

Discussion of “Why Has Inflation Remained So Low for So Long?”

By Robert King

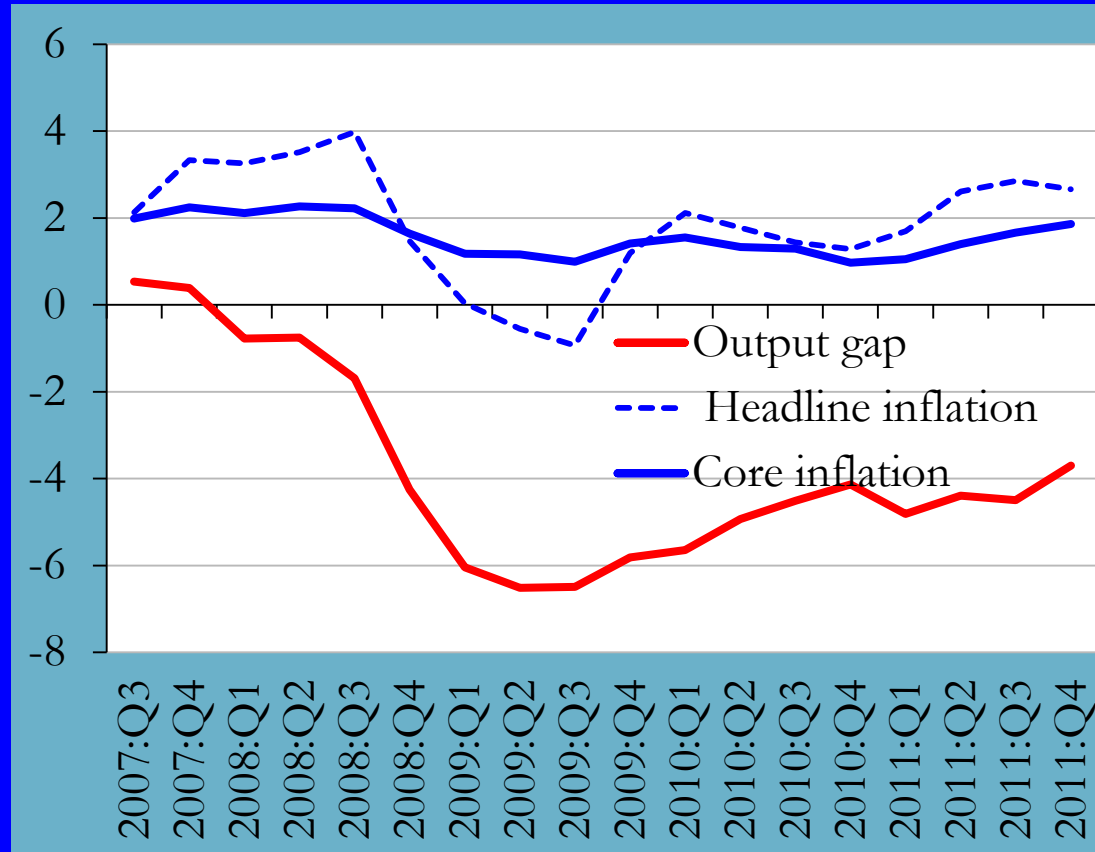
(with many comments that are only
partly motivated by Bob’s paper)

October 15, 2016

Jeff Fuhrer, EVP, Federal Reserve Bank of Boston

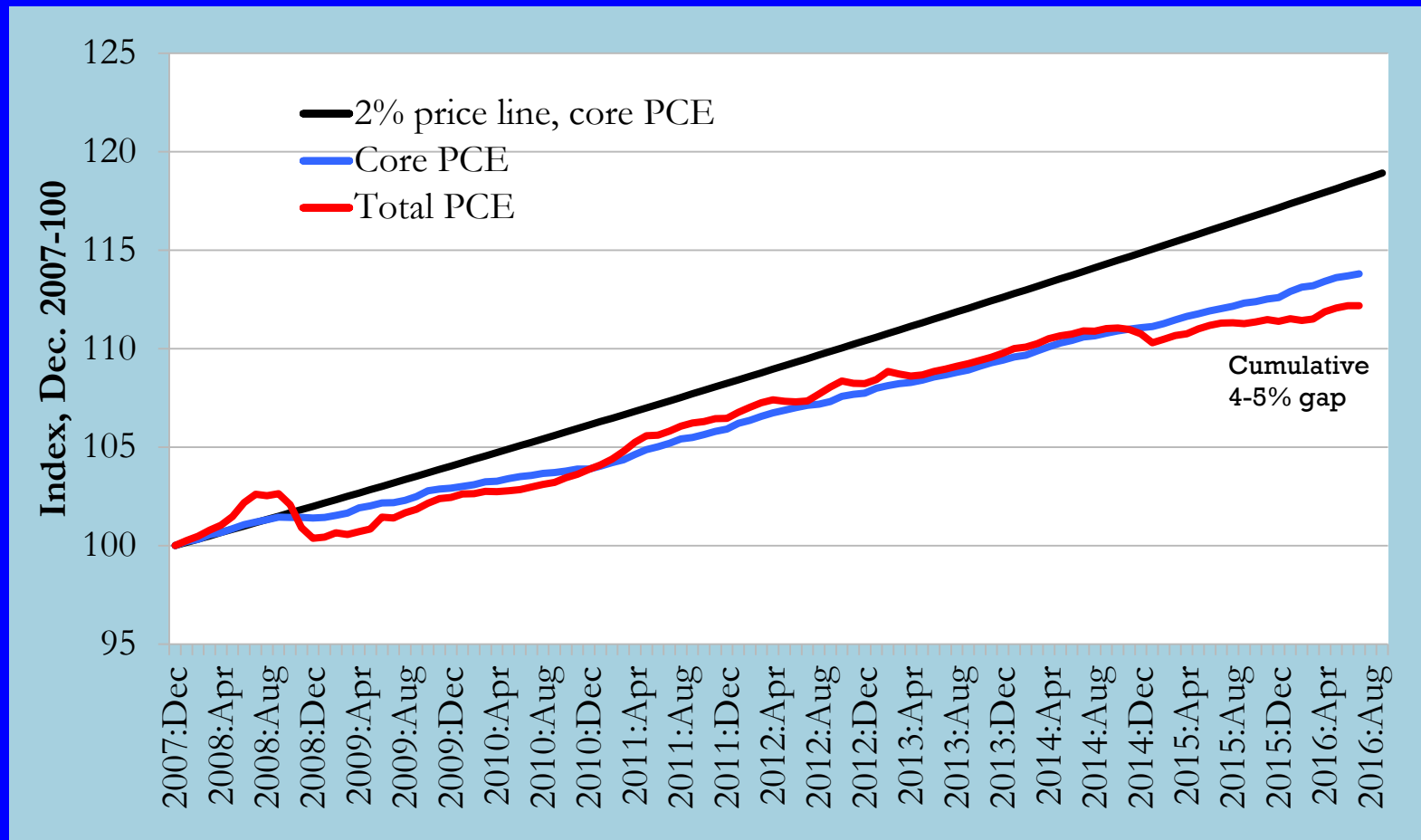
Actually, inflation appeared to be *too high* for a while

