Empirical and Policy Performance of a Forward-Looking Monetary Model

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Comments by Jeff Fuhrer

FRB Boston

The authors are to be applauded
and I mean that

- For moving beyond “toy” models
  - Incorporating recent advances in consumption, investment for monetary models
- For taking the data seriously
  - Empirical performance is a success criterion in this paper
- For using rigorous empirical standards
  - Serious estimation
  - Serious diagnostics (Impulse responses, covariance functions, etc.)

The result: A Sophisticated Model-About-Town

Start with canonical model

$$p_t = E_t p_{t+1} + g\, y_t + e_t^p$$

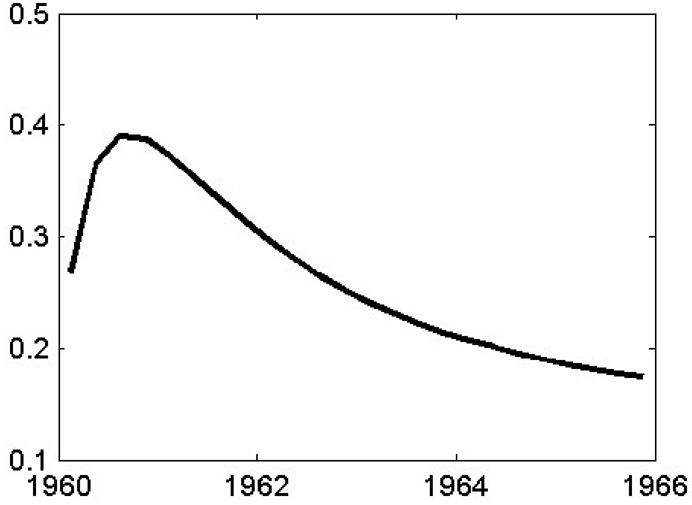
$$c_t = E_t c_{t+1} + e_t^b$$

$$i_t = r\, i_{t-1} + (1 - r)[a(p_t - \bar{p}_t) + b(y_t - y_t^*)] + e_t^r$$

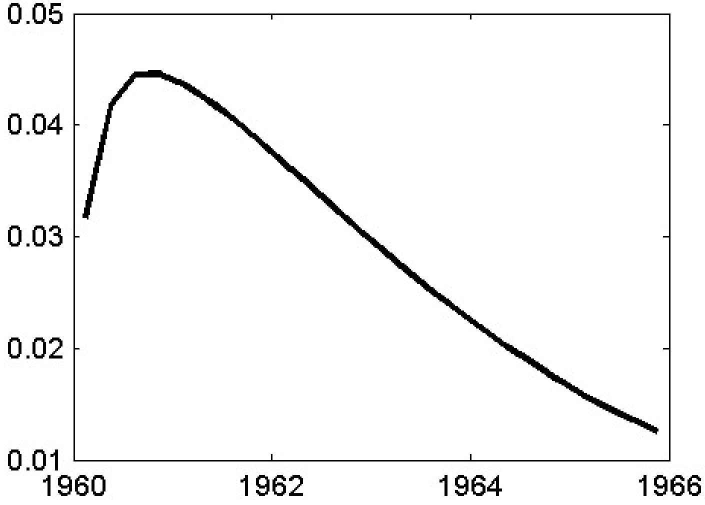
- Add habits, indexing in wages and prices, higher-order adjustment costs in investment
- Add autocorrelated errors (ρ=.9,.95,.98)
- And voila! The model really works!

This model really works!

