IAS 107 Lecture: Problem Review

J. Bradford DeLong
U.C. Berkeley
IAS107 Lecture Notes

http://delong.typepad.com/berkeley_econ_101b_spring/

April 7, 2011

Resolution for screencast capture: 1024x768

Logistics

- Problem Set 8 due Thursday April 14
- Next week: federal government budget
- Assigned reading: CBO Long-Term Budget Outlook <http://www.cbo.gov/ftpdocs/115xx/doc11579/06-30-LTBO.pdf>
- April 14 take-home assignment...
    - Due April 19 at start of class

Depression Economics: Equations to Know

$$Y = C + I + G + (GX - IM)$$

$$Y = \frac{c_0 + I + G + GX}{1 - (1 - t)c_y + im_y}$$

$$Y = \frac{A_0 + G - (I_r + X_\varepsilon \varepsilon_r)r}{1 - (1 - t)c_y + im_y}$$

$$r = i + \rho^t + \rho^r - \pi^e$$

$$u - u^* = 0.5(1 - Y/Y^*)$$

$$\Delta u = 0.5\left(\frac{\Delta Y}{Y} - 2.7\%\right)$$

Income-Expenditure

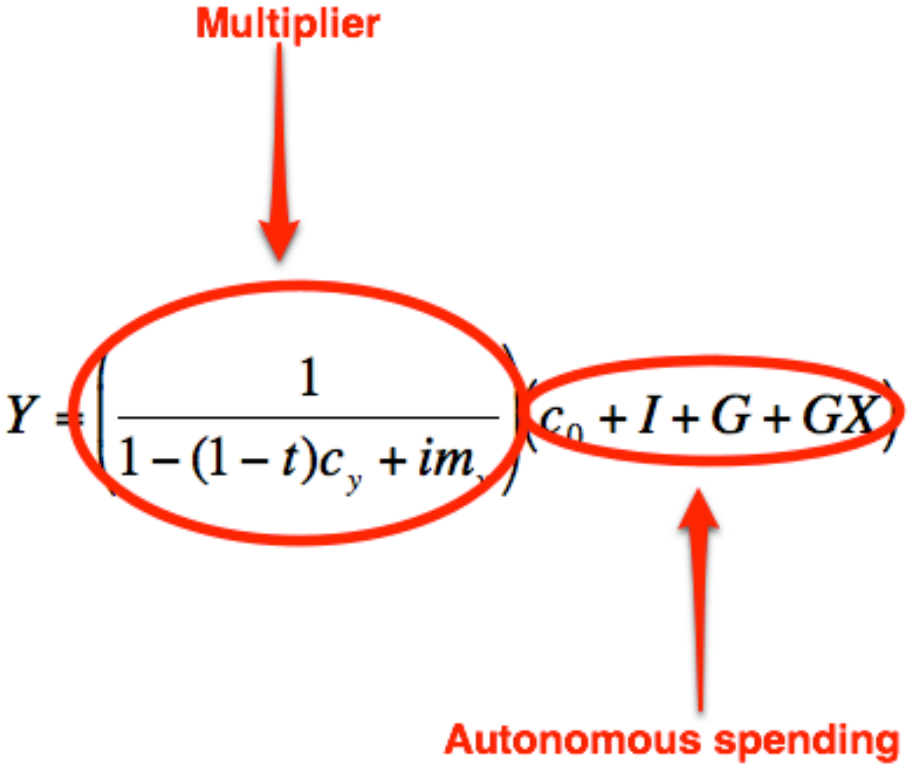
- In the simple income-expenditure model with real GDP Y equal to the sum of consumption spending by households C, investment spending by businesses I, government purchases G, and with net exports NX; with consumption spending C given by the equation: $C = c_o + c_y Y(1-t)$; and with imports IM given by the equation: $IM = im_y Y$...