- Great Recession produced an enormous output/employment gap
- Yet inflation fell only a little
- This may be the larger puzzle
- The quick and dirty answer: Long-run expectations remained well-anchored
- “Anchored expectations” doesn’t mean “inflation will not budge, even during a huge recession”

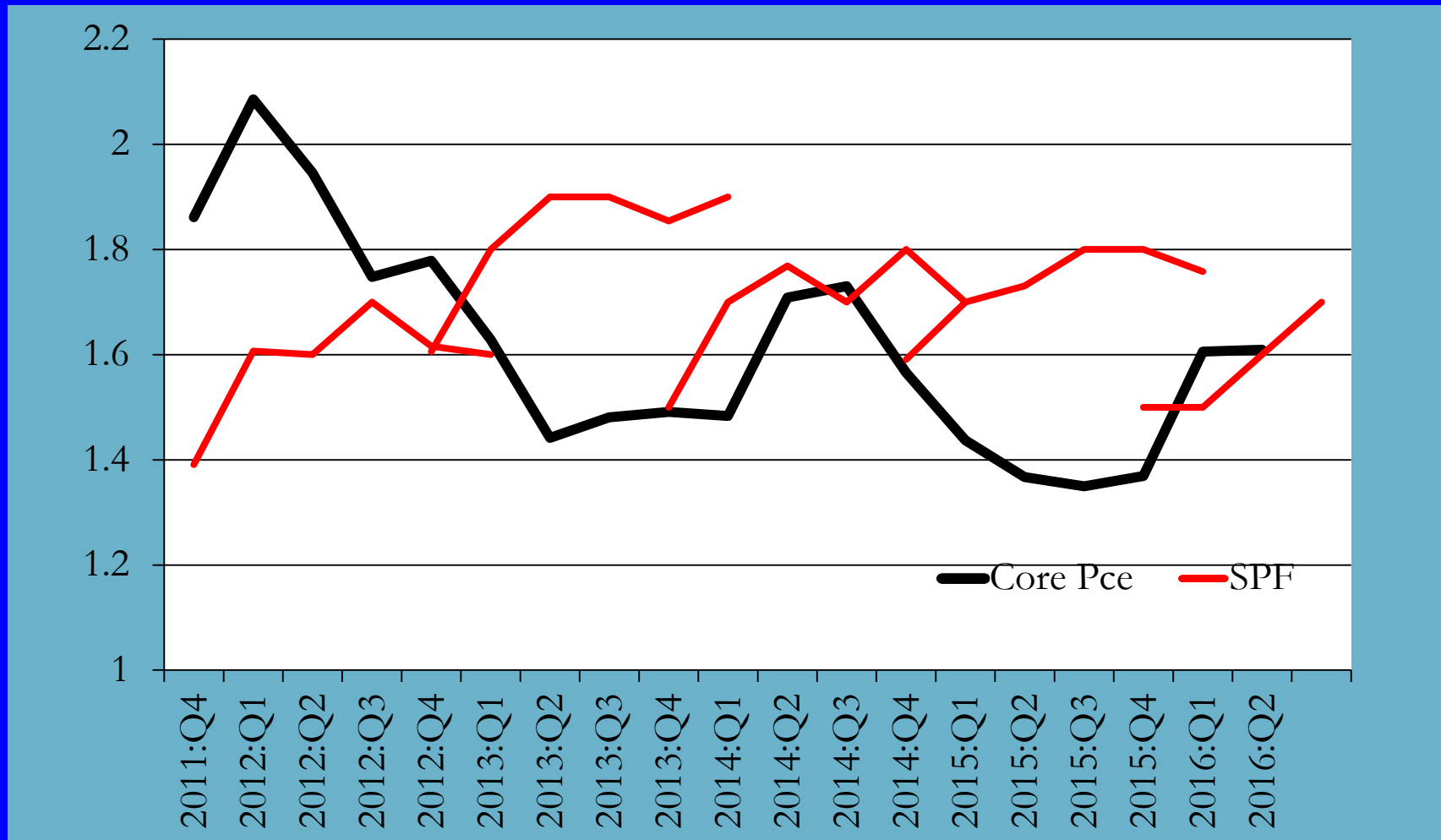


More recently, inflation has been low. Compared to what?

