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An overlapping generations version of Krugman's world's smallest macroeconomic model and fiscal deficit

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ABSTRACT

This paper attempts to introduce an overlapping generations structure into Paul Krugman's "The world's smallest macroeconomic model" (Krugman (1999)) to examine the implications of fiscal policy, particularly fiscal deficits, in a framework suitable for policy analysis. In that paper, Krugman argued that under the price rigidity assumption, a shortage in the money supply leads to underemployment and recession, so increasing the money supply would eliminate underemployment and restore full employment. But how can the money supply be increased? I show that in order to restore full employment out of a recession, a fiscal deficit is needed to increase the money supply. I also show that in a growing economy, fiscal deficits are necessary to maintain full employment at constant prices or inflation. Fiscal deficits are not only effective in pulling the economy out of recession, they are even necessary for growth to continue without recession or inflation. The fiscal deficit in this paper represents the difference between government spending and government revenues. If this difference is positive, we say that the government is in deficit. Krugman's original model is a one-period static model. I intend to extend this model to a dynamic overlapping generations model.

KEYWORDS

Fiscal deficit; full employment; price rigidity; growth; overlapping generations model

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1. Introduction

This paper attempts to introduce an overlapping generations structure into Paul Krugman's "The world's smallest macroeconomic model" (Krugman (1999)) to examine the implications of fiscal policy, particularly fiscal deficits, in a framework suitable for policy analysis. In that paper, Krugman argued that under the price rigidity assumption, a shortage in the money supply leads to underemployment and recession, so increasing the money supply would eliminate underemployment and restore full employment. He also noted that these arguments may be an implication of J.M. Keynes' famous statement that.

Unemployment develops, that is to say, because people want the moon; - men cannot be employed when the object of desire (*i.e.* money) is something which cannot be produced and the demand for which cannot be readily choked off. There is no remedy but to persuade the public that green cheese is practically the same thing and to have a green cheese factory (*i.e.* a central bank) under public control. (Keynes (1936) Chapter 17).

Murota (2017), citing Krugman (1999), presents an analysis of long-term stagnation due to insufficient aggregate demand using a money utility function model based on Ono's model (Ono (1994, 2001)). He proposes generous unemployment benefits to reduce unemployment. However, my interest is more basic and concerns fiscal deficits in general. In this paper, I use an overlapping generations model which is an extension of Krugman's static model to explore theoretically and normatively the role of fiscal deficits in achieving and maintaining full employment in a growing economy without causing inflation or with inflation. The fiscal deficit in this paper represents the difference between government spending on programs such as public investment and education, and government revenues from taxes and social insurance contributions. If this difference is positive, we say that the government is in deficit.

I have two questions about the arguments by Krugman.

- How do we increase the money supply?

I will prove that we can increase the money supply by creating a fiscal deficit and thereby overcome the recession and restore full employment.

- What is needed to maintain and sustain full employment in a growing economy at stable price or inflation?

On this issue as well, I show that a fiscal deficit is effective in achieving full employment at stable price or inflation. If the price is not constant and is expected to increase, we need a fiscal deficit which is larger than that with constant price to maintain full employment. Or, we can say that the larger fiscal deficit induces inflation.

Lerner's famous functional finance theory (Lerner (1944)) does not consider whether the government should run surpluses or deficits to be meaningful in and of itself, but believes that fiscal policy should be used to achieve near full employment while avoiding inflation as much as possible. In this paper, we follow Lerner's functional finance theory, using an overlapping generations version of a simple macroeconomic model by Krugman. For more on Lerner's functional finance theory, see Forstater (1999). Lopez-Gallardo (2000) studies the problem of fiscal deficit from the perspective of the post Keynesian Economics.

The intent of this paper is to argue that fiscal deficits are not a temporary anomaly, but a very normal and enduring situation, at least in major countries. Therefore, the pursuit of balanced budgets by unnecessarily reducing fiscal deficits and government debt in the name of sound public finances is an obstacle to the stable growth of each country's economy.

In the next section I present an overlapping generations version of Krugman's model. In Section 3 I analyze a fiscal deficit for full employment under the price rigidity. Price rigidity is an assumption made by Krugman, and I have followed it. Krugman explains his reasoning as follows. "The output effects of money come from the assumption of price rigidity. Where does that come from? (Overwhelming empirical evidence, that's where - but why?)." Using a graphical representation and a numerical example, I will show that an increase in the fiscal spending can restore full employment from recession. It is a short run effect of the fiscal spending.

In Section 4 I consider a fiscal deficit to realize full employment in a growing economy without inflation. In Section 5 I consider a fiscal deficit in a growing economy with inflation. In Section 6 I present an empirical evidence which shows that fiscal deficits are not a temporary anomaly, but a very normal and enduring situation, at least in the major countries. Section 7 is a concluding section. In Appendix 1 I will analyze the case where money as well as goods is produced by labor. In Appendix 2 I analyze the case where government bonds are issued instead of money.

