Box 1. Estimation of the Noncore Liquidity Price Index

The dynamic factor model (DFM) for the noncore liquidity price index assumes each standardized monthly financial indicator (y_t) can be decomposed into a common component(γF_t) and an idiosyncratic component (ε_t), such that

$$y_t = \gamma F_t + \varepsilon_t, \quad \text{where } \varepsilon_t \sim N(0, \varphi)$$

where φ is assumed to be diagonal, which implies that idiosyncratic components are uncorrelated across indicators. The common factor (F_t) is our estimated noncore liquidity price index (NLPI), which is assumed to follow an autoregressive (AR) p process:

$$F_t = \sum_{i=1}^{p} \beta_i F_{t-i} + \omega_t, \qquad \text{where } \omega_t \sim N(0,1)$$

where β_i's are the AR coefficients and ω_t is a normally distributed error term. The lag length p is selected using the Swartz-Bayesian information criteria. Given that the common factor is unobserved, we estimate the above State-space system using the Kalman filter.

The estimated NLPI is a weighted average of our chosen set of financial indicators, where the weights are optimally determined by the Kalman filter recursion. The Kalman filter allows accommodating mixed frequencies and uneven sample lengths (e.g., in the case of bank lending surveys). The indicators include variables such as interest rate spreads, asset prices, risk appetite, and lending condition surveys (Matheson, 2011). For missing data, "back-casting" is used to complete the series using the methodology of Giannone, Reichlin, and Small (2008). The global NLPI is constructed by pooling the G4 indicators.