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Sources of fluctuations in short-term yields and recession probabilities

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An inverted yield curve—defined as an episode in which long-maturity Treasury yields fall below their short-maturity counterparts—is a powerful near-term predictor of recessions.[1] While most previous studies focus on the predictive power of the spread between the long- and short-term Treasury yields,[2] **Engstrom and Sharpe (2019)** have recently shown that a measure of the nominal near-term forward spread (NTFS), given by the difference between the six-quarter-ahead forward Treasury yield and the current three-month Treasury bill rate, dominates long-term spreads as a leading indicator of economic activity.

In this *Chicago Fed Letter* we explore the economic forces that shape the NTFS fluctuations and identify channels through which the NTFS forecasts recessions. In particular, we highlight the role of the current stance of monetary policy and short-term inflation expectations in predicting downturns. Moreover, we examine the tradeoff between the Federal Reserve's ability to reduce inflation by increasing the federal funds rate, and the effect of such intervention on the estimated likelihood of an upcoming contraction.

Why does the near-term forward spread predict recessions?

The near-term forward spread is a measure of the short-run nominal yield curve slope,

$$NTFS_t = fwd_t^6 - y_t^1,$$

where fwd_t^6 is the six-quarter ahead one-quarter Treasury rate and y_t^1 is the one-quarter Treasury rate at time t.

To the extent that markets' expectations are correct, a negative near-term forward spread is associated with a heightened recession probability.

The NTFS closely mirrors market participants' expectations for the trajectory of the Federal Funds rate over the near future. Such expectations are influenced by views about the business cycle and monetary policy. For instance, if market participants anticipate a recession, they will also likely expect that monetary policymakers will lower the policy rate to provide accommodation. The expectation of lower future rates reduces forward rates, resulting in a negative NTFS. Thus, to the extent that markets' expectations are correct, a negative NTFS is associated with a heightened recession probability.

While the NTFS is an important measure of near-term monetary policy expectations, several underlying forces can affect its fluctuations. The spread embeds information about market participants' expectations about the path of real interest rates relative to their long-run equilibrium level, which is often called the policy gap. When real rates are at their neutral level, monetary policy is neither accommodative nor restrictive on the economy. In contrast, a negative policy gap indicates that the current, or future expected, monetary policy is accommodative, while a positive gap occurs when the Federal Reserve removes accommodation to the point that the policy stance becomes restrictive. The NTFS also reflects market participants' expectations of future inflation outcomes and their attitudes toward interest rate risk, which all can carry information about the future evolution of the economy. Thus, movement in any of these components can drive fluctuations in the NTFS and help forecast downturn risk in their own right.

Motivated by these insights, in this *Chicago Fed Letter* we explore the distinct channels through which the NTFS predicts recessions. Following Ajello, Benzoni, Schwinn, Timmer, and Vazquez-Grande (2022), we decompose the NTFS in terms of 1) current and expected measures of the policy gap—an indicator of the degree of accommodation of the monetary policy stance, defined as the difference between the short-term real rate and a model-consistent estimate for the natural rate, 2) the slope of the expected inflation path, and 3) the term premium on short-maturity forward rates:

$$1) \quad NTFS_t \approx \left(r^{e,1}_{t+6} - r^*_t\right) - \left(r^1_t - r^*_t\right) + \left(\pi^e_{t+7:t+10} - \pi^e_{t+1:t+4}\right) + \left(tp^{t+6}_t\right).$$

