



I. D. E. A.

BILL TRADING AROUND REFUNDING SETTLEMENTS

BACKGROUND: The U.S. Treasury has been arranging the quarterly refundings on a standardized basis since the mid-70's, when the entire cycle of U.S. debt issuance was "regularized" for the purpose of smoother underwriting by the primary dealer community. One highly distinctive by-product of these refundings has been a discernibly disruptive pattern in money market conditions around the time the refundings settle. On the 15th of the middle month of each quarter (or the nearest business day after the 15th if a weekend or holiday intercedes) the Treasury delivers all the securities that had previously been purchased during the refunding auction sequence earlier in the month, and accepts payment for these securities, either in maturing securities or in immediately available funds. The Treasury also makes all coupon and corpus payments due on outstanding securities payable that month, which primarily derives from obligations issued at previous quarterly refundings.

The disruption to the money markets takes place due to the heavy usage of the Fedwire. The Fedwire is the predominant method for transferring immediately available funds between financial institutions, as well as for notifying the Federal Reserve of a change in ownership in Treasury securities. Thus, on top of all the normal pressures faced by the Fedwire to process the trading of reserves between banks and the settlement of Treasury trades between private institutions, on refunding settlement days the Fedwire must also handle tens of billions of dollars additional in payments and securities transfers related to the settlement of the refunding auctions. The demand for funds to pay for these securities, as well as the fact that a large amount of reserves is delivered to the U.S. Treasury (the act of which drains reserves from the banking system), puts upward pressure on the Federal funds rate, the rate charged by banks to each other for the buying and selling of immediately available funds.

RESULTS: To see the disruption on the Fed funds market, we have isolated the daily changes in the Fed funds rate around each of the refundings, from 76:Q1 to 93:Q3 (85:Q4 excluded due to debt limit problems), in Table 1. The daily change in the effective Fed funds rate on each refunding settlement date, as well as the 3-trading day period both before and after, was identified. Median and average moves, along with standard and absolute deviation measures, were calculated for the entire period, as well as for selected sub-periods, and are presented in Table 1.

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Table 1 offers some interesting insights. Through all the different sub-periods, large surges in the median Fed funds rate are always reported on settlement days. Indeed, in the 70 quarters since 1976, only 14 have seen the funds rate actually fall on a refunding settlement day. The settlement day rise tends to wear off in the days following, although not necessarily the very next day. During the interest rate targeting procedures of the Fed in the 70's, refunding day movements were fairly restrained - during the Monetarist Experiment of the early 80's the moves were quite strong and volatile, while the return to a form of interest rate targeting during 84-93 appears to have left some lingering strength in the funds rate on settlement days. More importantly, perhaps, is the fact that relative to its volatility, the gains in the funds rate on refunding settlement days are strongest during 84-93.

For those who want to understand how to trade the money markets around these settlement day distortions, the data presented for "weekday" sub-periods help explain where the risks are. The overall period was sorted according to the day of the week on which the refunding actually settled, Monday through Friday. In every case of a Thursday or a Friday, the refunding day was the 15th and there was no holiday or weekend distortion in the days just prior. While all the settlement days that were a Wednesday were also the 15th of the month, some of the Wednesdays were Settlement Wednesdays and some were just Normal Wednesdays. A Settlement Wednesday adds to refunding pressures by colliding with the day that the nation's banking system must use the Fed funds market to square up with the reserve requirements of the Federal Reserve. As can be seen on the Table, Wednesdays that are both refunding settlement and bank settlement days have slightly higher Fed funds surges than Normal Wednesdays, but with far more volatility in their Fed funds changes.

The days worth watching, however, are Mondays and Tuesdays. Those Mondays that are coincidentally the 15th of the month are in Table 1 as Normal Mondays, while those Mondays that serve as settlement days because the 15th fell on a Saturday or Sunday are in Table 1 as Odd Mondays. Likewise, those Tuesdays that are coincidentally the 15th are labeled Normal Tuesdays, while those that are refunding settlement days as a result of a Monday holiday are labeled Odd Tuesdays. The difference between Normal Mondays and Odd Mondays is fairly sizable, and suggests the money markets do not handle the weekend-deferred settlement of the refunding very well. However, that pales in comparison to the distinction between Normal Tuesdays and Odd Tuesdays: Normal Tuesdays appear to be even quieter than Thursdays or Fridays, whereas Odd (i.e., holiday-distorted) Tuesdays have the greatest surge in settlement day Fed funds than any other "weekday" sub-period identified.

