A 7. WORLD OIL MARKET ASSIGNMENT

FOLLOW THE STANDARD INSTRUCTIONS FOR DOING THE ASSIGNMENTS.

1. **Assume** that there will be considerable increases in the world supply of oil in 2003 and that this will be accompanied by a sharp recession in the world economy brought about by a major world wide recession.

(a) Construct a simple algebraic linear air travel model for the Sleemanian **_airline_** industry.

(b) Illustrate your model with a supply and demand diagram.

(c) Calculate the equilibrium price and quantity transacted assuming that you are doing QCS.

(d) Use the result in (c) to derive the fundamental QCS equations for P^e and Q^e.

(e) _Use the information in the first paragraph_ and the fundamental QCS equations to sign ΔP^e and ΔQ^e.

(f) Draw a diagram to illustrate your answer to (e).

(g) Explain the **economic logic** underlying your results in (e). (This is **not** the same question as (e)!)

2. The Grand Inquisitor and Lord High Econometrician of the Greater Tyranny of Sleemania recently commissioned a study of the prospects for the world crude oil market in 2003. It is believed that the report was based on **two basic assumptions**: (1) rapid growth of the world economy during 2003; and (2) a belief that UN will rapidly increase the supply of Iraqi oil via the food for oil program leading to a complete resumption of Iraqi oil supplies in the second half of 2003. Unfortunately the courier carrying the final report of the study group to the Tyrant of Sleemania (whom God preserve!) was mugged in an alley behind the Ministry of

Econometrics and the report was lost except for the Mathematical Appendix reproduced (without the bloodstains) below. Meanwhile the authors of the report had fled to the neighboring democracy of Walrasia where they became acolytes in the Ministry of Astrology and are hence not available for comment.

You have been given the task of interpreting the mathematics and diagrams for the Tyrant (whom God preserve!). Your report is due soon. The Tyrant (whom God Preserve!) is not known to suffer fools gladly and so you must be careful to do a good job (penalties for irritating the Tyrant (whom God preserve!) **start** with impalement on a sharpened stake, move on to impalement on a blunt stake, and then begin to get nasty). Be brief but be careful to explain **exactly** what the mathematics and diagrams are telling us and why they are set up in the way they are.

Mathematical Appendix

$$f,g: R^0 \rightarrow R^0$$

$$Q^d = f(P) = a + bP \quad a>0, b<0.$$

$$Q^s = g(P) = c + dP \quad c<0, d>0.$$

$$Q^s = Q^d = Q^e \qquad ad>bc$$

where $a,b,c,d \in R$.

Diagram missing

Ask me to supply the diagram if I have not already done so.

$$P^e = \frac{a-c}{d-b} > 0,$$

$$Q^e = \frac{ad-bc}{d-b} > 0.$$

$$\Delta P^e = \frac{1}{d-b}\Delta a + \frac{-1}{d-b}\Delta c,$$

$$\Delta Q^e = \frac{d}{d-b}\Delta a + \frac{-b}{d-b}\Delta c.$$

The next part of the appendix was so badly stained that it was barely legible. However it seems to have been an attempt to **sign** the expected changes in the price and quantity transacted of crude oil (ΔP and ΔQ) using the behavior of the exogenous variables. You should fill in this gap with a careful explanation of how what you have done is related to the *two fundamental assumptions* that underlie the analysis.

Apparently there was a diagram at the end of the report, but this seems to have been torn off in the struggle. Draw a diagram to illustrate the QCS analysis that you have reconstructed in your report.

Finally write a paragraph (or two) advising the Tyrant (whom God preserve!) on an optimal Sleemanian **crude oil** policy for 2002.
(The Grand Tyranny imports all of its crude oil from foreign countries.)

A X. SIMPLE GENERAL EQUILIBRIUM ASSIGNMENT*

Look through this assignment but **do not do it**. There will not be a key for this assignment. This material will **not** be used in exams.

