Cheers to the Good Health of the US Short-Run Phillips Curve

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University of Notre Dame, May 2012

[1] The views expressed herein are those of the author and should not be attributed to the International Monetary Fund, its Executive Board, or its management.

Outline of the Talk

- Time series evidence
- Definition of inflation target (trend inflation)
- Dynamic New-Kynesian model simulations

Motivation

Relatively large literature on death of PC and real/nominal dichotomy

- Giannone, Reichlin and Sala (2004):
  "The bulk of medium- and long-run dynamics of output is explained by one shock that has similar effects on al real variables and the bulk of medium- and long-run dynamics of inflation by a shock, orthogonal to it, that has similar effects on all nominal variables."
- Smets and Wouters (2007), inflation dominated by cost-push shocks
- Stock and Watson (2005)
- Ball and Mazumder (2011) – Great Recession provides the evidence against the New Keynesian Phillips Curve with rational expectations.
- Dynamic factor models literature supports real/nominal dichotomy

Main findings & conclusions

US short-run Phillips curve is alive and well!

1. Stable relationship between unemployment and inflation across wide frequency band
2. Cyclical frequencies determined by spectral properties of deviation of inflation from long-term expectations survey
3. One principal component explains most variation in output, unemployment and inflation across business cycles, unlike in Stock and Watson (2005)
4. New-Keynesian forward-looking Phillips Curve is consistent with the US data
5. It is crucial to model long- and short-lived cost-push shocks and inflation target
6. Demand cycles drive most of US inflation dynamics

Time series analysis

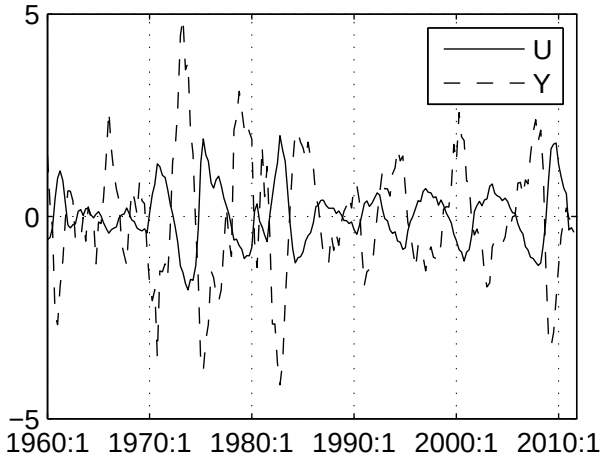
Data used:

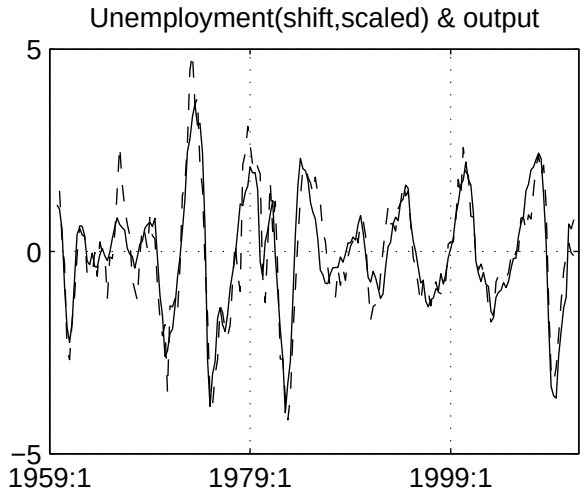
1. Unemployment rate
2. Real GDP (and its components)
3. Capacity utilisation
4. FRB Dallas Trimmed Mean Inflation
5. FRB Cleveland Median and Trimmed Mean Inflation consumption deflator, cons. deflator ex food and energy

