PREDICTING MONETARY POLICY WITH FEDERAL FUNDS FUTURES PRICES

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In theory, prices of current-month federal funds futures contracts should reflect market expectations of near-term movements in the federal funds rate and thus the Federal Reserve's funds rate target. This article shows that futures-based proxies for funds rate expectations have weak predictive power for the average funds rate using daily data but are more successful in predicting the average funds rate and the funds rate target around target changes and meetings of the Federal Open Market Committee. However, the futures-based expectations have a systematic bias related to the last days of the month and, in particular, calendar months. © 2001 John Wiley & Sons, Inc. Jrl Fut Mark 21:377–391, 2001

INTRODUCTION

Since their introduction in October 1988, the prices of federal funds futures contracts have become very popular as a simple way of measuring market expectations about the future path of monetary policy. Because

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these contracts are based on the monthly average of the federal funds rate, which is the main policy instrument of the Federal Reserve, efficient futures markets should set prices to reflect the expected path of Federal Reserve policy. The usefulness of federal funds futures contracts in predicting monetary policy moves 1 to 3 months ahead has been demonstrated by, for example, Carlson, McIntire, and Thomson (1995), Krueger and Kuttner (1996), Robertson and Thornton (1997), and Rudebusch (1998).

Existing studies have concentrated on using monthly averages or end-of-the-month observations of futures contracts of 1 to 3 months' maturity to predict policy moves on that horizon. However, in contrast to many other futures contracts, federal funds futures are traded also during the contract month, when past observations of the funds rate are known. Therefore, it should be possible to extract even more precise market expectations about the average funds rate for the rest of the current contract month. These measures could be interpreted as the expected average of the federal funds rate target for the remaining days of the month and, in particular on the day before a meeting of the Federal Open Market Committee (FOMC) from 1994 onward, as the level of the funds rate target expected to prevail after the meeting, because policy moves after 1994 have been made almost exclusively at FOMC meetings.[1]

The purpose of this article is to examine the use of current-month futures prices to measure expectations of the future path of the funds rate and the funds rate target. The focus is on expectations in the very short run (over the period from the next day until the end of the month, when the contract matures), for the period from the introduction of the futures contracts in October 1988 until March 1998. The main issue to examine is whether the futures prices have predictive power for the funds rate and, therefore, are reliable as measures of monetary policy expectations.

To briefly review the results, the expectations extracted from the futures market do not perform very well in predicting the average funds rate on a daily basis. Nevertheless, futures-based expectations from the day before meetings of the FOMC in the period from 1994 to 1998 are more successful in predicting the average funds rate as well as the target level that will prevail after the meeting. However, the funds rate expectations display some systematic variation across calendar months and during the last days of each month, and adjusting for the monthly variation improves their predictive power. Furthermore, the adjusted expectations are shown to improve somewhat on expectations taken from the financial press.

[1]See Pakko and Wheelock (1996) for such an exercise over the period from 1994 to 1996.

The article proceeds as follows. The next section describes some characteristics of the federal funds futures market and the extraction of funds rate expectations from futures prices, whereas the section thereafter presents the main empirical analysis. The section Estimates From the Financial Press compares these predictions with those obtained using expectations from the financial press, and the final section briefly discusses the results.

THE FEDERAL FUNDS FUTURES MARKET

The Futures Contract

The 30-day federal funds futures contract, traded on the Chicago Board of Trade since October 3, 1988, calls for delivery of the interest paid on a principal amount of $5 million in overnight federal funds held for the contract month.[2] At maturity, the contract is cash-settled against the monthly average of daily effective federal funds rates, including weekends and holidays, as calculated and reported each business day by the Federal Reserve Bank of New York.[3] A buyer of a federal funds futures contract will thus pay (or receive from) the seller an amount corresponding to the interest on $5 million held for the contract month, with the interest rate determined by the difference between the average funds rate for the month and the futures rate negotiated at the trade.

