**FAQ**

1. What do you mean by “anchored expectations”?

Long-run expectations stay where they are regardless of how actual inflation moves around. (Don’t respond to short-run mistakes)

1. Why don’t you show us some data on unanchoring?  
   Other authors (Carvalho et al and Milani, 2007, 2014) have shown that the model I propose works well, so let me defer to my estimation and you’ll see it works well.
2. Why adaptive learning? Why is this the right model / positive theory of expectations?

3 reasons:   
1) Adaptive expectations fit data on macro variables (Eusepi and Preston 2011 AER) and on aggregate expectations (Angeletos, Huo and Sastry 2020 NBER WP)  
2) Adaptive expectations provide the best fit to how people form expectations in lab settings (Anufriev and Hommes 2012)

3) Introspection: adaptive models make sense: we as economists estimate statistical models when we don’t know the true one, so it’s logical that firms and HHs do so too

1. Why is this good normative theory? / Lucas critique

*(First sentence only if questioner explicitly mentioned the Lucas critique.)*The Lucas critique is important whenever we do economics. But in my view we need a structural model of expectation formation. The dominant model is RE. But ample literature and data says that it’s not a great model. I’m offering an alternative model. While it offers a behavioral rule, there’s evidence (in lab and in ts and macro data (Anufriev & Hommes 2012, Eusepi & Preston 2011 and Angeletos & al. 2020) that it is a good model of expectations. It also incorporates a channel that captures what I’m interested in (unanchoring), so that’s why it is a valuable exercise.  
*If they persist:*I agree that E-formation is subject to the Lucas critique, but it is so in the least possible way. First: expectations are not invariant to policy. Second: expectation formation (g-function) isn’t invariant to policy.

1. What’s optimal about monetary policy when expectations aren’t optimal?

I agree: my model is a good structural model of how behavior works, but it’s not derived as an outcome of optimization. It would be interesting to see whether it can be derived from an optimization problem. In fact, that’s something I wish to investigate in future work.

1. What horizon are long-run expectations?

In the model, it’s expectations of average inflation, steady-state inflation if you will. In the data, it’s not clear whether a horizon exists that corresponds exactly to that. I use as long horizons as I have, 10 years.

1. What episodes can your model explain?

Great Inflation and Volcker

Ricardo Reis BIS keynote paper: “experience of the euro area in 2014–15 is instructive with regard to what policy can do when long-run inflation expectations start falling in a way that threatens a change in the anchor. ”

Missing Deflation / Inflation

1. Why care about anchoring?

Because long-run E determine how firms set prices, so if long-run E stable, prices are stable. Stable price level is the core concern of central banks. Also, the fact that policymakers talk about it suggests that it is a concern.

1. Why care about anchoring, when LRE haven’t moved in the last 20-30 years? We’re well anchored, end of the story.

I agree that LRE have been stable lately. But in my view, the question of unanchoring is a timeless one: history has taught us that LRE *can* move, so it can happen again (which is also what Reis BIS argues). My model captures both the scenario when LRE stable and when they are not – all the more reason to consider this model.

1. Why not RE?

Not only has RE been rejected in data (Coibion & Goro (2015)), but also it can’t capture unanchored expectation unless the DGP is unstationary. “The RE assumption regarding the Fed’s target implies LR-E will be 2%. Yet in the data we see E not only varying away from 2%, but doing so in a way that’s systematically related to forecast errors. Moreover, what this means is that it’s not enough for policy to tell the PS that inflation will be 2%, but it needs to deliver to get E back up.”

1. Why not RE with a drift in inflation? (noisy info, Philippe Andrade)

B/c you’d need a nonstationary environment for that. Here I don’t assume a nonstationary DGP.

1. Why not diagnostic expectations / Bordalo et al?

This is similar to Bordalo et al in the sense that they also have a wrong (too high) Kalman filter. But this fits the data better than Bordalo because Afrouzi et al 2020 WP document that diagnostic expectations don’t fit the varying levels of overreaction observed in experimental data.

1. What are the properties of Ehat? Can one differentiate through it? Does it satisfy LIE?

I follow the literature a la Evans Honkapohja 2001 which is not explicit about properties in detail, but assumes that a) you can differentiate through it b) it satisfies LIE on the individual level, but not on the aggregate b/c agents don’t know the forecasts of others (higher-order E).

1. Why not learn the slope?

B/c it does not fundamentally alter the dynamics. The object of interest is long-run inflation expectations, i.e. the intercept. That’s where the action is. Have done extensions with learning the slope, it just makes IRFs less smooth, all else is identical.