- ▣ Compared to the 2% target



Compared to real-time forecasts



Note: magnitude of most recent surprise is small by historical standards

- ▣ RMSE for inflation forecasts, recent history

RMS Forecast errors, SPF Core PCE, 2007-present	
Horizon	RMSE
Current quarter	0.50
t+1	0.58
t+2	0.60
t+3	0.60
t+4	0.58

- ▣ Current core PCE: 1.7% (12-month)
- ▣ 0.3 ppt below target is well within forecast accuracy
- ▣ We'll come back to this.

Simple qualitative explanations of low inflation

- ▣ The output/employment gap is not yet zero
- ▣ Real marginal cost/labor share remains low, even accounting for trend
- ▣ So inflation has been a little low
- ▣ That's a pretty good Squawk Box explanation, but you might want something more substantial...

What should we have expected?

- ▣ Depends on what modeling framework one uses
 - Accelerationist Phillips curve?
 - New-Keynesian Phillips curve?
 - So-called “anchored expectations” “model”?

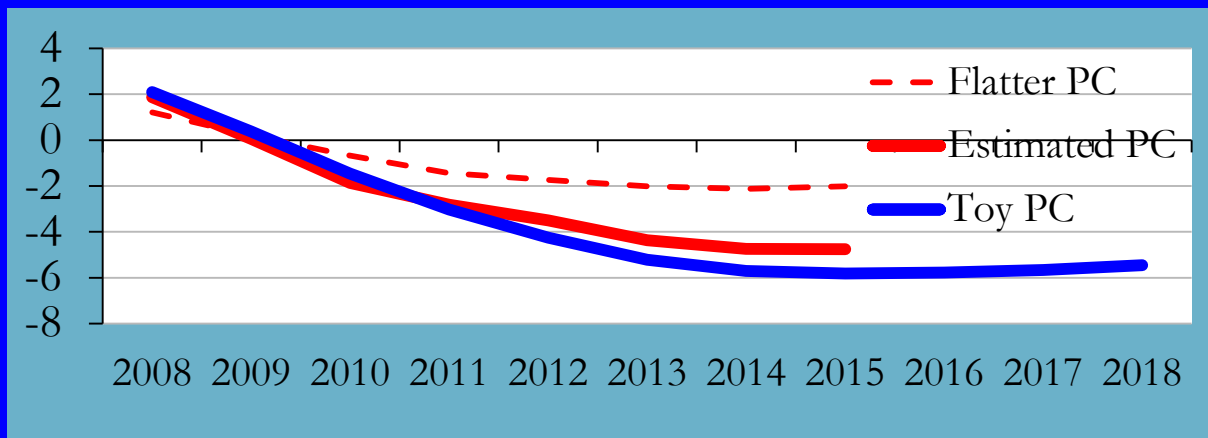
Quantitative explanations

(1) Accelerationist Phillips curve

▣ Accelerationist Phillips curve (toy version)

$$\pi_t = \pi_{t-1} - \beta(U_t - U_t^*) + \varepsilon_t$$

- Defines the change in inflation; CB influences changes so as to attain its target
- Once inflation is below the central bank's target, must have a period of below-NAIRU unemployment to get it back up
- Could be that's why inflation is stubbornly low today
- But look at this model's forecast for inflation during recession:



Simple quantitative explanations:

(2) New-Keynesian Phillips curve (with RE)

- ▣ Inflation importantly linked to “fundamental inflation”—the discounted expectations of output or real marginal cost

