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Monetary policy, bond risk premia, and the economy

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ABSTRACT

Within an affine model of the term structure of interest rates, where bond yields get driven by observable and unobservable macroeconomic factors, parameter restrictions help identify the effects of monetary policy and other structural disturbances on output, inflation, and interest rates and decompose movements in long-term rates into terms attributable to changing expected future short rates versus risk premia. When estimated, the model highlights a broad range of channels through which monetary policy affects risk premia and the economy, risk premia affect monetary policy and the economy, and the economy affects monetary policy and risk premia.

1. Introduction

With their traditional instrument of monetary policy, the short-term federal funds rate, locked up against its zero lower bound since 2008, Federal Reserve officials have resorted to other means for influencing long-term interest rates in order to provide further stimulus to a struggling US economy. Some of these non-traditional policy measures, such as the provision of "forward guidance," aim to lower long-term interest rates by shaping expectations about the future path of short-term rates, in particular, by creating expectations that the federal funds rate will remain at or near zero even as the economy continues to recover. Other new programs, including multiple rounds of "large-scale asset purchases," known more popularly as "quantitative easing," attempt to lower long-term interest rates more directly by reducing the term, or risk, premia that ordinarily cause long-term rates to exceed the average expected value of the short-term policy rate and thereby generate a yield curve with its most typical, upward slope. As former Federal Reserve Chair Ben Bernanke (2013, p. 7) explains: "To the extent that Treasury securities and agency-guaranteed securities are not perfect substitutes for other assets, Federal Reserve purchases of these assets should lower their term premiums, putting downward pressure on longer-term interest rates and easing financial conditions more broadly."

In addition to the assumption, stated clearly by the Chair, that Federal Reserve bond purchases work to lower long-term rates by reducing the size of term or risk premia, a second assumption, equally important but left implicit, that provides the rationale for those policy actions is that reductions in risk premia are effective at stimulating the private demand for goods and services and thereby work to increase aggregate output and inflation in much the same way that more traditional monetary policy actions do. Yet, as Rudebusch et al. (2007) astutely note, although this "practitioner view" that smaller long-term bond risk premia stimulate economic activity is quite widely held, surprisingly little support for the view can be found in existing theoretical or empirical work. In textbook New Keynesian models such as Woodford (2003) and Galí's

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(2008), for instance, the effects of monetary policy actions on aggregate output arise only to the extent that they have implications for current and future values of the short-term interest rate. Thus, as Eggertsson and Woodford (2003) show, these models offer a rationale for the provision of forward guidance but not for large-scale asset purchases. Andrés et al. (2004) elaborate on the New Keynesian framework, introducing features that imply the imperfect substitutability referred to in Chair Bernanke's comment from above, to demonstrate how downward movements in long-term yields can stimulate aggregate demand even holding the path of short rates fixed. More recently, however, Chen et al. (2012) have estimated this model with US data from 1987 through 2009 and concluded that the extra effects running through this additional channel are of limited practical importance. In a similar exercise, Kiley (2014) finds somewhat stronger effects of changes in risk premia on aggregate demand, but mainly when the long-term interest rates used in the estimation are those on corporate bonds instead of Treasury securities.

In the meantime, using a variety of empirical approaches, Ang et al. (2006) and Dewachter et al. (2014) find that changes in bond risk premia do not help forecast future output, while Hamilton and Kim (2002), Favero et al. (2005), and Wright (2006) obtain estimates associating larger bond risk premia with *faster* future output growth, exactly the opposite of what the practitioner view asserts. Jardet et al. (2013), by contrast, detect evidence of the expected, inverse relation between risk premia and future output, but estimate the effect to be short-lived, reversing itself after less than one year. Rudebusch et al. (2007) also find some evidence of an inverse relation between term premia and future output, although, as they point out, this result appears quite sensitive to both the specification of the forecasting equation and the choice of sample period used to estimate the model. Finally, Bekaert et al. (2013) find stronger links between monetary policy actions, financial market measures of risk, and economic activity that are consistent with the practitioner view, but derive their risk measures from the stock-option-based VIX instead of from risk premia embedded into the prices of the government bonds that the Federal Reserve has been purchasing.

