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Work in progress
(comments welcome)

THE REPO MARKET AND TREASURY SECURITY PRICING

The market for repurchase agreements exists to facilitate the trading of Treasury and other fixed-income securities, by providing investment dealers a market through which they can obtain collateralized financing and short sellers with a market through which they can obtain as collateral the securities needed to fulfill their delivery obligations. In a repo transaction, a dealer sells securities to an investor and simultaneously agrees to repurchase them at a higher price on a specified future date. The interest rate corresponding to the difference between the sale price and the repurchase price is called the repo rate. In a reverse repo agreement, on the other hand, the dealer buys the securities and agrees to resell them at an agreed upon price on a specified future date. Dealers use these reverse repo agreements to establish short positions[1]. The following formula can be used to calculate the forward price (including accrued interest) for a repo trade that settles *n* days hence:

$$\text{Forward price} = b*(1 + r*n/360)$$

where *b* is the security's starting price (including accrued interest) and *r* is the repo rate[2].

Although most securities can be financed in the repo market at "general collateral" rates that typically trade close to Fed funds rates, market conditions sometimes allow owners of certain issues to finance their securities at "special" rates. Short sellers are often willing to provide financing at special rates in exchange for issue-specific collateral that can be used to cover their shorts. Depending upon the extent to which the demand for a particular security exceeds the supply thereof, special rates trade below general collateral rates, and can even trade down to zero percent in a "squeeze".[3]

On-the-run issues usually trade with more specialness than do off-the-runs. A Treasury security goes on-the-run in the repo market on its issue date and remains so until the issue date of the next Treasury security with the same original maturity. An on-the-run tends to become increasingly special after its issue date (as "final demand" and non-leveraged investors reduce the proportion of the issue available to the repo market[4]) and it tends to peak on the announcement date of the next issue (on dealer short selling aimed at hedging positions that they accumulate in the when-issued security) but declines rapidly thereafter (as activity switches to the more liquid new issue) Also, for a typical three- or ten-year quarterly cycle issue, there tends to be a secondary peak as it passes through quarter end, reflecting the tendency of general collateral rates to rise at the end of quarters. In addition, the average level of specialness throughout a typical issuance cycle tends to be lower for re-opened issues, although the time pattern is the same[5]. Figure 1 profiles five-year note specialness so far in 1997, clearly showing a peak when the next five-year issue is announced about halfway through the monthly issuance cycle.

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1 Shorted securities must be borrowed through reverse repo agreements, under which the short seller has to borrow the security using the proceeds of the sale, on which he earns a negotiable rate, as collateral. This rate will likely be below the general collateral repo rate, depending upon the scarcity of the security. In addition, non-dealer short sellers have to pay the dealer's financing desk a spread of as much as 50 bps.

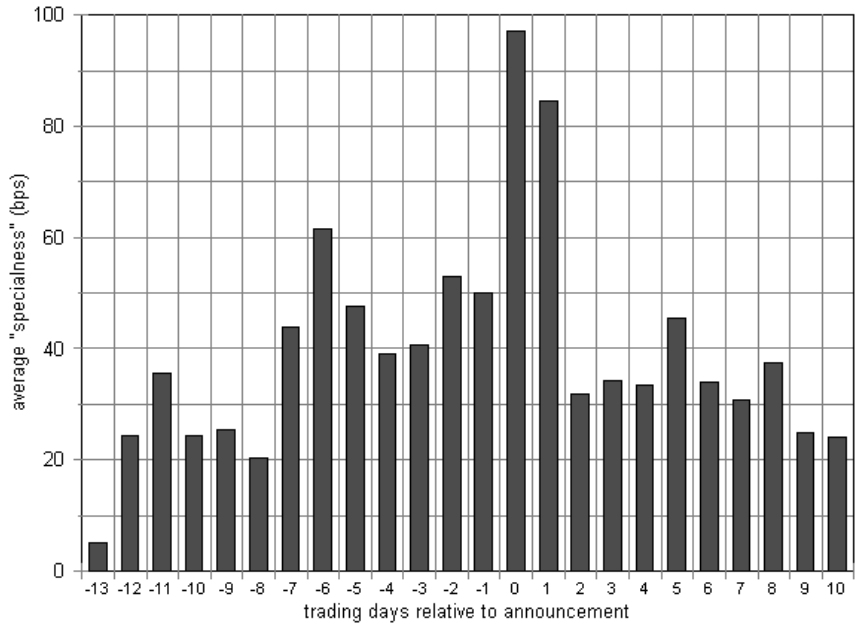
2 This analysis ignores haircuts, since they "are often not required on short maturity instruments [like Treasury bills], or after a good business relationship has been established between the parties" (D.Duffie,"Special repo rates", Journal of Finance, June 1996, p.501).