In contrast to the federal funds cash market, which is open only to those depository institutions required to hold reserves with Federal Reserve Banks (Goodfriend & Whelpley, 1993), the federal funds futures market is open to anyone who can satisfy margin requirements (Carlson et al., 1995). Thus, the futures market can be used both by institutions to protect themselves against movements in the funds rate and by traders and Fed watchers to speculate on the future path of the federal funds rate. Such speculation should drive the futures price to the level consistent with market participants' expectations of the average federal funds rate. Expected shifts in the monetary policy stance should, therefore, be priced into the futures market, and the prices of futures contracts should be useful to estimate the market's expectations of the path of monetary policy over the near future. In particular, during the contract month, when past observations of the funds rate have been observed, efficient futures markets should adjust prices to reflect the observed path of the

[2]See Chicago Board of Trade (1997) for details on the federal funds futures market.

[3]The effective federal funds rate is a weighted average of the rates on those overnight federal funds transactions arranged through New York brokers.

funds rate, providing even more reliable measures of the expected funds rate for the rest of the month.

Extracting Market Expectations from Futures Prices

Because the futures settlement price is calculated as 100 minus the average effective federal funds rate for the contract month, the implied futures rate at day t for the mth month-ahead, $i^f_{m,t}$, is given by

$$i^f_{m,t} = 100 - p^f_{m,t} \tag{1}$$

where $p^f_{m,t}$ is the price at day t of a futures contract maturing m months from now. For coming months, the implied futures rate is simply equal to the expected average effective funds rate for the contract month, so

$$i^f_{m,t} = \sum_{\tau=1}^{n_m} \frac{1}{n_m} E_t i^{ff}_{m,\tau} \tag{2}$$

where $i^{ff}_{m,\tau}$ is the effective funds rate on day τ in the mth month from now and n_m is the number of days in the mth month, including weekends and holidays.[4]

For the current month, market participants have observed the effective funds rate up to the previous trading day,[5] so the expected average funds rate for the entire contract month can be divided into two parts: the observed rates so far in the month and the expected rates for the remaining days. Thus,

$$i^f_t = \frac{1}{n}\left[\sum_{\tau=1}^{t-1} i^{ff}_\tau + \sum_{\tau=t}^{n} E_t i^{ff}_\tau\right] \tag{3}$$

where the month subscript m has been skipped for the current month. Defining i^a_{t-1} as the average funds rate up to day $t-1$ in the month and i^e_t as the average expected funds rate for the rest of the month, including day t,

$$i^a_{t-1} \equiv \frac{1}{t-1}\sum_{\tau=1}^{t-1} i^{ff}_\tau;\; i^e_t \equiv \frac{1}{n-t+1}\sum_{\tau=t}^{n} E_t i^{ff}_\tau \tag{4}$$

we can express the current-month futures rate as

[4]Equation 2 is valid under the assumption that there are no risk premia or calendar effects on the futures market.

[5]The effective funds rate for a trading day is published by the Federal Reserve Bank of New York on the following morning.

$$i_t^f = \frac{1}{n}\left[(t-1)i_{t-1}^a + (n-t+1)i_t^e\right] \tag{5}$$

Then, it is straightforward to solve for the implied expected average funds rate for the rest of the month as

$$i_t^e = \frac{ni_t^f - (t-1)i_{t-1}^a}{n-t+1} \tag{6}$$

which can be calculated from data on futures prices and past observations of the federal funds rate. This expression then gives a futures-based proxy for the market expectation of the average funds rate for the rest of the current month.

EMPIRICAL ANALYSIS

Predicting Funds Rate Movements

In theory, the futures-based funds rate expectations from Equation 6 should reflect the market expectation of the average funds rate for the rest of the current month. A natural starting point is, therefore, to examine the extent to which the futures-based funds rate expectations have predictive power for the average funds rate by estimating

$$\bar{i}_t^{ff} - i_t^T = \alpha + \beta\,(i_t^e - i_t^T) + \varepsilon_t \tag{7}$$

where $\bar{i}_t^{ff}$ is the average funds rate for the rest of the month (including day t), i_t^e is the futures-based funds rate expectations from Equation 6 at date t, and i_t^T is the Federal Reserve's target level for the funds rate.[6] We begin by estimating Equation 7 on daily data over the entire sample period from the introduction of federal funds futures on October 3, 1988, to March 6, 1998.

