

## Global macro matters

# Rising rates, flatter curve: This time isn't different, it just may take longer

Vanguard Research | Joseph Davis, Ph.D. | September 2018

Authors: Roger Aliaga-Díaz, Ph.D.; Qian Wang, Ph.D.; Joshua M. Hirt, CFA; Shaan Raithatha, CFA; and Ashish Rajbhandari, Ph.D.

The U.S. economy has seen a prolonged period of growth without a recession. As the business cycle has matured, the U.S. yield curve has flattened substantially. We expect further flattening and an increasing likelihood of curve inversion as the Federal Reserve continues to raise interest rates.

Historically, an inverted yield curve has been a strong leading indicator of an economic slowdown. There has been a growing debate, however, on the relevance of this signal in an environment where the bond market has been distorted by quantitative easing (QE). We find that it is still relevant and therefore caution against thinking that “this time is different.” Given the current environment and effects from QE, however, the timing may just take longer.

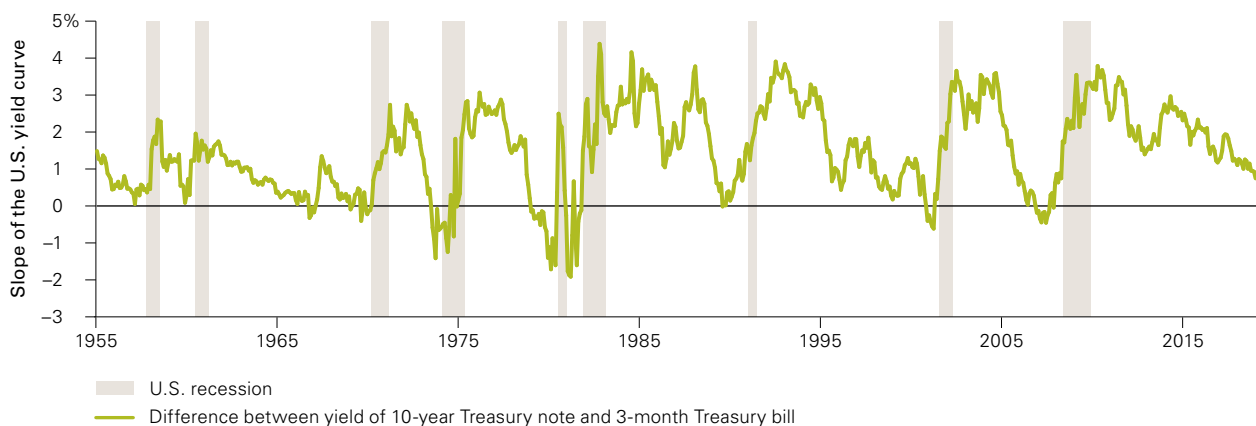
In this note, we explore the potential impact of a flattening and inverted yield curve on the economy and investment portfolios.

### Rising front end, anchored long end to continue driving a flatter yield curve

The gap between 10-year and 3-month U.S. Treasury yields has fallen from around 300 basis points (bps) at the beginning of 2014 to around 75 bps by the end of August 2018, its narrowest level since 2007 (see Figure 1).

As the Fed continues to drive up short rates, our analysis (see *From Reflation to Inflation: What's the Tipping Point for Portfolios?*) indicates that longer-term rates will remain range-bound, largely because of subdued long-term inflation expectations.

Figure 1. The U.S. yield curve has flattened considerably

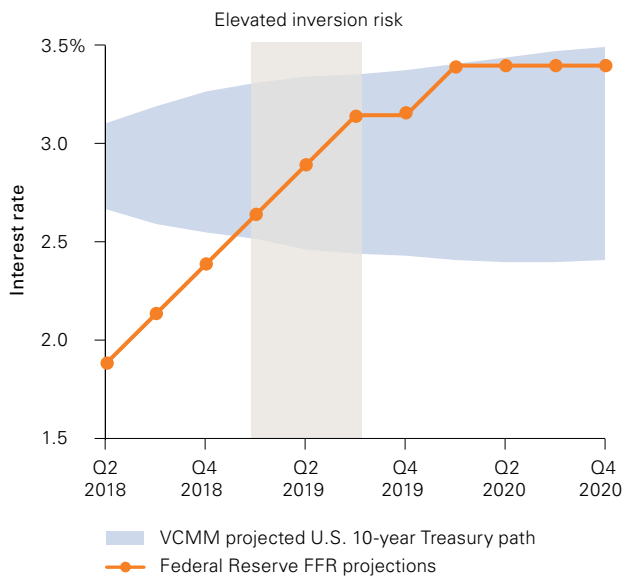


**Notes:** Another commonly used slope indicator uses the 2-year and 10-year Treasury yield spread. Both indicators lead to the same conclusion in their relationship with inversion and downturns; however, we favor the 3-month/10-year spread because of its stronger consistency with economic theory in measuring the term spread. See Bauer, Michael D. and Thomas M. Mertens, 2018. *Information in the Yield Curve About Future Recessions*. FRBSF Economic Letter.