Not every anomalous movement observed for the Fed funds rate around refunding settlement dates translate over to the 3 month bill yield. The results in Table 2 replicate everything done for the Fed funds rate in Table 1. For the whole period and the major sub-periods of different Fed operating procedures, 3 month bills react similarly as the Fed funds rate does - in the interest rate targeting environment of 76-79 bill yields were quite calm, even around refunding settlements. Bill yields do rise around the settlement day, however. In the 79-83 period, refunding dates stood out from the days surrounding as a day of upward movement in a sea of downward moves, albeit with huge volatility. In the 84-93 period bill yields appear to have reacted a bit differently than the Fed funds rate did over the same period - the median daily movements around the refunding settlements barely evidence a pattern, and the overall volatility around refunding weeks is even less than it was in the "quiet" 70's! A very slight tendency to increase on refunding settlement periods is apparent, however.

As for "weekday" sub-periods, 3 month bill yields show even greater deviation from the patterns evidenced by the Fed funds rate under a similar analytical breakdown. The most striking difference is the tendency of bill yields to decline on refunding Wednesdays, regardless of whether these Wednesdays are bank-reserve settlement Wednesdays. Indeed, in weeks that contain a Wednesday that is both a refunding settlement and a reserve settlement Wednesday, the pattern appears to be the opposite of what might be expected - a bill market rally on the Wednesday, sandwiched between periods of bill market declines, with little additional volatility above other weekday sub-periods. Also unusual is the fact that bill yields appear to show their greatest tendency to rise, with significant volatility associated, on Thursdays and Fridays, the exact days that were fairly quiet for the Fed funds market when refundings settle. The only other standout feature of bills is the sharp pickup in volatility on "Odd" Mondays and "Odd" Tuesdays.

TRADING RECOMMENDATIONS: When day-trading the bill market, swings in overnight financing costs (i.e., repo rates) can be crucial, since repo rates are very close to bill yields, and large swings in repo rates can offset any expected gains in the bill trades. Since repo rates are so closely tied to the swings observed in the Fed funds rate, we can infer useful trading results from a comparison of the typical Fed funds swings vs. the typical bill yield swing around Treasury refundings. Using the data in Tables 1 and 2 we would recommend the following:

(1) *Wednesday Trading* - despite the tendency of bills to rally on "Normal" refunding Wednesday, the rise in financing costs on those days recommend against a long position in bills. A short position in bills for that day and perhaps the next, with the proceeds lent back to the inflated money market, appears viable. Due to the much higher volatility of bank-reserve settlement Wednesdays, however, this trading plan should be limited to "Normal" refunding Wednesdays, when the volatility appears to be nil.

(2) *Volatility Trading* - The volatility in the bill markets around refunding settlements appears to have a fairly consistent pattern of going from low in the 2 or 3 days before the settlement day, then rising and staying firm for 2 or 3 days after the settlement day. This would recommend buying straddles for about a one-week time horizon, starting 2 or 3 days before the refunding settlement date. The pattern is most pronounced when the refunding settlement date is a Friday, a "Normal" Wednesday, or an "Odd" Tuesday.

(3) *Monday Trading* - While the cost of funds rises when a refunding settles on a "Normal" Monday, this cost appears to drop off rather sharply in the days that follows. At the same time, bills appear to do relatively well across the whole week centered on that Monday, suggesting going long bills for a 2 or 3 day horizon just after the refunding settlement, or perhaps locking in a one-week cost of funding for a long-bill trade for the entire week. Neither trade is recommended for "Odd" Mondays, however, when the volatility of the cost of funds is prohibitively risky.

(4) *Thursday Trading* - The recommendation appears to be the same for Thursday trading as for "Normal" Monday trading - bills appear to do well for the entire week that is centered on a refunding Thursday, although the cost of funds is a bit more volatile across this week than it is across a week centered on "Normal" Mondays. Sharp drops in the cost of funding for all three days following the refunding Thursday recommends strongly a 3-day long trade in bills.

