PS2 2025 Solutions (Due 7 October 2025)

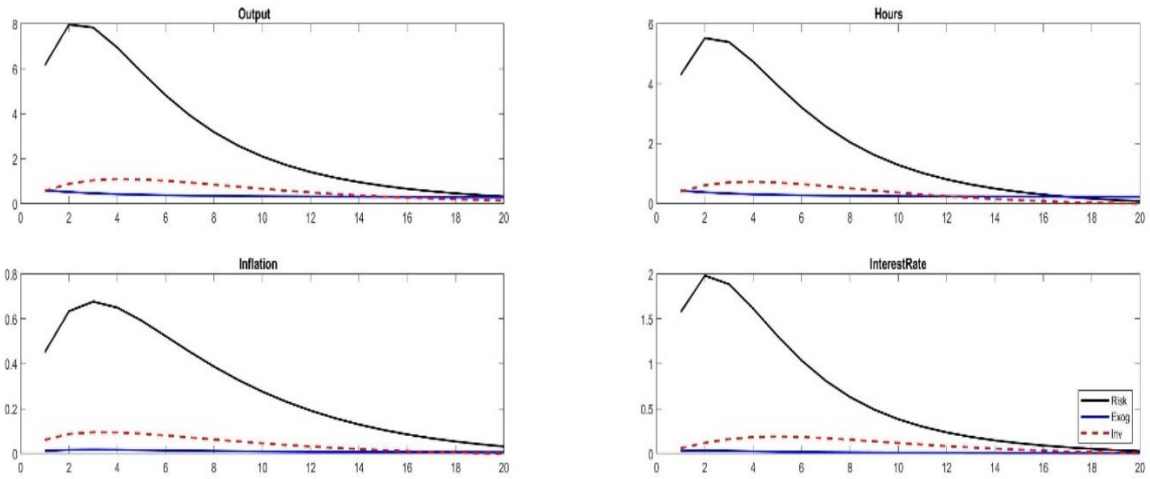
This Part is based on the SW model we discussed this week. You will be simulating the SW model and examining various facets.

Q1 – Q3.

Nothing to be said here. The work is straightforward. If all has been done correctly, you will indeed find that your results mirror those presented in the lecture this week.

Q4.

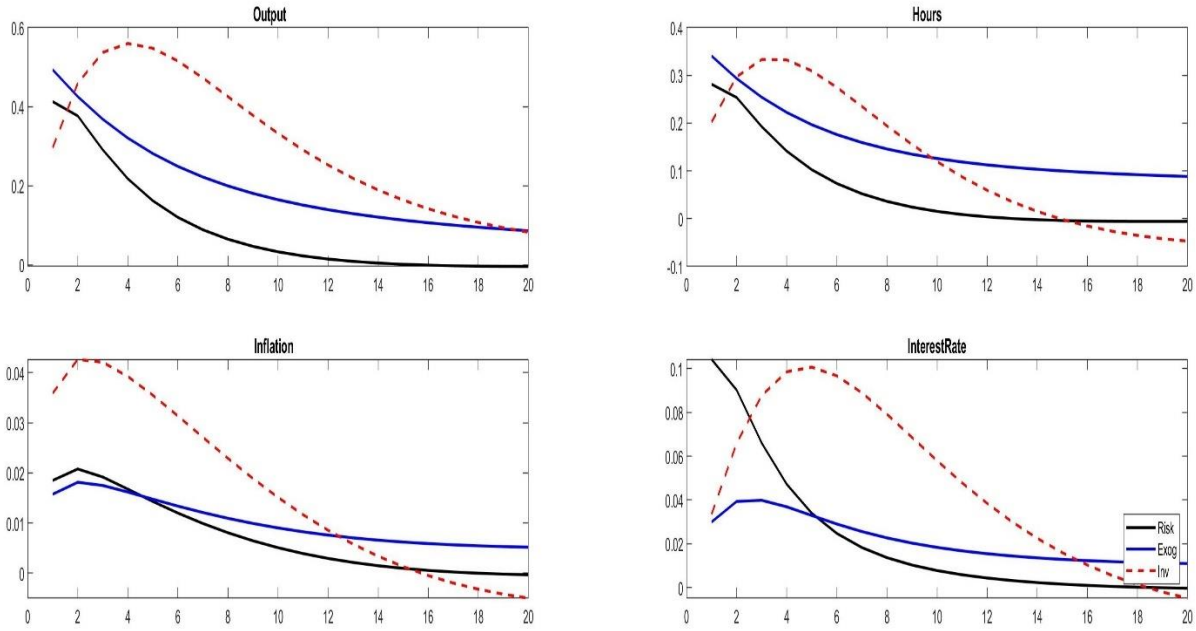
In your attempt to reproduce Figure 2 in SW2007, using as a basis the Matlab file "SW2007_orig_Fig2.m", you should have found a figure that looks like the one below (as noted, not at all like the original Figure 2!)
J:\MyCourseDSGEs2025\HW\PS2\SW2007original_4HW3Q4.mod
J:\MyCourseDSGEs2025\Tests\SW2007_orig_Fig2_4HW3Q4.m