However, on a daily basis there are large movements in the funds rate that are hard to predict, introducing noise into the estimation. This can be seen in Figure 1, which shows the daily effective funds rate and the funds rate target for the period from 1994 to 1996. The daily funds rate is very volatile, although in the long run it tends to return to the funds rate target. One way to diminish the amount of noise in the estimation is to concentrate on days when more fundamental issues are likely

[6]The current level of the funds rate target is subtracted from both sides of Equation 7 to control for the general level of the funds rate. Also, on the last day of each month, the futures rate for the next month's contract is used as a measure of the expected funds rate.

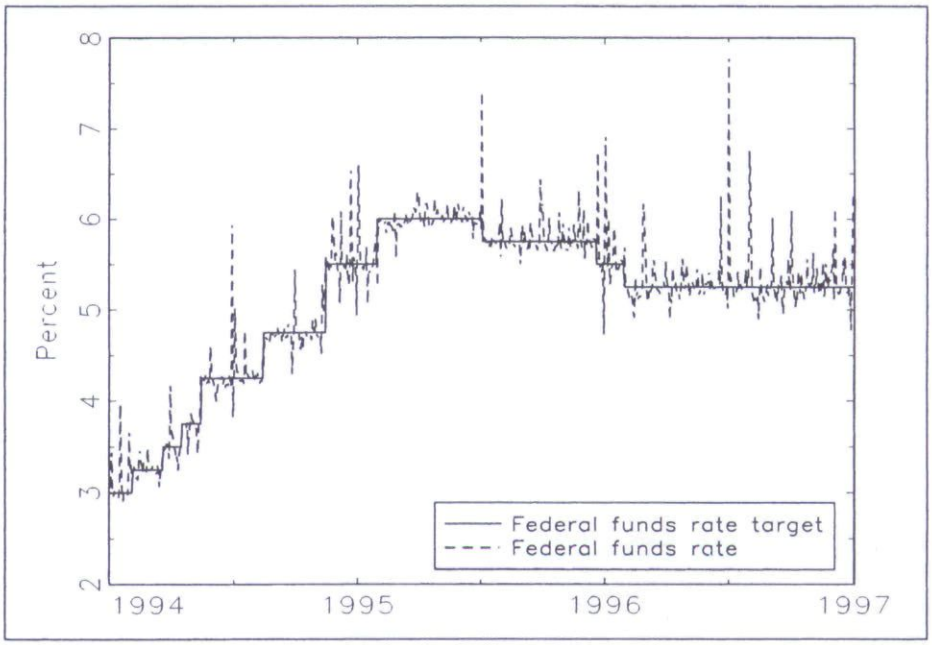

FIGURE 1
Federal funds rate and funds rate target, 1994–1996 (sources: Federal Reserve Banks of St. Louis and New York).

to have dominated the movements in the funds rate. Therefore, Equation 7 is estimated also on the sample of actual changes in the funds rate target during the sample period and on meetings of the FOMC from 1994 to 1998. This latter sample is of interest because the Federal Reserve in 1994 began a deliberate policy of changing the funds rate target only at FOMC meetings. Thus, although the timing of actual target changes in the first part of the sample period was not known *ex ante,* in the latter part market predictions of Federal Reserve policy actions have concentrated on these meeting dates.

