Accelerated Macro HW #1
Due in class Tuesday 2/24/2015

1 GDP, TFP, and MPL
The following data give real GDP, $Y$, capital, $K$, and labor, $N$, for Macroland. Assume that the production function takes the following Cobb-Douglas form: $Y_t = A_t K_t^{1/3} N_t^{2/3}$.

<table>
<thead>
<tr>
<th>Year</th>
<th>Y</th>
<th>K</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>2000</td>
<td>3000</td>
<td>250</td>
</tr>
<tr>
<td>2011</td>
<td>2200</td>
<td>3100</td>
<td>260</td>
</tr>
<tr>
<td>2012</td>
<td>2100</td>
<td>3050</td>
<td>240</td>
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</tbody>
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a. Calculate total factor productivity growth between 2010 and 2011, and between 2011 and 2012
b. Decompose contributions to real GDP growth from the capital stock, labor, and TFP
c. Calculate the marginal product of labor in each year

2 Labor market dynamics, taxes, and the minimum wage
Based on ABC Ch. 3 NP #6
Suppose that the production function is $Y = 9K^{0.5}N^{0.5}$. The capital stock is $K = 25$. The labor supply curve is $NS = 100(1 - \tau)w^2$, where $w$ is the real wage rate, $\tau$ is the tax on labor income, and hence $(1 - \tau)w$ is the after-tax real wage rate.

a. Assume the tax on labor income, $\tau$, equals zero. Find the equation of the labor demand curve. Calculate the equilibrium levels of the real wage and employment, the level of full-employment output, and the total after-tax wage income of workers.
b. Repeat part (a) under the assumption that the tax rate on labor income, $\tau$, equals 0.4.
c. Suppose that a minimum wage of $w = 2$ is imposed. If the tax rate on labor income, $\tau$, equals zero, what are the resulting values of employment and the real wage? Does the introduction of the minimum wage increase the total income of workers, taken as a group?

3 Okun’s law
Suppose the Okun’s law coefficient is 2, the full-employment level of output is $17,000$ billion, and the natural rate of unemployment is 5.5%.

a. What is the current level of output if the current unemployment rate is 8%? How big is the “output gap” between actual and potential GDP?
b. Suppose the unemployment rate falls to 5%; what are the current levels of output and output gap?
c. Suppose structural changes in the economy raise the natural rate of unemployment to 6.5%, and lower the full-employment level of output to $16,000$ billion. If the current unemployment rate is 8%, what is the current level of output? The output gap?

4 Government deficits and interest rates
2008 Prelim #1
What happens to the real interest rate and investment after an increase in the government budget deficit?
5 Derive optimal savings using the Euler equation

Calculate period $t$ savings or borrowing for the following two-period consumption-savings problems using the following parameters:

a. $U(c_t, c_{t+1}) = \log(c_t) + \beta \log(c_{t+1})$

b. $U(c_t, c_{t+1}) = \frac{c_t^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} + \beta \frac{c_{t+1}^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}}$

- $y_t = $50,000
- $y_{t+1} = $10,000
- $\beta = 0.95$
- $\sigma = 1.25$
- $r_t = 4\%$

If $y_t$ increases by $1$, how will $c_t$ change? Which utility form omits the higher marginal propensity to consume?