$$Y = C + I + G + (GX - IM)$$

$$Y = \frac{c_0 + I + G + GX}{1 - (1 - t)c_y + im_y}$$

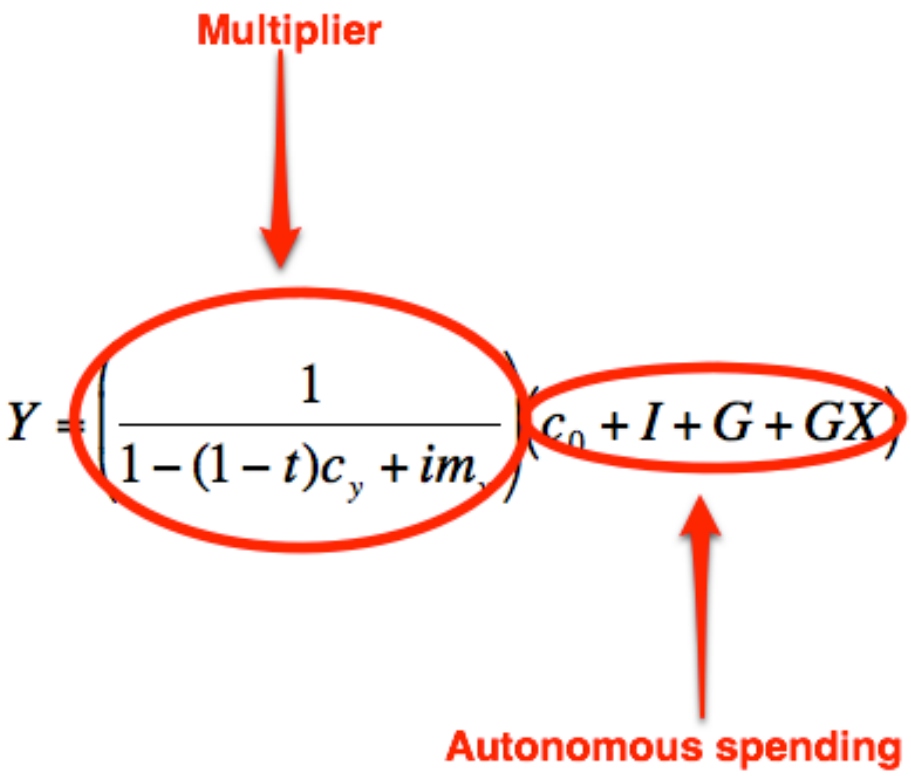
Income-Expenditure

- In the simple income-expenditure model with real GDP Y equal to the sum of consumption spending by households C, investment spending by businesses I, government purchases G, and with net exports NX; with consumption spending C given by the equation: $C = c_o + c_y Y(1-t)$; and with imports IM given by the equation: $IM = im_y Y$...



Income-Expenditure

- Suppose I = \$1.7 trillion, G = \$3 trillion, GX = \$1.7 trillion, c_o = \$3 trillion, c_y = 0.5, the tax rate t=0, and im_y = 0.1667. What is GDP Y?



$$Y = \left(\frac{1}{1-(1-t)c_y + im_y}\right)(c_0 + I + G + GX)$$

$$Y = \left(\frac{1}{1-(1-0)0.5 + 0.1667}\right)(c_0 + I + G + GX)$$

$$Y = \left(\frac{1}{1-0.5 + 0.1667}\right)(c_0 + I + G + GX)$$

$$Y = \left(\frac{1}{0.6667}\right)(c_0 + I + G + GX)$$

$$Y = (1.5)(c_0 + I + G + GX)$$

$$Y = (1.5)(3 + 1.7 + 3 + 1.7)$$

Ladies and Gentlemen, to your iClickers...

- Suppose I = \$1.7 trillion, G = \$3 trillion, GX = \$1.7 trillion, c_o = \$3 trillion, c_y = 0.5, the tax rate t=0, and im_y = 0.1667. What is GDP Y?

- A. \$14.1 trillion
- B. \$9.4 trillion
- C. \$6.3 trillion
- D. \$18.4 trillion
- E. \$6.6667 trillion

Why Is It Important to Know How to Do This?

- It's very important if you are Christina Romer and it is December of 2008. You have just taken soundings of the financial markets and your best guess is that I will be depressed by $400 billion a year for three years and you are supposed to forecast how bad the recession is going to be...
- It's less important if you are you—but you may wind up in jobs that require that you forecast or at least that you be able to ascertain whether forecasts handed to you make sense...
- And you are all citizens sitting in judgment on the politicians you elect...

Investment-Savings

- It is December 2008. You have forecast that—after all the expansionary banking and monetary policy planned—real GDP will still be depressed some $600 billion/year below its sustainable trend level for three years, and you are asked to recommend a fiscal policy.

$$Y = \frac{A_0 + G - (I_r + X_\varepsilon \varepsilon_r) r}{1 - (1 - t) c_y + i m_y}$$

Investment-Savings

- To close a gap of \$600 billion for three years (assume c_y = 0.75, the tax rate t=0.333, and im_y = 0.1667), what do you do?

$$Y = \frac{A_0 + G - (I_r + X_\varepsilon \varepsilon_r)r}{1 - (1 - t)c_y + im_y}$$

Investment-Savings

- To close a gap of $600 billion/year for three years (assume c_y = 0.75, the tax rate t=0.333, and im_y = 0.1667), what do you do?

$$Y = \frac{A_0 + G - (I_r + X_\varepsilon \varepsilon_r) r}{1 - (1-t)c_y + im_y}$$

$$Y = \left(\frac{1}{1-(1-t)c_y + im_y}\right)\left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r\right) r\right)$$

$$Y = \left(\frac{1}{1-(1-0.333)0.75 + 0.16667}\right)\left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r\right) r\right)$$

$$Y = \left(\frac{1}{1-0.5 + 0.16667}\right)\left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r\right) r\right)$$

$$Y = \left(\frac{1}{1-0.3333}\right)\left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r\right) r\right)$$

$$Y = \left(\frac{1}{0.667}\right)\left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r\right) r\right)$$

$$Y = (1.5)\left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r\right) r\right)$$

$$\Delta Y = (1.5)(\Delta G)$$

Ladies and Gentlemen, to your iClickers...

- To close a gap of $600 billion/year for three years (assume $c_y = 0.75$, the tax rate t=0.333, and $im_y = 0.1667$), what do you do?

- A. Boost government purchases G by $600 billion a year for this year only
- B. Boost government purchases G by $600 billion a year for two years
- C. Boost government purchases G by $400 billion a year for four years
- D. Boost government purchases G by $400 billion a year for three years
- E. Boost government purchases G by $600 billion a year for three years

Why Is It Important to Know How to Do This?