As mentioned in the introduction, the futures-based expectations are often used to measure market expectations of the actual funds rate target, not the average funds rate. In addition to examining the predictive power for the average funds rate, we thought it also interesting to see how successful the futures-based expectations are in predicting changes in the funds rate target. In particular, since 1994, when the target has been changed almost exclusively at FOMC meetings and never twice in the same month, the futures-based expectations from the day preceding an FOMC meeting can be interpreted as a measure of the funds rate target expected to prevail after the meeting. Thus, we also estimate the equation

$$\Delta i^T_{t+1} = \alpha + \beta (i^e_t - i^T_t) + \varepsilon_{t+1} \quad (8)$$

both on the sample of target changes from October 1988 to March 1998 and around FOMC meetings from January 1994 to March 1998.[7]

If the funds rate expectations have strong predictive power for the average funds rate or the target, we would expect the intercepts α to be zero and the slope coefficients β to be close to unity. An estimate of β below unity could, however, be due to several causes. It could be interpreted as market participants not being perfectly informed about the Federal Reserve's policy motivations but assigning a positive probability (although less than unity) to the possibility of a change. If market participants are completely ignorant about future policy moves, β should be close to zero, whereas $\beta = 1$ implies that markets are perfectly informed (or always guess correctly) about future moves. Alternatively, if there are movements over time in the perceived risk of the futures contracts, we would expect the estimated coefficient for β to be biased downward (e.g., Söderlind & Svensson, 1997).

Daily data on federal funds futures prices were obtained from the Chicago Board of Trade; data on the effective federal funds rate were obtained from the FRED database of the Federal Reserve Bank of St. Louis; and data on the federal funds rate target are taken from Rudebusch (1995) for 1988 to 1992 and the Federal Reserve Bank of New York for 1993 to 1998.

The results from estimating Equations 7 and 8 with ordinary least squares[8] on the various samples are presented in Table I.[9] With daily data in Column 1, the calculated expected funds rate has some predictive power for the average funds rate: the estimated slope coefficient is significantly positive, although below unity. The explanatory power is weak, however. The futures-based expectations are considerably more successful when the average funds rate is predicted around target changes and FOMC meetings in Columns 2 and 3:[10] neither slope coefficient is sig-

[7]With daily data, the change in the funds rate is zero in more than 98% of the observations, so we confine the analysis to the samples of target changes and FOMC meetings. Table III presents the data of FOMC meetings from 1994 to 1998.

[8]Attempts to capture the probability of target changes through probit modeling were not very successful because the futures-based expectations are very noisy.

[9]Because the futures-based funds rate expectations measure the expected funds rate for the rest of the month, the error terms are likely to be serially correlated when the sampling interval is shorter than a month. Therefore, standard errors are adjusted according to Newey and West (1987), setting the number of lags equal to the maximum number of overlapping observations: 20 with daily data, 3 with the sample of target changes, and 0 with FOMC meetings. Furthermore, when using the large daily samples, we should be aware of Lindley's paradox and interpret the results with caution.

[10]When FOMC meetings have lasted 2 days, the expectations from the day before the last day have been used in the regressions.

TABLE I

Predicting the Average Funds Rate and Funds Rate Target

	Average Funds Rate			*Funds Rate Target*	
	(1) *All Days* *1988–98*	*(2)* *Target Changes* *1988–98*	*(3)* *FOMC* *1994–98*	*(4)* *Target Changes* *1988–98*	*(5)* *FOMC* *1994–98*
Intercept	0.032 (0.009)[a]	−0.023 (0.056)	−0.028 (0.033)	−0.132 (0.031)[a]	−0.069 (0.026)[a]
Slope	0.364 (0.071)[a]	0.743 (0.169)[a,b]	0.928 (0.232)[a,b]	0.607 (0.204)[a,c]	0.869 (0.238)[a,b]
$\bar{R}^2$	0.090	0.293	0.482	0.331	0.460
Observations	2,376	47	33	47	33

Note: Least squares estimation of Equations 7 and 8 on various samples. Newey and West (1987) standard errors with 20 lags (daily data), 3 lags (target changes) and 0 lags (FOMC meetings) are given in parentheses.
[a]Coefficient significantly different from 0 at the 1% level.
[b,c]Coefficient not significantly different from 1 at the 10%/5% level.

nificantly different from unity, and the explanatory power is larger than with daily data. Similar results are obtained when the funds rate target is predicted around target changes and FOMC meetings in Columns 4 and 5.

