Ec 102: Seminar in Advanced Macroeconomics
Swarthmore College
Final Examination
December 20, 2012, 2-5pm, Kohlberg 218

Professor O’Connell
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Instructions  The exam consists of 4 questions. They are each worth 25 points. PLEASE USE A SEPARATE EXAM BOOKLET FOR EACH QUESTION, AND PUT YOUR NAME ONLY ON THE OUTSIDE OF THE EXAM BOOKLETS. Your answers do not have to be long, but they should bring in whatever theory and empirical evidence you consider relevant. Please make sure I can read what you write, including your equations and diagrams. Don’t leave any part of the questions you choose blank, because I’ll award partial credit – instead, let me know what you know.

SECTION 1. Please answer both questions in this section, in separate exam booklets.
1. [Fiscal multipliers] Consider a closed-economy Keynesian model with no investment. Desired consumption is given by $C = a + b(Y - T)$, where $a > 0$ and $0 < b < 1$. Government spending ($G$) and taxes ($T$) are treated as exogenous policy variables. The price level is fixed, and the goods-market equilibrium condition is $Y = C(Y, T) + G$.

1.1. Define the government-spending multiplier as $dY/dG$, the tax-reduction multiplier as $-dY/dT$, and the balanced-budget multiplier as $dY/dG |_{dG=dT}$. What are the values of these three multipliers in the Keynesian model?

1.2. Now consider a real-business-cycle (RBC) model with no investment. Firms are perfectly competitive and wages and prices are flexible. An infinitely-lived representative household maximizes its expected welfare, with diminishing within-period marginal utilities of consumption and leisure. The economy is subject to white-noise shocks to productivity and government-spending, so that $A(t) = \varepsilon^A(t)$ and $G(t) = \varepsilon^G(t)$ where $\varepsilon^A(t)$ and $\varepsilon^G(t)$ are mean zero, i.i.d., and mutually uncorrelated. Define the government-spending multiplier in this RBC model as $dY(t)/d\varepsilon^G(t)$, the tax-reduction multiplier as $-dY(t)/dT(t)$, and the balanced-budget multiplier as $dY(t)/d\varepsilon^G(t) |_{d\varepsilon^G(t)=dT(t)}$. Without trying to solve the model, use what you know about its properties to discuss the signs and magnitudes of the three short-run fiscal multipliers in the RBC economy.

1.3. It is early 2009, and the incoming Obama administration asks you provide a pair of multipliers suitable for calculating the impact on GDP of two types of stimulus: temporary increases in federal spending on goods and services, and temporary cuts in federal income taxes and/or increases in transfers to households. Assume that the tax cuts are distributed in proportion to existing taxes and transfers, so that all households with positive federal income tax bills receive a tax cut equal to $x > 0$ percent of their tax bill, and all households receiving federal transfers receive an additional $x$ percent of transfers. Drawing on the ideas behind the Keynesian and/or RBC models (if relevant), and on any empirical evidence you consider relevant, discuss what you would specify as reasonable empirical ranges for these two multipliers.

2.1. Write down a version of the three equations that characterize the core of a New Keynesian macroeconomic model. Please define your variables and be explicit about time subscripts and notation. Interpret each of these the equation in words, being as clear as you can about its theoretical underpinnings.

2.2. The macroeconomists that developed the New Keynesian model were aware of the zero lower bound on the nominal interest rate, but argued that it could be ignored. Would taking the zero bound seriously have rescued this model, in your view, as a tool for analyzing – and even guiding – monetary policy in the period leading up to the global financial crisis? Explain.

SECTION 2. Please choose only two of the following three questions, and put your answers in separate exam booklets.

3. [The equity premium] Let a representative household maximize the intertemporal welfare function

\[ W_t = E_t \left( \sum_{i=0}^{\infty} \frac{1}{(1+\rho)^i} u(c_{t+i}) \right), \]

where \( u(c) = c^{1-\theta}/(1-\theta) \) for \( \theta \geq 0 \). Assume that the household can trade freely in a variety of financial assets (including issuing these assets as liabilities), subject only to repaying its debts. Let the one-period real return on the \( i^{th} \) asset be \( r^{i}_{t+1} \) (i.e., if the asset is equity, denoted by \( i = q \), then \( r^{q}_{t+1} \) is the rate of return to purchasing equity in period \( t \), collecting period \( t+1 \)'s dividend, and then selling the equity in period \( t+1 \)).

