Macroeconomics

Fiscal Policy

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Fiscal Policy

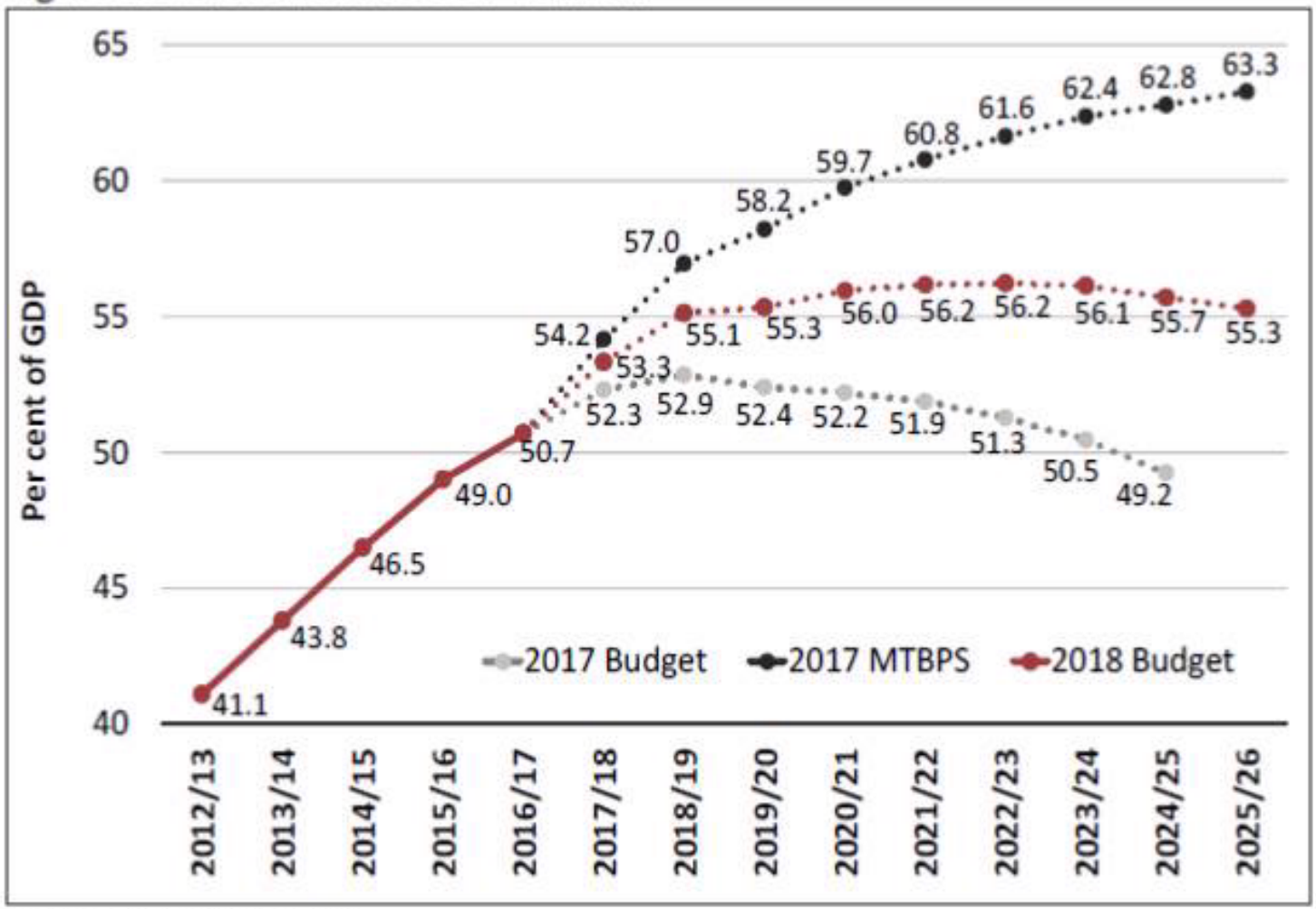
- Fiscal Policy back at the centre of policy discussions
- Theory of Fiscal Policy not well developed
  - Ricardian Equivalence (fiscal policy irrelevant) — very present in current debates
  - Old Keynesian (Static Multipliers) do not consider potential effects of expected fiscal and monetary policy response to future fiscal imbalances
- Modern macro emphasize Inter-temporal Relationships
- Monetary and Fiscal Policy are not independent as long as one affects expectations about the other

This Lecture

- Ricardian Equivalence and The Irrelevance of Fiscal Plans
- Sargent Wallace Unpleasant Monetarist Arithmetic (first example of studying intertemporal relationship between policy instruments)
- Fiscal Policy and the Current Account

