Economic Dynamics Exam, 2021 □

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As a condition of being allowed to take this exam and having it graded, you must not communicate during the exam in any way—including electronic communication— with another person, except the person who administers the exam.

'Sign' this honor pledge by typing your name in the space provided.
I did my own work on this exam. I did not receive help during the exam, and I did not give help to anyone else. I understand that if I 'sign' this pledge falsely, I will not qualify for a passing grade on the exam and I will not qualify for course credit.

□
signature (above)

You may consult your notes or your models during the exam. However, you will not be required to do any modeling, and you will not need to simulate any computer model. All the diagrams and equations you need will be displayed on the exam pages.

When finished, attach this exam to an email addressed to:
david.wheat@uib.no
and either novikaj@ukma.edu.ua **or** olisk@ukr.net

On the following pages, there are 5 questions worth 25 points each. You are required to answer 4 of them. Some questions have more than one part (a, b, c, etc.).

- Question 1 has five parts (a – e)
- Question 2 has four parts (a – d)
- Question 3 has four parts (a – d)
- Question 4 has two parts (a – b)
- Question 5 has two parts (a – b)

If you want to try answering all 5 questions, one will be counted as 'extra credit' and you will receive additional points depending on the quality of your answer. If you decide to answer all five questions, indicate which one should be counted as 'extra credit.' Otherwise, #5 will be considered your extra-credit question.

Type your answers in the text boxes provided under each question.

An extra blank page is available if you need more space for your answers. If you use the extra page, be sure to indicate which question you are answering (i.e., write the question #).

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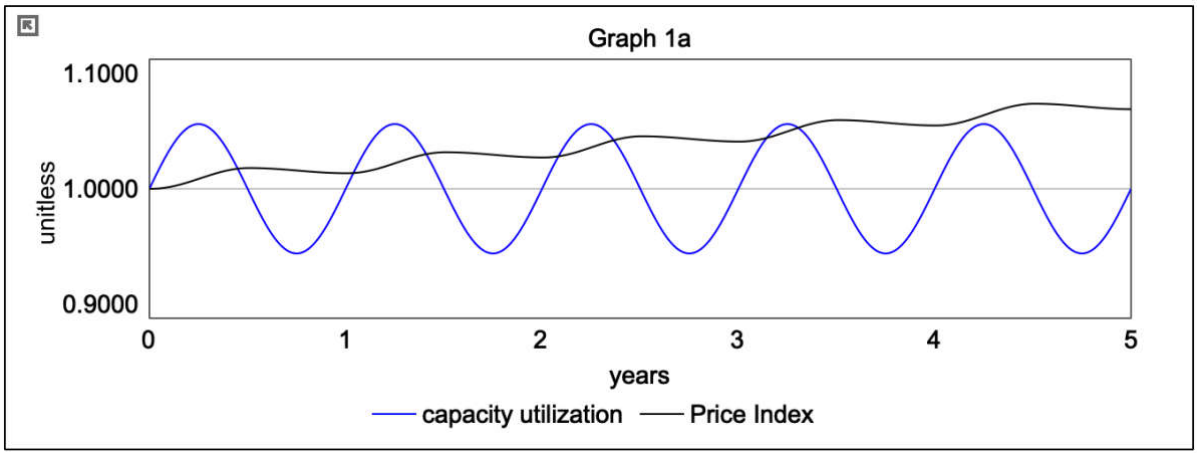
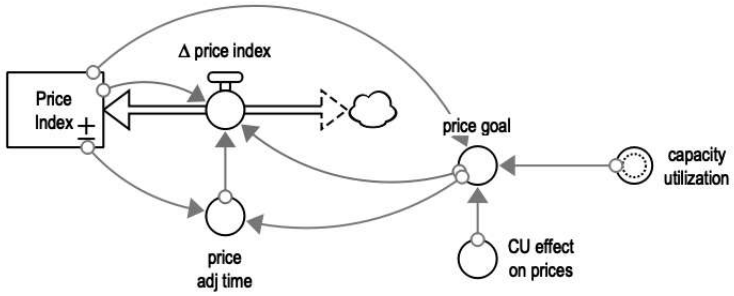
1(a). In Graph 1a, capacity utilization is rising and falling by equal amounts each year. In other words, average capacity utilization over the five-year period is constant: 1.0 (100%). Study the model below the graph and explain why the price index is rising over the five-year period.