1. The distinguished economist Rendigs Fels tells the following story. Late in 1945 he was sent to Japan as part of a military government team stationed in Yokohama. He was put in charge of rationing and price controls for the Kanagawa Prefecture. That meant that he had nothing to do. The occupation was being run exclusively by General MacArthur's headquarters in Tokyo.

    One day the medical officer of his company came to see him. The medical officer was worried about the health of the American troops who were picking up girls on the street, instead of patronizing the brothels where the girls were given a medical inspection once a week. The medical officer thought the soldiers were picking up the girls on the street because the brothels' prices were too high. Since Fels was in charge of price control, he wanted him to lower the prices charged in the brothels. Fels seriously considered setting price ceilings for the brothels until he considered the possibility that an American newspaper might get hold of a story about a United States Army officer setting prices in Japanese brothels!

    Fels tells the story to illustrate the fact that even someone with an undergraduate degree in economics from Harvard, and who had gone on to complete his Ph.D. comprehensive exams, could fail to apply simple supply and demand analysis

when presented with a straightforward economic policy problem.

Do a **verbal** and **diagramatic** analysis of the likely effects of imposing price controls on the brothels. (Note that you need to take account of **two** markets – after all this is an exercise in elementary general equilibrium analysis.)

2. Rendig Fels is best known for his work on the effect of minimum wage laws on employment. Not all low-productivity workers are covered by minimum wage laws. Do a **verbal** and **diagramatic** analysis of the impact of an increase in the minimum wage on both the covered and uncovered sectors of the low-productivity labor force.

3. Assume that tea and coffee are substitutes. Set up a simple **algebraic** linear simultaneous equation model of these **two** markets. Solve the model for the equilibrium levels of the price and quantities of tea and coffee. Analyze the impact of an increase in the supply of coffee, ceteris paribus.

A 8. INCOME DETERMINATION MODELS ASSIGNMENT

FOLLOW THE STANDARD INSTRUCTIONS FOR DOING THE ASSIGNMENTS.

1. The Grand Tyranny of Sleemania has an economy in which consumption is a linear function of disposable income and in which investment, government expenditure on goods and services, and taxes are all autonomous (exogenous).

    (a) Set up a linear algebraic model of the Sleemanian economy.
    (b) Illustrate it with a diagram.
    (c) Solve for the equilibrium level of income.
    (d) Calculate the autonomous investment, government expenditure, and autonomous tax multipliers.
    (e) Show (i.e. provide algebraic proofs) that the government expenditure multiplier is greater than one, that the autonomous tax multiplier is negative, and that the tax multiplier is smaller in **absolute value** than the government expenditure multiplier.
    (f) Show that the model has a balanced-budget multiplier equal to one.
    (g) Explain what a unit balanced budget multiplier tells us about the impact of a balanced budget increase in government expenditure on the equilibrium level of income.
    (h) If the mpc is 4/5ths show that $k_G = 5$ and that $k_T = -4$, i.e. $k_T = -(k_G - 1)$.
    (i) Does this relationship between the two multipliers hold in general in this model, i.e. irrespective of the size of the mpc?

2. The Sleemanian economy prides itself upon being very straight (no kinks or curves allowed).

(a) Set up a short-run algebraic model of the Sleemanian economy consisting of a consumption function, a tax function (with marginal tax rate t), autonomous investment and autonomous government expenditure on goods and services.

(b) Draw a diagram to illustrate your model.

(c) Solve for Y^e.

(d) Determine $k_A{}^t$, $k_G{}^t$, and $k_T{}^t$, (and k_t if you can differentiate). Sign these multipliers and show how they are related to one another.

(e) Explain the relationship between k_G and $k_G{}^t$. What does this relationship tell us about the behavior of this economy?

(f) The Court Econometrician has determined that the Sleemanian mpc is 4/5. We also know that the tax rate is 25%. Calculate $k_G{}^t$ and $k_T{}^t$.

(g) Determine $k_{BB}{}^t$ and compare it with k_{BB}.