**Sources:** Bloomberg; Vanguard calculations, as of August 31, 2018.

We expect the effect to be further curve flattening, and we anticipate that by 2019 the risk of curve inversion will have risen significantly (see Figure 2).

**Figure 2. Further flattening expected; inversion risk increases by 2019**



**Notes:** FFR refers to federal funds rate. The U.S.10-year Treasury path range uses the 35th to 65th percentile of projected Vanguard Capital Markets Model® (VCMM) path observations. VCMM is a proprietary financial simulation engine designed to help clients make effective asset allocation decisions.

**IMPORTANT:** The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modeled asset class. Simulations as of June 30, 2018. Results from the model may vary with each use and over time. For more information, please see Page 5.

**Sources:** Vanguard calculations, based on Thomson Reuters Datastream and Moody's Analytics Data Buffet; Federal Reserve Bank of New York.

### The yield curve as a growth indicator

Historically, an inverted yield curve has been a reliable predictor of economic recessions.<sup>1</sup> Since 1970, all seven U.S. recessions have been preceded by an inverted yield curve. The time between an inverted curve and the subsequent recession has ranged from 5 to 17 months (see Figure 3).

But has this relationship changed? There has been debate recently among market participants and central bankers that aspects specific to this environment have distorted the signal. This is primarily driven by the effect from central bank asset purchases (known as QE), which has suppressed the compensation investors require for bearing duration risk.

We acknowledge the changes that have occurred as a result of QE, and this may prolong the time between the inversion of the yield curve and the subsequent recession. However, our analysis suggests that the

**Figure 3. All seven U.S. recessions since 1970 have been preceded by an inverted yield curve**

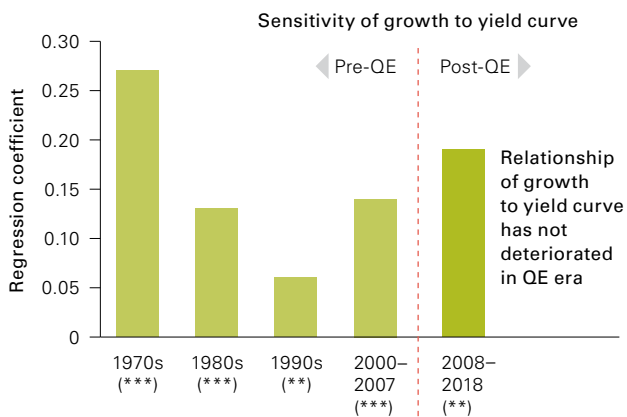
Yield curve inversion	Recession start date	Lead time (months)
July 1969	January 1970	6
June 1973	January 1974	7
November 1978	April 1980	17
October 1980	October 1981	12
May 1989	October 1990	17
August 2000	April 2001	8
August 2006	January 2008	17

**Note:** The yield curve as measured by month-end data using the spread between the 10-year and 3-month U.S. Treasury yields did not invert prior to the 1957 and 1960 recessions, although it narrowed to 6 bps and 30 bps, respectively.

**Sources:** Bloomberg; Vanguard calculations.

curve's relevance as a growth signal has not deteriorated relative to history (see Figure 4). We therefore caution against ignoring the robust information contained in the yield curve concerning capital market supply-and-demand dynamics and macroeconomic expectations.

**Figure 4. Yield curve remains a relevant leading indicator of economic growth**



**Notes:** Data are through June 30, 2018. Asterisks represent statistical significance (\*\*\* 99.9%, \*\* 99%). Sensitivity is represented by coefficients from an OLS model of yield curve slope (10-year Treasury yield minus 3-month T-bill yield), and the Vanguard Leading Economic Indicators (VLEI) series (used as a proxy for growth with monthly observations) 12 months forward.