Response to inflation target shock

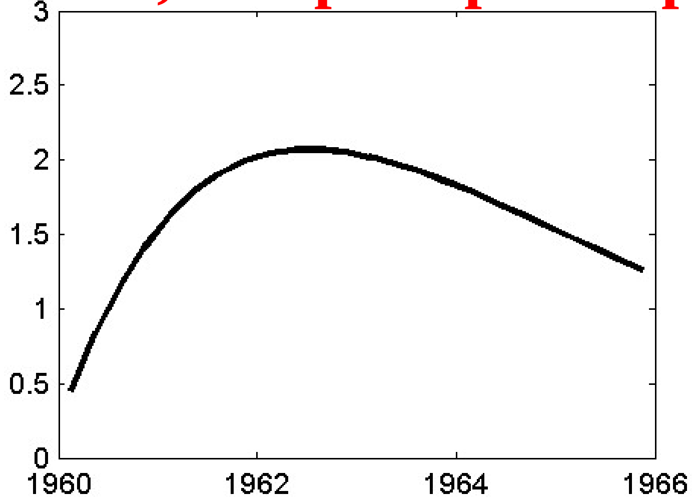


Consumption

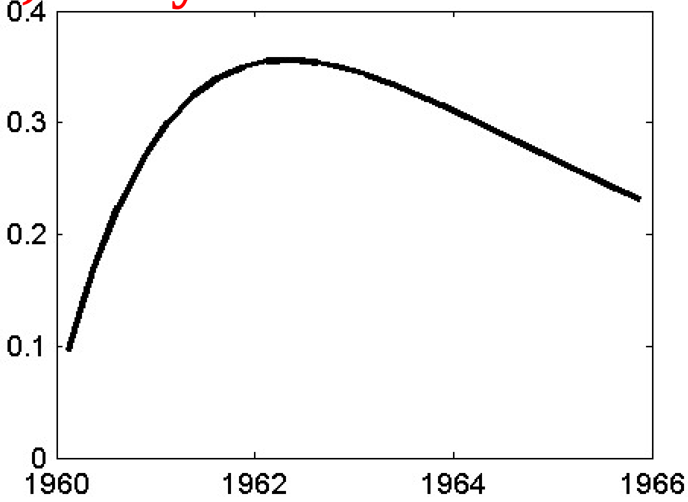


Inflation

Nice, hump-shaped responses, fairly data-consistent



Investment

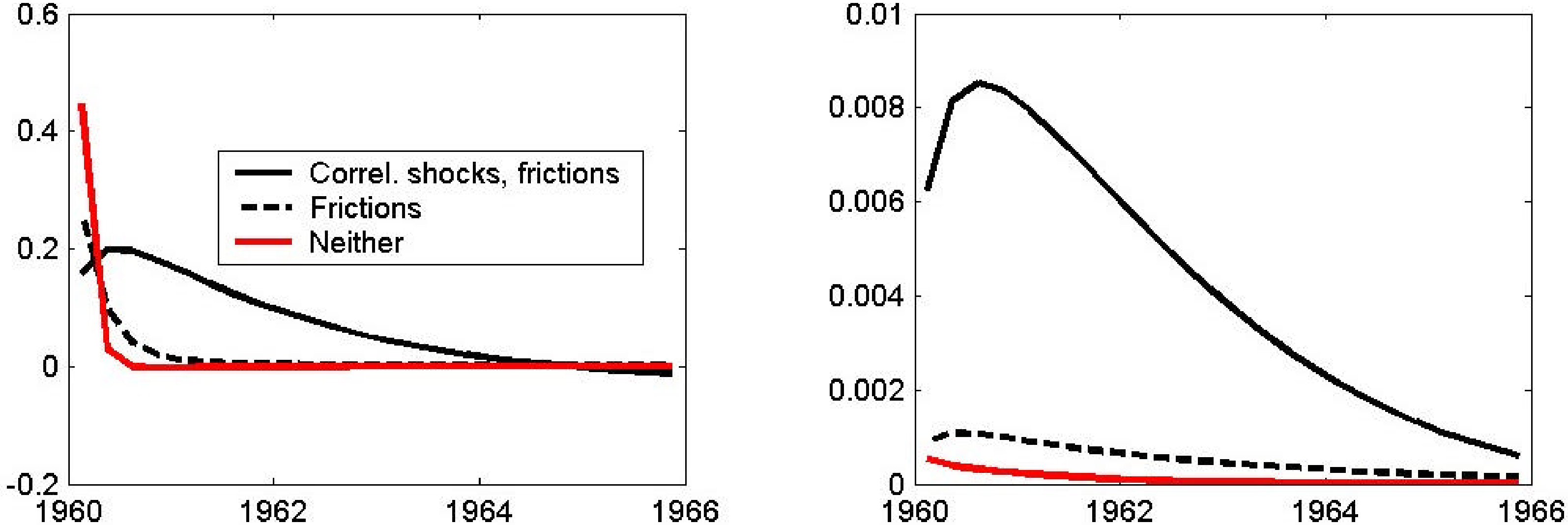


Real wage

But what are the relative contributions of shocks, frictions, and deep structure to dynamics?

