K. Salyer, Economics 200E, Spring 2004

# 1 Final Exam

*Directions: Answer all questions - they are equally weighted. Good luck and enjoy your summer — **after** the prelims.*

1. (25) Over the last fifteen years, much research in macroeconomics has focused on three "puzzles": the equity premium puzzle, the risk-free rate puzzle, and the small costs of business cycles (as demonstrated by R. Lucas, Jr.). Describe these puzzles and discuss to what extent they are related. In your discussion, be sure to develop the implications that these puzzles have for macroeconomists.

2. (25) Consider a competitive economy with an infinite number of identical firms and households. Each period, firms hire labor at the wage rate, $w_t$, in order to maximize profit. The production function for a representative firm is

$$y_t = z_t h_t^{\alpha}$$

where $y_t$ denotes output, $h_t$ is labor, and $z_t$ is an i.i.d. technology shock with $E(z_t) = 1$. It is assumed that $0 < \alpha < 1$.

Income in each period is determined by labor income and the proceeds from equity purchased in the previous period. This consists of current profits and the price of equity. (Initially, each household is endowed with one unity of equity denoted $\bar{z}$.) Household income is then allocated between consumption and purchases of equity. These choices are made in order to maximize the discounted stream of expected utility given by:

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left[ \frac{c_t^{1-\gamma}}{1-\gamma} + A(1-h_t) \right] \right\}$$

The parameters $(\beta, \alpha, A)$ are all positive with $(\beta, \alpha) \in (0,1)$. Given this environment, do the following:

   (a) Define the representative firm's and household's maximization problems. Derive and interpret the associated necessary conditions.

   (b) Define a *recursive competitive equilibrium* in this economy.

   (c) Rather than solve directly for the competitive environment, one can instead solve an associated social planner problem. For this environment, what is the relevant social planner problem. Show that the necessary conditions associated with this problem do indeed correspond to those in (a).

   (d) Characterize the equilibrium behavior of labor, the wage rate, and the price of equity.

3. Answer the following questions about RBC models

   (a) In Larry Summer's criticism of Real Business Cycle Theory, he claims that Prescott engages in "price-free economics." Do you agree?

   (b) Can RBC models generally account for the output dynamics displayed by U.S. GNP?

4. Consider the following variant of Stockman's cash-in-advance model. The primary distinction is that asset and goods markets are assumed to meet sequentially with the asset market preceding the goods market. The assets in the economy are: capital ($k_t$), one-period nominal bonds ($B_t$), one-period real bonds ($b_t$), and money ($M_t$). Nominal bonds costs 1\$ in period $t$ and return $\$N_t$ in the following period while real bonds cost one unit of consumption in period $t$ and return $R_t$ units of consumption in period $t+1$. In the asset market, agents receive the returns from capital (i.e. the revenue from the sale of output in last period's goods market and the sale of undepreciated capital), the returns from bonds, money not spent in last period's goods market, and the lump-sum monetary transfer and use this to buy new capital, bonds and money. Next agents visit the goods market where money is used to finance consumption (i.e. consumption is subject to the cash-in-advance constraint). The aggregate money stock grows at the constant rate $\mu > 0$. (Note that, as in Stockman, agents' use capital to produce output via the production function $y_t = f(k_t)$. This output is sold in the goods market.) Households have standard time separable preferences as in Stockman.

   (a) Set up the agent's maximization problem as a dynamic programming problem.

   (b) Prove that in this economy, the Lagrange multiplier associated with the budget constraint is equal to agent's marginal utility of consumption. Why is this different than in Stockman's model?

   (c) Define a steady-state equilibrium. Prove that money is superneutral.

   (d) Show that the Fisher relationship holds.

5. Out of the many intriguing theories and techniques discussed in class, what did you find most interesting?