Inflation risk premium implied by options

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ABSTRACT

One of the commonly used estimates of expected inflation is the yield differential between nominal bonds and inflation-indexed bonds (breakeven inflation). Breakeven inflation is however a biased estimate of expected inflation because it includes an inflation risk premium (IRP). The novelty of our approach is that we estimate the IRP using the volatility implied from foreign exchange (FX) option prices combined with a price of risk extracted from stock prices. Purchasing Power Parity theory provides the linkage between inflation and the foreign exchange rate. Using data from the Israeli government bond market, which has a long history of liquid markets in inflation-linked and nominal bonds as well as an active FX options market, we find a statistically and economically significant positive inflation risk premium.

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1. Introduction

Inflation expectations are a key variable for investors in capital markets and also play an important role in determining monetary policy in many countries, especially in countries with strong and independent central banks. In this paper we derive a market-based measure of unbiased inflation expectations, net of inflation risk premium (IRP), using data on inflation indexed government bonds, nominal government bonds and options on foreign exchange (FX) in lieu of options on inflation which are not available.

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A number of approaches are used to forecast inflation. Most models are econometric models, both structural and purely statistical. These models, however, rely on historic data and are not forward looking. Another source of inflation forecasts are surveys of professional analysts and economists.[1] Surveys are, however, based on samples that are usually small and therefore might not be representative of market expectations. In economies where inflation-indexed government bonds have been issued (e.g. TIPS in the U.S.) inflation expectations are derived from the yield differential between nominal bonds and inflation-indexed (real) government bonds. This estimate is referred to as breakeven inflation (BEI). [2]

Inflation indexed bonds exist now in many countries.[3] The BEI as a measure of inflation expectations is used by central banks in a number of countries (e.g., the Federal Reserve, the Bank of England, Bank of Canada and the Bank of Israel)[4]. The advantages of these estimates are that they are market based, forward looking, can be computed continuously and can provide the entire term structure of inflation expectations. Numerous papers have estimated inflation expectations in different countries from nominal and inflation indexed bonds.[5]

Breakeven inflation however is a biased estimate of expected inflation because it includes an inflation risk premium and possibly a liquidity premium. There is a growing body of literature, theoretical and empirical, on the IRP, providing estimates of this premium. These estimates, however, differ in size, maturity structure, volatility and even sign. As pointed out by Hördahl and Tristani (2007) the different results in the literature may be at least partly due to differences in samples (time) and/or country. Campbell and Shiller (1996) in a study that predates the issuing of TIPS in the U.S. use two methods to estimate the IRP from data on nominal bonds based on finance theory. They obtained estimates in the range of 50–150 basis points for a maturity of 5-year bonds. Foresi, Penati, and Pennacchi (1996) use two factors to price bonds, expected inflation and the real interest rate. Accordingly they define two risk premia where each risk premium is the product of the market price of risk of the factor multiplied by the risk of that factor. Their estimated excess return IRP for the U.K. varies from 0 for the short-run to 55 basis point for the long run; they found a much smaller IRP in Sweden.

In a study of the Israeli bond market Kandel, Ofer, and Sarig (1996) reported that the IRP in periods of high inflation was about 34 basis points a month and only 5 basis points in periods of low inflation. Evans (1998) using U.K. index-linked and nominal bonds and survey data on inflation expectations finds a positive and significant time-varying IRP that co-varies positively with the spread between nominal and real yields (BEI). In a later study Evans (2003), using a regime-switching model and index linked bonds data, finds a large and negative inflation risk premium (−1.8% to −3.5% for 10 years horizon). Buraschi and Jiltsov (2005) are using a structural monetary version of a real business cycle model to estimate the IRP and find an average IRP of 70 basis points that is time varying, ranging from 20 to 140 basis points. Chen et al. (2005) using a two factor CIR model and data on TIPS and nominal bonds found an inflation risk premium that ranges from −1 to 132 basis points. D'Amico, Kim and Wei (2007) finding indicate the presence of an inflation risk premium as well as a liquidity premium, using TIPS and Survey data of inflation expectations. Hördahl and Tristani (2007) find that on average the inflation risk premium in the Euro zone is not significantly different from zero over an EMU sample

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[1] The most popular one is the Federal Reserve Bank of Philadelphia's quarterly Survey of Professional Forecasters. This survey is based on a group of about 30 forecasters, professionals who work for Wall Street firms and other businesses, who forecast various economic variables.

[2] There is considerable research on forecasting inflation and economic activity using asset prices. For a review see Stock and Watson (2003).

[3] In the past they have been issued mainly in developing economies with high and uncertain inflation. However, since the 1980's indexed bonds were mainly issued by developed countries. These include the U.K. (1981), Australia (1985), Canada (1991), Sweden (1994), U.S. (1997) and France (1998).

[4] In his remarks Ben Bernake (2007), the chairman of the Federal Reserve Board, points out that the Fed is using all three approaches mentioned above, and tops them with expert judgment and out of model information.

[5] For example, Sack (2000) derives inflation expectations from U.S. Treasury nominal bonds and the inflation indexed bonds (TIPS). Scholtes (2002) outlines the derivation and interpretation of breakeven inflation from inflation linked gilts in the U.K. Christensen, Dion and Reid (2004) have estimated the breakeven inflation in Canada and found it to be higher on average and more variable than survey measures of inflation expectations. The Bank of Israel (BOI) has derived inflation expectations from the bond market since 1988. This is based on research done by Yariv (1990, 2000).