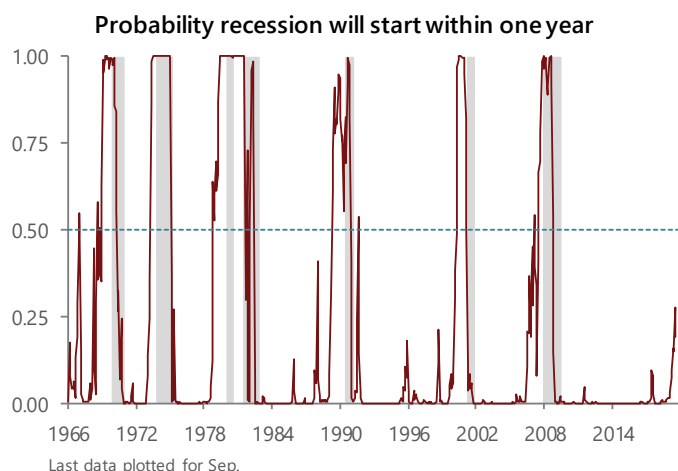


Recession Watch

2 October 2019

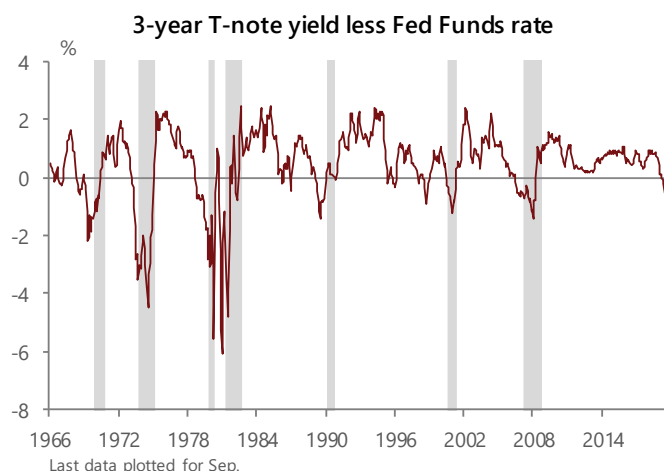
Recession odds are a bit elevated, but it's not the base forecast

- There is considerable focus on the recent inversion of the Treasury yield curve and whether it signals a recession is near. An inverted yield curve is a good, but imperfect predictor of an impending recession.
- Our carefully constructed model-based forecast of the US economy (and the IHS Markit forecast of the global economy) sees a different outcome, namely a couple more years of growth, but that outlook is not without risks.
- With volatility in financial markets, elevated uncertainty over trade policy, and signs of slowing growth scattered about globally, expectations and risk aversion can change quickly and materially impact the outlook, perhaps even tip the economy into a downturn.
- One method we use to assess such risks is a recession probability model that relies on more than just the slope of the yield curve (i.e., the "term slope") to estimate the probability the US economy will enter a recession within the next 12 months. That model is signaling a somewhat elevated risk, but at levels that historically have not indicated that a recession is near.
- Our recession probability model, which includes the term slope (defined as the 3-year T-note yield less the Fed Funds rate) as its most important driver, is signaling that the odds of a recession beginning within the next year are around 20%.



Initializing the model with published monthly economic data through August, financial data through September, and estimated economic data through September puts the odds of a recession beginning within the next 12 months at ("precisely") 19%. (See Box 1 on page 3 and Box 2 on page 6 for details regarding the model.)

The chart above shows how the model has fared pre-aging six prior recessions. Readings exceeding 50% probability have in every instance preceded a recession within one year. One minor exception is that the model briefly flashed a 55% probability of recession in October 2006, about 15 months ahead of the official start of



the 2008–2009 recession. The estimated probability then retreated before rising to 65% in July of 2007, six months prior to the official start of the 2008 recession.

As noted above, the term slope is the most important driver in the model in that its statistical significance is the highest of any variable in the model and its movement prior to recessions has accounted for the majority of the change in probability of a recession (from the model's perspective) prior to each historical recession in the sample, from mid-1966 to the middle of last year.