Fiscal Policy in South Africa

Figure 1.1 Gross debt-to-GDP outlook



Source: National Treasury

Fiscal Policy

Intertemporal Approach

- When discussing Fiscal Policy we must start by recognizing that countries (and governments) are in for the long term
- They don't need to balance their books year-by-year:
  - they can spend in excess of tax revenue today (running up debt)
  - provided they will be able to pay back their debt in the future thanks to tax revenues in excess of spending (otherwise households will not buy government bonds)
- That's why –in order to understand Fiscal Policy –we need to be able to value streams of income that will come at some time in the future
- The Present Value of a stream of income is the value today (time t_0) of a stream of income that will flow between t_0 and some future date, say $t_0 + T$

Reminder

Valuing today goods that will be received tomorrow

Assume the economy has a technology to transfer goods from today (period$t$) to tomorrow (period $t+1$). For instance one unit of corn used as seed and planted today yields $(1+r)$ units of corn tomorrow

$$y_{t+1} = (1+r)y_t$$

Then the price of a unit of good at time $t+1$ relative to a unit of good at time t (i.e. the number of units of t good required to obtain 1 unit of $t+1$good)
[units of goods at time t] 1

$$\frac{units.of.goods.at.time.t}{units.of.goods.at.time.t+1} = \frac{1}{1+r}$$

Thus if one wants to add up the two goods at time t, the way to do it is y

$$y_t + \frac{y_{t+1}}{1+r}$$

How Does Fiscal Policy Affect Consumption?

To start thinking about Fiscal Policy it is useful to think about consumption as a function of household's wealth

$$C = C\left(Y^{Disp}, Wealth\right)$$

$$Wealth = W^{financial} + W^{housing} + PDV\left(Y^{Disp}\right)$$

Financial wealth: stocks and bonds etc.,
Housing Wealth: because they can use it as "collateral" to borrow from a bank,
human wealth, the
$PDV\left(Y^{Disp}\right)$: Present Doscounted Value of Expected Income (Net of Taxes) over a lifetime

$$PDV\left(Y^{Disp}\right) = \sum_{i=0}^{T} \frac{Y_{t+1} - T_{t+i}}{(1+r)^{i}}$$

How Does Fiscal Policy Affect Consumption?

- The dependency of consumption on wealth is useful to understand how Fiscal Policy affects consumption and thus output
- The effect of fiscal policy on the economy depends critically on how it affects expectations of future income
- To see why this is the case, we begin by considering **Intertemporal Government Budget Constraints**

Government Budget Constraint

One period government budget,

$$B_{t+1} = (1 + r) B_t + G_t - T_t \tag{1}$$

Iterating forward

$$B_{t+2} = (1 + r) B_{t+1} + G_{t+1} - T_{t+1} \tag{2}$$

which we can substitute in (1)

$$\frac{B_{t+2} - G_{t+1} + T_{t+1}}{1 + r} = (1 + r) B_t + G_t - T_t \tag{3}$$

Rearranging to separate sources of revenues and debt accumulation from expenditure, we get

$$G_t + \frac{G_{t+1}}{1 + r} = -(1 + r) B_t + T_t + \frac{T_{t+1}}{1 + r} + \frac{B_{t+2}}{1 + r} \tag{4}$$

Government Budget Constraint

Repeating the process for n periods gives:

$$\sum_{s=t}^{t+n}\left(\frac{1}{1+r}\right)^{s-t}(G_s) = -(1+r)B_t + \sum_{s=t}^{t+n}\left(\frac{1}{1+r}\right)^{s-t}(T_s) + \frac{B_{t+n}}{(1+r)^{t+n-1}} \tag{5}$$

"No Ponzi Game" Condition

$$\lim_{n=\infty}\frac{B_{t+n}}{(1+r)^{t+n-1}} = 0 \tag{6}$$

Which gives

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s) = -(1+r)B_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(T_s) \tag{7}$$

Consumer Budget Constraint

Consumer budget

$$A_{t+1} = (1 + r) A_t + Y_t - C_t - T_t \tag{8}$$

Iterating forward we have

$$A_{t+2} = (1 + r) A_{t+1} + Y_{t+1} - C_{t+1} - T_{t+1} \tag{9}$$

which gives, as before,

$$C_t + \frac{C_{t+1}}{1 + r} = (1 + r) A_t + Y_t + \frac{Y_{t+1}}{1 + r} + \frac{A_{t+2}}{1 + r} \tag{10}$$

