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News and the cross-section of expected corporate bond returns

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ABSTRACT

We study the cross-section of expected corporate bond returns using an inter-temporal CAPM (ICAPM) with three-factors: innovations in future excess bond returns, future real interest rates and future expected inflation. Our test assets are a broad range of corporate bond market index portfolios. We find that two factors – innovations about future inflation and innovations about future real interest rates – explain the cross-section of expected corporate bond returns in our sample. Our model provides an alternative to the ad hoc risk factor models used, for example, in evaluating the performance of bond mutual funds.

1. Introduction

We study the factors that explain the cross-section of expected corporate bond returns. Our model adapts the Campbell (1993) inter-temporal CAPM (ICAPM) to the case of an investor who invests only in the bond market.

There is, surprisingly, little research on the cross-section of expected bond returns in comparison to that on the cross-section of stock returns.[1] This is striking given that, in 2005, according to the International Monetary Fund (2007), the capitalization of the US bond markets was US$24 trillion as compared to US$17 trillion for the US stock markets. The relative sizes of the corporate and government bond markets were US$18.1 trillion and US$5.9 trillion, respectively. More importantly from an investor's perspective, the most recent data (Investment Company Institute, 2007a) shows that, out of a total of US$18 trillion under management in US mutual funds in 2006, as much as US$2 trillion was invested in bond and money market funds compared to about US$10 trillion in equity funds. In terms of the number of funds, out of a total of about 8100 mutual funds, 2849 (35%) were classified as bond and money market funds, 4770 (58%) as equity market funds and the remaining as hybrid funds (Investment Company Institute, 2007b).

Our main results are as follows. Using a return decomposition for a consol bond, we obtain a three-factor ICAPM in the spirit of Campbell (1993). We test this model using returns, over the period 1988–2006, on seven corporate bond index portfolios of different default categories. We find, using a standard Fama–MacBeth approach that our model cannot be rejected. Of the three-factors in our model, innovations in future inflation rates (i.e. news about expected inflation) and future real rates are more important than innovations in expected excess bond returns in determining the cross-section of expected corporate bond returns. Our results are robust to a number of checks including the use of; alternative industry-based portfolios, different sub-samples of the data and an alternative GMM estimation technique.

The rest of the paper is organized as follows. Section 2 provides a brief outline of related research on the cross-section of expected corporate bond returns, while in Section 3, we describe the set-up of our model and the test methodology. In Section 4, we provide details of the data that we use and we discuss our empirical results in Section 5. Section 6 presents some robustness checks and Section 7 concludes the paper.

2. Related literature

As mentioned earlier, despite the large size of the US government and corporate bond markets relative to the equity markets and the substantial proportion of funds invested in bond-only mutual funds, there has been surprisingly little research on the factors that drive bond betas. In early work Chang and Huang (1990) find, using six portfolios based on Moody's rating quality as a criteria,

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[1] Selected examples include Chang and Huang (1990), Fama and French (1993) and Gebhardt et al. (2005) among others.

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that excess returns on corporate bonds are driven by two unobservable factors. Fama and French (1993) find that a five-factor model that adds a term structure factor and a default premium factor to the now familiar Market, SMB and HML factors explains the cross-section of both stock and bond returns well. More recently, Gebhardt et al. (2005) evaluate the factor loadings versus characteristics debate in the context of the cross-section of expected bond returns. They find that default betas and term betas are able to explain the cross-section of bond returns after controlling for characteristics such as duration and ratings. Their results imply that firm-specific information implicit in ratings and duration is not related to the cross-section of expected bond returns.

As pointed out earlier, there is a significant amount of investment in bond market mutual funds. The measurement of the performance of these funds using asset pricing models relies largely on ad hoc factor models. For example, Huij and Derwall (2008), who use a multifactor model with factors that include returns on the overall bond market, on low-grade debt, on a mortgage-backed securities index, the aggregate stock market index and three more factors obtained by a principal components analysis of yield changes.

We also note here that the literature on the predictability of holding period returns on corporate bonds (in contrast to government bonds) is rather sparse. This is relevant in our context, because we need to identify state variables that have predictive power for excess corporate bond returns. We rely here on Baker et al. (2003), who find that excess returns on corporate bonds are predicted by the real short rate and the term spread.

