
What's behind the liquidity spread? On-the-run and off-the-run US Treasuries in autumn 1998¹

Autumn 1998 witnessed the Russian sovereign default and the near collapse of the hedge fund Long-Term Capital Management. These two events were part of a generalised flight to liquidity that affected markets worldwide. In an in-depth analysis of the unique market events of that time, the Johnson Report identified ways in which market strains were exacerbated during the period.² In particular, various yield spreads widened, including spreads between off-the-run and on-the-run Treasuries. Although movements in the so-called liquidity spread have attracted much attention as a way to track shifts in market liquidity, there has been little careful analysis of the trading activity that lay behind the dramatic movements of 1998.

In this special feature, we find that trading activity in off-the-run Treasuries actually increased during autumn 1998, a fact that would appear to contradict the evidence derived from liquidity spreads, which seemed to indicate reduced liquidity for these securities. We then examine trading activity more closely by focusing on only the most recently off-the-run security and by accounting for anticipated factors that affect trading, including the auction cycle, announcement events and days of the week. Once these factors are isolated, we do find evidence that there was a marked shift in trading away from the off-the-run issue. We then examine the impact of trades on price movements in both the on-the-run and first off-the-run five-year note. We find that the impact of trades on both securities became stronger during autumn 1998, an indication of reduced liquidity for both securities. The increase in the price impact, however, was more pronounced for the off-the-run note. During this period of stress, the impact of trades on the price of the off-the-run note strengthened tenfold while that on the on-the-run note only doubled.

¹ The views expressed in this article are those of the authors and do not necessarily reflect those of the Bank for International Settlements. Anna Cobau provided expert statistical help.

² See CGFS (1999). Upper (2001) documents similar phenomena in the German market. Borio (2000) explores related issues, particularly the role of cash constraints and counterparty risks in exacerbating these strains.

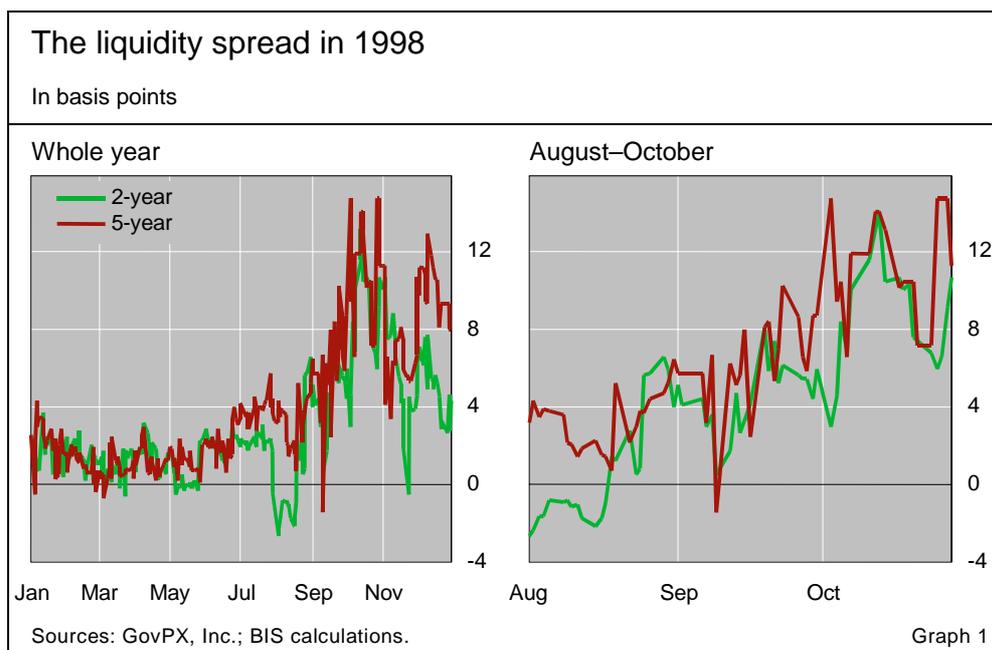
Movement of the liquidity spread in 1998

We rely on trade by trade data from the inter-dealer market for US Treasury securities. These data come from GovPX, Inc., a joint venture of the primary US dealers and inter-dealer brokers, and contain information on each quote, purchase and sale in the US Treasury market that was transacted through any of five of the leading six inter-dealer brokers in the market. The data identify by CUSIP number the particular security of a given original maturity that is currently “on-the-run”, ie the most recently issued security of a given original maturity. All other securities of the same original maturity are collectively defined to be “off-the-run” regardless of actual remaining time to maturity.