The accumulation of fiscal deficits is government debt. It is often said that government debt must eventually be repaid, but this is not true. Unless one is clearly aware of the destruction of the nation or the extinction of the human race and decides how to live in retrospect, there is no need to assume that the government debt will be repaid. What is important is to maintain as close to full employment as possible without causing excessive inflation and to achieve stable growth.

As Blanchard (2022, 2023) notes, many discussions of the relationship between the govenmnet debt and GDP use simple calculations based on comparisons of primary budget balances, the interest rate of the government bonds, and the growth rate. But is the argument not so simple? Assuming a steady state of full employment, which may or may not include inflation, the size of the fiscal deficit to achieve this is naturally determined, and the larger the fiscal deficit is, the higher the inflation rate is. On the other hand, as (10) of this paper shows, the larger (smaller) the propensity to consume is, the smaller (larger) the fiscal deficit required to achieve full employment under a constant rate of price increase is[1]. Therefore, the larger the propensity to consume is, the less likely it is that the debt-GDP ratio will become large. In another research I have shown the following result using a model in which people live forever.

Let r, g, $1-s$ and δ be interest rate of the government bonds, the nominal growth rate, the propensity to consume and the discount rate for consumers, then the condition for the debt-GDP ratio not to diverge is

$$g > r - (1-s)\delta$$

The purpose of this paper is to improve Krugman's simple model to make it a bit more general and to prove that budget deficits not only help economies recover from recessions, but are essential for maintaining full employment under constant prices or inflation in a growing economy.

2. An overlapping generations version of Krugman's model

We consider the following simple model of the economy. There is only one good, produced at constant returns to scale by the single factor of production, labor. One unit of labor produces one unit of the good, and the price level and the wage rate must be the same. They can be referred to with a single symbol, P_t for Period t. There is also only one asset, money. Agents live over two periods. They work in Period 1 (the younger period) and retire in Period 2 (the older period). They are born in each period and live one period overlapping with the generation before and after them. The agents derive utility both from the consumption in Period 1 and the consumption in Period 2 . The utility function is assumed to take a specific form:

$$(1-s)\ln C_t^1 + s\ln C_{t+1}^2, 0 < \mathrm{s} < 1. \quad (1)$$

C_t^1 is the consumption by the younger consumers in Period t. C_{t+1}^2 is their consumption in the next period (Period $t+1$). It is the consumption by the older consumers in that period. The budget constraints for the consumers are

$$P_t C_t^1 + M_{t+1} = P_t L_t, \quad (2)$$

and

[1] s in (10) is the propensity to save.

$$P_{t+1}^e C_{t+1}^2 = M_{t+1}. \tag{3}$$

P_t is the price of the good, and L_t is the employment in Period t. Denote the wage in Period t by W_t. Then,

$$P_t = W_t$$

P_{t+1}^e is the expected price in Period $t+1$. M_{t+1} is the money holding by the consumers in Period $t+1$. The budget constraints are rewritten in one equation as follows;

$$P_t C_t^1 + P_{t+1}^e C_{t+1}^2 = P_t L_t$$

The utility function is equivalently written as

$$(1-s)lnC_t^1 + sln\frac{M_{t+1}}{P_{t+1}^e}$$

This is the so-called money-in-the-utility-function. As Krugman said, "the utility of money presumably reflects its usefulness in providing future consumption". It is further alternatively written as

$$(1-s)lnC_t^1 + s_1 ln\frac{M_{t+1}}{P_{t+1}^e} + s_2 lnC_{t+1}^2, s = s_1 + s_2$$

This utility function reflects the assumption that utility is obtained from the liquidity of money along with consumption in the older period. Under the above budget constraints these utility functions are equivalent. Unless all of the consumer's wealth is held in money, the implications of these utility functions may be different, especially when real capital is present. However, the model in this paper has no real capital and the only asset is money.

By the utility maximization under the budget constraints we obtain

$$C_t^1 = (1-s)L_t, C_{t+1}^2 = s\frac{P_t}{P_{t+1}^e}L_t \tag{4}$$

They mean

$$M_{t+1} = sP_t L_t$$

For the consumers of the previous generation, we have

$$P_t C_t^2 = M_t$$

or

$$C_t^2 = \frac{M_t}{P_t}$$

The market equilibrium condition is

$$C_t^1 + C_t^2 = L_t \tag{5}$$

From this

$$(1-s)L_t + \frac{M_t}{P_t} = L_t$$

Therefore,

$$L_t = \frac{1}{s}\frac{M_t}{P_t} \tag{6}$$

Denote the employment under full employment, or labor supply, by L_t^f. It is constant, that is, $L_t^f = L_{t+1}^f$ in this section and the next section. Now let us introduce some rigidity of the price. Murota (2017) presented an argument about price rigidity or wage rigidity. He considers nominal wage stickiness attributed to union wage setting[2]. He assumes that labor unions are concerned not with a rise in real wages but with that in nominal wages because of money illusion. The nominal wage stickiness is more appropriate than the real wage stickiness for Krugman's model. But, Krugman said "never mind why the price and the wage are sticky. It comes from overwhelming empirical evidence." I assume, anyway, that price (wage) level is fixed above the level consistent with full employment, so that real balance $\frac{M_t}{P_t}$ is too low. Formally, I assume

$$\frac{M_t}{P_t} < sL_t^f$$

Then,

$$L_t < L_t^f$$

Therefore, under the price rigidity insufficient money supply induces insufficient demand for the good for full employment. If the money supply is increased to M'_t which satisfies

$$\frac{M'_t}{P_t} = sL_t^f$$

then

$$L_t = L_t^f$$

and full employment is restored.

