**ECON 503, Fall 2018, Test 1 (Please print a concise answer; I’m not looking for essays; if a question asks for an equation, and you do not know it, use a brief statement in its place for some credit)**

**Part I (12 points each)**1. a. Provide the 4 equations (with a label for each) that make up the structure of Prescott’s growth model with a label for each equation identifying it:

**Households Preferences: E[∑Bt{log c(t) +α log(100-h(t)]**

**Household Constraints: (1+τc)c(t) + (1+τx)x = (1-τh)wh + (1 - τk)(r-δ)K(t) + Transfers**

**Production: Y(t) = A(t)Kθh1-θ  and dK(t) = X(t) + (1- δ)K(t-1)**

**GDP Identity/Market Equilibrium: y(t) = c(t) + x(t) + g(t)**

b. What are the key parameters, exogenous variables, and endogenous variables in this model?

**parameters:** **B, α; theta exogenous variables: A, tax rates   
endogenous variables: c, h, x, K, w**

c. Explain how this equation system would predict/simulate that European labor hours would be much less than US labor hours

**higher labor tax rates in Europe increase the value of working relative to leisure; the magnitude depends on alpha; the increase in leisure value relative to work results in the choice of fewer labor hours**

2.a. With the aid of a basic regression framework, give examples of “identification problems” in empirical studies of long run, cross-country economic growth?

**GDP Growth = b0 + b1\*Institutions + b2\*X + e**

-- **the problem is a “feedback” issue of separating the cause from the consequence; specifically, it appears in separating the effects of factors such as democratic institutions or protections of freedoms on growth from the effects of growth on these institutions or freedoms;**

**-- it can also appear in trying to separate the effects of different causes from each other (distinguishing b1 from b2**

**-- omitted variables problem arises of variable Z is left out and correlated with X (and error), therefore b2 will be biased; this isn’t directly and identification problem**

b. Explain 2 empirical methods that Acemoglu used to try to solve these kinds of problems:

**Uses/develops two cases of natural experiments where instutional differences arise while geography and (in some cases) culture remain same**

**\* using comparisons of North and South Korea since World War II**

**\*using the degree of urbanization of colonial areas prior to colonization and associated colonial institutions (around 1500) as a measure of GDP at that time, using it to estimate changes in GDP since 1500 to 2000; He then uses a measure of the degree of institutions to measure the degree of protection since colonization and correlates it with his measure of change in GDP**

c. What was the basis of the early, 1960s-style growth models (Solow Growth Model)? Why did those models predict cross-country convergence in GDP growth rates? What does the evidence produced by Barro, Acemoglu, and others indicate that the problem is with this prediction of convergence?

**Solow growth model based solely on production function; policy emphasis on savings, investment, and capital; convergence predicted based on diminishing returns principle – countries with higher levels of capital would have lower MP of capital; Evidence showed that across all countries, convergence not found; but it could be observed across countries sharing similar institutions which fits with work of of Barro, Acmoglu, and others on the idea that institutions are endogenous**

3.a. What does DSGE stand for and what is the structure of a DSGE model of short run fluctuations (no equations needed)?

**Dynamic Stochastic General Equilibrium; Similar in structure to a long run growth model (such as the Prescott model), except that some source of stochastic (random shock) term to is added such as to the production function such as**

**Y(t) = A(t)Kθh1-θ + ε with A(t) = A0 + ε and ε is distributed normally (or otherwise) with a given standard deviation**

b. Explain the primary sources of economic shocks in an RBC version of such models (with an equation if possible)?

**Shocks to production/usually through A (Total factor productivity)**

c. Provide an example of how such a model can be amended to take account of additional sectors of the economy or “frictions” within the economy:

**-- frictions such as sticky wages or prices (wages or prices that have lagged effects and don’t adjust to full optimum)**

**-- adding sectors/variables such as money, finance (asset prices/debt), foreign sector, ..**

4a. Provide 3 sources of shocks that have been identified as possible causes of recessions:

**-- oil shocks  
-- technology shocks (general productivity shocks that can include oil shocks)**

**-- sector shifts (which may be a subset of tech shocks)**

**-- autonomous consumption shocks (consumer risk perceptions)**

**-- monetary shocks**

**-- financial shocks (changing risk perceptions)**

b. Provide quick reference to evidence supporting each of these shocks as causes of recessions:

**-- Hamilton data related post WWII shocks and oil prices**

**-- post WWII recession and sector shifts**

**-- large seasonal component in GDP related to basic RBC model**

**-- Great Depression and Great Recession related to monetary and financial shocks**

**Part II (10 points each)**

1. Provide specific numbers for the following

a. Long term average growth rate of real GDP: **3%**

b. U.S. GDP in 2018: **apx $20,000**

c, U.S. GDP per capita PPP in 2018: **apx $60,000**

d. Ranges for GDP Per Capita in high income countries (like US and UK), mid-income countries (like China), and lowest income countries (like DRC):

**High > $25,000**

**Mid >$10,000 to $25,000  
Low<$10,000 (very low less than $2500)**

2.a. Show an equation for computing annual percent changes in GDP (using quarterly data)

**100\*[(Yt/Yt-4) -1] = 100\*(yt – yt-4)/yt-4**

b. Show an equation for computing annualized percent change in GDP (using quarterly data)

**100\*[(Yt/Yt-1)4 -1]**

c. Show an equation for computing 2000 GDP in 2018 constant dollars:

**GDP(2000) x CPI(2018)/CPI(2000)**

3.a. With a graph, show how a purely transitory shock to a variable would progress over time and how a purely permanent shock to GDP would progress over time:



b. Explain the relationship between real GDP and unemployment rates over the business cycle. How do GDP and unemployment behave differently with respect to shocks with respect to (3a)?

**Inverse relationship; GDP results from both transitory and permanent shocks; unemployment primarily transitory shocks but with long memory (takes a long time, up to 5-7 years) to return to long run average**

4. Summarize the recessions since 1950:

**10+ recessions; largest ones in 1981-82, 2007-09  
GDP falls anywhere from <1% to about 5%  
Unemployment increases from ranging from 7% to 11%**

…

5. Summarize 2 key measurement issues that arise using one of the two topics from presentations other than the ones that you worked on: