Bocconi

International Economics and Business Dynamics
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Group Project

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Due Tuesday December 11, 2012, at the start of class

1. **Business cycles in various sectors**
   Using the employment data provided in the attached excel file you will analyze how different sectors react differently to aggregate business cycles and use this analysis to guide some forecasts and portfolio decisions
   a) Compute growth rates of each employment series and as measure of cyclicality use the correlation of each growth rate with the growth rate of total employment. Rank the sectors in terms of cyclicality. Now repeat the exercise above using the level of the series instead of the growth rates. Briefly discuss why the two rankings are quite different. For example why health looks very cyclical in level but not very cyclical in growth rates? And why for durable goods manufacturing the opposite is true? Suppose now that sectoral stock prices are perfectly correlated with employment in that sector and that you are a fund manager that wants to build a portfolio that hedges the risk of the next US recession. Based on the analysis above which sector would you buy (or short)?

   b) The data includes the three most recent US recessions. The one which officially started in July 1990, the one which officially started in March 2001 and the one which officially started in December 2007. Using your preferred method of data analysis in each recession select the sectors that were hit the hardest and the ones were hit the least. Briefly propose explanations of why information sector was hit hard in the 2001 recession and the construction sector was hard hit in the 2007/2008 recession?

2. **Tax policy under two views**

   Consider the following simple model of the macroeconomy. Consumption is given by

   $$C = C_f + c(Y(1-\tau))$$

   where C_f is a part of consumption that does not depend on income, c is a constant equal to 0.8, Y is before tax income and τ is the tax rate equal to 0.2. Assume that the government uses tax revenues τY to finance public spending G so that $\tau Y = G$.

   Define aggregate demand as a function of before tax income Y

   Now consider two different point of views

a) Keynesian economics. Assume that C_f is fixed and equal to 1 and that in equilibrium pre-tax income Y will adjust so that aggregate demand is equal to aggregate supply Y. Solve for the equilibrium level of pre-tax income Y. Compute what happens to private consumption $(C_f + c(1-\tau)Y)$ when taxes (τ) are raised from 0.2 to 0.3.

b) Supply side economics. Assume that Y is fixed and equal to 6.25 and that C_f will adjust so that in equilibrium aggregate demand is equal to aggregate supply. Solve for the equilibrium level of C_f. Compute what happens to total private consumption $(C_f + c(1-\tau)Y)$ when taxes are raised from 0.2 to 0.3

Briefly comment on why you are getting different answers on the effect of taxes in a) and b).

3. **Connections between monetary and fiscal policy**
In the famous article Some Unpleasant Monetarist Arithmetic economist and Nobel prize winner Thomas Sargent (together with Neil Wallace) stated that "tight money today can lead to high inflation in the future." Answering this question should help you understand his argument and its relevance for emerging markets.

Assume that the government of Bocconia is around for two periods. In period 2 it has to pay all its obligations and cannot raise debt. In each period, if no new money is printed, inflation is 0%. In the first period government spending is 30 billions of pesos, nominal GDP is 100 billions and government tax revenues are 20% of nominal GDP. The government can also raise revenues by printing money. Each extra billion of money that is printed raises government revenues by 1 billion (Government can use newly printed money to pay its obligations) but causes inflation in period 1 (π_1) to go up by 1%. Finally the government in the first period can issue bonds (at a 25% nominal interest rate) that need to be paid back in the second period. In the second period government spending is 30*(1+ π_1) billion pesos, nominal GDP is 100*(1+ π_1) billions (for example if the inflation rate in the first period is 10% then government spending is 33 billions and nominal GDP is 110 billions), tax revenues are 30% of nominal GDP, the government needs to pay off 10 billions of outstanding zero coupon debt (assume that this debt was issued before period 1) plus any bonds (capital plus interest) issued in period 1. Any government obligation that is not covered by tax revenues needs to be covered by money printing. In period 2 (as in period 1) each extra billion of money that is printed raises government revenues by 1 billion but also causes inflation in period 2 (π_2) to go up by 1%.

Consider the following two policies:

(a) Tight money: in the first period the government does not print any new money. Compute:
a) Inflation rate in the first period

b) The amount of debt the government needs to issue in the first period
c) The inflation rate in the second period.

