# FISCAL AND MONETARY INTERACTIONS

CHAPTER 16

OUTLINE

❑   In the news: *providing some real context for motivation for the topic.*

❑   Discussion on monetary policy and fiscal policy:

  ❑   *The two were discussed independently Lectures 1 and 3. Now, we will discuss them together since they are bound by the government's budget constraint. These two policies are governed by different authorities.*

❑   Monetary authority budget constraint & fiscal authority budget constraint: *Examining each budget constraint individually.*

❑   Consolidated government budget: *Merging the two individual constraints into one (government budget)*

❑   Active vs. passive policy: *which authority takes lead (or follows)*

❑   Fiscal and monetary interactions present-value analysis:

  ❑   *How current debt can be repaid by future fiscal & monetary revenues.*

❑   Ricardian vs. non-Ricardian policy: *Discussion on whether fiscal authority chooses to ensure the balance of government budget constraints or not.*

❑   Fiscal theory of inflation (FTI)

❑   Fiscal theory of the price level (FTPL)

❑   Monetary-fiscal interactions

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In the news

IN THE NEWS

Changes implemented to pre-2014 U.S. fiscal plans

2014   2015   2016
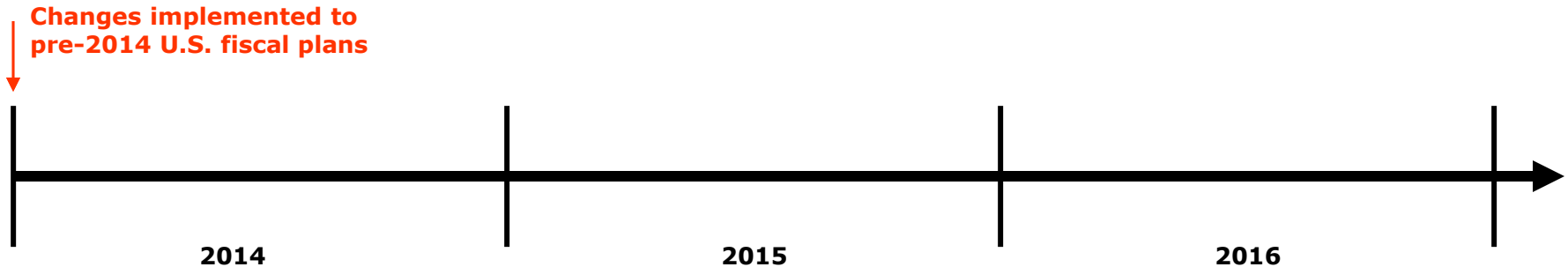
❑   Suppose new fiscal plans are "proposed" for 2014 and beyond

❑Planned expenditures g_{2014}, g_{2015}, g_{2016}, …

❑Planned tax collections T_{2014}, T_{2015}, T_{2016}, …

IN THE NEWS

❑ …

> ❑ Representative Paul Ryan's budget proposal
> ❑ Cut federal government deficits within next decade
> ❑ Lots of government spending cuts

❑ Are the monetary plans and fiscal "plans" consistent with each other?

> ❑ i.e., do they satisfy the consolidated government budget constraint?

Discussion on
MONETARY POLICY AND
FISCAL POLICY

MONETARY POLICY AND FISCAL POLICY

❑ Chapter 7: studied fiscal policy in isolation from monetary policy

   ❑ Illustrated some core issues of fiscal policy (i.e., lifetime budget constraint of government, Ricardian Equivalence)

❑ Chapter 15: studied monetary policy in isolation from fiscal policy

   ❑ Illustrated some core issues of monetary policy (i.e., neutrality debate, long-run monetarist link between money growth and inflation)

MONETARY POLICY AND FISCAL POLICY

❑ Monetary policy and fiscal policy interact with each other

    ❑ Conduct of one places <u>*restrictions*</u> on what the other can achieve

❑ Different classes of "interactions" between fiscal and monetary policy

❑ Policy coordination (explicit or implicit)

    ❑ Fed and Treasury coordination of policy actions amidst crisis

    ❑ European coordination(?) on sovereign debt crises

MONETARY POLICY AND FISCAL POLICY

❑ Political pressures on central banks

❑ Budget constraint effects (aka balance sheet effects)

  ❑ Central bank balance sheet ultimately under the control of the legislative body because legislative body charters the central bank

  ❑ Macroeconomic analysis has the most to say about this type of fiscal-monetary interaction

MONETARY POLICY AND FISCAL POLICY

❑ Chapter 16: Interactions between fiscal and monetary policy

    ❑ Focus on dynamic unfolding of events

    ❑ Main idea: budget constraints/balance sheets of one policy authority affect the other policy authority

❑ Representative consumer will be "in the background," not the focus, of analysis in Chapter 16

    ❑ No explicit utility maximization problems, etc.