**Sources:** Vanguard calculations, based on data from Moody's Analytics Data Buffet and Thomson Reuters Datastream.

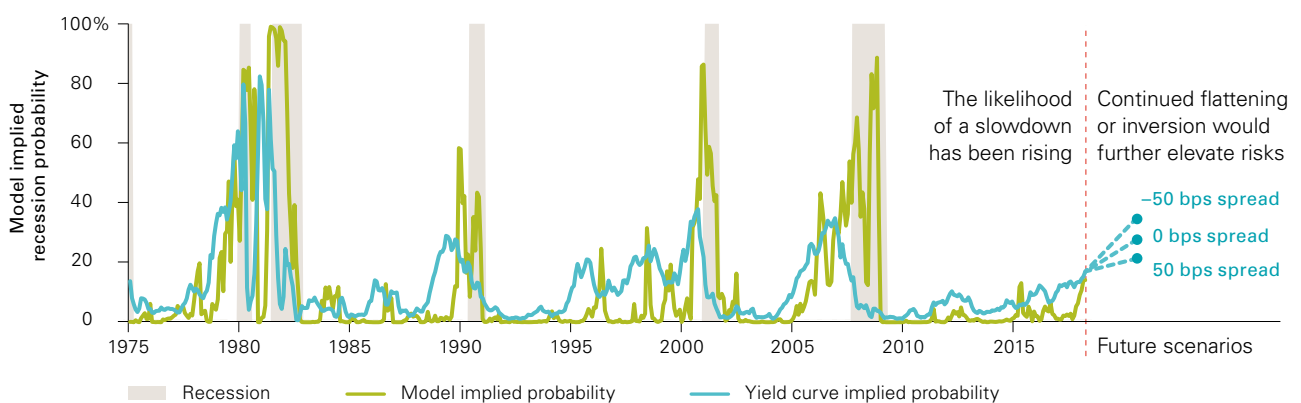
**Prospects of a recession have increased**

Given this relationship, the question naturally arises about the sustainability of the current cycle, in which the U.S. economy has expanded for eight consecutive years.<sup>2</sup> Although we view yield curve inversion as a potential risk on the horizon, it hasn't happened yet, and our evaluation of the economy fails to identify any obvious cracks at this point in what has become a broad-based expansion. Activity indicators that track consumption, business spending, and sentiment remain robust, and leverage indicators remain modest compared with previous late-cycle levels.

Looking ahead, however, we expect the effect from fading fiscal stimulus and higher interest rates to begin feeding through to activity toward the end of 2019 and through 2020. To estimate the probability of a recession we apply two different models: a single-factor model that uses just the slope of the yield curve, and a multi-factor model that incorporates other leading indicators as well, such as credit spreads, stock market returns, and economic growth signals.

As shown in Figure 5, the likelihood of a slowdown in the United States has been rising as the curve has flattened. Although it signals a modest risk currently, we expect probabilities to rise further as the Fed continues to raise interest rates.

**Figure 5. Recession probability has been rising as the yield curve has flattened**



**Notes:** Current yield curve spread is 75 bps as of August 31, 2018. Model implied probability is based on results of a probit model accounting for credit default spread (AAA interest rates minus Baa interest rates), yield curve (10-year Treasury yield minus 3-month T-bill yield), proprietary economic growth and momentum indicators as included in VLEI, changes in the Standard & Poor's 500 Index, and S&P 500 volatility. Yield curve implied probability is based on results of a probit model accounting for 10-year Treasury yield minus 3-month T-bill yield. Slope -50 bps, 0 bps, and 50 bps scenarios are based on instantaneous change in yield curve slope from the current level. Recession is as defined by the National Bureau of Economic Research (NBER). Estimates are based on data from January 1982 through August 2018.

**Sources:** Vanguard calculations, based on data from the Federal Reserve Bank of St. Louis, Moody's Analytics Data Buffet, Moody's Investors Service, NBER, Standard & Poor's, Thomson Reuters Datastream, and the Federal Reserve System Board of Governors.

<sup>2</sup> Expansion is measured in annual real GDP terms.

## Capital market expectations in the environment ahead

Based on our outlook of growing risks of inversion, we examine capital market expectations in some potential inversion scenarios over the next three years using the Vanguard Capital Markets Model (VCMM) (see Figure 6).

Various yield curve inversion scenarios can arise based on the expected path of short- and longer-term rates. We show possible scenarios where inversion may occur due to short rates rising faster than long rates, long rates falling faster than short rates, and short rates rising and long rates falling.

In all of the scenarios, expected portfolio returns appear subdued, although with different returns over the three years. We observe that fixed income assets should increasingly benefit from a higher interest rate environment and provide diversification to the more volatile equity return outlook.

