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The Predictive Power of Yield Curve Inversions

When has a yield curve inversion been an indicator of economic slowdown, and what are the implications for investors?

DEEPER ANALYSIS OF INVESTMENT TRENDS AND TOPICS

April 3, 2019

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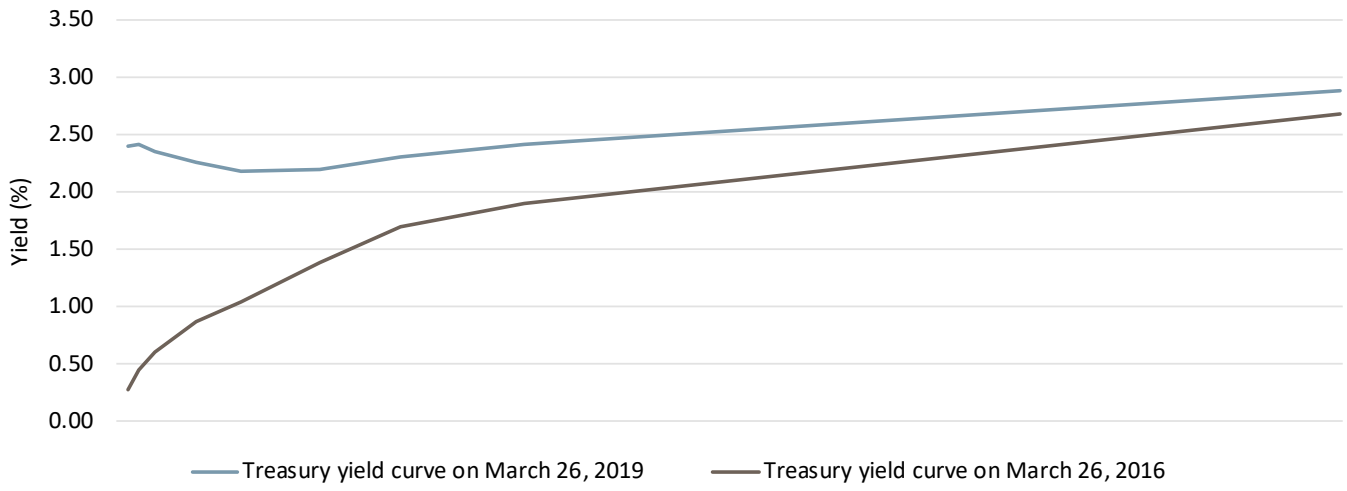
Key Insights

- *In recent weeks, the Federal Reserve (Fed) has turned decidedly dovish regarding the monetary outlook. We think that the rate hike cycle likely has come to an end.*
- *Some market participants now are concerned that a near-term yield curve inversion could signal impending U.S. economic weakness ahead. The Treasury yield curve has been a powerful predictor of recession in past economic cycles.*
- *While we believe that economic growth will continue at a moderate pace, the risks are building that the economic expansion may slow more than expected. We are at a key inflection point, and we believe that the yield curve merits close monitoring.*

The yield curve is essentially the difference between shorter- and longer-term interest rates. While it is a simple concept that often is shown graphically, the yield curve captures investors' attention, because it has a story to tell. The yield curve has inverted (short-term interest rates moving above longer-term rates) before each of the past six recessions. Yield curve inversion is an important forecasting tool. Yet, in and of itself, it does not cause a recession. While the yield curve can help to diagnose a problem in the economy, it is not foolproof—as it does not pinpoint exact timing, or how fast conditions may change. It does not necessarily signal when investors should immediately reduce portfolio risk. In fact, equity markets sometimes can continue to perform quite well after a yield-curve inversion occurs. In this report, we explore the power of the Treasury yield curve to predict U.S. recessions, discuss what the yield curve means for investors' portfolios today, and outline what market participants should monitor going forward.

Chart 1. Three years of curve flattening—U.S. Treasury yield curve in March 2019 and March 2016



Sources: Bloomberg, Wells Fargo Investment Institute, March 26, 2019. Yields represent past performance. **Past performance is no guarantee of future results.** Yields fluctuate as market conditions change. A yield curve is a curve on a graph in which the yield of fixed-interest securities is plotted against the length of time they have to run to maturity.

The Treasury yield curve has been flattening for more than three years. As the yield curve has continued to flatten, there is less breathing room for interest rates, and we now face the possibility of a meaningful yield curve inversion. Yield inversion can grab media headlines and become a focus for investors.

Yield curve inversion and history—predicting U.S. economic recessions

It is important to understand the ways in which yield curve inversion may be measured. The yield curve is composed of multiple points; some are far more important than others in offering a meaningful recessionary signal. Using just the Treasury yield curve, we looked at five different yield curve points and three different recessionary indicators. In this section, we explore each one and highlight which signals we believe are the most meaningful yield curve inversion signals for investors to watch today.

What are the "best" measures of yield curve inversion?