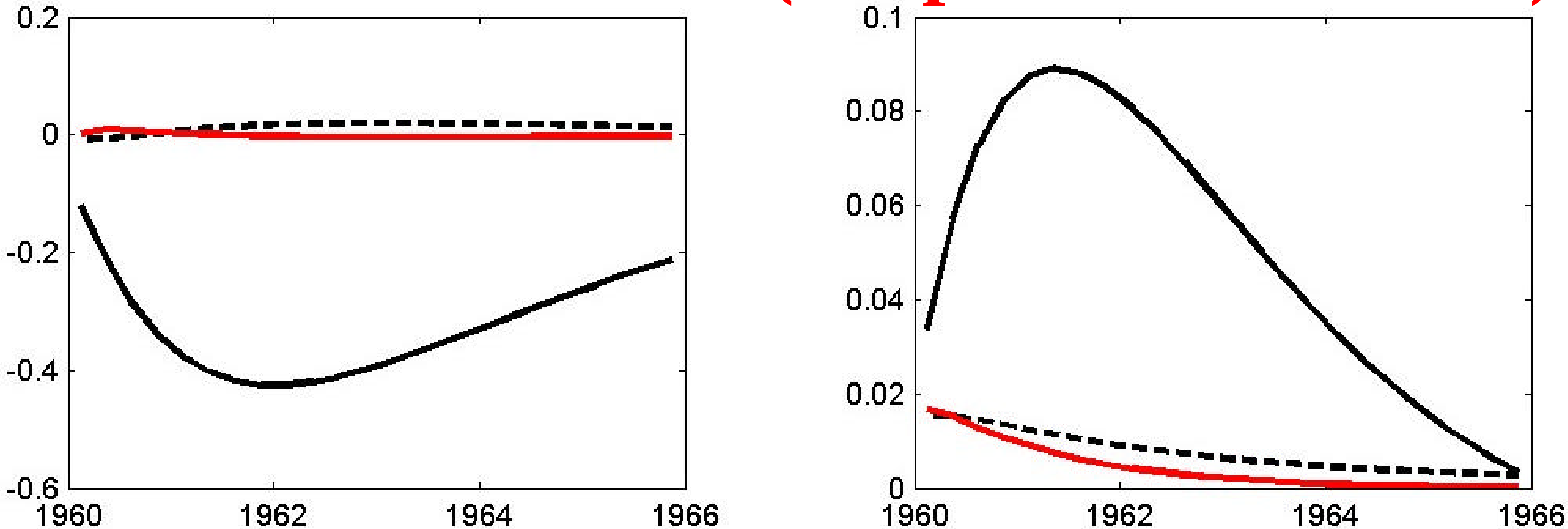
- Run impulse responses with
  - Full model
  - Model with all ρ’s set to zero
  - Model with all ρ’s set to zero, “frictions” set to zero: habits, indexing, policy smoothing (h=0, γ_w=0, γ_p=0, ρ=0)
  - Nice accounting of where the action is coming from in the model

This model really works: ALMOST
Response to preference shock, with and without AC errors, frictions



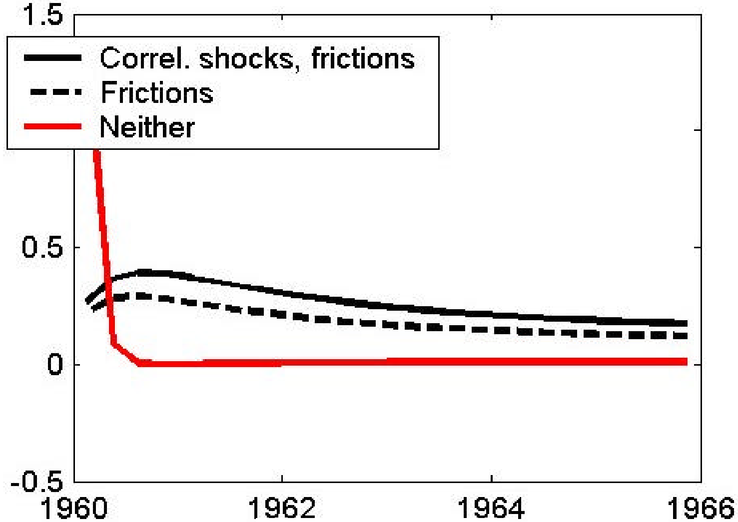
Consumption **Inflation**

It's all in the shocks (for preference shock)

