

STUDIENZENTRUM GERZENSEE
STIFTUNG DER SCHWEIZERISCHEN NATIONALBANK

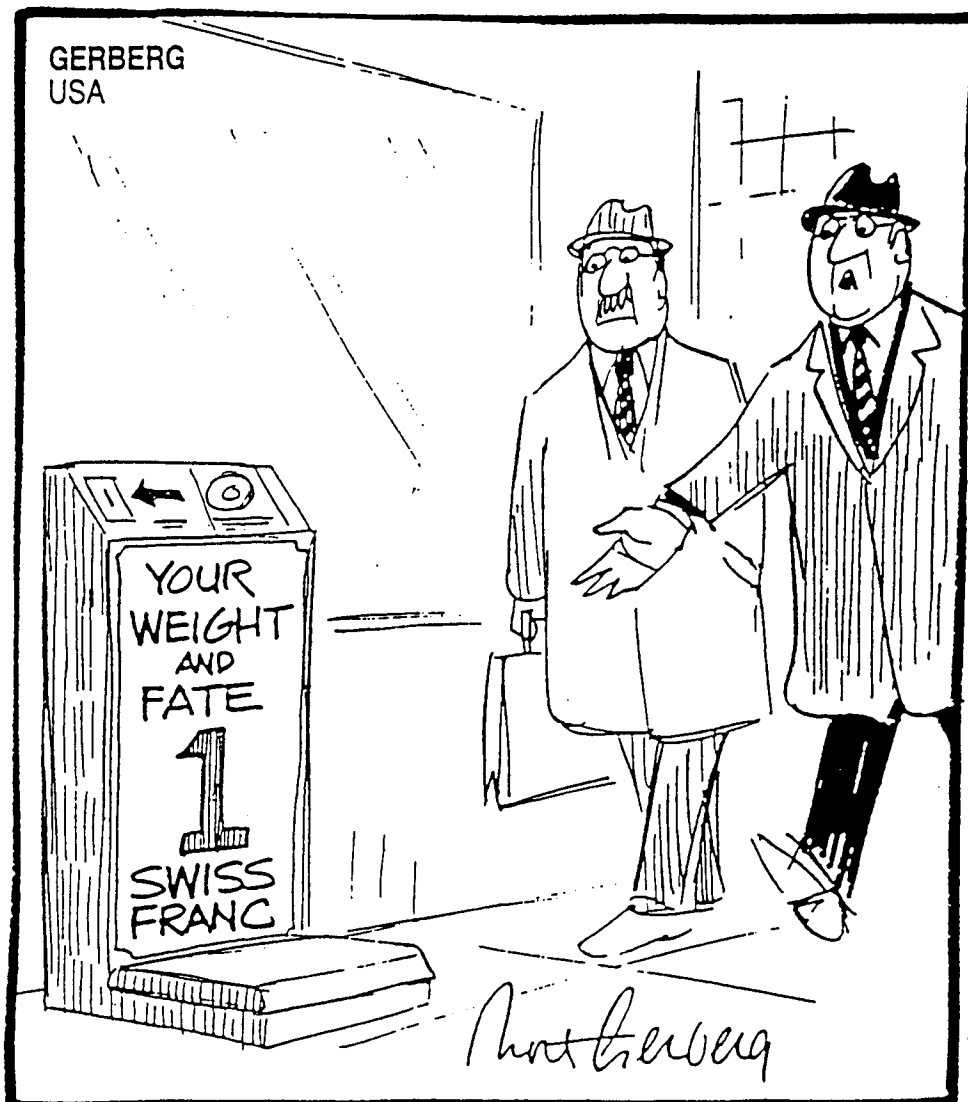


Program for Beginning Doctoral Students in Economics 1995/96

Exam in Macroeconomics

Tuesday, October 15, 1996

1. You are allowed to use all material that you want (lecture notes, books, etc.) with the exception of PC's.
2. Please **do not** mention your name on top of the pages, but use your identification number from the enclosed list. The reason is that the exams will be graded anonymously.



"There! Now will you agree the dollar is in deep trouble?"

STUDIENZENTRUM GERZENSEE
Doctoral Course in Macroeconomics

Final Examination

This examination involves a total of 200 points, evenly divided between two sections of the examination. Please allocate your time carefully so as to maximize the total number of points that you earn on the examination. If you think that any part of any question is not clearly defined, then begin your answer by defining the question as you will answer it.

Please write your answers neatly, as the exams will need to be photocopied for grading purposes. Please also answer all questions in the same order as they are given in the examination.

Part I: Shorter Questions
Total Points: 100

Please note that there are different numbers of points for different questions and allocate your time accordingly.

1. Cyclic behavior of the trade balance (30 points, 10 points each for (a),(b), and (c))

- (a) Describe the cyclic behavior of the trade balance, in terms of relative volatility and whether it moves procyclically or counter-cyclically.
- (b) Describe the ways in which the cyclic behavior of the trade balance is different in small economies compared with large economies.
- (c) Discuss the extent to which open-economy real business cycle models can explain the different behavior of small economies, and briefly describe the central mechanisms at work.