To construct our measure of the liquidity spread, we calculate the daily average transaction yield of the on-the-run security and subtract this from the similarly constructed yield of the first off-the-run security, ie the yield on the most recently on-the-run.³ Thus, for a security with a quarterly auction cycle, the difference in remaining maturities between the two instruments is three months.⁴ The left-hand panel of Graph 1 indicates the movement of this spread for the two- and five-year notes in 1998,⁵ as well as illustrating many features

The liquidity spread subtracts the on-the-run yield ...

... from the first off-the-run yield

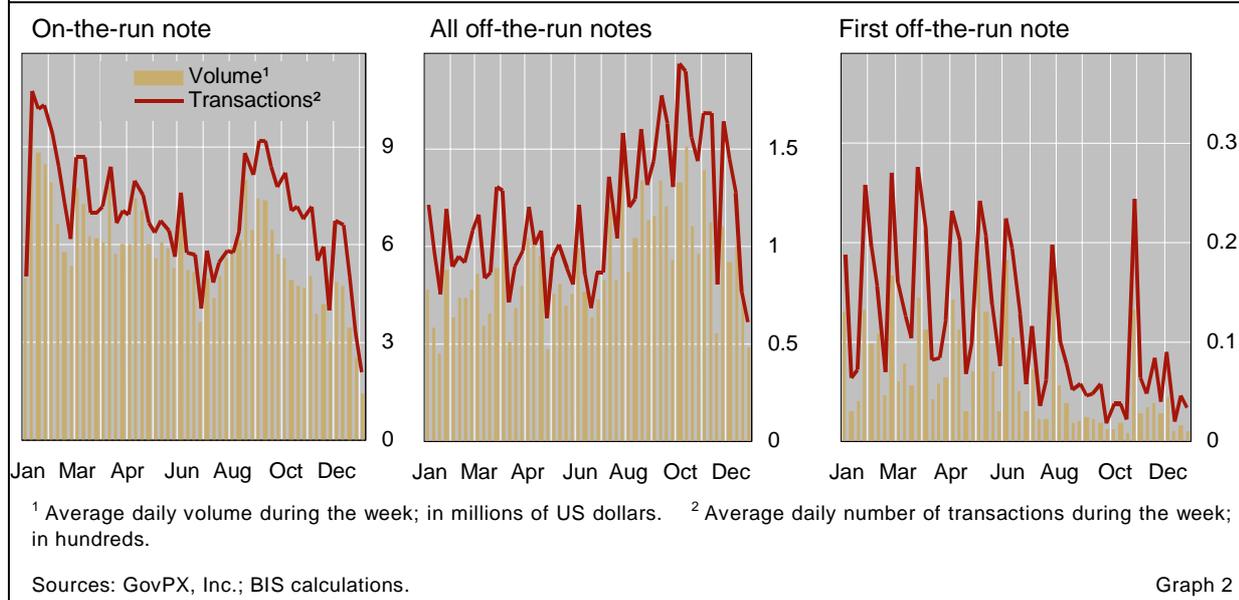


³ Note that this is slightly different from the way Reinhart and Sack (2002) calculate their “liquidity preference factor”. Their “off-the-run Treasury yield” is the par yield from a curve fitted to the prices of off-the-run notes and bonds and some coupon strips (see page 41, including footnote 3, in this *Review*), while our off-the-run yield is the yield on a specific security. While they focus on the 10-year maturity, we focus on the two-year and five-year maturities, for which we have better high-frequency data.

⁴ If there is a term premium for the slight difference in maturity, our calculated liquidity spread will be smaller than otherwise, but this should not affect our analysis of *movements* in this spread.

⁵ For the remainder of the feature, we use the five-year note as illustration, but similar qualitative findings were obtained for the two-year note. The off-the-run 10-year note was not sufficiently traded in GovPX to allow us to conduct an analysis at this maturity.

Trading of five-year notes in 1998



The spread widened to 15 basis points in October 1998

of the liquidity spread that have been documented extensively elsewhere. In particular, the spreads for both maturities were narrow throughout the first half of 1998, only rarely exceeding 4 basis points in magnitude. Beginning in August, however, the spread began to widen, reaching 15 basis points for the five-year note in October. Remarkably, the spread often *widened* by more in a single day than the level of the spread had been earlier in the year. On 27 October alone, for example, the liquidity spread widened by nearly 8 basis points.