- It’s very important if you are Christina Romer and it is December of 2008...
- It’s less important if you are you—but you may wind up in jobs that require that you forecast or at least that you be able to ascertain whether forecasts handed to you make sense...
- And you are all citizens sitting in judgment on the politicians you elect...

Investment-Savings

- Suppose that we are worried about monetary and banking policy, or about other aspects of the situation...

$$Y = \left(\frac{1}{1-(1-t)c_y + im_y} \right) \left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r \right) r \right)$$

$$r = i + \rho^t + \rho^r - \pi^e$$

$$A_0 = X_\varepsilon \left(\varepsilon_0 + \varepsilon_r r^f \right) + X_y Y^f + I_0 + c_0$$

Investment-Savings

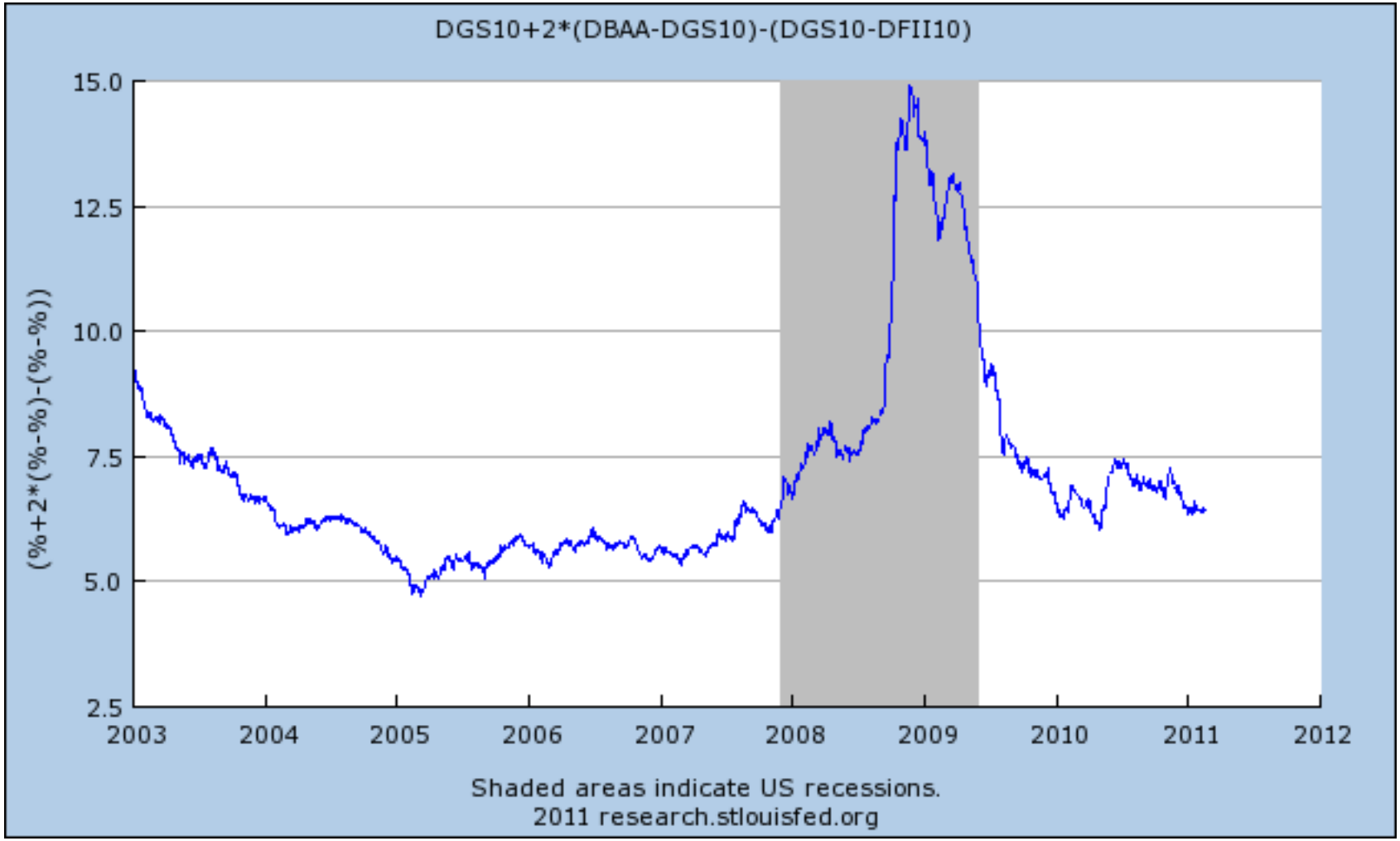
- Had things broken otherwise, we might now be focusing on A_0. But they didn't...
- And we don't have good back-of-the-envelope models of the components of r...
- Indeed, economists are squabbling right now about whether and how effective the Federal Reserve's QE II policies have been...
- And nobody expected $500 billion of defaults on subprime mortgages to spike r the way it did...

$$Y = \left(\frac{1}{1 - (1-t)c_y + im_y} \right) \left(A_0 + G - \left(I_r + X_\varepsilon \varepsilon_r \right) r \right)$$

