Notes on Farmer’s “Confidence, Crashes, and Animal Spirits”

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1 Model

I took Roger’s model and boiled it down to the essentials, so I could see what is going on. The model is essentially static, and we do not need capital or a separation between households and firms to tell the story. I will assume a continuum of households with unit mass each of whom receives utility $c$ from consuming $c$ goods. Each household has a continuum of agents with unit mass who each have an endowment of one unit of time. An agent’s unit of time can be used to post a vacancy, or the agent can search for work with another household. Agents cannot work for their own household. Let the quantity of vacancies chosen by the household be $v$ and the number of agents in the household who search for work be $u$. We thus have $u + v = 1$. We will look for a symmetric equilibrium. Let $\bar{u}$ and $\bar{v}$ denote the values of $u$ and $v$ chosen by all other households. Assume that the number of matches $m$, resulting from the posting of vacancies and would-be workers searching from each household, is given by

$$m = \mu \bar{v} \bar{u}^{1-\delta},$$

where $\mu > 0$ and $0 < \delta < 1$. Here, I have assumed that the matching function is Cobb-Douglas for simplicity, and $\mu$ is a parameter representing matching efficiency.

2 Equilibrium

Let $\theta = \frac{v}{u}$ denote labor market tightness. For an individual household, the probability that posting a vacancy results in a match is $\mu \theta^{\delta-1}$, and the probability that a would-be worker gets a match is $\mu \theta^\delta$. Once a match occurs, $z$ units of output are produced, the worker receives surplus $w$, and the firm’s surplus is $z - w$, where $w$ is the real wage. Then, each household solves the problem

$$\max_{v \in [0, 1]} \left[ z - w v \mu \theta^{\delta-1} + w (1 - v) \mu \theta^\delta \right]$$

so in a symmetric equilibrium where all households choose the same $v$, we get

$$w = \frac{z}{1 + \theta}.\quad (1)$$

There is then a continuum of equilibria, given by equation (1). For example, we could have an equilibrium with high $\theta$ (high labor market tightness) and low real wages, or an equilibrium with low $\theta$ (low labor market tightness) and high real wages. What is efficient? We want to find the quantity $v$ that maximizes the number of matches, i.e.

$$\max_{v} v^\delta (1 - v)^{1-\delta}$$

so the optimal $\theta$ is

$$\theta^* = \frac{\delta}{1 - \delta}.\quad (2)$$

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Thus, we could have an equilibrium where \( \theta < \theta^* \), so that there is too much unemployment in equilibrium because the real wage is too high - very much an Old Keynesian idea. But everyone is optimizing here in equilibrium. It makes no sense to describe output as being “demand-determined,” or to say that firms are on their “demand curve for labor” while workers are not on their “supply curve for labor.” That is the wrong language for the model at hand, and does not help us understand what is going on.

3 Old Keynesian Policy

We can certainly do Old Keynesian fiscal policy in this model. For example, we could have the government take over a fraction \( g \) of households. For these households, have the government set \( v = v_g \) and \( w = w_g \), and permit lump-sum transfers from the government to private households. I have not worked this out, but it seems clear that the government can increase welfare by manipulating \( g \), \( v_g \), and \( w_g \), though perhaps the government cannot achieve efficiency with \( g < 1 \). Efficiency can certainly be achieved with \( g = 1 \).

For monetary policy, suppose that \( W \) is the nominal wage. The private sector moves first, choosing \( W \); then the government chooses \( P \), the price level. The real wage is then \( w = W/P \). The government can always achieve efficiency. If you don’t like that, suppose money demand is proportional to nominal income, so \( M = kPz_m \) in equilibrium, and you can obtain efficiency if the government manipulates \( M \) appropriately.

4 New Keynesian Policy

Maybe this is something like what Kocherlakota had in mind in his talk, but I’m not sure. Repeat the static model, assuming for simplicity that there is no aggregate uncertainty, and give each household preferences

\[
\sum_{t=0}^{\infty} \beta^t c_t.
\]

Then, following the approach Woodford uses for his “cashless model” in Interest and Prices, suppose that there are money prices for goods \( \{P_t\}_{t=0}^{\infty} \), but (in contrast to Woodford) prices are not sticky. As above, think of the private sector choosing a sequence of nominal wages \( \{W_t\}_{t=0}^{\infty} \). Let \( R_0 \) be the nominal interest rate, which is determined by the asset-pricing relationship

\[
\frac{1}{1 + R_t} = \frac{\beta P_t}{P_{t+1}}
\]

Now, from (1) and (2), optimal policy will support a real wage path

\[
\{w_t\}_{t=0}^{\infty} = \{z_t(1-\delta)\}_{t=0}^{\infty}.
\]
so if the private sector chooses nominal wages \( \{ W_t \}_{t=0}^{\infty} \), then the asset pricing relationship allows us to back out the optimal monetary policy rule, i.e.

\[
R_t = -1 + \frac{W_{t+1} z_t}{\beta W_t z_{t+1}},
\]

so we obtain a Taylor rule which dictates that the nominal interest rate be high when nominal wage growth is expected to be high, and that the nominal interest rate be low when productivity growth is expected to be high. In cases where the central bank bumps up against the zero lower bound, we can resort to Old Keynesian fiscal policy.

5 Conclusion

Old Keynes, and New Keynes, in a nutshell, and no sticky wages or prices. But it’s quite a chicken model. The private sector agents somehow cannot figure out how to split the surplus in a match, let alone do it efficiently, but the government has a great deal of insight into how this should be done.