Q5.

Using the ***mode*** of the ***posterior*** distribution shown in Tables 1A and 1B, your result should now look very like SW2007's Figure 2:
J:\MyCourseDSGEs2025\HW\PS2\SW2007original_4HW3Q5.mod

J:\MyCourseDSGEs2025\HW\PS2\SW2007_orig_Fig2_4HW3Q5.m



Q6.

[J:\MyCourseDSGEs2025\Tests\SW2007original_4HW3Q7a.mod]
[J:\MyCourseDSGEs2025\Tests\SW2007a_fiscal_Walsh.m]

Adding the ***fiscal*** sector can be done by adding the following equations to the SW2007 model of Q3:

```
//government budget constraint <=== NEW
debt=cr*(1/cpie*debt(-1)+g-t);
//fiscal rule <=== NEW
t=phi_b*debt(-1)+phi_g*g;
```

Including the ***Non-Ricardians*** is done by changing the notation for the extant consumption equation in the sticky-price part of the model so that it is specific to the ***Ricardians***:

```
// Consumption of Ricardian HH <=== NEW
    c_nlc = (chabb/cgamma)/(1+chabb/cgamma)*c_nlc(-1) +
    (1/(1+chabb/cgamma))*c_nlc(+1) +((csigma-
    1)*cwhlc/(csigma*(1+chabb/cgamma)))*(lab-lab(+1)) - (1-
    chabb/cgamma)/(csigma*(1+chabb/cgamma))*(r-pinf(+1) + 0*b) +b ;
```

and adding to the sticky-price part of the model the following equations for the Non-Ricardians and aggregate consumption:

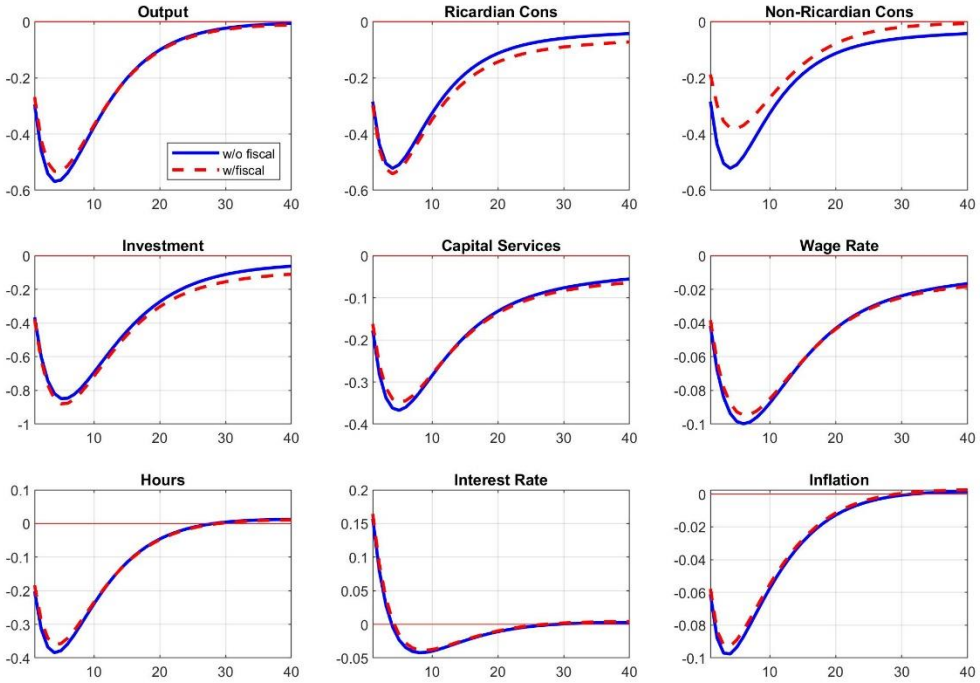
// Consumption of Non-Ricardian HH <=== NEW
c_lc=cwhlc*(w+lab)-1/ccy*t;
//aggregate consumption <=== NEW
c=(1-omega)****c_nlc***+omega****c_lc***;

[Note the explicit inclusion of ***taxes t*** in the equation for non-Ricardians.] Similar equations must be added to the flex-price part of the model.

Once the fiscal sector is incorporated into the model, and the Ricardians and non-Ricardians are separated out, two major changes in the model responses become clear: first, the pattern of response of the consumption of Ricardians and non-Ricardians differs significantly; and second, more generally, the shock responses in the IRFs do not differ only as regards the exogenous spending shock, as might be expected. These results should come as no surprise, as the fiscal sector's primary impact is on the consumption of non-Ricardians (who are liquidity constrained and therefore cannot offset the impact of taxes via changes in saving), but in a general equilibrium solution, every variable will be impacted somewhat.

Below are the comparative IRFs for the MonPol, exogenous spending, wage markup and TFP shocks. All these display the characteristics noted above.
[J:\MyCourseDSGEs2025\HW\PS2\ HW3Q7_MonPol.jpg]

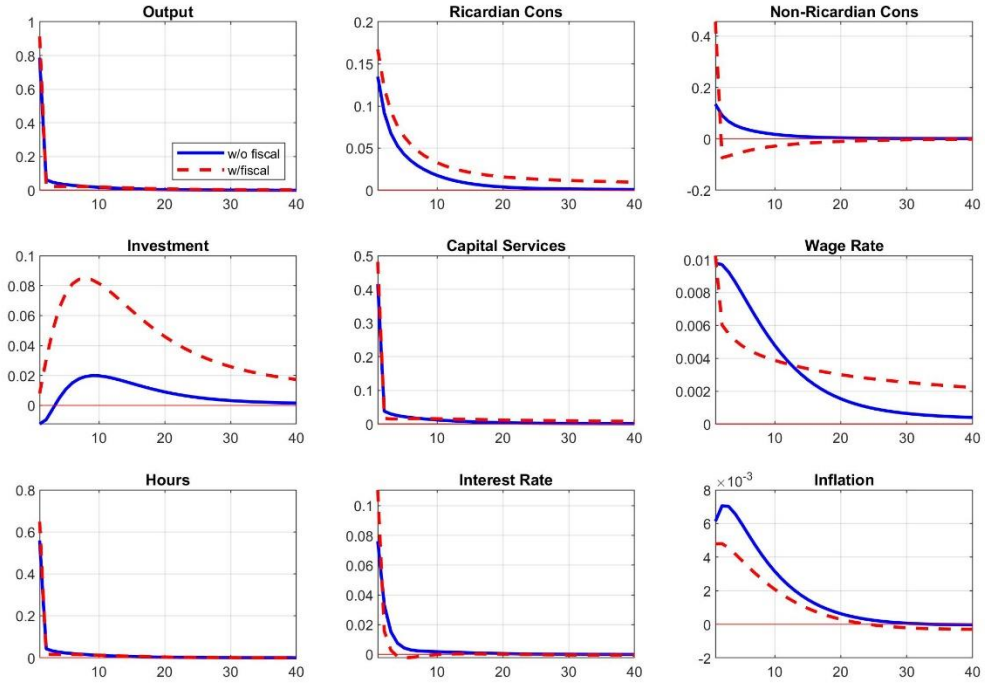
Monpol:



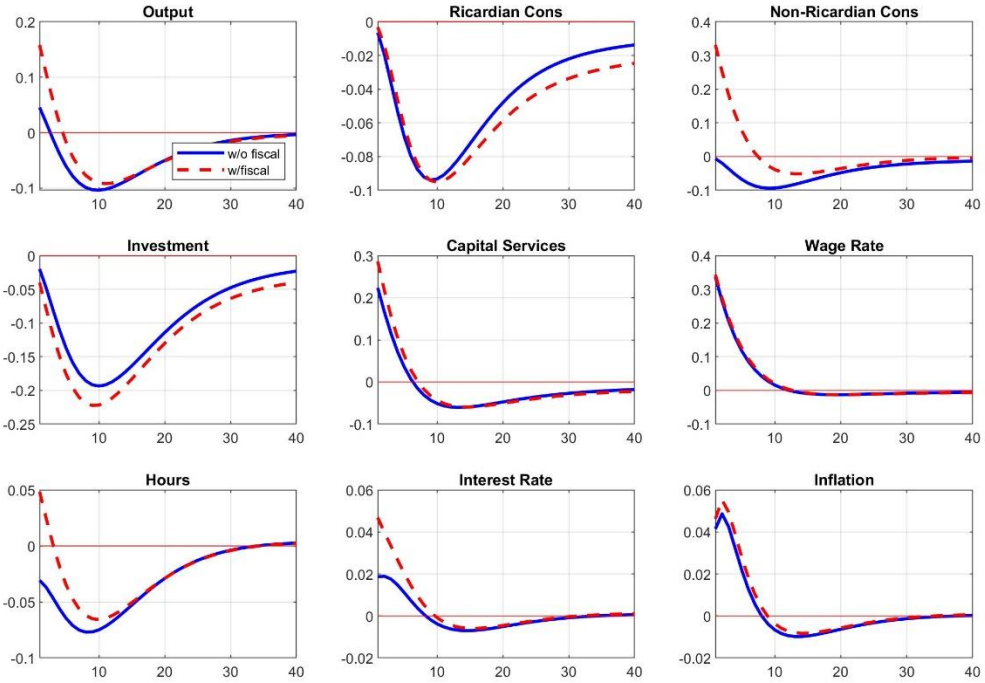
Notice that essentially only the consumption responses differ. [Here, as the SW2007 model does not differentiate between Ricardians and non-Ricardians, the **blue** lines for consumption are both simply the aggregate consumption responses]

Exogenous spending:

Recall that in this version of the model, exogenous spending g = eg, i.e., just an IID shock. Hence the sharp one-period impact on output, hours and the interest rate, as well as on non-Ricardian consumption (as opposed to the smoother response of Ricardian consumers, who cushion the shock via changes in saving).