Thus, the results in Table I suggest that the futures data have substantial predictive power for both the average funds rate and the funds rate target on those occasions when the market might have suspected a target change. On other days, however, the extracted expectations seem rather noisy when the average funds rate is predicted. Some of this noise could come from regularities on the federal funds market that spill over to the futures market. In the next section, we attempt to decrease the amount of noise by taking account of these regularities.

Accounting for Market Regularities

As seen in Figure 1, although the federal funds rate in the long run is largely determined by movements in the Federal Reserve's funds rate target, in the short run the funds rate is very volatile, and there are significant temporary deviations between the funds rate and the target. Some of these deviations are due to the behavior of depository institutions and as such are predictable, whereas other deviations are more difficult to predict in advance.[11]

[11]Several studies (e.g., Griffiths & Winters, 1995; Hamilton, 1996; Ho & Saunders, 1985; Saunders & Urich, 1988; and Spindt & Hoffmeister, 1988) have demonstrated how the current system of reserve maintenance for depository institutions leads to predictable movements in the funds rate. In

It is, therefore, interesting to see whether the predictive power of the futures-based expectations can be enhanced by accounting for some of the regularities. Thus, Equations 7 and 8 are re-estimated, including intercept dummies for (a) the last 3 days in each month and (b) calendar months.[12] The end-of-month dummies are included to account for balance sheet window dressing effects, whereas the monthly dummies are included to capture possible seasonal variation. The estimated coefficient for a monthly dummy then represents the average intercept for observations in that particular month, whereas the coefficients on the end-of-month dummies are the average change in the intercept on the last days of each month relative to other days.[13] A significantly positive coefficient on an intercept dummy would suggest that the futures-based funds rate expectations tend to underpredict the average funds rate or funds rate target in that particular month or day of the month and vice versa.

Table II shows the results when the intercept dummies are included in the prediction regressions with the samples most interesting for prediction purposes: all trading days and FOMC meetings from 1994 to 1998. (Note that only significant dummy coefficients are reported.) In Column 1, only end-of-month dummies are included when the average funds rate for the rest of the month is predicted with daily data. The only significant dummy is that of the last day of the month, which is positive: the futures-based expectations tend to underpredict the average funds rate on the very last day of each month by 4.5 basis points more than usual (the average intercept is 3 basis points). Thus, there seems to be a systematic prediction bias on the last day of each contract month.

In Column 2, both end-of-month and monthly dummies are included.[14] Now, the end-of-month effect is no longer significant, but there are large variations in the intercept across months. In particular, the futures-based expectations tend to underpredict the average funds rate in a large number of months (and by more than 8 basis points in September) but overpredict the funds rate by more than 17 basis points in December.

particular, there is increased volatility on the federal funds market on the last days of the 2-week reserve maintenance period, especially on the so-called settlement Wednesday. There are also year-end and quarter-end regularities on the federal funds market due to banks and other firms engaging in balance sheet window dressing. Over the period from 1978 to 1986, Allen and Saunders (1992) found strong evidence of systematic upward window dressing adjustment on the last day of each quarter.

[12]Regularities over the reserve maintenance period do not have a systematic effect on the average monthly funds rate and thus do not affect the futures market. See the working paper version (Söderström, 1999) for details. Several different configurations of interaction dummies were tested, but they never proved significant.

[13]Because the monthly dummies are mutually exclusive, no separate intercept is included when these dummies are used.

[14]When only monthly dummies are used the results are virtually identical to those in Column 2.