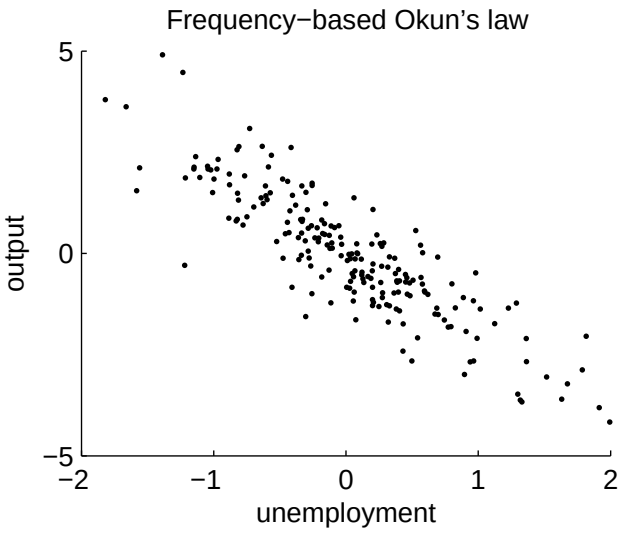
Extraction of cyclical information

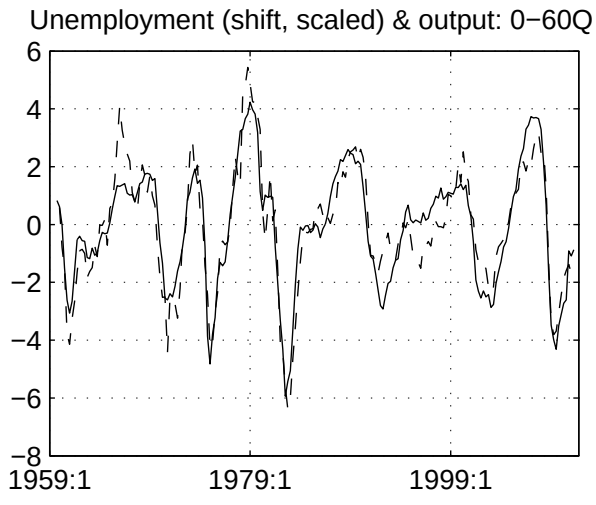
1. Frequency-domain based band-pass filter with Hamming window, see e.g. Iacobucci and Noullez (2005)
2. Christiano-Fitzgerald band-pass filter
3. Frequency-selective dynamic PCA filter (Andrle 2012, Pollock 2003)

Real business cycle co-movements (0-32 0-60)