    ❑ But we know where optimal choices of c_t and M_t/P_t etc. come from…

    ❑ Focus just on government actions

MONETARY POLICY AND FISCAL POLICY

- ❑ Two distinct "sides" of the government
  - ❑ Fiscal authority – i.e., Congress/Treasury
    - ❑ Controls government spending g_t
    - ❑ Collects taxes T_t
    - ❑ Issues (sells) new bonds (for various financing needs)
    - ❑ Receives "profits" from central bank (because it legally charters C.B.)
  - ❑ Monetary authority (aka central bank) – i.e., Federal Reserve, ECB
    - ❑ Controls money supply of economy…
    - ❑ …by engaging in open-market operations
    - ❑ Turns over any "profits" it earns to fiscal authority

Balance sheet linkage between fiscal and monetary policy

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MONETARY AUTHORITY BUDGET CONSTRAINT
&
FISCAL AUTHORITY BUDGET CONSTRAINT

FISCAL AUTHORITY

❑ Fiscal authority budget constraint in period *t*

$$P_t g_t + B^T_{t-1} = T_t + P^b_t B^T_t + RBC_t$$

$\underbrace{\phantom{P_t g_t + B^T_{t-1}}}$
Total outlays in period *t*

$\underbrace{}$
Total inflows in period *t*

❑ B^T_t: The TOTAL amount of (one-period) bonds (each with *FV* = 1) Congress <u>sells</u> in period *t*, each of which has price P^b_t

❑ B^T_{t-1}: the TOTAL amount of (one-period) bonds (each with *FV* = 1) that Congress must <u>repay</u> in period *t*

❑ RCB_t: <u>r</u>eceipts (profits) turned over from the <u>c</u>entral <u>b</u>ank to the fiscal authority in period *t*
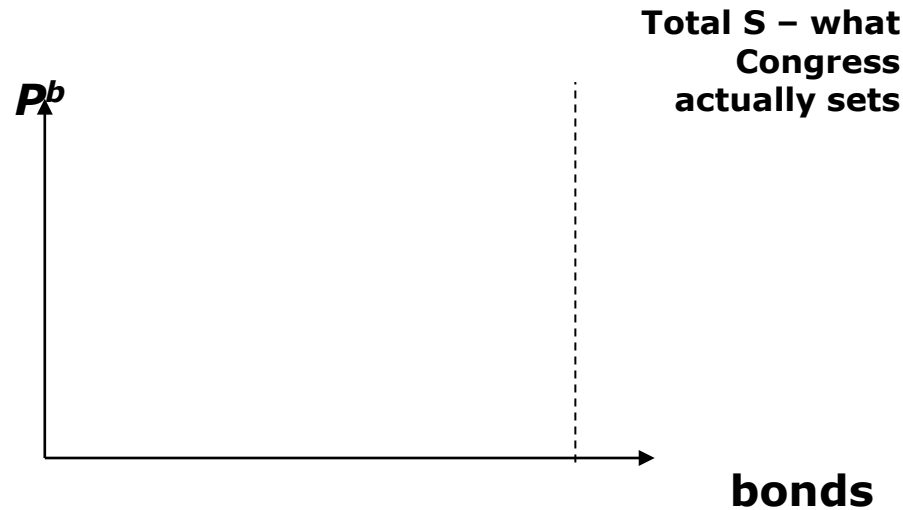
FISCAL AUTHORITY

❑ Fiscal authority budget constraint in period $t+1$

$$\underbrace{P_{t+1}g_{t+1} + B_t^T}_{\text{Total outlays in period } t+1} = \underbrace{T_{t+1} + P_{t+1}^b B_{t+1}^T + RBC_{t+1}}_{\text{Total inflows in period } t+1}$$

Total outlays in period *t+1*

Total inflows in period *t+1*

❑ And so on for $t+2$, $t+3$, etc.

FISCAL AUTHORITY

❑ The amount of bonds set by the congress is fixed: Some are bought by the public, some by the central banks

Total S – what Congress actually sets

P^b

bonds

OPEN MARKET FOR BONDS

MONETARY AUTHORITY

❑ Monetary authority budget constraint in period t

$$B_t^M + bonds\ bought\ by\ public = B_t^T$$

$$\underbrace{P_t^b B_t^M + RCB_t}_{\text{Total outlays in period } t} = \underbrace{B_{t-1}^M + M_t - M_{t-1}}_{\text{Total inflows in period } t}$$

❑ B_t^M: the amount of (one-period) bonds (each with $FV = 1$) Fed _buys on open market_ in period t, each of which has price P_t^b

❑ B_{t-1}^M: the payoffs of (one-period) bonds (each with $FV = 1$) that Fed _receives_ in period t

MONETARY AUTHORITY

❑   …

    ❑ RCB_t: profits turned over by the central bank to the fiscal authority in period t

    ❑ $M_t - M_{t-1}$: the <u>*change*</u> in the money supply engineered by the central bank during the course of period t

❑   Monetary authority budget constraint in period t+1

$$P_{t+1}^b B_{t+1}^M + RCB_{t+1} = B_t^M + M_{t+1} - M_t$$

❑   And so on for period t+2, t+3, etc.

MONETARY POLICY AND FISCAL POLICY

❑ Until late 2007, ≈ 100% of Fed's assets were Treasury securities (light blue)

❑ During 2007-2009, fell to ≈ 25% of Fed's assets….

