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Special Report

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How to Calculate the Odds of a Change in the Fed Funds Rate

By Michael Geraty

The fed fund futures contract is a cash settled instrument. The price quoted is 100 minus the effective fed funds rate. This rate represents the market's expectation of the simple average of the overnight Fed Funds Rate for the entire delivery month.

Assumptions:

- The current target Fed Funds Rate is 5.50%.
- The contract is based on the effective funds rate, not the target fund rate. However, for purposes of our discussion, we ignore the difference between the effective rate and the target rate. We assume that they are the same when one is looking at the average for the entire month. Except for year-end pressures, this has largely been the case over the last few years.
- We define a change in the funds rate as 25 basis points (bps). Since the FOMC has a history of moving the target fed funds rate in 25 bps increments, we assume that this practice will continue.
- In theory, if the FOMC changes the fed funds rate, the amount is equally likely to be 25, 50, 75, or 100 bps.
- In theory, there are three equally likely results of an FOMC meeting:
    1. Raise the target fed funds rate
    2. Maintain the target fed funds rate
    3. Lower the target fed funds rate
- In reality, the market typically debates two outcomes. Such as, will they raise/lower the fed funds rate 25 bps, or not move? Or, will they raise/lower the fed fund rate by 25 or 50 bps?

Example:
Will they raise the fed funds rate or not?

- February Fed Funds Futures Contract Price = 94.375
- Implied Fed Funds Rate (100 – Contract Price) = 5.625%

Assume the current target fed funds rate is 5.50%. It is January and the FOMC meets in February. The implied rate (100 minus the closing price) by the February fed funds futures contract is (100-94.375*)* 5.625%. This rate is precisely halfway between the target rate, and the target rate plus 25 bps (the typical amount the FOMC usually raises the fed funds rate). This means that 12.5 bps of tightening is "priced in the market". We conclude that it is equally likely that the FOMC will raise the fed funds rate by 25 bps to 5.75%, or will leave the fed funds rate unchanged; each outcome has a 50% probability (or odds).

It is easy to see that the yield on the contract is mid-way between the target fed funds rate (5.50%) and the expected fed funds rate after a tightening (5.75%). This makes the proposition an even-money bet.

Another Example:

- February Fed Funds Futures Contract Price = 94.35
- Implied Fed Funds Rate (100 – Contract Price) = 5.65%

Suppose the yield implied by the contract is 5.65%. Now it is somewhat more likely that the FOMC will raise the fed funds rate at its next meeting. The difference between the target fed funds rate and the implied fed funds rate is 15 bps. In general, the probability that the FOMC will change rates or not is given by the following equation:

[(**Implied Fed Funds Rate**) minus
(**Current Target Fed Funds Rate**)]

Divided by:

[(**Expected Fed Funds Rate If The Fed Hikes**) minus
(**Current Fed Funds Rate**)]

Is equal to:

The Probability that the Fed Raises Rates

(5.65 – 5.50) / (5.75 – 5.50)
=. 15 / .25
= .60

In this case, there is a 60% probability (odds) that the FOMC will raise the target fed funds rate 25 bps, and 40% probability (odds) that the FOMC will leave the target fed funds rate unchanged.

Example:
Will they raise rates 25 or 50 bps?

- February Fed Funds Futures Contract Price = 94.125
- Implied Fed Funds Rate (100 – Contract Price) = 5.875%

If the implied rate by the February Fed Funds Futures Contract is 5.875%, then what are the odds that the FOMC will raise rates 50 bps? If you answered 75%, by following the previous examples, **you would be incorrect**.

Why is this logic incorrect? In this case, the difference between the implied fed funds rate and the target fed funds rate is (5.875 – 5.50) 37.5 bps. Since this difference is more than 25 bps (the typical amount the FOMC moves the funds rate), we will assume there is 0% probability (odds) that rates remain unchanged, and 100% probability (odds) that the funds rate will rise at least 25 bps. Now the question becomes will they raise rates 25 bps to 5.75% or 50 bps to 6.00%?

As before, it is easy to see the 5.875% yield implied by the futures contract is mid way between a 25 and 50bp rate hike. So, there is a 50% probability (odds) that the FOMC will raise rates by 25 bps and a 50% probability (odds) that they raise rates by 50 bps. This is another even money bet. The following equation is used to determine the odds the fed funds futures contract is placing on these outcomes:

[**Probability of 25 bps** times
(**Current Fed Funds Target Rate** +25 bps)]

Plus:

[Probability of 50 bps times
(**Current Fed Funds Target Rate** +50 bps)]

Is equal to:

(**Implied Fed Funds Rate**)

Recall that the sum of these probabilities must equal 100%. The probability of a 25 bps move becomes "P" and a 50 bps move becomes "1-P." We restate the equation with the numbers from our example:

P(25) * 5.75 + [1- P(25)] * 6.00 = 5.875
Then
5.75P(25) + [6.00 –6P(25)] = 5.875
Then
-.25P(25) = -.125
Finally
P(25) = .50

It is certain that the FOMC will raise the fed funds rate however the market is uncertain of the magnitude of the hike. It is equally likely that the FOMC will raise the fed funds rate by 25 or 50 bps.

One Last Refinement:
The day of the month that the FOMC meets

Rarely does the FOMC meet on the first or last day of the month. Therefore, the simple average target fed funds rate for the delivery month must be calculated. Remember that for purposes of our discussion, we ignore the difference between the target and effective fed funds rate.

Assume the FOMC meets on February 4 and is expected to raise rates 25 bps to 5.75%. The *average* expected target Fed Funds rate can be determined by using the following equation:

[(**Number of Days before the FOMC meeting**
* **Current Fed Funds Rate**)

Plus

(**Number of Days after the FOMC meeting** *
Expected Fed Funds Rate if they Move)]

Divided by

Number of Days in the Month

is equal to

The Average Expected Target Fed Funds Rate

[(4*5.50) + (24 * 5.75)] / 28
= (22 + 138) / 28
=5.714

(Note that all days, not just business days, are used in this equation.)

The average target funds rate for February, when adjusted for the day of the month that the FOMC meets is 5.714. This rate should be substituted for 5.75% in the last example above. Using the same calculation, 5.929% should be substituted for 6.00% in the last example. Given the meeting day adjustment, the odds of a 25 bps change moves from 50% to 25% and the odds of 50 bps change moves from 50% to 75%. So, these meeting day adjustments can be significant.

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