But, how do we increase the money supply. Let's consider that in the next section. Neither our model nor Krugman's model has any monetary assets other than money, so it is not possible to conduct monetary policy such as open market operations. Even if there were non-monetary assets such as government bonds, monetary policy would only exchange those assets for money, not increase net assets. Furthermore, there is no capital, no investment, and no bank. I think that the only thing that can increase net financial assets is a fiscal deficit.

3. Fiscal deficit for full employment under the price rigidity

We introduce the fiscal spending G_t and the tax T_t in Period t. The budget constraints for the consumers are

$$P_t C_t^1 + M_{t+1} = P_t L_t - T_t$$

and

$$M_{t+1} = P_{t+1}^e C_{t+1}^2$$

T_t is the tax in Period t. By utility maximization, we obtain

[2] Greiner (2013) and Raurich, Sala, Sorolla (2006) considerred real wage stickiness attributed to union wage setting.

$$C_t^1 = (1-s)\left(L_t - \frac{T_t}{P_t}\right), C_{t+1}^2 = s\frac{P_t L_t - T_t}{P_{t+1}^e}$$

The market equilibrium condition is

$$C_t^1 + C_t^2 + G_t = L_t$$

From this

$$(1-s)\left(L_t - \tfrac{T_t}{P_t}\right) + \tfrac{M_t}{P_t} + \tfrac{G_t}{P_t} = L_t. \quad (7)$$

Then,

$$L_t = \frac{1}{s}\left[\frac{M_t}{P_t} + \frac{G_t}{P_t} - (1-s)\frac{T_t}{P_t}\right]$$

or

$$P_t L_t = \frac{1}{s}[M_t + G_t - (1-s)T_t]. \quad (8)$$

Determine G_t and T_t given M_t and P_t so that

$$L_t = L_t^f$$

Denote such values of G_t and T_t by G_t^f and T_t^f. Then,

$$P_t L_t^f = \frac{1}{s}[M_t + G_t^f - (1-s)T_t^f]$$

Let

$$C_t^{1f} = (1-s)\left(L_t^f - \frac{T_t^f}{P_t}\right)$$

This is the consumption of the younger consumers under full employment. From the budget constraint,

$$M_{t+1}^f = P_t L_t^f - P_t C_t^{1f} - T_t^f = sP_t L_t^f - sT_t^f$$

By (8)

$$M_t = sP_t L_t^f - G_t^f + (1-s)T_t^f$$

From them,

$$G_t^f - T_t^f = M_{t+1}^f - M_t$$

Therefore, the fiscal deficit equals an increase in the money holding. In this model, there is neither capital nor investment, so the demand for goods comes only from consumption and government spending. The savings of the elderly are already set. To recover from the recession, either government spending must be increased or consumption must be increased by increasing the disposable income of young people through tax cuts. We have shown the following result.

Proposition 1

Under the price rigidity, the increase in money supply required to restore full employment from recession can be achieved through a fiscal deficit.

In other words, a fiscal deficit is necessary to restore the economy from recession to full employment. The conclusion calls for a fiscal deficit, but there are two main ways to run a fiscal deficit: increase spending and decrease taxes. If society's needs call for the enhancement of public capital, it may be desirable to increase fiscal spending, and if society's needs call for the support of people's consumption, it may be appropriate to reduce taxes.

Graphical representation

Assume that $T_t = T_t^f$, P_t and M_t are given. For now, let us assume that employment is not necessarily full employment, denoted by L_t. From (7),

$$(1-s)\left(L_t - \frac{T_t^f}{P_t}\right) + \frac{M_t}{P_t} + \frac{G_t}{P_t} = L_t$$

This means

$$L_t = \frac{1}{sP_t}\left[M_t + G_t - (1-s)T_t^f\right]$$

Under the constant price to achieve full employment, G_t must be a value that satisfies the following equation.

$$L_t^f = \frac{1}{sP_t}\left[M_t + G_t - (1-s)T_t^f\right] \tag{9}$$

This is the multiplier property of the fiscal spending. From this

$$G_t = sP_tL_t^f - M_t + (1-s)T_t^f$$

Denote it by G_t^f. In Figure 1, I depict the value of L_t with $G_t = 0$ by L_t^0.

$$L_t^0 = \frac{1}{sP_t}\left[M_t - (1-s)T_t^f\right]$$

The line L_t^0A depicts (9). Its slope is $\frac{1}{sP_t}$. L_t^f is the value of L_t with $G_t = G_t^f$.

The increase in the fiscal spending given tax level increases money in the next period. Then, without economic growth in the next period we can realize full employment with the previous level of the fiscal spending. Please see the following numerical example.