❑ …as other (perhaps riskier…) assets were purchased

❑ Since then has grown to ≈ 50% in 2013
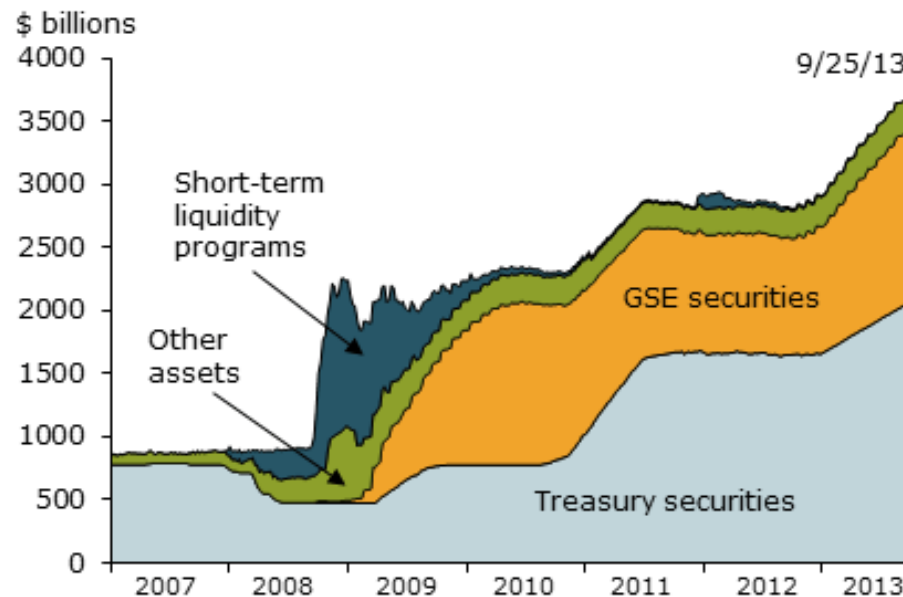
(obtained from Federal Reserve Bank of San Francisco)

CONSOLIDATED GOVERNMENT BUDGET

CONSOLIDATED GOVERNMENT BUDGET

$$P_t^b B_t^M + RCB_t = B_{t-1}^M + M_t - M_{t-1} \qquad P_t g_t + B_{t-1}^T = T_t + P_t^b B_t^T + RCB_t$$

$$RCB_t - B_{t-1}^M = M_t - M_{t-1} - P_t^b B_t^M \qquad P_t g_t + B_{t-1}^T - RCB_t = T_t + P_t^b B_t^T$$

$$+ \quad RCB_t - B_{t-1}^M = M_t - M_{t-1} - P_t^b B_t^M$$

$$P_t g_t + B_{t-1}^T - RCB_t = T_t + P_t^b B_t^T$$

$$\overline{P_t g_t + B_{t-1}^T - B_{t-1}^M = M_t - M_{t-1} - P_t^b B_t^M + T_t + P_t^b B_t^T}$$

$$\boxed{P_t g_t + B_{t-1}^T - B_{t-1}^M = T_t + P_t^b (B_t^T - B_t^M) + M_t - M_{t-1}}$$

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CONSOLIDATED GOVERNMENT BUDGET

❑ Can view two sides of the government as one consolidated entity

$$P_t^b B_t^M + RCB_t = B_{t-1}^M + M_t - M_{t-1} \qquad P_t g_t + B_{t-1}^T = T_t + P_t^b B_t^T + RCB_t$$

Combine by eliminating RCB_t

$$P_t g_t + B_{t-1}^T - B_{t-1}^M = T_t + P_t^b (B_t^T - B_t^M) + M_t - M_{t-1}$$

❑ B^T is the total quantity of fiscally-issued bonds…

❑ …of which B^M is purchased by the central bank on the open market

❑ → B^T – B^M is total quantity of fiscally-issued bonds held by the private sector (i.e., consumers, mutual funds, domestic investors, foreign investors, etc.) – the quantity available on the open market

Back to outline

CONSOLIDATED GOVERNMENT BUDGET

❑ Define $B = B^T - B^M$ as bonds held by the **private sector**

    ❑ What really matters for policy actions and interactions

    ❑ Consolidated government budget constraint (GBC)

$$P_t g_t + B_{t-1} = T_t + P_t^b B_t + M_t - M_{t-1}$$

Congress

Private sector

Monetary authority

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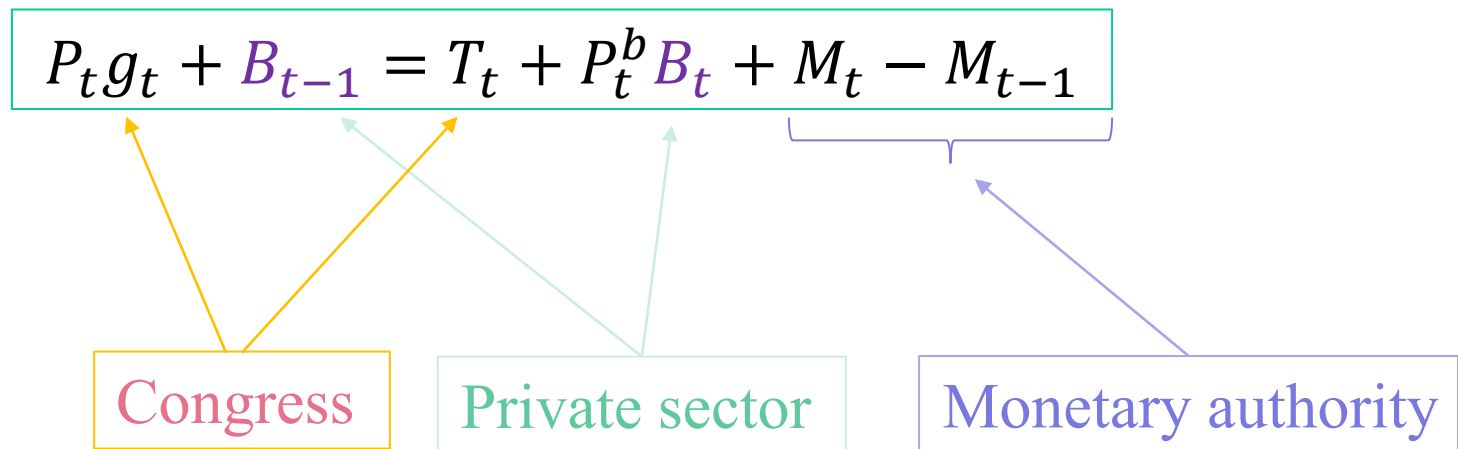
CONSOLIDATED GOVERNMENT BUDGET