The model we use is based on the ICAPM derived in Campbell (1993). Campbell uses a log-linear approximation to an investor's budget constraint to express unanticipated consumption as a function of current and future returns on wealth. In our adaptation of the Campbell (1993) model, we rely on a present value decomposition for the return on a consol bond, as in Engsted and Tanggaard (2001), which corresponds to the long-term investment horizon of our investor.[2] We also assume that our investor invests only in the bond market. This may seem, at first blush, a restrictive assumption – but there are two points that make this assumption a reasonable one. Firstly, from an investor's perspective, the most recent data (Investment Company Institute, 2007a) shows that, out of a total of US$18 trillion under management in US mutual funds in 2006, as much as US$2 trillion was invested in bond and money market funds, compared to about US$10 trillion in equity funds. In terms of the number of funds, out of a total of about 8100 mutual funds, 2849 (35%) were classified as bond and money market funds, 4770 (58%) as equity market funds and the remaining as hybrid funds (Investment Company Institute, 2007b). This is because a large number of market participants such as pension funds and insurance companies, among others, have mandates that restrict the application of their funds to fixed-income securities. Secondly, as Ferson et al. (2006) observe: *'Ideally, one would like an SDF model or a set of factors to price both stocks and bonds. Empirically, however, this is challenging ... However it is more common to find bond factors used for pricing bonds and stock factors for pricing stocks'.*

Estimating the Campbell (1993) model requires the specification of the VAR, where the choice of the state variables is essentially an empirical issue. Campbell and Vuolteenaho (2004), for example, find that the success of their two factor model relied critically on including the small-stock value spread as a state variable in their VAR estimation. Recently, Chen and Zhao (2008) also show that estimating innovations is sensitive to the specification of the VAR system. We find, in this paper, that our results are robust to an alternative vector of state variables. We also note that despite the critique about the specific choice of state variables, recent applications (see for example Brunnermeier and Julliard, 2007 among others) also use a similar VAR approach.

3. Model set-up and test methodology

We now provide brief details of our inter-temporal CAPM and of the econometric methodology used in this paper.[3]

3.1. Bond return decomposition

In this paper, we use a return decomposition for a consol bond rather than that for zero coupon bond (see, for example, Campbell and Ammer, 1993) since our investor has a long horizon. We define the log one-period gross return from t to $t+1$ on a consol bond as

$$r_{b,t+1} = log\left(\frac{C + P_{b,t+1}}{P_{b,t}}\right) = log(C + \exp(p_{b,t+1})) - p_{b,t} \tag{1}$$

in which C denotes the coupon and $P_{b,t}$ the price. It can then be shown (see Engsted and Tanggaard, 2001) that

$$(E_{t+1} - E_t)(r_{b,t+1} - r_{f,t+1}) = -(E_{t+1} - E_t)\left\{\sum_{j=1}^{\infty} \rho^j (r_{b,t+1} - r_{f,t+1+j}) + \sum_{j=1}^{\infty} \rho^j r_{r,t+1+j} + \sum_{j=1}^{\infty} \rho^j \pi_{t+1+j}\right\} \tag{2}$$

in which ρ_b is the constant from the linearization and is a number slightly smaller than one. Using more compact notation, we define $\tilde{x}_{b,t+1} = ((E_{t+1} - E_t)r_{b,t+1} - r_{f,t+1})$ as the innovation in the log excess one-period return, and the three terms on the right-hand-side of (2) as: $\tilde{x}_{x,t+1}$, the innovation in the *future* log excess one-period return; $\tilde{x}_{r,t+1}$, the innovation in the log excess one-period real return; $\tilde{x}_{\pi,t+1}$, the innovation in the log excess one-period inflation. We can then rewrite Eq. (2) as

$$\tilde{x}_{b,t+1} = -\tilde{x}_{\pi,t+1} - \tilde{x}_{r,t+1} - \tilde{x}_{x,t+1} \tag{3}$$

This expression is a dynamic accounting identity and holds by construction, having been obtained from the definition of the return on a consol bond. Unexpected excess bond returns must be due to 'news' (or changes in expectations) about either future excess bond returns, future inflation or future real interest rates, or combinations of these three. We note here that a similar decomposition can be derived based on the present value relation for a n-period coupon bond (see for example Campbell et al., 1997). This analogous expression, using the definition of the return on a coupon bond, differs from (2) above only in that the summations run from 1 to n (where n is the time to maturity of the coupon bond) instead of from 1 to ∞.[4]

3.2. Expected future bond returns and default risk

An issue that can be raised is that, if we are modelling the cross-section of expected corporate bond returns, we should provide for a factor that reflects default risk. It is possible to include in our decomposition a fourth factor specifically to model default risk. We could, for example, follow Perraudin and Taylor (2003) who

[2] Using a consol bond return decomposition rather than that for a coupon bond with finite-maturity is not crucial to our results.

[3] Further details on the derivations of these results are available in the Working Paper version of this paper available at http://www.ssrn.com.

[4] In empirical estimation this means summing the series from 1 to n (e.g. $n = 120$ if we use monthly data and assume a 10 year maturity bond) instead of an "infinite" sum to extract the news components from the VAR. We find (in results not reported here to conserve space) that our main empirical results remain unchanged even if we use the n-period coupon bond return decomposition.