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The small open macroeconomy and the yield curve: A state-space representation



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ABSTRACT

This study extends a state-space representation of the yield curve and the macroeconomy to a small open economy in order to study the dynamic interaction between the yield curves in Canada and the U.S. The framework treats the U.S. term structure of interest rates as being exogenous to both the Canadian yield curve and macroeconomy. The empirical results support very strong links between the yield curves in the two countries, with the U.S. yield curve accounting for as much as 45 per cent of the variation of the movement in the level and about 30 per cent of the movements in the slope and the curvature of the Canadian yield curve. Canadian yield-curve factors are found to account for about 50 per cent of the variation in output and the monetary policy rate, and about 25 per cent of the variation in inflation, much larger than the yield curve effects found for future developments of the macroeconomies of other countries. A relatively strong bilateral relationship is found to exist between the yield curve and the instrument of monetary policy, supporting recent studies that find the dynamic relationship between the yield curve and the macroeconomy is due to the pivotal role that monetary policy plays in the macroeconomy.

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1. Introduction

The yield curve, especially the longer end of the curve, can be driven by a number of domestic factors, such as current and expected short-term policy rates, expected inflation, and term prima. In an

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open economy, the yield curve may also be driven by a number of global or international factors, such as foreign interest rates, expected exchange rates, and perceived risk premia. The relative contribution of international versus domestic factors in driving the yield curve is particularly important for small and open economies where interest rates in general are believed to be driven in part by global factors and developments. This study focuses on Canada, a small and open economy, that is strongly influenced by external economic and financial factors, especially those in the U.S. The objective is to determine the relative importance of the domestic macroeconomy and the U.S. yield curve in driving movements in the term structure of interest rates in Canada.

The relative influence of movements in global or international factors is particularly important for policy makers that extract information from the domestic yield curve on the current stance of monetary policy and for expectations of future economic activity, real interest rates, and inflation. In Canada, for example, interest rates along the term structure are found to have relatively good information about expectations of future economic activity, medium-term inflation, and interest rates.¹ In fact, the slope of the yield curve had been such a good measure of the stance of monetary policy in Canada that it was the primary interest-rate variable in the demand side of the Bank of Canada's quarterly projection model.² Also, short-term policy decisions may have limited effects on long-term real interest rates and as a result on the stance of monetary policy, if the effects of international factors on the longer end of the term structure are relatively important.

Similarly, investment practitioners that exploit arbitrage opportunities in the fixed-income security market and other financial markets may benefit by incorporating the influence of important external factors, as well as the macroeconomic fundamentals, on the term structure of interest rates. Fluctuations in interest rates in domestic debt markets due to international developments may also affect hedging strategies of investors in those markets. Investors that extract expectations of future interest rates from the yield curve to predict future versus current borrowing costs may also benefit by discounting the effects of relatively large movements in interest rates due to external factors. In addition, market participants using models with unobserved latent factors may improve their forecasts and pricing of interest-rate-related securities in a small open economy by incorporating additional factors for external principal drivers or determinants of the yield curve that may be quite important during volatile periods.

In the spirit of the recent macroeconomic-finance literature, a state-space framework is adopted in this study over other time series models because it captures movements in the yield curve with a few latent factors, which are not dependent on the particular choice and number of bond yields.³ Nevertheless, the dynamic factor approach still provides the same in sights as a VAR model. The external global factors facing a small open economy like Canada are captured with empirical factors for the U.S. yield curve. In line with much recent research, the yield curve factors for the U.S. are preferred to current macroeconomic factors since they are widely believed to also incorporate expectations about future interest rates inflation, and output growth.⁴

In this study, the parameter estimation and factor extraction framework in [Diebold, Rudebusch, and Aruoba \(2006\)](#) is extended to a small open economy by assuming that U.S. yield-curve factors are exogenous to Canada, so that the U.S. yield curve is allowed to affect the Canadian yield curve,

¹ See [Hassapis \(2003\)](#), [Harvey \(1997\)](#) and [Cozier and Tkacz \(1994\)](#) for real activity; [Hejazi, Lai, and Yang \(2000\)](#) and [Lange \(1999\)](#) for future interest rates; and [Day and Lange \(1997\)](#) for medium-term inflation. [Clinton \(1995\)](#) is a useful summary of the information content of the long-term yield for inflation and the term spread for output growth in Canada.

² See [Poloz, Rose, and Tetlow \(1994\)](#).

³ [Diebold et al. \(2008\)](#), [Diebold et al. \(2006\)](#), [Kanjilal \(2011, 2013\)](#), and [Rudebusch & Wu \(2008\)](#) use latent factors to reduce the dimensionality of yield curve data to apply a traditional VAR estimation technique. Similarly, [Vasishtha and Maier \(2013\)](#) use a factor-augmented VAR (FAVAR) approach to replace the economic data series for 20 countries with a few unobserved factors in order to study the impact of the global business cycle on small open economies.

⁴ For example, [Ang and Piazzesi \(2003\)](#) and [Diebold et al. \(2006\)](#) show that latent level and slope factors are linked to, and interact dynamically with inflation and real activity. Similarly, [Rudebusch and Wu \(2008\)](#), find that the level of the yield curve is linked to the perceived medium-term central bank inflation target and the slope is related to cyclical variation in inflation and output gaps as the central bank moves the short rate in order to achieve its macroeconomic goals. Also, [Diebold et al. \(2008\)](#) find that the a global level factor is closely linked to average G-7 inflation during their sample period and [Kanjilal \(2011\)](#) finds that the level of the yield curve can be used as an indicator of inflation in India.

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