## Conclusion

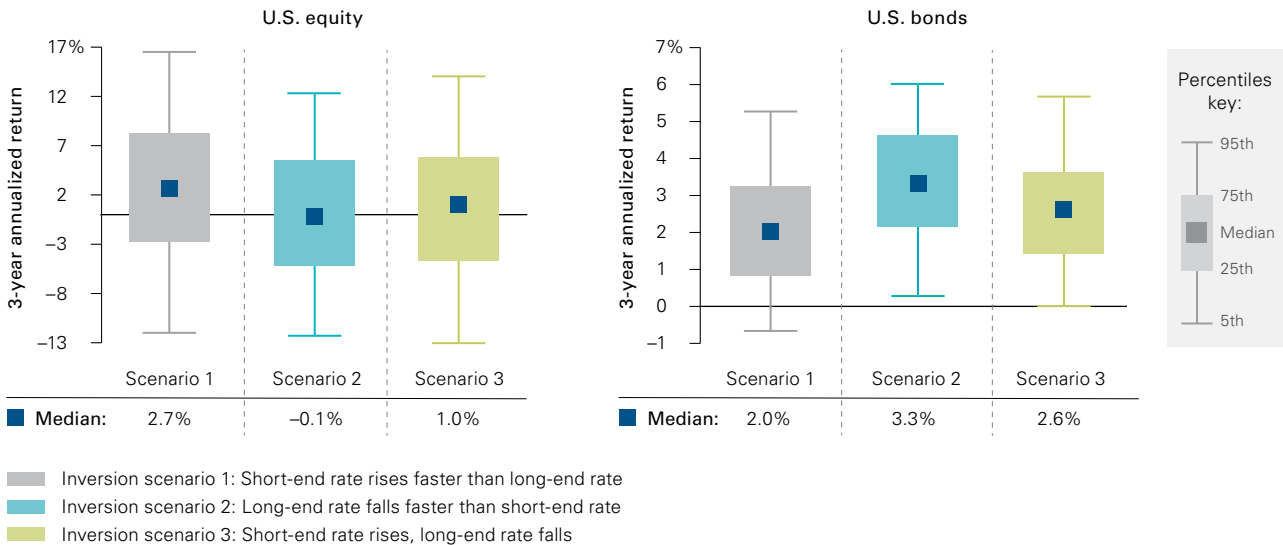
As the U.S. business cycle matures, the yield curve has flattened substantially. We expect further flattening as the Fed continues to raise short-term interest rates, while the long end remains range-bound. In our view, the likelihood of the yield curve inverting increases substantially as we enter 2019.

Historically, the yield curve has been a reliable signal of economic growth. Although it is not infallible, we find that it is still relevant in a post-financial-crisis world of QE.

Expected portfolio returns appear more muted in the environment ahead. However, we expect an increasing diversification benefit of fixed income assets as interest rates continue to normalize.

Figure 6. Investors can benefit from diversification in any inversion scenario

Yield curve inversion: VCMM implied probability 30%



**Notes:** The scenarios are based on a subset of 10,000 VCMM simulations. The short-end rate is represented by the 3-month T-bill, and the long-end rate is represented by the 10-year U.S. Treasury note. The inversion scenarios are based on yield curve spread reaching a negative threshold by June 30, 2019. The return forecast displays a three-year horizon as of June 30, 2018.

**Source:** Vanguard, from VCMM forecasts.

### Notes on risk

Bond funds are subject to the risk that an issuer will fail to make payments on time, and that bond prices will decline because of rising interest rates or negative perceptions of an issuer's ability to make payments.

Diversification does not ensure a profit or protect against a loss.

All investing is subject to risk, including possible loss of principal.

**IMPORTANT:** The projections and other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The Vanguard Capital Markets Model® is a proprietary financial simulation tool developed and maintained by Vanguard's primary investment research and advice teams. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include U.S. and international equity markets, several maturities of the U.S. Treasury and corporate fixed income markets, international fixed income markets, U.S. money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data from as early as 1960. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

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#### Vanguard global economics team

Joseph Davis, Ph.D., Global Chief Economist

##### Europe

Peter Westaway, Ph.D., Europe Chief Economist

Alexis Gray, M.Sc.

Shaan Raithatha, CFA

Eleonore Parsley

##### Asia-Pacific

Qian Wang, Ph.D., Asia-Pacific Chief Economist

Matthew Tufano

Beatrice Yeo

##### Americas

Roger A. Aliaga-Díaz, Ph.D., Americas Chief Economist

Jonathan Lemco, Ph.D.

Andrew J. Patterson, CFA

Joshua M. Hirt, CFA

Vytautas Maciulis, CFA

Jonathan Petersen, M.Sc.

Asawari Sathe, M.Sc.

Adam Schickling, CFA



**Vanguard®**

#### Vanguard Research

P.O. Box 2600

Valley Forge, PA 19482-2600

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