2. Welfare analysis in dynamic models (20 points)

Consider an economy in which agents value consumption and leisure according to the standard utility specification,

$$U = E_0 \sum_{t=0}^{\infty} \beta^t u(c_t, L_t)$$

Initially, suppose that the economy is in steady state with consumption equal to c in each period and leisure equal to L in each period, so that expected lifetime utility is given by

$$\frac{u(c, L)}{1 - \beta}$$

Now, suppose that the economy is disturbed by a policy shock that causes expected consumption and leisure to follow new paths, denoted by c_t and L_t . Describe how to compute the welfare effect of this policy shock in a way that expresses the welfare gain or loss in goods units.

3. Factors affecting investment (20 points, 10 points per part)

The basic neoclassical model of investment specifies that

$$E_t \lambda_{t+1} [A_{t+1} \frac{\partial F(k_{t+1}, n_{t+1})}{\partial k_{t+1}} + (1 - \delta)] = \lambda_t$$

where λ_t is the marginal utility that the firm's owners attach to goods at date t , A_t is the productivity level at date t , k_t is the capital stock at date t , n_t is the quantity of labor input, $F(k, n)$ is the firm's production function and where δ is the depreciation rate on capital.

- (a) how is this related to the familiar rule that the marginal product of capital, net of depreciation should be equal to the real interest rate?
- (b) if output is determined by demand in the short run, then what are the channels by which changes in money can affect investment?

4. Models of the demand for money (30 points: 10 points per model)

The demand for money is typically written as a function of a transactions (scale variable), an interest rate and also of some costs of alternatives to holding money. Consider three of the following models of money demand. For each, discuss the nature of the money demand function and indicate how each of the above factors is represented in the model.

the basic cash-in-advance model (Lucas)

the cash-in-advance model with credit and money goods (Lucas and Stokey)

the standard transactions model (Baumol-Tobin)

the shopping time model (McCallum-Goodfriend)

the money and credit as means of payment (Prescott)

**Part II:
Longer Questions
Total Points: 100**

Questions 1 and 2 are each worth 50 points in total.

1. Implications of productivity shocks when output is demand determined

(Each part is worth 10 points).

Real business cycle models highlight the role of productivity shocks as sources of economic fluctuations. Keynesian macroeconomic models, new and old, view output as demand-determined in the short run. This question considers the effect of productivity shocks when output is demand-determined.

To begin to analyze this problem, suppose that there is a simple economy with the following three elements. First, the production function of the form $y=af(k,n)$, where $f(k,n)$ is constant returns-to-scale and Cobb Douglas. Second, there is a monetary equilibrium condition of the form $Mv=Py$, where the velocity (v) of money (M) is taken as exogenous. Third, the price level is assumed constant through time. Assume that the capital stock is historically given.

- (a) If there is an increase in productivity (the parameter “a” multiplying the production function) with money held fixed, then what will happen to:

the volume of output (y)
the quantity of labor input (n)

Now suppose that there is a labor supply function which specifies that labor supply is a positive function of the real wage rate.

- (b) What will be the effect of productivity shocks on the real wage? Why?

Suppose finally that prices are not constant through time, but rather that the price level is adjusted according to the specification of Calvo/Rotemberg, i.e., by

$$P_t - P_{t-1} = \theta [P_t^* - P_{t-1}]$$

where the “target price level” is a based on a distributed lead of marginal cost,

$$P_t^* = \frac{1}{1-\beta\theta} E_t \sum_{j=0}^{\infty} (\beta\theta)^j \psi_{t+j}$$

with Ψ_t being nominal marginal cost, i.e., the nominal wage rate W_t divided by the marginal product of labor.

Suppose also that this pattern of price dynamics is incorporated into the sort of RBC model that is commonly studied, with intertemporal consumption and labor supply decisions.

- (c) Explain why this extended model will have the same long-run effect on the price level and output of a productivity shock as the RBC model. What are these effects?
- (d) Explain why the price level will move to a greater extent if the variation in productivity is perceived as permanent by price-setters than if it is perceived as temporary.
- (e) Suppose that an empirical study finds that an unanticipated, permanent increase in productivity lowers labor input relative to its initial level in the first few quarters after the shock, raises labor input for the next few years relative to the initial level, and then leaves it unaffected in the long run. Why might this time pattern occur?

2. A model of a small open economy

(parts (a) and (b) are each worth 10 points; parts (c) and (d) are each worth 15 points)

- (a) Write down a model of a small open economy that faces an exogenous interest rate and economy produces a single good. The rest of the world also produces the same, single good which can be used either for consumption or investment. The government of the small open economy is not a source of shocks to the economy. Assume that investment is NOT subject to convex costs of adjustment.
- (b) Derive the first-order conditions for this model. What are the controlled state variables; the exogenous state variables; the costate variables; and the controls for this problem? What variables would be computed as "flows", i.e., as simple functions of the solutions for the other variables?
- (c) Describe the reaction of the small open economy to a permanent shock to in the level of domestic technology--make sure you discuss the behavior of consumption, investment, output, the capital stock; labor input; real wages; and the trade balance.
- (d) Suppose a foreign government, operating in a country that is "large" in terms of its effect on the world economy, decides to substantially increase expenditure on defense purchases. Describe the channels through which this would affect the small open economy, and describe as completely as you can the equilibrium response of the small open economy (i.e., the same variables as in part (c) above).