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Financial crises and estimation bias in international bond markets

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A B S T R A C T

This paper analyses the impact of estimation bias on various international bond markets during recent financial crises, using a unique empirical design. We estimate the Kalman filter over the period 2004–2014 using weekly data from the US and its main trading partners and construct measures of model forecasts, term premia, and risk premia in the presence of estimation bias, and in its absence. We find that the impact of estimation bias was the strongest for all sampled countries during the Global Financial Crisis of 2007–2010, and the ongoing eurozone sovereign debt crisis.

1. Introduction

The past couple decadesá saw an admittedly large number of crises including the Russian Default Crisis of autumn 1998, Y2K in 2000, the Dot Com Bubble spanning the period 1997–2000, the recent Global Financial Crisis of 2007–2010 and the Eurozone sovereign debt crisis that began in October of 2009 (Bussiere and Fratzscher, 2006; Juneja and Pukthuanthong, 2015). It is not surprising that much recent work documenting their consequences for financial markets has emerged in the extant literature (e.g., Bowe and Doumta, 2001; Forbes and Rigobon, 2002; Corsetti et al., 2005; Inyeob Ji and In, 2010; Ivashina and Scharfstein, 2010; Kenourigos et al., 2011; Wang, 2014). Recently, authors have also begun to explore consequences for international bond markets (e.g., Dungey et al., 2006; Beetsma et al., 2013; Philippas and Siriopoulos, 2013). Concurrent with this literature, scholars have examined the impact of estimation bias on the empirical performance of models for the dynamics of bond markets (e.g., Dempster and Tang, 2011; Bauer et al., 2012; Bauer et al., 2014; Wright, 2014; Juneja, 2016). Based upon these studies, there is reason to believe that the impact of estimation bias on the dynamics of international bond markets is exacerbated during financial crises. Such bias likely creates patterns of elevated volatility in measures of empirical performance associated with international bond markets and those crisis periods.

The primary focus of this research is to study the impact of estimation bias on the dynamics of international bond markets during recent financial crises. We focus on the US and its main trading partners, Canada, China, the eurozone, Japan, and Mexico; due to the fact that countries that are intimately involved with each other from the perspective of international trade

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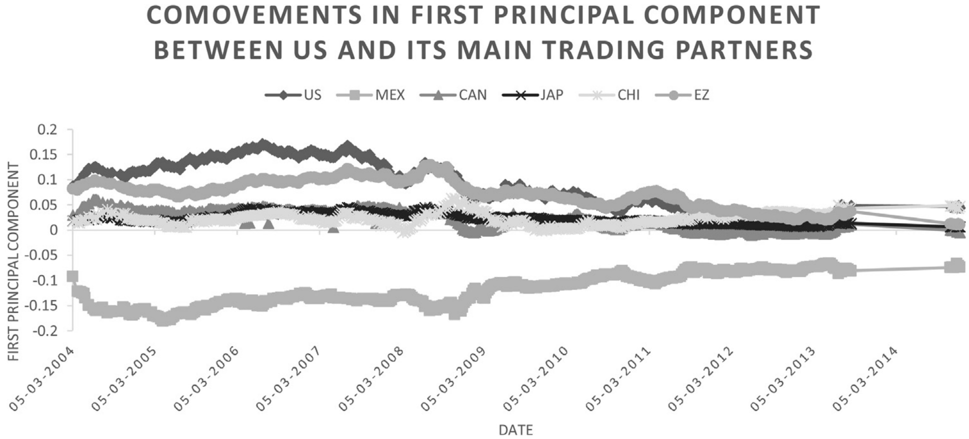

Fig. 1. Plot of first principal component of the US and its main trading partners.
This figure plots the first principal component of the term structure of interest rates for the US and its main trading partners. Principal components are estimated using the data described in Section 2 of the body of the paper.

would presumably be characterized by similarities in bond market dynamics.[1] To provide motivation for this selection, we run principal components analysis on zero coupon yields corresponding to each country in our data sample over the period under investigation in the current study; March 5, 2004 through December 12, 2014. Carrying out principal components analysis enables us to extract the main factors driving the variation in interest rates for each country. For each country, only one factor explains the majority of variation in interest rates. 97.73% of the variation in US interest rates can be explained by the first factor. 97.42% of the variation in Mexican interest rates can be explained by the first factor. 97.95% of the variation in interest rates in the eurozone can be explained by the first factor. 94.68% of the variation in Japanese interest rates can be explained by the first factor. 93.03% of the variation in Chinese interest rates can be explained by the first factor, and finally 93.06% of the variation in Canadian interest rates can be explained by the first factor. In Fig. 1, we present a time-series plot of the first factor for the US and its main trading partners. Patterns in co-movements across the first principal component of the US and its main trading partners appear to be quite strongly related as the first factor generally has the same shape. In the case of Mexico, its first principal component moves inversely with that of the US. In fact, the correlation coefficient between the first principal component of the US and Mexico is −0.861, while the correlation coefficients between the first principal component and the remaining countries are 0.855 for the eurozone, 0.841 for Japan, −0.064 for China, and 0.897 for Canada. With the exception of China, the time series dynamics of the main factor driving variation in interest rates between the US and its main trading partners are very strongly interrelated. Indeed, the main factor influencing China's interest rates also exhibits similar patterns in co-movements. Byrne et al., 2012 study the co-movement in long-term interest rates for eight industrialized countries, including the US, Canada, and Japan, over the period January 1988 through July 2006. They find that yields on government debt at the 10-year maturity for the eight nations included in the sample display a remarkable degree of co-movement that increases toward the end of their sample period, which coincides with the beginning of our sample period. Taken together, Fig. 1 and this prior finding suggest that co-movements across factors were especially pronounced during the Global Financial Crisis of 2007–2010 and the ongoing eurozone sovereign debt crisis that began in October 2009. Additionally, these remarkable patterns in co-movements support the notion that the US and its main trading partners are quite similar from the standpoint of bond market dynamics and this provides motivation for the inclusion of these countries in the study.

We carry out our assessment of model accuracy by constructing estimates of three measures; model forecast error, long maturity term premia, and long maturity risk premia and follow the implementation of Juneja (2016) in our empirical design. Therefore, our analysis relies on the data which we believe represents an advantage relative to prior approaches (e.g., Yang and Cheng, 2010; Juneja, 2014, 2015) which rely on observation or theory (e.g., Dempster and Tang, 2011; Bauer et al., 2012). Additionally, we focus exclusively on the class of affine term structure models because it received a large amount of attention in the literature (e.g., Dai and Singleton, 2000; Dejong, 2000; Collin-Dufresne et al., 2008; Christensen et al., 2011; Duffee and Stanton, 2012; Hamilton and Wu, 2014).[2]

Within the class of affine term structure models, we study the Joslin, Singleton, and Zhu (hereafter, JSZ) normalization, which, due to its formulation in discrete-time, is characterized by ease of implementation, relative to its continuous time, observationally equivalent specifications (e.g., Joslin et al., 2013; Joslin et al., 2014). Moreover, it retains all the essential properties of the class of affine term structure models. We begin by reporting the serial correlation in the JSZ normalization,

[1] Please see http://www.census.gov/foreign-trade/statistics/highlights/toppartners.html for more information on the total trade between the US and these countries and Eurozone.
[2] See Juneja (2014) or Juneja (2016) for an extensive list of studies that focus exclusively on this class of models.