❑ Consolidated government budget constraint highlights the short-run limits that fiscal policy places on monetary policy and vice-versa

$$P_t g_t + B_{t-1} = T_t + P_t^b B_t + M_t - M_{t-1}$$

❑ All analysis from the perspective of the very beginning of period t

❑ Fiscal policy in period t is a particular setting for all three of its instruments (g_t, T_t, B_t)

  ❑ Fiscal policy has three instruments (aka policy tools)

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CONSOLIDATED GOVERNMENT BUDGET

❑ Monetary policy in period *t* is a particular setting for all one of its instruments (M_t)

  ❑ Monetary policy has one instrument (aka policy tool)

❑ (A policy is defined by unique settings for each available instrument)

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Active vs. Passive policy

ACTIVE VS. PASSIVE POLICY

❑ Definition: A policy authority is active if *every instrument* at its disposal can be completely freely chosen, without any concern for the consolidated government budget constraint

   ❑ Active authority does not engage in policy in such a way as to make sure the consolidated government budget balances

ACTIVE VS. PASSIVE POLICY

❑ Definition: A policy authority is passive if <u>*not every instrument*</u> at its disposal can be completely freely chosen, without any concern for the consolidated government budget constraint

  ❑ Passive authority must engage in policy in such a way as to make sure the consolidated gov. budget balances

$$P_t g_t + B_{t-1} = T_t + P_t^b B_t + M_t - M_{t-1}$$

❑ At beginning of period t, B_{t-1} and M_{t-1} are fixed (assume no default)

  i.e., how will *equality* of the consolidated budget be achieved?

❑ Fiscal authority sets g_t, B_t, and T_t

❑ Monetary authority sets M_t

Question: How will "consistency" between them be guaranteed?

ACTIVE FISCAL/PASSIVE MONETARY POLICY

- ❑ Suppose fiscal authority sets all of its policy instruments (all *three* of them) with no concern for the consolidated GBC
  - ❑ Fiscal authority is active

- ❑ Monetary authority must *react* by setting M_t to ensure the consolidated GBC holds
  - ❑ Monetary authority is passive

ACTIVE FISCAL/PASSIVE MONETARY POLICY

❑ Game-theoretic undertones

   ❑ Fiscal authority is the "dominant" policy-maker

   ❑ Fiscal authority is the "leader"

   ❑ Monetary authority is the "lagging" policy-maker

   ❑ Monetary authority is the "follower"

❑ Policy pressure (by fiscal authority on monetary authority) is implicit and (largely…) through market forces

   ❑ Situations facing the Federal Reserve? The ECB?

   ❑ And in developing countries?...

ACTIVE MONETARY/PASSIVE FISCAL POLICY

❑ Suppose monetary authority sets all of its policy instruments (all *one* of them) with no concern for the consolidated GBC

    ❑ Monetary authority is active

❑ Fiscal authority must *react* by setting at least one of (g_t, T_t, B_t) to ensure the consolidated GBC holds

    ❑ Fiscal authority is passive…

    ❑ …because it cannot set *all three* of its instruments freely

ACTIVE MONETARY/PASSIVE FISCAL POLICY

❑ Game-theoretic undertones

    ❑ Monetary authority is the "dominant" policy-maker

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Back to outline

ACTIVE VS. PASSIVE POLICY

❑ Which regime describes the U.S.? The euro area?

  ❑ Matter of a lot of debate

  ❑ Maybe there's "regime switching" – i.e., each authority "takes turns" being the follower and the leader

    ❑ Through the rise and fall of political power?

    ❑ Through the ascendancy of strong central bankers?

❑ Game theory a compelling way to study monetary-fiscal interactions (more advanced course)

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Fiscal and Monetary Interactions: Present-Value Analysis

CONSOLIDATED GOVERNMENT BUDGET

❑ Core issue: there are *limits* or *restrictions* that each policy-setting authority places on the actions of the other

❑ Analysis so far: the period-*t* choices of one policy authority restrict choices of other policy authority *in period t* (i.e., in short run)

$$P_t g_t + B_{t-1} = T_t + P_t^b B_t + M_t - M_{t-1}$$

Period-t consolidated GBC

Back to outline

CONSOLIDATED GOVERNMENT BUDGET

❑ A more realistic view: the period-t choices of one policy authority may restrict the choices of the other policy authority in period t and/or period $t+1$ and/or period $t+2$ and/or period $t+3$, …

❑ Emphasizes that the limits may not be realized immediately, but can occur later (in the economy's/government's lifetime)

❑ Requires analyzing the present discounted value (PDV) version of the consolidated GBC (aka lifetime consolidated GBC)

SEIGNORAGE REVENUE

$$P_t g_t + B_{t-1} = T_t + P_t^b B_t + M_t - M_{t-1}$$

Period-*t* consolidated GBC

Divide by P_t to put in real terms

$$g_t + \frac{B_{t-1}}{P_t} = \frac{T_t}{P_t} + \frac{P_t^b B_t}{P_t} + \underbrace{\frac{M_t - M_{t-1}}{P_t}}_{sr_t}$$

❑ <u>Definition</u>: seignorage revenue is the real quantity of resources the government raises for itself through the act of money creation

    ❑ Abbreviate sr_t

SEIGNORAGE REVENUE

❑ Printing money is a source of income for the government!