* Not learning the slope corresponds to the fact that higher-order expectations are in the background (Susanto, Notes 14, p. 82) – not sure about that!

1. What happens if people learn the slope?

It just makes IRFs less smooth, all else is identical.

1. Why not cgain or dgain? Or: why does the endogenous gain matter?

Dgain and cgain vs. endogenous gain: the first two improve on RE in data, but as Milani 2014 showed, data favor an endogenous gain, so that’s the empirically relevant case. Carvalho et al 2019 showed that Great Inflation was a period of high gains, again an endog gain explains that, c or d don’t.

Cgain looks like noisy info in the data (Coibion & Gorodnichenko 2015)

1. What difference would it make if past forecast errors (or the CB’s fe) would enter the gain function? Would the gain time series become more persistent?

Yes, having lagged fe or k in the gain function would render it more persistent – likely a desirable feature that I would like to incorporate in the future. As for the CB’s forecast error, since the CB’s expectations are rational, the CB’s fe only has an exogenous part, whereas private sector fe has an endogenous component too, so (maybe counterintuitively) the CB’s fe would not introduce a direct channel through which the CB can influence the gain.

1. But these expectations are not optimal!  
   I agree, but since agents don’t know the DGP, it makes sense that they don’t use an optimal filter.
2. What are the key features of the model (that distinguish it from say Phelps?)

The heart of the model is the endogenous gain, and in particular that it is continuous.

1. What do agents think? / What’s in their heads? (Susanto) (Notes 14 p. 65)

I don’t take an explicit stance on what they think, I present a behavioral model of how they form expectations. The main assumption is that a) they do not know how others think and therefore don’t know the model b) they infer about the model from data c) their expectations are flexible in that it changes according to the volatility of the environment.

1. How do you estimate anchoring?

I estimate the function that links forecast errors to the size of the gain. In particular, I consider a piecewise linear approximation to the true functional form and estimate the approximating coefficients via an adaption of SMM (Smith 1993, Lee and Ingram 1991)

1. Is RE necessary for lambda\_x to be what it is? / Is the linear-quadratic approximation to the objective function dependent on the form of expectation formation?  
   We don’t know, so I’m using the one from RE.
2. Why so large an interest rate response?

Because unanchored expectations induce a lot of additional volatility, and the more unanchored they are, the larger responses are necessary to get them anchored again. So the large interest rate response allows the CB to make sure expectations remain anchored (pibar remains in the 0-space for most of the time), thereby avoiding even larger costs in the future. Short-run cost for long-run benefit.

1. Why so volatile?

As in RE, current observables depend on each other and on expectations. But here, expectations move much more in response to shocks than in RE. The more unanchored (the larger the gain), the more they move. Because of unanchoring, the gain is larger exactly when you’re hit by shocks. This results in more volatile observables.

1. What does this mean for the forward guidance puzzle?

That depends on how you conduct monetary policy. If you do the optimal policy, the puzzle disappears because expectations ignore promises completely. If you do a reaction function, then the puzzle is there very strongly, but it has the opposite sign b/c FG is interpreted as entirely Odyssean.

1. Why is the asymmetry not there?

B/c I’m plotting i as a function of pibar. If I’d plot i as a function of fe, it would be there.

1. How do results change if the steady state inflation is 2%, not 0%?  
   My main story is about fluctuations around the steady state, so I expect it doesn’t change qualitatively or quantitatively. But then you would have to address the question of the costs vs. benefits of positive steady state inflation, which Philippe Andrade and others have investigated.
2. Discretion?

Looks identical. Here I’m assuming full commitment, but because expectations cannot incorporate promises, the two are identical, and resemble discretion.

1. Why should I use your model? It looks hard…

Because it is the only model out there that can guide policy-making in an environment that is stressed as important and relevant by central bankers. Mounting empirical evidence supports that potential unanchoring is a feature in the data (Angeletos and coauthors, 2020, Carvalho et al, my own work). The Great Inflation period shows that this is a timeless problem.

1. Do you really believe the CB should respond so much with the interest rate?

Yes, under extreme circumstances yes. For example, Goodfriend 1980, March 1980, the Fed raised i by 300bp to fight an inflation scare. By following this policy, the Fed made sure that inflation scares do not happen, which is exactly what optimal policy does in my model: it keeps LRE stable around 0.

