Journal of Financial Markets 25 (2015) 33–51

Contents lists available at ScienceDirect

Journal of Financial Markets

journal homepage: www.elsevier.com/locate/finmar

Equity volatility as a determinant of future term-structure volatility ☆

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ARTICLE INFO

Article history:
Received 28 September 2013
Received in revised form
8 May 2015
Accepted 13 May 2015
Available online 22 May 2015

JEL classification:
G12
G14

Keywords:
Equity risk
Term structure
Bond volatility

ABSTRACT

We show that equity volatility serves as a determinant of future Treasury term-structure volatility over the recent October 1997 to June 2013 period. We find that equity volatility contains incrementally reliable information for the subsequent volatility of: (1) 10-year and 30-year bond futures returns, (2) the term-structure's level, and (3) the term-structure's slope. We present additional evidence that suggests a flight-to-quality/flight-from-quality pricing avenue is a likely contributor to the volatility linkages, where time-varying economic uncertainty can generate both a large positive serial correlation in stock volatility and a time-variation in the precautionary savings motive and diversification benefits of holding bonds.

1. Introduction

Understanding term-structure volatility is a fundamental issue in financial economics with both theoretical and practical importance. In this paper, we show that realized equity volatility can serve as an important determinant of future term-structure volatility. By term-structure volatility, we refer to

☆ We thank Andrew Lim and seminar participants at the 2013 Financial Management Association meetings, the 2013 Midwest Finance Association meetings, and the 2013 Missouri Economics Conference for helpful comments. We also gratefully acknowledge an anonymous referee who provided thoughtful comments that improved the paper.

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http://dx.doi.org/10.1016/j.finmar.2015.05.002
1386-4181/

the volatility of Treasury bond futures returns, and the volatility of both the level and slope of the Treasury term-structure. By determinant, we refer to an intertemporal relation between the lagged realized equity volatility and the subsequent bond-market volatility that holds in a multivariate framework, when also controlling for the past term-structure volatility and other term-structure state variables.

Researchers have offered both theory and empirical evidence that suggest important linkages between equity risk and the Treasury bond market. For example, Bekaert, Engstrom, and Xing (2009) find that higher economic uncertainty can lead to both higher equity volatility and an increased motive for precautionary savings that can depress interest rates. Fleming, Kirby, and Ostdiek (1998) and Kodres and Pritsker (2002) suggest cross-asset-class effects tied to hedging and portfolio rebalancing. Pricing effects linking the stock and bond markets have been attributed to flight-to-quality/flight-from-quality (FTQ/FFQ), where some investors (presumably) switch between riskier stocks and safer Treasuries as risk perceptions change (Connolly, Stivers, and Sun, 2005, 2007; Underwood, 2009; Baele, Bekaert, and Inghelbrecht, 2010; BenRaphael, Kandel, and Wohl, 2012; Jubinski and Lipton, 2012; Bansal, Connolly, and Stivers, 2014).[3] Chordia, Sarkar, and Subrahmanyam (2005) find that innovations to stock volatility forecast an increase in bond bid–ask spreads.

Why might the realized equity volatility contain important incremental information for the *subsequent* bond volatility? First, consider a FTQ/FFQ avenue, as motivated by the literature cited above. With linkages between the economic state and stock volatility, a higher stock volatility this month is likely to be associated both with more extreme stock price movements over the next month (volatility clustering), and with higher economic uncertainty and volatility in that uncertainty (stock volatility tending to be higher in stressful economic times with greater economic-state uncertainty). If a higher stock-return volatility and a higher time series variability in economic uncertainty are likely following months with a high realized stock volatility, then the likelihood of FTQ/FFQ pricing influences over the subsequent month is presumably much greater.[4] Second, the return volatility of both equities and bonds may be responding to some omitted factor or news that bears on the volatility of each asset class, in the sense of Fama and French (1993). If there is volatility clustering in that common factor, then equity volatility may be providing an additional signal about the underlying volatility environment for subsequent bond returns.[5]

Our empirical investigation is also motivated by Andersen and Benzoni's (2010) findings. Under standard affine term structure models, they note that the instantaneous yield volatility should be spanned by the cross-section of yields. They find evidence inconsistent with this prediction and conclude that "a broad class of affine diffusive, quadratic Gaussian, and affine jump-diffusive models cannot accommodate the observed yield volatility dynamics," (p. 603). Their findings suggest that factors outside the bond market are likely to be important for understanding yield volatility. In this paper, we examine the role of equity volatility as one potential factor.

We focus on the October 1997 to June 2013 period since the literature indicates a clear change in the joint distribution of stock and bond returns around October 1997. Fig. 1 in Baele, Bekaert, and Inghelbrecht (2010, p. 2376) depicts the shift in the stock-bond correlation from sizably positive to predominantly negative in the latter part of 1997. Bansal, Connolly, and Stivers (2014) argue that the equity-risk dynamics and flight-to-quality pricing influences may be particularly important for understanding bond market dynamics over the post-1997 period since this period features a predominantly negative stock-bond-return correlation, a low inflation-risk environment, and several episodes of high and volatile equity risk. We also briefly examine an earlier period in the mid-1990's

[3] Some authors use the phrase flight-to-safety, rather than flight-to-quality. For the purposes of our study, we consider these terms as interchangeable.

[4] We focus on volatility measures over the monthly horizon, but also evaluate the quarterly horizon.

[5] See Fleming, Kirby, and Ostdiek (1998), for an alternate discussion on the intuition behind these two avenues for a stock-bond volatility linkage. In their model, "two distinct sources of linkages arise. One is common information, such as news about inflation, which simultaneously affects investor expectations in multiple markets. The second source is due to cross-market hedging. When information alters expectations in one market, traders adjust their holdings across markets, producing an information spillover," (p. 135). In our view, their cross-market hedging and our FTQ/FFQ capture a similar perspective and their common information is similar to our "omitted common factor" perspective.