3 D.Duffie (*op. cit.*, p504) discusses the relationship between "fail" penalties and sub-zero special repo rates. He also proves that the general collateral rate represents an upper bound on special rates (p.503).

4 D.Duffie (*op. cit.*, p.507) characterizes some of the types of investors and activities that tend to reduce collateral supply.

5 See F.Keane, “Repo rate patterns for new Treasury notes”, FRB of NY Current Issues, September 1996, and M.Fisher and C.Gilles, The term structure of repo spreads, unpublished FRB Board of Governors Working Paper, July 5, 1996.

Figure 1: Average five-year note specialness (Jan/97 to April/97)



Specialness tends to increase the prices of the underlying security by the present value of the borrowing cost savings associated with the lower repo rate:

*Dollar value = ((b*n*(r - x))/360)/(1 + r*n/360)*

where *r* is the general collateral *n* - day repo rate, *x* is the *n* - day special term repo rate. Basically, the formula calculates the value (at the end of the n-day term) of being able to borrow funds at the special rate and invest them at the general collateral rate, discounted back to the start date. The yield decrement associated with specialness can be approximated with the following formula:

Yield value = (n/d)(r - x)/365

where *d* is the modified duration of the security[6].

For example, on May 5, 1997 the then current ten-year Treasury (the 6.25% notes due February 15, 2007) were trading at a price of 96.859375% of par to yield 6.691%. With general collateral two-week term repo trading at 5.45%, the special 13-day rate on these ten-year notes was 3.65%. With accrued interest, the gross price (b) was 98.223325% of par, indicating that the dollar value of the special rate was 0.063720% of par, which works out to 0.9 basis points of yield:

*Dollar value = ((98.223325*13*(5.45% - 3.65%))/360)/(1 + 5.45%*13/360) = 0.063720*
Yield value = (13/7.084)(5.45% - 3.65%)/365 = 0.9 basis points

It is noteworthy that the February 2005 notes were yielding about three basis points less than the old ten-year Treasuries (the 6.50% notes due October 15, 2006). The other two basis points of the yield differential may have related to the newer note's liquidity and expectations of further specialness beyond the 13 days.

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6 See A.Ilmanen, R.McAdie, C.Feng and J.Showers, Financing advantage and relative value tools, Salomon Brothers mimeo, September 17, 1996.

These magnitudes of yield differentials beg an assessment of the tradeoff between financing current Treasuries at special rates versus holding slightly older issues at general collateral repo rates. Salomon Brothers' research suggests that, at least for the ten-year note, the total return from holding current issues and lending them out at special rates exceeds the total return from holding the previous issue[7].

7 See J.Showers, Bond Market Weekly Roundup, Salomon Brothers, March 7, 1997. I'm also looking forward to seeing some fairly rigorous research from Susan and Bradford Jordan ("Special repo rates: an empirical analysis", Journal of Finance (forthcoming), and "Special repo rates and the relative pricing of US Treasury securities", presented at the March 1996 annual meeting of the Midwest Finance Association).