Price Index(t) = Price Index(t - dt) + (Δ price index) * dt
Δ price index = (price goal - Price Index) / price adj time
CU effect on prices = 1
price adj time = IF(price goal < Price Index) THEN(4)ELSE(1)
price goal = Price Index *capacity utilization ^CU_effect_on_prices

1(a) Why is the price index rising over the 5-year period when capacity utilization is above-and-below its constant average value by an equal amount each year?

□ *Prices are adjusted upward more quickly than downward. The recurring upswing in capacity utilization puts upward pressure on prices before the previously intended price reduction is completed. Thus, the next upswing in the price goal starts from a higher level each year. That results in an average change in prices that is positive each year, making the Price Index rise each year even though the average capacity utilization is 100% over the five-year period.*

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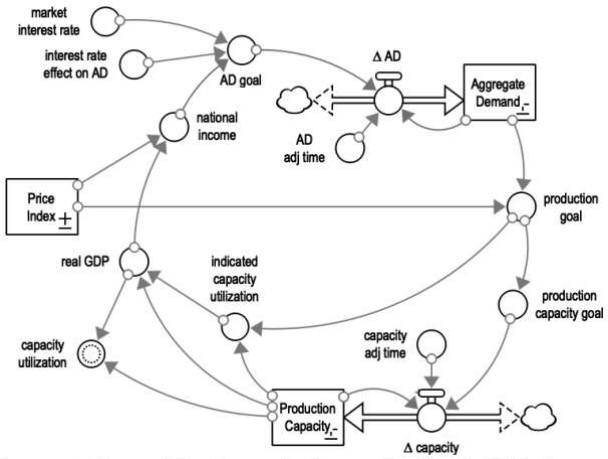
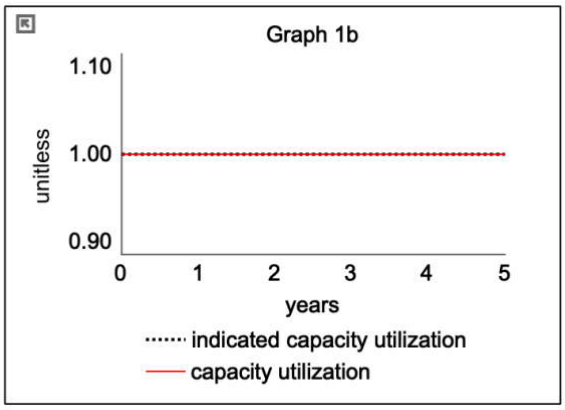
1(b) This simple model is part of the supply side in the model developed in the ED course. (The link from capacity utilization to the price index has been deleted to simplify the diagram.) Graph 1(b) displays the initial equilibrium conditions, with both 'indicated capacity utilization' and 'capacity utilization' equal to 1.0 (100%). Study the structure of this model and answer the questions below.





Aggregate Demand(t) = Aggregate Demand(t - dt) + (Δ AD) * dt
Production Capacity(t) = Production Capacity(t - dt) + (Δ capacity) * dt
Δ capacity = (production capacity goal - Production Capacity) / capacity adj time
capacity adj time = 3
indicated capacity utilization = production goal / Production Capacity
market interest rate = 5
production capacity goal = SMTH3(production goal, .25)
real GDP = Production Capacity * indicated capacity utilization
AD goal = national income * (market interest rate / INIT(market interest rate)) ^interest_rate_effect_on_AD

Price Index(t) = Price Index(t - dt)
Δ AD = (AD goal - Aggregate Demand) / AD adj time
AD adj time = 1
capacity utilization = real GDP / Production Capacity
interest rate effect on AD = -.04
national income = real GDP * Price Index
production goal = Aggregate Demand / Price Index

1(b) What will happen to 'capacity utilization' if market interest rates fall? Explain why.

□ *Capacity utilization will rise if market interest rates fall.*

Why? *1. Fall in interest rates raised AD goal.*
2. Rise in AD goal increases Aggregate Demand
3. Rise in Aggregate Demand raises the production goal.
4. Rise in production goal increases capacity utilization.

1(c) If it were possible to change Production Capacity faster, how would that affect capacity utilization (and inflation) after the interest rate increase? Explain why.