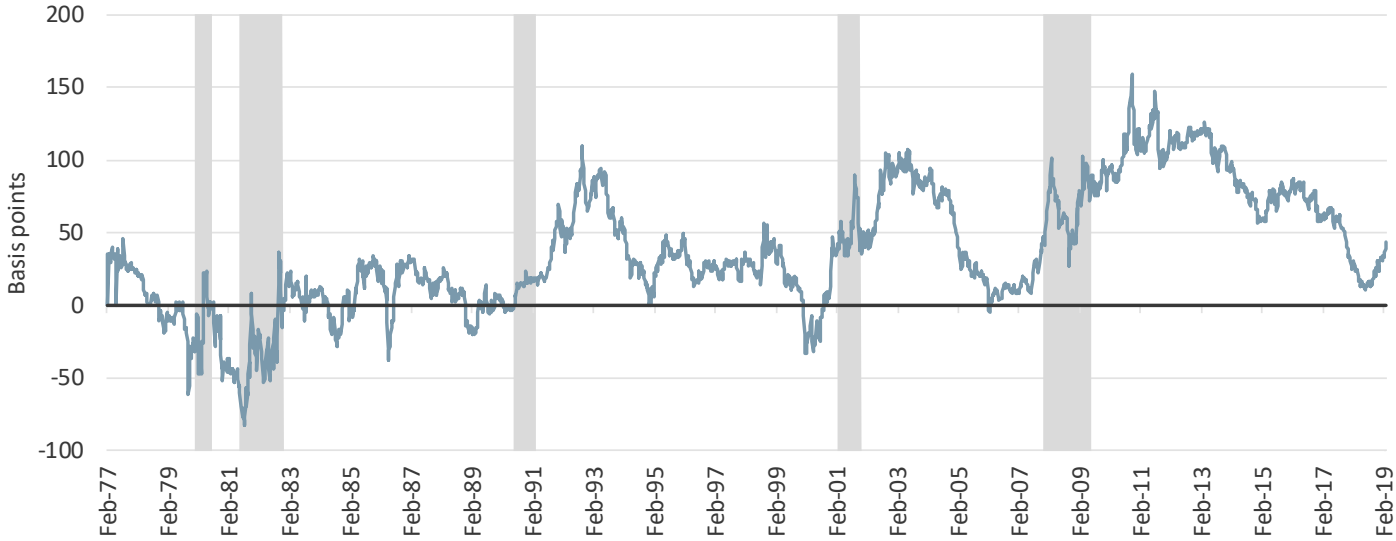
As noted, we examined five key points on the Treasury yield curve. These included the 3-month, 1-year, 2-year, 7-year, 10-year, and 30-year maturities. While other Treasury maturities also could be examined, these selected points cover the entirety of the yield curve term structure and provide a lengthy historical data set. Using weekly data, we explored three yield curve indicators: a single week of curve inversion, four consecutive weeks of curve inversion, and a single week of at least 25 basis points of curve inversion.[1] For each indicator, we examined each of the past seven recessions for which data was available. The recessions are identified by the National Bureau of Economic Research, and they include: December 1969 to November 1970, November 1973 to March 1975, January 1980 to July 1980, July 1981 to November 1982, July 1990 to March 1991, March 2001 to November 2001, and December 2007 to June 2009.

The yield curve inverted before each of the recessions studied. Yet, the indicators also provided a false positive for recession in the mid-1960s—when an inversion was followed by an economic slowdown, but not by an official recession.[2] At that time, an official recession did not materialize until December 1969, which was more than three years after the initial inversion trigger.

[1] One hundred basis points equal 1%.

[2] A recession is an economic contraction that lasts for at least two quarters.

Chart 2. Thirty-year Treasury yield minus 10-year Treasury yield



Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, March 26, 2019. Shaded area represents timeframe of a U.S. economic recession. Yields represent past performance and fluctuate with market conditions. **Past performance is no guarantee of future results.**

Table 1. Treasury yield curve inversion (30-year minus 10-year yield) and U.S. recessions

Indicator	Number of weeks before recession						
	Dec 1969	Nov 1973	Jan 1980	July 1981	July 1990	Mar 2001	Dec 2007
One week of inversion	No Data	No Data	149	48	396	58	95
Four weeks of inversion	No Data	No Data	59	43	316	55	92
Inversion of 25 basis points	No Data	No Data	12	44	305	56	N/A

Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, July 16, 2018.

Thirty-year bonds did not become a staple of the Treasury issuance calendar until 1977. This limits the ability for market observers to analyze long-maturity yield curve inversion for early recessionary periods.

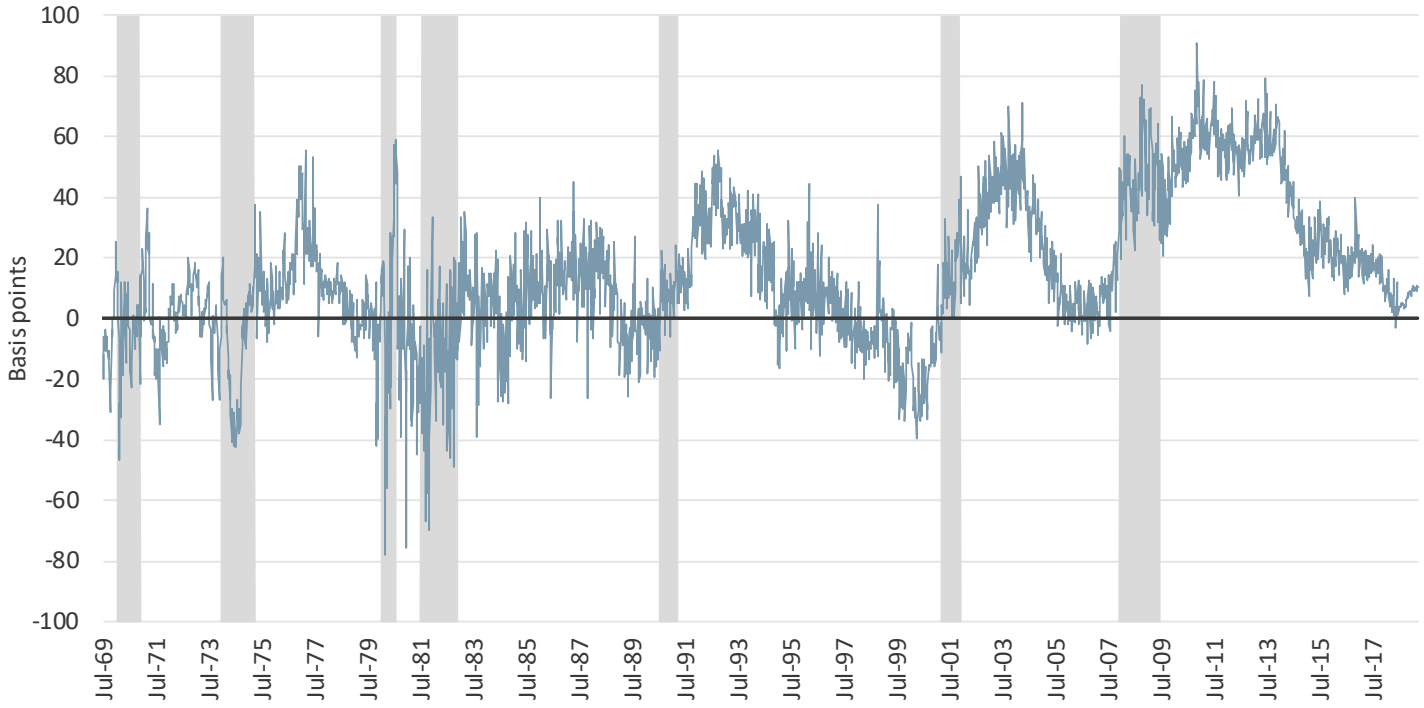
For any of the three indicators, we found that using the 30-year Treasury yield minus the 10-year Treasury yield provided an inconsistent recessionary signal.

