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# Futures prices as risk-adjusted forecasts of monetary policy[☆]

Monika Piazzesi[a,*], Eric T. Swanson[b]

[a] University of Chicago, NBER, Chicago, USA
[b] Federal Reserve Bank of San Francisco, USA

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ABSTRACT

Many researchers have used federal funds futures rates as measures of financial markets' expectations of future monetary policy. However, to the extent that federal funds futures reflect risk premia, these measures require some adjustment. In this paper, we document that excess returns on federal funds futures have been positive on average and strongly countercyclical. In particular, excess returns are surprisingly well predicted by macroeconomic indicators such as employment growth and financial business-cycle indicators such as Treasury yield spreads and corporate bond spreads. Excess returns on eurodollar futures display similar patterns. We document that simply ignoring these risk premia significantly biases forecasts of the future path of monetary policy. We also show that risk premia matter for some futures-based measures of monetary policy shocks used in the literature.

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## 1. Introduction

Predicting the future course of monetary policy is of tremendous importance to financial market participants. The current state of the art in this area is to use futures contracts on the short-term interest rate that is targeted by the central bank and to interpret the futures rate on, say, the December federal funds futures contract as the market expectation of what the federal funds rate will be in December. This procedure is widely used in the financial press (e.g., The Wall Street Journal, 2005; Financial Times, 2005), by Fed watchers (e.g., Altig, 2005; Hamilton, 2006), by central banks (e.g., European Central Bank Monthly Bulletin, 2005, p. 24; Federal Reserve Monetary Policy Report to Congress, 2005, p. 22), and in the academic literature (e.g., Krueger and Kuttner, 1996; Rudebusch, 1998, 2002; Bernanke and Kuttner, 2005).[1]

The standard practice is appealing for many reasons. First, producing the forecasts is simple—the rates on various contracts can be obtained directly from futures exchanges at any time during the day. Second, the forecasts work well—federal funds futures outperform forecasts based on alternative methods, such as sophisticated time series specifications, monetary policy rules, and forecasts derived from Treasury bills or other financial market instruments

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[*] Corresponding author.
*E-mail address:* piazzesi@uchicago.edu (M. Piazzesi).

[1] Some of these studies allow for constant risk premia.

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(e.g., Evans, 1998; Gürkaynak et al., 2007). Third, previous studies did not find any large time variation in risk premia in fed funds futures (e.g., Krueger and Kuttner, 1996; Sack, 2004; Durham, 2003).[2]

However, there is by now a large and well-accepted body of evidence in the finance literature against the expectations hypothesis for Treasury yields (e.g., Fama and Bliss, 1987; Stambaugh, 1988; Campbell and Shiller, 1991; Cochrane and Piazzesi, 2005). Over a very wide range of sample periods and bond maturities, excess returns on Treasury securities have been positive on average, time-varying, and significantly predictable. Time-varying risk premia in these markets may well carry over to related markets and therefore lead to systematic deviations of fed funds futures rates from expectations of the subsequently realized fed funds rate.

In this paper, we show that the expectations hypothesis also fails for federal funds futures. In particular, excess returns on fed funds futures contracts at even short horizons have been positive on average and significantly predictable. The $R^2$'s depend on the forecast horizon and range from 10% at a two-month horizon up to 39% at a six-month horizon. We find that macroeconomic business-cycle indicators such as employment growth capture this predictability surprisingly well. We also find that financial business-cycle indicators such as corporate bond spreads and Treasury yield spreads do well at predicting excess returns. These findings stand up to a battery of robustness checks, including bootstrapped test statistics, real-time data, subsample stability pre- and post-1994, rolling-endpoint regressions, out-of-sample forecasts, and a comparison to excess returns on eurodollar futures, for which we have a somewhat longer sample.

We exploit the significant predictability of excess returns on futures to propose a risk adjustment to forecasts of monetary policy. We find that not implementing our risk adjustment can produce very misleading results. Specifically, forecasts based on the expectations hypothesis make large mean errors and large mean-squared errors. Moreover, errors from unadjusted forecasts vary systematically over the business cycle; futures rates tend to overpredict in recessions and underpredict in booms. Non-risk-adjusted forecasts also tend to perform very poorly around economic turning points, adapting too slowly to changes in the direction of monetary policy. For example, right before recessions, when the Fed has already started easing, fed funds futures keep forecasting high funds rates. As a consequence, forecast errors using unadjusted futures rates are more highly autocorrelated than are forecast errors using our risk-adjusted futures rates.

Our findings also suggest that monetary policy shocks may not be accurately measured by the difference between the fed funds rate target and an ex ante market expectation based on fed funds futures. Indeed, we document that the amount by which we need to adjust these shocks can be substantial, at least relative to the size of the shocks themselves. However, risk premia seem to change primarily at business-cycle frequencies, which suggests that we may be able to "difference them out" by looking at one-day changes in near-dated fed funds futures on the day of a monetary policy announcement. Indeed, our results confirm that differencing improves these policy measures.

Our findings for federal funds futures complement those in the traditional finance literature on Treasuries in several ways. First, we find that the most important predictive variables for excess returns are macroeconomic variables, such as employment growth. This finding allows us to link the predictability in excess returns directly to the business cycle, while the existing literature on Treasuries has focused mainly on predictability using financial variables such as term spreads (e.g., Cochrane and Piazzesi, 2005).

Second, fed funds futures are actually traded securities, while the zero-coupon yield data used in Fama and Bliss (1987) and many other papers are data constructed by interpolation schemes. While the predictability patterns in this artificial data may not lead to profitable trading rules based on actual securities, investors can implement our results directly by trading in fed funds futures. Interestingly, we document evidence that suggests that futures market participants were aware of these excess returns in real time: traders that are classified as "not hedging" by the U.S. Commodity Futures Trading Commission (CFTC) went long in these contracts precisely when we estimate that expected excess returns on these contracts were high, and they went short precisely in times when we estimate expected excess returns were very low.

Finally, fed funds futures contracts have maturities of just a few months and may therefore be less risky than Treasury notes and bonds, which have durations of several years; moreover, the holding periods relevant for measuring excess returns on fed funds futures are less than one year, while the results for Treasuries typically assume that the investor holds the securities for an entire year (an exception is Stambaugh, 1988, who studies Treasury bills). Given the short maturities and required holding periods to realize excess returns in the fed funds futures market, one might think that risk premia in this market would be very small or nonexistent. We find that this is not the case.

Throughout this paper, we will often use the label "risk premia" to refer to "predictable returns in excess of the risk-free rate." This use of language should *not* be interpreted as taking a particular stance on the structural interpretation of our results. The existing literature has proposed several appealing explanations for why excess returns on these contracts might be predictable. Some of these explanations are based on preferences: for example, investors may exhibit risk aversion which varies over the business cycle, or care about the slow-moving, cyclical consumption of items like housing. Other explanations are based on beliefs that deviate from rational expectations, for example because of learning or for psychological reasons. It is not easy to make the case for just one of these explanations: beliefs and other preference

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[2] These studies run regressions of one-month excess returns on fed funds futures on a variety of variables, including macroeconomic variables. While some of the regression coefficients are statistically significant, they are economically small. Our results are different: we show that for holding periods longer than one month, risk premia are large on average and vary over time substantially.

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