

Forecasting the New York State Economy

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Outline

Recent Economic Trends

Labor Market Deterioration

Coincident Indices

What is a Coincident Index?

What is a Coincident Index Useful For?

Forecasting with “Terraced” VARs

What is a “Terraced” VAR?

A Few Forecasts

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Executive Summary

- ▶ By applying the Kalman Filter to the unemployment rate, nonfarm employment, real wages and average hours, we generate a (“smooth”) estimate of the underlying “state of the economy,” which is commonly called a “coincident index.”
- ▶ Our forecasting strategy incorporates coincident indices into “Terraced” VARs.
- ▶ Unlike traditional VARs, the variables in a “Terraced” VAR are not all endogenous to each other.
- ▶ Like traditional VARs, the variables in a “Terraced” VAR are simultaneously forecast, which enables us to obtain forecast confidence intervals that depend solely on the variables that affect the value of the forecasted variable.

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Labor Market Deterioration

- ▶ So far, the current economic recession has impacted the United States economy relatively harder than New York State.
- ▶ New York City, however, has fared worse overall in terms of the unemployment rate.
- ▶ Between Dec. 2007¹ and Dec. 2009, nonfarm employment:
 - ▶ decreased by 6.3% in the United States
 - ▶ decreased by 2.7% in New York State
 - ▶ decreased by 2.7% in New York City
- ▶ Over the same period, the unemployment rate:
 - ▶ increased 5.0 points in the United States (from 5.0% to 10.0%)
 - ▶ increased 4.4 points in New York State (from 4.6% to 9.0%)
 - ▶ increased 5.8 points in New York City (from 4.8% to 10.6%)

¹when the NBER dates the beginning of the current recession



Labor Market Deterioration

- ▶ New York State has endured relatively less pain because it entered the recession later than the rest of the country.
- ▶ According to our coincident indices, the recession began in:
 - ▶ Mar. 2007 in the United States
 - ▶ Feb. 2008 in New York State
 - ▶ Mar. 2008 in New York City

which may explain why the decline in nonfarm employment and the rise in the unemployment rate was steeper in the United States than in New York State.

- ▶ Of more interest is the impact of the recession over the coming year and how it will affect variables of interest to public policymakers and financial institutions.

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What is a Coincident Index?

- ▶ People say: “The economy is in bad shape right now.”
- ▶ What are they referring to?
 - ▶ A rising unemployment rate?
 - ▶ Fewer hours worked?
 - ▶ Fewer total jobs?
 - ▶ Declining real wages and salaries?
- ▶ Each of these measures depends on the underlying “state of the economy” and the particular characteristics of each measure.
- ▶ A coincident index is an estimate of the “state of the economy” and is estimated from these four measures.

Coincident Index

Coincident Index of the New York State Economy



Note: The series depicted above runs from January 1976 to May 2009.



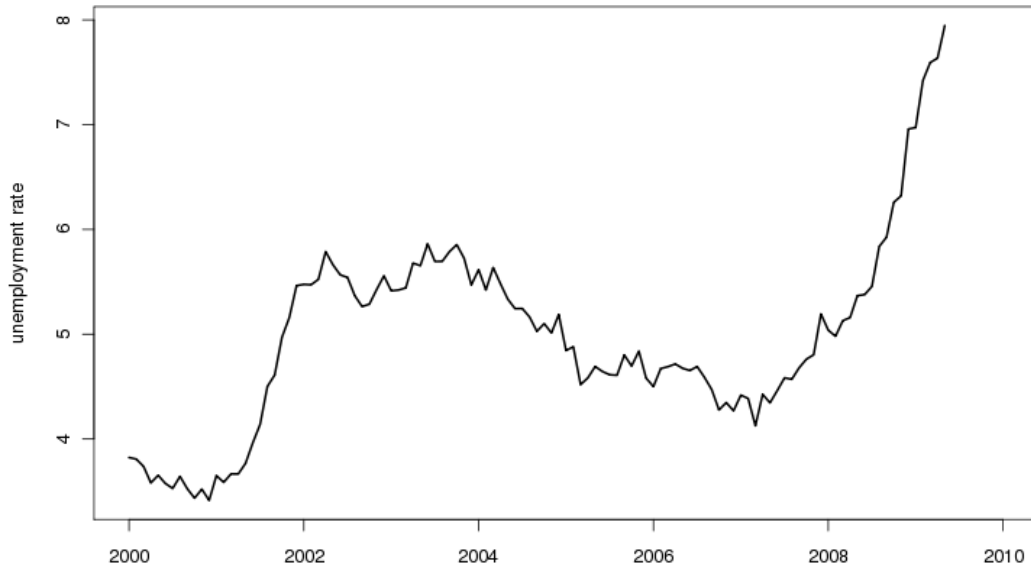
What is a Coincident Index Useful For?