Treasury market activity during 1998

Trading volume is often used as a proxy for market liquidity. To the extent that volume serves this purpose, one might have expected the US Treasury market to witness a decline in trading activity, at least for off-the-run issues, during the flight to liquidity in autumn 1998. The on-the-run issue, however, is often thought of as the instrument of choice during liquidity crises. In this case, it is to be expected that flights to liquidity would be associated with an increase in on-the-run trading.

Trading in on-the-run securities rose during the crisis ...

Trading intensity did increase dramatically for the on-the-run security during the crisis period. As indicated by the left-hand panel of Graph 2, the five-year on-the-run Treasury averaged 758 transactions per day during New York business hours during the first half of 1998. This was at a time when the Treasury market was experiencing a general decline in trading activity, as witnessed by a discernible downward trend in activity over the year as a whole. By June 1998, the same security averaged only 622 transactions a day. During the crisis period, however, trading in on-the-run Treasuries intensified. The five-year note averaged 715 daily transactions between 1 August and 30 November. Focusing on the period from the Russian default announcement on 17 August to the Federal Reserve's surprise inter-meeting cut in the target

federal funds rate on 15 October, trading intensity of the five-year on-the-run Treasury was even higher, averaging 826 daily transactions during business hours. Furfine and Remolona (2002) have documented similar patterns for on-the-run Treasuries of other maturities.

What is perhaps surprising is that trading in off-the-run Treasury securities also appears to have risen during the crisis period. From the middle panel of Graph 2, it is hard to discern a decline in the volume of trading activity across all off-the-run five-year Treasuries during the first half of the year. What is more apparent is that off-the-run trading was far less intense between January and June, averaging only about 100 transactions per day, than later in the year. In fact, trading activity in off-the-run five-year Treasuries increased to 150 transactions a day between the Russian default and the surprise interest rate cut by the US Federal Reserve. We are unable to account for this pattern, in part because the data cover all the off-the-run five-year notes regardless of remaining maturity.

... and so did trading in off-the-run securities

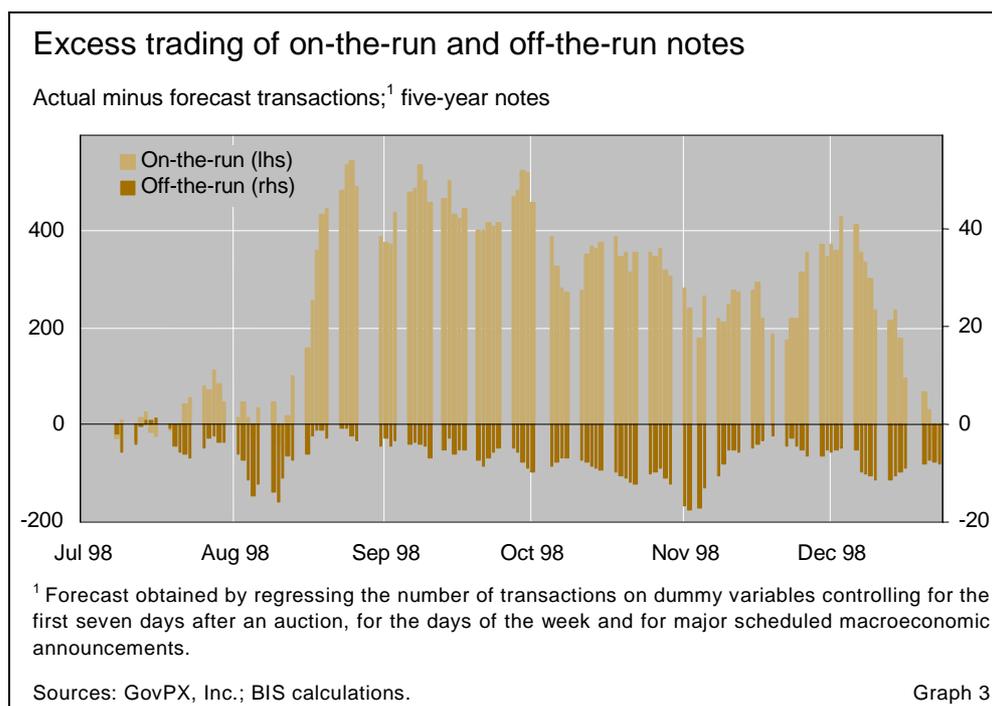
A shift in trading?

