

Dynamic Factor Models

Francis J. DiTraglia

University of Pennsylvania

Econ 722

Last Time: Classical Factor Analysis Model

$$\underset{(N \times 1)}{X_t} = \underset{(N \times 1)}{\mu} + \underset{(N \times k)}{\Lambda} \underset{(k \times 1)}{Z_t} + \underset{(N \times 1)}{\epsilon_t}$$

$$\begin{bmatrix} Z_t \\ \epsilon_t \end{bmatrix} \stackrel{iid}{\sim} \mathcal{N} \left(\begin{bmatrix} 0_k \\ 0_N \end{bmatrix}, \begin{bmatrix} I_k & 0 \\ 0 & I_N \end{bmatrix} \right)$$

What Can We Do with Factors?

There are just a few possibilities:

1. Use them as Instrumental Variables
2. Use them to construct Forecasts
3. Use them to “Augment” a VAR

Factors as Instruments – Bai & Ng (2010)

Endogenous Regressors x_t

$$y_t = x_t' \beta + \epsilon_t \quad E[x_t \epsilon_t] \neq 0$$

Unobserved Variables F_t are Strong IVs

$$\underset{(k \times 1)}{x_t} = \underset{(k \times r)}{\Psi'} \underset{(r \times 1)}{F_t} + \underset{(k \times 1)}{u_t} \quad E[F_t \epsilon_t] = 0$$

Observe Large Panel z_{1t}, \dots, z_{Nt}

$$z_{it} = \lambda_i' F_t + e_{it}$$