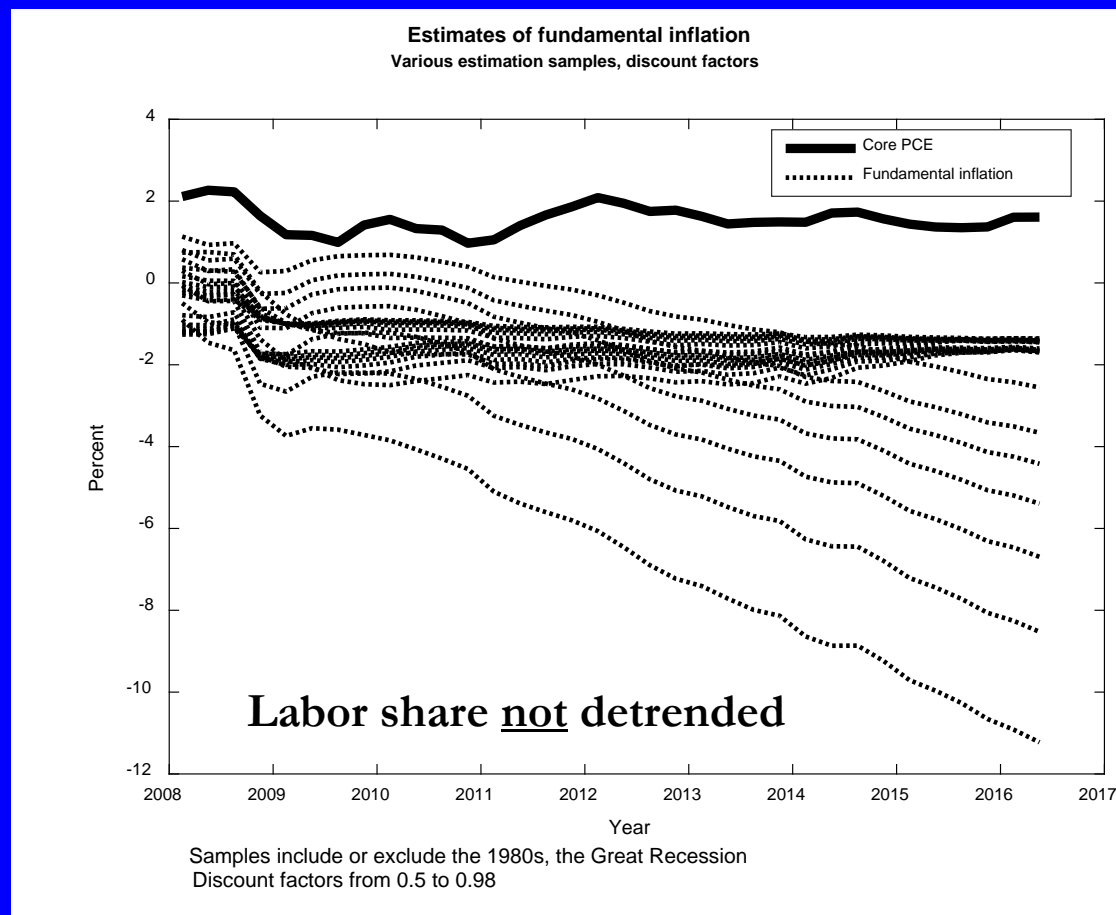
$$\pi_t = \omega\pi_{t-1} + (1-\omega)\pi_t^F + \mu_t$$

$$\pi_t^F = \lambda \sum_{j=0}^{\infty} \beta^j E_t s_{t+j}$$

- ▣ Papers differ in their claims for the success of the NKPC in explaining inflation during the GR
 - Del Negro *et al* find a model that fits the data fairly well
 - Next slides present some estimates of fundamental inflation
- ▣ NB: Expectations are perfectly anchored in this model

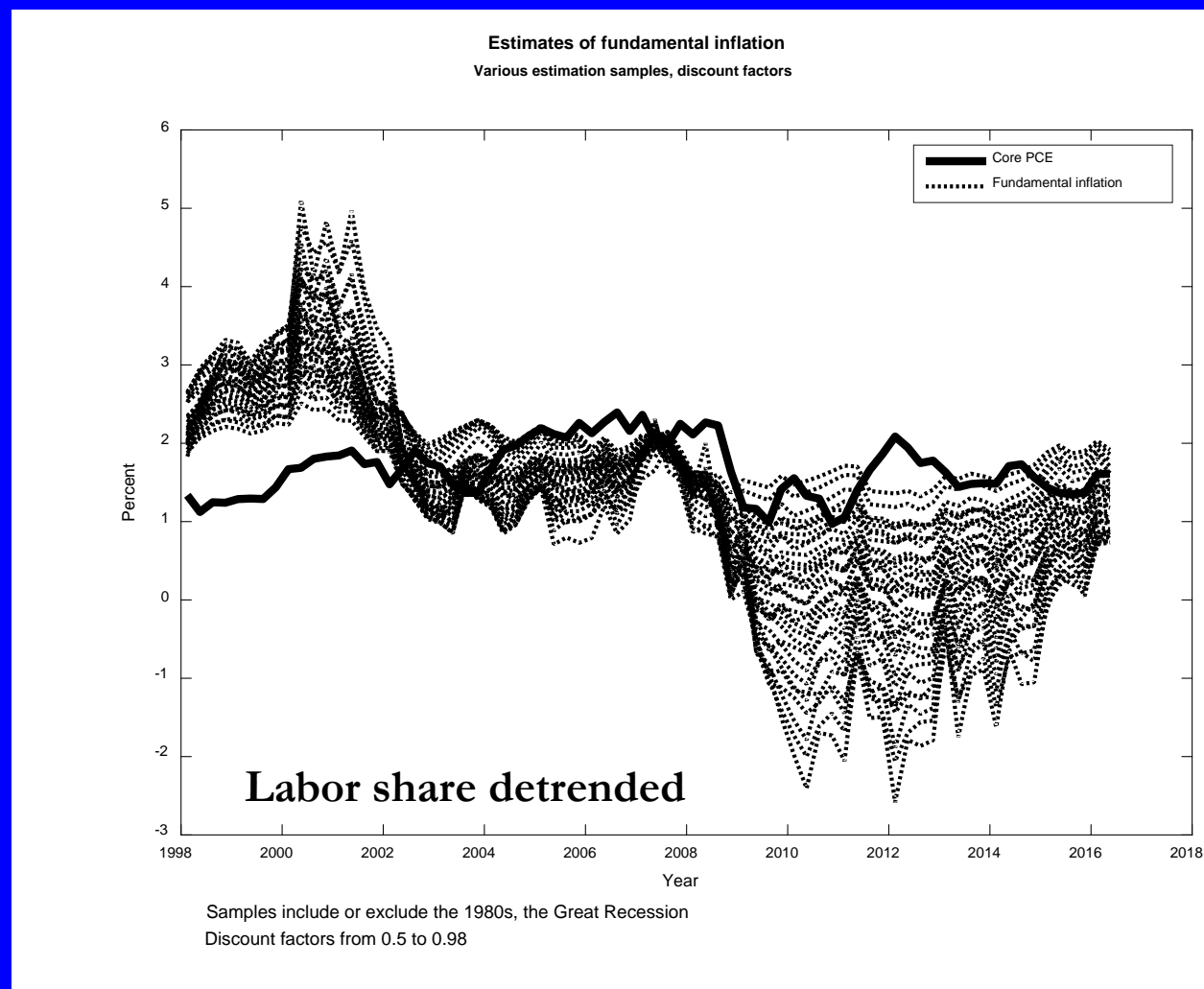
Estimates of fundamental inflation

- Method: Like King-Watson (2012). 8-variable VAR (includes long-run infl. expectations, output, wages, ulc, C, I, ff)
- Add an identity defining fundamental inflation, using VAR forecasts of labor share
- Trend in labor share is a serious problem
 - King and Watson point this out