The signals turned negative as much as eight years before the July 1990 recession—and as few as three months before the January 1980 recession. While inversion in the long part of the Treasury yield curve may provide investors with information about the market's long-term economic outlook, it is not a precise (or necessarily useful) tool for U.S. recession prediction.

As of March 26, 2019, 10-year yields were 11 basis points higher than 7-year Treasury yields. In our analysis, we found yield curve inversion between these two Treasury maturities to be of little predictive value. In our view, investors should not be overly concerned if this portion of the yield curve does invert.

The data we analyzed showed that inversion of the yield curve between 7-year and 10-year Treasury securities is comparable to an inversion further out on the yield curve. That is, it often is not meaningful for U.S. recession prediction.

Chart 3. Ten-year Treasury yield minus 7-year Treasury yield



Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, March 26, 2019. Shaded area represents timeframe of a U.S. economic recession. Yields represent past performance and fluctuate with market conditions. **Past performance is no guarantee of future results.**

Table 2. Treasury yield curve inversion (10-year minus 7-year yield) and U.S. recessions

Indicator	Number of weeks before recession						
	Dec 1969	Nov 1973	Jan 1980	July 1981	July 1990	Mar 2001	Dec 2007
One week of inversion	No Data	134	70	45	369	327	121
Four weeks of inversion	No Data	131	52	42	307	193	53
Inversion of 25 basis points	No Data	N/A	9	3	360	81	N/A

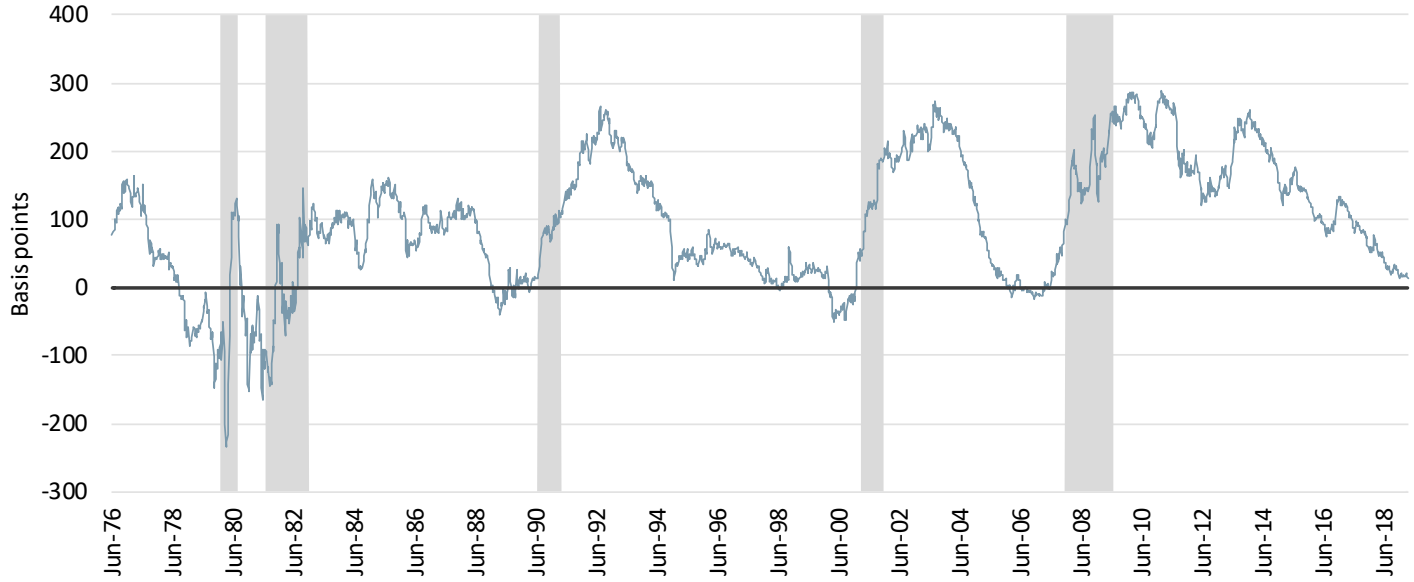
Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, July 16, 2018.