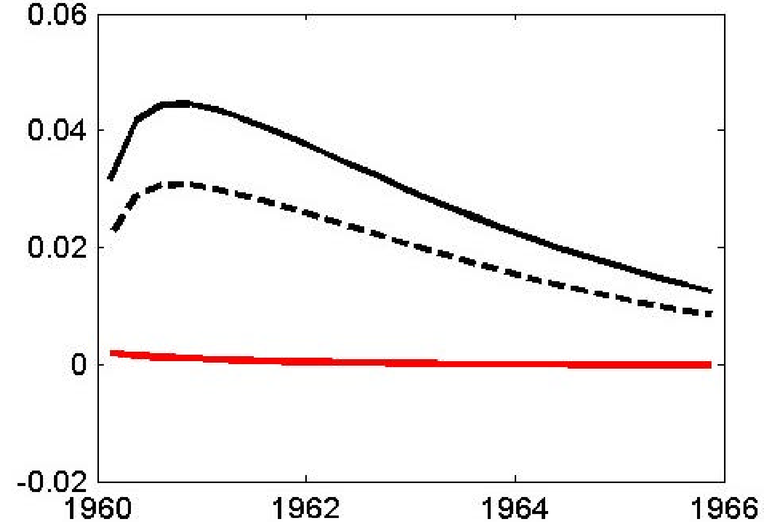


Investment **Real wage**

This model really works: ALMOST
Response to inflation target, with and without AC errors, frictions

