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journal homepage: www.elsevier.com/locate/jfecLiquidity risk of corporate bond returns:
conditional approach[☆]Viral V. Acharya^{a,c,d,e}, Yakov Amihud^a, Sreedhar T. Bharath^{b,*}^a Stern School of Business, New York University, 44 West 4th St., New York, NY 10012, United States^b W.P. Carey School of Business, Arizona State University, 325 E. Lemon Street, Tempe, AZ 85287, United States^c NBER, United States^d CEPR, United Kingdom^e ECGI, Belgium

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ABSTRACT

We study the exposure of the US corporate bond returns to liquidity shocks of stocks and Treasury bonds over the period 1973–2007 in a regime-switching model. In one regime, liquidity shocks have mostly insignificant effects on bond prices, whereas in another regime, a rise in illiquidity produces significant but conflicting effects: Prices of investment-grade bonds rise while prices of speculative-grade (junk) bonds fall substantially (relative to the market). Relating the probability of these regimes to macroeconomic conditions we find that the second regime can be predicted by economic conditions that are characterized as “stress.” These effects, which are robust to controlling for other systematic risks (term and default), suggest the existence of time-varying liquidity risk of corporate bond returns *conditional* on episodes of flight to liquidity. Our model can predict the out-of-sample bond returns for the stress years 2008–2009. We find a similar pattern for stocks classified by high or low book-to-market ratio, where again, liquidity shocks play a special role in periods characterized by adverse economic conditions.

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1. Introduction

This paper shows that the pricing of liquidity risk in the bond market is *conditional* on the state of the economy, with liquidity risk becoming more important in times of financial and economic distress. Using a regime-switching model, we find a significant (absolute) increase in the exposure (“beta”) of corporate bond returns to liquidity shocks in stocks and Treasury bonds, after controlling for term and default risks. We provide an econometric time-series model that predicts the likelihood of regime in which liquidity matters more for asset pricing, show that the likelihood is greater in times of macroeconomic and financial distress, and use the prediction to generate a conditional forecast of bond returns. We further find that

stocks with high book-to-market ratio, which reflects persistent distressed performance and lower liquidity, also exhibit an increase in their (absolute) liquidity betas in times of economic distress.

Liquidity shocks affect realized returns because expected liquidity affects expected returns (Amihud and Mendelson, 1986, 1991). Given the persistence of illiquidity, a positive illiquidity shock raises future expected illiquidity and expected return which in turn lowers prices. This usually generates a negative liquidity beta.¹ These relations between illiquidity shocks and returns have been documented for stocks by Amihud (2002), Pastor and Stambaugh (2003), Acharya and Pedersen (2005), and Sadka (2006), and for corporate bonds by de Jong and Driessen (2007), and Lin, Wang, and Wu (2011). This paper contributes to these studies by showing that the impact of liquidity shocks on asset prices is *conditional*, being significantly stronger in adverse economic times.

The relation between liquidity shocks and adverse economic and financial episodes has been noted by Acharya and Pedersen (2005).² In times of adverse economic and financial conditions, the greater demand for liquidity and the rise in its value reduces asset prices by more than usual, and this applies particularly for the less liquid assets. Yet, these episodes may be coupled by a flight to liquidity, by which securities with higher liquidity become relatively more valuable. Then, unexpected rise in illiquidity may *raise*, rather than depress, the prices of assets that provide greater liquidity in adverse economic times relative to the prices of less liquid assets. This is indeed what we find for investment-grade (IG) corporate bonds, which are known to be more liquid than speculative (junk) bonds. Analogously, we also find that in times of economic distress, the effect of adverse liquidity shocks is positive (relative to the market) for stocks with low book-to-market ratio, which have stronger sustained profitability and higher liquidity, whereas the effect is negative for stocks with high book-to-market ratio.

Formally, we estimate a regression model of bond returns on four pricing factors—term spread returns, default spread returns (or the bond market excess returns), and liquidity shocks on stocks and Treasury bonds. We study the association between changes in corporate bond price shocks and changes in the illiquidity of stocks and Treasury bonds. We show that this response varies over time, switching between two regimes which we characterize as “normal” and “stress.” Employing Hamilton's (1989) methodology, we first identify statistically the two regimes between which there are variations in the liquidity betas as well as the betas of the term risk and default risk. We then show that these two regimes can be predicted by macroeconomic and financial variables. The regime which we call “stress” is associated with adverse macroeconomic conditions such as

recessed economic activity and adverse financial market conditions such as negative stock market returns, heightened volatility, and shrinking balance-sheets of financial intermediaries.

Employing our economic prediction model of being in the normal or in the stress regime, we provide an *out-of-sample* forecast of corporate bond returns for the years 2008–2009. In regressions of monthly realized returns on predicted returns that are conditional on the pricing factors, R^2 is 76% and 77% for junk and IG bonds, respectively, and the coefficients indicate unbiased prediction: the slope coefficients are close to one and the intercepts are close to zero. As shown in Fig. 5, the predicted return does a reasonable job at predicting the returns of March 2008 (Bear Stearns' collapse) and September to December 2008 (Lehman Brothers' collapse and the post-Lehman phase). In another out-of-sample test for the second half of the sample,³ we again obtain that the prediction has significant power with an accuracy of over 88%.

Importantly, we find that in the stress regime, the sign of liquidity betas is quite the opposite for IG and junk bonds. Junk bond returns respond negatively to illiquidity shocks while IG bond returns respond in a positive and significant way (these effects are relative to the effect of liquidity shocks on the bond market excess return). In this regime, there is a large significant difference in the return-illiquidity shock relation between IG and junk bonds, whereas in the normal regime, this difference is smaller and less significant. This pattern is robust to controlling for maturity and default risk. The evidence thus suggests that in the stress regime there is a “flight to liquidity” wherein investors prefer (or price more favorably) more liquid assets such as IG bonds rather than the less liquid junk bonds. To further confirm this flight to liquidity, we show that Treasury bill yields fall relative to the federal funds rate during the stress regime and become more sensitive to bond liquidity shocks.

This analysis is extended to stocks sorted on their book-to-market ratio. Fama and French (1995) show that the profitability of stocks with high book-to-market ratio is persistently distressed, with the opposite holding for stocks with low book-to-market ratio. And, Fang, Noe, and Tice (2009) show that stocks with higher book-to-market ratio are associated with lower liquidity, because lower liquidity depresses stock value. Thus, stocks with higher book-to-market ratio are similar to junk bonds in the sense that they have greater economic distress and lower liquidity. Similar to our findings for corporate bonds, we identify statistically two regimes which differ mainly in the effect of stock liquidity shocks on the excess returns of stock portfolios constructed based on their book-to-market ratio. Again, we find that the probability of being in these regimes is predictable by the same macroeconomic and financial market variables that predict the

¹ This holds under reasonable assumptions on the asset cashflows; see a formal model in Acharya and Pedersen (2005).

² Over the period 1963–1999, Acharya and Pedersen (2005) identify these shocks to be 5/1970 (Penn Central commercial paper crisis), 11/1973 (oil crisis), 10/1987 (stock market crash), 8/1990 (Iraqi invasion of Kuwait), 4–12/1997 (Asian crisis), and 6–10/1998 (Russian default, LTCM crisis).

³ For each month, we progressively estimate the best econometric fit using macroeconomic and financial-market variables that explain the model-implied probability of being in the stress regime until the previous month, and use it to predict the statistically identified probability of being in the stress regime in that month obtained from the time-series regressions of bond returns on the pricing factors.

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