Real-Time Measurement of Business Conditions

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Summary of the paper

x_t - indicator of business conditions:

- Daily frequency
- Measures business conditions on a given day
- Extracts information from mixed frequency variables (daily, weekly, monthly quarterly)

  -> information from high frequency can be incorporated as soon as they are released

Summary of the paper

Econometric framework

- Factor model

  -> indicator is the latent factor
- Estimation by maximum likelihood
- Factor extracted using the Kalman filter
- Data are detrended rather than “log-differenced”

Indicators

1. spread between the 10-year and 3-month Treasury yields (daily)
2. Claims for unemployment insurance (weekly)
3. Employees on non-agricultural payrolls (monthly)
4. GDP (quarterly)

Similarities and differences wrt the existing work

Assessing the current state of the economy:

- CFNAI (Stock and Watson), Eurocoin (old and new, Altissimo et al. 2001, 2006)
- GDP nowcasts (Giannone et al., 2008; Camacho and Perez-Quiros, 2008, Bańbura and Rünstler, 2007)
- Daily GDP from monthly and quarterly data (Evans, 2005)

The most interesting distinguishing element (for me) of the paper

-> proposes a framework for using the information of higher frequency than monthly.

Similarities and differences wrt the existing work

Typically studies use monthly and quarterly data, daily data are tranformed to monthly frequency.

-> disregards the “partial” monthly data

Do we discard useful information? Maybe.

High frequency data:

- timely
- noisy (from FAQ to the Business Cycle Dating Committee: *claims numbers have a lot of noise*).

Two general questions

1. Do high frequency indicators provide relevant signal?
2. How can we use the indicator?
   - Policy and business decisions?

     ->Usually not made on a day-by-day baisis (indexes of business conditions usually refer to monthly or quarterly period)
     New Eurocoin - deprived of short term-fluctuations
   - Forecasting GDP or other variables?
   - ...

Partial answers

1. The factor disregarding the weekly data has *a discontinous “step-function” look*.

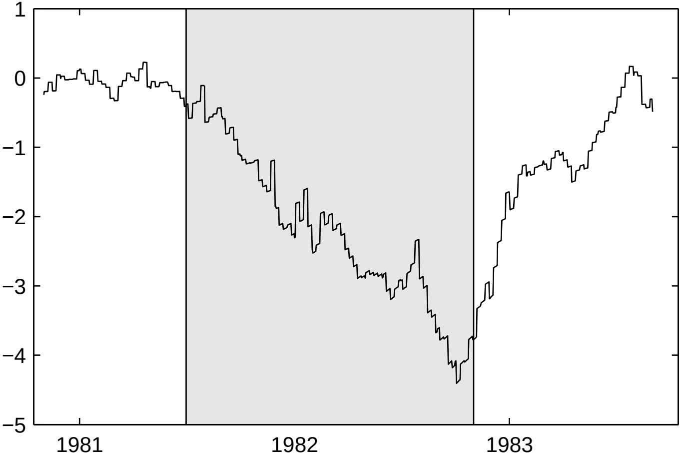
   Is therefore weekly data useful?

2. The indicator can be used as a timely business cycle dating tool

   -> *it tends to indicate earlier turning points*

   Problem: noisy tool

Indicator during the 81-82 recession



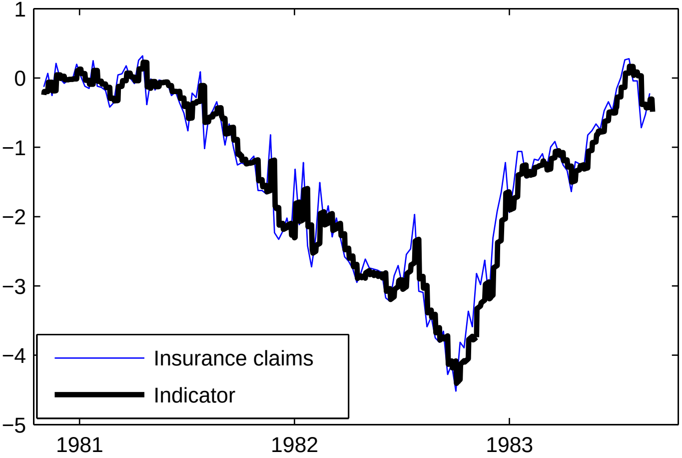
Some more specific issues

In the four variable model, how is the information used?

- The indicators with or without the daily series are almost identical
- What about the weekly, monthly and quarterly data?

  ->*Incorporating weekly data was very helpful*

Indicator based on weekly data



Some specific issues

Weekly data is 'too helpful'

-> the indicator is driven by the insurance claims.

