"Headwinds" and Fed policy: a new model (WKP, May 4, 2015; revised May 8)

Yellen and other Fed speakers have cited 'headwinds' as a reason for keeping rates at zero even as year-over-year growth remains healthy and payroll growth is consistent with continued declines in the unemployment rate. These 'headwinds' are factors that push down the short-run neutral Fed funds rate, i.e. the policy rate consistent with stable inflation and unemployment. Examples of headwinds might include continued weakness in housing demand and household formation, consumer deleveraging, abnormally tight credit conditions or lending standards, fiscal drag, negative global demand shocks, and a lack of 'animal spirits' resulting in subpar investment growth. In a recent speech, Yellen cited the Laubach-Williams estimate of the neutral real Fed fund rate as evidence that headwinds do (still) exist.

There are two apparent problems with the 'headwinds' story. First, as Macro Advisers points out, many or most of these specific headwinds, which were formerly severe, have now dissipated: e.g. credit conditions for corporates are not tight, and US fiscal drag is in the past. Second, as RDQ Economics points out, the Laubach-Williams estimates do not explain current Fed policy settings, since they estimate that the output gap closed in late 2013 and the Fed funds rate should now be about 1.25%.

Still, the fact that investment is not booming and inflation is not spiraling higher suggests that there must be something to the headwinds story. In order to quantify it, though, we need a model. To construct one, I used the Laubach-Williams approach as a starting point, but extended it as follows:

- Both potential growth and the inflation trend can move away from their long-run averages for long periods of time, longer than an economic cycle, thus affecting the real and nominal neutral Fed funds rate for prolonged periods of time.
- In addition, the real neutral Fed funds rate can be affected by an extra 'headwinds' factor, which in turn is linked to excess unemployment as well as to unspecified other factors.

Note that since the model incorporates slowly varying biases (to growth and inflation rates), it needs to be estimated using a lot of historical data, spanning more than just a couple of economic cycles. I used US data for a 55-year period, from 1959 to 2015. Also, in order to get a better read on short-term/recent changes, I used monthly rather than quarterly data series; unfortunately, this rules out using GDP data.

Details of my model appear below (page 3). I used the software package Dynare to estimate the parameters of the model. I found that in order to get good results, I had to run an unusually large number of Monte Carlo simulations: three million, rather than just a few hundred thousand. This takes over nineteen hours... and I am still rather cautious interpreting the results with too much confidence.

Investment implications (see the following page for rationale)

- A delayed start to rate hikes is justified. June is very unlikely unless April/May payrolls are huge.
- The pace will be faster than expected; thus, 2018-2020 maturities are most at risk.
- Inflation risk is modest; the case for short/intermediate maturity TIPS is not compelling.
- A muted growth outlook for 2015-2017 implies muted profit growth and more M&A risk.

Summary of results

The following comments are my interpretation of the charts below (pages 4-6); see also my interpretation of the parameter estimates on the last page. I'll comment on each chart in turn.

There are indeed substantial headwinds affecting the current neutral real Fed funds rate. The headwind factor is estimated to be 1.62ppt as of 2015Q3, though it is declining fairly rapidly. The model estimates that in a years' time, it will have fallen to less than 1ppt (see below, the bottom of the last page).

The strong labor market is currently reducing the headwind, since there is currently no excess unemployment. However, the very high unemployment in 2009-2001 played an important role in creating the headwind in the first place. Note that there was no excess unemployment in the early '80s.

Potential growth is indeed depressed, about 0.5ppt lower than its long-run rate. This variable is linked to the productivity trend, which is now as weak as it got in the mid-80s. The last bar chart (at the bottom of page 8) suggests that this is due to an unusual series of negative productivity shocks in the past several years, contrasting with an unusual series of positive productivity shocks starting in the mid/late 1990s.

There's currently an inflation rate bias, but not an historically large one. It was actually larger in the late 1990s, when inflation 'should have' been much higher than it actually was. The inflation rate bias is estimated to be very persistent, and one should probably think of it as influencing the nominal Fed funds rate through a whole cycle. Note that there is no obvious correlation between the potential growth rate gap and the inflation rate bias. (E.g. secular stagnation need not imply deflation.)

The output gap is now fairly small. That is, one can no longer point to a large output gap as a justification for easy monetary policy. However, to be frank, I'm a bit uncertain about how to interpret this variable.

The Fed has a modestly 'dovish' bias right now, about 0.25ppt, though note that the estimated monetary policy bias tends to swing around fairly quickly, over a period of a year or so. By the way, the apparently huge dovish monetary policy bias in 2008/2009 is just an artefact of timing: when Lehman collapsed, the Fed responded to the massive financial shock almost immediately, whereas the (predictable) impact on growth, employment and inflation took another couple of quarters to show up in the data.