(h) The Treasury estimates that the economy is operating $500b below Y_F. What increase in G would close the gap? What decrease in T would close the gap? What balanced budget change in G would close the gap?

(i) Sleemania's Donkey party wishes to increase government expenditure because they believe in the efficacy of government and of fiscal stimulus. The Jumbo party wants to reduce taxation and the size of the government sector. Both parties agree that tax cuts and government expenditure increases stimulate the economy and that cuts in government expenditure and increases in taxes deflate the economy. Everyone agrees that the economy should be stimulated towards full employment. The Tyrant (whom God preserve!) points out that decreases in government expenditure and increases in taxes are also compatible with fiscal expansion. Everyone else thinks that the Tyrant (whom

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God preserve!) is "off his chump" as the Sleemanians say. Who is right?

3. The **closed** Sleemanian economy is now **opened** up to foreign trade.

(a) Set up a linear algebraic model (with a marginal tax rate) to include exports and imports.

(b) Draw a diagram and label it.

(c) Determine the equilibrium level of income.

(d) Determine the government expenditure, autonomous tax, export, and autonomous import multipliers.

(e) Calculate the marginal tax rate and marginal propensity to import multipliers.

(f) Is the economy more or less sensitive to exogenous shocks than before?

(g) If the Tyrant (whom God preserve!) decides to pay for any increases in government expenditure by increasing autonomous taxes by an equal amount, is the corresponding change in GDP equal to, less than, or greater than the change in government expenditure?

(h) Is the balanced budget multiplier in the open economy less than, greater than, or equal to the balanced budget multiplier for the closed economy model?

A XX. ISLM ASSIGNMENT[*]

Look through this assignment but **do not do it**. There will not be a key for this assignment. This material will **not** be used in exams.

This assignment requires you to add a monetary sector to the macro model you have been analyzing. It also requires you to extend the macro model from a **partial** to a **general** equilibrium framework. This is what macroeconomics is really about. You will find H&R Chs. 25 and 26 helpful, especially pp. 430-432 and pp.437-8 Figures 27.2 and 27.3 (a) - (c); **however the best source for this model is A&I 3.12.** Remember that we are: (a) *keeping the price level constant*, and (b) using **linear** rather than general functional forms.

1. The Tyrant (whom God preserve!) has decided to close the Sleemanian economy and shut down the government sector (hooray!). However he has also introduced money into the economy which is exogenously determined by his exaltedness. The Grand Inquisitor and Lord High Econometrician has determined that the Sleemanian demand curve for M1 is linear in real income, Y, and "the" rate of interest, R. Set up a linear algebraic model of the reconstructed Sleemanian economy consisting of a goods sector (our familiar – and simplified! – three equation IE Model but with investment a linear function of "the" rate of interest), and a monetary sector (with a linear demand function, an exogenously given M1 supply, and an equilibrium condition). Reduce the IEM to a single equation relating Y to R (this is what economists call an IS curve). Reduce the model of the monetary sector to a single equation relating Y to R (what economists call the LM curve). Then use the two reduced form equations to solve for Y^e and R^e.

2. Now shift the IS curve by assuming that there has been an autonomous increase in government expenditure and calculate the corresponding k_G multiplier. Is this multiplier equal to, larger, or smaller than the k_G multiplier in the old IE Model?

3. If the Tyrant (whom God preserve!) increases the supply of money, M1, calculate the corresponding multiplier k_M.

4. Repeat exercises 2 and 3 but with a goods market with autonomous government expenditure and taxes a linear function of Y. What happens to the size of k_G and k_M?

5. Now add a simple linear foreign trade sector to the goods sector in question 4 and do the corresponding comparative static exercises.

A 9. THEORY OF THE FIRM ASSIGNMENT

FOLLOW THE STANDARD INSTRUCTIONS FOR DOING THE ASSIGNMENTS.

