

A visual analysis of some macroeconomic series

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November 11th, 2014

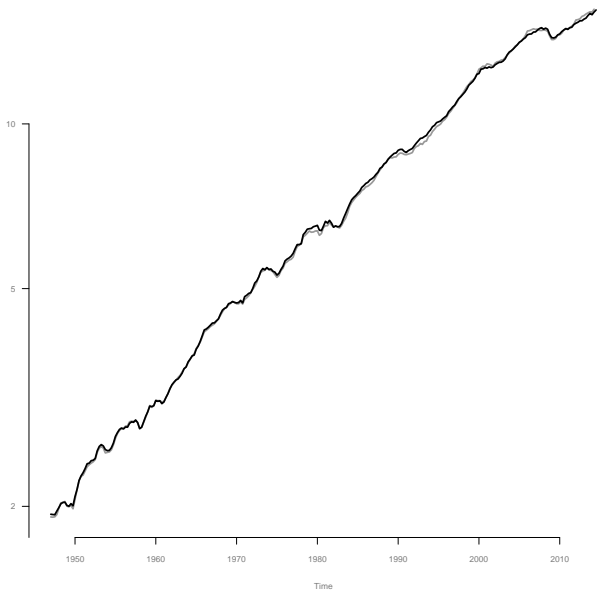
Introduction

- Look at some major US macroeconomic time-series
 - GDP
 - Inflation and price levels
 - Unemployment rate
- Also discuss some aspects of persistence
- Estimate a recession indicator based on the unemployment rate
- Focus on changes in trends and changes in recession dynamics
 - Difficult to model explicitly
 - Clearly important after visual inspection

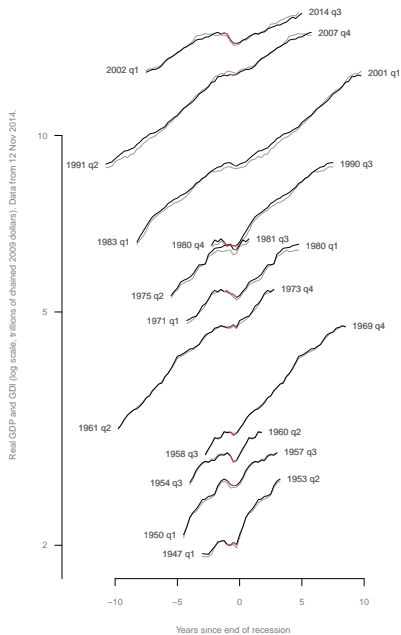
- Slides available online: http://pseudotrue.com/dl/graphics_slides.pdf
- Lots of macroeconomic data are available through “FRED”
<http://research.stlouisfed.org/fred2/> including “real time data”
 - Import from FRED into R with the *quantmod* package
- In this talk, I’m going to continue a long and esteemed tradition of pretending there are no data revisions

US real output, emphasis GDP

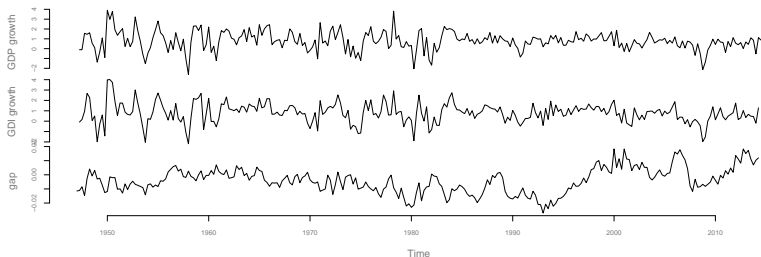
Real GDP and GDI (log scale, millions of chained 2009 dollars). Data from 12 Nov 2014.