Numerical Example

Suppose $P_t = 1$, $s = 0.4$, $M_t = 20$, $T_t = T_t^f = 30$, $L_t^f = 100$, $G_t = 30$ in Period t. Then, the employment in Period t is

$$L_t = \frac{1}{sP_t}\left[M_t + G_t - (1-s)T_t^f\right] = 80 < L_t^f$$

When the fiscal spending G_t increases to 38, then we have

$$L_t = 100 = L_t^f$$

In the next period the money supply increases to 28, and the employment is

$$L_{t+1} = 100 = L_{t+1}^f$$

Thus, full employment is realized with $G_t = 30$.

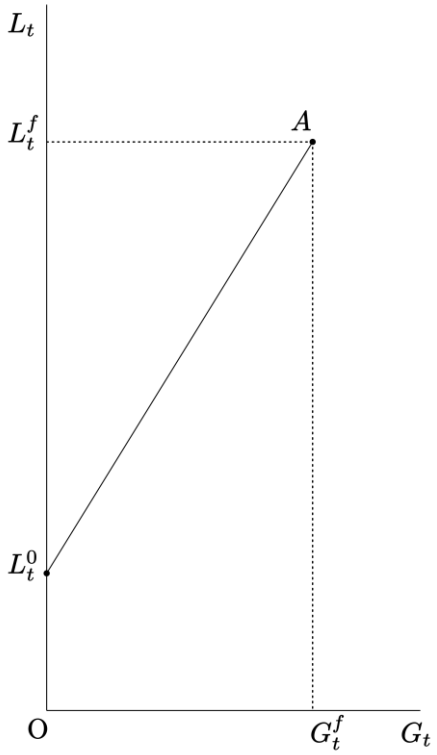

Figure 1. Fiscal spending for full employment.

4. Growth under constant price with full employment

Next I examine fiscal policy in a growing economy under full employment without inflation. The reason for growth can be population growth, technological progress, or anything else. The real growth rate is

$$0 < n < 1$$

Let us consider a steady state under constant price with full employment. Thus, P_t is constant, and we can assume $L_t = L_t^f$, $L_{t-1} = L_{t-1}^f = \frac{1}{1+n} L_t^f$, $M_{t+1} = (1+n)M_t$, $T_{t-1} = \frac{1}{1+n} T_t$ and $G_{t-1} = \frac{1}{1+n} G_t$. L_{t-1}^f is the employment in Period $t-1$ under full employment. Economic growth can be driven by population growth or by technological progress that increases labor productivity. In the latter case, L_t and L_t^f represent employment and labor supply in efficiency units, taking into account the increase in labor productivity. The budget constraints for the consumers are

$$P_t C_t^1 + M_{t+1} = P_t L_t - T_t$$

and

$$M_{t+1} = P_{t+1} C_{t+1}^2$$

By the utility maximization of the younger consumers, we obtain

$$P_t C_t^1 = (1-s)(P_t L_t - T_t)$$

and

$$P_{t+1}C_{t+1}^2 = s(P_tL_t - T_t) = M_{t+1}$$

For the consumers of the previous generation,

$$P_tC_t^2 = M_t = s(P_{t-1}L_{t-1} - T_{t-1}) = \frac{1}{1+n}s(P_tL_t - T_t) = \frac{1}{1+n}M_{t+1}$$

The market equilibrium condition is

$$C_t^1 + C_t^2 + G_t = L_t$$

This means

$$(1-s)(P_tL_t - T_t) + \frac{1}{1+n}s(P_tL_t - T_t) + G_t = P_tL_t$$

From this we get

$$G_t - T_t = s(P_tL_t - T_t) - \frac{1}{1+n}s(P_tL_t - T_t) = M_{t+1} - M_t = nM_t \tag{10}$$

If $n > 0$, $G_t - T_t > 0$. We have shown the following result.

Proposition 2

In a growing economy, the increase in money supply required to maintain full employment under constant price can be achieved through a fiscal deficit.

We can also say that a fiscal deficit is necessary to maintain full employment under constant price in a growing economy.

Numerical Example

Suppose $P_t = P_{t-1} = 1$, $s = 0.4$, $M_t = 25.2$, $T_{t-1} = T_t = T_t^f = 30$, $L_t = L_t^f = 100$ in Period t, and the growth rate $n = \frac{1}{9}$. I assume full employment under constant price. Then,

$$P_tC_t^1 = (1-s)(P_tL_t - T_t) = 42$$

$$P_{t+1}C_{t+1}^2 = s(P_tL_t - T_t) = M_{t+1} = 28$$

On the other hand, for the consumers in the previous generation

$$P_tC_t^2 = 0.9s(P_tL_t - T_t) = M_t = 25.2$$

The total consumption is 67.2. Therefore, we need the fiscal spending G_t =32.8. It is larger than $T_t = 30$, and we need fiscal deficit $2.8 = M_{t+1} - M_t = \frac{1}{9}M_t$ for full employment.

