• No class Thursday, March 2
• Exam 2 can be picked up from your TA after class
• Grading scale for Exam 2 posted on course web page http://econweb.ucsd.edu/~jhamilto/Econ110B.html
• Problem set 5 (will be reviewed Monday March 6) is also on web page

Outline of Chapter 18 lectures
18.1. Fiscal policy and monetary policy
18.2. Spending and deficits
18.3. The three categories of government spending
18.4. Fiscal challenges of the 21st century
18.5. The government’s long-term budget constraint
18.6. Sovereign debt crises

18.1. Fiscal policy and monetary policy
• Fiscal policy: administered by U.S. Treasury
  – Collects taxes
  – Spends money on programs
  – Borrows money if spending exceeds taxes

• Fiscal policy matters for:
  – Direct contribution to aggregate demand shock \( a \) (Chapters 12 and 13)
  – more spending increases demand, more taxes decrease demand
  – Determine total amount government borrows and owes (Chapter 18)

• Monetary policy: administered by Federal Reserve
  – Has power to create deposits with the Fed ( = credits for currency)
  – Can use this power to buy assets or make loans to banks

• Monetary policy matters for
  – Controlling interest rates and influencing aggregate demand (Chapters 12-13)
  – Controlling inflation (Chapters 8, 12, and 13)
  – Responding to financial crises (Chapter 14)
  – Determining whether debt issued by Treasury is owned by the public or owned by the Fed (Chapter 12)
18.2 Spending and deficits

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<thead>
<tr>
<th>U.S. Federal Budget, Fiscal year 2013</th>
<th>$ billions</th>
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<tbody>
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- Total federal spending as % of GDP has risen since 1960
- This has been accompanied by a decline in defense spending and increases in health and income support as % of GDP
- Combined federal, state, and local government spending is about 40% of GDP in the U.S.

- How did government spend $690 B more during FY 2013 than it took in as taxes?
  - Answer: it borrowed more money
  - At end of fiscal year 2012 federal government owed $11.6 trillion
  - At end of fiscal year 2013 federal government owed $12.3 trillion
  - Debt grew by $700 billion during FY 2013 as a result of the 2013 FY deficit

Stocks and flows

- Deficit (flow variable, measured in dollars per year)
  - Deficit measures how much more government spends each period than it collects in revenue
  - Example: government spent $700 B more than it collected during FY 2013
• Debt (stock variable, measured in dollars at a point in time)
  – The debt measures how much the government owes at a fixed point in time
  – For example, the federal government owed $11.6 T on September 30, 2012 (the end of FY 2012)
  – The federal government owed $12.3 T on September 30, 2013 (the end of FY 2013)

Flow causes change in stock
• In any year that the government runs a deficit (spending is greater than taxes), its level of debt will be higher at the end of the year than it was at the beginning of the year
• Government has run a deficit every year since 1970 except for 1998-2001
• Debt increased every year since 1970 except for 1998-2001

• It is more meaningful to express these numbers as a percent of GDP
• If deficit = 0, dollar value of debt does not change but debt as a % of GDP will fall because GDP is growing

18.3. The three categories of government spending
• Want to distinguish between
  – Purchases of goods and services
  – Transfer payments
  – Interest expense
• One reason: GDP = value of purchases of final goods and services
  – Transfer payments and interest are not a purchase of final good or service so are not part of GDP
1) Government purchases of goods and services
   • This includes items like defense spending, road construction, and judicial system
   • Is included in GDP as government purchases of goods and services

   • Will represent real value of government purchases of goods and services by G and nominal value by G^n
   • In calendar year 2014, G^n (federal + state + local) was $3.2 T = 18.2% of GDP

But there are many things government spends money on that are not part of G

Distinguish 3 different categories of government spending

2) Government transfer payments
   • This includes items like income support, social security, and most health spending by government
   • Is not counted as part of GDP
   • Instead, whatever consumers buy with those transfer payments (e.g., health services) is included in GDP as part of C

Distinguish 3 different categories of government spending

3) Government interest payments
   • At the start of 2016 the federal government owed $13,600 B
   • The average nominal interest rate on that debt was 1.8%
   • During FY 2016 the federal government needed to pay (13,600)(0.018) = $240 B in interest

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• These interest payments are not included in GDP
• Instead, only something purchased by the person receiving the interest payment would be counted as final purchase of a good or service

Summary of notation
\[ G^n_t = \text{nominal govt purchases of goods and services} \]
\[ TR^n_t = \text{nominal govt transfer payments} \]
\[ T^n_t = \text{total nominal taxes collected} \]
\[ Y^n_t = \text{nominal GDP} \]

Components of real GDP:
\[ Y_t = C_t + I_t + G_t + EX_t - IM_t \]
\(G_t\) does not include transfers and interest.

Components of nominal GDP:
\[ Y^n_t = C^n_t + I^n_t + G^n_t + EX^n_t - IM^n_t \]
\(G^n_t\) does not include transfers and interest.

Recall that we can write this as
\[ Y - C - G + (IM - EX) = I \]
\[ (Y + TR + INT - T - C) + (T - G - TR - INT) + (IM - EX) = I \]
(private saving) + (government saving) + (foreign saving) = I

• Says that if government saving goes down with no change in private saving or foreign saving, investment must go down

![FIGURE 12.5](chart.png)

U.S. Investment and the Budget Deficit

- Percentage of GDP
- Investment
- Government saving

Percentage of GDP

- 15
- 10
- 5
- 0
- -5
- -10
- -15

Year

nominal govt surplus (= deficit if negative) = $T_i^n - G_i^n - TR^n_i$ – interest payments surplus or deficit does include transfers and interest.