US real output, emphasis GDP



Real GDP and GDI growth rates and discrepancy

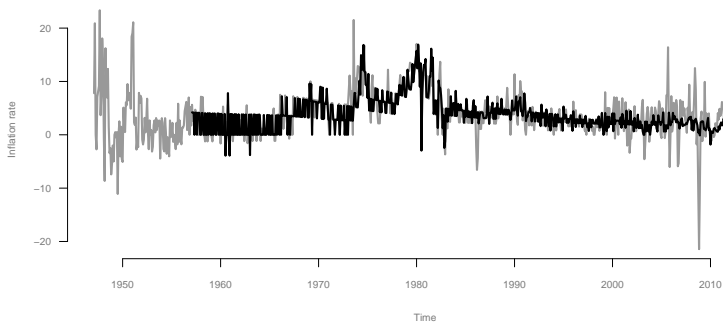


- The original series are (almost certainly) *cointegrated*, so modeling the first difference is inappropriate
- If we want to look at dynamics, we should estimate an Error Correction Model

$$\Delta y_t = a_0 + b(y_{2,t-1} - y_{1,t-1}) + \sum_{i=1}^4 A_i \Delta y_{t-i} + \varepsilon_t$$

- $\Delta y_t = (\Delta GDP_t, \Delta GDI_t)'$

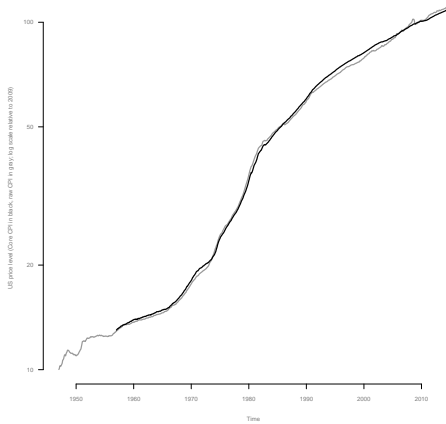
US CPI Inflation



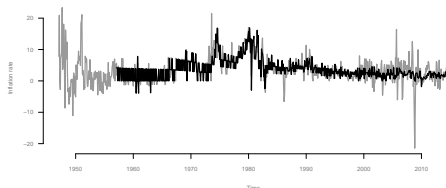
Interesting aspect of inflation

- The Federal Reserve has a **strong** influence on inflation through policy
 - Intentional disinflation in 1979 through early 80s
- Currently targets inflation rate (makes inflation $I(0)$, price levels (1))
- Talk of targeting price level or nominal GDP, both would make price level mean-reverting (around trend)