- ▶ Sometimes, the data series that we use to estimate the coincident index look "jagged" or "saw-toothed."
- ▶ The "jaggedness" makes it difficult to discern whether a one-month increase in the unemployment rate represents a deterioration of local economic conditions or simply represents the natural fluctuations of the series.



Jagged Series

Rochester Unemployment Rate (seasonally adjusted)



Note: The series depicted above runs from January 2000 to May 2009.



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Jagged Series

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Note: The series depicted above runs from January 2000 to May 2009.



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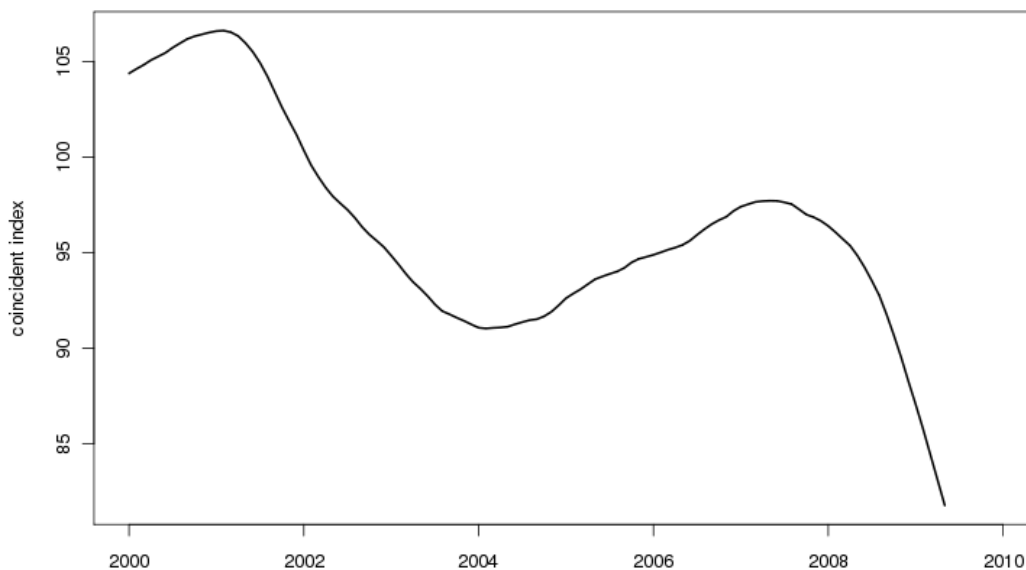
Forecasting the New York State Economy

What is a Coincident Index Useful For?

- ▶ Coincident indices filter out the "noise" in the data and give us an estimate of the ("smooth") underlying state of the economy.
- ▶ This enables us to quickly discern the trend in regional economic activity.
- ▶ A coincident index extracts the underlying "state of the economy" from the unemployment rate, nonfarm employment, real wages and average hours worked in manufacturing.

Smooth Series

Coincident Index of the Rochester Economy



Note: The series depicted above runs from January 2000 to May 2009.

What are the Limitations of a Coincident Index?

- ▶ We **cannot** compare one region’s coincident index to another.
- ▶ The indices are not comparable because each region’s index is measured in its own units:
 - ▶ New York City’s index is measured in “New York City coincident units.”
 - ▶ Rochester’s index is measured in “Rochester coincident units.”
- ▶ There is some debate about whether we can convert one set of “coincident units” to another.

What is a Coincident Index Useful For?

- ▶ Because the coincident indices are “smooth,” they follow AutoRegressive (AR) processes, which makes them relatively easy to forecast.
- ▶ Because the indices are relatively easy to forecast, they are very useful for forecasting variables that depend on the state of the economy.
- ▶ For example, if people’s ability to repay their mortgages depends on local labor market conditions, then we could use our coincident indices to forecast non-current loans and mortgage delinquency rates.

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What is a “Terraced” VAR?

- ▶ Because the coincident index is “smooth,” its future values depend on its own past values. i.e.: The coincident index follows an AutoRegressive (AR) process.
- ▶ Changes in other variables may, of course, influence the “state of the economy,” so we included such “leading variables” in our estimates of Vector AutoRegressive (VAR) models.
- ▶ Specifically, we estimated “Terraced” VARs, in which variables in the “upper terraces” influence variables in the “lower terraces,” but the reverse is not true.