1. Define TC, FC, AC, AVC, and MC.

2. Draw a diagram showing the usual configuration and shapes of the AC, AVC, and MC curves.

3. How can you determine AFC from this diagram?

4. Draw TC, FC, and VC curves which would be consistent with the curves shown in question 2, and indicate the output level where diminishing returns to the variable input set in, and where MC = AVC and MC = AC. Explain how you determined these points.

5. (a) If $TC = f(Q) = a + bQ$ $(Q \in R^0)$ determine FC, VC, AFC, AVC, AC, and MC? What must the sign of b be if this is to be a plausible total cost function?

   (b) If $TC = f(Q) = a + bQ + cQ^2$ $(Q \in R^0)$ determine FC, VC, AFC, AVC, AC and MC? What must the sign of c be if this is to be a plausible total cost function?

   (c) Explain why economists usually choose a cubic equation when modeling Total Costs.

   (d) How would you have to modify the two equations in (a), and (b) to make them acceptable long-run TC curve equations?

6. If $TC = a + bQ - cQ^2 + dQ^3$ $(Q \in R^{0)}$ determine FC, VC, AC, AFC, AVC, and MC. (Difficult and so optional: what restrictions must be applied to the coefficients of this cubic function if the average and marginal cost curves are to have their usual economic textbook shapes?)

7. Stan and Ollie are planning to start a business producing comedy videos. They believe that they can sell as many videos as they can produce at a price of P_0 per video and that their total costs are linear over the range of outputs that they are expecting to produce.

   (a) Set up a simple algebraic model consisting of a total revenue function, TR, and a total cost function (short-run), TC, and an equilibrium condition that requires TR=TC (i.e. they are trying to determine the break-even output for their firm).

   (b) Draw a diagram illustrating your model.

   (c) Solve for the break-even output Q_{BE}.

   (d) What will happen to Q_{BE} if they now learn that they will have to pay for a business license specifically targeted at comedy videos?

   (e) Stan is worried that they may have underestimated their variable costs per unit. What would you expect to be the effect of such an underestimate on Q_{BE}?

(f)   Stan and Ollie determine that if they set their price at $500 per video they will break even if they can sell 100 videos; that if they price their videos at $19 they will break-even if they sell 2500 videos; and if they set their price at $2 they will break-even if they sell 35,000 videos. Which price would you recommend that they choose?

(g)   As an economic consultant how would you evaluate Stan and Ollie's model?

8.   Stan and Ollie believe that the demand for their comedy videos is given by

$$f: R^0 \dashrightarrow R^0$$

$$s.t. \ Q^d = f(P) = a + bP \qquad a, b \in R, \quad a > 0, b < 0$$

They have also determined that their total cost function is a linear function of output. They ask you whether there is a unique break-even output for their firm. How would you answer their question? (You have to think about this question. Note that they did **_not_** ask you to calculate the break-even output level).

9.   Mary's Gadget Company has a demand curve given by

$$f: R^0 \dashrightarrow R^0$$

$$s.t. \ Q^d = 20 - 1/5P$$

and a long-run total cost function

g: $R^0 \rightarrow R^0$

s.t. TC = 20Q.

What are Mary's profit maximizing output and price? Does Mary make a profit at this output level?

If Mary's monopoly were broken up into many small competitive firms what would be the **industry** output and price? What is the cost to society of Mary's monopoly?

A 10. LINEAR MODELS ASSIGNMENT

FOLLOW THE STANDARD INSTRUCTIONS FOR DOING THE ASSIGNMENTS.

1. Show that the algebraic versions of the Supply and Demand, Income Determination, and Break-Even Analysis models are all *special cases* of the basic two linear equation model of high school algebra.

2. Set up a linear model of a labor market in which the demand and supply of labor both depend on the (real) wage. Solve the model for the equilibrium level of employment and the equilibrium wage. Draw a carefully labeled diagram illustrating your model. Do the standard algebraic QCS exercises and illustrate them diagrammatically. (**You may substitute any other linear model from any other branch of economics you may have studied or have an interest in.**)