(b) Money printing: In the first period the government prints 10bln pesos of new money. Compute:
d) Inflation in the first period,
e) The amount of debt the government needs to issue in the first period
f) The inflation rate in the second period.

g) Suppose you live and spend in Bocconia. Before period 1 you purchased a zero coupon bond maturing in period 2 you are holding it until maturity, that is you receive your money at the end of period 2. What is your preferred policy? Why?

h) Show that if the government can control government spending then zero inflation in period 1 and 2 can be achieved. Does this mean that inflation is controlled by fiscal policy?

4. **Mexico: A country study**
This question asks you to analyze the performance of the Mexican economy in the past and to forecast its performance for the next 50 years, using the basic tools of growth theory. Throughout this question assume that the aggregate production function is given by is given by $Y_t = A_t K_{t-1}^{\alpha}(L_t H_t)^{1-\alpha}$where Y_t is GDP in year t, A_t is total factor productivity (TFP) in period t, K_{t-1} is the capital stock at the end of year t-1, L_t is the labor force and H_t is the per-capita stock of human capital (education). Assume that the per capita stock of human capital in the country (H) is equal to the average years of education of the workforce in the country and that α =0.33.

a) The capital stock series for Mexico is incomplete as it starts in 1965 and ends in 1990. Fortunately, we have investment data. Using the information you have for investment during the year t I_t and the capital stock at the end of years t-1 and t, K_{t-1} and K_t plus the law of motion for capital stock ($K_t = (1-\delta)K_{t-1}+I_t$) compute the capital stock for Mexico in the period 60-65 (assuming an annual depreciation of 20%) and in the period 91-09 (assuming an annual depreciation of 10%)

b) Decompose the growth of real GDP per capita over the periods 1960-1976, 1977-1994, 1995-2009 into the components due to per capita capital accumulation, total factor productivity growth, labor force/population growth and human capital growth. What can you say about the impact of NAFTA (Mexico entered NAFTA in 1994) on the Mexican economy?

c) Compute the TFP level (A) for Mexico in 2009

d) In 2009 the ratio between GDP per capita in Mexico and in US is around 5.5. Assume that US GDP per capita grows at 2% per year until 2050. Compute the path of GDP per capita in Mexico until 2050 and compute its ratio to US GDP in 2050.
To do so you will need the following assumptions:

- Capital stock in Mexico will evolve according to $K_t = (1-\delta)K_{t-1} + sY_t$ where s is a constant investment to output ratio. Compute s using the investment output ratio in Mexico in the last 10 years (1999-2009) and assume $\delta = 0.1$.

- The stock of human capital in Mexico from 2009 to 2050 will grow at the same rate at which it has grown in the last 10 years (2000-2009).

- The population is going to grow according to the forecasts reported by the Census Bureau and labor force as a fraction of the population is going to increase at a decreasing rate so that in 2050 the ratio is equal to 0.5 (as it is for US now).

- Total factor productivity (A) growth between year t and year t+1 is given by 1.3%-1.5%$*ln(\frac{\text{GDP per capita Mexico in year t}}{\text{GDP per capita US in year t}})$
(This assumption is also used in the GS piece Dreaming with the BRICS).

e) Looking back at your answers in parts b and d which of the assumptions of part d seems less plausible? How would you modify it? Assess the impact of your proposed modification on forecasted Mexican GDP per capita in 2050.

5. **The past and the future of the Euro**
Go to the OECD i-library national Accounts Statistics and get data for quarterly GDP (in constant PPP dollars) and for total employment for Germany, France, Italy and Spain (the 4 major countries in the Euro area) for the period 1996.1-2012.2. (No need to print the data and attach them to the project).

   (a) Compute the levels of GDP per worker in 1996.1 and 2012.2 and assess whether over this period there has been convergence in the Euro Area.

   (b) Prepare a table that includes for each country and for the following subperiods: 1996.1-2006.1, 2006.2-2012.2 growth rates of real GDP, employment and labor productivity for all the 4 countries.

   (c) Suppose you have just been hired by a Chinese company who wants a brief report (max 1 page typed) on what macro developments in the Euro area can tell about the future of the common currency. Use the data above (and other data if you wish, but stick to the one page limit) to write the report.