The Quarterly Review of Economics and Finance xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

The Quarterly Review of Economics and Finance

journal homepage: www.elsevier.com/locate/qref

An empirical decomposition of the liquidity premium in breakeven inflation rates

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ARTICLE INFO

Article history:
Received 24 July 2015
Received in revised form 25 February 2016
Accepted 10 April 2016
Available online xxx

Keywords:
Breakeven inflation
Inflation expectations
Liquidity premium
Inflation risk premiumC32
E31
E43
E52
G12

ABSTRACT

In this paper, we propose a novel way to calculate the relative liquidity premium between the nominal and inflation-indexed government bonds. We assume that both nominal and inflation-indexed bonds contain liquidity premium. Moreover, the methodology that is used in the paper does not need survey data to extract changes in the long-run inflation expectations. Hence, we can report the changes in the long-run inflation expectations on a daily basis. We apply this methodology to the Turkish bond market data. Results of the paper indicate the existence of a relative liquidity premium that takes values between -31 basis points and 43 basis points for the period between October 2012 and November 2015. This result also shows that the inflation-indexed bonds sometimes can be more liquid than nominal bonds in Turkey.

1. Introduction

In this study, we contribute to the literature by proposing a novel way to identify the relative liquidity premium between nominal and inflation-indexed (CPI-linker) government bonds. On the contrary to the extant literature, where mostly nominal government bonds are assumed to be liquid, we assume that the yields on both nominal bonds and linkers contain liquidity premia that are specific to the bond type and maturity. Employing an empirical approach, we calculate the time varying price of liquidity to attain the relative liquidity premium across 10 year nominal and CPI-linker government bonds at a given time. Removing this relative liquidity premium from the breakeven inflation rates, we are able to measure changes in the long-run inflation expectations. As our methodology does not make use of survey data, we can report changes in expected inflation. Hence, our methodology is especially useful for those countries that lack survey-based, long-term inflation expectations.

To be able to measure the level and the variation of the inflation expectations is a central issue for most of the agents in the economy, but it is especially important for the monetary policy makers. A central bank's power to affect aggregate demand (and so inflation) relies on its power to change real interest rates prevalent in the economy[1]. However, central banks can only set nominal interest rates. Real interest rates are determined as the economic agents respond to the changes in the nominal policy rate by altering their inflation expectations. Hence, a timely and accurate measure of inflation expectations (especially at longer horizons) is a very efficient tool that helps assessing both the effectiveness of the monetary policy changes and the credibility of the central bank.

There are two basic ways of measuring the inflation expectations; the market participants can either be directly asked to reveal their inflation expectations through surveys or the information on inflation expectations can be inferred from the observed market prices. The latter way can be claimed to have several superiorities to the former; (i) it has a higher frequency compared to the surveys that are done twice a month or once a month, (ii) market based measures are derived from actual transactions, where the market players risk their money while trading in the market. However, since most of the time there is no accountability for the respondents of the surveys, forecasters may give biased or nonsense answers to the survey questions (Croushore (1993), Laster et al. (1997),

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[1] Economic theory asserts that agents in the economy make their consumption (or investment) decisions by comparing the prevalent real interest rate in the economy to their discount factor (or the internal rate of return of the investment).

http://dx.doi.org/10.1016/j.qref.2016.04.002
1062-9769/

Giordani and Söderlind (2003)). Despite to their mentioned superiority, market based measures have an essential drawback. The prices, from which market based measures are derived, contain noise and premia. These premia have to be removed from the prices in order to get the desired information on the inflation expectations.

Using nominal bonds together with CPI-linkers (under the no-arbitrage assumption) is a very popular way of attaining market based measures of the inflation expectations. Both the nominal and the real yield curves contain information about expected future real interest rates and expected inflation. However, the rate observed on a CPI-linker comprises expected real interest rate, real rate premium and liquidity premium. In addition to the expected real interest rate and the real rate premium, the rate on a nominal treasury bond contains expected inflation rate, inflation risk premium and a liquidity premium[2] that is not necessarily equal to that of the CPI-linker.

The main difference of this paper from the existing regression-based studies in the literature is its calculation of the liquidity premium. The studies in the literature (Gürkaynak et al. (2010), Pflueger and Viceira (2011), Grishchenko and Huang (2012) etc.) directly regress the breakeven inflation rates on liquidity measures to calculate the liquidity premium. However, the breakeven inflation rate includes expected inflation and inflation risk premium other than the liquidity premium. When the dependent variable includes premia other than liquidity premium, it is not possible to extract the absolute level of the liquidity premium without indexing the level of the liquidity premium to zero at a point in time.

