



A Primer on Measures of Government Financing Shortfalls and Liabilities

Liqun Liu, Andrew J. Rettenmaier and Thomas R. Saving

Private Enterprise Research Center
Texas A&M University

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Summary

This note presents measures of financing shortfalls and liabilities, both for an individual government program such as Social Security and for government financing as a whole. At the level of individual programs, the widely accepted measure of financing shortfall is the (infinite horizon) unfunded obligation, which is the present value of scheduled future benefits less the present value of the dedicated future tax revenues. At the aggregate level, a measure of financing shortfall is the fiscal imbalance, which is the total unfunded obligation of all government programs plus the debt held by the public. At the aggregate level, there is also a relative measure of financing shortfall, the fiscal gap. It is basically the fiscal imbalance divided by the present value of all of the future GDP.

At both the individual and the aggregate level, a portion of the corresponding financing shortfall measure is due to past actions, and the rest is contingent on the continuation of the current policies in the future. The portion of the financing shortfall measure that is due to past actions provides a measure of liabilities for an individual program or the government financing as a whole.

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Introduction

Population aging has put in the spotlight the projected deficits in Social Security and Medicare for many years to come, and motivates a long-term perspective on the federal budget. A government's long-term financial status can be viewed from two basic aspects: the financing shortfall and the liabilities. Simply put, the financing shortfall summarizes the projected future deficits, whereas the liabilities – which includes the sovereign debt – captures how much a government owes through all of its programs.

This note presents measures of financing shortfalls and liabilities, both for an individual government program such as Social Security and for government financing as a whole. At the level of individual programs, the widely accepted measure of financing shortfall is the (infinite horizon) unfunded obligation, which is the present value of scheduled future benefits less the present value of the dedicated future tax revenues. At the aggregate level, a measure of financing shortfall is the fiscal imbalance, which is the total unfunded obligation of all government programs plus the debt held by the public. At the aggregate level, there is also a relative measure of financing shortfall, the fiscal gap. It is basically the fiscal imbalance divided by the present value of all of the future GDP.

At both the individual and the aggregate level, a portion of the corresponding financing shortfall measure is due to past actions, and the rest is contingent on the continuation of the current policies in the future. The portion of the financing shortfall measure that is due to past actions provides a measure of liabilities for an individual program or the government financing as a whole.

We begin with the financing shortfall and liabilities measures for a single government program, and then move to the financing shortfall and liabilities measures for a government as a whole.

Measuring Financing Shortfalls and Liabilities in a Single Government Program

Here we discuss measures of financing shortfall and liabilities for individual government programs such as Social Security and Medicare. The widely-accepted measure of financing shortfall for a program is the (infinite horizon) unfunded obligation, which is denoted as UO^∞ and defined as

$$UO^\infty = \sum_{t=0}^{\infty} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t}{(1+r)^t}.$$

In this definition, B_t are total benefits in year t under current law, R_t are total dedicated

revenues in year t under current law, and r is the discount rate. In words, unfunded obligation of a government program is the present value of the scheduled benefits under current law minus the present value of the scheduled dedicated revenues under current law.

Benefits in each year can be decomposed as follows

$$\begin{aligned} B_t &= B_t^{rcp} + B_t^{wcp} + B_t^{fp} \\ &= B_t^{rcp} + \tilde{B}_t^{wcp} + \bar{B}_t^{wcp} + B_t^{fp}, \end{aligned}$$

where B_t^{rcp} are benefits in year t payable to retired current participants (as of the evaluation year $t = 0$), B_t^{wcp} are benefits in year t payable to working age current participants (as of $t = 0$), and B_t^{fp} are benefits in year t payable to future participants (as of $t = 0$). B_t^{wcp} can be further decomposed as $B_t^{wcp} = \tilde{B}_t^{wcp} + \bar{B}_t^{wcp}$, where \tilde{B}_t^{wcp} are the current participants' accrued benefits in year t (as of $t = 0$) and \bar{B}_t^{wcp} are the current participants' yet-to-be-earned benefits in year t (as of $t = 0$) based on continued future participation in the program.

Revenues in each year can be similarly decomposed as

$$R_t = R_t^{rcp} + R_t^{wcp} + R_t^{fp}$$

where R_t^{rcp} , R_t^{wcp} and R_t^{fp} are taxes payable in year t that will be paid by retired current participants, by working age current participants and by future participants, respectively.

Putting the benefits and tax revenues together we can write the unfunded obligation of a program as

$$\begin{aligned} UO^\infty &= \left(\sum_{t=0}^{\infty} \frac{B_t^{rcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{rcp}}{(1+r)^t} \right) + \left(\sum_{t=0}^{\infty} \frac{B_t^{wcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{wcp}}{(1+r)^t} \right) + \left(\sum_{t=0}^{\infty} \frac{B_t^{fp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{fp}}{(1+r)^t} \right) \\ &= \left(\sum_{t=0}^{\infty} \frac{B_t^{rcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{rcp}}{(1+r)^t} \right) + \left(\sum_{t=0}^{\infty} \frac{\tilde{B}_t^{wcp}}{(1+r)^t} \right) + \left(\sum_{t=0}^{\infty} \frac{\bar{B}_t^{wcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{wcp}}{(1+r)^t} \right) + \left(\sum_{t=0}^{\infty} \frac{B_t^{fp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{fp}}{(1+r)^t} \right) \end{aligned}$$

Each difference/term in the parentheses in the equation above represents a component part of the unfunded obligation. In words, the unfunded obligation is equal to the present value of net benefits for retired current participants plus the present value of net benefits for working age current participants plus the present value of net benefits for future participants (according to the first decomposition); or equivalently, the unfunded obligation is equal to the present value of net benefits for retired current participants plus the present value of accrued benefits for working age current participants plus the present value of net yet-to-be-earned benefits for working age current participants plus the present value of net benefits for future participants according to the second decomposition.