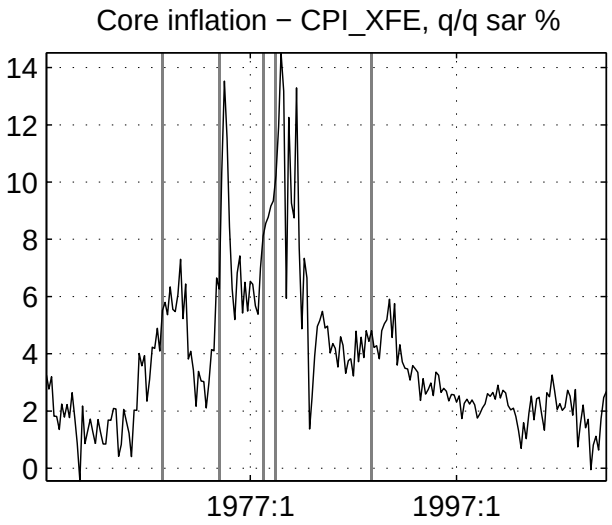


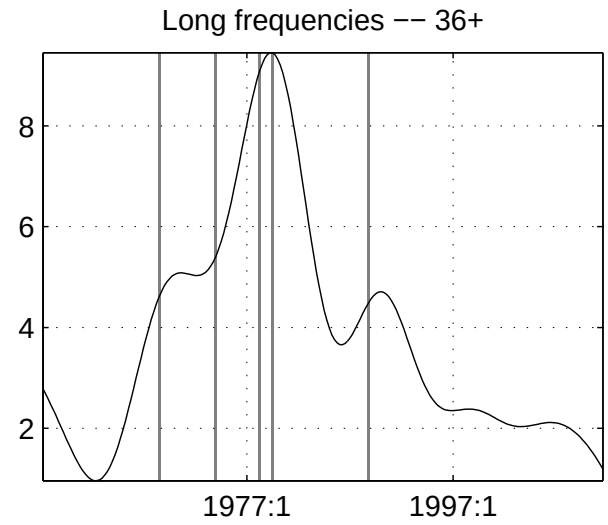
Linking real economy to inflation

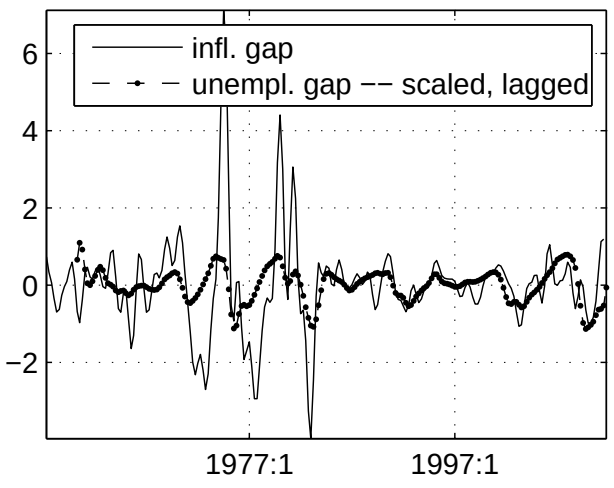
Intuitively, three types of drivers of inflation

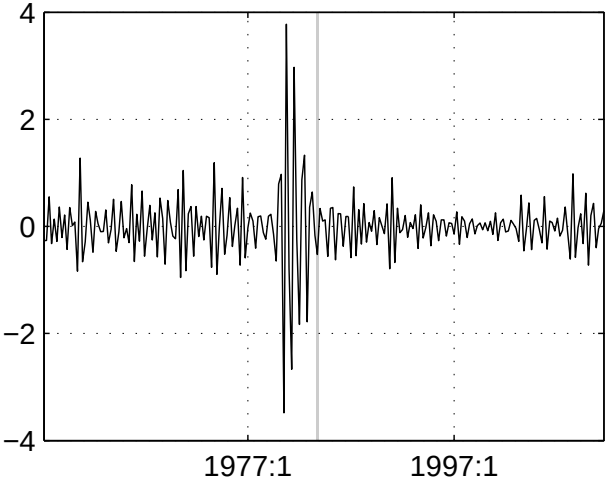
1. inflation target or long-term inflation expectations
2. high-frequency volatility, mis-measurements, market churning
3. sustained increase in inflation to cyclical changes in real marginal costs

Slicing inflation. . .

