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# The impact of liquidity on inflation-linked bonds: A hypothetical indexed bonds approach

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A B S T R A C T

Sovereigns mainly issue inflation-linked bonds (ILB) in order to save money. More than 15 years' experience with this financial instrument in the United States has led to the conclusion that these bonds are characterized by low liquidity issues. Recently, various papers have started to analyze the impact of liquidity on ILB yields. This paper develops a new strategy for estimating the liquidity premium based on Campbell and Shiller's (1996) hypothetical ILB yields. We find significant effects of ILB-specific liquidity measures for the United States, the United Kingdom and Canada. Based on these findings, we derive the liquidity premium in ILB yields, liquidity-adjusted estimates for the break-even inflation rate and the inflation risk premium. In the United States, for instance, the average of the liquidity premium is 0.56%-points, and the average liquidity-adjusted break-even inflation rate and inflation risk premium amount to 2.67%-points and 0.22%-points, respectively.



## 1. Introduction

Inflation-linked bonds (ILB) represent a financial instrument which is potentially beneficial for issuers, investors and policy makers. Their feature of inflation compensation has advantages for investors since these bonds have an inflation protection as well as for issuers through saving the

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inflation risk premium. In addition, policy makers gain market-implied inflation expectations from the yields of ILB. See Deacon, Derry, and Mirfendereski (2004) or Shen (1998) for a comprehensive overview of ILB advantages.

It is important to discuss potential savings for Treasuries by issuing such bonds in more detail. Several studies in the late 1990s and early 2000s investigate the size of the inflation risk premium in order to determine the potential savings for Treasuries by issuing such bonds.[2] However, the current ILB history in the United States was shaped by too high yields in comparison to nominal bond yields. In this context, recent studies investigate these high ILB yields focusing on liquidity-based explanations. In a first step, all these studies extract a time series which includes the potential liquidity premium. The second step, a regression of the relevant time series on several liquidity measures, is rather similar for all studies, the first step (i.e., the extraction of the relevant time series), however, differs considerably over the existing studies.

The paper of D'Amico, Kim, and Wei (2008) includes the liquidity premium in a term structure model. The authors create a 3-factor affine term structure model for yields of ILB issued by the US Treasury.[3] They find that an important factor in the observed yields cannot be captured by the 3-factor model since it exhibits considerable pricing errors and delivers inaccurate implications for the break-even inflation rate. Consequently, the authors include a fourth factor in the model and get in this way better results for the expected inflation which are comparable with the values of the Survey of Professional Forecasters. The authors show that this fourth factor can be attributed to a substantial liquidity premium since it is highly correlated with a range of liquidity measures. In a regression analysis, D'Amico et al. (2008) are able to explain about 80% of the variation of the liquidity premium.

Pflueger and Viceira (2011b) as well as Gürkaynak, Sack, and Wright (2010) use break-even inflation rates as relevant times series to determine the liquidity premium in ILB yields. Pflueger and Viceira (2011b) regress the break-even inflation rate on a set of four liquidity measures of which two are ILB-specific (i.e., ILB transaction volume and the financing cost for buying ILB). The estimation shows significant results with signs consistent with theory. The underlying idea of this approach is that a liquidity premium will be inversely included in the break-even inflation rate since this rate is defined as the difference between the yields of nominal bonds and ILB. The break-even inflation rate declines with lower liquidity (i.e., a higher liquidity premium) in the ILB market. Hence, a low break-even inflation rate is caused by high, illiquid ILB yields. Similar to Pflueger and Viceira (2011b), Gürkaynak et al. (2010) regress five and ten year break-even inflation rates on two liquidity proxies which are trading activity and overall market liquidity. They find a high liquidity premium during the first years of the issuance and a rather moderate premium between 2000 and 2005. Furthermore, with the beginning of the financial crisis the premium considerably increased again.

A partly different procedure is adopted by Grishchenko and Huang (2013) and Shen (2006). Grishchenko and Huang (2013) estimate the magnitude of the inflation-risk premium and control for liquidity problems in their estimation. They regress the inflation-risk premium on a set of liquidity measures to get a liquidity-corrected premium. They calculate an average liquidity adjustment of 13 basis points. Similarly, Shen (2006) calculates the difference between a survey forecast measure of inflation and the break-even inflation rate of which only the second is potentially biased by liquidity issues. Analogous to Grishchenko and Huang (2013), this series is again regressed on a set of liquidity measures and a liquidity premium declining over time is detected.

We align ourselves with this stream of literature and apply the concept of hypothetical ILB yields by Campbell and Shiller (1996) and Campbell, Shiller, and Viceira (2009) to estimate the liquidity premium. More precisely, we calculate hypothetical ILB yields for the United States, the United Kingdom and Canada and compare these synthesized yields with their observed counterparts. We regress the difference between these two times series, called GAP series in the remainder of the paper, on various liquidity measures in order to determine whether there is an impact of liquidity or not. Since we find

[2] The basic idea of issuing ILB was to save the inflation risk premium which is present in the case of nominal bonds but does not exist in ILB. See, e.g., Campbell and Shiller (1996).

[3] Usually, these securities are called Treasury inflation protected securities (TIPS). However, for simplicity, we generally use the term ILB for all inflation-linked securities in the remaining part of the paper.