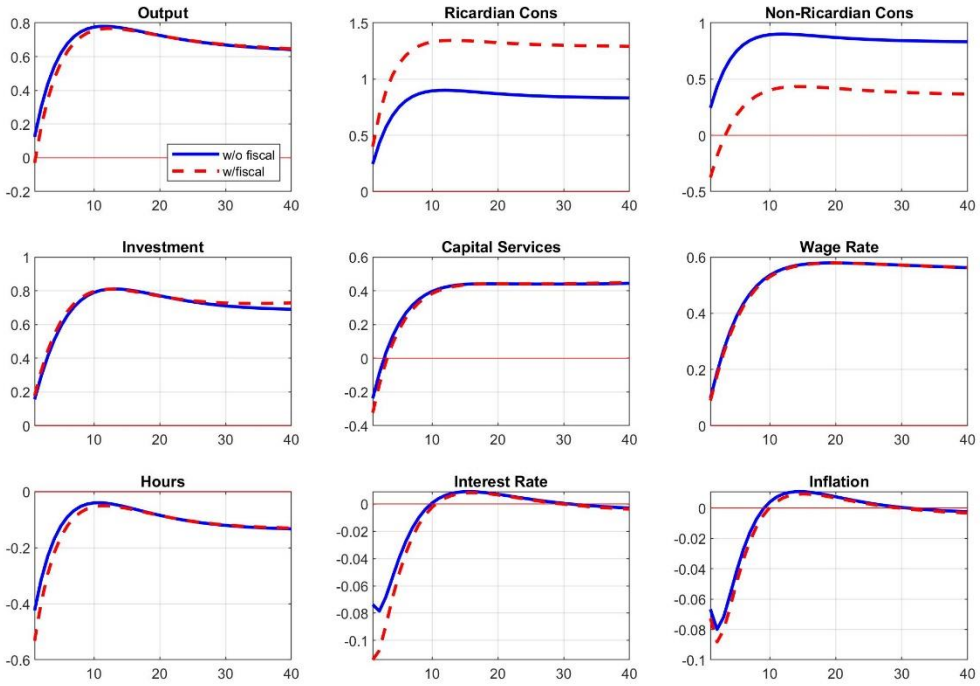
Wage markup:



Notice how differently hours worked and non-Ricardian consumption respond when the fiscal sector is included: the introduction of taxes requires greater work effort on the part of non-Ricardians but that response coupled with the higher wage rate is sufficiently great that non-Ricardians are actually able (for

the first couple of years) to increase their consumption relative to the non-tax world.

TFP:



As is clear, essentially the only difference here is in the pattern of consumption between Ricardians and non-Ricardians: the introduction of taxes reduces non-Ricardian consumption. Notice the difference with the previous (wage marh-up) graph: here of course the wage rate does not increase initially.

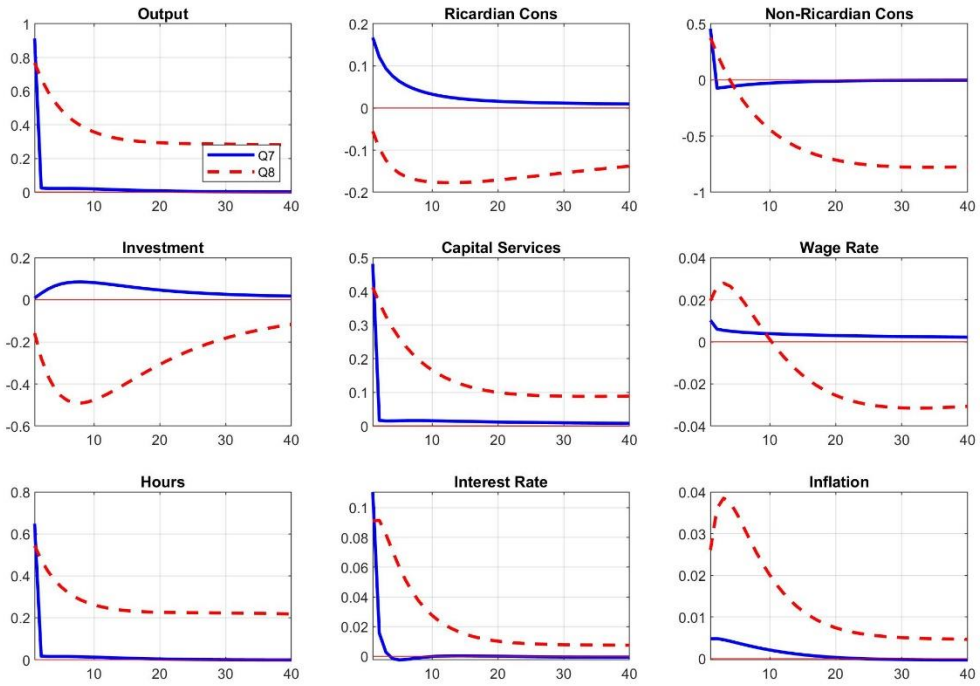
Q7.