5. Growth under inflation with full employment

In this section I consider a steady state of a growing economy with inflation. Inflation is predicted. Similarly to the previous section, the real growth rate is $0 < n < 1$. The inflation rate is π>0. Then, we have $P_t = (1+\pi)P_{t-1}$and $P_{t+1} = (1+\pi)P_t$. Under full employment $L_t = L_t^f$, $L_{t-1} = L_{t-1}^f$. By the growth $L_{t-1} = \frac{1}{1+n}L_t$. Also we

have $T_{t-1} = \frac{1}{(1+n)(1+\pi)} T_t$ and $G_{t-1} = \frac{1}{(1+n)(1+\pi)} G_t$. The budget constraints for the consumers are

$$P_t C_t^1 + M_{t+1} = P_t L_t - T_t$$

and

$$M_{t+1} = (1+\pi) P_t C_{t+1}^2$$

About M_t and M_{t+1},

$$M_{t+1} = (1+n)(1+\pi) M_t$$

By the utility maximization of the younger consumers, we obtain

$$P_t C_t^1 = (1-s)(P_t L_t - T_t)$$

and

$$P_{t+1} C_{t+1}^2 = (1+\pi) P_t C_{t+1}^2 = s(P_t L_t - T_t) = M_{t+1}$$

For the older consumers, we get

$$P_t C_t^2 = M_t = s(P_{t-1} L_{t-1} - T_{t-1}) = \frac{1}{(1+n)(1+\pi)} s(P_t L_t - T_t) = \frac{1}{(1+n)(1+\pi)} M_{t+1}$$

The market equilibrium condition is

$$P_t C_t^1 + P_t C_t^2 + G_t = L_t \tag{11}$$

Then,

$$(1-s)(P_t L_t - T_t) + \frac{1}{(1+n)(1+\pi)} s(P_t L_t - T_t) + G_t = P_t L_t$$

This means

$$G_t - T_t = s(P_t L_t - T_t) - \frac{1}{(1+n)(1+\pi)} s(P_t L_t - T_t) = M_{t+1} - M_t$$

$$= (1+n)(1+\pi) M_t - M_t = (n + \pi + n\pi) M_t$$

$n + \pi + n\pi$ is the nominal growth rate. We have shown the following result.

Proposition 3

In a growing economy under predicted inflation, the fiscal deficit required to maintain full employment equals the increase in money holding. The larger the inflation rate is, the larger the fiscal deficit is.

A fiscal deficit in excess of the size needed for full employment under constant price leads to inflation. The analysis in this section includes the analysis in the previous section because if $\pi = 0$, the price is constant.

Numerical Example

Suppose $P_t = 1$, $s = 0.4$, $M_t = 22.68$, $T_t = T_t^f = 30$, $L_t = L_t^f = 100$ in Period t, the growth rate $n = \frac{1}{9}$, the inflation rate $\pi = \frac{1}{9}$, that is, $P_{t-1} = 0.9$, $P_{t+1} = \frac{10}{9}$. I assume full employment with inflation. Then,

$$P_t C_t^1 = (1-s)(P_t L_t - T_t) = 42$$

$$P_{t+1} C_{t+1}^2 = s(P_t L_t - T_t) = M_{t+1} = 28$$

On the other hand, for the consumers in the previous generation

$$P_t C_t^2 = 0.9 \times 0.9 s(P_t L_t - T_t) = M_t = 22.68$$

The total consumption is 64.68. Therefore, we need the fiscal spending G_t =35.32. It is larger than $T_t = 30$, and we need fiscal deficit $5.32 = M_{t+1} - M_t = (n + \pi + n\pi)M_t$ for full employment.

6. Empirical evidence

The purpose and intent of this paper are to argue that fiscal deficits are not a temporary anomaly, but a very normal and enduring situation, at least in the major countries. Therefore, the pursuit of balanced budget by unnecessarily reducing fiscal deficit and government debt in the name of sound finances is an obstacle to the stable growth of each country's economy.

Table 1. Fiscal deficit (% of GDP).