A negative term slope is a potentially good indicator of an impending recession because it reflects market ex-

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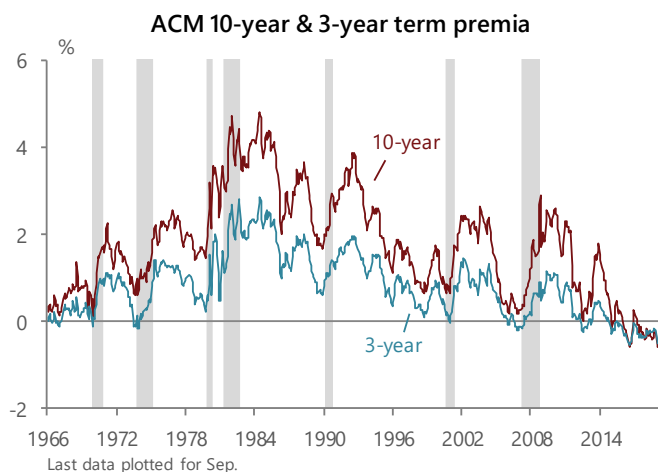
expectations that short-term rates will be lower in the future, as the Fed responds to economic weakness by lowering the fed funds rate. The reasoning goes that because current “long” rates reflect expected future short rates, a negative term slope indicates that the collective wisdom of financial-market participants is that economic weakness lies ahead and the Fed will be cutting rates. But, there are significant reasons why a negative term slope may not always be a good indicator of an impending recession, in addition to the possibility that financial-market participants might just get it wrong.

Beware the term slope

Typically, analysts define the term slope in this context as the 10-year Treasury Note yield relative to some short-term rate. Long-term rates reflect not only market expectations of future short-term rates, but other factors as well. Those influences are reflected in the *term premium*, the difference between the yield on a bond of a given horizon and the average of expected short-term rates over the same horizon. Declines in the term premium, even to negative territory, could result in a false signal about an impending recession, first because they have nothing to do with expected short-term rates, and second because a lower term premium, consistent with lower long-term yields, can actually be good for growth in the period just ahead. For example, increases in capital inflows, low expected inflation, and the size of the Fed’s balance sheet could all lower long-term yields relative to short-term rates (and reduce the term premium), but be supportive of growth. A recession probability model that did not adjust for the term premium might therefore mistake a flattening of the yield curve that was supportive of growth as actually raising the odds of a recession.

It is possible to use estimates of the term premium to derive a so-called “risk-neutral” yield curve. Changes in the term premium do not change the slope of the “risk neutral” yield curve. This suggests the risk neutral yield curve could have an advantage in a recession probability model. Analysts at the New York Fed (Adrian, Crump and Moench, “ACM”) developed a method for estimating the term premium.¹ The chart at the top right shows the ACM estimates of the term premia for the 10-year and 3-year Treasury Note yields.

¹ ACM estimates are the term premium estimates published by the New York Fed and based on a paper by Adrian, Crump and Moench. [Federal Reserve Bank of New York Staff Reports, NO. 340](#), August 2008 (Revised April 2013)



As the chart shows quite clearly, these term premia have moved materially over time, more so for the 10-year term premium than for the 3-year premium. The decline in term premia recently to less than zero contributes directly to the flatness of the yield curve compared to prior periods when term premia were significantly positive. In those prior periods, a flat or inverted yield curve was consistent with future short-term yields much below the then current short-term rate. Today an inverted yield curve could be the result entirely of the negative term premium. At a minimum, this suggests that we need to take the currently negative term slope with a large grain of salt and consider that this time could indeed be different.

We could look directly at futures markets, such as the Overnight Index Swap (OIS) markets for clues as to where markets expect future short-term rates. We can, and we did, and in the current environment, expected future rates have not come close to levels we might expect in the next recession, suggesting low probability assigned to that outcome. We can’t employ these rates in a fully specified recession-probability model because these markets didn’t exist for most of the sample.

What is in the recession probability model?

Box 1 on the next page describes in some detail what is in the model and why. In light of the foregoing, we chose not to use the 10-year Treasury Note yield in our measure of the term slope. The recent sharp decline in the term premium relative to the sample average would tend to give a misleading signal of an impending recession. We instead elected to use the 3-year Treasury Note yield, which has seen less of a decline in the term premium relative to the sample average. Nevertheless, the decline is large enough that it suggests some cau-

Box 1**The Macroeconomic Advisers by IHS Markit Recession Probability Model for the US**

The recession probability model is a binary probit model estimated by a maximum likelihood method (in EViews). The dependent variable is 1 for each month in the sample in which a recession begins within 12 months and 0 otherwise. To avoid confusing the estimates in those cases where recessions lasted longer than a year, we excluded from the sample all months when the economy was already in a recession. The estimation sample extends from June 1966 to September of 2018. As seen in the chart on the previous page, the model indicated greater than 50% probability several months prior to the onset of each of the recessions in the sample and only gave one slightly early signal.