Our data set for two-year Treasury yields begins in 1976, which limits our ability to analyze this data for pre-1970 recessions. This is a data point that we have been watching closely as the Treasury yield curve continues to flatten. As of March 26, 2019, the 10-year Treasury note offered 16 basis points of additional yield over 2-year Treasury securities. While our expectation is that the 10-to-2-year Treasury curve will remain flat to slightly positive over the near term, risks are increasing that this portion of the yield curve will invert. Still, it is important to note that this indicator often turns negative well over a year before a U.S. recession strikes—and that it is most reliable when it inverts by at least 25 basis points.

The yield gap between the 10-year Treasury note and 2-year Treasury securities turned negative almost three years before the March 2001 recession. Not only did it turn negative, but it remained negative for four weeks. Using a negative 25-basis-point threshold as a trigger improved the forecast accuracy, but it also decreased the lead time of the indicator. The shortest amount of time between a 25-basis-point inversion in this indicator and a U.S. recession was 31 weeks (almost 8 months). That occurred before the Great Recession that began in December 2007.

The 10-year to 2-year yield curve is a useful indicator, but it is prone to giving a signal that may be too early for investors to meaningfully act. If we instead focus on a higher threshold (the 25-basis point-indicator), a magnitude of inversion that has occurred in every recession in which we have available data to analyze, this indicator proved more reliable.

Chart 4. Ten-year Treasury yield minus 2-year Treasury yield



Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, March 26, 2019. Shaded area represents timeframe of a U.S. economic recession. Yields represent past performance and fluctuate with market conditions. **Past performance is no guarantee of future results.**

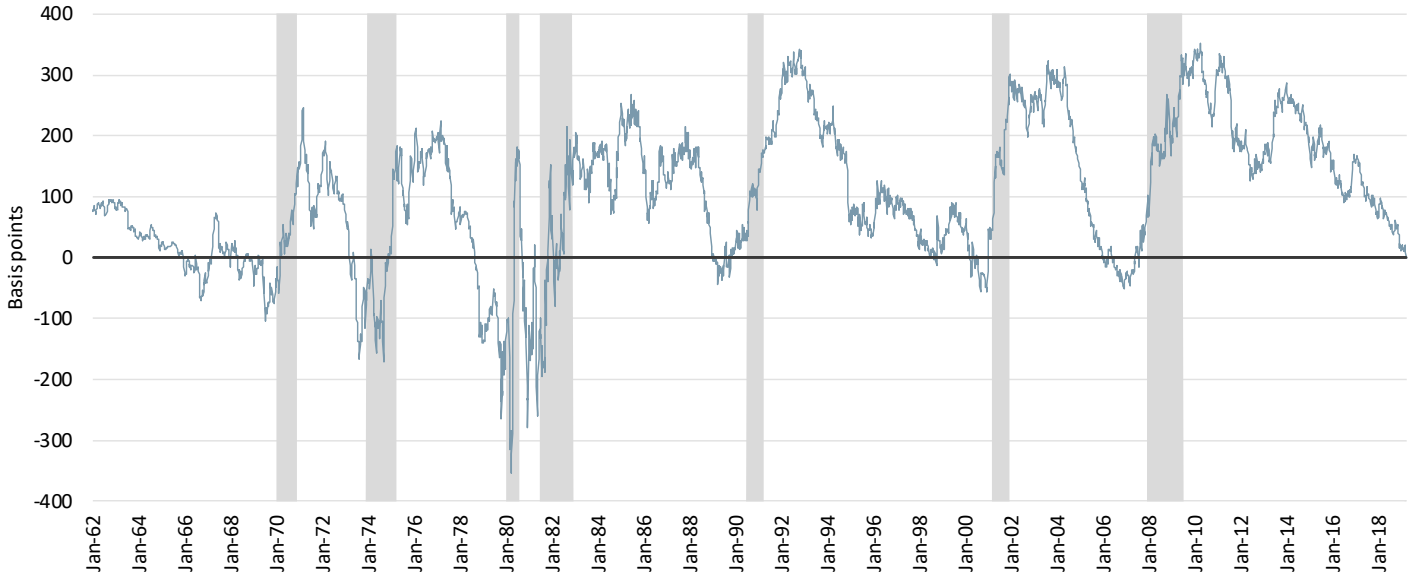
Table 3. Treasury yield curve inversion (10-year minus 2-year yield) and U.S. recessions

Indicator	Number of weeks before recession						
	Dec 1969	Nov 1973	Jan 1980	July 1981	July 1990	Mar 2001	Dec 2007
One week of inversion	No Data	No Data	72	42	81	142	101
Four weeks of inversion	No Data	No Data	69	39	75	139	93
Inversion of 25 basis points	No Data	No Data	62	41	69	50	31

Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, July 16, 2018.

Our analysis shows that a review of the yield gap between 10-year and 1-year Treasury securities improves on the ability to predict U.S. recessions (over what we see in data points further out on the yield curve). While 2.5 years before the March 2001 recession, this indicator did turn negative for one week, when we consider a four-week inversion trigger, we saw inversion between 19 and 93 weeks before each of the last six recessions with an average of 45 weeks, or just over 10 months before a U.S. recession officially started. Using a single 25-basis-point inversion as a trigger offered a similar outcome of predictability.

Chart 5. Ten-year Treasury yield minus 1-year Treasury yield



Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, March 26, 2019. Shaded area represents timeframe of a U.S. economic recession. Yields represent past performance and fluctuate with market conditions. **Past performance is no guarantee of future results.**

Table 4. Treasury yield curve inversion (10-year minus 1-year yield) and U.S. recessions

Indicator	Number of weeks before recession						
	Dec 1969	Nov 1973	Jan 1980	July 1981	July 1990	Mar 2001	Dec 2007
One week of inversion	207	31	61	32	75	126	99
Four weeks of inversion	204	19	58	29	72	46	93
Inversion of 25 basis points	170	18	61	31	67	47	68

Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, July 16, 2018.

