○ **Slide 1. The paper by Gali and Rabanal has two main parts.** Part I is a survey of papers in the structural VAR literature that considers the fit of RBC models and the role of technology shocks for business cycles.

  ○ **The title of the paper is**, How well does the RBC model fit postwar US data? The Answer given is 'not so well."

  ○ **Why? According to their VAR evidence**, hours fall in response to technology shocks and the contribution of technology shocks to the business cycle is small.

  ○ **In standard RBC models, the opposite is true.** Thus, in GR's view, the VAR evidence is the death knell for RBC theory.

  ○ **Part II considers life after RBC models.** They describe a model that, at least for some parameterizations, is consistent with the VAR evidence laid out in Part I. This model, which I call the "triple-sticky" model has sticky prices, sticky wages, and sticky consumption or habit persistence. They estimate the model and report the contributions of different shocks to aggregate fluctuations.

  ○ **From that, they conclude that demand factors** — not technological factors — are key for business cycles.

  ○ **This slide serves and an outline** for my discussion – which will be divided in two parts: my views on the evidence in Part I and my views on the model in Part II.

○ **Slide 2. Let me start by summarizing how GR reach their conclusion** that RBC theory is not doing well.

  ○ **It is a direct application of Blanchard and Quah** who estimate this VAR. For data given in X, they first regress X on lags, they invert it to get the Wold Moving Average, they then use the coefficients in the Wold MA to back out estimates in this moving average that I have written here. How do they do that? They impose some structure here in order to identify the C's.

  ○ **What is the data for GR?** It is the change in log labor productivity and the change in log of hours.

  ○ **What names do GR give their shocks?** They call them "technology" and "demand."

  ○ **How do GR identify the C's?** They assume that the shocks are orthogonal and they assume that demand shocks have no long-run effect on labor productivity. Set the sum of the upper right corner of these matrices to 0.

  ○ **To get their main figure,** blip the second element of e_t and trace out the log of labor productivity and hours.

○ **Slide 3**. **On impact, you see a rise in productivity** and a fall in hours. This fall in hours and the fact that something else must be going on to get a high correlation between hours and output is GR's evidence against RBC theory.

○ **Slide 4**. **Since I want to compare models to the national accounts** I am actually going to work, not with the nonfarm business sector as they do, but with GDP and Total hours. If I do, not a problem for GR: same conclusions.

○ **Slide 5**. **What is the most obvious simple check** on this methodology?

　　○ **I can be the data-generating-process** and Gali-Rabanal can be the detectives. This is a game I play when I teach students at the University of Minnesota. I hand them "data" for an economy of my own making and they have to tell me what is going on in that economy.

　　○ **So, how do we play this game?** Well, I will take a plain vanilla RBC model. I will simulate time series from that model and I will apply the GR methodology. Then I can compare the GR impulse responses with the true ones. I can see if GR recover the technology that I put in.

○ **Slide 6. What is my plain vanilla RBC model?**

  ○ **It has 4 shocks:** TFP, government spending, a labor wedge which is essentially a tax on labor chosen to satisfy the static first order condition for the labor-leisure choice, and an investment wedge which is essentially a tax on capital chosen to satisfy the dynamic Euler equation.

  ○ **I compute maximum likelihood estimates** for the vector stochastic process. Given the results, I can compute impulse responses, and I can compute the contribution of these shocks to the output spectrum.

  ○ **What do my MLE estimates imply**, and what would GR conclude when they take data generated by my RBC model?

○ **Slide 7. Let's start with the facts about my model** given MLE estimates.

  ○ **Fact 1** (READ)

  ○ **Fact 2** (READ)

  ○ **If GR apply their methodology**, what do they find? (READ)

○ **Slide 8. What if we compare the technology** backed out by GR to the technology I put into the model? In this picture I plot them after taking logs and HP-filtering. As you can see GR don't back out what I put in.

   ○ **In fact, the realization of their technology** has very different properties than the one that I fed into the model. It is hardly correlated with output and negatively correlated with hours. The true technology is highly correlated with output and positively correlated with hours.

○ **Slide 9. Why do GR get it so wrong?** They assume: (READ)

○ **Slide 10. But I didn't and I usually don't!** The two important assumptions for my example are these. MLE flat out rejects orthogonality. And obviously I have more than 2 shocks.

○ **Slide 11. These points have been made before** in a response by Cooley and Dwyer to Blanchard and Quah. It saddens me that this fine paper seems to get ignored.

    ○ **At this point, I thought perhaps the** most useful thing to do would be to figure out which of these assumptions were most critical quantitatively. But then I thought, to what end? How would knowing this salvage the methodology?

○ **Slide 12**. **Really the most useful advice** is that it is time to move on. The literature seems so stuck in the past. They are picking a fight with work done long ago that people have improved upon — no one works with the original KP model. Even Ed would tell you that other factors like taxes are important.

○ **More recent research that evolved from** the RBC literature is looking to model sources of variation in TFP. Work by Schmitz, Lagos, Prescott and Parente consider the impact of work rules and labor market distortions on TFP. Chari, Kehoe, and I have explored static financial frictions reminiscent of Bernanke/Gertler's frictions that cause variations in TFP. Work by Bergoing and coauthors and Chu in her thesis considers the impact of subsidizing losers through policies like import substitution. These are examples I am most familiar with but there are many more.

○ **In Part II of their paper, the authors take a different route**. Let's now consider the factors that they think are important.

○ **Slide 13. The original title of their paper was** something like "After RBC models." In Part I of their paper, they ruled out the RBC paradigm. In Part II, they focus instead on what I call the "triple-sticky" model.

   ○ **This adds sticky p,w,c.**

   ○ **There are some unfortunate subtractions**. What is ironic here is this: in standard RBC models, technology has a much bigger impact on investment than on hours. By leaving out investment, they are minimizing the role that technology would have.

   ○ **What is the point of their additions?** The motivation for including these things is to have a role for money. (READ.)

   ○ **I said at the beginning that they conclude** that demand shocks are the main force for business cycles. Is it shocks to the Fed's policy instrument?

   ○ **To think about this, I decided to put my own** triple sticky model on the computer — one that adds back in all of the components of GDP. I want to feed in a realization of monetary shocks and see what the time series for GDP and inflation would look like. I am very close, but not done, with my triple-sticky, so I will show you the results for the double-sticky with sticky prices and sticky wages. I am going to take CGG's estimated Taylor rule for the Fed and feed in backed out innovations.

○ **Slide 14. This is what I get**. These figures compare time series from data (after detrending or demeaning) with time series from the sticky model. These results are consistent with the variance decompositions that GR report — which indicates that adding habit persistence is not going to change this much.

  ○ **The reaction that I expect from this is: Ellen you are not being fair.** We think the action is in how the Fed reacts to other shocks. Ok, there is certainly a big gap to fill here. So, if we tossed out technological shocks and we find monetary shocks are trivially important, what are these demand factors, element 1 of vector e?

○ **Slide 15. They are preference shocks, shocks to the price markup, and shocks to the wage markup.** This is reminiscent of Rotemberg and Woodford's findings in their Macro Annual from 6 or 7 years ago. They needed large and variable shocks to preferences and to a variable called aggregate demand appearing in the resource constraint. Given their work and some calculations that I have done, I was not surprised by this table.

○ **Slides 16-22** READ.