❑ Unimportant in the U.S. (about 1% of government revenue, but has been rising….) and other developed countries

❑ But can be important in developing countries (because of poorly-developed tax collection systems and corruption)

❑ Plays an important role in how fiscal-monetary interactions affect exchange rate systems (Chapter 31)

DERIVING THE LIFETIME CONSOLIDATED GBC

$$P_t g_t + B_{t-1} = T_t + P_t^b B_t + M_t - M_{t-1}$$

Divide by P_t to put in real terms

$$g_t + \frac{B_{t-1}}{P_t} = \frac{T_t}{P_t} + \frac{P_t^b B_t}{P_t} + sr_t$$

<u>REAL</u> *value of government debt that must be repaid at start of period t*

Define $b_t = \frac{B_t}{P_t}$, $t_t = \frac{T_t}{P_t}$, and rearrange terms

$$\frac{B_{t-1}}{P_t} = sr_t + (t_t - g_t + P_t^b b_t)$$

Period-*t* consolidated GBC

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.   *Back to outline*

DERIVING THE LIFETIME CONSOLIDATED GBC

$$\frac{B_{t-1}}{P_t} = sr_t + (t_t - g_t + P_t^b b_t)$$

Period-*t* consolidated GBC

Revenue generated by monetary authority actions

Revenue generated by fiscal authority actions

$$\frac{B_t}{P_{t+1}} = sr_{t+1} + \left(t_{t+1} - g_{t+1} + P_{t+1}^b b_{t+1}\right)$$

Period-t+1 consolidated GBC (same thing, just update subscripts)

$$\frac{B_t}{P_t} \cdot \frac{P_t}{P_{t+1}} = \frac{b_t}{1 + \pi_{t+1}} = sr_{t+1} + \left(t_{t+1} - g_{t+1} + P_{t+1}^b b_{t+1}\right)$$

$$b_t = sr_{t+1}(1 + \pi_{t+1}) + \left(t_{t+1} - g_{t+1} + P_{t+1}^b b_{t+1}\right)(1 + \pi_{t+1}) \quad (\star)$$

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Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.   *Back to outline*

DERIVING THE LIFETIME CONSOLIDATED GBC

$$\frac{B_{t-1}}{P_t} = sr_t + (t_t - g_t + \frac{1}{1+i_t}\boldsymbol{b_t})$$

$$\because P_t^b = \frac{1}{1+i_t}$$

Sub b_t into the above expression:

$$\frac{B_{t-1}}{P_t} = sr_t + (t_t - g_t + \frac{[sr_{t+1}(\boldsymbol{1+\pi_{t+1}}) + (t_{t+1} - g_{t+1} + P_{t+1}^b b_{t+1})(\boldsymbol{1+\pi_{t+1}})]}{1+i_t})$$

Factorizing $(1+\pi_{t+1})$:

$$= sr_t + (t_t - g_t + \frac{1+\pi_{t+1}}{1+i_t}[sr_{t+1} + (t_{t+1} - g_{t+1} + P_{t+1}^b b_{t+1})])$$

Fisher equation

$$= sr_t + (t_t - g_t) + \frac{1}{1+r_t}[sr_{t+1} + (t_{t+1} - g_{t+1} + P_{t+1}^b b_{t+1})]$$

Total Revenue without considering bond issuance in period t

Total Revenue in period t+1

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students. *Back to outline*

DERIVING THE LIFETIME CONSOLIDATED GBC

$$= sr_t + (t_t - g_t + \frac{1}{1+r_t} [sr_{t+1} + (t_{t+1} - g_{t+1} + P^b_{t+1} b_{t+1})])$$

$$= sr_t + \frac{sr_{t+1}}{1+r_t} + (t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{1+r_t} + \frac{P^b_{t+1} b_{t+1}}{1+r_t} \quad (\star\star)$$

- Following $(\star)$, we can just increase the time index by 1 to get b_{t+1}:

$$b_{t+1} = sr_{t+2}(1 + \pi_{t+2}) + (t_{t+2} - g_{t+2} + P^b_{t+2} b_{t+2})(1 + \pi_{t+2})$$

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.

DERIVING THE LIFETIME CONSOLIDATED GBC

▪ Substitute

$$b_{t+1} = sr_{t+2}(1 + \pi_{t+2}) + \left(t_{t+2} - g_{t+2} + P^b_{t+2}b_{t+2}\right)(1 + \pi_{t+2})$$

into (⋆⋆), we have:

$$\frac{B_{t-1}}{P_t} = sr_t + \frac{sr_{t+1}}{1 + r_t} + (t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{1 + r_t}$$

$$+ \frac{P^b_{t+1}[sr_{t+2}(1 + \pi_{t+2}) + \left(t_{t+2} - g_{t+2} + P^b_{t+2}b_{t+2}\right)(1 + \pi_{t+2})\,]}{1 + r_t}$$

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Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.   *Back to outline*

DERIVING THE LIFETIME CONSOLIDATED GBC

Factorizing $(1 + \pi_{t+2})$:

$$\frac{B_{t-1}}{P_t} = sr_t + \frac{sr_{t+1}}{1 + r_t} + (t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{1 + r_t}$$

$$+ \frac{P^b_{t+1}(1 + \pi_{t+2})[sr_{t+2} + (t_{t+2} - g_{t+2} + P^b_{t+2}b_{t+2})]}{1 + r_t}$$