Overall, the results make me modify my outlook for the economy and the Fed in the following ways:

- The current headwind is larger than I thought, so the Fed did and does have a reasonable justification for delaying the *start* of rates hikes; however, it should not be highly persistent, so it does not justify a very slow *pace* of rate hikes through 2016.
- That is, the Fed is not as incoherent as I thought, though I still can't justify the path of rates implied by the Fed funds futures market.
- Potential growth is currently more depressed than I thought, and that makes me dial down my outlook for growth (and inflation risk) in 2016; however, note that a lower potential growth rate, and no output gap, actually implies faster rate hikes initially, as well as a 'soft endpoint'.
- The labor market should be cooling off. March may not have been a complete aberration.

Details of the model

$$y = \rho_y y_{-1} + \alpha(\mathrm{FF} - \pi - r) + \varepsilon_y$$

The output gap y is determined by last period's output gap, the real Fed funds rate and a growth shock.

$$\pi = \pi^* + p + \beta y + \gamma(x - \pi^*)$$

The current inflation rate π is determined by the long-run average inflation rate π^*, the short- to medium-term inflation bias p, the output gap y (Phillips curve) and the energy price inflation rate x.

$$\mathrm{FF} = (r + \pi^*) + \kappa_p(\pi - \pi^*) + \kappa_y y + b$$

The nominal Fed funds rate is equal to the short-run neutral nominal Fed funds rate (i.e. the short-run neutral real Fed funds rate r plus the long-run average inflation rate π^*), adjusted via a Taylor-type policy rule (depending on the inflation bias p and the output gap y), plus a policy bias b.

$$\mathrm{PCE} = g^* + g + 1200(y - y_{-1})$$

The observed real growth rate is determined by the long-run potential real growth rate g^*, plus any medium-term bias in the potential growth rate g ('potential growth rate gap'), plus short-term growth as measured by the change in the output gap.

$$u = u^* - \varsigma y + v$$

The observed unemployment rate is determined by long run NAIRU u^*, the output gap y (Okun's Law) and the short- to medium-term 'excess unemployment rate' v related to labor market disruption.

$$h = \rho_h h_{-1} + \xi v + \varepsilon_h$$

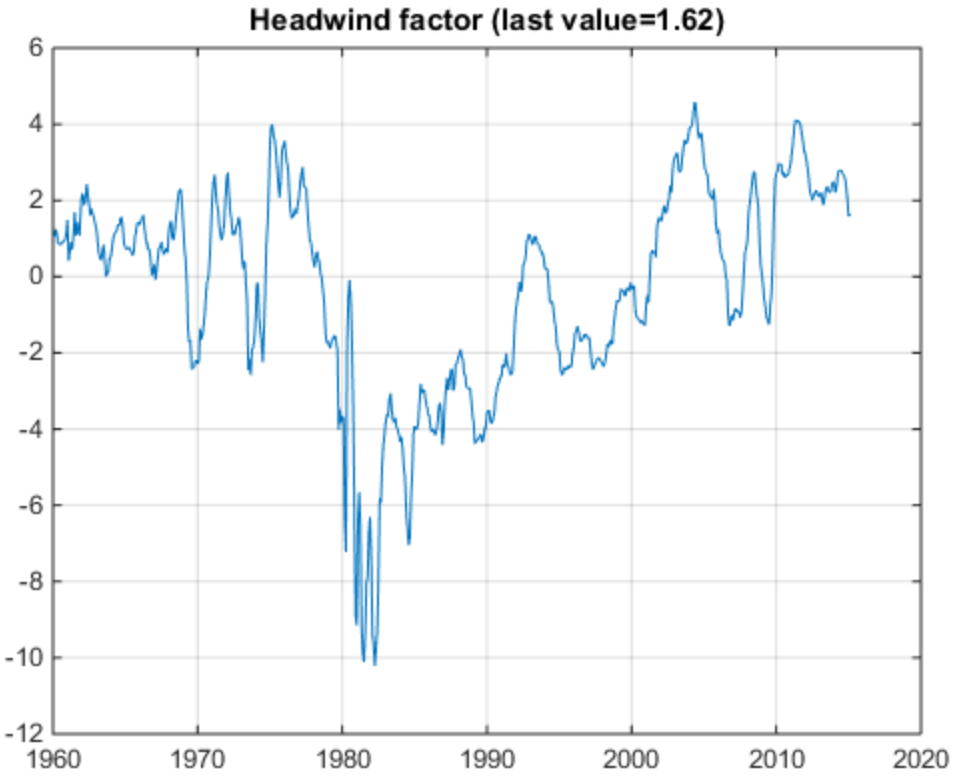
The headwinds factor h is determined by the excess unemployment rate, and is also persistent (implying that it cumulates if there is persistent excess unemployment); there is also a shock term interpreted as headwinds arising from factors unrelated to excess unemployment (including global factors, if any).

