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## Out-of-sample bond risk premium predictions: A global common factor<sup>☆</sup>



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### ABSTRACT

This paper investigates the out-of-sample predictability of international bond risk premia. We endogenously construct a global common Cochrane and Piazzesi (2005) factor. We find that the global factor strongly predicts international bond risk premia and delivers economically significant gains relative to the historical average. The forecasting power of the global factor is above and beyond the predictive power contained in country-specific factors. As predicted by economic theories, bond return forecasts appear countercyclical. We also find that the global factor is related to international economic activity.

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## 1. Introduction

The issue of bond return predictability is of great interest to academics and practitioners. Accordingly, a vast amount of research has been devoted to predicting excess bond returns. Traditional literature focuses on the predictive ability of forward rates for future excess bond returns. Because forward rates represent the rate one can lock in now for a commitment to buy a one period bond in the

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future, it is natural to hypothesize that they incorporate useful information for predicting future bond returns. In the US market, many studies (e.g., Fama and Bliss, 1987; Campbell and Shiller, 1991; Cochrane and Piazzesi, 2005) reveal that forward rates are able to generate accurate forecasts of excess bond returns. In international markets, several studies (e.g., Dahlquist and Hasseltoft, 2013; Kessler and Scherer, 2009) find that forward rates strongly predict international excess bond returns.

We contribute to the existing literature in three ways: First, we endogenously construct a global common Cochrane and Piazzesi (2005, CP hereafter) factor, which is a linear combination of international forward rates. Second and foremost, we evaluate the predictive power of the global common CP factor in an out-of-sample forecasting exercise. Though a few studies (e.g., Ilmanen, 1995; Dahlquist and Hasseltoft, 2013) reveal that some global common factors forecast international bond risk premia in-sample, little is known about the out-of-sample predictability of excess bond returns in international markets. Since a model's in-sample predictive ability tends to correlate poorly with its out-of-sample forecasting performance (e.g., Thornton and Valente, 2012; Inoue and Kilian, 2004, 2006), it is important to evaluate the out-of-sample predictability of international excess bond returns. Indeed, the out-of-sample forecasting analysis can sharpen our understanding on the global driving force of excess bond returns. Third, because statistical significance does not mechanically lead to economic significance, we assess the economic value of the global common CP factor in asset allocation.

We analyze the predictable variation in bond risk premia from January 1980 to December 2011 in the four largest and most liquid markets: the United States, the United Kingdom, Germany, and Japan. We endogenously construct the global CP factor by regressing the average of annual international excess returns on the country-specific CP factors. Our empirical analysis proceeds in three steps.

First, we investigate the statistical significance of the global CP factor in bond return predictions. The out-of-sample forecasting analysis shows that the global CP factor consistently delivers significant out-of-sample gains relative to the historical average.<sup>1</sup> More importantly, we find that the forecasting power of the global factor is above and beyond the predictive power contained in the country-specific CP factors. Indeed, the global factor strongly predicts international bond risk premia with the out-of-sample  $R^2$  up to 42.8%. The average out-of-sample  $R^2$  is 19.4%. These results are robust in subsamples. These results are also robust in international data, which are not used to construct the global CP factor.

Second, we move beyond comparing forecasting performance from a statistical perspective and evaluate the economic gain of the global CP factor from an asset allocation perspective. Specifically, we quantify how much a risk-averse investor is willing to pay to switch from a dynamic portfolio strategy based on the no-predictability benchmark to a model that uses the information content of the global factor. We find that the information content of the global CP factor does generate systematic economic value to investors.

Third, we investigate the nature of the predictive ability of the global factor. Rational asset pricing theories (e.g., Campbell and Cochrane, 1999; Wachter, 2006; Buraschi and Jiltsov, 2007) usually imply that return predictability can result from exposure to time-varying aggregate risk or time-varying risk aversion. Intuitively, heightened risk aversion during economic recessions demands a higher risk premium. It thus generates return predictability. To provide some insight on the economic interpretation of the global factor, we link the global factor to international economic activity. In line with Kojien et al. (2012) and Dahlquist and Hasseltoft (2013), we find that the global factor predicts international industrial production growth, suggesting that the global factor contains important information about macroeconomic fundamentals. The empirical analysis also suggests that bond risk premia predicted by the global CP factor appear countercyclical in all four markets. This finding is consistent with economic theories suggesting that investors must be compensated with risks associated with economic recessions.

On the theoretical side, how to understand the forecasting power of the global factor across markets? Rizova (2010) shows that a two-country, Lucas-tree framework with gradual information diffusion (e.g., Hong and Stein, 1999; Hong et al., 2007; Rapach et al., 2013) can cause asset returns in one country to predict asset returns in a trading-partner country. In the context of international bond risk premium predictability, information about global economic fundamentals diffuses simultaneously

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<sup>1</sup> It is consistent with the expectations hypothesis of interest rates, which states that the premium on long-term bonds over short-term bonds is constant over time.

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