I. D. E. A. TABLE 1: Daily Fed Funds Changes Around Refunding Settlement Days

Period	Measure	Days Prior to Settlement			Settle	Days After Settlement		
		-3	-2	-1	0	1	2	3
Overall	Median	-4	4	0	15	-12	-8	-2
	Average	-3	3	4	17	-11	-5	-5
	Ave Dev.	15	20	21	22	28	26	22
	Std. Dev.	27	39	35	37	50	45	39
1976 to 79	Median	-5	4	1	4	-7	2	5
	Average	-2	10	2	0	-11	8	3
	Ave Dev.	8	11	5	11	19	17	8
	Std. Dev.	10	16	7	16	29	26	12
1979 to 1983	Median	-1	8	-3	21	3	-14	-8
	Average	-3	-8	3	34	10	-26	-6
	Ave Dev.	33	46	45	39	60	46	45
	Std. Dev.	51	73	61	58	90	67	67
1984 to 1993	Median	-4	2	0	16	-19	-8	-4
	Average	-4	6	5	16	-21	0	-8
	Ave Dev.	9	14	16	18	16	22	16
	Std. Dev.	13	21	25	28	24	35	27
"Normal" Mondays	Median	-8	14	-1	12	-16	-12	8
	Average	-6	17	-1	14	-12	-8	6
	Ave Dev.	7	13	3	7	8	10	6
	Std. Dev.	8	15	5	9	11	13	9
"Odd" Mondays	Median	0	2	-3	25	-17	-7	-1
	Average	-2	1	-10	34	0	-12	-3
	Ave Dev.	25	19	18	26	30	32	24
	Std. Dev.	47	35	22	49	48	47	38
"Normal" Tuesdays	Median	-6	0	3	3	-15	0	-1
	Average	-5	-5	7	0	-30	18	-13
	Ave Dev.	9	9	13	13	41	36	20
	Std. Dev.	12	14	24	20	48	43	29
"Odd" Tuesdays	Median	-5	10	3	42	-42	-10	-11
	Average	-4	-13	22	46	-66	9	-30
	Ave Dev.	14	57	37	23	48	37	32
	Std. Dev.	18	95	54	28	61	47	40
"Normal" Wednesdays	Median	-5	11	-9	14	7	-24	-12
	Average	-2	9	-8	13	6	-17	-12
	Ave Dev.	8	7	5	2	7	9	9
	Std. Dev.	11	10	7	2	11	12	14
Settlement Wednesdays	Median	-5	11	0	16	-9	-8	7
	Average	-1	8	1	12	-5	-6	9
	Ave Dev.	7	8	12	13	13	3	5
	Std. Dev.	9	9	16	20	17	4	8
Thursdays	Median	-1	12	0	6	-20	-2	-17
	Average	0	13	8	0	-14	-9	-18
	Ave Dev.	10	14	40	36	11	14	19
	Std. Dev.	14	20	60	51	17	19	26
Fridays	Median	-12	-2	13	3	4	-8	-4
	Average	-6	6	16	1	30	-16	20
	Ave Dev.	21	32	29	17	44	48	46
	Std. Dev.	32	39	41	23	67	85	70

I. D. E. A. **TABLE 2: Daily 3Mth Bill Changes Around Refunding Settlement Days**

Period	Measure	Days Prior to Settlement			Settle	Days After Settlement		
		-3	-2	-1	0	1	2	3
Overall	Median	-1	-1	0	1	0	-2	0
	Average	-1	-3	0	3	0	-4	-2
	Ave Dev.	7	7	6	10	9	9	9
	Std. Dev.	12	12	9	18	17	15	14
1976 to 79	Median	1	-2	1	1	1	-2	5
	Average	0	-4	1	0	4	-3	4
	Ave Dev.	6	4	2	5	6	4	7
	Std. Dev.	10	8	3	9	8	6	9
1979 to 1983	Median	-4	-3	-3	1	-2	-5	-7
	Average	0	-7	-1	7	0	-11	-12
	Ave Dev.	17	15	12	26	22	21	18
	Std. Dev.	22	22	15	35	33	29	24
1984 to 1993	Median	-1	0	0	1	0	-2	0
	Average	-2	0	0	1	-1	-1	0
	Ave Dev.	3	4	5	5	5	4	5
	Std. Dev.	4	6	7	7	8	6	7
"Normal" Mondays	Median	2	-1	0	-2	0	-4	-1
	Average	0	-1	-1	0	3	-4	0
	Ave Dev.	5	5	7	6	6	3	5
	Std. Dev.	6	7	12	8	7	4	7
"Odd" Mondays	Median	-1	-1	0	1	0	-2	0
	Average	1	-5	2	3	-6	-7	-3
	Ave Dev.	8	13	7	13	12	9	12
	Std. Dev.	14	21	10	26	19	15	19
"Normal" Tuesdays	Median	-1	-2	1	2	-1	-2	3
	Average	-2	1	3	5	-3	-2	3
	Ave Dev.	5	6	5	5	8	3	5
	Std. Dev.	7	8	6	7	15	4	7
"Odd" Tuesdays	Median	1	-2	1	1	-1	-4	-5
	Average	3	-1	0	2	-3	-19	-9
	Ave Dev.	5	4	5	11	6	23	11
	Std. Dev.	8	7	6	20	8	30	15
"Normal" Wednesdays	Median	-1	0	1	-7	1	-1	-1
	Average	2	0	-3	-7	-1	0	-3
	Ave Dev.	4	1	5	6	4	2	7
	Std. Dev.	5	2	7	10	5	3	10
Settlement Wednesdays	Median	0	1	2	-2	1	2	5
	Average	-4	-3	-1	-5	2	0	5
	Ave Dev.	8	7	5	8	5	7	7
	Std. Dev.	12	11	7	11	7	10	10
Thursdays	Median	-4	-2	0	2	-1	2	-1
	Average	-8	-4	-2	5	5	0	-7
	Ave Dev.	11	9	5	12	12	7	12
	Std. Dev.	16	12	7	19	17	10	20
Fridays	Median	-2	-3	-1	1	2	-5	-2
	Average	1	-2	-3	8	9	4	1
	Ave Dev.	10	4	9	14	22	13	7
	Std. Dev.	15	5	14	21	30	17	9