TABLE II

Predicting the Average Funds Rate and Funds Rate Target, Including Intercept Dummies

	Average Funds Rate			*Funds Rate Target*
	(1) *All Days* *1988–98*	*(2)* *All Days* *1988–98*	*(3)* *FOMC* *1994–98*	*(4)* *FOMC* *1994–98*
Slope	0.350 (0.074)[a]	0.555 (0.078)[a]	0.933 (0.178)[a,c]	0.982 (0.151)[a,c]
Intercept	0.030 (0.008)[a]			
End-of-month dummies				
Last day	0.045 (0.022)[b]			
Monthly dummies				
February		0.061 (0.023)[a]		
June		0.053 (0.022)[b]		
July				−0.111 (0.038)[a]
August		0.037 (0.015)[b]		
September		0.083 (0.027)[a]		−0.247 (0.086)[a]
November		0.076 (0.030)[b]		
December		−0.177 (0.029)[a]	−0.243 (0.061)[a]	−0.230 (0.046)[a]
$\bar{R}^2$	0.092	0.192	0.576	0.706
Observations	2,376	2,376	32	32

Note: Least squares estimation on (1) 2,376 daily observations (1988–1998), including only end-of-month dummies (for the last 3 days in each month); (2) 2,376 daily observations (1988–1998), including end-of-month and monthly dummies; and (3,4) 32 FOMC meetings (1994–1998; Jan 31, 1996 excluded), including only monthly dummies. Only dummy coefficients significant at the 5% level are reported. Newey and West (1987) standard errors with 20 lags (daily data) and 0 lags (FOMC meetings) are given in parentheses.

[a,b]Coefficient significantly different from 0 at the 1%/5% level.

[c]Coefficient not significantly different from 1 at the 10% level.

Furthermore, in comparison with Table I, including the monthly dummies increases the explanatory power considerably, and the slope coefficient rises to 0.56 (from 0.36).

Column 3 shows the results when the average funds rate is predicted around FOMC meetings, including monthly dummies.[15] Now, only the December dummy is significant, again large and negative. The slope coefficient increases further and is not significantly different from unity.

Finally, Column 4 shows the results when the funds rate target is predicted around FOMC meetings. Also the July and September inter-

[15]Because only two FOMC meetings (January 31, 1996, and September 30, 1997) were held on the last day of the month and none were held on the second- or third-to-last day, end-of-month dummies are not included when the target level after policy meetings is predicted. Also, because only one FOMC meeting was held in January, it is excluded from the sample. Except for this observation, there were no FOMC meetings in January, April, June, or October, so dummies for these months are not included.

cepts are now significantly negative. Adjusted R^2 is increased further, and the slope coefficient is again very close to unity.

These results indicate that taking the monthly effects into account improves the prediction of both the average funds rate and the funds rate target on a daily basis as well as around FOMC meetings. The end-of-month regularities, though significant on their own, are dominated by the seasonal effects.

ESTIMATES FROM THE FINANCIAL PRESS

As a further test of the market expectations extracted from futures prices, these are compared to expectations taken from the *Financial Times* on the day preceding each meeting of the FOMC from January 1994 to February 1998. On the day preceding an FOMC meeting, the financial press typically interviews a number of traders and analysts to see what outcome the market expects from the meeting. These reports have been collected from the *Financial Times* and processed to yield a measure of the expected target change for the 33 dates of FOMC meetings.

To calculate the average market expectations from the newspaper reports, the possible outcomes suggested by market participants have been given different weights. When possible, these weights have been taken from poll results reported by the *Financial Times;* otherwise, they have been assigned by careful study of the newspaper reports. Consequently, an element of arbitrariness in the measurement of market expectations from the newspaper reports is inevitable. Table III shows the federal funds rate target before and after each meeting; the predicted target change from the futures data, both the simple measure used in Table I, Column 5, and the fitted value after adjustment for monthly variation in Table II, Column 4; and the data collected from the *Financial Times.*

The question is whether the expectations from the financial press perform better than those extracted from the futures market when target changes are predicted at FOMC meetings. Additionally, do the futures-based estimates improve on the expectations from the newspaper reports?