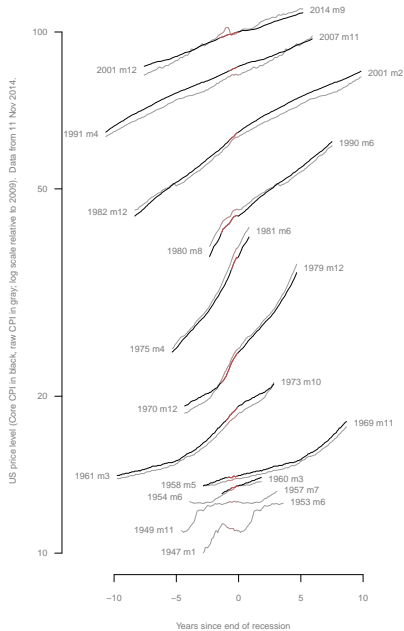
log US CPI



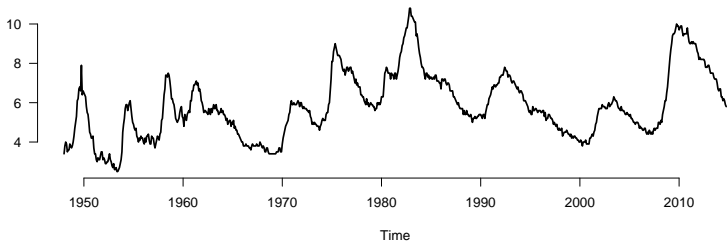
US CPI inflation



US CPI, piecewise and centered at recession troughs



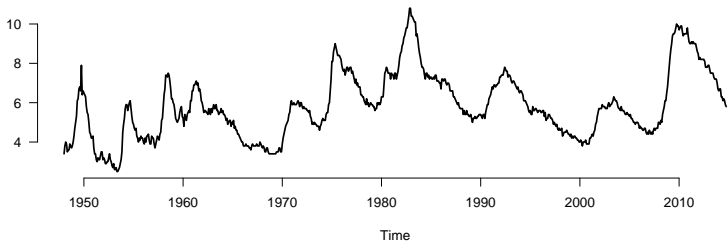
US Unemployment rate



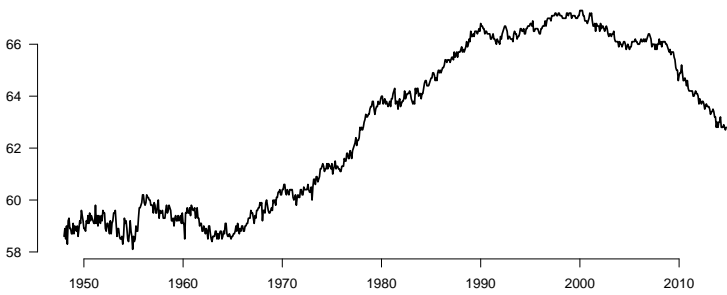
Remember, the unemployment rate is the percentage of people who are in the labor force but are not working

- If people leave the labor force because they can't find a job, the unemployment rate goes down!

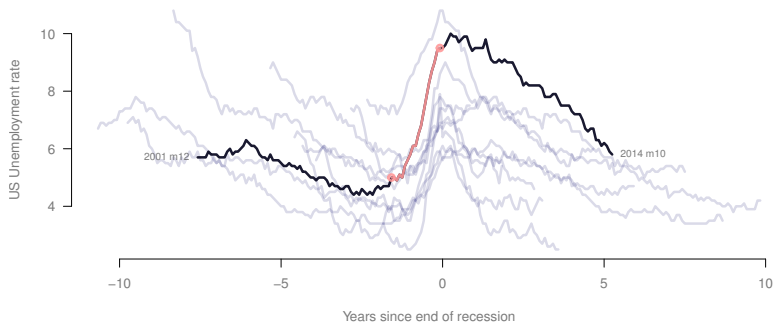
US Unemployment rate



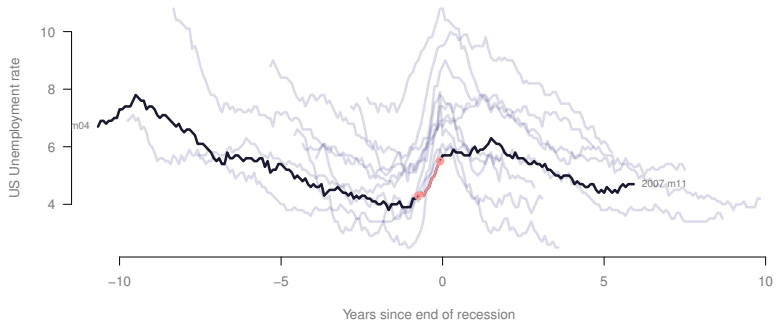
Labor force participation rate



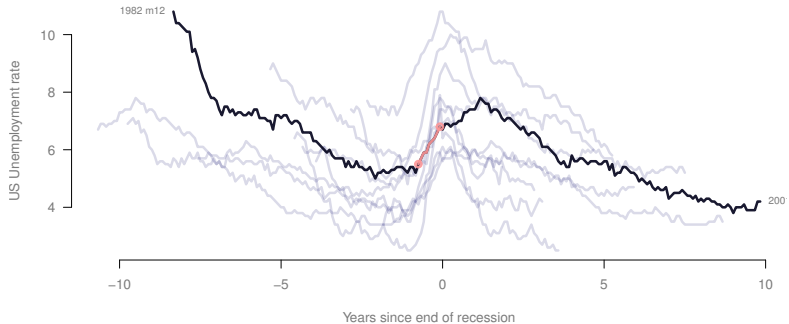
US unemployment rate, 2001 m12...2014 m10 (updated Wed Nov 12, 2014 at 00:02)



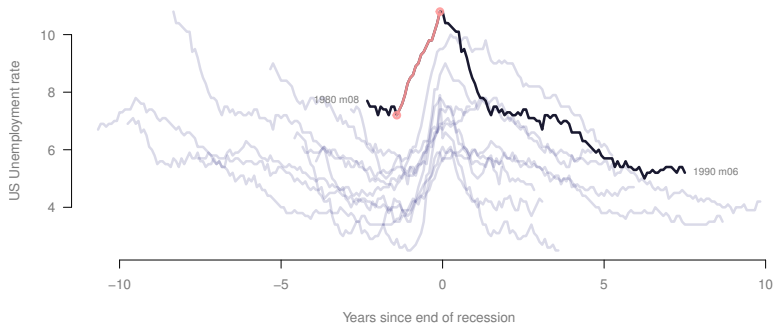
US unemployment rate, 1991 m04...2007 m11 (updated Wed Nov 12, 2014 at 00:02)