	Average	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Australia	-3.57	-4.60	-2.80	-2.80	-2.20	-2.20	-1.60	-1.20	-1.40	-7.00	-9.20	-4.30
Austria	-2.35	-2.60	-2.20	-2.00	-2.70	-1.00	-1.50	-0.80	0.20	0.60	-8.00	-5.80
Belgium	-3.43	-4.30	-4.30	-3.10	-3.10	-2.40	-2.40	-0.70	-0.90	-2.00	-9.00	-5.50
Canada	-2.06	-3.30	-2.50	-1.50	0.20	-0.10	-0.50	-0.10	0.40	0.00	-10.90	-4.40
Chile	-2.58	0.90	0.30	-0.60	-1.80	-2.30	-2.70	-2.90	-1.30	-3.40	-7.30	-7.30
Colombia	-3.93	-0.50	-0.40	-1.50	-3.10	-3.40	-4.60	-3.80	-5.20	-4.10	-8.80	-7.80
Costa Rica	-2.85	-5.10	-1.70	-2.60	-1.40	-2.40	-2.30	-3.50	-2.90	-3.10	-5.30	-1.00
Czech Republic	-1.65	-2.70	-3.90	-1.30	-2.10	-0.60	0.70	1.50	0.90	0.30	-5.80	-5.10
Denmark	0.37	-2.10	-3.50	-1.20	1.10	-1.30	-0.10	1.80	0.80	4.10	0.40	4.10
Estonia	-0.68	1.10	-0.30	0.20	0.70	0.10	-0.40	-0.50	-0.60	0.10	-5.50	-2.40
Finland	-2.17	-1.00	-2.20	-2.50	-3.00	-2.40	-1.70	-0.70	-0.90	-0.90	-5.60	-3.00
France	-4.48	-5.20	-5.00	-4.10	-3.90	-3.60	-3.60	-3.00	-2.30	-3.10	-9.00	-6.50
Germany	-0.13	-0.90	0.00	0.00	0.60	1.00	1.20	1.30	1.90	1.50	-4.30	-3.70
Greece	-5.16	-10.50	-9.10	-13.40	-3.70	-5.90	0.20	0.60	0.90	0.90	-9.70	-7.10
Hungary	-3.45	-5.20	-2.30	-2.60	-2.80	-2.00	-1.80	-2.50	-2.10	-2.00	-7.50	-7.10
Iceland	-1.35	-6.50	-2.60	-1.20	0.30	-0.40	12.50	1.00	0.90	-1.50	-9.00	-8.40
Ireland	-3.75	-13.60	-8.50	-6.40	-3.60	-2.00	-0.80	-0.30	0.10	0.50	-5.00	-1.60
Israel	-3.66	-3.40	-4.40	-4.10	-2.30	-1.20	-1.70	-1.20	-3.60	-3.90	-10.80	-3.70
Italy	-3.84	-3.60	-2.90	-2.90	-3.00	-2.60	-2.40	-2.40	-2.20	-1.50	-9.70	-9.00
Japan	-5.60	-9.00	-8.20	-7.60	-5.60	-3.70	-3.60	-3.10	-2.50	-3.00	-9.10	-6.20
Korea	1.01	1.00	1.00	1.30	1.20	1.20	2.20	2.70	3.00	1.00	-2.70	-0.80
Latvia	-2.15	-4.30	-1.40	-1.20	-1.60	-1.40	0.00	-0.80	-0.80	-0.60	-4.40	-7.10
Lithuania	-1.96	-8.90	-3.20	-2.60	-0.60	-0.30	0.30	0.40	0.50	0.50	-6.50	-1.20
Luxembourg	0.95	0.70	0.50	0.80	1.30	1.30	1.90	1.40	3.00	2.20	-3.40	0.70
Mexico	-4.50	-5.30	-4.70	-4.50	-4.20	-5.20	-2.90	-2.50	-5.10	-3.70	-5.40	-6.00
Netherlands	-1.52	-4.40	-3.90	-3.00	-2.30	-1.90	0.10	1.40	1.50	1.80	-3.70	-2.30
New Zealand	-1.57	-4.30	-2.40	-0.70	0.20	0.00	1.00	1.50	0.80	-0.70	-8.00	-4.70
Norway	7.59	13.30	13.70	10.60	8.60	6.00	4.00	5.00	7.80	6.50	-2.60	10.60
Poland	-2.99	-5.00	-3.80	-4.30	-3.70	-2.60	-2.40	-1.50	-0.20	-0.70	-6.90	-1.80
Portugal	-4.05	-7.70	-6.20	-5.10	-7.40	-4.40	-1.90	-3.00	-0.30	0.10	-5.80	-2.90
Slovak Republic	-3.09	-4.30	-4.40	-2.90	-3.10	-2.70	-2.60	-1.00	-1.00	-1.20	-5.40	-5.40
Slovenia	-4.21	-6.60	-4.00	-14.60	-5.50	-2.80	-1.90	-0.10	0.70	0.70	-7.60	-4.60
Spain	-6.39	-9.70	-11.60	-7.50	-6.10	-5.30	-4.30	-3.10	-2.60	-3.10	-10.10	-6.90
Sweden	-0.31	-0.30	-1.10	-1.50	-1.50	0.00	1.00	1.40	0.80	0.60	-2.80	0.00
Switzerland	0.10	0.70	0.20	-0.40	-0.20	0.50	0.20	1.10	1.30	1.30	-3.10	-0.50
United Kingdom	-5.70	-7.40	-8.00	-5.40	-5.60	-4.60	-3.30	-2.50	-2.30	-2.50	-13.10	-8.00
United States	-7.76	-11.00	-9.20	-5.80	-5.20	-4.60	-5.40	-4.40	-6.10	-6.70	-14.90	-12.10
Average	-2.51	-3.94	-3.11	-2.92	-2.08	-1.76	-0.84	-0.66	-0.51	-0.86	-6.91	-4.02

Table 1 shows fiscal deficits in recent years for several representative nations (from OECD Economic Outlook, 2023)[3]. Doesn't this table show that fiscal deficits are very typical?

Table 2. Government debt (% of GDP).