$$r = \left(0.75 + \frac{\nu}{2}\right)(g^* + g) - h$$

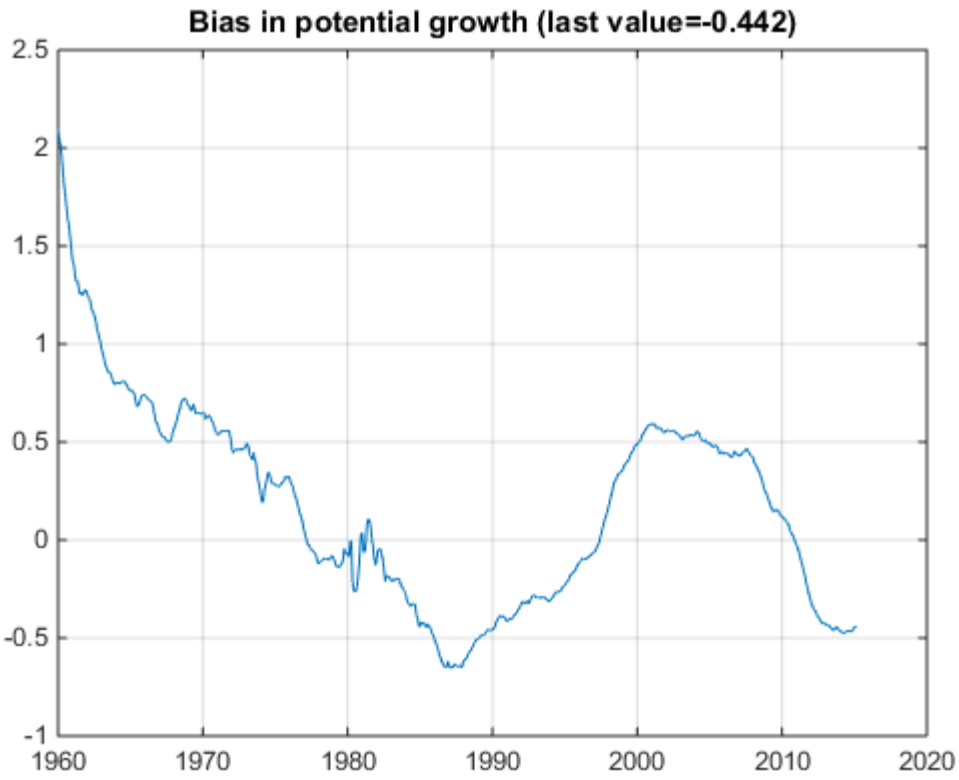
The short-run neutral real Fed funds rate r is determined by the current potential real growth rate $g^* + g$ (via a coefficient that is not too far from unity) and the headwinds factor h.

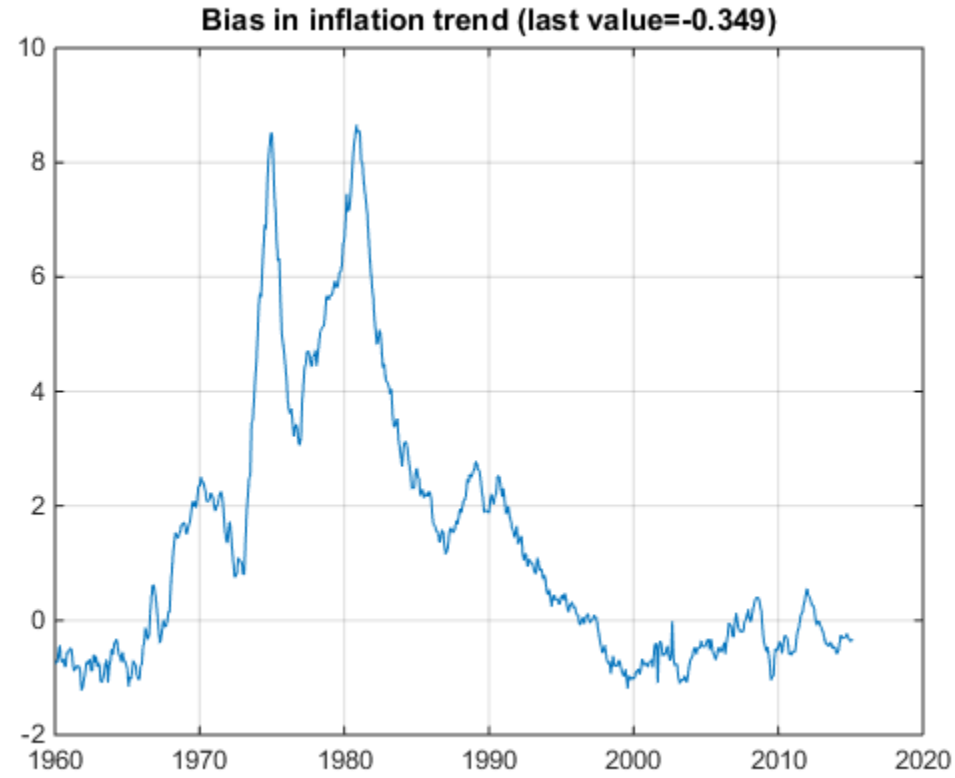
The following five processes are assumed to be AR(1): p, x, b, g, v, with corresponding shocks $\varepsilon_p, \varepsilon_x, \ldots$ Thus, including the growth shock ε_y and the headwinds shock ε_h, there are a total of seven shocks.