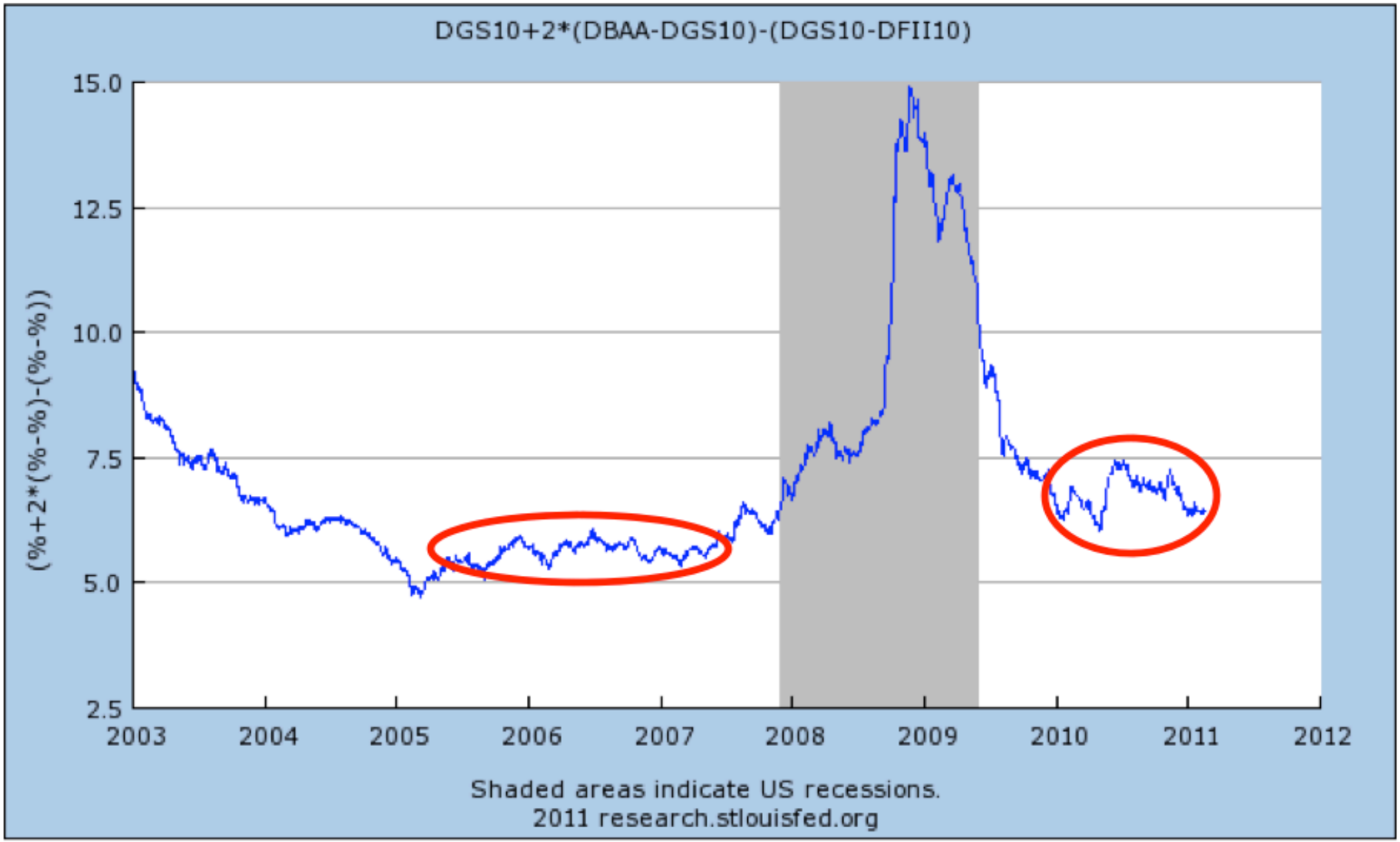
$$r = i + \rho^t + \rho^r - \pi^e$$

$$A_0 = X_\varepsilon \left(\varepsilon_0 + \varepsilon_r r^f \right) + X_y Y^f + I_0 + c_0$$

