest income and interest expense, normalized by the average size of its interest-earning assets. The aggregate NIM for U.S. banks peaked in 1994 and has generally declined since then, reaching a historical low in fourth quarter 2015.[4]

In theory, the portion of bank profits derived from interest-rate-sensitive activities should reflect changes in the term spread. In practice, the relationship can be difficult to demonstrate using static econometric methods, and some attempts have produced mixed and even counterintuitive results in advanced economies.[5, 6]

When grouped by size, banks in all groups find their net interest margins generally move in the same direction, but consistent differences in NIM levels arise between groups of various sizes (*Chart 2*). Banks with smaller average earning assets (less than $1 billion) report higher relative profitability from interest-sensitive activities, though their outperformance vis-à-vis larger peers (those with assets greater than $15 billion) has narrowed over time.

The NIM for smaller banks was 140 basis points (a basis point equals 0.01 percentage points) higher than for the largest banks in 1984—when collection of these data began—but the difference narrowed to less than 100 basis points in 2017, primarily due to a decline in the profitability of smaller institutions.

Net Interest Margin Modeling

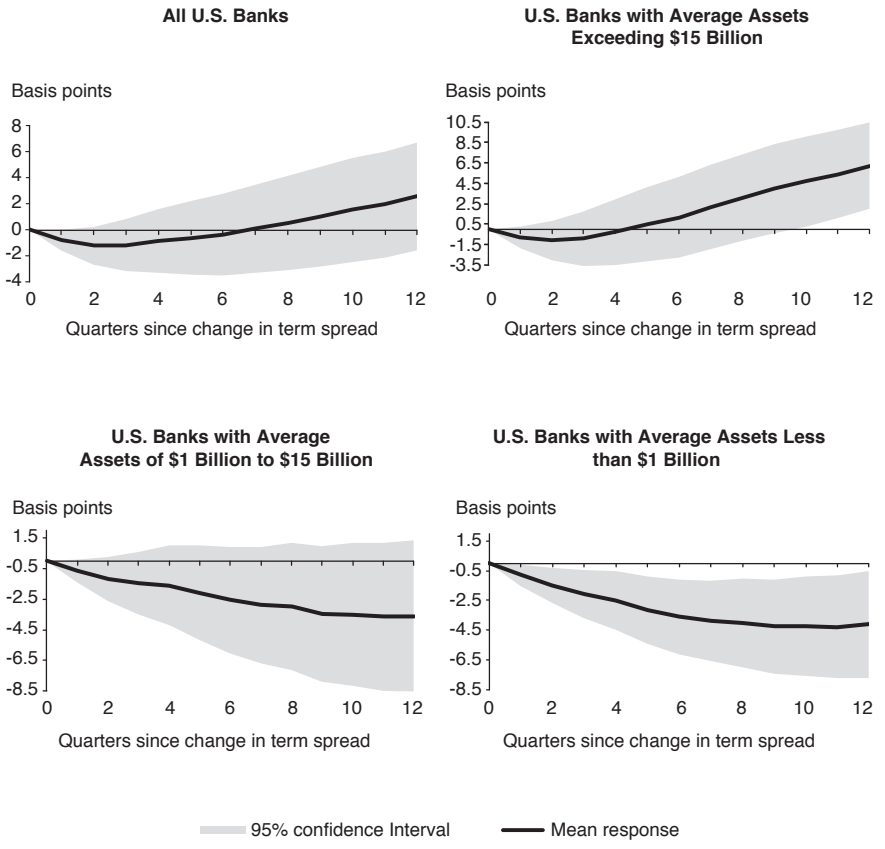
Disentangling the effects of a changing term spread on NIM is inherently difficult because both variables evolve dynamically. Thus, it's not useful to look at a correlation coefficient between the two variables or estimate a simple regression model of NIM on the term spread because the statistical strength of the relationship may depend on the variables' joint exposure to a common factor such as business-cycle conditions.

Moreover, a one-period variation in the term spread may affect NIM with a lag, another aspect of the dynamic relationship between them. Controlling for exposure to common drivers helps isolate the effect of the term spread on NIM.

A macroeconomic time-series model that studies the joint dynamic evolution of NIM, real gross domestic product growth, its deflator inflation rate and the term spread provides a more complete view.[7] This method takes into account the dynamic relationships between all variables and traces the effects of a one-time change in the term spread. In other words, the model accounts for the interplay between all the variables and then teases out the effect of the term spread on bank profitability.

Chart 3 presents the responses of several NIM measures over three years to a one-time, 100-basis-point decrease in the term spread, corresponding to a flattening of the yield curve, as depicted by the model.[8]

CHART 3 Effect of 100-Basis-Point Term-Spread Decrease Varies by Bank Size



NOTES: The charts show the impact on net interest margin of a one-time 100-basis-point reduction.
SOURCES: Federal Reserve Bank of St. Louis FRED database; authors' calculations.

The top left panel suggests that the response is indeed negative but small during the first six quarters, significant only during the first couple of quarters and insignificant thereafter. When the yield curve flattens, the NIM shrinks for multiple quarters.