The first of these questions is answered by the estimation of the prediction regression (Equation 8) but now with the expected target change from the *Financial Times*, $i_t^{FT} - i_t^T$, as the independent variable:

$$\Delta i_{t+1}^T = \alpha + \beta\,(i_t^{FT} - i_t^T) + \varepsilon_{t+1} \qquad (9)$$

The results are presented in Table IV, Column 2. For reference, Column 1 repeats the results when the expected target change from the futures

TABLE III

Actual and Predicted Target Changes around FOMC Meetings

Date	Old Target	New Target	Target Change	*Futures Predictions*		*Financial Times Predictions*		
				Simple	*Adjusted*	*Range*	*Weights*[b]	*Average*
940204	3.00	3.25	0.25	0.162	0.194	+0.25	100	+0.25
940322	3.25	3.50	0.25	0.295	0.188	+0.25/+0.50	75/25	+0.3125
940517	3.75[a]	4.25	0.50	0.361	0.353	+0.25	100	+0.25
940706	4.25	4.25	0.00	0.247	0.132	0	100	0.00
940816	4.25	4.75	0.50	0.345	0.370	+0.25/+0.50	50/50	+0.375
940927	4.75	4.75	0.00	0.246	−0.006	0/+0.25	50/50	+0.125
941115	4.75	5.50	0.75	0.588	0.594	+0.50	100	+0.50
941220	5.50	5.50	0.00	0.364	0.128	0/+0.25	75/25	+0.0625
950201	5.50	6.00	0.50	0.460	0.487	+0.50	100	+0.50
950328	6.00	6.00	0.00	0.112	0.007	0	100*	0.00
950523	6.00	6.00	0.00	0.031	0.029	0	100	0.00
950706	6.00	5.75	−0.25	−0.161	−0.269	0/−0.25	50/50	−0.125
950822	5.75	5.75	0.00	−0.015	0.017	0	100	0.00
950926	5.75	5.75	0.00	0.040	−0.208	0/−0.25	75/25	−0.0625
951115	5.75	5.75	0.00	−0.034	−0.016	0	100	0.00
951219	5.75	5.50	−0.25	0.001	−0.228	0	100	0.00
960131	5.50	5.25	−0.25	0.198	NA	0/−0.25/−0.50	25/50/25	−0.25
960326	5.25	5.25	0.00	0.242	0.135	0	100	0.00
960521	5.25	5.25	0.00	0.011	0.010	0	100	0.00
960703	5.25	5.25	0.00	0.060	−0.052	0/+0.25	75/25	+0.0625
960820	5.25	5.25	0.00	0.052	0.082	0	100*	0.00
960924	5.25	5.25	0.00	0.186	−0.064	0/+0.25/+0.50	44/48/8*	+0.16
961113	5.25	5.25	0.00	0.066	0.083	0/−0.25	90/10	−0.025
961217	5.25	5.25	0.00	0.148	−0.084	0	100	0.00
970205	5.25	5.25	0.00	0.031	0.066	0	100	0.00
970325	5.25	5.50	0.25	0.278	0.170	0/+0.25/+0.50	10/80/10	+0.25
970520	5.50	5.50	0.00	0.111	0.108	0/+0.25	54/46*	+0.115
970702	5.50	5.50	0.00	0.050	−0.062	0	100	0.00
970819	5.50	5.50	0.00	0.001	0.032	0	100	0.00
970930	5.50	5.50	0.00	0.535	0.278	0	100	0.00
971112	5.50	5.50	0.00	0.072	0.088	0	100	0.00
971216	5.50	5.50	0.00	0.167	−0.065	0	100	0.00
980204	5.50	5.50	0.00	−0.034	0.002	0	100	0.00

Note: The observation of 960131 was excluded from the calculation of the adjusted expected funds rate; see Table II. The sources are the Federal Reserve Bank of New York, the *Financial Times*, and the author's calculations.

[a]Target changed 940418 from 3.50 to 3.75.

[b]Author's subjective estimate, unless marked with *, based on poll results reported in the *Financial Times*.

