GENERAL INSTRUCTIONS:

This is a 3-hour (180 min) field exam.

There are 4 questions in total, but you only need to answer 3 questions.

Questions 1A and 1B are from the two parts of course 280A. Question 2 is from course 280B.

Question 3 is from course 280C. Question 4 is from course 280D.

Each question has equal weight, so you have 1 hour for each of the 3 questions that you answer.

Question 1 (280A)

This question has two parts (A and B). Both parts have equal weight (30 min each). Answer all questions.

Part A: Consider a model with N countries and T periods. In each period there is trade as in the Armington model, but there is also inter-temporal trade (current-account imbalances). Utility is

$$U_j = \left(\sum_{t=1}^{T} C_{jt}^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}},$$

with

$$C_{jt} = \left(\sum_{i=1}^{N} C_{ijt}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

where C_{ijt} is the consumption in country j at time t of the good from country i, and $\gamma > 0$ and $\sigma > 1$. Think of trade all happening in period 1, with period 1 prices for delivery of a unit of good i in country j at date t being P_{ijt}. Evaluated at those prices trade flows are $X_{ijt} \equiv P_{ijt}C_{ijt}$. On the production side, we assume that there is a per-period endowment of each good, Q_{it}. The resource constraint is then $\sum_j C_{ijt} = Q_{it}$. Imagine that for each country we have balanced trade in the sense that

$$\sum_{t=1}^{T} \sum_{i=1}^{N} X_{ijt} = \sum_{t=1}^{T} \sum_{n=1}^{N} X_{jnt}.$$

What are the gains from trade for country j as a function of $\{X_{ijt}\}$? What happens in the special case in which $\gamma = \sigma$? Can you guess what happens if there discounting, as in

$$U_j = \left(\sum_{t=1}^{T} \beta^{t-1} C_{jt}^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}} ?$$

Part B: This question is about quality differentiation in international trade. Answer all three questions.

i) In absence of direct information on product quality, why could the use of unit values (higher or lower prices per unit or other metric) be problematic when estimating the relative quality of products within product groups?

ii) Explain how Khandelwal (2010) estimates the quality ladder of different origin countries within product groups, and how his findings relate to your answer in i) above.

iii) Explain how Kugler and Verhoogen (2012) conclude that more productive firms produce on average higher product quality, and how this is related to the scope for vertical differentiation across sectors.

Question 2 (280B)

The Lucas Paradox refers to the observation that capital flows from rich (low return) to poor (high return) countries are too low compared to what standard frictionless neoclassical theory would predict. Discuss at least one paper that documents this paradox using capital-flow data. In particular, describe at least one empirical measure of capital flows and discuss the empirical results.

An alternative way to summarize the paradox is to compare the returns to capital across rich and poor countries. Discuss at least one paper that documents this paradox using data on rates of return. In particular, describe at least one empirical measure of the rate of return to capital and discuss the empirical results.

Consider one potential explanation of the Lucas Paradox in the literature: investments in poor countries are riskier than investments in rich countries as in David, Henriksen and Simonovska (2016). Assume a marginal US investor compares payoffs from investments at home and abroad. Let * denote a foreign country.

Preferences are recursive and represented by:

$$V_t = \left[(1-\beta) C_t^{\frac{\psi-1}{\psi}} + \beta v_t (V_{t+1})^{\frac{\psi-1}{\psi}} \right]^{\frac{\psi}{\psi-1}}, \text{ where } v_t (V_{t+1}) = \left[E_t \left(V_{t+1}^{1-\gamma} \right) \right]^{\frac{1}{1-\gamma}}$$

Discuss the components of the utility function and their interpretation. State the parameter restriction that obtains CRRA preferences.

A standard Euler equation corresponding to the utility function above is given by:

$$\mathbb{E}_t[M_{t+1} R_{t+1}] = 1,$$

$$m_{t+1} = \theta \log \beta - \frac{\theta}{\psi} \Delta c_{t+1} + (\theta - 1) r_{ct+1}$$

where $\theta = \frac{1-\gamma}{1-\frac{1}{\psi}}$ and $m_{t+1} = \log M_{t+1}$ is the log of the investor's stochastic discount factor (SDF). Discuss the interpretation of r_{ct+1}. What does the SDF look like when preferences are CRRA?