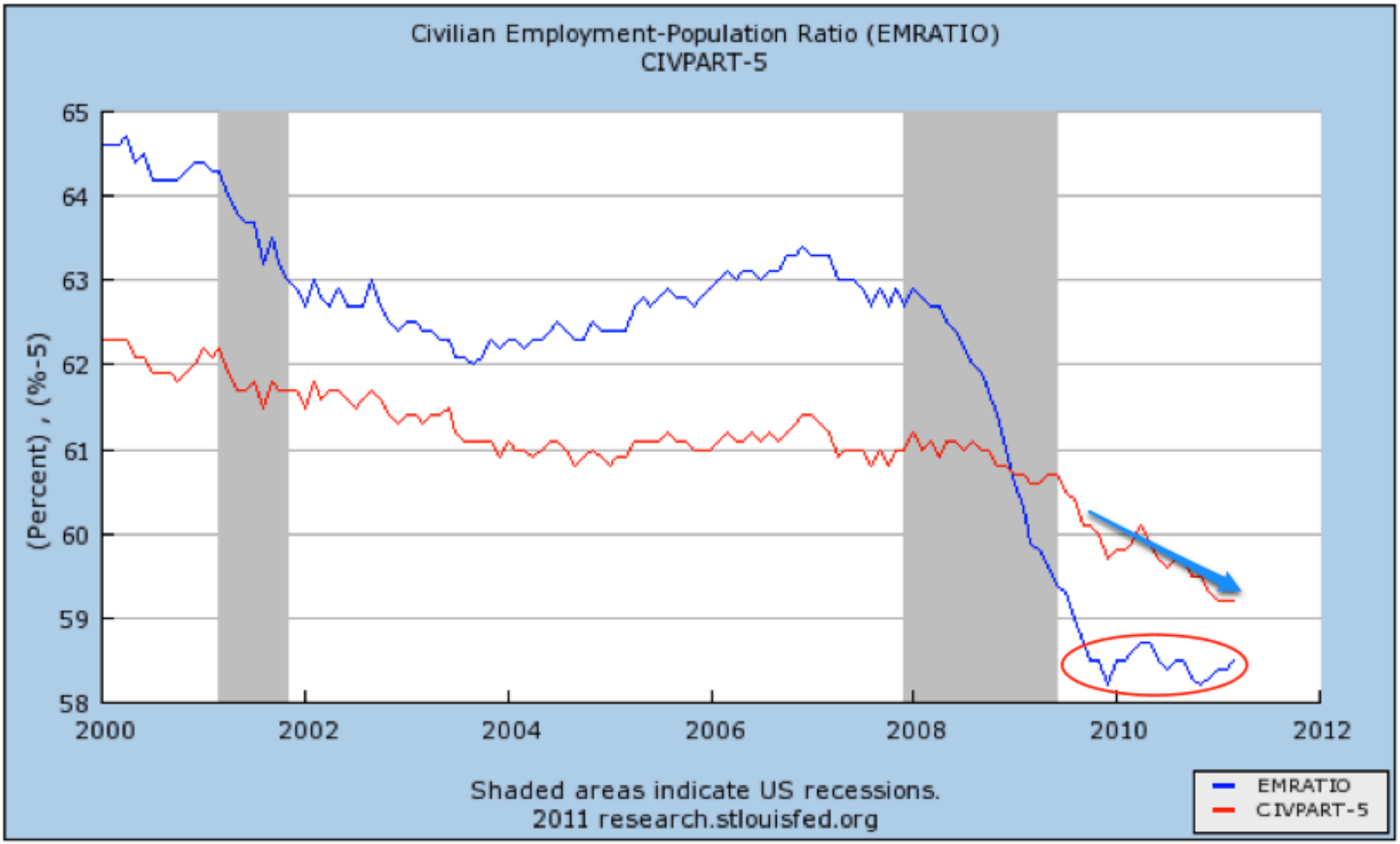
Investment-Savings: Effects of the Financial Crisis



Investment-Savings: Why Is the Economy Still Depressed?



Investment-Savings: Low-Level (Near) Equilibrium



Growth Economics: Equations to Know

$$Y = K^{\alpha}(EL)^{1-\alpha}$$ ← Production function

$$\frac{Y}{L} = \left(\frac{K}{L}\right)^{\alpha}(E)^{1-\alpha}$$ ← Per-worker production function

$$E_t = E_0 e^{gt} \approx E_0(1+g)^t$$ ← Compound growth

$$(1+g)^{72/g} \approx 2$$ ← Rule of 72

$$\frac{Y}{L} = \left(\frac{s}{n+g+\delta}\right)^{(\alpha/(1-\alpha))} E$$ ← Balanced-growth equation

Ladies and Gentlemen, to Your i>Clickers...

- From the equation that was the solution to our growth model: $Y/L = (s/(n+g+\delta))^{(\alpha/(1-\alpha))}E$;
- Suppose E=$10000/year, s=0.20, n=0.02, g=0.03, δ=0.05, and α=2/3; what then is Y/L?
- A. $40,000/year
- B. $9/year
- C. $30,000/year
- D. $90,000/year
- E. $4,000,000/year

The Solution...