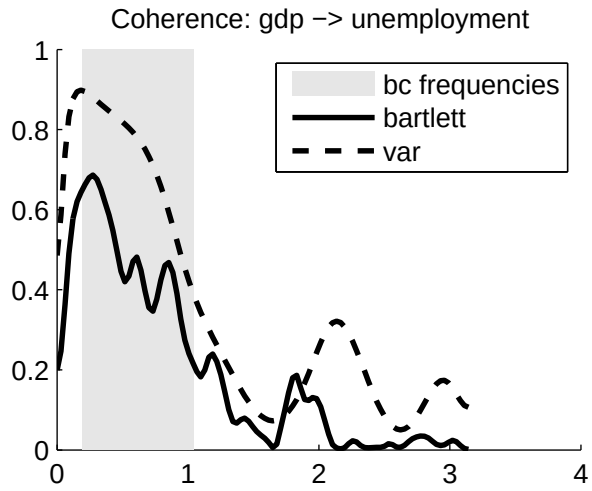


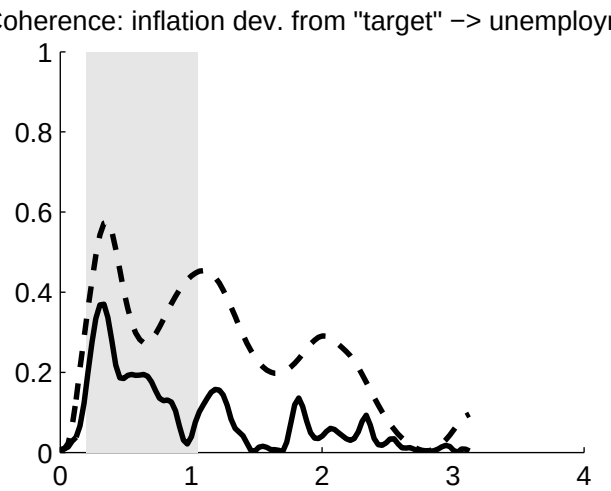






Real and nominal coherence





Inflation dynamics in layers

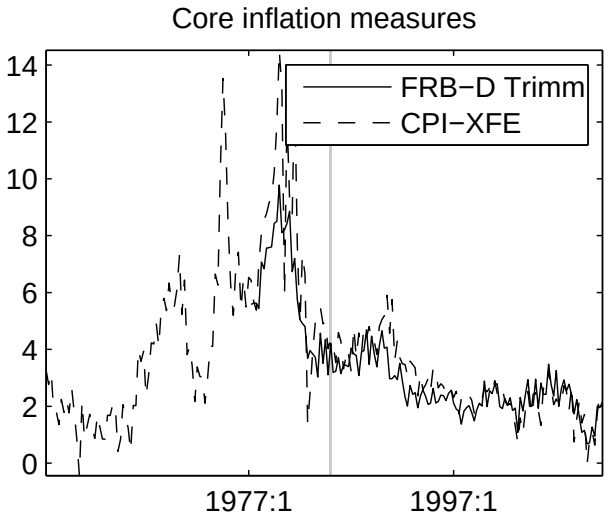
Inflation target (implicit in US) ⇒ long-term inflation expectations

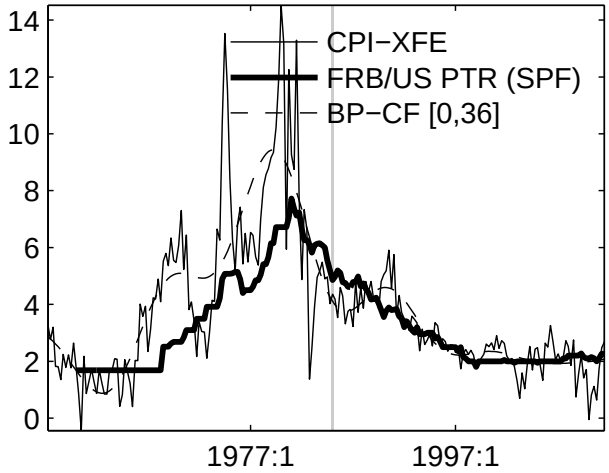
- a priori one hopes for stable inflation target (trend shifts)
  (e.g. Czech Republic official target and band-pass trend almost coincide. . .)
- I use FED's 'target' data (FRB/US model's PTR) based on Survey of Prof. Forecasters 10Y expectations
- I select bandwidth that minimizes distance between the band-pass component of inflation and deviation of inflation from long-term infl. expectations

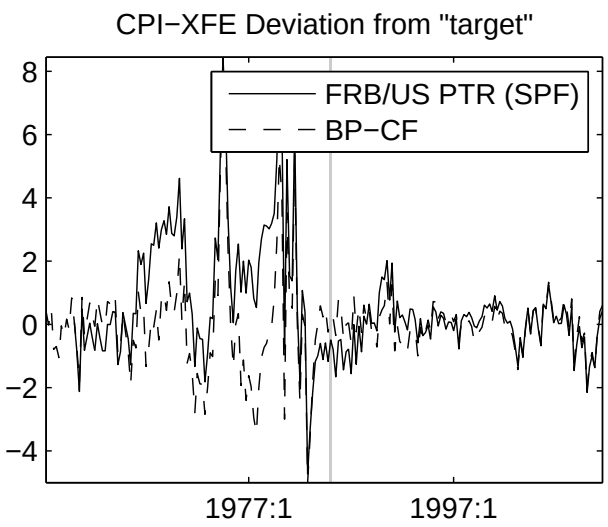
High-frequency variations

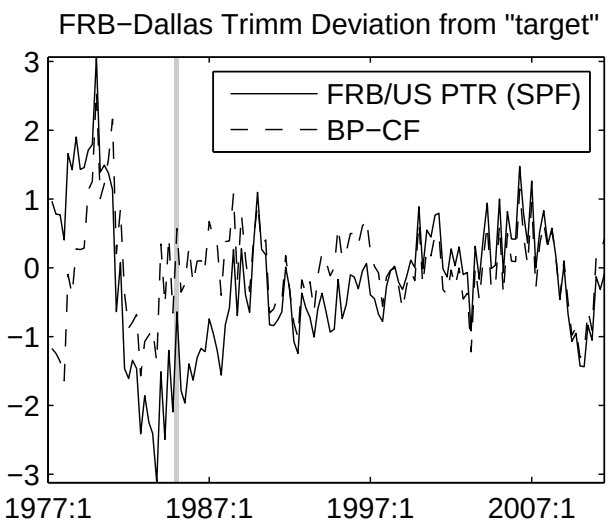
- explicit account of short-lived cost-push shocks
- relevant not only for emerging market economies. . .
- frequency-based view on core inflation vs. price changes distribution