Estimates of fundamental inflation

- Use detrended labor share
 - Where does trend come from?
- Most of these estimates of “fundamental” inflation have a hard time explaining recent inflation
- They generally suggest that inflation should have been even lower than it has been
 - Similar results using output gap instead of L share



Quantitative explanations:

(3) “anchored expectations” models

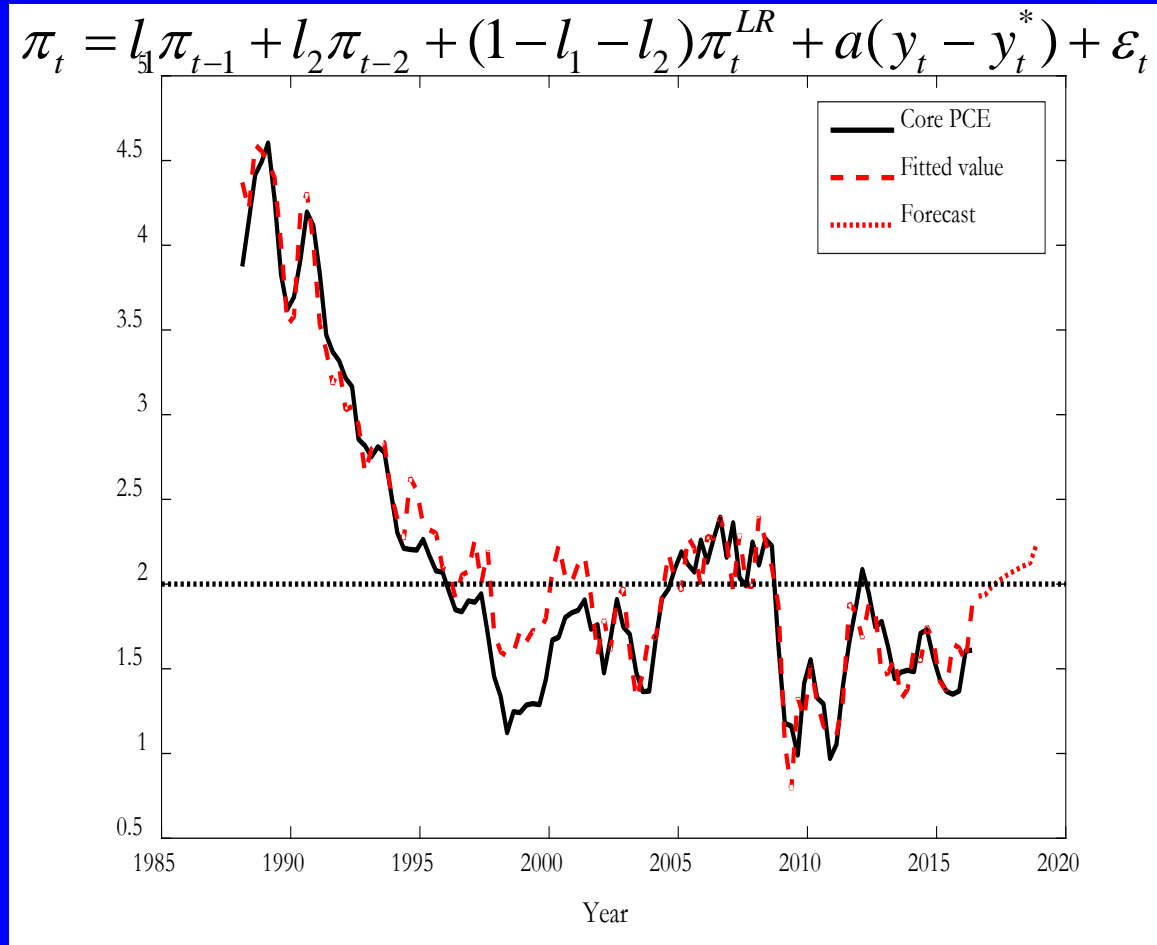
- ▣ The simple version

$$\pi_t = \pi_t^{LR} + a(y_t - y_t^*) + \varepsilon_t; \pi^{LR} = \pi_{CB}^* ?$$

- ▣ As output gap disappears, inflation goes to long-run expectation
 - Somewhat like NKPC, but only LR expectations are explicit
- ▣ Important that the long-run expectation remain “anchored”—i.e. fixed at CB target
 - If not, inflation could settle somewhere other than CB target, even as output goes to equilibrium
 - How does a CB make sure that is the case?

Do anchored expectations models work (empirically)?

- ▣ They kinda do
 - Long-run expectations capture the trend
 - The gap captures some of the up and down prior to and during the recession
 - Puzzle for this model: Output gap is probably nearly closed, possibly turning positive in the coming years
 - But inflation is still below 2%
 - But not a huge puzzle



Long-run expectations = FRB/US PTR; output gap uses CBO estimate of potential GDP; estimation from 1998:1-2016:2

How does the “anchored expectations” model really work?