The top right panel indicates that the overall shape of the response is primarily driven by the largest banks. For entities with more than $15 billion in assets, the response stays marginally negative for the first five quarters and becomes significantly positive after 10. These large banks appear to move in the direction *opposite* of the one predicted by theory at the longer time horizons.

The picture is different for smaller banks. Among banks with assets between $1 billion and $15 billion (bottom left panel), the response to the term-spread shock remains negative over the entire three-year period, increasing over time yet remaining statistically insignificant. Among banks with less than $1 billion in assets (bottom right panel), the chart shows a sizable and consistently negative NIM response to the term-spread shock that remains negative and significant over the entire three-year horizon.[9]

Differing Asset Bases, Impacts

The relationship between the slope of the yield curve and bank profitability remains very much intact once multiperiod effects and institutional size are accounted for. The continued flattening of the Treasury yield curve will likely diminish the smaller banks' net interest margins. Margins likely will remain largely unaffected among midsize institutions and will potentially improve among the largest banks in the longer term.

Large banks' relative insensitivity to the slope of the yield curve may reflect more diversified portfolios of earning assets. Loans, which constitute almost 70 percent of assets for many midsize banks, compose less than 50 percent of assets at the largest institutions. In turn, large banks hold higher percentages of trading assets—securities, including debt instruments—which respond to changes in the term spread differently and insulate the banks' income statements from variances in interest rates and spreads.

Smaller banks have a more limited asset base and generally focus on higher-yielding loans, which tend to reprice faster than deposit rates when the yield curve is steepening and longer-term rates rise. Thus, small banks' NIMs widen in an era of rising rates more significantly and for a longer period.

Further research may uncover additional factors that explain the differential responses of small and large banks to changes in the slope of the yield curve.

Kapinos is a research economist and Musatov is a specialist in the Supervisory Risk and Surveillance Department at the Federal Reserve Bank of Dallas.

Notes

[1] See "Predicting U.S. Recessions: Financial Variables as Leading Indicators," by Arturo Estrella and Frederic S. Mishkin, *Review of Economics and Statistics,* MIT Press, vol. 80, no. 1, 1998, pp. 45–61. For an ongoing evaluation of this relationship, see "Yield Curve and Predicted GDP Growth, April 2018," Federal Reserve Bank of Cleveland, accessed April 23, 2018, www.clevelandfed.org/our-research/indicators-and-data/yield-curve-and-gdp-growth.aspx.

[2] 10-Year Treasury Constant Maturity Minus 3-Month Treasury Constant Maturity [T10Y3M], FRED database, Federal Reserve Bank of St. Louis, Feb. 15, 2018, accessed April 24, 2018, https://fred.stlouisfed.org/series/T10Y3M.

[3] Banks derive profits from many other activities, such as liquidity transformation, credit transformation and payment services.

[4] For a comprehensive discussion of factors behind net interest margin decline, see "Why Are Net Interest Margins of Large Banks So Compressed?" by Francisco B. Covas, Marcelo Rezende and Cindy M. Vojtech, *FEDS Notes,* Federal Reserve Board of Governors, Oct. 5, 2015, accessed April 24, 2018, www.federalreserve.gov/econresdata/notes/feds-notes/2015/why-are-net-interest-margins-of-large-banks-so-compressed-20151005.html.

[5] "Interest Rate Risk and Bank Net Interest Margins," by William B. English, *BIS Quarterly Review,* Bank for International Settlements, December 2002, www.bis.org/publ/qtrpdf/r_qt0212g.pdf.

[6] A number of studies have suggested that the absolute level of interest rates—not just the term spread—affects bank profitability and have posited possible explanations. For a summary of recent studies related to bank profitability in a low-rate environment, see "Low Interest Rates and Bank Profits," by Katherine Di Lucido, Anna Kovner and Samantha Zeller, *Liberty Street Economics,* Federal Reserve Bank of New York, June 21, 2017, accessed April 24, 2018, http://libertystreeteconomics.newyorkfed.org/2017/06/low-interest-rates-and-bank-profits.html.

[7] Technical details of the estimation framework are available upon request. The results are robust to alternative measures of business-cycle conditions, such as the change in the unemployment rate and core personal consumption expenditures (PCE) inflation or other definitions of the term spread.

[8] "Estimation and Inference of Impulse Responses by Local Projections," by Oscar Jorda, *American Economic Review,* vol. 95, no. 1, 2005, pp. 161–82. The results hold in the time series from Haver Analytics that start in first quarter 1991 and group banks in three categories: smaller than $50 billion, $50 billion–$500 billion and over $500 billion.

[9] The framework we use here imposes symmetry between positive and negative 100-basis-point increases. Allowing for asymmetries and nonlinearities in Jorda's approach *(see note 8),* the responses of large banks' net interest margins are largely symmetric, whereas most of the small banks' responses are driven by the episodes of negative term-spread shocks that correspond to the flattening or inversion of the yield curve and are disproportionately larger as those shocks increase in size.

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Federal Reserve Bank of Dallas
2200 N. Pearl St., Dallas, TX 75201