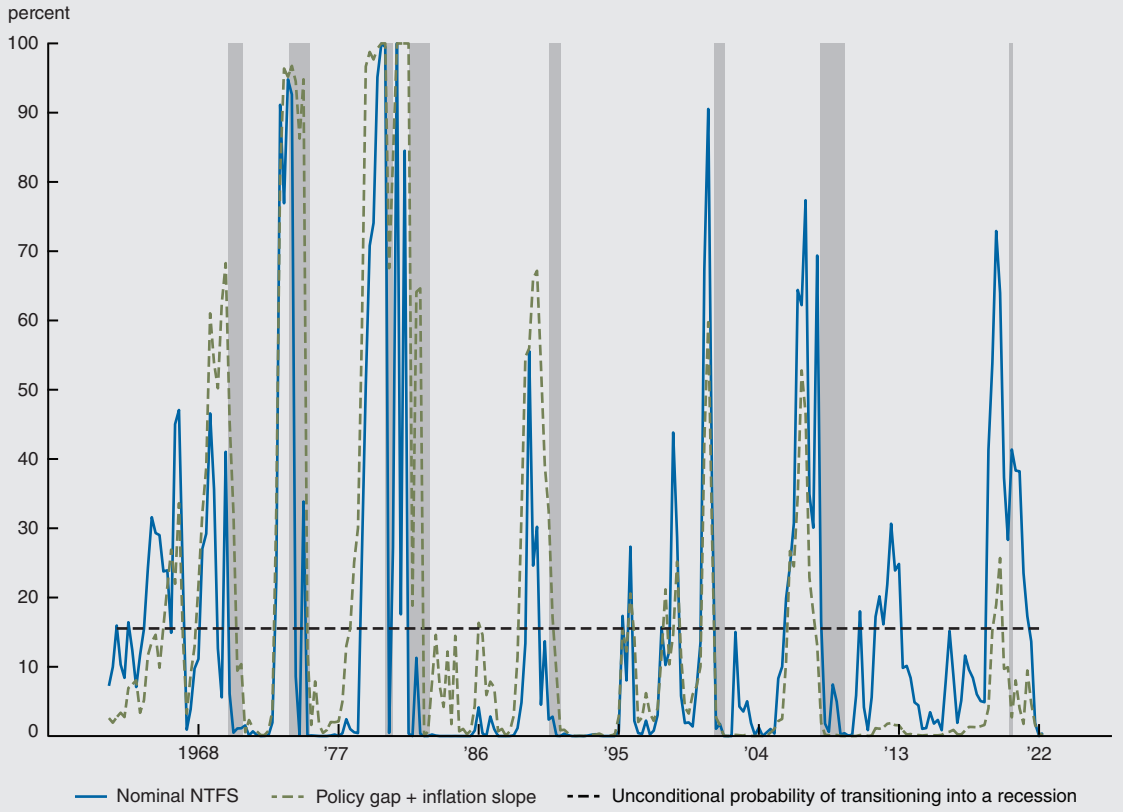
The first two terms capture the slope of the policy gap over the next six quarters, defined as the distance of the expected and current real spot rates, $r^{(e,1)}_{(t+6)}$ and r^1_t, from the natural rate, denoted by r^*_t. The next term, $\left(\pi^e_{t+7:t+10} - \pi^e_{t+1:t+4}\right)$, reflects the slope of the times $t+6$ and t one-year-ahead headline inflation forecasts computed using time t information. The last term, tp^{t+6}_t, is the term premium that gauges the compensation for real and inflation risks embedded in the six-quarter forward nominal rate. All such variables respond over time to aggregate shocks to the outlook and to the conduct of monetary policy.

While the NTFS is easily measured with interest rate data, its constituents are not directly observable. To overcome this problem, we turn to the dynamic term structure model of Ajello, Benzoni, and Chyruk (2020, ABC) to decompose Treasury yields into expectation and risk premia components. To this end, we estimate the ABC model on quarterly Treasury yields and inflation data from 1962:Q2 to 2022:Q2.[3] During this long window the U.S. economy has experienced alternating periods of inflationary pressure and easing, several monetary policy cycles, expansions, and recessions with different underlying drivers. These events inform the ABC estimates of the terms in equation 1 and thus help us to identify the channels through which the NTFS predicts recessions.

As a proxy for the natural rate $\left(r^*_t\right)$, we use the ABC estimate of the level of real rates expected to prevail between five and ten years in the future. We interpret this measure as a market-based estimate of long-run equilibrium real rates, which serves as an approximation to the natural rate of interest. Finally, the proxy for expected inflation computed at quarters t and $t+6$ is the average of quarterly ABC expected headline inflation over the following year.

Using the variables from the NTFS decomposition, we estimate a probit model that predicts the probability of a recession in the U.S. economy over the next 12 months. We find that tighter current monetary policy relative to a neutral stance is associated with a higher probability of an upcoming contraction. Moreover, lower future expected inflation relative to current expected inflation (a negative slope in the expected inflation curve) points to a higher likelihood of downturn.[4] This result is mostly driven by the experience observed in the second part of the sample period, during which economic downturns have generally been accompanied by mild or even negative inflation.[5] In contrast, the marginal effect of the six-month ahead expected policy gap and the near-term premium are insignificant in our probit estimates. Hence, we omit these variables from our baseline specification.[6] Overall, we conclude that the quality of fit and the predictive ability of our model is at par with a probit specification that only includes the near-term forward spread.[7]