Consumer Budget Constraint

Iterating the process forward and imposing the condition that people cannot accumulate assets indefenetely we have

$$\lim_{n=\infty} \frac{A_{t+n}}{(1+r)^{t+n-1}} = 0 \tag{11}$$

$$\sum_{s=t}^{\infty} \left(\frac{1}{1+r}\right)^{s-t} (C_s) = (1+r) A_t + \sum_{s=t}^{\infty} \left(\frac{1}{1+r}\right)^{s-t} (Y_s - T_s) \tag{12}$$

Consumer Budget Constraint

If the economy is closed and the only assets is riskless government bond, it is easy to show that government financing methods are irrelevant knowing that $A = B$:

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(C_s) = (1+r)\,A_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s) - \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(T_s) \tag{13}$$

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(C_s) = (1+r)\,A_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s) - \left[(1+r)\,B_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s)\right] \tag{14}$$

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(C_s) = \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - G_s) \tag{15}$$

Public Wealth is not part of consumer wealth - why? Present Debt is equal to future taxes

Ricardian Equivalence

- This result is known as Ricardian Equivalence from David Ricardo the British economist who first noted this in his Essay on the Funding System (1820) Ricardo studied whether it makes a difference to finance a war with the £ 20 million in current taxes or to issue government bonds with infinite maturity (consols) and annual interest payment of £ 1 million in all following years finnanced by future taxes at the assumed interest rate of 5%, Ricardo concluded that there is no difference between the two modes: 20 millions in one payment, 1 million per annum for ever, or £ 1,2 million for 45 years are all precisely of the same value
- The limits of Ricardian Equivalence
  - The horizon of households corresponds to that of the government. In other words, people think they will pay all the taxes the government will eventually have to levy, i.e. they will not leave debts (future taxes to pay) to their children to pay
  - People can freely borrow
- Useful as Benchmark - Fiscal Deficit must be corrected sometime in the future and how it is corrected determine the effect of fiscal policy on the economy

Debt Monetization : Sargent-Wallace Unpleasant Monetarist Arithmetic

- The main objective of the paper was to show that, even in a pure monetarist framework, unbounded fiscal policy produces negative spillover effects on monetary policy, and ultimately it can undermine the ability of monetary policy to control inflation.
- This conclusion largely based on the "assumption" that permanent budget deficits must be monetized.
- Not surprisingly, with an exogenous stream of budget deficits, there is only one integral of money creation that is consistent with long run equilibrium, and the only choice in the hand of the monetary authority isthe time profile of money creation.
- Very Simple Model

Debt Monetization : Sargent-Wallace Unpleasant Monetarist Arithmetic

Very Simple Model

Quantity Theory of Money

$$P_t = \frac{1}{k} M_t$$

Government Budget Constraintfi..

$$D_{t+1} = (1 + r_t) D_t + (G_t - T_t) - \frac{M_{t+1} - M_t}{P_t}$$

...in term of Growth Rate of Money

$$\frac{M_{t+1} - M_t}{P_t} = \frac{M_{t+1} - M_t}{M_t} \frac{M_t}{P_t} = \mu_t \frac{M_t}{P_t}$$

$$D_{t+1} = (1 + r_t) D_t + (G_t - T_t) - \mu_t \frac{M_t}{P_t}$$

Debt Monetization : Sargent-Wallace Unpleasant Monetarist Arithmetic

Integrating Forwards

$$D_t + \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} (G_s - T_s) = \frac{M_t}{P_t} \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} (\mu_s)$$

that, given a constant level of budget deficits and the constant real interest rate , can be rewritten as :

$$D_t + \frac{1+r}{r} (G - T) = \frac{M_t}{P_t} \sum_{s=t}^{\infty} \left(\frac{1}{1+r} \right)^{s-t} (\mu_s)$$

The Choice of the Central Bank: choose the time profile of money growth

Debt Monetization : Sargent-Wallace Unpleasant Monetarist Arithmetic

- "Without help from the fiscal authorities, fighting current inflation with tight monetary policy must eventually lead to higher future inflation".
- The introduction of rational expectations has the effect of anticipating the inflationary pressure at time zero, then eliminating even the possibility to choose the desired time profile of inflation consistent with long run solvency of the public sector
- Highly influential Results
- Fiscal Criteria born from this analysis
- The policy conflict between fiscal and monetary policy can be resolved simply assigning policy leadership to the Central Bank.