□ *If Production Capacity could change more quickly, that would reduce the amount of change that occurs in capacity utilization and inflation. For a given change in the production, CU and inflation would rise less and fall less.*

Why? *Technical reason: Production Capacity is the numerator in the capacity utilization equation. When the numerator gets larger, the value of the equation will be smaller.*
Intuitive reason: The faster the Production Capacity can reach the production capacity goal, the less need there will be for working overtime (or undertime).

In this model, 'indicated capacity utilization' and 'capacity utilization' are always equal.
1(d) Give an example of some situation in real life that might cause them to have different values.

□ *Various constraints on utilization of factors of production (especially labor) might make it difficult to work overtime as much as called for by the 'indicated' capacity utilization in the model. That would result in actual capacity utilization being less than indicated (or 'desired') capacity utilization.*

1(e) Describe in words how you might change the equation for 'real GDP' or the equation for 'capacity utilization' (or both) to reflect the behavior you suggested above. No need to write any equations, but you can if that will help clarify your answer.

□ *A parameter could be added to the real GDP equation that would reduce the effect of the 'indicated capacity utilization.'*

For example, if no overtime was allowed:
*real GDP = MIN(1, indicated capacity utilization) * Production Capacity*
For example, if max overtime was 5%:
*real GDP = MIN(1.05, indicated capacity utilization) * Production Capacity*
A more complex equation could make the 'max overtime' decrease over time, to reflect limits on how long a high overtime situation could be maintained.

If you decide to answer all five questions, indicate which one should be counted as 'extra credit.'

Economic Dynamics Exam, 2021

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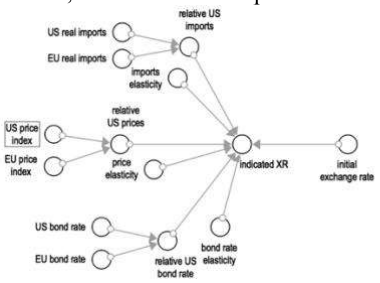
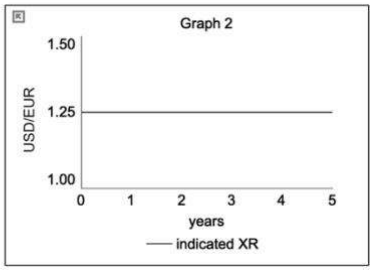
2. Below is a very simple model of exchange rates (XR). Graph 2 displays the initial equilibrium condition when 'indicated XR' is equal to 1.25 USD/EUR. Study the structure of the model, including the parameter values, and answer the questions below.





initial exchange rate = 1.25
indicated XR = initial exchange rate * (relative US imports ^imports_elasticity)
* (relative US prices ^price elasticity) * (relative US bond rate ^bond rate elasticity)

US real imports = 4e+12 EU real imports = 3.2e+12 imports elasticity = -1
relative US imports = (US real imports / EU real imports) / INIT(US real imports / EU real imports)

US price index = 1 EU price index = 1 price elasticity = -1
relative US prices = (US price index / EU price index) / INIT(US price index/ EU price index)

US bond rate = 4 EU bond rate = 4 bond rate elasticity = 1
relative US bond rate = (US bond rate / EU bond rate) / INIT(US bond rate / EU bond rate)

Note to Marianna & Alina: I think my imports elasticity and bond rate elasticity are backwards. Thus, we need to grade the students' work very carefully and generously (see below). I think my mistakes occurred when I tried to simplify the SD322 exchange rate to use on this exam. I flipped the initial exchange rate (from 0.80 EUR/USD to 1.25 USD/EUR) but failed to flip the bond rate elasticity that exists in the SD322 model. And, without thinking carefully, I double-flipped the SD322 model imports relationships after single-flipping the initial XR. Please double-check my work below, to be sure did not overlook other errors. My basic reasoning on XR is based on the hypothesized demand for goods, services, and assets; increased demand for them translates into an increased demand for the currency needed to pay for them. And, an increase in the demand for a currency causes it to appreciate. In the exam model, the US currency is in the numerator, and appreciation of the USD means the XR will fall (one EUR buys fewer USD). Also, on the exam, I deliberately excluded the possibility of feedback effects on demand; thus, I'm looking for only the initial effect. Sorry for the confusion on this question.