1. Probability of recession implied by NTFS, the policy gap, and inflation slope



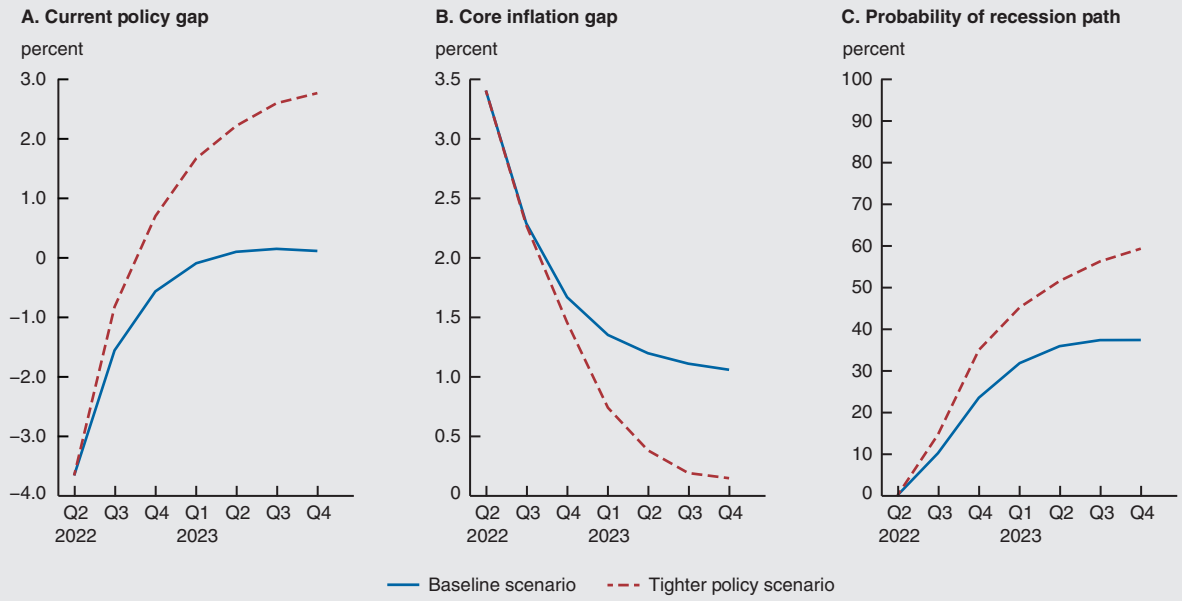
NOTES: This chart depicts fitted recession probabilities, conditional on being in an economic expansion, using quarterly data from 1962:Q2 to 2022:Q1. The blue line shows results from the probit model using the nominal NTFS as the independent variable. The green dashed line shows results from the probit model using two explanatory variables: the current policy gap and headline inflation slope. The black dotted line marks the unconditional probability of transitioning from an expansion into a recession, which is 15.5%.
SOURCES: Interest rate data from Board of Governors of the Federal Reserve System. Expected inflation and real rates from ABC model.

Figure 1 compares the fitted recession probability estimates based on the model in Engstrom and Sharpe (2019), the blue solid line, and our baseline model, the green dashed line, as well as the 16% unconditional estimate of the recession-transition probability (the dotted line).[8] While the signal that the probit models provide ahead of recessions is comparable across the two specifications, the fitted recession probability for our baseline model features fewer false positives than the model that relies only on the NTFS as a leading indicator. This is visible in the mid-1960s and, more recently, in response to the taper tantrum episode of 2013.[9]

Why does the near-term forward spread predict that a recession is not imminent?

Turning now to the current outlook, as of early June 2022, the six-quarter forward rate is higher than the one-quarter yield. Hence, in figure 1, a wide and positive NTFS predicts a near-zero probability that a recession will occur over the next four quarters. This evidence confirms the result highlighted by Engstrom and Sharpe (2022) for the first quarter of 2022 and extends it to 2022:Q2. We use our framework to explain this finding. Our analysis has highlighted that the predictive power of the NTFS mostly stems from the information contained in the current monetary policy stance and the slope of expected inflation. Using data through early June 2022, we estimate a largely accommodative current policy gap that lowers the odds of an incipient economic downturn. We also find a downward sloping expected inflation curve. Historically a decrease in the slope of the expected inflation curve is associated with a higher likelihood of a recession. Of these two counteracting effects the first one prevails, resulting in the low recession probability documented by Engstrom and Sharpe (2022). This is a rare combination of events that has not been observed prior to a U.S. recession since 1962.

2. Expected path of the current policy gap, core inflation gap, and probability of recession under two scenarios



NOTE: This chart shows the expected paths of the current policy gap, core inflation gap, and recession probabilities in the baseline scenario (blue line) and the tighter scenario in which monetary policy becomes restrictive in 2023 (red line).