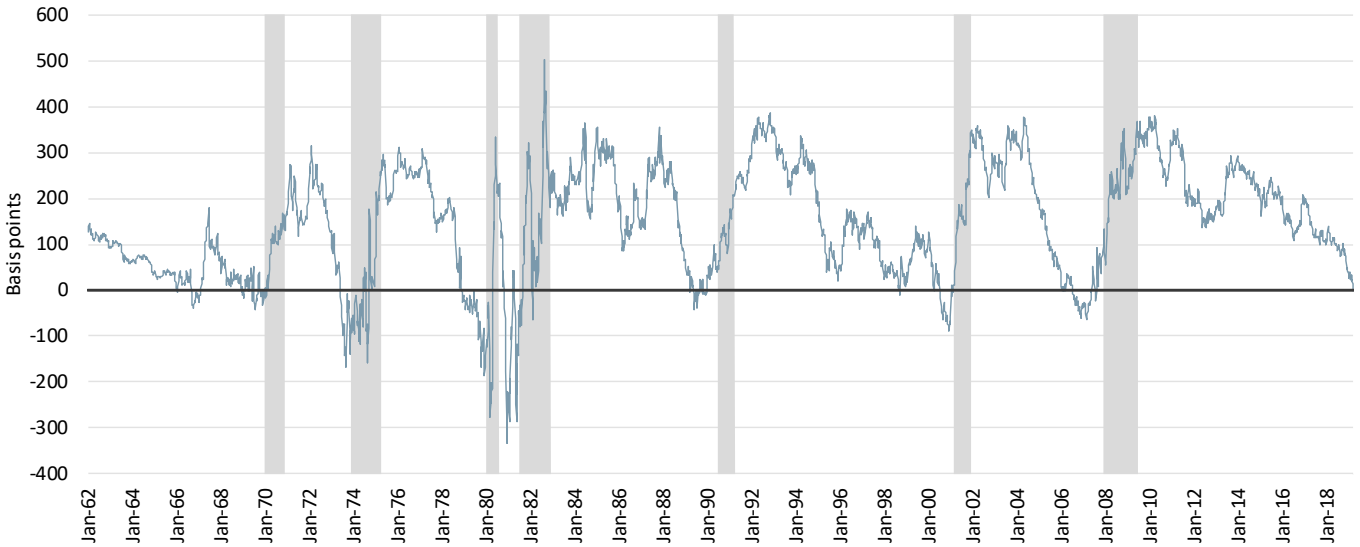
This indicator (10-year minus 3-month Treasury yields) showed a similar result as the 10-year minus 1-year indictor. Yet, the average of both the four negative weeks and 25-basis-points of magnitude indicators was about two months less than the 10-year minus 1-year indicator. Although this indicator is reliable, it provides a shorter lead time for investors to act.

Inversion indicator conclusions

While a single point of yield curve inversion can be meaningful, it also can be unpredictable. Thus, we prefer either four consecutive weeks of curve inversion for a given indicator and/or at least 25 basis points of inversion before concluding that the yield curve has meaningfully inverted. Indicators that incorporated shorter maturities saw fewer false positives. Unfortunately, as we move to shorter maturities on the yield curve, the indicators also provide less lead time from when the indicator is triggered until the time U.S. recessionary conditions hit.

If we had to select just one yield curve indicator to predict an upcoming recession, we would favor the 10-year Treasury yield minus the 1-year Treasury yield. We would focus on four weeks of curve inversion as a trigger—as that indicator provides a bit more warning than using a 25 basis-point curve inversion threshold. Yet, either one is acceptable. We would note that the 10-year Treasury yield minus the 2-year yield does provide additional warning in many cases, but the potential for a false positive also is greater. The 10-to-2-year Treasury yield curve is worthy of attention, given its ability to provide additional warning, but we must be sure to confirm with other indicators.

Chart 6. Ten-year Treasury yield minus 3-month Treasury yield



Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, March 26, 2019. Shaded area represents timeframe of a U.S. economic recession. Yields represent past performance and fluctuate with market conditions. **Past performance is no guarantee of future results.**

Table 5. Treasury yield curve inversion (10-year minus 3-month yield) and U.S. recessions

Indicator	Number of weeks before recession						
	Dec 1969	Nov 1973	Jan 1980	July 1981	July 1990	Mar 2001	Dec 2007
One week of inversion	203	22	57	35	58	129	98
Four weeks of inversion	166	19	54	32	55	31	69
Inversion of 25 basis points	167	20	54	34	56	30	68

Sources: Bloomberg, Wells Fargo Investment Institute, Federal Reserve Bank of St. Louis FRED database, July 16, 2018.

In our view, simple yield curve flattening is not indicative of a pending recession. However, we believe a meaningful inversion that is consistent with our highest conviction yield curve indicators could foreshadow a potentially more challenging economic environment. The risks to triggering a meaningful inversion signal are increasing and should be closely monitored.

What does yield curve inversion mean for U.S. equity markets?

Now that we have identified our preferred yield curve inversion indicator, we will examine what it has meant for the equity market when we have experienced this trigger. Specifically, we reviewed the total return performance of the S&P 500 Index both before and after changes in our preferred inversion trigger.