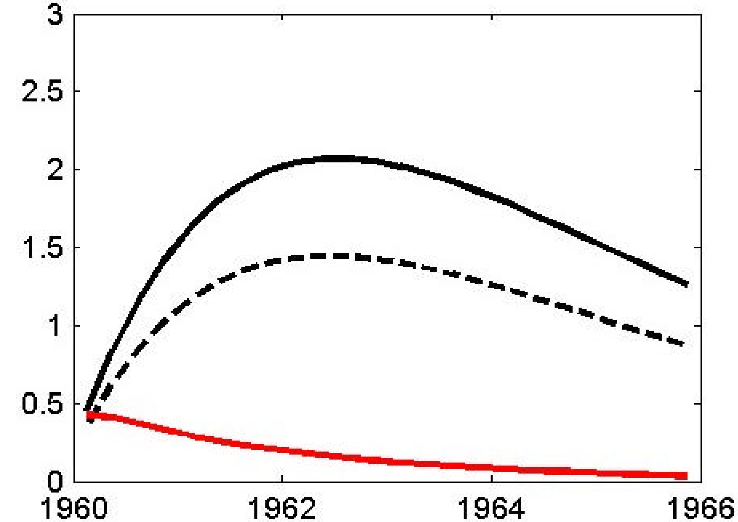


Consumption

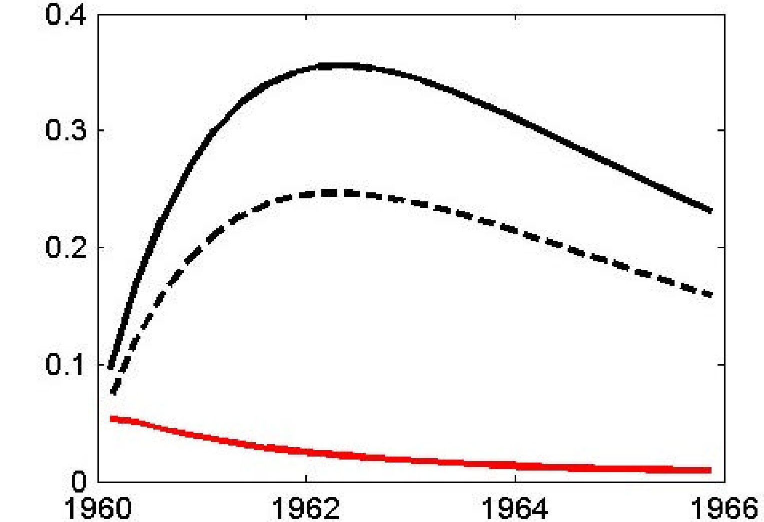


Inflation

A lot's in the shocks; everything is in shocks + frictions



Investment



Real wage

Why am I whining about shocks?

- **I AM NOT OPPOSED TO AUTOCORRELATED SHOCKS**
- But the shocks and *ad hoc* frictions shouldn't explain too much!
- Because if they do, then what does the welfare function mean?
  - Applies only to steady-state or unconditional welfare
  - But then we're choosing optimal inflation rates, not transition paths (i.e. monetary policies)
- And what about the Lucas critique?
  - We *may* have found deep behavioral parameters, but
  - Much of the dynamics come from ρ_a, ρ_b, etc.
  - Why would these be "deep?"

That said, the estimated contribution from "frictions" in O-W is somewhat small

- **Habits**
  - Note that with h=.4, the weight on past consumption ($h/(1+h)$) is 0.29
  - This is well below other estimates that often place weight on past consumption well above 0.5
  - Micro concerns: Little evidence of habits in micro data
- **Indexing**
  - Similarly, weight on lagged inflation from indexing ($\gamma_p/(1+\beta\gamma_p)$) is 0.24
  - Again, well below many estimates which are often well above 0.5
  - For wage indexing, preferred estimate has lagged inflation contribution at zero

Stronger frictions might imply a smaller role for shocks

- Like difference between autocorrelated errors

$$y_t = b\,x_t + \frac{e_t}{1 - r\,L} \rightarrow y_t = r\,y_{t-1} + b\,x_t - r\,b\,x_{t-1} + e_t$$

- And lagged dependent variables (habits, adj. costs, indexing)

$$y_t = r\,y_{t-1} + b\,x_t + e_t$$

- Common factor restriction, but for small β, as is typical in these models, may not be important
- How “deep” are adjustment costs?
  - “Higher-order” adj. costs smacks of adding lags without much restriction (FRB-US?)

For example, my parameter estimates on Smets-Wouters (detrended) data:

Parameter	O-W Estimate	My estimate
h	0.4	0.99
γ_p	0.32	0.99
γ_w	0	0.99
ρ_b	0.88	0.001
ρ_I	0.94	0.07
ρ_π	0.58	0.88
ξ_p	0.93	0.985
ξ_w	0.704	0.918
Likelihood: 1.57e03		
Likelihood, O-W parameters: 22.07		

"Frictions" more prominent

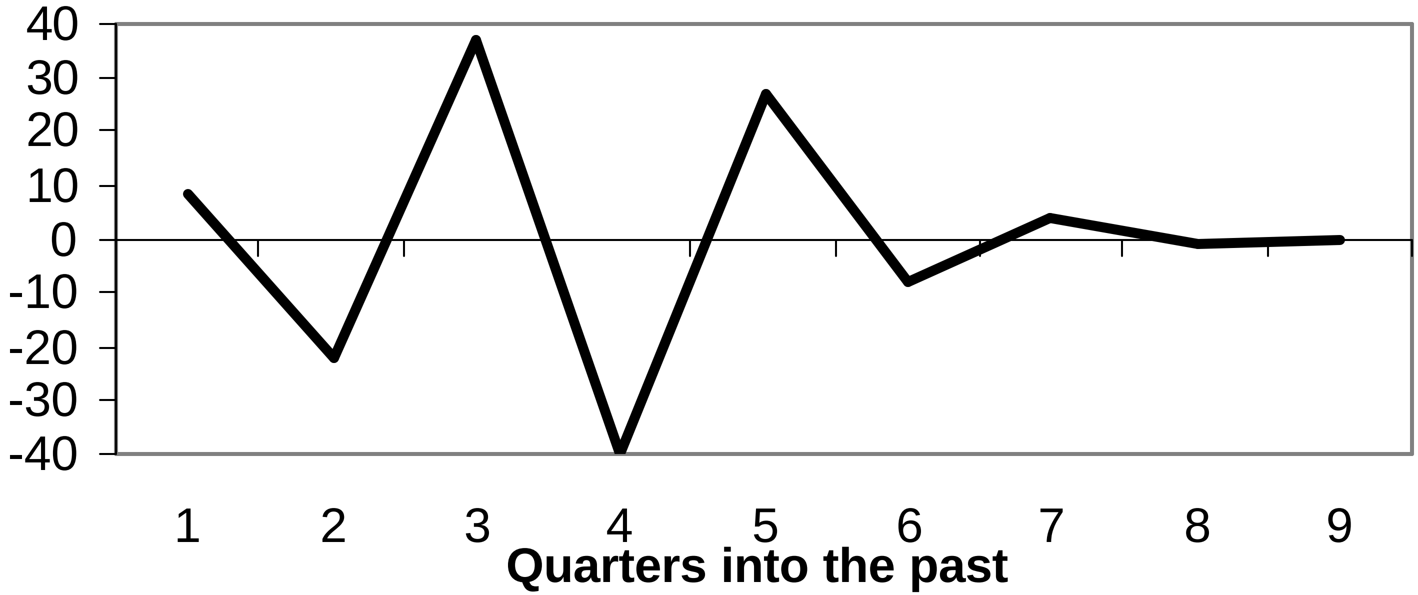
Shocks less correlated

A Larger Concern

- Are we adding “epicycles” to a dead model?
  - Habits help, but no compelling evidence that they’re present in micro data
  - Indexing in wages and prices (basically adding lags) is a bit *ad hoc*, no?
  - Higher-order adjustment costs are also subject to suspicion
  - Big “rho’s” on shocks make me nervous
- In a way, this takes us back to the very old models
  - With decent long-run, theory-grounded properties
  - But dynamics from a-theoretic sources
- If so, don’t push the model’s implications too far
  - “Optimal” policy may be more than we can ask