SOURCE: Authors' calculations.

What lies ahead as monetary policy continues to tighten?

While the NTFS is positive in 2022:Q2, market participants anticipate further monetary policy tightening in the upcoming months.[10] If such interest rates hikes indeed materialize, they could result in a lower NTFS and thus an increase in recession probabilities. In the final part of this *Chicago Fed Letter*, we turn again to the NTFS decomposition to ask how the pace of future monetary policy tightening could influence recession risk and inflation outcomes.

We simulate future realizations of the policy gap and the slope of inflation forecasts from the 2022:Q2 initial conditions through 2023:Q4 using the ABC model. We then evaluate the recession probability predicted by our preferred probit model for each of these simulated paths. Through this analysis, we show that future inflation outcomes and the odds of a recession depend critically on both the pace of removal of monetary policy accommodation and on how restrictive the monetary policy stance will become over the medium term. In particular, we highlight two scenarios: The first one, which we refer to as the "baseline case," reflects the ABC model forecasts or, equivalently, the average of all simulated paths. The second one, which we label the "tighter-policy scenario," is characterized by a faster removal of monetary policy accommodation; it is identified by the average of the simulated paths in which policy becomes restrictive by the end of 2022.[11]

1. **Baseline case:** As of early June 2022, the ABC model predicts that nominal and real yields will rise over the next six quarters, the current policy gap will narrow and become mildly restrictive in mid-2023, while core inflation will fall and remain around one percentage point above its model-implied longer-run expectations through 2023 (figure 2, blue lines in panels A and B). The expected tightening of the policy gap and a downward-sloping expected inflation path combine to increase the one-year-ahead recession probability to about 35% by 2023 (figure 2, blue line panel C). Such a level is comparable to the one estimated ahead of the 1994 monetary policy tightening cycle that was followed by a soft-landing scenario.

2. **Tighter-policy scenario:** In this alternative scenario, monetary policy becomes more restrictive than in the baseline case, in that the policy gap is markedly restrictive over 2023. In this case we find that core inflation declines more rapidly than under the baseline, closing the gap with its model-implied longer-run expectations almost completely by the end of 2023. By that date, in this scenario the likelihood of a recession approaches 60%, a level that, based on our historical estimates, is generally followed by a recession in our sample (figure 2, red lines).

Conclusion

In this *Chicago Fed Letter*, we highlight the role of the policy gap and the slope of near-term expected inflation as important predictors of U.S. recessions. Moreover, our analysis allows us to quantify the outcomes associated with monetary policy scenarios characterized by a different pace of removal of accommodation and different degrees of overshooting of a model-consistent measure of the neutral long-run real rate. In our baseline case, as of early June 2022, the model expects the policy gap to close and become mildly restrictive, inflation to decline, and the one-year-ahead recession probability to increase to around 35% by 2023. However, we also identify a tighter-policy scenario for monetary policy in which the policy gap closes more rapidly and becomes more restrictive than under the baseline over the same time horizon. In this scenario inflation retreats more rapidly at the cost of a significantly higher recession risk. This analysis highlights the relationship between the potential risk of an economic contraction and the degree of monetary policy tightness that is enacted in response to inflationary pressures.

Of course, our results hinge on several modeling assumptions. First, we rely on a specific dynamic term structure model to parse the expectations and risk premium NTFS components, and to infer the long-run equilibrium real rate r^*. The literature has provided a wide range of alternative r^* estimates that are generally characterized by a high degree of uncertainty. In unreported checks, we verify that our main conclusions are robust to adopting such alternative measures.[12] Second, and more importantly, our analysis focuses on the decomposition of the Engstrom and Sharpe (2019) NTFS, rather than long-term yield spreads. We focus on the NTFS because of both its success as a leading indicator of economic activity and the desire to better understand the link between the short- and medium-term monetary policy stance and recessions. Usually, the information content of the NTFS is qualitatively similar to that of long-term spreads. However, current times are different. The recent decline in the ten-minus-two-year spread, which has turned negative, has received considerable attention as it has already started to point toward a significantly higher probability of recession. Part of the signal from the long-term spread comes from the slope of long-term risk premia. For instance, Benzoni, Chyruk, and Kelley (2018) show that the slope in long-term inflation and real-rate risk premia are significant predictors of incoming downturns. In particular, the ABC model estimates a recent increase in the real rate risk premium, which in Benzoni, Chyruk, and Kelley is associated with a significant increase in downturn risk.[13] This discussion underscores that more work is warranted to better understand the link between the yield curve and the economy. We leave further analysis to future research.