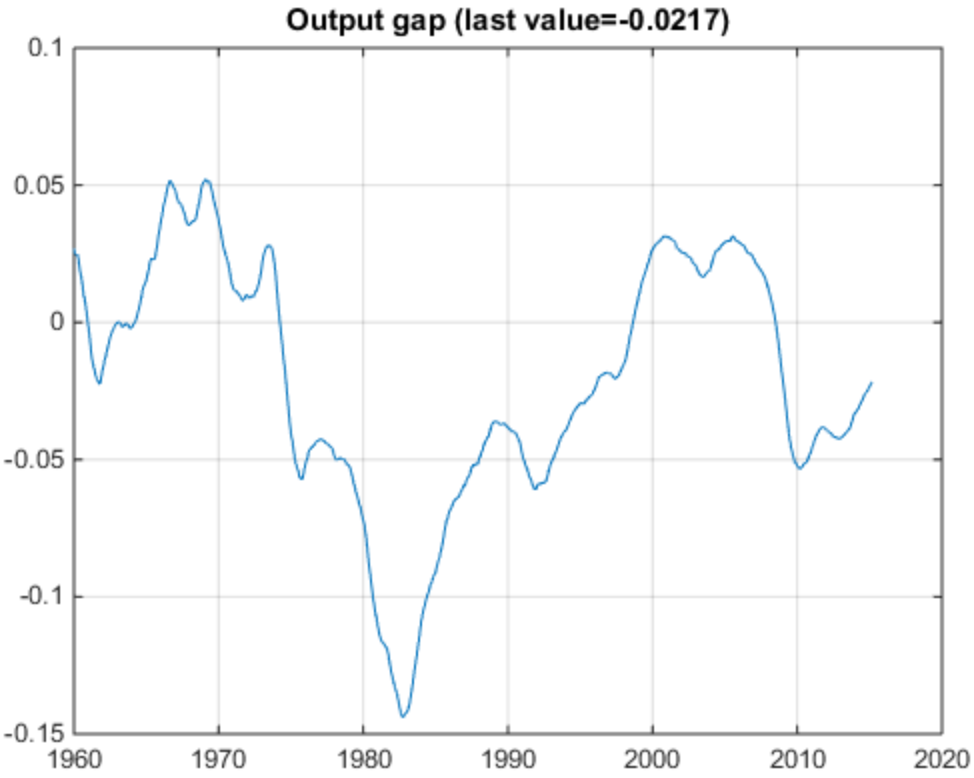
The model is estimated using monthly data from 1959-2015 for: nominal personal consumption expenditures (proxy for nominal growth), the civilian labor force (used to translate into per capita figures), the chain-type PCE price index (proxy for inflation), CPI energy (proxy for energy price inflation), the civilian unemployment rate and the effective Fed funds rate.