To make the analysis of trading patterns more tractable, we now focus only on the trading patterns of the individual securities that we used to determine the liquidity spread. The right-hand panel of Graph 2 details the daily trading activity in the first off-the-run security, which is the one used in calculating the spread. It is evident that for a given off-the-run security there are sharp spikes in activity. These spikes appear to be related to the auction cycle, and the five-year note changed from a monthly issuing cycle to a quarterly cycle in August 1998. Trading activity in the first off-the-run security is at its highest on the day of the auction for the next on-the-run security of that maturity. This may be because dealers wait for auction information before they sell the latest off-the-run to make room for the new on-the-run. This issuance-related trading activity is also discernible for the on-the-run security shown in the left-hand panel of Graph 2, but is less apparent because trading in the on-the-run security is active during the entire period for which the security is on-the-run. Note that there is no apparent issuance-related movement in the liquidity spread. That is, market participants understand that when a new five-year security is issued, the trading in the previously issued security will fall rapidly over a few days, but prices will adjust immediately.

The auction cycle produces spikes in trading ...

To facilitate an analysis of shifts in market activity related to the crisis in 1998, we first try to account for the issuance-related movements in trading activity, particularly for the security that has just become off-the-run. For both the on-the-run and most recent off-the-run security, we fit a regression model to explain trading activity during the first half of 1998. The dependent variable in the regression is the number of transactions for the given security on the given day. To control for the auction cycle, we employ dummy variables for each of the first seven trading days after the auction. We find no significant auction cycle effects beyond the seventh day. We further add dummy variables

... so we adjust for these



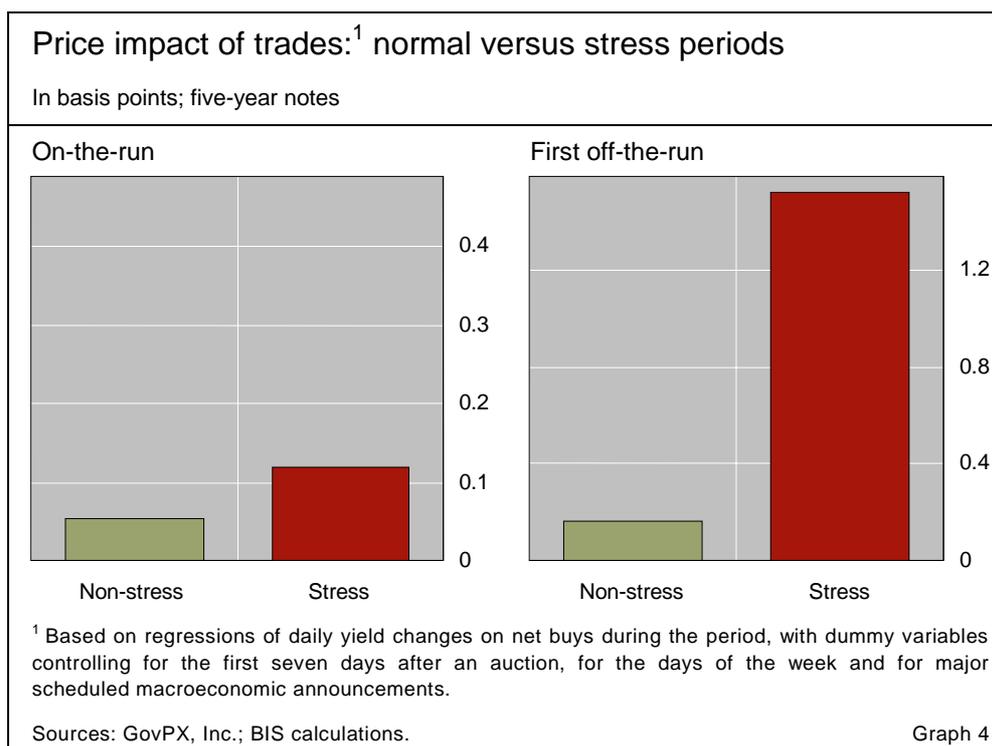
for days of scheduled announcements of major economic news.⁶ Finally, we similarly control for day-of-the-week effects and a potential time trend.

Once we control for the issuance cycle and other anticipated events, it becomes apparent that trading activity did indeed shift from off-the-run to on-the-run Treasury securities during the crisis period of autumn 1998. With the regression estimated on data for the first half of 1998, we forecast Treasury market trading for both the on-the-run and the first off-the-run five-year notes for the latter half of the year. Graph 3 plots the residuals from these regressions, which we call the “excess” trading volume. The small values of the residuals for the on-the-run note indicate that trading volume in this security was close to what would have been expected from July until early August. Beginning in mid-August, trading volume in the on-the-run five-year Treasury note increased far beyond what would have been expected. At times, more than 500 “excess” transactions occurred for the on-the-run note. By contrast, the residuals from the transaction forecast of the off-the-run security are almost exclusively negative, indicating that, relative to what one would have predicted, trading in off-the-run Treasury notes was lower during the latter half of 1998. Thus, there does seem to be some evidence that market participants increasingly wanted to trade the on-the-run Treasury issues during the crisis period of autumn 1998.

A shift in trading is apparent ...

... with less activity in the off-the-run note

⁶ The announcements considered were employment, CPI, PPI, retail sales and NAPM (now known as the ISM survey). Fleming and Remolona (1999a) and Furfine (2001) find these to be the major announcements, while Fleming and Remolona (1999b) find elevated trading in the market on these announcement days.



The price impact of trades

A further measure of liquidity is the impact of trades on prices. While in general purchases would tend to raise prices and sales lower prices, we should find these price effects to be weak in a liquid market. In the case of the US Treasury market, off-the-run securities are considered much less liquid than on-the-run securities and the price impact of trades should be stronger for the former than for the latter. The question we ask here is: what happened to these effects during the crisis period of autumn 1998?

The price impact of trades measures liquidity inversely

To assess liquidity during the crisis period, we compare daily changes in the yields of the on-the-run five-year US Treasury note with the corresponding daily yield changes of the first off-the-run five-year note. Specifically, we regress these yield changes on the “net buys” during the trading day for corresponding securities while controlling for macroeconomic announcements, days of the week and the auction cycle. The “net buy” variable is the number of buyer-initiated trades (or “takes”) minus the number of seller-initiated trades (or “hits”) for a given trading day. This variable is analogous to the direction-of-trade variable that Hasbrouck (1991) introduced, a variable that has become standard in the literature. We account for the effect of the crisis by interacting a dummy variable with the “net buy” variable, where the dummy variable defines the crisis period as 17 August to 15 October 1998.

Our results indicate a significant decline in liquidity during the crisis period for both securities. Moreover, the decline in liquidity is proportionately greater for the off-the-run note than for the on-the-run note. In Graph 4, the left-hand panel compares the price impact of trades on the on-the-run note during normal trading days with that on stress days, where stress days are those during the crisis period. The impact is shown to more than double during stress

The crisis makes that impact stronger ...

... but especially for the off-the-run note

days, a result that suggests that liquidity declined even for a security that is supposed to have been favoured by the flight to liquidity. The right-hand panel shows a similar comparison for the off-the-run note. When comparing the green bars in the two panels, and taking account of the different scales, the impact is stronger for the off-the-run note, confirming the relatively poor liquidity for this security. The crisis served to make the impact of trades on the price of this security nearly 10 times stronger, indicating a loss in liquidity for the off-the-run note that was much greater than for the on-the-run note. Hence, while the widening of the yield spread reflected a loss of liquidity in the off-the-run note *relative* to that of the on-the-run note, it also seems that liquidity in *both* securities declined.⁷

Conclusion

In this special feature, we reconcile the evidence on yield spreads between off-the-run and on-the-run Treasury securities, on their trading activity and on the price impact of trades during the crisis period of autumn 1998. While the widening of spreads during the period suggested a shift in liquidity from off-the-run to on-the-run securities, we find that in fact trading activity in both types of securities increased. However, by focusing on only the first off-the-run security and by accounting for anticipated factors that would affect trading – notably the auction cycle – we do find that there was a marked shift in trading activity towards the on-the-run issues. By examining the impact of trades on price movements in both the on-the-run and first off-the-run five-year notes, we find in common a stronger price impact during autumn 1998, indicating that liquidity declined in both securities. The increase in the price impact, however, was more pronounced for the off-the-run note. Hence, the widening of the spread indicated not an absolute shift in liquidity from off-the-run to on-the-run Treasury securities but an overall loss of liquidity in both securities, with the off-the-run security being particularly affected.

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⁷ Note that liquidity is defined differently here from Reinhart and Sack (2002). To them, the “liquidity preference factor” refers to the strength of demand for *holding* the on-the-run security, while we define liquidity in terms of the ease of trading.

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