We include seven explanatory variables in the model and a constant. Below we describe each without indicating the exact functional form in every case (as we consider that proprietary) but we do provide sufficient detail to clarify why the terms are present and why the expected signs are satisfied. The regression results are shown in the table in the appendix.

1) The **term slope of the yield curve** (defined as the 3-year Treasury Note yield less the fed funds rate): This term slope has a negative coefficient indicating that a positively sloped yield curve signals a lower probability of a recession than a negatively sloped yield curve. A negatively sloped curve is likely to result when investors come to believe the economy will weaken, requiring that the Fed lower interest rates in the near future. The 3-year horizon captures the period over which the policy rate and other short-term rates are likely to be low. This will pull down the 3-year Treasury Note yield as it should equal the expected average of some shorter-term yield and a term premium. Potential distortions to the term premium are also likely to be less important over a shorter horizon than over a longer horizon. Importantly we found this measure of the term slope to improve the model relative to both a nominal term slope, say a 10-year Note yield less the fed funds rate, or the term slope calculated from an ACM so-called "risk-neutral" yield curve which would exclude an estimate of the term premium.

2) **Change in oil prices:** (WTI):

Not surprisingly, large increases in oil prices have presaged and often either caused or contributed to the severity of several recessions, including the 1974–75, 1980 and 1981–82, 1990–91 and 2008–09 recessions. Historically, large increases in oil prices have resulted in large increases in energy good prices and prices more broadly, which then eroded real incomes and resulted in slumping consumer spending, among other distortions. More recently, with the US becoming a more significant producer of energy goods, this term may not be as reliable an indicator in recession probability models. However, to the extent a sharp rise in energy prices still impacts consumer spending adversely, before it stimulates more investment in energy production, it may still be useful in signaling the likelihood of a recession in the year ahead.

3) **Change in stock prices:**

Stock prices also reflect investor sentiments about the future health of the economy, but more importantly constitute a causal link to spending. Increases in stock prices bolster household sector wealth, a key driver of consumer spending. Thus, higher share prices reduce the probability of recession, while slumping share prices raise the odds of a recession.

4) **Change in real home prices:**

This works identically to the change in stock prices, through the impact on household balance sheets and consumer spending via the so-called wealth effect. Rising real home prices reduce the odds of a near-term recession, falling real home prices raise it.

5) **The unemployment gap** (unemployment rate less the natural rate or NAIRU):

We have written previously how the maturity of an expansion, as distinct from the age of an expansion, can influence the likelihood of a recession in the years ahead.² Historically, there is a very low probability of a recession beginning shortly after a recession has ended and the unemployment rate is high. However, once the unemployment rate has declined to below the NAIRU,

² See our *Recently Asked Questions* report, 13 January, 2017 discussing how the *maturity* of an expansion impacts recession probability.

Box 1 (continued)

The Macroeconomic Advisers by IHS Markit Recession Probability Model for the US

which can take a short period or a long period depending on the severity of the prior recession and the vigor of the recovery relative to the growth of potential output, the odds of a recession in the years ahead rise sharply.

6) **Growth in manuf. durable good shipments:**

This term has a negative coefficient indicating that strong growth of shipments reduces the likelihood of a recession and declining shipments raise the odds of a recession. The strength of shipments impacts the growth of employment and also reflects confidence.

tion in interpreting the probability estimate of the model now, and whenever the term premium is far below the sample average.

During our specification search we tested several different term slope drivers. These included a nominal term slope using a longer maturity Treasury Note yield, a risk-neutral term slope (i.e., with the term premium excluded), as well as a nominal term slope with the ACM term premium entered separately. We found that the specification with the term slope defined as the nominal 3-year T-note yield less the fed funds rate was far superior to the others we tested.