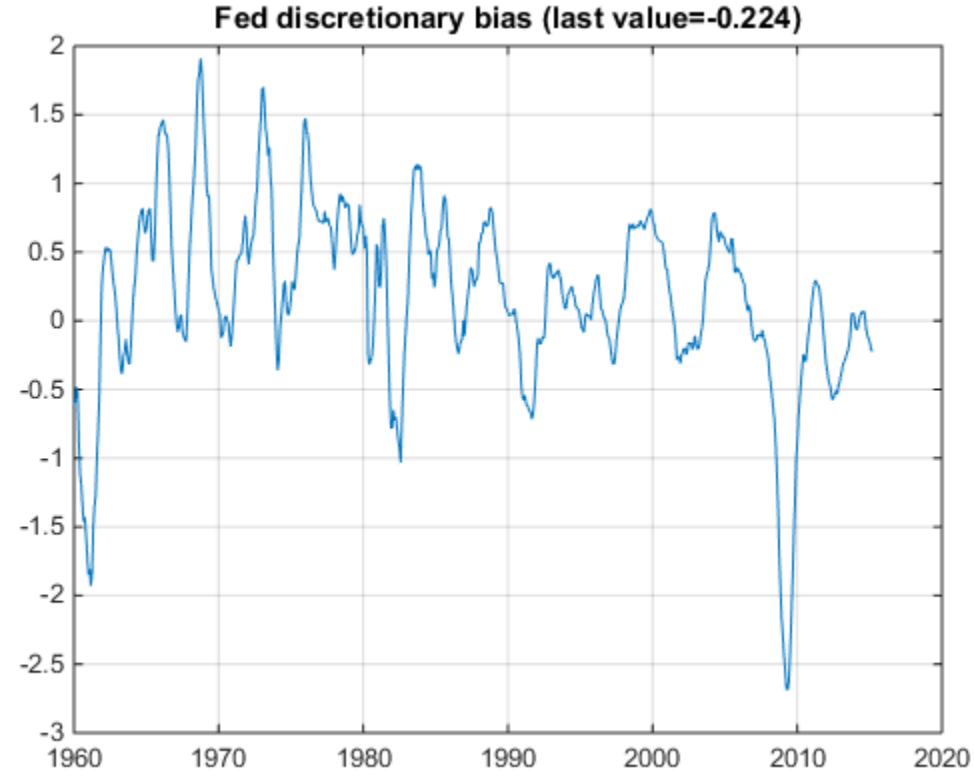

Headwind factor (last value=1.62)
6
4
2
0
-2
-4
-6
-8
-10
-12
1960
1970
1980
1990
2000
2010
2020

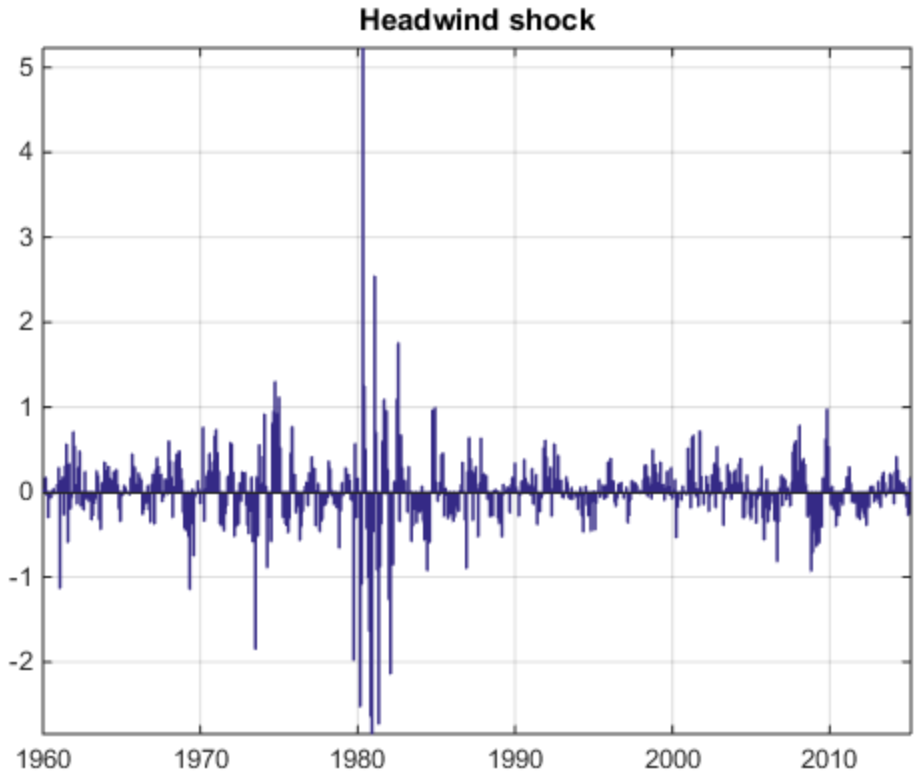

Excess unemployment (last value=-0.715)
3
2
1
0
-1
-2
-3
1960
1970
1980
1990
2000
2010
2020