	Average	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Australia	67.3	45.8	58.6	55.1	61.1	64.4	69.0	66.3	66.9	77.0	92.1	84.4
Austria	97.6	91.5	97.3	94.4	101.9	101.3	102.5	96.3	90.9	89.3	107.1	101.1
Belgium	123.9	111.6	121.0	118.6	130.6	126.2	127.7	120.8	117.8	119.6	139.8	129.1
Canada	116.8	111.1	113.7	107.8	108.6	114.4	115.4	111.8	109.8	111.9	146.1	134.1
Chile	28.8	18.0	18.4	19.0	22.4	24.3	28.4	29.4	32.2	38.7	44.2	42.1
Colombia	77.7					68.5	73.1	75.2	89.0	82.9		
Czech Republic	48.2	47.0	56.2	56.0	54.8	51.7	47.4	43.3	40.1	37.8	47.0	48.5
Denmark	54.0	60.1	60.6	56.7	59.1	53.4	51.5	49.0	47.2	48.4	58.4	49.4
Estonia	15.0	9.5	13.1	13.6	13.8	12.7	13.7	13.1	13.0	13.6	24.8	24.3
Finland	75.6	60.9	68.0	68.8	75.9	79.9	80.5	77.9	75.0	75.2	87.2	82.2
France	122.1	103.8	111.9	112.5	120.2	120.8	123.7	122.9	120.7	123.1	145.9	138.1
Germany	78.6	86.3	88.7	84.1	83.9	79.8	77.0	72.4	69.2	67.6	78.4	77.1
Greece	188.4	113.6	167.1	181.4	183.1	184.2	188.9	193.0	199.3	200.8	236.8	224.3
Hungary	94.4	95.1	98.4	97.2	100.6	98.8	98.7	93.2	86.9	83.9	97.1	88.6
Iceland	113.4	117.6	115.7	106.9								
Ireland	92.9	110.8	129.4	132.3	121.2	88.3	85.3	76.2	74.3	68.9	71.3	64.1
Israel	77.9	78.0	79.1	77.1	77.7	78.4	76.9	73.7	71.8	74.1	86.5	83.2
Italy	152.0	117.2	135.4	143.2	155.6	156.9	154.6	152.0	146.9	154.2	183.1	172.5
Japan	235.1	218.0	226.6	229.7	234.4	233.3	231.4	230.3	234.2	234.8	257.0	256.0
Korea	51.5	45.3	47.5	47.9	50.7	52.5	51.6	49.4	50.4	52.7	58.9	59.6
Latvia	49.7	51.4	49.1	46.2	51.2	46.6	50.3	47.6	46.3	47.5	53.8	57.2
Lithuania	49.2	45.7	51.2	48.0	52.6	53.4	50.9	47.1	41.0	44.7	55.5	50.9
Luxembourg	28.8	26.7	27.5	28.1	28.9	28.9	26.9	28.6	28.4	30.1	32.0	31.0
Mexico	50.6	44.0	45.9	50.2	52.5	53.5	49.8	48.6	48.5	50.7	58.6	54.5
Netherlands	73.4	73.6	79.4	78.8	83.3	79.6	77.6	70.8	66.0	62.3	70.2	65.7
New Zealand	42.4	42.4	45.6	42.4	42.2	41.8	40.8	39.5	37.4	34.1	46.9	53.3
Norway	42.0	34.5	35.6	36.2	34.5	40.0	44.0	44.3	45.1	46.4	52.9	48.9
Poland	68.7	62.6	66.0	67.1	71.9	70.3	73.4	69.0	66.7	63.6	77.5	68.1
Portugal	140.8	109.9	137.3	141.1	150.7	148.4	144.3	143.1	137.2	135.6	157.1	143.7
Slovak Republic	66.0	51.1	60.7	65.1	67.8	66.2	67.6	65.3	63.3	62.9	77.6	78.4
Slovenia	85.0	51.3	61.5	78.5	99.3	102.4	97.2	89.4	83.9	81.4	100.5	89.8
Spain	118.2	78.3	97.1	111.3	123.8	121.1	120.9	119.1	117.5	120.4	148.1	142.7
Sweden	59.3	53.8	55.1	58.0	64.2	62.3	61.9	60.4	59.5	56.2	62.8	58.4
Switzerland	42.4	43.2	43.7	43.0	42.9	42.9	41.6	42.5	40.3	40.1	43.9	41.8
United Kingdom	118.9	103.2	107.4	103.3	113.3	112.6	119.6	119.4	116.0	118.8	151.2	142.6
United States	138.8	130.5	132.3	135.8	135.5	136.9	138.8	135.4	137.3	136.1	159.9	148.1
Average	85.7	75.5	82.9	83.9	87.4	85.6	85.8	83.3	82.0	82.4	97.4	92.2

Table 2 shows government debt (also from OECD Economic Outlook, 2023). The accumulation of fiscal deficits is government debt, but if full employment and stable growth can be achieved without causing high rates of inflation, then the government debt need not and should not be eliminated through taxation. Unless people are deciding their current actions in anticipation of the destruction of the nation, the extinction of the human race, etc., the government debt need not be repaid and may be accumulated.