2(a) What happens to 'indicated XR' when US real imports increase by 10% ? Explain why.

 Given an imports elasticity of -1, the indicated XR would fall when US real imports rise.
However, I made a mistake with the elasticity; it should be +1, and indicated XR should rise.
[Give full credit to the students if they gave the 'correct' answer for an elasticity of -1.
Deduct only 2 points if they gave the 'incorrect' answer for an elasticity of -1.
Give full credit if the students mentioned the elasticity error, regardless of their answer.

2(b) What happens to 'indicated XR' when the EU price index increases by 10% ? Explain why.

 The indicated XR would fall when EU prices rise. rise
Technical reason: Relative US prices would decrease and the elasticity is negative indicated XR increases
Intuitive reason: More USD would be needed to purchase the same volume of real imports from EU, thus, EUR appreciates and the indicated XR would rise. [There is no feedback effect on US real imports in this model. If the feedback loop was active and, for example, US real imports declined by 10% after the EU price increase, then XR would fall back to its original value. If students gave the incorrect answer but justified it by explaining the (missing) feedback effect, deduct only 1 point.]

2(c) What happens to 'indicated XR' when US bond rates increase by 10% ? Explain why.

 Given an imports elasticity of +1, the indicated XR would rise when US bond rates rise.
However, I made a mistake with the elasticity; it should be -1, and indicated XR should fall.
[Give full credit to the students if they gave the 'correct' answer for an elasticity of +1.
Deduct only 2 points if they gave the 'incorrect' answer for an elasticity of +1.
Give full credit if the students mentioned the elasticity error, regardless of their answer.

2(d) What happens to 'indicated XR' when both EU prices & bond rates rise by 10% ? Explain why.

My intent was for this scenario to result in no change in the indicated XR because the 'price effect' and the 'bond rate effect' would cancel out. However, due to my error in the bond rate elasticity, that does not happen.
Given the elasticities, indicated XR will rise. Give full credit if the student gave this answer.
Deduct only 2 points if they gave the 'incorrect' answer for the given elasticities.
Give full credit if the students mentioned the elasticity error, regardless of their answer. not change

If you decide to answer all five questions, indicate which one should be counted as 'extra credit.'

More mistakes on my part...this time in reading my own question 2(d). It clearly says that 'EU' prices & bond rates would rise by 10%, but that was not the way I was thinking when I wrote the suggested solution. I was thinking that 'US' bond rates were rising. Thus, my suggested solution was not correct, given the actual wording of the question. The correct 'math' answer is 'no change' and students should get full credit.

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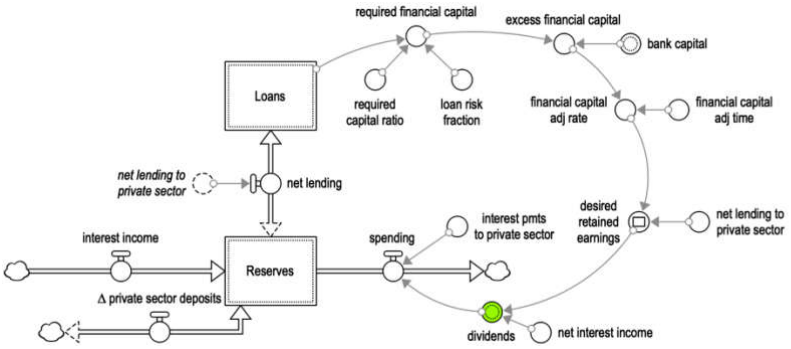
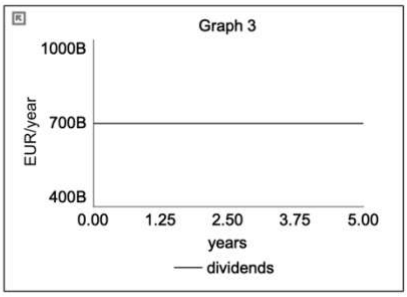
3. This is a simple model of financial capital regulation of banks. Graph 3 displays the behavior of 'dividends' when the model is initially in equilibrium. Study the structure of the model, including equations and parameter values, and answer the questions below.