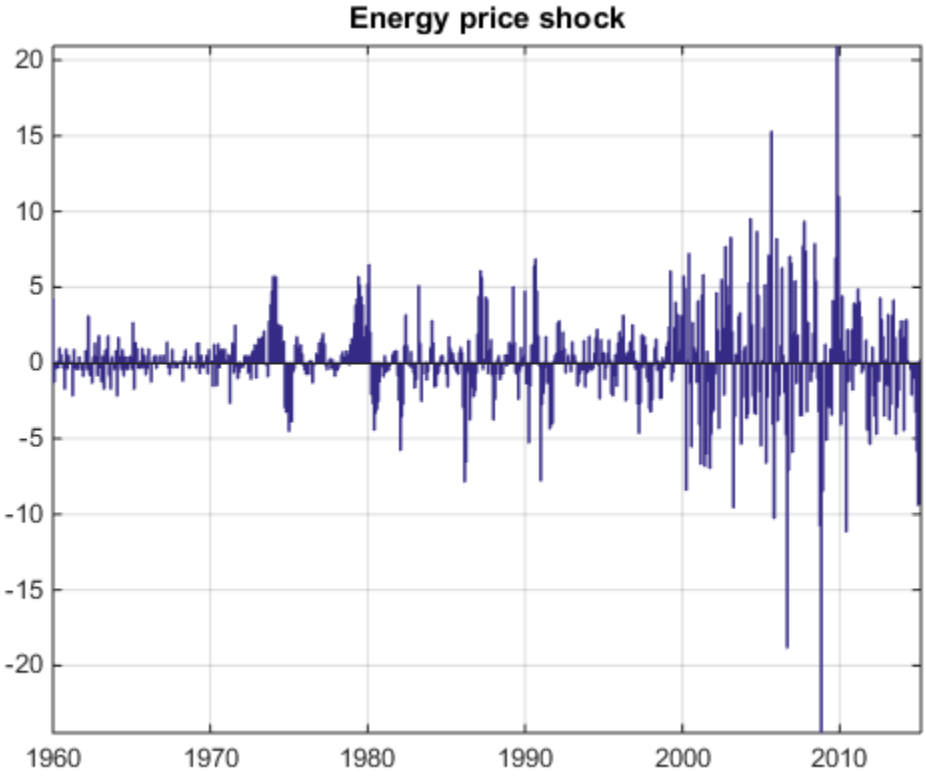

Bias in potential growth (last value=-0.442)
2.5
2
1.5
1
0.5
0
-0.5
-1
1960
1970
1980
1990
2000
2010
2020


Bias in inflation trend (last value=-0.349)
10
8
6
4
2
0
-2
1960
1970
1980
1990
2000
2010
2020

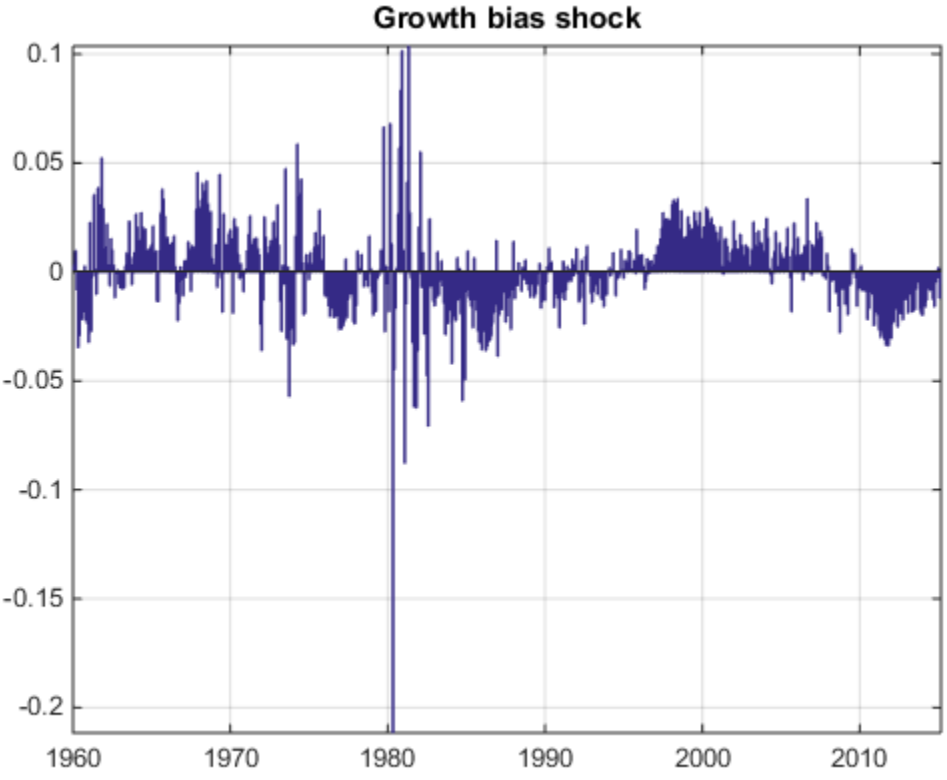

Output gap (last value=-0.0217)
0.1
0.05
0
-0.05
-0.1
-0.15
1960
1970
1980
1990
2000
2010
2020

