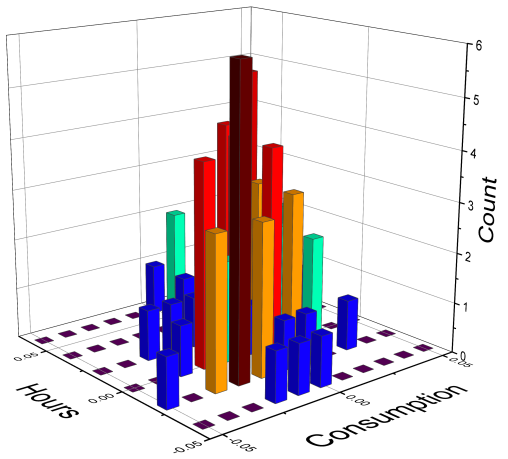

Figure 1: The bivariate distribution for detrended logged consumption and hours worked obtained from annual U.S. data, 1948 to 2017.

(The Welfare Cost of Business Cycles) After logging and detrending U.S. consumption and hours worked the bivariate distribution shown in Figure 1 obtains. The standard deviations for consumption and hours worked are 0.0217 and 0.0257. The correlation between these two variables is 0.6160.

Consider a representative agent whose momentary utility function is given by

$$\theta \ln c + (1 - \theta) \ln(1 - h),$$

where c is consumpton and h is hours worked.

1. Consider two economies: the first where c and h have the bivariate distribution $F(c, h)$ and the second where c and h are constant at the mean values for the first economy. How would you compute the welfare cost of business cycles?

2. Write a MATLAB program that computes the welfare cost of business cycles. When doing this, assume that $\ln c$ and $\ln h$ follow a bivariate normal distribution. Assume that $\theta = 0.67$. Do the means for $\ln c$ and $\ln h$ matter?

3. Can you think of a better way of doing things?

GOOD LUCK!

Hint: Suppose that x and y are distributed according to a bivariate normal distribution with means μ_x and μ_y, standard deviations σ_x and σ_y, and correlation ρ. This bivariate distribution can be constructed from two independently normally distributed variables v and w each with zero means and unit standard deviations. To do this, use the formulae

$$x = \mu_x + \sigma_x v,$$

and

$$y = \mu_y + \sigma_y[\rho v + \sqrt{(1-\rho^2)}w].$$