Searching for an ‘inflation target’…(a)

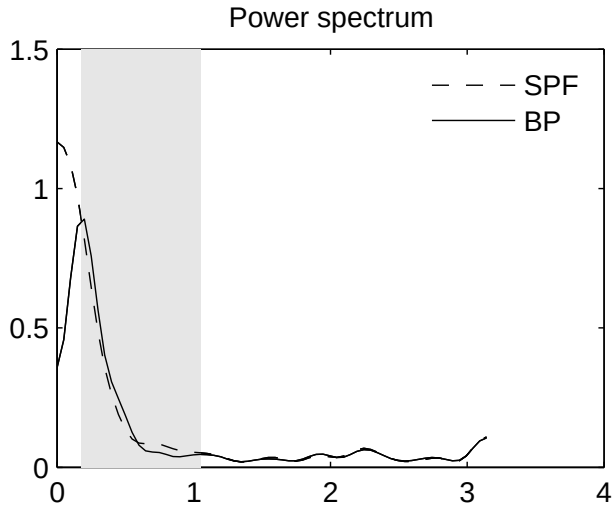


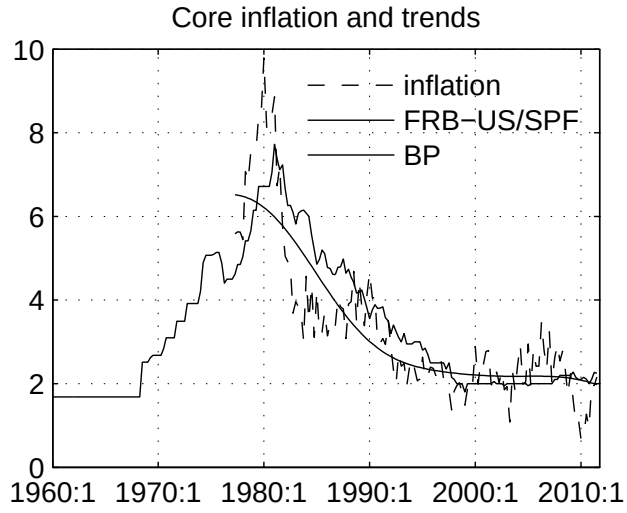


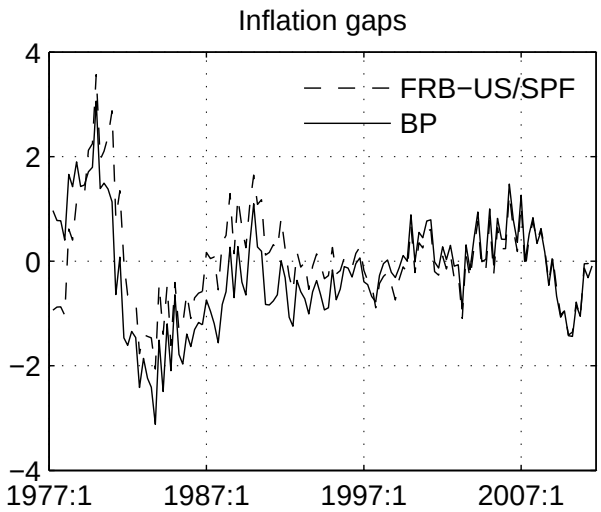


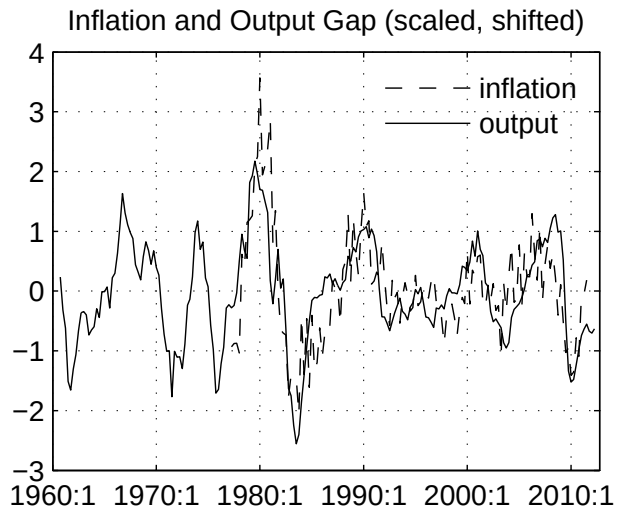


Searching for an‘inflation target’…(b)









Principal component analysis

Dynamic principal component analysis as a prelude to structural model. . .

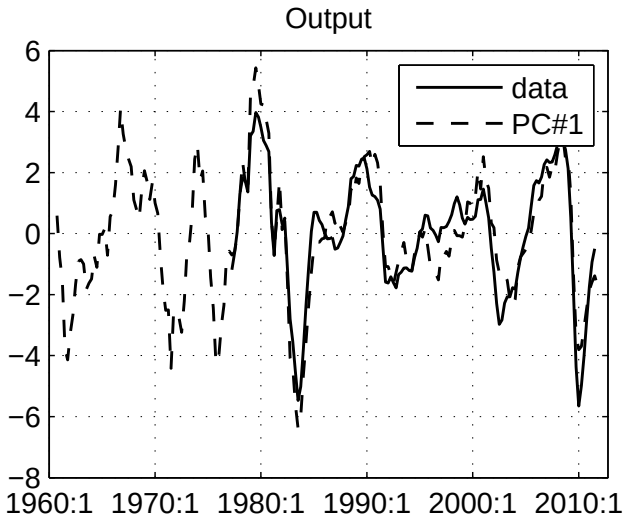
Two approaches:

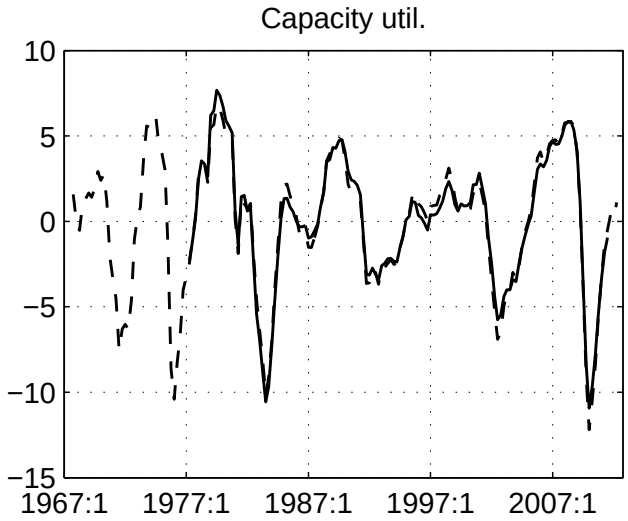
- dynamic principal components filter (Brillinger, 1984)
- static principal components + phase shift + frequency specific filter

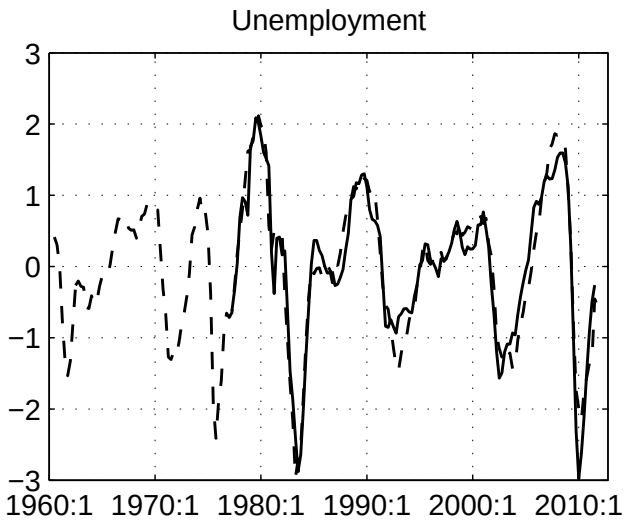
Both methods deliver quite similar results:

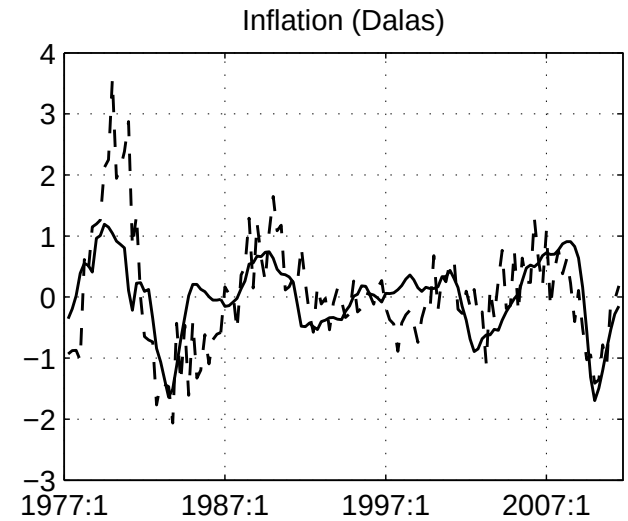
1. Single principal component explains virtually all cyclical dynamics of real variables
2. Single principal component can explains real & nominal business cycle dynamics!

Principal component analysis









Simple monetary model (a)

The Model

$$\hat{y}_t = \alpha_1 \hat{y}_{t+1} + \alpha_2 \hat{y}_{t-1} - \alpha_3(\hat{r}_t + rp_t) + \varepsilon_t^{\hat{y}} \tag{1}$$

$$\hat{\pi}_t = \lambda_1 \hat{\pi}_{t+1} + (1-\lambda_1)\hat{\pi}_{t-1} + \widehat{rmc}_t + \varepsilon_t^{\hat{\pi}} \tag{2}$$

$$i_t = \rho_i i_{t-1} + (1-\rho_i)[(r_{eq,t} + \pi^{\star}_{t+1}) + \iota_\pi(\pi^{c}_{y/y,t+3} - \pi^{\star}_{t+3}) + \iota_{\hat{y}}\hat{y}] + \varepsilon_t^{i} \tag{3}$$

$$r_t = i_t - \pi^{c}_{t+1} \tag{4}$$

$$\hat{r}_t = r_t - r_{eq,t} \tag{5}$$

$$\hat{\pi}_t = \pi_t - \pi^{\star}_t \tag{6}$$

$$\pi^{c}_t = \pi_t + \varepsilon^{c}_t \tag{7}$$

$$\hat{u}_t = \alpha \hat{u}_{t+1} + (1-\alpha)\hat{u}_{t-1} + \xi \hat{y} + \varepsilon_t^{u} \tag{8}$$

$$\widehat{rmc}_t = \hat{u}_t \tag{9}$$

$$i^{(N)}_t = \tau^{(N)}_t + \frac{1}{N}\sum_{j=0}^{N-1} i_{t+j} + \varepsilon^{i(N)}_t \qquad \text{for } N = 4, 20, 40 \tag{10}$$

$$y_t = y_{eq,t} + \hat{y}_t + \varepsilon^{y}_t \tag{11}$$

$$y_{eq,t} = y_{eq,t-1} + \mu_t + \varepsilon^{l}_t \tag{12}$$

$$\mu_t = \rho_\mu \mu_{t-1} + (1-\rho_\mu)\bar{\mu} + \varepsilon^{\mu}_t \tag{13}$$

$$r_{eq,t} = \rho_r r_{eq,t} + (1-\rho_t)[(y_{eq,t+1} - y_{eq,t}) - \log(\beta)] + \varepsilon^{r}_t \tag{14}$$

Simple Monetary Model (b)

Time series analysis seems in favor of a short-run Phillips Curve. Model follows broadly Blanchard and Gali (2008).