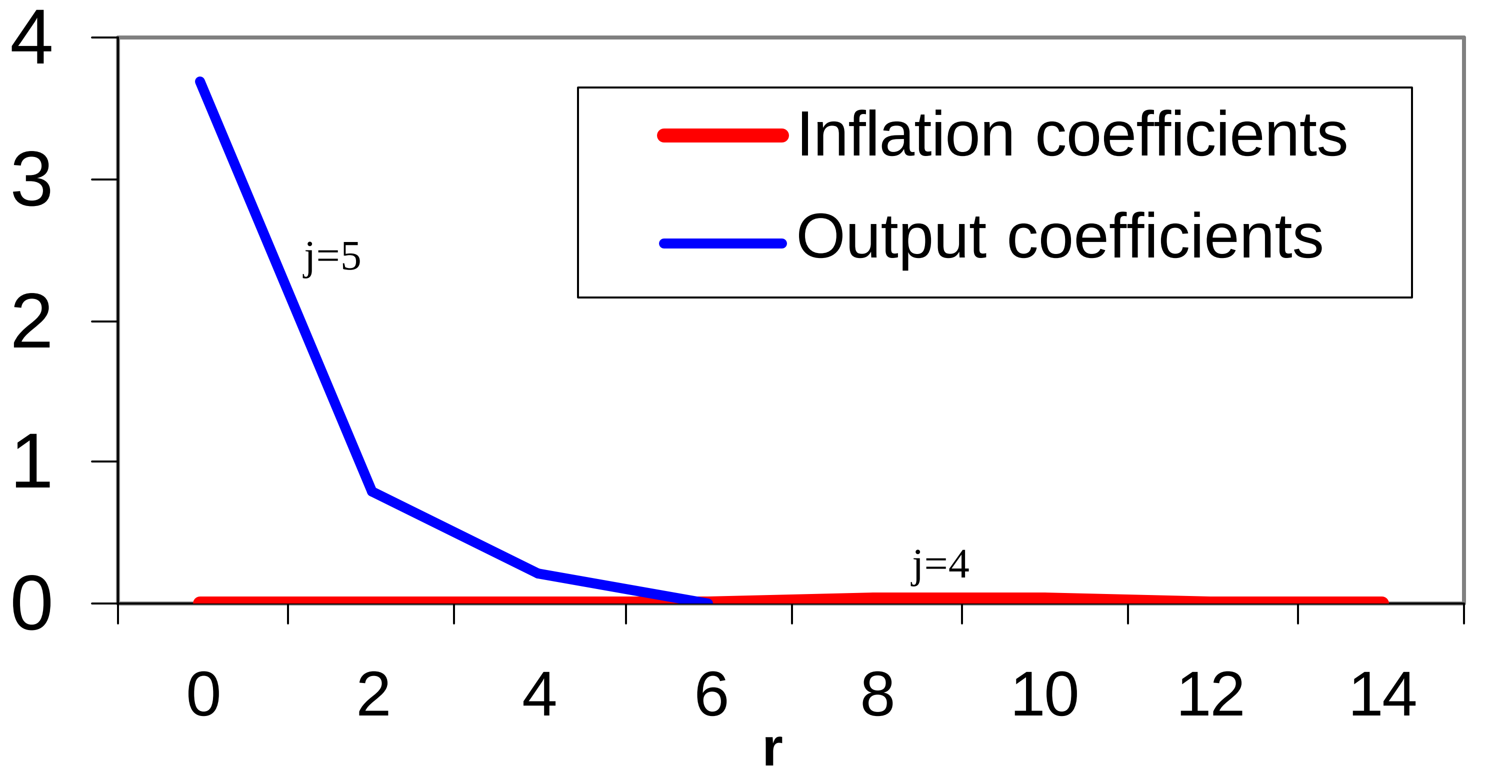
On Optimal Policy

- O-W Results
  - Optimal utility-based policy reduces loss by a factor of **50** relative to estimated rule
  - Rule which implements optimal policy looks like figure 16, with lagged interest rate coefficients like:



  - One root of polynomial inside unit circle, hence “super-inertial” in a generalized sense

In the rule which implements optimal policy, inflation gets essentially no weight (from figures 17-18)



Robustness: With Smets and Wouters' parameters, the rule looks somewhat different

- Although many of the qualitative properties are preserved
- Lagged interest rate coefficients about the same
- Output coefficients still much larger than inflation
- This latter result holds for the "simple rule" that approximates the optimal

Simple Rules in the O-W model

- They find a nice simple rule that captures most of the 50x reduction in losses:

$$i_t = i_{t-1} + 0.4(Y_t - Y_t^*)$$

- Now *that's* something the Fed can really work with!
- **No response to inflation necessary**; difference specification
- **The "nominal anchor" is lagged inflation**?
  - This really shouldn't work
  - Does it work in other models?

Look at the nominal anchor issue in a simple model

- "Hybrid" model, similar to O-W but simpler

$$p_t = wp_{t-1} + (1-w)E_t p_{t+1} + g\, y_t$$

$$y_t = w\, y_{t-1} + (1-w)E_t y_{t+1} - s\,(i_t - E_t p_{t+1})$$

$$i_t = i_{t-1} + ap_t + by_t$$

- For all values of 0≤ω≤1, if a=0, no value of b will stabilize the system
- System requires a true nominal anchor
  - Anchor works because CB moves i_t to attain its inflation target
  - Nothing else in system pins down long-run value of inflation.
  - CB attains inflation goal by moving real rates to influence *y*
  - It can move real rates because it can move *i* faster than π
- Another non-robust result

What to take away from the paper

- Big models are complicated and hard to understand!
- Optimal policy conclusions from these models can be quite counter-intuitive, seldom robust, not practical (O-W would agree)—super-inertia, nominal anchors
- The dependence on many *ad hoc* "frictions" and time series shock processes is worrisome
- But to match the data for this class of models, we need these epicycles
- Could other avenues be explored to improve models?
  - Heterogeneity: not hard to document, may be important
  - Aggregation: disaggregated time series often don't look like aggregates—micro foundations?
  - Learning: as some others at this conference are exploring
  - "Behavioral" explanations