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Notes

[1] Many studies have documented the predictive power of the term structure slope to forecast recessions. Early work by Kessel (1965) was followed by several influential articles, e.g., Fama (1986), Harvey (1988, 1989, 1991, and 1993), Stock and Watson (1989), Laurent (1989), Estrella and Hardouvelis (1991), Estrella and Mishkin (1998), Rudebusch and Williams (2009).

[2] Many practitioners focus on the signal in the spread between the ten- and two-year Treasury yields, while several academic studies look at the difference between the ten-year yield and the three-month rate.

[3] More specifically, we use inflation and Treasury yields data available through June 10, 2022. There is a trade off in the choice of the sample period. On the one hand, including the inflationary episodes of the 1960–70s is beneficial to study the recent, unusually high inflation realizations. On the other hand, this choice forces us to span a sample period characterized by multiple regimes of monetary policy that might be better captured by, e.g., a regime switching model (see, e.g., Ang, Bekaert, and Wei (2008)). Indeed, using data prior to the recent inflation outburst, Ajello, Benzoni, and Chyruk (2020) show that their model has a better out-of-sample performance when estimated on post-1985 data.

[4] Recent work by Cooper, Fuhrer, and Olivei (2020) documents that the stance of monetary policy plays a determinant role in forecasting recessions. While they focus on the forecasting power of the policy gap as a complement to longer-term yield spreads, we document that the policy gap and the expected inflation slope drive the forecasting power of the near-term forward spread.

[5] Indeed, we find that the marginal effect of the near-term inflation slope is even stronger when we estimate the probit model with the NTFS decomposition produced by the Ajello, Benzoni, and Chyruk (2020) model over the post-1985 period.

[6] Ang, Piazzesi, and Wei (2006) also find that the term premium is insignificant in predicting economic activity.

[7] Ajello, Benzoni, Schwinn, Timmer, and Vazquez-Grande (2022) conduct a series of specification tests and conclude that our baseline specification outperforms other model flavors based on the pseudo R2 of McKelvey and Zavoina (1975) and the Akaike information criterion.

[8] The unconditional estimate of the recession-transition probability is computed as the fraction of times, measured in quarters, during which the economy was in a recession since 1962.

[9] Consistent with these findings, we document in unreported results that the variables in our NTFS decomposition predict real activity measures such as GDP growth in linear regressions.

[10] For instance, the consensus forecasts for the 2023 realization of the federal funds rate are in the 3.4–3.5% range in the *Blue Chip Survey of Financial Indicators* released on July 1, 2022. This forecast is slightly below the 3.6–4.1% central tendency projection for the 2023 federal funds rate associated with the appropriate monetary policy path in the Summary of Economic Projections (SEP) released in June 2022 by the Federal Open Market Committee.

[11] As of June 10, 2022, the baseline Ajello, Benzoni, and Chyruk (2020) model predicts that nominal yields will rise to 2.5% in 2022 and peak at 2.8% in 2023. In the alternative more restrictive scenario, the nominal spot rate path peaks at 5.1% in 2023. (Note that in the June 2022 SEP, the ranges for the federal funds rate at the end of 2022 and 2023 were 3.1 to 3.9% and 2.9 to 4.4%, respectively.) Core CPI inflation in the baseline scenario declines to 3.8% by the end of 2023, and the longer-run core inflation expectation, defined as the 5-year-5-year-forward average core inflation rate, is 2.7%. In the alternative scenario core CPI inflation in 2023 is 3.1% and the longer-run expectation is 3.1%.

[12] In unreported robustness checks, we have also considered r^* estimates obtained from the models of Holston, Laubach and Williams (2017), Johannsen and Mertens (2016), Lewis and Vazquez-Grande (2017), Lubik and Matthes (2015), and Del Negro et al. (2017). The results are qualitatively similar to those for our baseline probit model, except that in some cases the six-quarter-ahead expected policy gap is negative and significant.

[13] The slope of the near-term premium is insignificant in our baseline probit model, while the risk-premia slopes are significant in Benzoni, Chyruk, and Kelley (2018). There are two reasons for this discrepancy. First, in this article we focus on a decomposition of the NTFS and therefore only consider the effect of the short-term premium, which is smaller and less cyclical than the premia estimated on longer-term yields. Second, Benzoni, Chyruk, and Kelley decompose the term-premium slope into its inflation and real-rate components, which they find to have marginal effects of opposite sign.

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