Motivated by the weak and often conflicting results reported in previous studies, this paper develops and estimates a model designed specifically to explore the interplay between monetary policy, bond risk premia, and the economy. Rather than imposing a strong set of theoretical assumptions about how these channels of transmission arise, as, for example, Andrés et al. (2004) do in their extension of the tightly parameterized New Keynesian model, the approach taken here uses a more flexible, multivariate time series model to assess the extent to which, operating through a wider range of mechanisms, changes in monetary policy affect bond risk premia and the economy and changes in bond risk premia influence aggregate output and inflation and lead the Federal Reserve, in turn, to adjust its monetary policy stance relative to what purely macroeconomic conditions would otherwise dictate. The paper's goal, therefore, is to add to the existing empirical literature, cited above, in hopes of highlighting more clearly the regularities in the data that future theoretical work, perhaps along the same lines as Andrés et al. (2004), might try to explain more fully.

Of course, even with a more flexible empirical specification, *some* assumptions must be drawn from theory in order to identify the effects that different fundamental shocks have on endogenous variables. Here, those assumptions are borrowed from three sources. First, following Ang and Piazzesi (2003), cross-equation restrictions implied by no-arbitrage in an affine model of the term structure of interest rates are used to identify the unobserved risk premia built into observable bond yields. But while Ang and Piazzesi (2003) original model allows macroeconomic variables to affect the behavior of the yield curve, by design it omits channels through which changes in the yield curve can feed back on and affect their macroeconomic drivers. Here, as in Ang et al. (2006), Diebold et al. (2006), and Pericoli and Taboga (2008), the model allows for such feedback effects. Going further than those previous studies, however, the model developed here draws, second, on identifying assumptions like those used in more conventional vector autoregressions for macroeconomic variables alone to isolate the effects of monetary policy shocks on bond risk premia and the effects of shocks to bond risk premia on output and inflation. Similar assumptions are also employed by Bekaert et al. (2013) but, as noted above, using observed movements in the equity options-based VIX measure of stock market volatility rather than movements in bond risk premia implied by no-arbitrage. Third, as in the New Keynesian models outlined by Woodford (2003) and Galí (2008), Federal Reserve policy is described here by a monetary policy rule like that proposed by Taylor (1993), according to which the short-term interest rate adjusts in response to movements in output and inflation. Once again going beyond previous work, however, the analysis here adds a bond risk premium term, identified with the help of the affine term structure model, to the short list of variables to which the policy rate potentially responds. Estimates of the model's key parameters provide evidence of a rich set of multi-directional channels linking monetary policy, bond risk premia, and the economy, while impulse responses and forecast error variance decompositions highlight the quantitative importance of these various channels.

In addition to its three core macroeconomic variables – the short-term nominal interest rate, the output gap, and inflation – and five longer-term bond yields, the model developed here also includes two unobserved state variables. Inspired by Cochrane and Piazzesi (2008), time-variation in bond risk premia within the affine pricing framework is driven by a single factor. Rather than measuring this factor using the observable combination of forward rates isolated by Cochrane and Piazzesi (2005) in their earlier work, however, the specification here follows Dewachter and Iania (2011), Dewachter et al. (2014), and Cieslak and Povala (2015) by treating this “risk” variable as unobservable, identified through the comparison of long-term rates and the expected path of future short-term rates implied by the affine model's cross-equation restrictions. This more flexible approach leaves the model free to focus on the possible linkages between monetary policy, bond risk premia, and the economy, while still imposing enough structure to avoid the overparameterization that, as Bauer (2015) explains, often blurs the view of bond risk premia provided by less highly constrained term structure models.

The model features, in addition, an unobservable long-run trend component of inflation, interpreted as a time-varying target around which the Federal Reserve has used its interest rate policy to stabilize actual inflation. A fluctuating, but unobserved,