Loans(t) = 16e+12
Reserves(t) = .320e+12
financial capital adj time = .25
interest income = 1e+12
bank capital = .64e+12
interest income = 1e+12
Δ private sector deposits = 0
net interest income = .7e+12
required capital ratio = 0.10

required financial capital = Loans * loan risk fraction * required capital ratio
financial capital adj rate = excess financial capital / financial capital adj time
excess financial capital = bank capital - required financial capital
spending = interest pmts to private sector +dividends
net lending = net lending to private sector
dividends = MAX(0, (net interest income - desired retained earnings)
net lending to private sector = lending - repayments
interest pmts to private sector = .3e+12
loan risk fraction = 0.40

desired retained earnings = SMTH1(net lending to private sector - financial capital adj rate, .25, 0)

3(a) What happens to dividends if regulators raise the required capital ratio from 10% to 11%? Explain why.

 Dividends will decrease.

1. *Required financial capital increases.*
2. *Excess financial capital decreases (becomes negative when model is initially in equilibrium).*
3. *Financial capital adj rate becomes negative.*
4. *Desired retained earnings increase.*
5. *Dividends decrease.*

3(b) What happens to Reserves if the required capital ratio is raised? Why?

 Reserves will increase because dividends decrease and the spending outflow will be lower.

3(c) Think about the links between the Banks sub-model and the Household sub-model. What is the effect on consumption when the required capital ratio is raised? Why?

 Consumption will decrease. In the Households sub-model, the reduction in dividends will cause Household Deposits to be lower than they otherwise would be, and consumption will decrease.

3(d) Assume the economy weakens after the required capital ratio is raised: net lending falls and Loans decline. Also, assume more Loans are considered risky, and regulators raise the 'loan risk fraction.' Will the 'required financial capital' increase or decrease? Explain.

 We cannot know the answer from the information given.

*required financial capital = Loans * loan risk fraction * required capital ratio*

A decline in the Loans stock would reduce required financial capital, ceteris paribus.
However, an increase in the loan risk fraction would increase required financial capital, ceteris paribus.
Since the question does not specify how much Loans decline and how much the risk fraction increases, the net effect on required financial capital cannot be predicted.

If you decide to answer all five questions, indicate which one should be counted as 'extra credit.'

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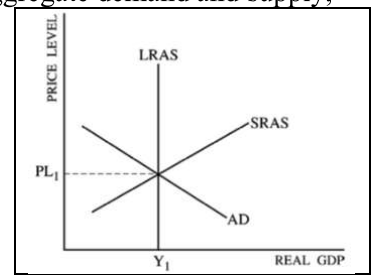
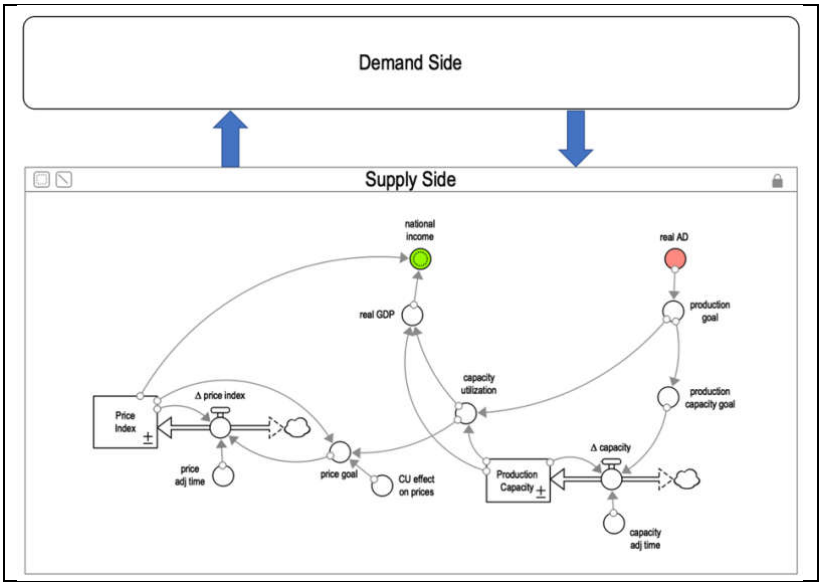
4. Macroeconomics textbooks do not ignore the interaction between aggregate demand and supply, but most hypothesize a different kind of interaction. 'AD-AS' graphs like the one at right are common. Here, AD refers to 'aggregate demand' and LRAS & SRAS refer to 'short-run' and 'long run' aggregate supply. The slopes of the AD and SRAS are hypothesized to reflect the response to changes in the general price level in the economy. The particular locations of AD, LRAS, and SRAS depend on factors other than the price level. The location of AD depends on C, I, G, and NX. The location of the vertical LRAS depends on the size and productivity of the labor force and the cost of labor & capital equipment. The SRAS depends on the location of the LRAS and on prices.