Solution

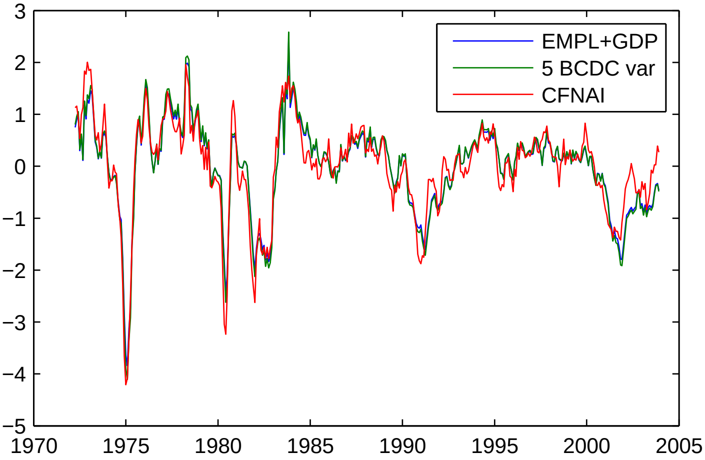
- More series?
- Richer dynamics?

General problem

- Is the latent factor from few series representative of the state of the economy?
- What if we use different/more variables?

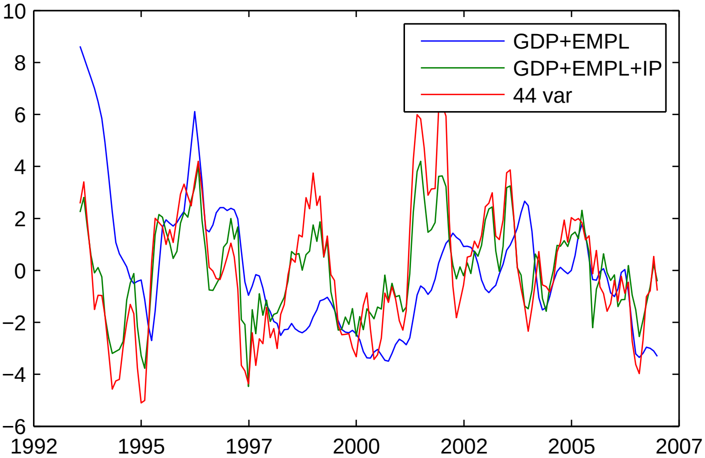
Indicators based on different data sets, US

Factor model at monthly frequency



Indicators based on different data sets, euro area

Factor model at monthly frequency



Computational considerations

Scale of the problem

- sample length: 16.000
- dimension of the state vector: 90.

Computational complexity is substantial - it takes

- couple of weeks to find starting values
- one week to estimate
- 1 GB memory to run the Kalman filter and smoother

Is it feasible

- to extend the dataset by further indicators,
- to use the framework in real-time applications?

Computational complexity, possible routes

- Explore the Jungbacker and Koopman (2008) method to speed up the calculations

  -> this works if observation vector is larger than the state vector, here not the case!

- Possible to have a smaller state vector

  -> use the cumulator variable (Harvey, 1989).

$$y_t^q = \sum_{i=0}^{89} \beta_q x_{t-i} + y_{t-90}^q + u_t^q = c_t^q + y_{t-90}^q + u_t^q$$

State space form with the cumulator variable

$$\begin{bmatrix} y_t^w \\ y_t^m \\ y_t^q \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ \beta_m & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_t \\ c_t^w \\ c_t^q \end{bmatrix} + \begin{bmatrix} \gamma_w \cdot y_{t-7}^w \\ \gamma_m \cdot y_{t-30}^m \\ \gamma_q \cdot y_{t-90}^q \end{bmatrix} + \begin{bmatrix} 0 \\ u_t^m \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} x_t \\ c_t^w \\ c_t^q \end{bmatrix} = \begin{bmatrix} \rho & 0 & 0 \\ \rho \cdot \beta_w & \Xi_t^w & 0 \\ \rho \cdot \beta_q & 0 & \Xi_t^q \end{bmatrix} \begin{bmatrix} x_{t-1} \\ c_{t-1}^w \\ c_{t-1}^q \end{bmatrix} + \begin{bmatrix} 1 & 0 & 0 \\ \beta_w & 1 & 0 \\ \beta_q & 0 & 1 \end{bmatrix} \begin{bmatrix} e_t \\ u_t^w \\ u_t^q \end{bmatrix}$$

$$\Xi_t^w = \begin{cases} 0, & \mathrm{t = 1st\ day\ of\ the\ week} \\ 1 & \mathrm{t = otherwise} \end{cases} \quad \Xi_t^q = \begin{cases} 0, & \mathrm{t = 1st\ day\ of\ the\ qrt} \\ 1 & \mathrm{t = otherwise} \end{cases}$$

Size of the state vector = 1+no of different frequency flow variables.

Conclusions

Welcome *call for action* to incorporate high frequency information

Suggestions

- Extensions of the model
- Robustness and evaluation
- Reduction in computational complexity