3.1. Explain why the equation

\[ c^{-\theta}_t = \frac{1}{1+\rho} E_t \left( (1 + r^{i}_{t+1}) \cdot c^{-\theta}_{t+1} \right) \]

must hold for any asset the household can freely trade.

3.2. As we saw in Romer’s textbook, the equation in part 3.1 of this question, when applied separately to equity and riskless debt, implies the following a second-order approximation to the expected-return premium on equity:

\[ E[r^q] - \bar{r} \approx \theta \cdot \text{Cov}(r^q - \bar{r}, g^c). \]

Where \( \bar{r} \) is the return on riskless one-period bonds and \( g^c \) is the growth rate of consumption between adjacent periods. Suppose that there is an increase in \( \theta \), with the covariance unchanged. What happens to the value of the stock market (i.e., the current price of an equity claim)? What is the economic intuition for this effect?

3.3. What is the equity premium puzzle?

3.4. What modeling directions would you pursue, if you wanted to account for the equity premium puzzle while retaining the idea that households are forward-looking in their financial behavior?
4. **Investment and taxes** In the seminar we studied a perfect-foresight version of Tobin’s $q$ theory. The cost to the firm of an additional unit of installed capital, when the firm is investing at rate $I(t)$, is $1 + C'(I(t))$, where $C(\cdot) \geq 0$ is an installation-cost function that satisfies $C(0) = 0$ and displays increasing marginal cost of investment or disinvestment ($C'' > 0$). The value to the firm of that additional unit of capital, in terms of discounted increases in profits, is $q(t)$. Aggregate investment by a set of identical firms must therefore satisfy the equation $1 + C'(I(t)) = q(t)$. If depreciation is zero, $\dot{K}(t) = I(t)$. Putting these two expressions together gives us one dynamic equation in $K(t)$ and $q(t)$. A second dynamic equation comes from equating the after-tax marginal revenue product of capital with the user cost of capital. If the pre-tax marginal revenue product is $\pi'(\cdot) < 0$, and the tax rate on profits is $\tau$, then this second equation is given by $(1 - \tau) \cdot \pi(K(t)) = r q(t) - q(t)$.

4.1. Draw the $\dot{K}(t) = 0$ and $\dot{q}(t) = 0$ curves in $[K(t), q(t)]$ space, and explain why they slope the way they do in your diagram.

4.2. Suppose that during the recent Presidential campaign, businesses were completely certain that Romney would win and therefore that business tax rates would remain completely unchanged in 2013. Suppose further that when President Obama was re-elected in early November 2012, businesses switched to being completely certain that their tax rates would rise starting in January 2013. What happens to investment immediately following the election? Assuming that the businesses are proven correct, and that business taxes do indeed rise in early 2013, what will happen to investment at the time the tax increase is actually implemented? Show the full adjustment path in your diagram, and explain the intuition.

4.3. Now think about investment more generally (i.e., not necessarily in a $q$ theory framework). Introduce uncertainty about taxes, and let $E[\tau]$ be the expected value, today, of the future tax rate for early 2013 – in other words, this is the tax rate businesses expect to come out of the negotiations that are currently happening between President Obama and Congress. Assume that businesses are risk neutral. Now suppose that the fiscal cliff negotiations get badly stuck, so that uncertainty about the future tax rate rises. Assume that the expected value is unchanged. How (if at all) will this increase in uncertainty affect the current rate of investment by risk-neutral firms?

5. **Unemployment** The table below gives approximate unemployment rates for Spain and the USA.

<table>
<thead>
<tr>
<th>Country</th>
<th>Unemployment rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average, 1995-2006</td>
</tr>
<tr>
<td>Spain</td>
<td>14.7</td>
</tr>
<tr>
<td>USA</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Sources: [http://www.indexmundi.com/spain/unemployment_rate.html](http://www.indexmundi.com/spain/unemployment_rate.html) and *Economic Report of the President* 2012.

5.1. What labor-market theories would you appeal to in order to explain the data in the first column, i.e., the difference between the average unemployment rate in Spain between 1995 and 2006 and the average unemployment rate in the USA over the same period?
5.2. Can the theories you used in part 5.1 account for the unemployment patterns observed in these two countries between 2007 and 2011? If so, how? If not, what theory or theories would you appeal to in order to explain these very sharp increases?