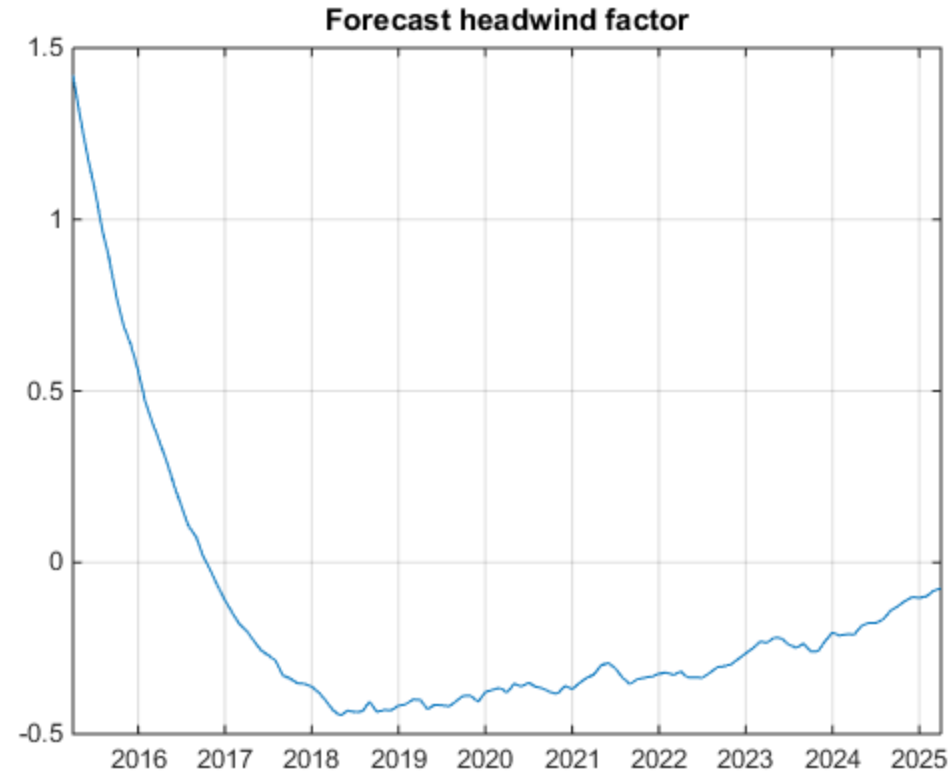

Fed discretionary bias (last value=-0.224)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
1960
1970
1980
1990
2000
2010
2020