$$Y/L = \left(\frac{s}{n+g+\delta}\right)^{[\alpha/(1-\alpha)]} E$$

$$Y/L = \left(\frac{.20}{.02+.03+.05}\right)^{[\alpha/(1-\alpha)]} E$$

$$Y/L = \left(\frac{.20}{.10}\right)^{[\alpha/(1-\alpha)]} E$$

$$Y/L = \left(\frac{.20}{.10}\right)^{[(2/3)/(1-(2/3))]} E$$

$$Y/L = \left(\frac{.20}{.10}\right)^{[(2/3)/(1/3)]} E$$

$$Y/L = \left(\frac{.20}{.10}\right)^{2} E$$

$$Y/L = 4E$$

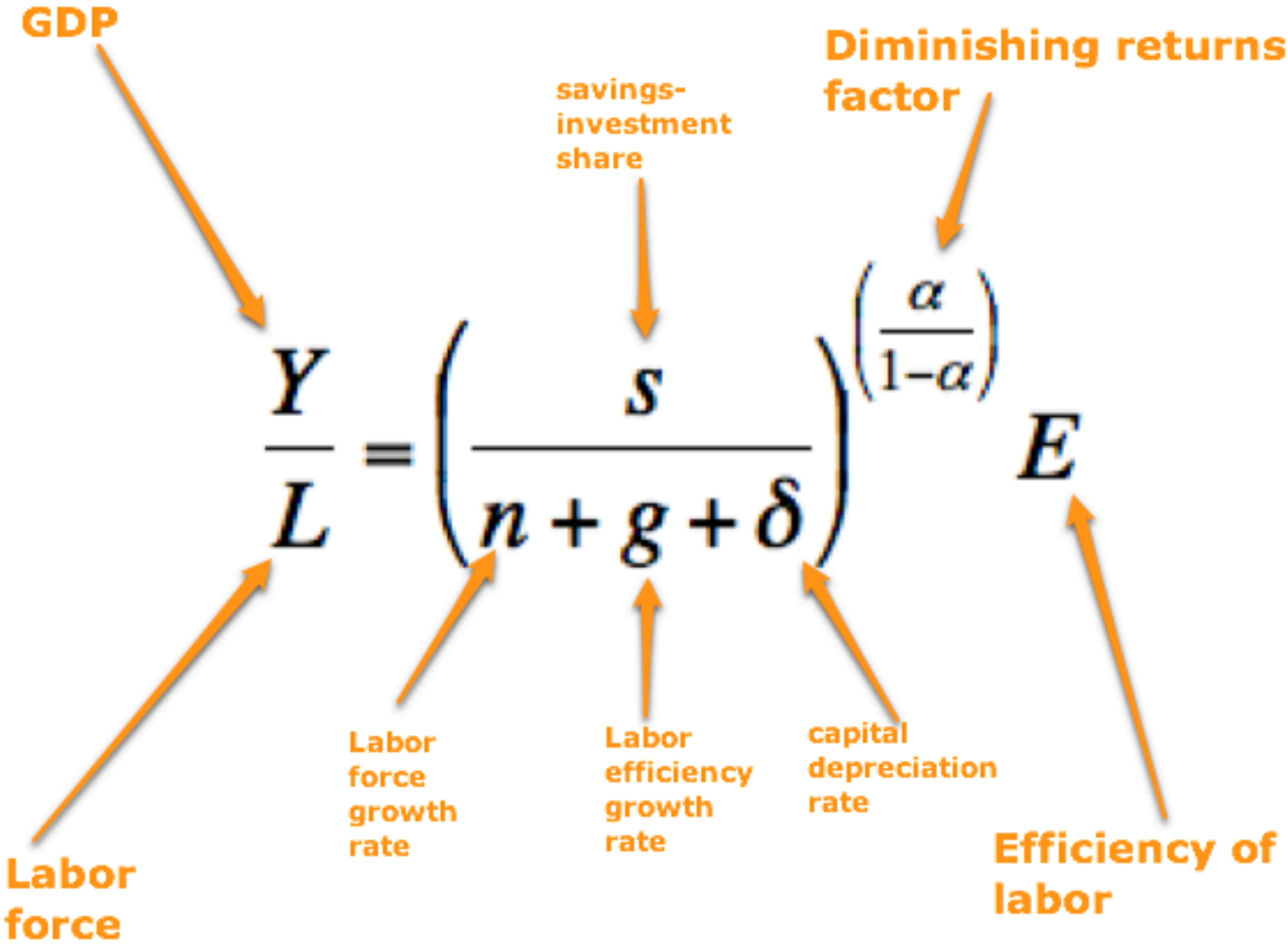
$$Y/L = 4 \times \$10{,}000$$

$$Y/L = \$40{,}000$$

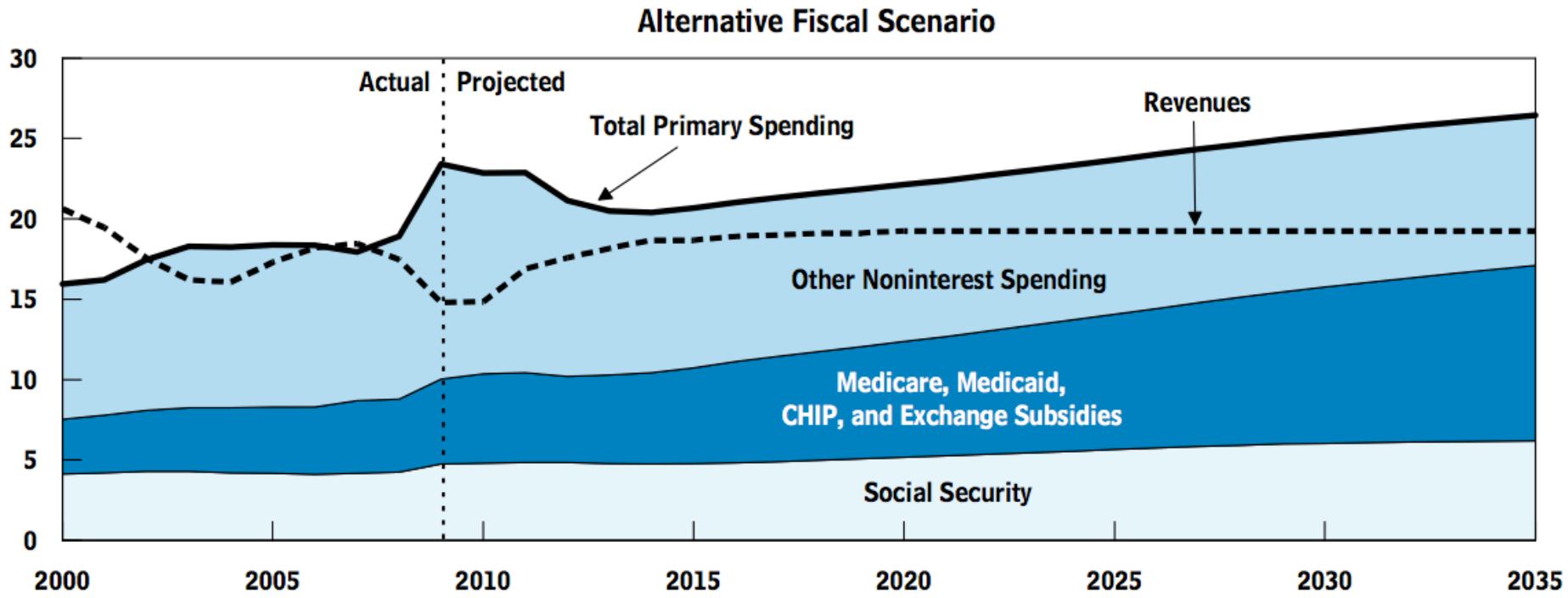
Why Is It Important to Know How to Do This?

