2020 Economics Honors Exam Answers

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Question 1

(My choice is #3, below is my essay)

In the market for labor in a physical workspace, virus spread is a negative externality whose cost is neither shouldered by employers nor employees. Every laborer in this workplace brings the risk of spreading COVID-19 to other employees. This negative externality means the socially optimal level of physical labor is lower than the actual equilibrium quantity of labor.

To address this, government have introduced bans in the forms of stay at home orders for non-essential employees. Bans are certainly one way to tackle an externality, but they are not the preferred way according to economist Arthur Pigou and those who embrace his model. A Pigouvian corrective tax is the preferred means by which government can move equilibrium quantities to the socially optimal quantity in the case of a negative externality. The tax should equal the marginal social cost of an additional unit of labor in the work force.

Using numbers provided in the tweet of this question, say a single death costs $10 million. Let’s say the odds any one worker has COVID-19 is 0.01% and that the odds they give it to an at-risk individual on any one work day is 0.001%. With some back of the envelope math, the marginal social cost of one worker going to work is: 0.01\*0.001\*10,000,000 = $100. So, the government should tax companies $100 for every employee that goes to work by this math.

A tax of sorts is better than a ban because a ban completely shuts down economic activity and brings us to a quantity of labor smaller than the socially optimal level of labor. Some might argue this is worth it if we save lives. Of course, we are venturing into normative territory, but to assume a recession does not cost people lives is foolish. Recessions have short-term and long-term effects on medicine and health that leads to loss of life for many. Frankly, back of the envelope calculations are not going to cut it for policy decisions of this proportion.

Lastly, the tweet for this question compares something to nothing. With regards to the COVID-19 shutdown, Professor Stevenson claims the economy saves $5.4 trillion. Is this worth a recession, given that the last recession cost the U.S. economy an estimated $12.8 trillion? One could again argue that lives are more important than money, but that would be circular reasoning since Professor Stevenson equated lives to money in order to support social distancing measures in the first place.

Question 2

2.1

a) COVID-19 and social distancing measures have caused an exogenous shock to both consumption and investment in the goods market of the IS/LM model. Consumers in many states must now stay home, preventing them from purchasing things they otherwise would have purchased, such as a drink at a bar, for example. So, consumption decreases. Investment also decreases because investors do not have the same investment opportunities as before now that they must stay home, although thanks to modern technology this effect is not as pronounced as it would be without the internet.

A decrease in both consumption and investment shifts the IS curve to the left/downward because real GDP in the goods market decreases at all levels of the real interest rate. As a result, the new equilibrium levels of real GDP and the real interest rate are lower.

b) If people begin wanting to hoard cash, this is an autonomous increase in money demand in the liquidity market, leading to a higher interest rate at all levels of real GDP. Ceteris paribus, this causes the LM curve to shift up/left in the IS/LM model, pushing interest rates back up but putting more downward pressure on real GDP.

Moreover, the demand to hoard cash would cause consumption to decrease even more as consumers opt to hold onto currency instead of purchasing various goods. This would cause the IS curve to shift even further to the left, causing more downward pressure on the real interest rate and on real GDP.

c) Considering the US economy is close to the zero-lower bound (although not quite there like some other countries), the IS/LM model has some important features to consider. Note that the LM curve flattens at the zero-lower bound. Thus, expansionary monetary policy shifts the LM curve to the right but this would have no effect on real GDP if the economy is already at the zero-lower bound. We are not quite at the zero bound, so expansionary monetary policy could help the economy in the short run slightly, but further expansionary monetary policy by the Federal Reserve at this point is risky given the unique historical situation the Fed finds itself in.

Fiscal policy, under this model, retains its ability to stimulate the economy through actions like tax cuts and government spending even in the case of low interest rates: the IS curve can be pushed to the right by the government

d) Quantitative Easing is one tool the Fed used during the financial crisis, which is essentially the Fed purchasing assets from banks and pumping cash into the banking system. Another objective of the Fed was to target long term interest rates like the 10-year treasury yield. These policies may work today, but certainly to a lesser degree given how low the 10-year treasury yield is today and the stability threat of another round of QE.

Question 3: Econometrics

1. Descriptive Analyses

Take the Governor of New Hampshire, Chris Sununu. He is likely interested in the public’s belief about best policies to handle coronavirus. After all, he is a politician who is interested in being re-elected. Specifically, he could ask the discrete question: “how do New Hampshire parents feel about cancelling spring recess for students in the state?” which can be measured on a classic seven-point scale.

To answer this question, the Governor’s team could randomly distribute a survey to a sample of the population of New Hampshire with the question via phone. He could do such sampling multiple times. This is the data from which he could make his decision.

The Governor can then draw conclusions about the population (New Hampshire) mean and standard deviation from the data of these samples. By taking a mean of the sample means, we have an estimate for the population mean. The variance of the sampling distribution of sample means is the variance of the population distribution divided by the sample size. However, the Governor likely does not know the variance of the population distribution. Therefore, he can use a t-distribution instead of a normal distribution for approximation of the population mean and standard error.

1. Forecasting/Prediction

The Governor of New Hampshire, Chris Sununu, is certainly interested in the following question: how many hospital beds will we need in the next month? If there are not enough beds, the governor may want to turn public facilities, such as schools, into hospitals.

This question is centered on prediction. First, the governor should collect data on cases of COVID-19 in his state already, with any interval he chooses, though having one day as the time interval is popular. With daily values of COVID-19 and an assumption of exponential growth, the governor can utilize an autoregressive model to predict how many cases of COVID-19 New Hampshire can expect to see in the following month. Then, using data from other states, he can estimate how many hospital beds these cases would require. Finally, he can complicate the model by introducing eventual immunity for individuals who catch the disease (this is the downward portion of the curve policymakers hope to flatten).

1. Causal Inference

Harvard educators are likely interested in the following question: how does changing to a pass/fail system affect knowledge attained by students? I propose the following methodology.

A teacher could look at pset grades in three periods: before students are sent home, after they are sent home but before the change in Harvard’s policy, and after the change in policy. Assuming the effects of coronavirus disruption on knowledge attainment are similar in periods 2 and 3, we can do a difference-in-differences analysis comparing both periods to the grades in period 1. With the assumption that grades predict knowledge attainment, we can then have some idea of the causal effect of Harvard’s pass/fail decision on knowledge gains.