- ▣ The model says that once we get output to equilibrium, inflation equals long-run expected inflation
- ▣ But not explicitly because the central bank is acting to move inflation toward the target
- ▣ In fact, the CB could just target output, and inflation would always return to the long-run expectation

$$\pi_t = l_1 \pi_{t-1} + \pi_t^{LR} + \beta(y_t - y_t^*); \pi_t^{LR} = \pi^*$$

$$y_t = E y_{t+1} - \sigma(f_t - E \pi_{t+1} - 2)$$

$$f_t = 2 + \pi^* + a_y(y_t - y_t^*)$$

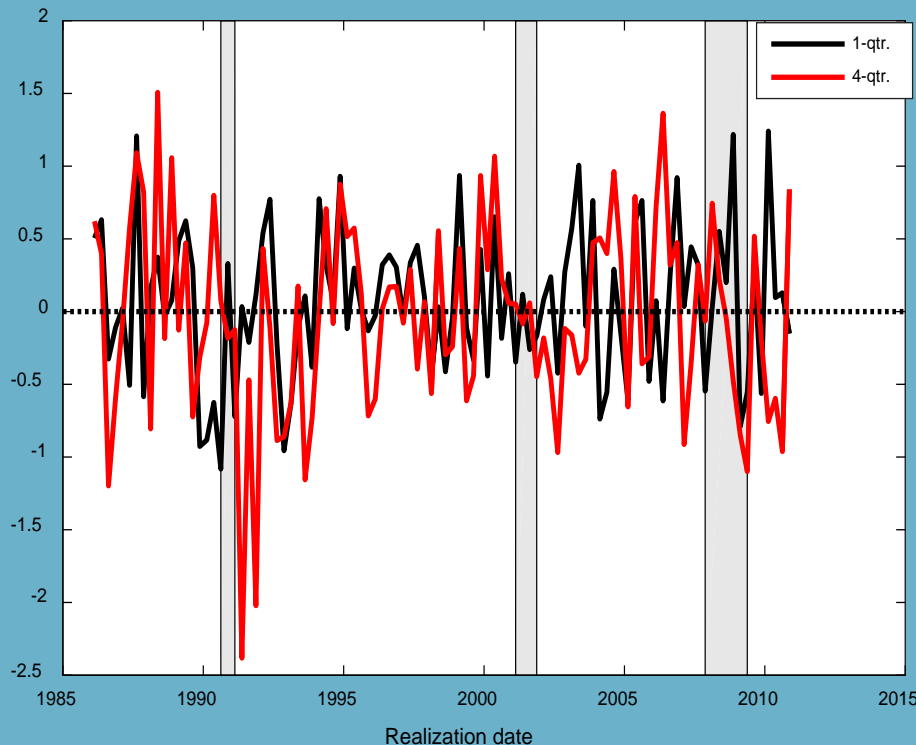
- ▣ The model above behaves just fine with NO policy response to inflation—*that's* a little different (certainly not true for standard models, e.g. with NKPC or OKPC)
- ▣ Not just an academic point—this is about how CB's ensure that inflation returns target, a central issue today.

“Surprises” and “Puzzles”

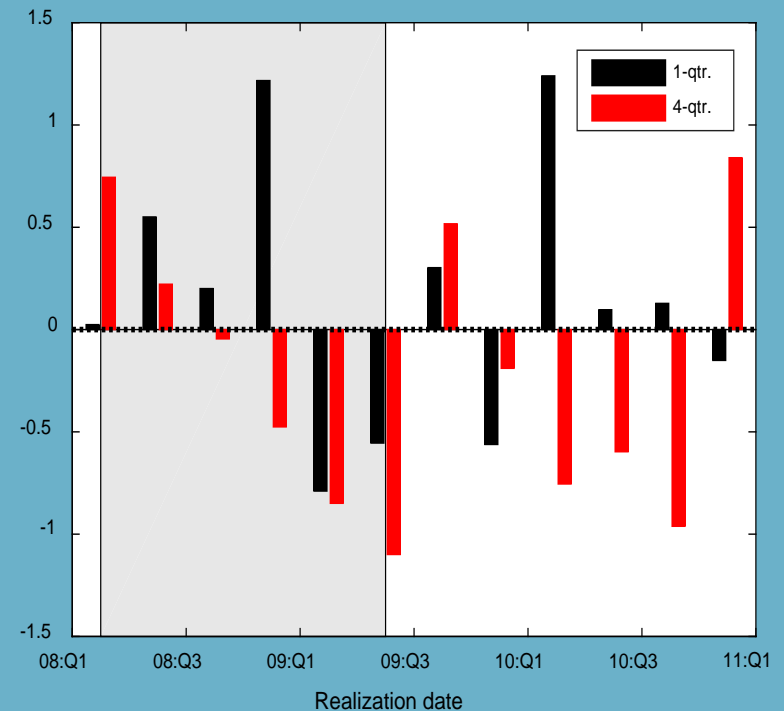
Let’s step back a bit ...

- ▣ Bob identifies a few surprises (possibly puzzles)
 - 2008 decline; return to 2% in 2011; below-2% inflation recently
- ▣ How big are these surprises/puzzles? Compare to history.