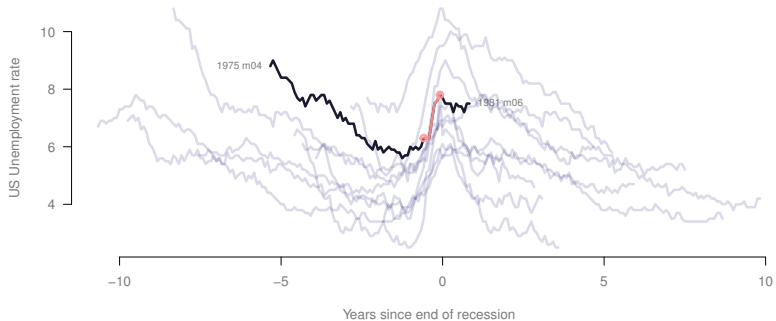
US unemployment rate, 1982 m12...2001 m02 (updated Wed Nov 12, 2014 at 00:02)



US unemployment rate, 1980 m08...1990 m06 (updated Wed Nov 12, 2014 at 00:02)



US unemployment rate, 1975 m04...1981 m06 (updated Wed Nov 12, 2014 at 00:02)



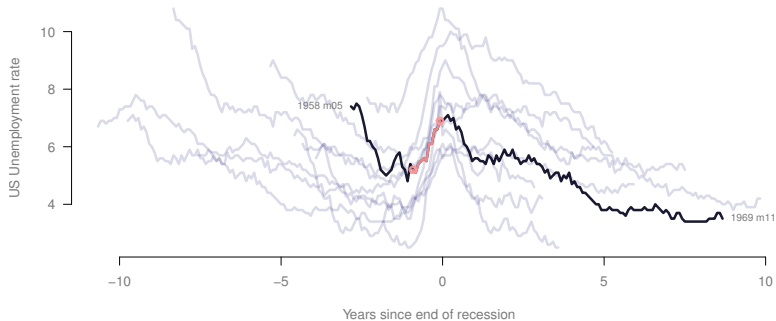
US unemployment rate, 1970 m12...1979 m12 (updated Wed Nov 12, 2014 at 00:02)



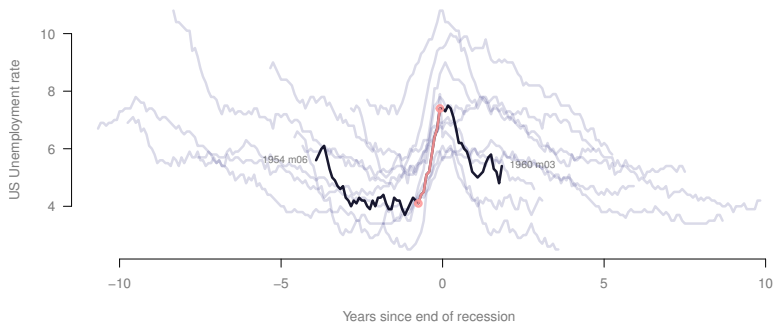
US unemployment rate, 1961 m03...1973 m10 (updated Wed Nov 12, 2014 at 00:02)



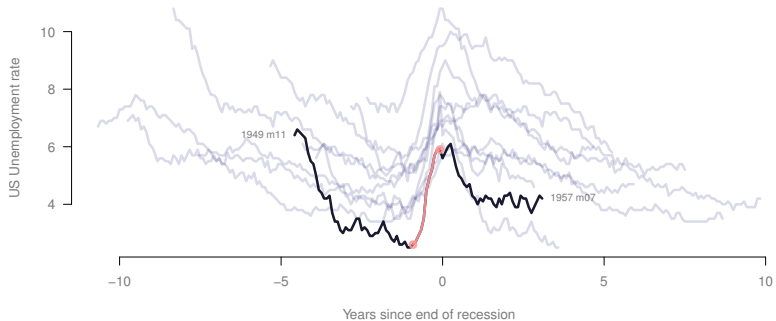
US unemployment rate, 1958 m05...1969 m11 (updated Wed Nov 12, 2014 at 00:02)



