Econ 809: Assignment 1

Answer Key

Consider an aggregate matching technology with the following functional form:

$$m_t = e^{x_t} v_t^{\alpha} u_t^{1-\alpha}.$$

This may alternatively be specified as $p_t = e^{x_t} \theta_t^{\alpha}$, where $p_t \equiv m_t/u_t$ denotes the job-finding rate and $\theta_t \equiv v_t/u_t$ denotes the vacancy-unemployment ratio. This data is presented in Figure 1.

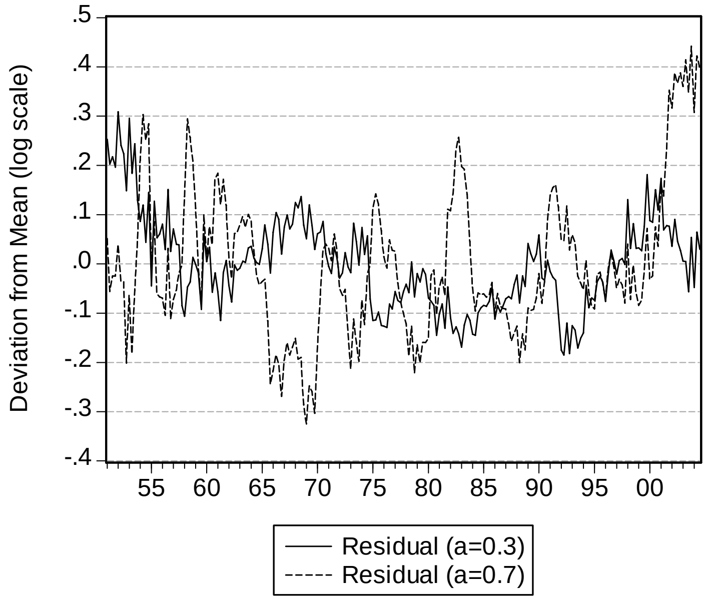
FIGURE 1
Job Finding Rate and VU Ratio
U.S. Data 1951.1-2004.3

Since Shimer provides (U.S. quarterly) data on $\{p_t, \theta_t\}$, we can compute:

$$x_t = \ln(p_t) - \alpha \ln(\theta_t),$$

for different values of α. In Figure 2, I compute x_t (as a deviation from its mean value) for two values: $\alpha \in \{0.3, 0.7\}$.

FIGURE 2
Residual on Matching Technology



For both values of α, there appears to be a significant amount of unexplained variation (variation in the job-finding rate not accounted for by movements in the vacancy-unemployment ratio). The amount of unexplained variation appears to be larger in the case of $\alpha = 0.70$ (a greater sensitivity of the job-finding rate to vacancies). All series appear to be approximately stationary. Table 1 reports the standard deviations for $\ln(p_t), \ln(\theta_t)$ and x_t (for each value of α).

Table 1

	$\ln(p)$	$\ln(\theta)$	x $(\alpha = 0.3)$	x $(\alpha = 0.7)$
SD	0.2055	0.4556	0.0945	0.1505

As with the so-called Solow residual in an aggregate production function, the residual here can be interpreted in one of two ways. One interpretation is that it reflects exogenous 'technology shocks' to the aggregate matching technology. This interpretation might be more plausible if we actually observed a secular increase in x, but this does not appear to be the case. On the other hand, perhaps there are shocks in the economy that affect the technology of matching at different points in the cycle. For example, a sectoral (versus an economy-wide) productivity shock may imply a greater need for intersectoral movements in labor. If matching across sectors is more difficult than matching within sectors, this may show up as a negative shock to the matching residual.

An alternative interpretation is that the matching function we used to compute the residual is mispecified. This would be the case, for example, if search intensity on the part of unemployed workers varies over the cycle. That is, let s_t denote search intensity. Then the matching function may plausibly be written as:

$$p_t = e^{x_t} s_t^{-\alpha} \theta_t^{\alpha},$$

so that,

$$x_t = \ln(p_t) + \alpha \ln(\theta_t) + \varepsilon_t,$$

where $\varepsilon_t \equiv \alpha \ln(s_t)$. Now, imagine that the 'true' x_t is fixed; $x_t = x$, but that s_t fluctuates. If we do not account for s_t and instead naively estimate the residual as before, our estimated residual will be given by $\hat{x}_t = x - \alpha \ln(s_t)$. In this case, an increase in the search intensity of workers will show up as a negative shock to the aggregate matching function (since workers now find it more difficult to find a given number of jobs).