Assume that the investor lives in an endowment economy. Her consumption growth process is given by:

$$
\begin{aligned}
\Delta c_{t+1} &= \mu_c + x_t + \eta_{t+1} \quad \text{where } x_{t+1} = \rho x_t + e_{t+1} \\
\Delta d_{t+1} &= \mu_d + \phi x_t + \pi \eta_{t+1} + \mu_{t+1} \\
\Delta d_{t+1}^* &= \mu_d^* + \phi^* x_t + \pi^* \eta_{t+1} + \pi_d^* \mu_{t+1} + \tilde{\phi}^* x_t^* + \mu_{t+1}^* \quad \text{where } x_{t+1}^* = \rho^* x_t^* + e_{t+1}^*
\end{aligned}
$$

She receives dividends from her investment at home and abroad, with processes given by:

$$
\begin{aligned}
\Delta d_{t+1} &= \mu_d + \phi x_t + \pi \eta_{t+1} + \mu_{t+1} \\
\Delta d_{t+1}^* &= \mu_d^* + \phi^* x_t + \pi^* \eta_{t+1} + \pi_d^* \mu_{t+1} + \tilde{\phi}^* x_t^* + \mu_{t+1}^* \quad \text{where } x_{t+1}^* = \rho^* x_t^* + e_{t+1}^*
\end{aligned}
$$

Assuming that η, μ, μ^*, e, e^* are IID shocks, discuss the interpretation of the remaining objects in the consumption and dividend processes.

For any asset j (home or foreign, *), the risk premia over the risk-free rate r_f that arise in this framework are given by:

$$\mathbb{E}\left[R_t^{e^j}\right] = \underbrace{\left(\phi^j - \frac{1}{\psi}\right)\left(\gamma - \frac{1}{\psi}\right)\frac{\kappa_{m,1}^j}{1 - \kappa_{m,1}^j\rho}\frac{\kappa_1}{1 - \kappa_1\rho}\sigma_e^2}_{\text{object 1}} + \underbrace{\gamma\pi^j\sigma_\eta^2}_{\text{object 2}}$$

Discuss object 1 and object 2. What is the risk premium when preferences are CRRA?

David, Henriksen and Simonovska (2016) show that the values of the parameters ϕ^j (home and foreign, *) are critical in accounting for expected risk premia in the data. With the above model in mind, discuss at least one moment in the data that you think is informative about ϕ. Do the same for ϕ^*.

Question 3 (280C)

In a text titled "On the Puzzling Prevalence of Puzzles" (August 2, 2016), former Minneapolis Federal Reserve President Narayana Kocherlakota writes:

> "To an outsider or newcomer, macroeconomics would seem like a field that is haunted by its lack of data. In the absence of that data, it would seem like we would be hard put to distinguish among a host of theories with distinct policy recommendations. So, to the novice, it would seem like macroeconomists should be plagued by *underidentification* or *partial identification*. But, in fact, expert macroeconomists know that the field is actually plagued by failures to fit the data – that is, by *overidentification*.
>
> Why is the novice so wrong?
>
> The answer is the role of *a priori* restrictions in macroeconomic theory.[...] The mistake that the novice made is to think that the macroeconomist would rely on data alone to build up his/her theory or model. The expert knows how to build up theory from *a priori* restrictions that are accepted by a large number of scholars.[...] Those restrictions are what give the models their empirical content. As it turns out, the resulting models actually end up with too much content "hence, the seemingly never-ending parade of puzzles."

Discuss **three** puzzles of your choosing in international macroeconomics. For each of puzzle you will (a) present the theoretical predictions as sharply (and analytically) as possible; (b) discuss the empirical evidence; (c) discuss possible resolutions of the puzzle in the literature, or your own. Which *a priori* restrictions of the model are responsible for these puzzles in your view?

Question 4 (280D)

1. What is Zipf's law? Sketch the model given in Gabaix (1999) to explain Zipf's law for city sizes. What assumption is made on the growth rate of cities? Is it consistent with the data?

2. You want to estimate firm-level productivity using a dataset that has 10 years of firm-level data, with information on total sales, labor employed and capital stock.

    (a) Making the assumption that the production function is Cobb-Douglas, write down your estimating equation, and list the source of potential biaises in estimation.

    (b) What estimation techniques can you use given the data at hand? Which one would you choose to use? Explain why this is your preferred choice, and detail the caveat(s) of the approach.

    (c) The statistical agency offers to collect one more piece of data for all firm-years. Which one would you ask for? Explain why.