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Intraday periodicity, long memory volatility, and macroeconomic announcement effects in the US Treasury bond market

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Abstract

In this paper, we provide a detailed characterization of the return volatility in US Treasury bond futures contracts using a sample of 5-min returns from 1994 to 1997. We find that public information in the form of regularly scheduled macroeconomic announcements is an important source of volatility at the intraday level. Among the various announcements, we identify the Humphrey–Hawkins testimony, the employment report, the producer price index (PPI), the employment cost, retail sales, and the NAPM survey as having the greatest impact. Our analysis also uncovers striking long-memory volatility dependencies in the fixed income market, a finding with important implications for the pricing of long-term options and other related instruments.

JEL classification: C14; C22; G14

Keywords: Treasury bonds; High-frequency data; Macroeconomic news announcements; Intraday volatility patterns; Long-memory volatility

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1. Introduction

The US Treasury bond market is one of the largest and most active financial markets in the world. Unlike the stock and corporate bond markets, most of the information of direct relevance for the Treasury bond market are likely related to macroeconomic news. There appears to be little, if any, asset-specific information concerning Treasury bonds. Consistent with this view, a number of prior studies have documented a significant bond market impact from numerous macroeconomic announcements.[1] Meanwhile, the recent availability of high-frequency data has dramatically increased the power to identify and estimate such announcement effects.

In particular, Ederington and Lee (1993) examine the impact of monthly economic announcements on 5-min Treasury bond futures returns and find that the return volatility is much higher between 0830 and 0835 Eastern Standard Time (EST) than during any other 5-min trading period. Similarly, Fleming and Remolona (1997, 1999) report significant announcement effects in the return volatility, bid–ask spread, and trading activity of the 5-year US Treasury note. In a closely related context, Balduzzi et al. (1999) study the impact of macroeconomic announcements on the price, trading volume, bid–ask spread, and volatility of both short- and long-term US interest rate instruments.

Most of these earlier studies simply regress the absolute value of the change in log prices on announcement dummies, sometimes augmented with an additional set of dummy variables to control for intraday patterns in the price volatility. Although this approach has been quite successful in identifying the announcements with the greatest impact, it does not account for the complex volatility dynamics that exists at the low interdaily and high intradaily frequencies. However, the time-of-the-day patterns (intraday calendar effects), macroeconomic announcements (public information effects), and the well-documented interday volatility persistence (ARCH effects) all constitute an integral part of the overall volatility process, and should therefore be accounted for simultaneously, or distorted estimates for any one of the individual components may arise.

Building on the methodology in Andersen and Bollerslev (1997a,b, 1998), this paper offers a comprehensive study of the intraday patterns in the volatility for the US Treasury bond futures contracts that explicitly incorporate all the different volatility components in a coherent framework. Our analysis is based on a 4-year sample of 5-min returns from 1994 to 1997. Our main findings are as follows. First, there exist two spikes in the intraday volatility at 0830 and 1000 EST, respectively, corresponding to the regularly scheduled macroeconomic announcements in the US at these times. There is also an overall U-shaped pattern in the

[1] Fleming and Remolona (1997) provide a summary of the earlier literature.