The AD-AS model is quite different from the ED model developed in this course (partial diagram at right). The main difference is NOT because the ED model is dynamic and the AD-AS model is static. The same AD-AS hypotheses could be used to develop a dynamic version: the LRAS would move to the right as 'potential GDP' responded to growth in productive resources. More important are the different behavioral hypotheses in the two models.



4(a) Which two variables in the ED model are similar to the SRAS and LRAS concepts in the AD-AS model?

□ *Real GDP is similar to SRAS. Production Capacity is similar to LRAS.*
However, SRAS and LRAS are 'curves' (schedules of price/quantity relationships), unlike real GDP (quantity produced) and Production Capacity (quantity that could be produced).

4(b) Compare the different hypotheses about what influences those two variables in the two models. Discuss both similarities and differences.

□ *Real GDP responds to changes in aggregate demand via capacity utilization (and Production Capacity) but SRAS responds to prices (and LRAS).*
Real GDP is the quantity produced at the given price; SRAS is a price/quantity schedule.

Production Capacity responds to aggregate demand but LRAS does not. LRAS depends on exogenous changes in quantity, cost, and productivity of exogenously-determined factors of production, and leaves unanswered the question of how to evaluate and respond to those changes without knowing aggregate demand.

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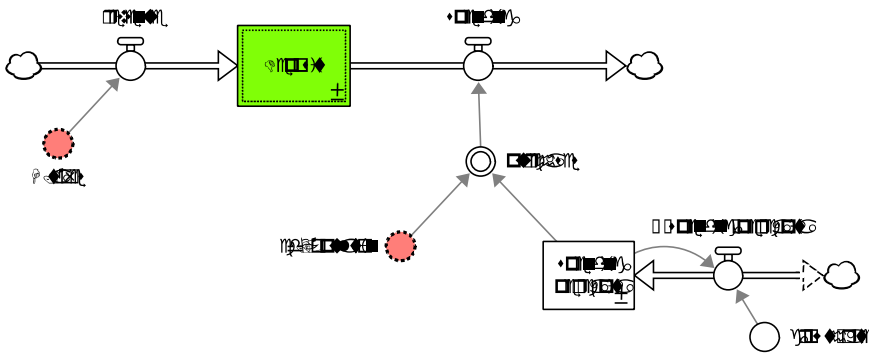
5. The Government sub-model is the simplest part of the model developed in Economic Dynamics this year. Here it is:



Let's assume you wanted to improve the structure of this sub-model.

5(a) What would be the most important thing you would add or delete? Why?

Some possible modifications:

1. Add Government Debt and the possibility of deficit spending to the model (more realistic).

2. Endogenize taxes so that desired taxes reflects some fiscal objective; e.g., target Debt/GDP ratio.

3. Make purchases dependent on revenue or level of deposits (less realistic)

5(b) Describe generally <u>how</u> you would change the sub-model. Equations or diagrams are not necessary; a clear written description will be fine. But if you prefer to include some equations or diagrams (using another app to create them and pasting here) that would also be fine.

1. Government Debt could be structured in a way that is similar to the Debt structure in the Firms and the Households sub-models. The desired borrowing would be a function of the desired deficit.

2. Taxes could be endogenized by, for example, setting a target Debt/GDP ratio. Then a desired debt could be determined from the expected GDP. Then, with some clever algebra, the desired debt could be converted to desired borrowing, desired deficit, and desired taxes. Finally, given the expected taxable income, the desired tax rate could be determined. The desired tax rate could be implemented in the model by gradually adjusting the current tax rate.

3. Making purchases a function of revenue would be simple, and making purchases a function of the level of deposits could be similar to that kind of structure in the Firms and Households sub-models.

[The students may have other good examples of changes and model implementation techniques.]

If you decide to answer all five questions, indicate which one should be counted as 'extra credit.'

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[If you use this extra page, be sure to indicate which question you are answering.]