It is also important to note that including the term slope (as we have defined it) in a fully specified model with several other drivers dilutes its influence as an indicator of recession. In case you're wondering why we go with a fully specified model, it is because it makes intuitive sense to us and improves the fit dramatically. The R-squared (the proportion of variation of the variable we are trying to explain that is correctly predicted by the model) rises from 0.55 to 0.78, roughly a 50% improvement. Relying on a combination of factors rather than a single indicator to signal recession and being able to quantify the contribution give us some comfort that the still imperfect term slope measure will not steer us wrong.

The charts on the following page show the recent historical paths of the explanatory variables used in the model, although the transformations shown are not necessarily those we employed.

7) **Inflation expectations:**

Inflation expectations have been very stable near two percent since the late 1990s, so this is really a story about how high inflation expectations in the 70's and 80's gave rise to expectations of aggressive Fed tightening to squelch the high expected inflation, thereby raising the odds that a recession would follow.

Box 2 on page 6 shows the regression output for the recession probability model. We have not shown the exact specification of every term to protect our intellectual property.

To be sure, the negative term slope is a key driver of the recent increase in recession probability. The recent decline in the unemployment gap and weakness in the growth of durable goods shipments has also contributed to the rise in recession probability.

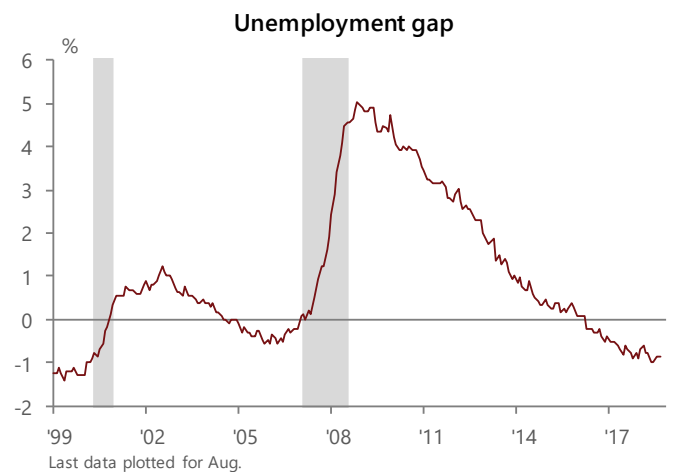
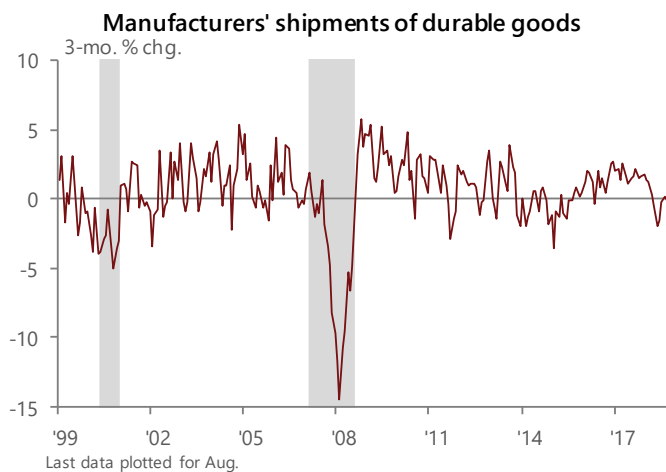
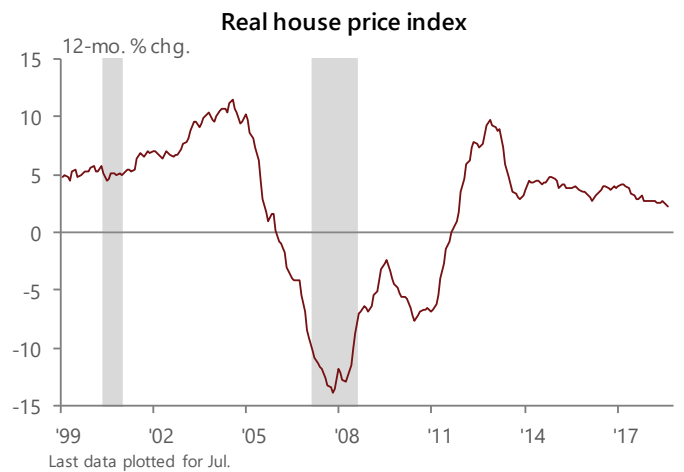
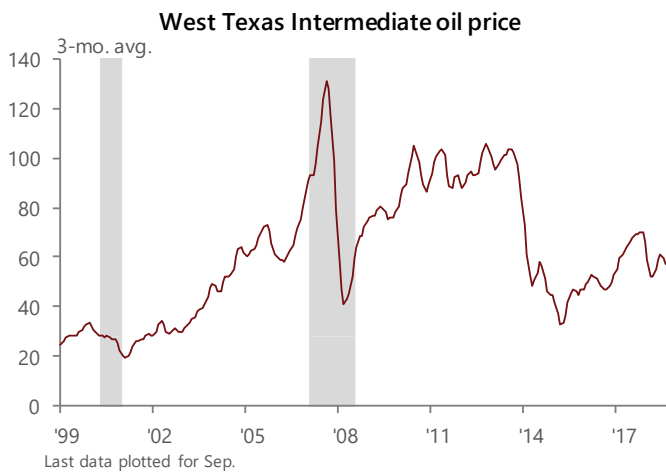
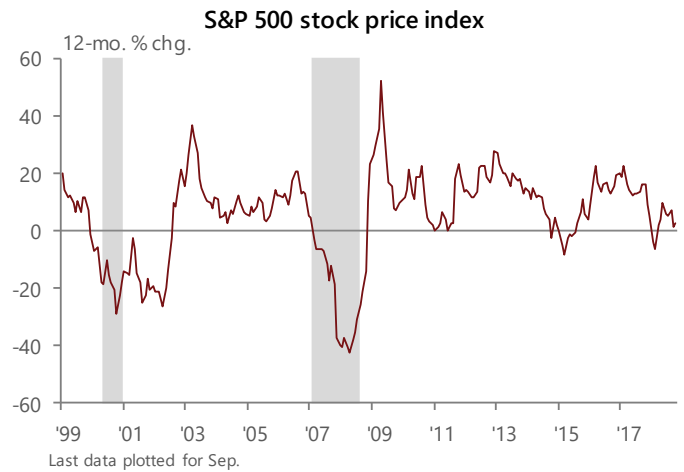
Offsetting these effects are recent strong gains in stock prices and real home prices. These factors are key components of healthy household balance sheets and, along with strong employment and income gains, suggest that consumer spending will remain solid in the near term. Oil prices have been somewhat volatile, but we have not seen a sharp sustained increase of the sort that helped previously to push the economy into recession.