- Debates we are about to have about:
  - Economic development
  - Government budgeting
  - Dealing with global warming
- You can understand the arguments being made only if you understand the quantitative shape of long-run growth
  - Example: Eichengreen's forecast of a "stop" to Chinese growth
  - Example: How much should the shadow of large projected deficits come 2040 affect our budgeting now?
  - Example: better to slow growth now to prevent global warming or to have a richer earth clean up the mess in a century?

Eichengreen's Forecast of a "Stop" to Chinese Growth



The Shadow of Projected Deficits in 2040



Source: Congressional Budget Office.

Notes: Primary spending refers to all spending other than interest payments on federal debt.

The extended-baseline scenario adheres closely to current law, following CBO's 10-year baseline budget projections through 2020 (with adjustments for the recently enacted health care legislation) and then extending the baseline concept for the rest of the long-term projection period. The alternative fiscal scenario incorporates several changes to current law that are widely expected to occur or that would modify some provisions that might be difficult to sustain for a long period. (For details, see Table 1-1 on page 3.)

CHIP = Children's Health Insurance Program.

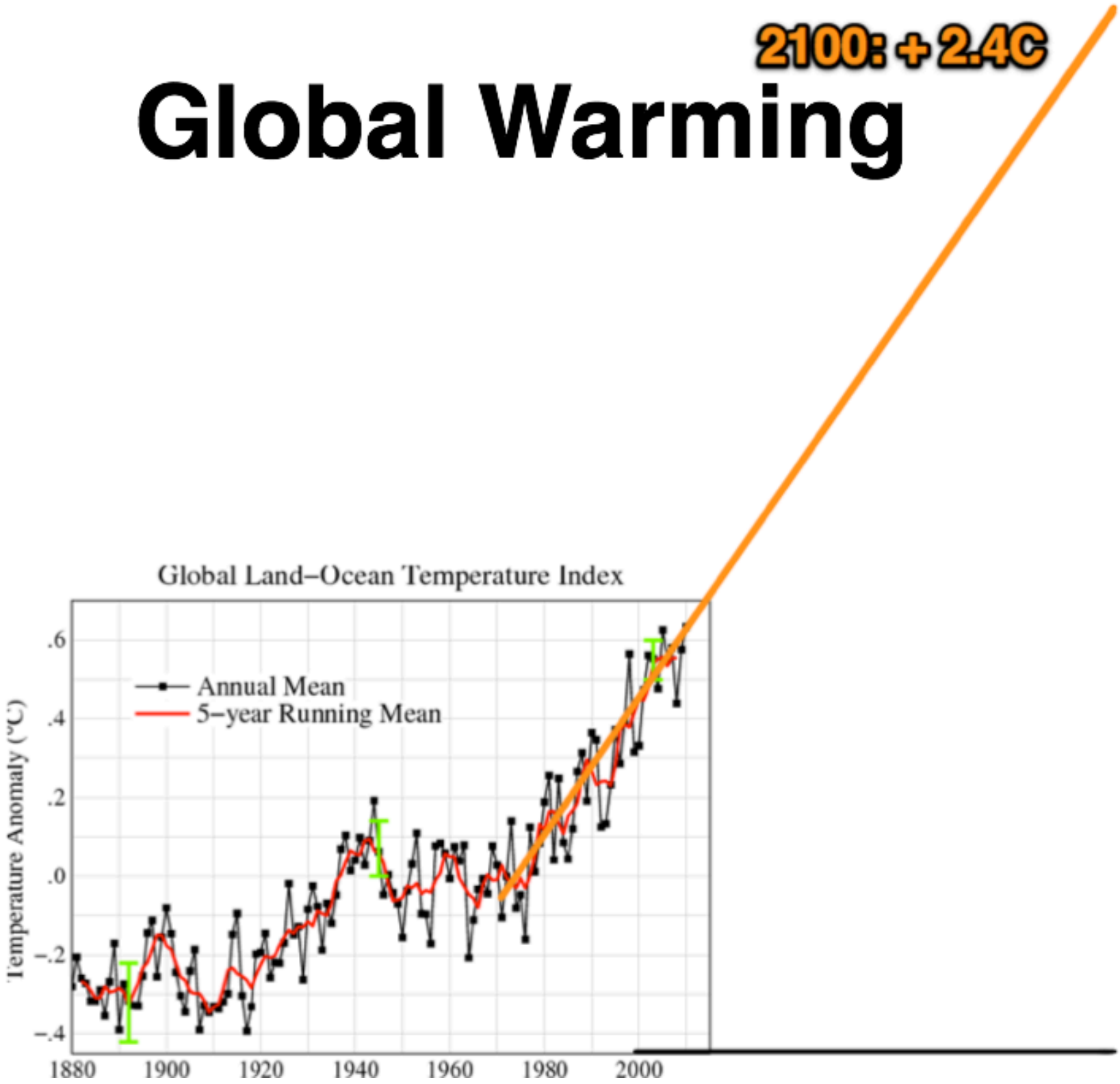
Evaluating the Shadow of Projected Deficits in 2040