Clearly, past performance is not a guarantee of future results. Yet, we can draw some conclusions from the data in Tables 6 and 7. Historically, the S&P 500 Index has performed well in the months leading up to yield curve inversion. Post-inversion results are more mixed. While still remaining positive, the historical average S&P 500 Index return has declined following yield curve inversion (relative to the pre-inversion return). Still, we would point out that there are post-inversion periods in which we continued to experience strong S&P 500 Index performance. Over the past six recessions, the average peak in the S&P 500 Index occurred 31 months after we hit the inversion trigger. Market forces continue to change, and this time the market could react differently. Yet, history suggests there will be time for equity investors to react after the yield curve inverts.

Table 6. S&P 500 Index return in periods surrounding inversion of 10-year minus 1-year Treasury yield curve

Date of inversion trigger	S&P 500 total return 12 months prior	S&P 500 total return 6 months prior	S&P 500 total return 6 months after	S&P 500 total return 12 months after
April 6, 1973	2.75%	1.10%	2.10%	-11.97%
September 15, 1978	13.37%	18.45%	-0.62%	10.31%
October 10, 1980	30.98%	28.93%	5.71%	-2.01%
March 10, 1989	15.15%	11.79%	21.06%	19.37%
April 7, 2000	14.21%	14.16%	-6.54%	-24.71%
February 23, 2006	9.44%	8.04%	1.50%	14.82%
Average	14.32%	13.75%	3.87%	0.97%
Median	13.79%	12.98%	1.80%	4.15%

Sources: Bloomberg, Wells Fargo Investment Institute, July 16, 2018.

Table 7. Weeks from inversion trigger to S&P 500 Index peak

Inversion trigger	S&P 500 peak post-inversion	Weeks from inversion trigger to S&P 500 peak
April 6, 1973	April 20, 1973	2
September 15, 1978	September 8, 1978	-1
October 10, 1980	November 28, 1980	7
March 10, 1989	July 13, 1990	70
April 7, 2000	September 1, 2000	21
February 24, 2006	October 12, 2007	85
Average		**31**

Sources: Bloomberg, Wells Fargo Investment Institute, July 16, 2018.

For illustrative purposes only. There is no guarantee any asset class will perform in a similar manner in the future. An index is an unmanaged and not available for direct investments. **Past performance is no guarantee of future results.** Please see the end of this report for the definition of the indices.

Is this time different?

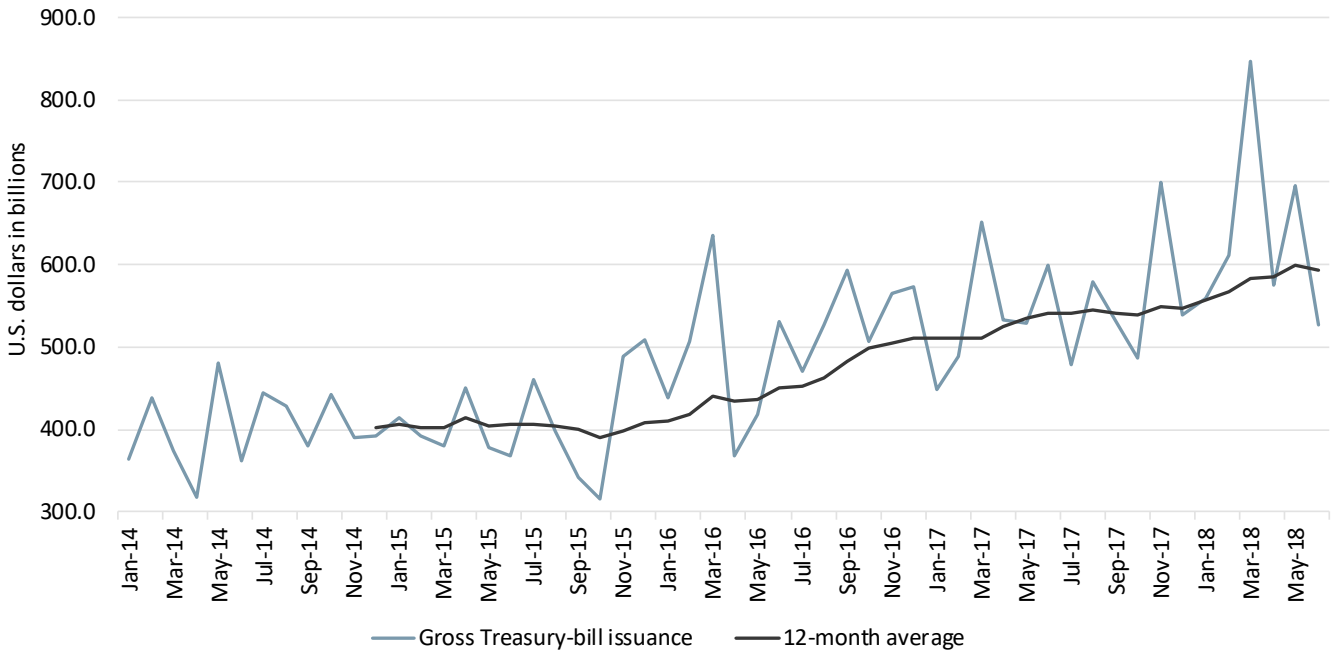
The monetary and fiscal response to the Great Recession of 2007-2009 was unprecedented, and it continues to influence financial markets to this day. An inflated Fed balance sheet, significant short-term debt issuance, and very low interest rates in the U.S. and global markets are notable factors. Could the yield curve indicator be different this time—proving to be less reliable than it has in each of the past six recessions?

Low interest rates often are highlighted as one of the primary factors that make this cycle different from the others that we have analyzed. It is true that rates are lower than at almost any other time when the U.S. economy was experiencing similar periods of very low unemployment and positive (and growing) economic expansion prospects. Since interest rates are so low, Fed rate increases may not slow the U.S. economy down as they have in the past—or so the argument goes. We do not concur with this view. In fact, we see this argument as mostly hope by those who believe this growth cycle can continue indefinitely in the face of increased short-term rates.