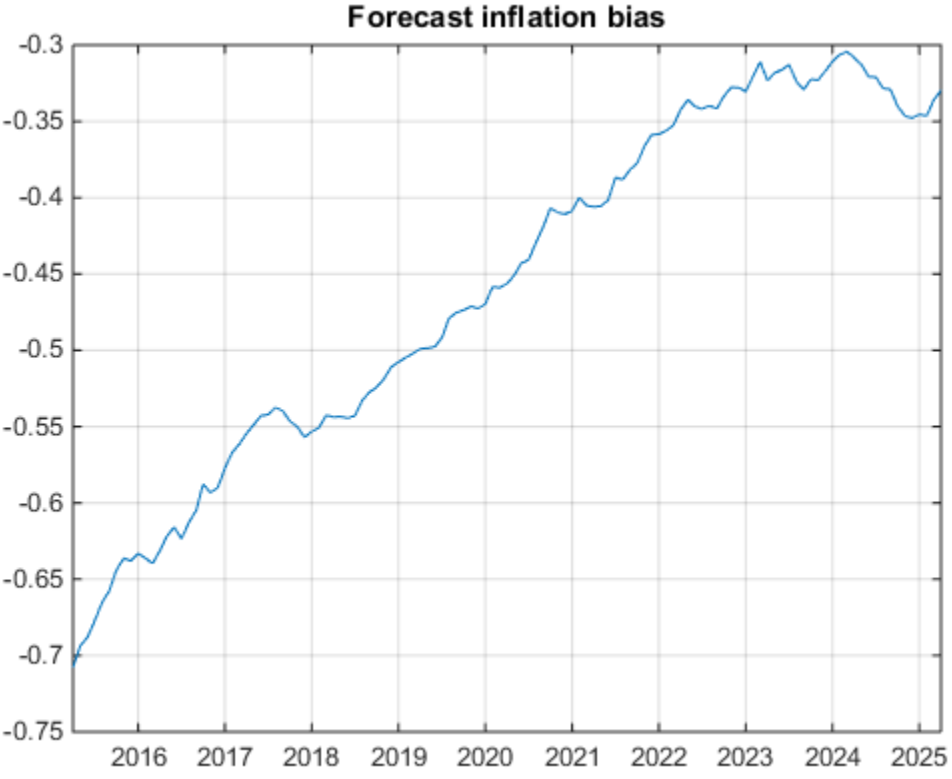

Headwind shock
5
4
3
2
1
0
-1
-2
1960
1970
1980
1990
2000
2010


Energy price shock
20
15
10
5
0
-5
-10
-15
-20
1960
1970
1980
1990
2000
2010


Excess unemployment shock
0.6
0.4
0.2
0
-0.2
-0.4
1960
1970
1980
1990
2000
2010


Growth bias shock
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
1960
1970
1980
1990
2000
2010


Forecast headwind factor
1.5
1
0.5
0
-0.5
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025


Forecast inflation bias
-0.3
-0.35
-0.4
-0.45
-0.5
-0.55
-0.6
-0.65
-0.7
-0.75
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

Parameter estimates

parameters

	prior mean	post. mean	90% HPD interval		prior	pstdev
gstar	1.800	1.7002	1.3486	2.0747	norm	0.5000
pistar	2.400	2.4128	1.8519	2.8605	norm	0.5000
ustar	5.250	5.3437	4.7253	5.9604	norm	0.5000
alpha	0.001	0.0023	0.0018	0.0028	beta	0.0005
beta	12.000	9.1736	3.6590	14.7280	norm	5.0000
gamma	0.050	0.0610	0.0576	0.0645	beta	0.0200
kappa_p	0.500	0.7684	0.6847	0.8534	norm	0.5000
kappa_y	10.000	5.3770	2.7019	7.9760	invg	15.0000
zeta	45.000	45.8047	40.9382	50.6116	invg	Inf
xi	0.150	0.1416	0.0785	0.2063	norm	0.2000
nu	0.500	0.4785	0.4243	0.5254	beta	0.0500
rho_y	0.950	0.9702	0.9582	0.9819	beta	0.0250
rho_p	0.950	0.9939	0.9905	0.9974	beta	0.0250
rho_g	0.950	0.9787	0.9670	0.9906	beta	0.0250
rho_v	0.950	0.9777	0.9634	0.9913	beta	0.0250
rho_h	0.950	0.9516	0.9332	0.9702	beta	0.0250
rho_x	0.950	0.9613	0.9451	0.9785	beta	0.0250
rho_b	0.950	0.9632	0.9474	0.9794	beta	0.0250

standard deviation of shocks

	prior mean	post. mean	90% HPD interval		prior	pstdev
e_y	0.010	0.0006	0.0006	0.0006	invg	Inf
e_h	0.500	0.5163	0.4890	0.5424	invg	Inf
e_v	0.200	0.1611	0.1539	0.1685	invg	Inf
e_g	0.300	0.1205	0.0829	0.1569	invg	Inf
e_p	0.200	0.1782	0.1702	0.1864	invg	Inf
e_x	3.000	3.2046	3.0555	3.3473	invg	Inf
e_b	0.250	0.1737	0.1354	0.2117	invg	Inf

Interpretation of the estimated parameters

- The estimates $g^* = 1.70\%$ and $u^* = 5.3\%$ seem quite plausible (remembering that the model is written in terms of *per capita* growth rates). The estimate $\pi^* = 2.4\%$ seems a little high, which should influence how we interpret the estimated inflation rate bias.
- The small value for α reflects the fact that a Fed policy tilt won't affect growth much in a single month – it has to be maintained for longer to have a substantial impact on the output gap.
- The estimate for γ is comparable to the energy weight in the CPI basket, as you'd expect.
- The estimated Taylor rule coefficients are plausible, though the coefficient on the output gap is not very well identified by the data (which is also plausible, as the Fed's framework has varied).
- The estimated Okun's Law coefficient ς is fairly close to its rule-of-thumb value of 50 (i.e. ½).
- The small value for ξ reflects the fact that excess unemployment only creates a substantial headwind if it's maintained for a substantial period of time, i.e. years rather than quarters.
- The fact that ν is only a little smaller than 0.5 (corresponding to the neutral real rate moving one-for-one with the short-run potential real growth rate) is consistent with the finding of Laubach-Williams that the neutral rate moves just a touch less than one-for-one.
- The mean reversion coefficients ρ imply the following: shocks to the headwinds factor have a fairly short half-life of about a year, so you need *continued* new headwinds to keep the neutral rate low; shocks to potential growth and excess unemployment have a longer half-life (about two and a half years), and shocks to underlying inflation are very persistent (ten years).