Intertemporal Approach to Current Account and Fiscal Policy

Basic Current Account Relation:

$$CA = (S - I) + (T - G)$$

Reasons for Current Account Deficit:

- High consumption: perhaps temporary fall in output.
- High Investment - sustainable if produces higher income in the future
- High government spending (or fall in taxes) - twin deficit hypothesis

Private Sector's Intertemporal Choices Determine $(S - I)$
Government Intertemporal Choices Determine $(T - G)$
Expectations of future events play an important role

A Two Periods Model

- Assumptions
  - Two periods, Small Open Economy - World Ends after period T
  - Income is "Manna from Heaven"
  - Consumer can Borrow or Lend in International Capital Market
  - Consumer Not Permitted to Die in Debt
  - Interest rate and Subjective Discount Rate Constants
  - Representative Agent (one person per country)
  - No Uncertainty

A Two Periods Model

Consumer Problem

$$\max U(C_{1,}C_2) = u(C_1) + \beta u(C_2)$$

subjected to the following budget constraint

$$\begin{aligned} C_1 &= Y_1 - S_1 \\ C_2 &= Y_2 + (1+r)S_1 \end{aligned}$$

which reduces to the following:

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$

Solution Using Lagrange Multiplier

$$L(C_1, C_2, \lambda) = u(C_1) + \beta u(C_2) + \lambda \left[Y_1 + \frac{Y_2}{1+r} - C_1 - \frac{C_2}{1+r} \right]$$

First Order Conditions:

$$\begin{aligned}
\frac{\partial L}{\partial C_1} &= u'(C_1) - \lambda = 0 \\
\frac{\partial L}{\partial C_2} &= \beta u'(C_2) - \frac{\lambda}{1+r} = 0 \\
\frac{\partial L}{\partial C_2} &= Y_1 + \frac{Y_2}{1+r} - C_1 - \frac{C_2}{1+r} = 0
\end{aligned}$$

From which

$$\frac{\frac{\partial L}{\partial C_1}}{\frac{\partial L}{\partial C_2}} = \frac{u'(C_1)}{\beta u'(C_2)} = \frac{\lambda}{\frac{\lambda}{1+r}}$$

$$\frac{u'(C_1)}{u'(C_2)} = \beta(1+r)$$

First Implications of the model

Assuming $u' > 0$ and $u'' < 0$, this result implies:

- if r increases, $u'(C_1)$ must increase relative to $u'(C_2)$ - C_1 must fall relative to C_2
- An increase in impatience, a reduction in β , produces the opposite result
- if $\beta = (1+r)^{-1}$, $u'(C_1) = u'(C_2)$, hence $C_1 = C_2$ - Consumer tends to smooth consumption

Substituting this last result in the budget constraint we have:

$$C_1 = C_2 = \frac{(1+r)\,Y_1 + Y_2}{2+r}$$

Defining the Current Account

- Consumer tends to smooth consumption - but income is exogenous. International borrowing and lending to move income intertemporally
- First period

$$CA_1 = Y_1 - C_1 = B_2$$

- Second Period

$$\begin{aligned} CA_2 &= Y_2 + rB_2 - C_2 \\ CA_2 &= Y_2 + r\left(Y_1 - C_1\right) - C_2 \\ CA_2 &= -\left(Y_1 - C_1\right) = -CA_1 \end{aligned}$$

- Implications:
  - if a country run a current account deficit, it is infact borrowing from abroad
  - A country in current account deficit in period one need to have a current account surplus in the future to pay back the borrowing in period one

Adding Government (Balance Budget)

$$G_1 = T_1, G_2 = T_2$$

$$C_1 + \frac{C_2}{1+r} = Y_1 - G_1 + \frac{Y_2 - G_2}{1+r}$$

$$CA_1 = Y_1 + rB_1 - C_1 - G_1 = B_2 - B_1$$

How does the presence of the Government affect private consumption?

$$C_1 = C_2 = \frac{(1+r)(Y_1 - G_1) + (Y_2 - G_2)}{2+r}$$

for any Y and G (if $\beta = (1+r)^{-1}$)

Temporary increase in public expenditure

$(G_1 > 0, G_2 = 0)$
Private sector smoothing behaviour makes very important the distinction between temporarary and permanent changes, or shocks.

$$C_1 = C_2 = \frac{(1+r)(Y_1 - G_1) + (Y_2)}{2+r}$$

if $Y_1 = Y_2$, in absence of fiscal expenditure, the current account will be always in equilibrium.

$$\begin{aligned} CA_1 &= Y - C_1 \\ CA_1 &= Y - \frac{(1+r)(Y - G_1) + (Y)}{2+r} \\ CA_1 &= -\frac{(1+r)\,G_1}{2+r} < 0 = -CA_2 \end{aligned}$$

Current Account Deficit in the first period, CA surplus in the second.