Key model properties:

- Long-run money neutrality, vertical long-run PC (LR-PC)
- Expectational short-run Phillips curve
- Long- and short-lived cost-push/markup shocks
- Policy shocks: (i) inflation target (ii) interest rate rule deviations
- Simple 'Okun's law'
- Observations on yield curve to indicate long-term infl. expectations

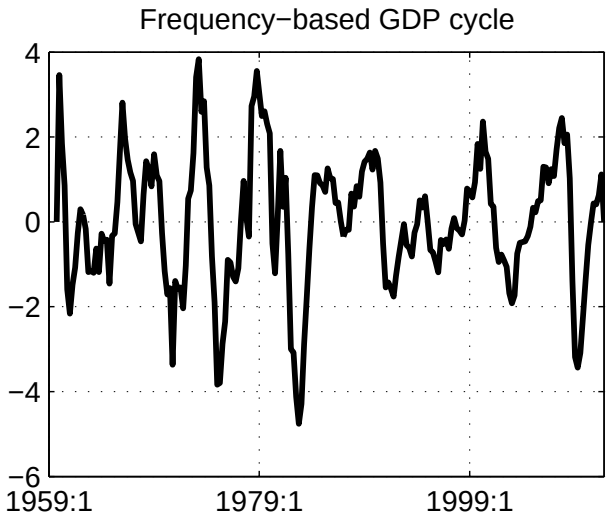
Counter-factual scenario (a)

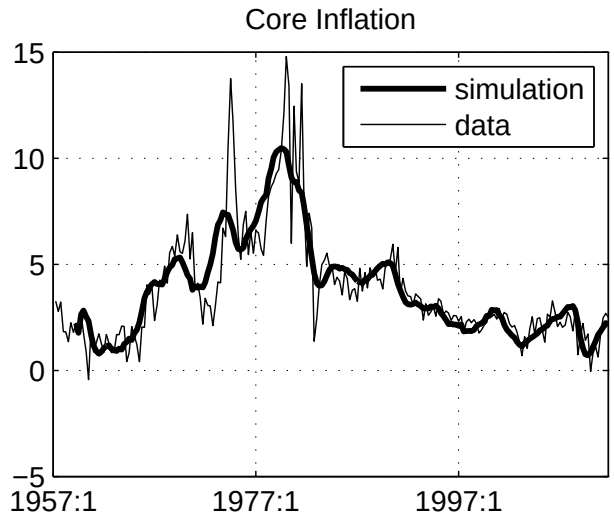
Setup:

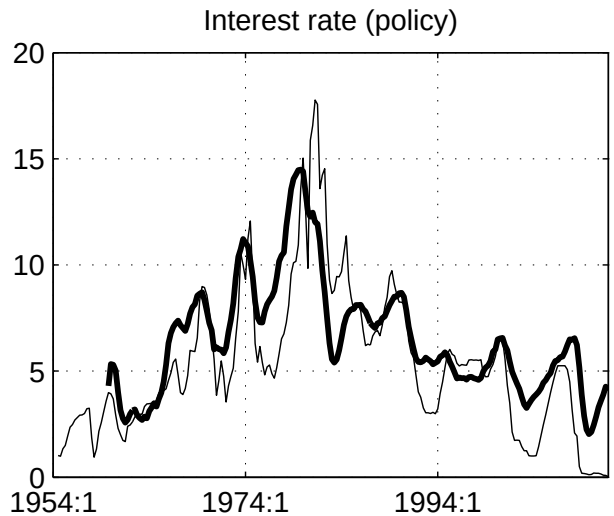
1. Condition on the path of GDP cycle from freq. specific filter (0-60)
2. Condition inflation target as consistent with long-term expectations

The model parameterization reflect the choice of inflation target variable, which determines band-width and persistence of the output cycle

Counter-factual scenario – [0,32] (b)







Work in progress. . .

Related and ongoing work relating inflation and real economy

- Medium-scale DSGE model with structure explaining the “common factor”
- Estimator of stochastically singular DSGE models (Andrle 2012, CEF)
- Optimal filter design for real time analysis and forecasting

Conclusions

- Short-run US Phillips curve is still with us, even in the crisis!
- One factor explains most of real nominal cycle
- Inflation gap is becoming an observed variable due to FED
- Inflation gap determines cyclical frequencies of interest, which are far beyond 0-32 quarters
- Stylised, forward-looking model is consistent with the evidence
- Inflation dynamics with long-, cyclical- and high-frequency dynamics is for structural model shock identification

Thank you for your patience. . .