TABLE IV

Funds Rate Target Expectations from the *Financial Times* Versus Futures-Based Estimates

	(1) *Futures Only*	(2) *Financial Times Only*	(3) *Financial Times and Simple Futures*	(4) *Financial Times and Adjusted Futures*
Intercept	−0.069 (0.026)[a]	−0.023 (0.014)	−0.042 (0.018)[b]	−0.026 (0.013)[b]
Expectations				
Financial Times		1.207 (0.117)[a,d]	1.080 (0.095)[a,c]	0.771 (0.142)[a,c]
Simple futures	0.869 (0.238)[a,c]		0.182 (0.093)	
Adjusted futures				0.481 (0.147)[a]
$\bar{R}^2$	0.460	0.832	0.839	0.884
Observations	33	33	33	32

Note: Least squares prediction of funds rate target changes with futures-based and/or *Financial Times* expectations on 33 FOMC meeting dates from January 1994 to February 1998. White (1980) standard errors are given in parentheses.
[a,b]Coefficient significantly different from 0 at the 1%/5% level.
[c,d]Coefficient not significantly different from 1 at the 10%/5% level.

market is used as the independent variable in Equation 8 shown in Table I, Column 5. The *Financial Times* estimates seem to outperform the estimates from the futures market, yielding a higher adjusted R^2 and a slope coefficient above unity.

To see if the information in the financial press is completely superior to that from the futures markets, the *Financial Times* predictions are included in the same regression as the futures-based expectations, first with the simple expectations and then with the expectations adjusted for monthly regularities. The results from estimating these regressions are shown in Columns 3 and 4 of Table IV. The simple futures-based expectations in Column 3 add virtually nothing to the *Financial Times* predictions. However, when the adjusted expectations in Column 4 are used, the slope coefficient on the futures-based expectations is significantly positive, and that on the *Financial Times* forecast falls relative to Column 2. Although this suggests that there is a positive correlation between the *Financial Times* forecasts and the futures-based expectations, the slight increase in predictive power indicates that the adjusted expectations improve somewhat on the newspaper reports when the funds rate target is predicted.

The expectations from the *Financial Times* seem to be a better predictor of target changes than both the simple and adjusted futures-based expectations, in that the slope coefficient on the *Financial Times* data is

larger and more strongly significant. This may not be surprising because the *Financial Times* data avoid the noise from market regularities and also predict target changes directly, whereas the futures-based expectations predict the average funds rate. Nevertheless, at least the adjusted futures-based expectations seem to contain some information about future target changes that is not in the *Financial Times* data.

DISCUSSION

The results presented in the section Empirical Analysis indicate that the futures-based funds rate expectations tend to overpredict changes in the funds rate target in July, September, and December. A clue to understanding this result can be gained from studying the data of FOMC meetings in Table III and comparing the futures-based estimates (labeled *simple futures predictions*) with the actual target changes and the predictions from the *Financial Times*.[16] On a number of occasions, the futures-based expectations have either predicted positive target changes that did not occur or predicted no target change when in fact the target was reduced. These occasions have tended to arise in the months of September and December, yielding the negative intercepts. On some of these dates, for example, in December 1995, the *Financial Times* predictions also were mistaken, but on a number of occasions, the futures-based proxy seems to be a truly biased measure of market expectations.

With the subsample of FOMC meetings from 1994 to 1998, the econometric results are of course only indicative because there are only four observations for each month. Nevertheless, the significance of the monthly variation also when the average funds rate on all trading days is predicted suggests that there are important calendar effects on the futures market, particularly in December. This result is somewhat surprising because it indicates that there are systematic inconsistencies between the futures prices and the movements in the average funds rate.[17]

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[16]I am grateful to a referee for suggesting this more detailed analysis.

[17]As demonstrated in the working paper version of this article (Söderström, 1999), these calendar effects remain also in average monthly data more commonly used to assess market expectations of monetary policy moves (e.g., Carlson et al., 1995; Krueger & Kuttner, 1996).

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