Tealbook forecast errors, core CPI, 1990-2010
Forecast-actual



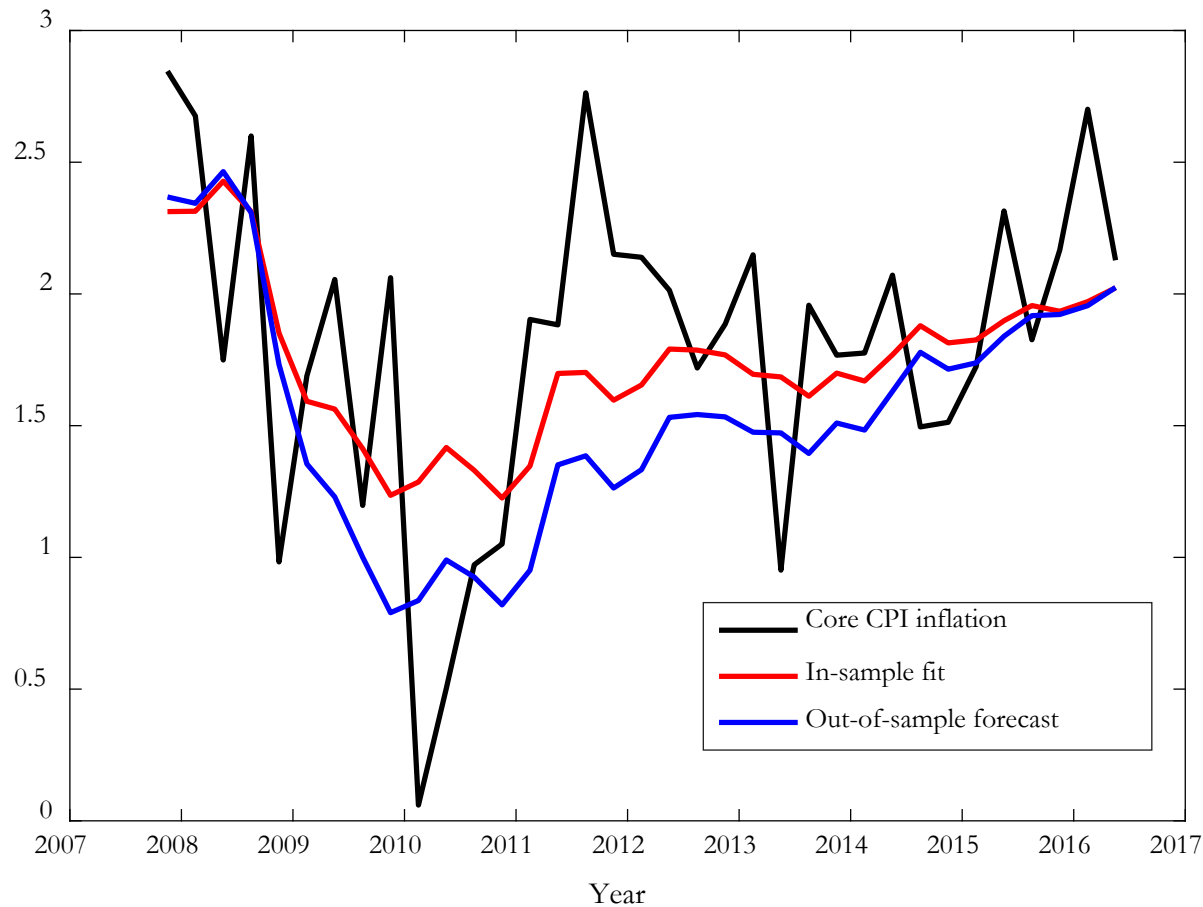
Tealbook forecast errors, core CPI, 2008-2010
Forecast-actual



Not so large, nor too one-sided. 15

Could better measures of expectations help explain inflation?

Phillips curve model with SPF expectations (long- and short-run)



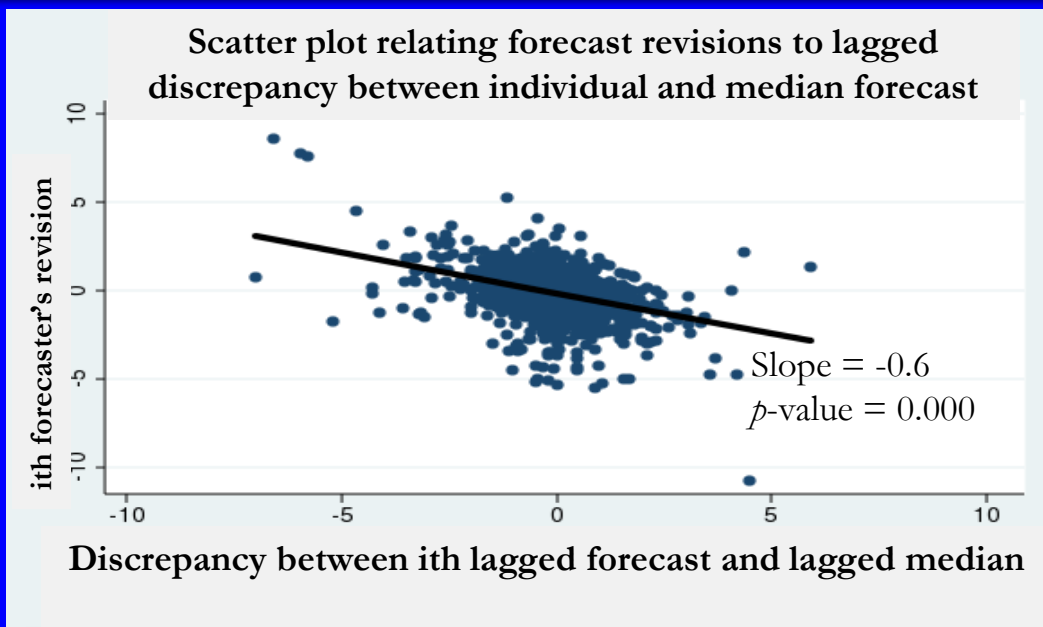
- ▣ Survey-based PC does OK during recent period
- ▣ Suggests that a better understanding of expectations may improve our imperfect understanding of inflation

$$\pi_t = a\pi_t^{SPF, 10yr} + (1-a)\pi_t^{SPF, 1q} - b(U_t^{SPF, 1q} - U_t^*)$$

Why do survey expectations work better?