Another popular theory on why this time may be different is the high levels of U.S. Treasury issuance in short-term maturities. The Great Recession was met by significant fiscal spending to help cushion the economic blow for the U.S. economy. This spending significantly expanded the need to finance U.S. Treasury debt in the public markets. Borrowing eventually stabilized, but last year, the passage of tax-cut legislation led to a renewed need for federal debt issuance. Looking to keep overall costs down, the U.S. Treasury has chosen short-term debt markets for the bulk of this new debt. The theory is that the excess supply in short-term paper relative to longer-term maturities is leading to a supply/demand imbalance that is flattening the yield curve.

In a March 5, 2018, paper titled "Economic Forecasts with the Yield Curve," San Francisco Fed researchers Michael Bauer and Thomas Mertens examined some of these arguments surrounding the predictive power of the yield curve. Their conclusion was: "While the hypotheses have some intuitive appeal, our analysis shows they are not substantiated by statistical analysis." We do not recommend that investors assume this time will be different. Yield curve inversion has delivered a powerful message in recent cycles. In our view, it is a message that is unlikely to change through multiple cycles.

Chart 7. Monthly issuance of U.S. Treasury bills



Source: SIFMA (Securities Industry and Financial Markets Association), March 26, 2019.

It's the Fed

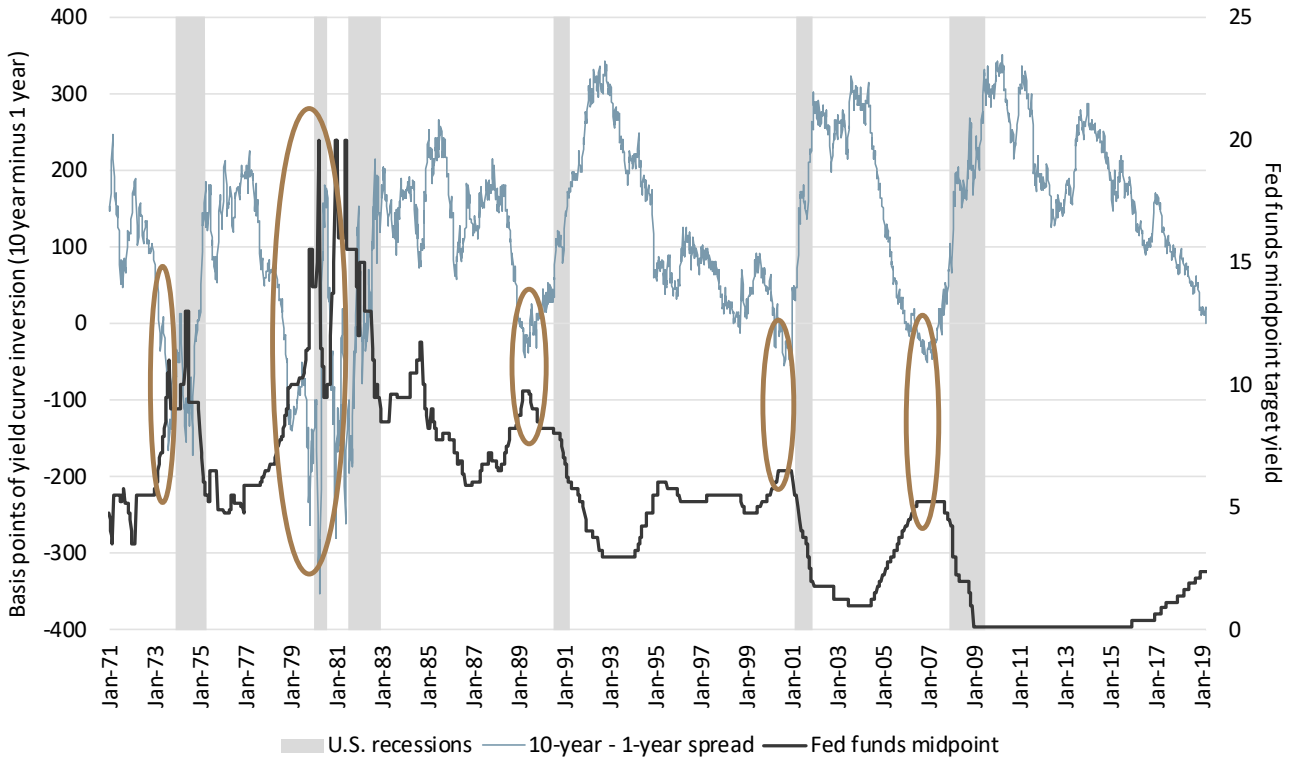
Given the predictive power of the short end of the yield curve and the direct power that the Fed has over it, we can reasonably assume that the Fed has a significant part to play in yield curve inversion. There have been times when the Fed has had no choice but to continue to raise short-term interest rates, even if the yield curve inverted—as the damage of high inflation must be mitigated through slower growth, even if it inflicts a recession. Inflation trends have moderated recently, and most indicators suggest that a meaningful move above the Fed inflation target is very unlikely. The Fed appears to have finally acknowledged that inflation is unlikely to move above its targets and has moved to a "patient" stance when it comes to additional Fed rate hikes.

The relationship between Fed tightening and curve inversion historically has been strong. The yield curve does not invert every time the Fed enters a monetary tightening cycle. Yet, history also shows that Fed tightening does appear to be a necessary component of curve inversion. It is possible that, even though the Fed has paused federal funds rate increases, they have already raised rates too far.