Different from these regression-based methodologies, we use a dependent variable that is believed to be isolated from any premium other than the liquidity premium in our liquidity premium calculations. Similar to the direct approach, we take the yield difference between two bonds in order to calculate the liquidity premium. In particular, we use the difference between the yields of two maturity-matched nominal government bonds, with similar types, in our liquidity premium calculations. However, different from the direct approach, we do not use the yield difference between these two bonds as a direct measure of the liquidity premium. As an additional step, we regress this difference on several bond level liquidity measures in a reduced-form model. Finally, we use the estimated coefficients as the price of liquidity in order to calculate the relative liquidity premium between any two bonds at this maturity. Since our dependent variable does not include any premium other than the liquidity premium, we are able to measure the absolute level of the liquidity premium more correctly.

Application of our methodology to the 10 year nominal and CPI-linker bonds for the period between October 2012 and November 2015 indicates a premium that is −3 on average and taking values between −31 basis points at its lowest point and 43 basis points at its highest point. This indicates that the CPI-linkers can sometimes be more liquid relative to the nominal bonds. Also, our results indicate that 10 year expected average inflation (plus the inflation risk premium) moves between 4.91 and 7.69% for the same period.

The organization of the paper is as follows; section 2 briefly reviews the recent literature on market based measures of inflation expectations. The third section introduces the mechanics of the CPI-linkers and provides information on the pricing of the nominal bonds and CPI-linkers. The fourth section introduces our methodology and the data set we used. Section 5 presents our results and the final section concludes.

2. Literature Review

In this section, we provide a brief review of the recent literature that uses inflation-indexed bonds[3] and nominal bonds together to extract the inflation expectations and associated premia.

The literature mostly uses affine term structure models (with no-arbitrage assumption) to decompose the breakeven inflation rates into its subcomponents of the inflation expectations and the inflation risk premium. Affine models with latent factors are simultaneously fitted to both nominal and real government yield curves. The resulting model is estimated with the help of Kalman filter, where high-frequency (i.e. daily) inflation expectations are obtained from the noisy survey data on long-term inflation expectations. Chen et al. (2010) (using a two-factor affine model with weekly data), Hördahl and Tristani (2010) (using an affine macro-finance model with monthly data on inflation, output gap, survey-based inflation expectations and short-term interest rates), Adrian and Hao (2009) (using an eight-factor affine term structure model), Christensen et al. (2010) (using a three-factor affine model without using any kind of data on inflation expectations and the headline inflation) can be given as examples of the studies that use affine term structure models to measure the inflation expectations for USA. Joyce et al. (2010) also use a three-factor model with a monthly data to derive inflation expectations and inflation risk premium for the UK. Again with a similar methodology that uses the survey data, Garcia and Werner (2010) apply a term structure model on euro denominated nominal and real yields to get the inflation expectations and the inflation risk premium for the euro area.

The aforementioned studies, which use affine term structure models to attain the inflation expectations, do not take into account the liquidity premium between the nominal bonds and CPI-linkers. However, neglecting this liquidity premium may lead misleading results for the calculated inflation expectations and the inflation risk premium. D'Amico et al. (2010) attend to that matter by incorporating a fourth factor to a three-factor affine model in order to account for the liquidity premium. Being aware of the liquidity premium, Grishchenko and Huang (2012) provides a liquidity correction for the inflation risk premium. Their liquidity premium estimation is based on Hu et al. (2013). They measure the market liquidity of the CPI-linkers by using the difference between the observed treasury real yields and the benchmark real yields generated from the estimated yield curve. The proposed measure both incorporates the price and the amount of the liquidity risk.

There is also a branch of the literature that uses reduced-form (regression) models in order to get the liquidity premium between the nominal bonds and the CPI-linkers. A regression-based measure of the liquidity premium is provided by Gürkaynak et al. (2010), where they regress the breakeven inflation rates on several measures of liquidity. As the level of the liquidity premium in the breakeven inflation rates is not directly observable, it is only possible to find the variation of the breakeven rates caused by the liquidity measures. Hence, they normalize the liquidity premium in April 2005 to zero and evaluate the variation relative to that time as the liquidity premium. Finally, the authors implement Kalman filter to eliminate the noise in the survey-based inflation expectations to decompose the inflation expectations and the inflation risk premium from the breakeven inflation rates. Using a similar methodology with that of Gürkaynak et al. (2010), Pflueger

[2] Definitions of the premia, associated with the nominal bonds and and the CPI-linkers, are given in the third section, which provides the basics of the pricing of the two bond types.

[3] There are two good review papers on the topics related to the inflation-indexed bonds. The first study is Campbell et al. (2009), which presents the mechanics of the inflation-indexed bond markets in the U.S. and in the U.K. The second one is Bekaert and Wang (2010), which reviews the literature on the inflation-indexed bonds.