We have: $P^b_{t+1}(1 + \pi_{t+2}) = \frac{1+\pi_{t+2}}{1+i_{t+1}} = \frac{1}{1+r_{t+1}}$

$$= sr_t + \frac{sr_{t+1}}{1 + r_t} + (t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{1 + r_t}$$

$$+ \frac{sr_{t+2} + (t_{t+2} - g_{t+2} + P^b_{t+2}b_{t+2})]}{(1 + r_t)(1 + r_{t+1})}$$

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students. *Back to outline*

DERIVING THE LIFETIME CONSOLIDATED GBC

Arranging terms of the same kinds together:

$$= sr_t + \frac{sr_{t+1}}{1+r_t} + \frac{sr_{t+2}}{(1+r_t)(1+r_{t+1})}$$

$$+(t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{1+r_t} + \frac{t_{t+2} - g_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{P_{t+2}^b b_{t+2}}{(1+r_t)(1+r_{t+1})}$$

▪ Following ($\star$), find b_{t+2} again and sub. it to the expression above to get:

$$= sr_t + \frac{sr_{t+1}}{1+r_t} + \frac{sr_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{sr_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})}$$

$$+(t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{1+r_t} + \frac{t_{t+2} - g_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{t_{t+3} - g_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})}$$

$$+ \frac{P_{t+3}^b b_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})}$$

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.

DERIVING THE LIFETIME CONSOLIDATED GBC

- Keep on doing the same process, we can expand the expression by substituting $b_{t+3}, b_{t+4}, b_{t+5}, b_{t+6}, \ldots$ and you can see a pattern.
  - b_{t+1} is inside b_t, b_{t+2} is inside b_{t+1}, b_{t+3} is inside b_{t+2}, and so on… b_{t+n+1} is inside b_{t+n},

$$\frac{B_{t-1}}{P_t} = sr_t + \frac{sr_{t+1}}{1+r_t} + \frac{sr_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{sr_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})} \ldots$$

$$+ (t_t - g_t) + \frac{t_{t+1}-g_{t+1}}{1+r_t} + \frac{t_{t+2}-g_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{t_{t+3}-g_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})} \ldots$$

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.

DERIVING THE LIFETIME CONSOLIDATED GBC

$$\frac{B_{t-1}}{P_t} = sr_t + \frac{sr_{t+1}}{1 + r_t} + \frac{sr_{t+2}}{(1 + r_t)(1 + r_{t+1})} + \frac{sr_{t+3}}{(1 + r_t)(1 + r_{t+1})(1 + r_{t+2})} \dots$$

$$+ (t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{1 + r_t} + \frac{t_{t+2} - g_{t+2}}{(1 + r_t)(1 + r_{t+1})} + \frac{t_{t+3} - g_{t+3}}{(1 + r_t)(1 + r_{t+1})(1 + r_{t+2})} \dots$$

- *Using math notation:* $\exp_0 \cdot \exp_1 \cdot \exp_2 \cdot \dots \cdot \exp_n = \prod_{s=0}^{n} \exp_s$

$$\frac{B_{t-1}}{P_t} = sr_t + \frac{sr_{t+1}}{\prod_{x=0}^{0}(1 + r_{t+x})} + \frac{sr_{t+2}}{\prod_{x=0}^{1}(1 + r_{t+x})} + \frac{sr_{t+3}}{\prod_{x=0}^{2}(1 + r_{t+x})} \dots$$

$$+ (t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{\prod_{x=0}^{0}(1 + r_{t+s})} + \frac{t_{t+2} - g_{t+2}}{\prod_{x=0}^{1}(1 + r_{t+x})} + \frac{t_{t+3} - g_{t+3}}{\prod_{x=0}^{2}(1 + r_{t+x})} \dots$$

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.

Back to outline

DERIVING THE LIFETIME CONSOLIDATED GBC

$$= sr_t + \frac{sr_{t+1}}{\prod_{x=0}^{0}(1 + r_{t+x})} + \frac{sr_{t+2}}{\prod_{x=0}^{1}(1 + r_{t+x})} + \frac{sr_{t+3}}{\prod_{x=0}^{2}(1 + r_{t+x})} \dots$$

$$+ (t_t - g_t) + \frac{t_{t+1} - g_{t+1}}{\prod_{x=0}^{0}(1 + r_{t+s})} + \frac{t_{t+2} - g_{t+2}}{\prod_{x=0}^{1}(1 + r_{t+x})} + \frac{t_{t+3} - g_{t+3}}{\prod_{x=0}^{2}(1 + r_{t+x})} \dots$$

$$= sr_t + \sum_{s=1}^{\infty} \frac{sr_{t+s}}{\prod_{x=1}^{s}(1 + r_{t+x-1})}$$

$$+ (t_t - g_t) + \sum_{s=1}^{\infty} \frac{t_{t+s} - g_{t+s}}{\prod_{x=1}^{s}(1 + r_{t+x-1})}$$

My expression here is slightly different from the textbook (Some expression in textbook is not correct due to typo errors)

Note that the derivation will not be tested, but it is good to know the derivation, esp. for interested students.   *Back to outline*

DERIVING THE LIFETIME CONSOLIDATED GBC

If you are not comfortable with expression involving summation and product signs, you can just write it this way. (remember to include the ellipsis "…")

$$\frac{B_{t-1}}{P_t} = sr_t + \frac{sr_{t+1}}{1+r_t} + \frac{sr_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{sr_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})} \ldots$$

$$+ (t_t - g_t) + \frac{t_{t+1}-g_{t+1}}{1+r_t} + \frac{t_{t+2}-g_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{t_{t+3}-g_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})} \ldots$$

DERIVING THE LIFETIME CONSOLIDATED GBC

- The first part $sr_t + \frac{sr_{t+1}}{1+r_t} + \frac{sr_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{sr_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})}$ ... is the total of current and future discounted seignorage revenues.