Conclusions

The model is well specified and works better than the term slope alone and better than at least dozens of alternative specifications. It has an enviable track record (at least in-sample), and it is less susceptible to giving a false signal than the term slope alone. The latest data suggest only about 20% chance of recession in the next 12 months, a number that will shift with the incoming data. We don't want to put all our eggs in this basket, but the probability strikes us as reasonable, especially given the newly passed fiscal stimulus and relatively strong stock market performance of late. Of course, Fed policy accommodation also reduces the negativity in the term slope, helps validate the low level of long rates, and helps reduce recession odds.

For now, we're sticking with no recession for the next year, while beyond that we think recession odds drift higher.

Leading recession indicators



Box 2

Estimation of the Recession Probability Model for the US

Dependent Variable: RECAHEAD

Method: ML - Binary Probit (Quadratic hill climbing / EViews legacy)

Sample: 1966M06 2018M09 IF RECESSM2=0

Included observations: 545

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Constant	-2.87	0.54	-5.35	0.00
3-yr T-note yield - Fed Funds rate	-1.98	0.27	-7.20	0.00
Change in oil prices	0.03	0.01	4.88	0.00
Change in manuf. durable good shipments	-0.19	0.05	-4.15	0.00
Change in stock prices	-0.04	0.02	-2.26	0.02
Change in real home prices	-0.30	0.09	-3.48	0.00
Unemployment gap	-0.66	0.18	-3.67	0.00
Inflation expectations	0.71	0.15	4.78	0.00
McFadden R-squared	0.78	Mean dependent var		0.15
S.D. dependent var	0.36	S.E. of regression		0.17
Akaike info criterion	0.21	Sum squared resid		14.83
Obs with Dep=0	461	Total obs		545
Obs with Dep=1	84			

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