1. Why is TR less aggressive?

B/c with an internalized monetary policy reaction function (TR), interest rate expectations incorporate anticipated policy in the future. This makes expectations more volatile the more aggressive you are, because e.g. low inflation today and thus low expected inflation leads to stronger expected future interest rate hikes.

Eusepi, Giannoni, Preston 2008, Limits

* Gürkaynak, Sack and Swanson 2005 find that interest rates in the future go negative after a positive int rate shock today, b/c corr(int, E(pi future) < 0).

1. Does it matter that you’re using LH instead of EE learning?  
   EE assumes that monpol can control output directly, so the whole AD-side is out. Here instead I include AD.
2. What’s the main difference between optimal policy under RE and in your model?

Here it’s time-consistent in the sense of Kydland & Prescott 1977 and not history-dependent b/c because there is no distinction between discretion and commitment. In RE, optimal thing to do is to move pi and x to absorb a cost-push shock. In adaptive learning, a new thing is Ex, you can push some of the shock to the future. With anchoring, the extent you can do that is governed by current and future expected degree of unanchoring.

1. How do you solve the monetary policy problem?

I derive first-order conditions of the Ramsey problem of the central bank analytically. This gives a nonlinear system of difference equations which I solve for the optimal interest rate sequence using the parameterized expectations algorithm (den Haan and **Marcet** (1990), and described in more detail by. **Marcet** and Marshall (1994). I use the version of Christiano & Fisher 2000). This involves approximating the unknown expectations in the difference equations as a projection on a basis of state variables. Given the thus parameterized expectations, I solve for the interest rate sequence by collocation (zeroing out residuals to all model equations at all times t). This generates a synthetic time series, which allows me to update the projection coefficients on expectations. The process is iterated until convergence.

1. Why, if in RE you can write the IS curve in the recursive fashion, do expected interest rates play a bigger role here than under RE?

B/c since the LIE doesn’t hold in the aggregate, agents overweight public information. I.e. they think that what will happen to the interest rate on aggregate is more informative about the economy in the future than what others might do (b/c they don’t know the latter).

1. Is this behavioral economics?  
   Yes in the sense that agents do not have rational expectations, meaning they do not have model-consistent expectations
2. How do you control for liquidity risk in TIPS?

Andreasen et al 2018 use a state-space model to filter out the liquidity premium from the TIPS. Since they demonstrate that their liquidity risk measure is correlated with the VIX, I use data on the VIX to obtain a fitted liquidity risk measure, and subtract it from the TIPS.

1. Why SPF and not market-based infl expectations or surveys of HH expectations?

B/c surveys have misunderstanding and interpretation problems (only about 1/3 of households pass basic financial literacy tests), and because of liquidity and risk premium issues in TIPS. But I have robustness checks with TIPS.

1. How do you relate to Sargent’s Conquest of American Inflation? He discredits adaptive learning, no?

He does b/c he disagrees with the account that “the Fed learned, then forgot, then relearned the natural-rate (of unemployment) hypothesis.” But he investigates a different question: whether the CB could have had adaptive expectations and whether that could have produced the data.

1. Regression:

It’s not a test of a particular theory, but what I’m saying is “if the 2% target is fully credible, LR-E should be 2%. Instead the regression shows sensitivity to fe. ‘E deviate from 2% all the time and they do so in response to observed movements in inflation.’ So if you’re a CB-er, what do you do about this to get E anchored? I can’t rely on a regression b/c not causal, so I develop a fully developed model w/ a departure from RE.”

1. Estimation: 2015 period: something might be going on with oil prices:

World Bank blog: “ 2014-16 collapse in oil prices” was the biggest drop in oil prices in modern history (70% drop). It was mainly driven by efficiency gains in shale oil production. According to the World Bank, there was also low demand. Goro et al have shown that consumer expectations very sensitive to oil prices b/c gasoline is salient. (Jenny)

1. What’s the 2 seconds-takeaway?

That the central bank should do “whatever it takes” to anchor expectations.

1. What do you do (in 2 seconds)?

“We observe in data (which the CB observes too) phenomena that reflect fundamental deviations from RE (in a particular way) and CB-ers ask: ‘what should I do?’ I take a canonical model and tailor to a) explain the phenomenon b) tell central bankers what to do. My paper is the first to answer these questions.”

1. What is the key thing our institution should focus on? Tell it to the governor while in the elevator.

Understanding better expectations. We know that RE isn’t an empirically good structural model of expectations, my JMP suggested an alternative, but there is much more work to do.