What is a “Terraced” VAR?

- ▶ Unlike traditional VAR forecasting, “Terraced” VARs do not require exogenous and endogenous variables to be forecast in two separate steps.
- ▶ Instead the exogenous and endogenous variables are forecasted simultaneously, which enables us to obtain confidence intervals that depend only on the respective “predictor” variables.

Simple Example of a “Terraced” VAR

- ▶ Three variables:
 - ▶ change in the US index
 - ▶ change in the New York City index
 - ▶ change in the New York City unemployment rate
- ▶ **“Top terrace:”** the change in the US index depends only its own past changes.
- ▶ **“Middle terrace:”** the change in the New York City index depends on its own past changes and the past changes in the US index
- ▶ **“Bottom terrace:”** the change in the New York City unemployment rate depends on its own past changes and the past changes in the New York City index

Simple Example of a "Terraced" VAR

- ▶ Three variables:
 - ▶ change in the US index
 - ▶ change in the New York City index
 - ▶ change in the New York City unemployment rate

$$\begin{bmatrix} \Delta US_t \\ \Delta NYC_t \\ \Delta unemp_t \end{bmatrix} = \begin{bmatrix} \alpha_{US} & 0 & 0 \\ \beta_{US} & \beta_{NYC} & 0 \\ 0 & \gamma_{NYC} & \gamma_{unemp} \end{bmatrix} \begin{bmatrix} \Delta US_{t-1} \\ \Delta NYC_{t-1} \\ \Delta unemp_{t-1} \end{bmatrix} + \begin{bmatrix} u_{US,t} \\ u_{NYC,t} \\ u_{unemp,t} \end{bmatrix}$$

A Few Forecasts

Observed values and forecasts:

%Δ nonfarm employment			
	USA	NYS	NYC
Dec. 2007 to Dec. 2009	-6.3%	-2.7%	-2.7%
Dec. 2009 to Dec. 2010	-0.5%	-1.0%	-2.1%

Δ unemployment rate			
	USA	NYS	NYC
Dec. 2007 to Dec. 2009	+5.0 pts.	+4.4 pts.	+5.8 pts.
Dec. 2009 to Dec. 2010	+0.2 pts.	+0.3 pts.	+1.5 pts.

How Accurate Will These Forecasts Be?

- ▶ The forecast error covariance matrix enables us to obtain an imperfect, but useful estimate of the confidence interval.
- ▶ For example, the confidence interval around the forecast of New York City’s unemployment rate accounts for:
 - ▶ error in the prediction of variables that exogenously affect the unemployment rate (i.e. the US index, the NYC index, etc.)
 - ▶ random error in the prediction of the unemployment rate itself.
- ▶ Variables that do not affect the prediction (i.e. ones with a zero coefficient) do not affect the confidence interval.
- ▶ The imperfect 90% confidence interval around our Aug. 2010 forecast of 12.1% ranges from 8.8% to 15.4%.

How Accurate Will These Forecasts Be?

- ▶ “Why are the confidence intervals imperfect?”
- ▶ There are two sources of variance that our confidence intervals do not account for:
 - ▶ Revisions to the data used to make our forecasts.
 - ▶ “Sampling error” – We assume that the estimated parameters in our model are exactly equal to their true values.
- ▶ So – in practice – if we compared 1000 forecasts to their true values, **less than 900** of the true values would lie between the upper and lower bounds of the 90% confidence interval.
- ▶ These imperfections occur in all VAR model forecast confidence intervals (not just “Terraced” VARs).

“Don’t the Imperfections Bother You?”

- ▶ To our knowledge, there is no way to account for the effect of data revisions.
- ▶ We have a love-hate relationship with “bootstrapping,” which we could use to account for the sampling error.
 - ▶ The complexity of our “Terraced” VARs could introduce human error into the bootstrapped confidence intervals.
 - ▶ Our goal is to provide a general sense of the direction in which the economy is headed. Nothing that we are doing requires precise estimates of the distribution of the forecast error.
- ▶ These imperfections occur in all VAR model forecast confidence intervals (not just “Terraced” VARs).

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- ▶ We have used coincident indices to estimate the state of the underlying state of the economy.
- ▶ We have also shown how the indices can be used to forecast variables that are correlated with the state of the economy.
- ▶ Our innovative twist on traditional VAR modeling – “Terraced” VARs – enables us to simultaneously forecast both exogenous and endogenous variables and the confidence intervals around those forecasts.
- ▶ If one is willing to assume that sampling error is zero, then the forecasted confidence intervals also provide a good idea of how accurate the forecasts will be.