[J:\MyCourseDSGEs2025\Tests\SW2007original_4HW3Q3c.mod]
[J:\MyCourseDSGEs2025\Tests\SW2007c_fiscal_Walsh.m]
[J:\MyCourseDSGEs2025\Tests\SW2007comp4_fiscal_Walsh.m]

Reverting to the SW2007 formulation of exogenous spending implies using
g = crhog*(g(-1)) + eg + cgy*ea;
instead of
g = eg;
in the model; everything else remains the same.

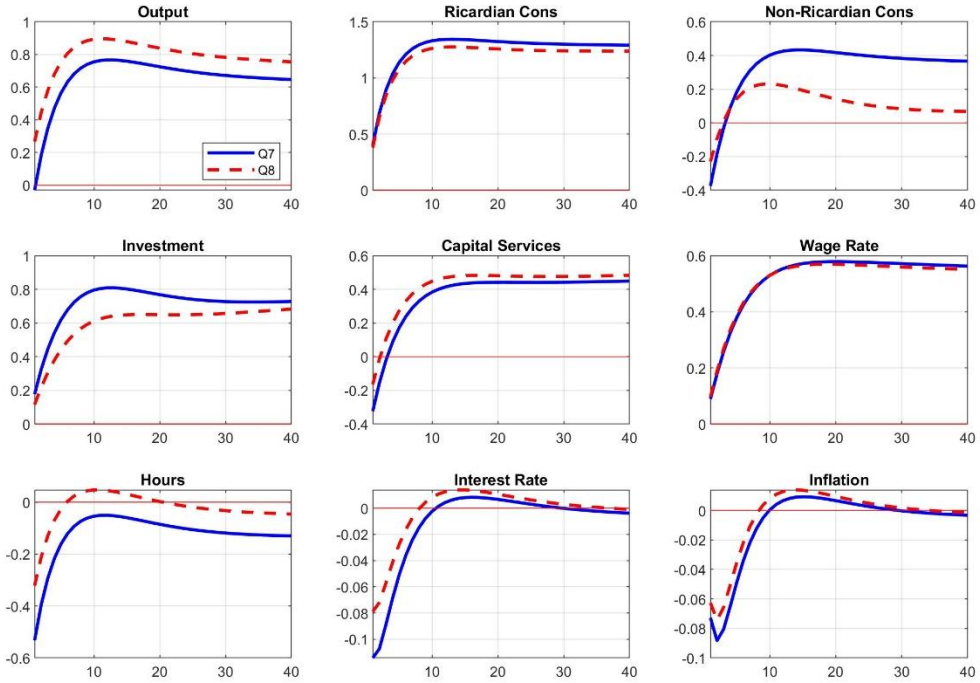
The result is that only the exogenous spending and TFP responses differ between the models:

Exogenous spending:



The impact of the changed formulation is especially clear in the response of output to the shock: instead of a sharp one-period response, the IRF is now smoothly declining. This behaviour carries over to the capital services, interest rate (via the Taylor Rule), wage rate and hours worked IRFs. The change in the investment response seems puzzling, but is the result of the smoother response of output (and thence investment in the following periods).

TFP:



The changes between Q6 and Q7 are much less pronounced as regards the TFP shock, which enters the model in Q6 only via the production function, but has an additional (second-order) impact in Q7 via its inclusion in the exogenous spending shock.