Intrinsic persistence in expectations

- Intrinsic persistence in expectations formation (macro evidence-Fuhrer 2015)
 - That is, (short-run) expectations add persistence beyond what is in the series for which they are forming expectations
- Micro-data on expectations display a specific kind of “intrinsic persistence”- Fuhrer 2016
 - The source: Forecasters and households keep their forecasts close to the lagged central tendency of forecasts
 - What’s the evidence? (SPF, Michigan, Euro SPF)

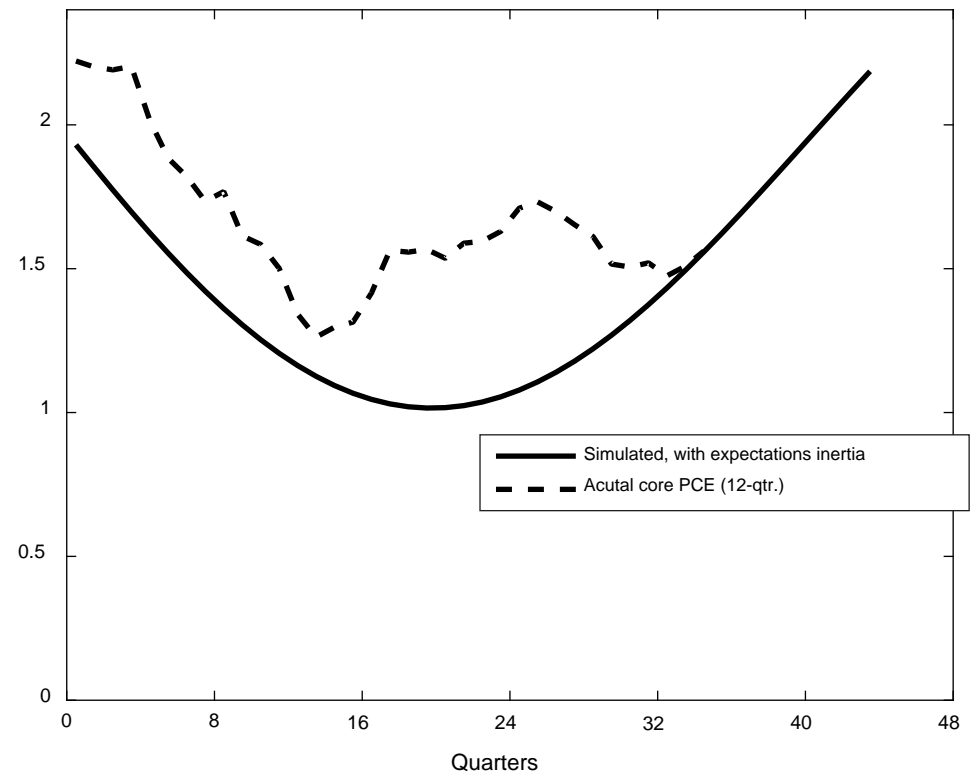


Dependent variable: Revision from t-1 to t for forecast period						
Lagged discrepancy	t+1	t+2	t+3	t+1	t+2	t+3
$\pi_{t+1,t-1}^i - \pi_{t+1 t-1}^{Median}$	-0.58 (0.000)			-0.56 (0.000)		
$\pi_{t+2,t-1}^i - \pi_{t+2 t-1}^{Median}$		-0.54 (0.000)			-0.53 (0.000)	
$\pi_{t+3,t-1}^i - \pi_{t+3 t-1}^{Median}$			-0.61 (0.000)			-0.61 (0.000)
π_{t-1}^i				0.01 (0.648)	0.03 (0.019)	0.05 (0.000)
Other forecast controls	N	N	N	Y	Y	Y
Observations	3274	3257	3180	3029	3017	2960

Could reconcile sluggish response to recession and recovery

- ▣ Intuition is simple:
 - During Great Recession, expectations inertia tempered the decline in inflation
 - ▣ See this in the survey-based PC
 - Similarly, during recovery, expectations inertia slows the increase toward the long-run target
- ▣ Simple macro model with this kind of explicit expectations inertia illustrates these effects:

Inflation during recession and recovery with inertial expectations



Conclusions

- ▣ Inflation dynamics are still not well understood, especially in low-inflation environments
 - Although forecast misses/model failures this time are not particularly large
 - Some serial correlation of errors, but not striking
 - Thought errors aren't huge, we'd like to hit our target!
- ▣ Simple old-style Phillips curves can't explain both episodes (recession and recovery)
- ▣ Neither do NKPC's (by my estimates)
- ▣ Anchored expectations—sort of do (not perfectly)
 - But the theoretical underpinnings, and the links to real-world price-setting, are somewhat suspect (to me)
- ▣ Alternative models of expectations (perhaps captured well by surveys), both short- and long-term, may help