- The second part $(t_t - g_t) + \frac{t_{t+1}-g_{t+1}}{1+r_t} +$

$\frac{t_{t+2}-g_{t+2}}{(1+r_t)(1+r_{t+1})} + \frac{t_{t+3}-g_{t+3}}{(1+r_t)(1+r_{t+1})(1+r_{t+2})}$ ... is the total of current and future discounted fiscal surpluses

- *Thus, we can say that:*

$$\frac{B_{t-1}}{P_t} = sum\ of\ \text{discounted s.r.} + \text{sum of discounted fiscal surpluses}$$

LIFETIME CONSOLIDATED GBC

$$\frac{B_{t-1}}{P_t} = sr_t + \sum_{s=1}^{\infty} \frac{sr_{t+s}}{\prod_{x=1}^{s}(1+r_{t+x-1})} + (t_t - g_t) + \sum_{s=1}^{\infty} \frac{t_{t+s} - g_{t+s}}{\prod_{x=1}^{s}(1+r_{t+x-1})}$$

REAL value of government debt that must be repaid at start of period t

Present-discounted value of all seignorage revenues starting in period *t*

Present-discounted value of all fiscal surpluses starting in period *t*

- The period-*t real* value of maturing government debt must be repaid by…
  - …either period-*t and/or later* fiscal surpluses (*t – g* is real fiscal surplus in any given year – recall from Chapter 7)
  - …or year-*t and/or later* seignorage revenues…
  - …or both
  - "Or later" implies rolling over maturing debt
  - Borrowing anew to repay debt that is due

LIFETIME CONSOLIDATED GBC

❑ **The period-*t* *real* value of maturing government debt must be repaid by…**

$$\frac{B_{2013}}{P_{2014}} = (tax_{2014} - g_{2014}) + \frac{tax_{2015} - g_{2015}}{1 + r_{2014}} + \frac{tax_{2016} - g_{2016}}{(1 + r_{2014})(1 + r_{2015})} + \frac{tax_{2017} - g_{2017}}{(1 + r_{2014})(1 + r_{2015})(1 + r_{2016})} + \dots$$

$$+ sr_{2014} + \frac{sr_{2015}}{1 + r_{2014}} + \frac{sr_{2016}}{(1 + r_{2014})(1 + r_{2015})} + \frac{sr_{2017}}{(1 + r_{2014})(1 + r_{2015})(1 + r_{2016})} + \dots$$

PDV of fiscal surpluses/deficits in 2014 and beyond

PDV of seignorage revenue in 2014 and beyond

Real value of maturing government debt at start of 2014

LIFETIME CONSOLIDATED GBC

REAL value of government debt that must be repaid at start of year _t_ **=** **PDV of all current and future fiscal surpluses starting in year _t_** **+** **PDV of all current and future seignorage revenues starting in year _t_**

❑ **Key idea**: present-value consolidated GBC shows that government debt can be paid for by…

    ❑   Fiscal adjustment (a real payment…)

    ❑   Money creation policies (a nominal payment…)

❑ Money creation typically sparks inflation (Friedman effect)

    ❑   Expansion of money supply → value of each unit of money falls (i.e., price of goods rises)

RICARDIAN VS. NON-RICARDIAN POLICY

RICARDIAN VS. NON-RICARDIAN POLICY

❑ In considering dynamic (i.e., over many periods) interactions between fiscal and monetary policy, most relevant case is usually when fiscal authority is active (i.e., the "leader")

❑ Definition: A Ricardian fiscal policy is in place if the fiscal authority sets its planned *sequence* of tax and spending policy to ensure that present-value consolidated GBC is balanced

❑ Definition: A non-Ricardian fiscal policy is in place if the fiscal authority sets its planned *sequence* of tax and spending policy without regard for whether present-value consolidated GBC is balanced

RICARDIAN VS. NON-RICARDIAN POLICY

❑ Example: (Textbook end-of-chapter question 2)

  ❑ "Geithner, because of his background as president of the New York federal Reserve, implicitly advocates that no matter what fiscal policy actions the new administration takes, they should be designed in such a way as to have no effects on the conduct of monetary policy whatsoever"

  ❑ Is the above fiscal policy Ricardian or non-Ricardian?

RICARDIAN VS. NON-RICARDIAN POLICY

❑ What matters is

 ❑ The fiscal authority's entire plan for t_t, t_{t+1}, t_{t+2}, t_{t+3}, t_{t+4}, ….

 ❑ The fiscal authority's entire plan for g_t, g_{t+1}, g_{t+2}, g_{t+3}, g_{t+4}, ….

 ❑ Whether *and* when the monetary authority "reacts" to what the fiscal authority chooses

RICARDIAN CHANGES IN FISCAL POLICY

$$\frac{B_{t-1}}{P_t} = sr_t + \sum_{s=1}^{\infty} \frac{sr_{t+s}}{\prod_{x=1}^{s}(1 + r_{t+x-1})} + (t_t - g_t) + \sum_{s=1}^{\infty} \frac{t_{t+s} - g_{t+s}}{\prod_{x=1}^{s}(1 + r_{t+x-1})}$$

❑ Start of analysis:

  ❑ Fiscal authority has in place entire planned *sequence* for *t* and *g*

  ❑ Monetary authority has planned *sequence* for *sr* (i.e., money creation)

RICARDIAN CHANGES IN FISCAL POLICY

❑   Fiscal authority then changes the precise timing of *t* collection but does so in a Ricardian way

   ❑   i.e., makes sure it changes *t* collection so as to balance the present-value consolidated GBC

❑   For example:

   ❑   the original plan is $(t_t - g_t)$, $(t_{t+1} - g_{t+1})$, $(t_{t+2} - g_{t+2})$, …

   ❑   ***But now:*** $(t_t - g_t) \downarrow$ *and the subsequent* $(t_{t+1} - g_{t+1})$, $(t_{t+2} - g_{t+2})$, $(t_{t+3} - g_{t+3})$, … *change to accommodate the decrease in period t fiscal surplus.*

RICARDIAN CHANGES IN FISCAL POLICY

❑ Question: What is the impact on monetary policy (i.e., on *sr* collection)?

