Measuring Term Premia for the Euro Area

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1 Introduction

Nominal yields at different maturities can be decomposed in two terms, capturing respectively the expectations of future monetary policy and the term premium. The first term can be represented as the market expectations on the average short rate (the monetary policy rate) over the maturity of the bond, while the term premium is a risk premium component representing the additional compensation required by the investor to be indifferent between a buy-and-hold strategy in the longer maturity bond and a roll-over investment strategy in the sequence of monetary policy rates. Given the common monetary policy in Europe, term premia on bonds issued by different countries are an immediate gauge of the heterogeneity in the transmission mechanism of monetary policy in Europe and of the need for intervention to protect the Euro area against it. Given the observation of the yields on bonds at different maturities, the derivation of term premia requires a proxy for the average future short rate over the maturity of the bond. This website provides first historical estimates for the 10-year term premia from 2000 onwards for Germany, France, Spain and Italy using the consensus forecasts and a simple autoregressive model for the change in monetary policy rates to predict monetary policy rate in real time in each period. It then allows to compute current value of the term premia using the two historical benchmarks and forecasts for the future monetary policy rates inputed by the user. Many different models have been proposed in the literature to predict monetary policy and decompose yields to maturity into a term premium and an expected monetary policy components (see, for example, Favero et al. (2022)), and the term premium can be further decomposed in compensation for real rate risk and for inflation (see, for example, Haubrich et al. (2012),Berardi (2022)).

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2 Theoretical Framework

Consider zero-coupon bonds and efine the relationship between price and yield to maturity of a zero-coupon bond as follows:

$$P_{t,T} = \frac{1}{(1 + Y_{t,T})^{T-t}}, \tag{1}$$

where $P_{t,T}$ is the price at time t of a bond maturing at time T, and $Y_{t,T}$ is yield to maturity. Taking logs we have:

$$p_{t,T} = -(T - t)\, y_{t,T}, \tag{2}$$

The one-period return of holding form period t to period t+1 a bond with maturity t+T is therefore:

$$r^T_{t,t+1} = p_{t+1,T} - p_{t,T}, \tag{3}$$

By applying the no-arbitrage condition to an investment of one-period in the one-period bond and an investment of one-period in the T-period bond we have :

$$E_t(r^T_{t,t+1} - r^1_{t,t+1}) = E_t(r^T_{t,t+1} - y_{t,t+1}) = \phi^T_{t,t+1}$$

where $\phi^T_{t,t+1}$ is the one-period risk premium on a one-period investment in the T-period bond.

Solving forward the difference equation $p_{t,T} = p_{t+1,T} - r^T_{t,t+1}$, we have :

$$\begin{aligned} y_{t,T} &= \frac{1}{(T-t)} \sum_{i=0}^{T-1} E_t\left(r^T_{t+i,t+i+1}\right) \\ &= \frac{1}{(T-t)} \sum_{i=0}^{T-1} E_t\left(y_{t+i,t+i+1} + \phi^T_{t+i,t+i+1}\right) \end{aligned}$$

Which provides the decomposition of nominal yields at different maturities into the market expectations on the average short rate (the monetary policy rate) over the maturity of the bond, and a risk premium component, the term premium, representing the additional compensation required by the investor to be indifferent between a buy-and-hold strategy in the longer maturity bond and a roll-over investment strategy in the sequence of monetary policy rates.The term premium over the residual life of the bond is the average of the sequence of the one-period future term premia.

By subtracting from the left-hand side and the right-hand side of the equation above the one-period rate, we have the following equation for the term spread:

$$y_{t,T} - y_{t,t+1} = \sum_{i=1}^{T-t-1} \left(1 - \frac{i}{T-t}\right) E_t \Delta y_{t+i,t+i+1} + \frac{1}{T-t} \sum_{i=1}^{T-t-1} \phi_{t+i,t+i+1}^{T} \tag{4}$$

2.1 The Implementation of the Decomposition

Equation (4) can be used to decomposed yields in an expected monetary policy component and a term premium given an estimate of the future expected future path for short-term rates $E_t \Delta y_{t+i,t+i+1}$ We implement the decomposition on the data by using the 3-month common short-rate for the Euro Area, and the yields on the 10-year government bond yields for the term spread. To estimate the future path of short-term rates we use two approaches -

1. Consensus forecasts -
   The ECB's Professional Forecasters Survey gives the average forecasts for the expected future short-term rates. These can be directly used to estimate the expected path of short-term rates..

2. Naive Predictive Model -

   $$\Delta y_{t+1,t+2} = \rho \Delta y_{t,t+1} + \epsilon_{t+1}$$

   where the autoregressive parameter ρ is estimated using the historical data available.