Fiscal challenges of the 21st century

(1) Aging population means
   – Fewer people working and paying taxes
   – Increased cost for Social Security and health care

(2) Health care costs are also going up for everybody

Other advanced countries in similar situation

- More spending on health care not necessarily a bad thing
- As people become richer, longer lives is what they want to spend money on
18.5. The government’s long-run budget constraint

- How much you pay in interest each year depends on (1) how much you owe and (2) what the interest rate is
- If you owe $100 and interest rate is 2%, your interest bill is \((0.02)(100) = $2\)
- If you owe $150 and interest rate is 2%, your interest bill is \((0.02)(150) = $3\)
- If you owe $100 and interest rate is 3%, your interest bill is \((0.03)(100) = $3\)

\[ i_t = \text{average nominal interest rate on outstanding government debt} \]
\[ B^n_t = \text{outstanding nominal govt debt at start of period} \]
\[ i_t B^n_t = \text{nominal govt interest payments} \]

For example, with a 2% interest rate and $100 in debt,
\[ i_t = 0.02 \]
\[ B^n_t = 100 \]
then by end of year we’ll have to pay $2 in interest.

- How much the U.S. government pays in interest each year depends on (1) government debt and (2) average interest rate on that debt
- In 2016 the government owed $13,600 B at an average interest rate of 1.8\%T, so paid \((13,600)(0.018) = $240 B\) in interest
- If government debt was bigger or the interest rate was higher, the interest cost would be higher

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<td>13.5%</td>
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\[ \text{Evolution of govt debt:} \]
\[ B^n_{t+1} = B^n_t + G^n_t + TR^n_t + i_t B^n_t - T^n_t \]

Example: if \( G^n_t + TR^n_t = T^n_t \),
then \( B^n_{t+1} = (1 + i_t) B^n_t \).

If govt only collects enough revenue \( T^n_t \) to cover current programs \( (G^n_t + TR^n_t) \),
then next year it will still owe what it started with \( (B^n_t) \) plus interest \( (i_t B^n_t) \).
Define $S^n_i = T^n_i - G^n_i - TR^n_i$
= nominal primary surplus
(goov surplus excluding interest costs)

$B^{n}_{t+1} = (1 + i_t)B^n_t - S^n_t$

What happens to debt as a % of GDP?

$B^{n}_{t+1} = (1 + i_t)B^n_t - S^n_t$

Divide both sides by $Y^n_t$

$b^{n}_{t+1} = (1 + i_t)(B^n_t/Y^n_t) - (S^n_t/Y^n_t)$

$S^n_t = Y^n_t - G^n_t - TR^n_t$
= nominal primary surplus

$B^{n}_{t+1}/Y^n_t = (1 + i_t)(Y^n_{t-1}/Y^n_t)(B^n_t/Y^n_{t-1}) - (S^n_t/Y^n_t)$

Let $g^n_t = $ growth rate of nominal GDP
during year $t$

$Y^n_t/Y^n_{t-1} = (1 + g^n_t)$

E.g., if $Y^n_t$ is 2% bigger than $Y^n_{t-1}$,
then $g^n_t = 0.02$.

$b^{n}_{t+1} = \frac{(1+i_t)}{(1+g^n_t)}b^n_t - s^n_t$

$S^n_t = \frac{b^{n}_{t+1}}{(1+i_t)} - s^n_t$

$Y^n_t/Y^n_{t-1}$
= debt at end of year $t$ as percent of
year $t$ GDP

$s^n_t = S^n_t/Y^n_t$
= primary surplus in year $t$ (deficit if negative) as percent of year $t$ GDP

$b^{n}_{t+1} = (1 + i_t)(Y^n_{t-1}/Y^n_t)b^n_t - s^n_t$

Conclusion: the debt-to-GDP ratio
at the end of year $t$ (denoted $b^{n}_{t+1}$)
depends on the primary surplus as
a percent of GDP in year $t$ (denoted $s^n_t$),
the average nominal interest rate on
outstanding govt debt (denoted $i_t$) and the
nominal growth rate of GDP during year
$g^n_t$.

Example:
Suppose $s^n_t = 0$ (taxes just sufficient to cover
all spending other than interest expense)
and $i_t = g^n_t$ (nominal interest rate equals
nominal growth rate)
then $B^{n}_{t+1}$ will have growth from $B^n_t$ by $1+i_t$.
But if nominal GDP also grew by the same
amount ($i_t = g^n_t$), then the debt-to-GDP
ratio will be unchanged.
Historically U.S. nominal interest rate was close to GDP growth

- If nominal interest rate equals growth rate, then keeping debt/GDP constant requires primary surplus $= 0$.
- This means a government deficit equal to net interest payments ($240 \text{ B currently}$) could keep debt/GDP stable.
- Actual deficit for 2016 was $590 \text{ B}$.
- Conclusion: the ratio of debt to GDP likely went up during 2016

Debt-to-GDP at start of 2016 $= 76\%$
Debt-to-GDP at end of 2016 $= 77\%$
Debt-to-GDP would have risen even faster if interest rates were not so low

The CBO says under current law, deficits are big enough that debt will grow relative to GDP

And the CBO expects interest rates to rise gradually

The two together explain why CBO is expecting interest expense to be an ever-growing part of budget

Equal to total defense spending by 2027