  ❑ NONE, because fiscal policy is being conducted in Ricardian way. That is, fiscal authority is mindful of the constraint so the monetary authority does not need to do anything to balance the GBC. You can say it is an "nice" leader.

Fiscal Theory of Inflation (FTI)

FISCAL THEORY OF INFLATION (FTI)

❑ Fiscal authority then changes the precise timing of t collection but does so in a non-Ricardian way

❑ For example:

    ❑ the original plan is $(t_t - g_t)$, $(t_{t+1} - g_{t+1})$, $(t_{t+2} - g_{t+2})$, ...

    ❑ *But now:* $(t_t - g_t) \downarrow$ *and the subsequent* $(t_{t+1} - g_{t+1})$, $(t_{t+2} - g_{t+2})$, $(t_{t+3} - g_{t+3})$, ... **remain unchanged**.

FISCAL THEORY OF INFLATION (FTI)

$$\frac{B_{t-1}}{P_t} = sr_t + \sum_{s=1}^{\infty} \frac{sr_{t+s}}{\prod_{x=1}^{s}(1+r_{t+x-1})} + (t_t - g_t) + \sum_{s=1}^{\infty} \frac{t_{t+s} - g_{t+s}}{\prod_{x=1}^{s}(1+r_{t+x-1})}$$

❑ Question: What is the impact on monetary policy (i.e., on *sr* collection)?

❑ <u>Case 1</u>:

    ❑ If monetary authority alters its plan for *sr* (i.e., money creation), it has "reacted" ("passive") to ensure present-value consolidated GBC holds

    ❑ Here, monetary authority has to help to balance the GBC.

    ❑ Money-creation leads to inflation (monetarist link of Chap 15) → Terminology "Fiscal Theory of Inflation"

Fiscal Theory of the Price Level (FTPL)

FISCAL THEORY OF THE PRICE LEVEL (FTPL)

$$\frac{B_{t-1}}{P_t} = sr_t + \sum_{s=1}^{\infty} \frac{sr_{t+s}}{\prod_{x=1}^{s}(1+r_{t+x-1})} + (t_t - g_t) + \sum_{s=1}^{\infty} \frac{t_{t+s} - g_{t+s}}{\prod_{x=1}^{s}(1+r_{t+x-1})}$$

❑ Question: What is the impact on monetary policy (i.e., on *sr* collection)?

 ❑ <u>Case 2</u>: If monetary authority does not alter its *sr* plan…

 ❑ The right hand side is now smaller, B_{t-1} does not change

 ❑ …the entire adjustment must come via a change in the period-t price level

 ❑ A one-time change in price level, not a sustained increase in prices

FISCAL THEORY OF THE PRICE LEVEL (FTPL)

❑ Question: What is the impact on monetary policy (i.e., on *sr* collection)?

❑ Case 3:

❑ If monetary only help partially… that is the plan of money creation does not generate enough seignorage revenues to balance the GBC.

❑ Fiscal pressures are relieved through both channel: changes to both ***current*** price level and the future inflation. (both FTPL and FTI at work)

FISCAL THEORY OF THE PRICE LEVEL (FTPL)

❑ In reality, division of fiscal pressure on nominal prices into current pressure versus future pressure is hard to disentangle (diff economies experience different combinations)

❑ But theory behind helps us in policy making and is useful for economy watchers.

Monetary-Fiscal Interactions

MONETARY-FISCAL INTERACTIONS

❑ Does Congress act in a way to ensure long-run budget balance?

 ❑ Sometimes seems yes…sometimes seems no…

❑ If not, then inflationary finance (FTI or FTPL) an important concern

❑ "When" would effects of inflationary finance be felt in economy?

 ❑ Timing not at all clear

MONETARY-FISCAL INTERACTIONS

❑ Why US or Japan can live with such a huge debt?

  ❑ These economies are strong

  ❑ The intertemporal consolidated GBC shows that current debts can be repaid using infinite number of future seignorage revenues and fiscal surpluses. So if the economic potentials are there, investors usually do not worry about defaulting of the government.

❑ But Greece is different:

  ❑ Was doing well before subprime mortgage crisis so 128% debt-to-gdp was overlooked

  ❑ Went into recession due to subprime mortgage crisis (2009). Investors started to demand repayments.

  ❑ Part of EU so cannot decide monetary authority (cannot print its own money to balance the GBC). OH NO!

MONETARY-FISCAL INTERACTIONS

❑ FTI: effects of inflationary finance felt as a long and sustained (though not necessarily very sharp) rise in inflation

  ❑ In period t *and/or* in future periods

❑ FTPL: effects of inflationary finance felt as a short-lived but very sharp rise in inflation

  ❑ A *one-time* (i.e., in period t) change in prices, but no further inflation in future periods

❑ Many historical episodes in developing countries
❑ Little empirical evidence for developed countries