Some Federal Open Market Committee (FOMC) members appear concerned about possible yield curve inversion. For years, St. Louis Fed president James Bullard has argued that the Fed should not aggressively increase rates so long as the U.S. economy remains in a low-growth, low-productivity, and low-inflation regime. Dallas Fed president Robert Kaplan and Atlanta Fed president Raphael Bostic also have expressed reservations about the flattening yield curve. In a May 2018 interview, Raphael Bostic stated that it was his job "to make sure that (curve inversion) doesn't happen."

Not all Fed officials seem to have the same concerns. They see curve flattening as a normal part of the monetary policy normalization process. In the past, Fed chair Jerome Powell stated that a flattening yield curve is worth watching, but that it is not a recession warning sign today.

Chart 8. The Fed helps to power the yield curve



Sources: Bloomberg, Wells Fargo Investment Institute, March 26, 2019. Shaded area represents timeframe of a U.S. economic recession. Yields represent past performance and fluctuate with market conditions. **Past performance is no guarantee of future results.** The circles highlight the periods in which yield curve inversion was preceded by Fed rate hikes.

In May 2018, Fed governor Lael Brainard discussed the current low "term premium"[3] in the markets, by stating "A smaller term premium will make the yield curve flatter by lowering the long end of the curve. With the term premium today very low by historical standards, this may temper somewhat the conclusions that we can draw from a pattern that we have seen historically in periods with a higher term premium. With a very low term premium, any given amount of monetary policy tightening will lead to an inversion sooner, so that even a modest tightening that might not have led to an inversion in the past could do so today." Essentially, Lael Brainard was arguing that this time *is* different. It appears that Brainard was correct that a low term premium could lead to yield curve inversion. It is not clear, however, if this time is different when it comes to the yield curve inversion signal.

Implications for investors

We are skeptical that this time is different when it comes to yield curve inversion indicators. Such an assumption is a strong bet against history. It is not entirely clear exactly why an inverted yield curve has had such a strong ability to predict a recession, but the evidence clearly suggests that it does. A flattening yield curve likely impacts risk taking and slows lending, but it does not cause a recession (in and of itself). The Treasury yield curve has proven to be a meaningful indicator throughout history—a history that covers many different types of economic and market regimes. This time could be different, but the odds suggest that the yield curve will act the same in this cycle as it has in the past, and that it merits monitoring.

If investors want to select just one yield curve indicator to watch, we recommend the gap between the 10-year Treasury yield and the 1-year Treasury yield. If this indicator turns negative for at least four weeks or the curve inverts by more than 25 basis points, we believe that it would be an indication that a recession is likely within the next 18 months. Focusing on other indicators could provide an early warning, but acting too early could lead to missing out on potential late-cycle gains in risk assets. Yet acting too late could be a missed opportunity to pare tactical portfolio risk. The data suggest that investors have time to act once the yield curve does invert; we stress the importance of patience and waiting for a conclusive signal before taking meaningful portfolio actions.

The yield curve is precariously close to meaningfully inverting in key areas. We would remind investors that the economy can continue to expand after initial yield curve inversion and that likewise risk assets can continue to perform well. However, given the powerful message an inverted yield curve has historically delivered, investors should be watchful, informed, and vigilant. We believe a more neutral portfolio risk stance within a well-diversified portfolio is appropriate for such an environment. We recently adjusted portfolio recommendations to take a more neutral risk stance—moving from equities into cash and fixed income—better balancing current market risks implied by the yield curve.

Brian Rehling, CFA

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Global Investment Strategy
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Brian Rehling is the co-head of global fixed-income strategy for Wells Fargo Investment Institute. In his role, Mr. Rehling focuses on global fixed-income asset allocation, strategy guidance, and the interest rate outlook. He maintains a strong connection to the more than 15,000 Wells Fargo Advisors, Wells Fargo Private Bank, and Abbot Downing advisors through in-depth bond market publications and speaking engagements for a wide range of retail and institutional clients. Mr. Rehling has extensive investment strategy experience and has spent more than 17 years in leadership roles at Wells Fargo Advisors and predecessor firms working with retail, high-net-worth, ultra-high-net-worth, and institutional clients. Mr. Rehling is based in St. Louis.

[3] The term premium in fixed-income markets reflects the higher yields often paid for longer-maturity securities to reflect greater uncertainty for longer-term periods than for shorter-term periods.

Risk Considerations

All investing involves risk including the possible loss of principal. Diversification does not guarantee investment returns or eliminate risk of loss. Stocks are subject to market risk which means their value may fluctuate in response to general economic and market conditions, the prospects of individual companies, and industry sectors. Investing in the bond market is subject to risks, including market, interest rate, credit/default, liquidity, inflation, and other risks. Bond prices generally fall as interest rates rise. Bonds and bond strategies with longer durations tend to be more sensitive and volatile than those with shorter durations. High yield bonds, also known as junk bonds, have lower ratings and are subject to greater volatility than investment grade securities. U.S. government securities are backed by the full faith and credit of the federal government as to payment of principal and interest if held to maturity and are subject to interest rate risk. The guarantee on U.S. government securities applies to an investment's underlying holdings and not to the investment itself.

Definitions

An index is unmanaged and not available for direct investment.

The Ten-Year Treasury Constant Maturity and the One-Year Treasury Constant Maturity Indexes are published by the Federal Reserve Board and are based on the average yield of a range of Treasury securities, all adjusted to the equivalent of a 10-year maturity and the equivalent of a one-year maturity.. Yields on Treasury securities at constant maturity are determined by the U.S. Treasury from the daily yield curve.

S&P 500 Index is a market capitalization-weighted index composed of 500 widely held common stocks that is generally considered representative of the US stock market.

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