Although called government “debt”, government bonds are assets just like money, and their creditworthiness is equal. The difference between them is whether they earn interest or not. Therefore, money should be issued instead of government bonds, and government bonds should not be regarded as debt. For government bonds please see also Appendix 2.

[3] OECD Economic Outlook, https://data.oecd.org/gga/general-government-deficit.htm.

7. Concluding remarks

Mainly, I have shown the following two results.

- Under the price rigidity, the increase in money supply required to restore full employment from recession can be achieved through a fiscal deficit.
- In a growing economy, the increase in money supply required to maintain full employment under constant price or inflation can be achieved through a fiscal deficit. Under an inflation expectation we need a larger fiscal deficit than under static expectations.

Fiscal deficits are not only effective in pulling the economy out of recession, they are even necessary to keep growth going without causing either recession or inflation.

For the past 10 to 20 years, Japan has been running fiscal deficits and yet has been unable to boost its economy and increase its growth rate despite low interest rates. This is due to the fact that despite the apparent fiscal deficits, the government has not necessarily spent enough, and the consumption tax hike was implemented even though the economy was still recovering. In my opinion, even a moderate fiscal deficit may not solve the lack of demand, since the current propensity to consume among the Japanese is very small. However, this is a subject for future research.

Fiscal deficits are accumulated as government debt and correspond primarily to assets held by the private sector in the form of money. The private sector accumulates financial assets because it assumes that the state/government will continue forever, as far as our imagination can go. If the doom of the state is foreseen, there is no need to worry, since all assets must be consumed by that date, demand will increase and the budget will be in surplus. Unless such national doom is foreseen, there is no need to worry about government debt.

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Conflict of interest

The author claims that the manuscript is completely original. The author also declares no conflict of interest.

Appendix

A1. When money is produced.

In this appendix, I consider the case where the money is also produced by labor. I introduce the production of money by labor into a model of inflation with full employment. Let us assume that one money is produced by l_m unit of labor, where $0 < l_m \leqq 1$. The market equilibrium condition (11) is rewritten as

$$P_t C_t^1 + P_t C_t^2 + G_t + l_m(M_{t+1} - M_t) = L_t$$

Then,

$$(1-s)(P_t L_t - T_t) + \frac{1}{(1+n)(1+\pi)} s(P_t L_t - T_t) + G_t + l_m(M_{t+1} - M_t) = P_t L_t$$

This means

$$G_t - T_t + l_m(M_{t+1} - M_t) = s(P_tL_t - T_t) - \frac{1}{(1+n)(1+\pi)}s(P_tL_t - T_t) = M_{t+1} - M_t \quad (12)$$

Since

$$M_{t+1} = (1+n)(1+\pi)M_t$$

(12) means

$$G_t - T_t + l_m(n + \pi + n\pi)M_t = (n + \pi + n\pi)M_t$$

If $l_m = 1$, we have

$$G_t - T_t = 0$$

Therefore, if the money as well as goods is produced by labor, and its productions cost equals its value, the fiscal deficit is not necessary for full employment with or without inflation. Alternatively, one might interpret the required fiscal deficit as the cost of money production.

A 2. Case of government bonds.

In this appendix, I consider the case where the consumers hold government bonds as savings instead of money in a model of inflation with full employment. Let r be the interest rate of the government bonds. The budget constraints for the consumers are

$$P_tC_t^1 + M_{t+1} = P_tL_t - T_t$$

and

$$M_{t+1} = \frac{1+\pi}{1+r}P_tC_{t+1}^2$$

By the utility maximization of the younger consumers, we obtain

$$P_tC_t^1 = (1-s)(P_tL_t - T_t)$$

and

$$(1+\pi)P_tC_{t+1}^2 = s(1+r)(P_tL_t - T_t) = (1+r)M_{t+1}$$

For the older consumers, we get

$$P_tC_t^2 = (1+r)M_t = s(1+r)(P_{t-1}L_{t-1} - T_{t-1})$$

$$= \frac{1+r}{(1+n)(1+\pi)}s(P_tL_t - T_t) = \frac{1+r}{(1+n)(1+\pi)}M_{t+1}$$

The market equilibrium condition is

$$P_tC_t^1 + P_tC_t^2 + G_t = L_t \quad (11)$$

Then,

$$(1-s)(P_tL_t-T_t)+\frac{1+r}{(1+n)(1+\pi)}s(P_tL_t-T_t)+G_t=P_tL_t$$

This means

$$G_t-T_t=s(P_tL_t-T_t)-\frac{1+r}{(1+n)(1+\pi)}s(P_tL_t-T_t)=M_{t+1}-(1+r)M_t$$
$$=(1+n)(1+\pi)M_t-(1+r)M_t=(n+\pi+n\pi-r)M_t \quad (12)$$

or

$$G_t-T_t+rM_t=(n+\pi+n\pi)M_t$$

The left hand side of this equation is the fiscal deficit including interest payments. $n+\pi+n\pi$ is the nominal growth rate.

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