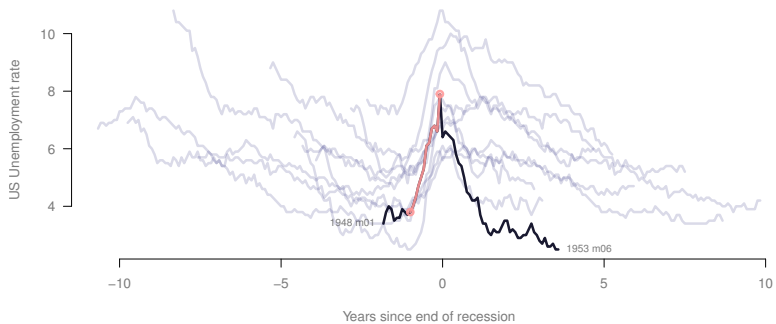
US unemployment rate, 1954 m06...1960 m03 (updated Wed Nov 12, 2014 at 00:02)



US unemployment rate, 1949 m11...1957 m07 (updated Wed Nov 12, 2014 at 00:02)



US unemployment rate, 1948 m01...1953 m06 (updated Wed Nov 12, 2014 at 00:02)



Short summary of past recoveries & recessions

- The most recent recession was huge
 - Unemployment rose a lot
 - GDP fell a lot
- The recovery from the last recession has been very steady
 - Initial recovery period more gradual than we saw in early 80s recessions and before
 - Also substantially longer (partly because of the size of the recession)
- The recovery/expansion is fairly long relative to past expansions

Are we in a recession right now?

- Probably not, but we may want to quantify it
- Jim Hamilton has a recession indicator using a simple state-space model (<http://econbrowser.com/recession-index>)
 - NBER recession dating is slow <http://www.nber.org/cycles.html>
- I want one too
 - Jim's too responsible to make fun predictions
 - I'd like to see whether we learn much from new data releases
- The model

$$S_t = \begin{cases} 1 & \text{if period } t \text{ is a recession} \\ 2 & \text{if period } t \text{ is not a recession} \end{cases}$$

$$\Pr[S_{t+1} = 1 | S_t] = \begin{cases} p & \text{if period } t \text{ is a recession} \\ q & \text{if period } t \text{ is not a recession} \end{cases}$$

$$\Delta \logit^{-1}(\text{unemployment}_t) | S_t \sim N(\mu_{S_t}, \sigma^2)$$

Are we in a recession right now?

- These models are fairly easy to estimate with MCMC/Gibbs
- Uninformative beta prior on p and q
- Uninformative Normal-inverse gamma prior on μ_1, μ_2, σ^2
- Want to know

$$\Pr[S_{T+1} = 1 \mid \text{unemployment}_1, \dots, \text{unemployment}_T] \quad (1)$$

and

$$\Pr[S_{T+1} = 1 \mid \text{unemployment}_1, \dots, \text{unemployment}_{T-1}] \quad (2)$$

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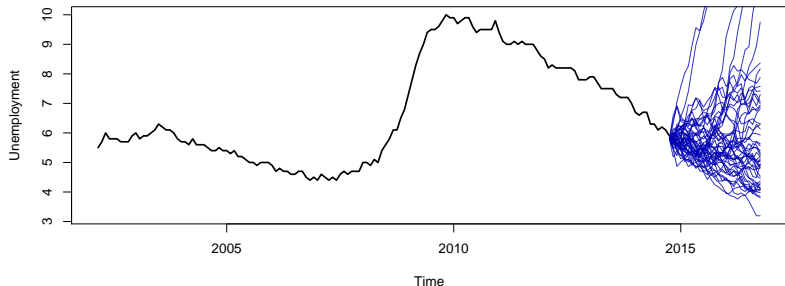
$$\Pr[S_{T+1} = 1 \mid \text{unemployment}_1, \dots, \text{unemployment}_{T-1}] \quad (2)$$

- (1): 2% probability we are in a recession in November (based on 1200 simulations)
- (2): 3.25% assigned probability before learning October's unemployment rate

Don't take the recession probabilities too seriously because the model is awful

- This model makes terrible forecasts
- It has missed historical recessions
- It occasionally predicts 6 year recessions

Sample unemployment rate forecasts from this model (blue)



Thanks!

- Thanks for coming!
- Comments are welcome
- Also over email: gcalhoun@iastate.edu