$$\text{annual carrying cost} = \left(\text{i} - \pi - (\text{n} + \text{g})\right)\left(D/Y\right)$$

$$\text{optimistic}: \ \text{annual carrying cost} = \left(.05 - .02 - (.01 + .02)\right)\left(D/Y\right) = 0 \times \left(\$600\right) = 0$$

$$\text{pessimistic}: \ \text{annual carrying cost} = \left(.08 - .02 - (.01 + .01)\right)\left(D/Y\right) = .04 \times \left(\$600\right) = \$24$$

Global Warming



Dealing with Global Warming

- Debates we are about to have about:
  - Economic development
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  - Dealing with global warming
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  - Example: How much should the shadow of large projected deficits come 2040 affect our budgeting now?
  - Example: better to slow growth now to prevent global warming or to have a richer earth clean up the mess in a century?

Inflation Economics: Equations to Know

$$\pi = \pi^e + \beta(u^* - u)$$

$$u = u_0 + \phi(\pi - \pi^t)$$

$$\pi = \frac{\pi^e}{(1+\beta\phi)} + \frac{\beta\phi\pi^t}{(1+\beta\phi)} + \frac{\beta(u^* - u_0)}{(1+\beta\phi)}$$

$$\pi^* = \frac{(u^* - u_0)}{\phi} + \pi^t$$

$$\text{static}: \ \pi^e = \bar{\pi}$$

$$\text{adaptive}: \ \pi_t^e = \pi_{t-1}$$

$$\text{rational}: \ \pi_t^e = \pi_t$$

$$\pi_t - \pi^* = \frac{\pi_{t-1} - \pi^*}{(1+\beta\phi)}$$

$$\pi_t - \pi^* = \frac{(\pi_{t=0} - \pi^*)}{(1+\beta\phi)^t}$$

Phillips Curve

- **Phillips Curve**: In the Phillips Curve framework in which $\pi = E(\pi) + \beta(u^* - u)$—the inflation rate π equals the previously-expected inflation rate $E(\pi)$ plus the Phillips Curve slope parameter β times the difference between the economy's natural rate of unemployment u^* and the current rate of unemployment u... Suppose that the economy starts out with an expected rate of inflation of 2%/year, a Phillips Curve slope parameter of 1/2, and a natural rate of unemployment of 5%. Suppose that the Federal Reserve decides to reduce the rate of unemployment to 3% through expansionary monetary policy and does so. What is the inflation rate?

Ladies and Gentlemen, to Your iClickers...

- An expected rate of inflation of 2%/year, a Phillips Curve slope parameter of 1/2, and a natural rate of unemployment of 5%. Unemployment at 3%. Inflation is?

- A. 2%
- B. 3%
- C. 4%
- D. 5%
- E. 6%

Monetary Policy

- **Monetary Policy**: Suppose we have an economy with a natural rate of unemployment of 6%, current expected inflation of 2%, and a Phillips Curve slope parameter of 1/2. Suppose that the Federal Reserve has a target u^t for the unemployment rate and a target π^t for the inflation rate, and suppose that for each percentage point inflation is above its target level the Federal Reserve raises unemployment by an extra percentage point above its target level. If the target for the inflation rate is 2% and the target for the unemployment rate is 6%, what will inflation and unemployment be?

Ladies and Gentlemen, to Your iClickers...

- **Monetary Policy**: Nate of unemployment 6%, expected inflation 2%, Phillips Curve slope 1/2. MPRF slope of 1, inflation target 2%, unemployment benchmark 6%. What will inflation be?

- A. 2%
- B. 6%
- C. 4%
- D. 3%
- E. 0%

$$\pi = \frac{\pi^{e}}{(1+\beta\phi)} + \frac{\beta\phi\pi^{t}}{(1+\beta\phi)} + \frac{\beta(u^{*}-u_{0})}{(1+\beta\phi)}$$

Why Is It Important to Know How to Do This?

- Right now it isn't...
- But the economy and economic problems change over time...
- This "inflation economics" stuff was not taught in the 1960s...
- Hence the level of political debate in the 1970s was... unusually low, even for America...
- This stuff was of key importance for the 1970s, 1980s, and perhaps even the early 1990s...
- Those days may come again...

Test Your Knowledge: Inflation

- Why does the Phillips Curve slope down?
- What is the natural rate of unemployment u*?
- How many significant shifts in inflation expectations have there been in the post-WWII U.S.?
  - When did they occur?
- Why is inflation worth worrying about?
  - What are the three reasons to fear inflation?
- How can the Federal Reserve expand or contract the money stock?
  - How can the banking system as a whole expand or contract the money stock?
- Why would any central bank allow inflation, ever?
- What is hyperinflation?