The various items in the unfunded obligation of a government program can be classified

into two categories: those that came into existence because of the past actions and those that are contingent on the continuation of current policies in the future. The portion of the unfunded obligation that is due to past actions constitute the program's liabilities.

There are three alternative liabilities measures here. All of these three liabilities measures exclude the net benefits to future generations, but they differ in inclusiveness as to what the program owes the current participants.

- The first liabilities measure, and the least inclusive one, is the **accrued benefits to retired current participants** or $\left(\sum_{t=0}^{\infty} \frac{B_t^{rcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{rcp}}{(1+r)^t} \right)$.
- The second liabilities measure, and the most inclusive one, is the **closed-group unfunded obligation** or $\left(\sum_{t=0}^{\infty} \frac{B_t^{rcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{rcp}}{(1+r)^t} \right) + \left(\sum_{t=0}^{\infty} \frac{B_t^{wcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{wcp}}{(1+r)^t} \right)$.
- The third liabilities measure, between the first and the second measure above in terms of inclusiveness, is the **maximum transition cost** or $\left(\sum_{t=0}^{\infty} \frac{B_t^{rcp}}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{R_t^{rcp}}{(1+r)^t} \right) + \left(\sum_{t=0}^{\infty} \frac{\tilde{B}_t^{wcp}}{(1+r)^t} \right)$.

Intuitively, the **accrued benefits to retired current participants** measures how much a government program owes the current retirees as of the evaluation day ($t = 0$). While it does not represent the entire liabilities under the program, the accrued benefits to retired current participants represent that part of the liabilities that most closely resemble the publicly held debt because they are very unlikely to be affected by future policy changes.¹

In contrast, the **closed-group unfunded obligation** measures how much the program owes its current participants (including both retired current participants and working age current participants) if the program is closed to all future participants beginning on the evaluation day, but is allowed to run its course according to current law for the current participants.²

Finally, the **maximum transition costs**, consisting of the already accrued net benefits to current participants while excluding the yet-to-accrue net benefits to the working age current participants, measures how much the government has to pay the current participants if the program were to be ended on the evaluation day.³

Noticeably, none of these measures of a program's liabilities – the accrued benefits to retired current participants, the closed-group unfunded obligation or the maximum transition

¹ The accrued Social Security and Medicare benefits of the retired participants are reported annually in the Statements of Social Insurance in the *Financial Report of the United States Government*.

² The closed-group unfunded obligations for Medicare and Social Security are reported in the programs' respective annual Trustees Reports.

³ The Social Security program's Maximum Transition Costs are available in Shultz and Nickerson (2015).

costs – includes the trust fund balance as an offsetting asset. This is because the trust fund balance of a program is simply a notional commitment to pay a particular amount which does not represent real assets. Viewed from the consolidated budget perspective, the trust fund balance of a program is a corresponding liability for the rest the government (also notional) and always cancel each other out.

Measuring Financing Shortfalls and Liabilities for a Government as a Whole

The overall financing shortfall of a government is measured by fiscal imbalance (FI^∞), which is defined as the publicly held debt plus the sum of the unfunded obligations of all government programs, or

$$\begin{aligned}
 FI^\infty &= D + \sum_{i=1}^m UO_i^\infty \\
 &= D + \left(\sum_{t=0}^{\infty} \frac{E_t}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{T_t}{(1+r)^t} \right),
 \end{aligned}$$

where D is the publicly held debt, UO_i^∞ is the unfunded obligation of program i as defined in the last section, m is the total number of government programs, and E_t and T_t are the total expenditures and taxes of all government programs in year t , respectively.

The financing shortfall for a government as a whole includes the financing shortfalls of all of the government's programs, which are represented by the programs' unfunded obligations. There is an important difference, however, as we move from individual programs to aggregate government financing. Fiscal imbalance, the aggregate financing shortfall measure, also includes the publicly held debt, whereas the shortfall measure for individual programs do not include a trust fund balance (be it positive or negative).⁴ As we explained previously, the trust fund balance of an individual program is not a meaningful economic concept because any positive trust fund balance necessarily implies a negative balance of the same size somewhere else in government budget. On the other hand, the aggregate debt level is real and should be included in the measure of a government's financing shortfall, which is a component of the fiscal imbalance.

Like the unfunded obligation of an individual program, the fiscal imbalance can be decomposed into a portion that is due to past actions and a portion that is contingent on the continuation of current policies in the future. The first portion constitutes the total liabilities of the government. In theory, the total liabilities of a government is given as follows.

$$\text{Total liabilities of a government} = D + \sum_{i=1}^m \text{liabilities of program } i.$$

As discussed earlier, there exists alternative notions of liabilities of an individual program depending on the view on what a program owes to its current participants. Consequently, there could be alternative notions of total liabilities of a government.

⁴ See Gokhale and Smetters (2003) for a description of the fiscal imbalance and its composition.

In practice, the total liabilities of the U.S. federal government is calculated by adding the estimated liabilities of Social Security and Medicare to the federal liabilities reported in the Financial Report of the United States Government (FRUSG), which includes the debt held by the public, accrued pension and other benefits by federal employees, and other liabilities. That is,

$$\begin{aligned} & \text{Total liabilities of the US federal government} \\ & = \underbrace{D + \text{accrued benefits by federal employees} + \text{other liabilities}}_{\text{reported in FRUSG}} \\ & + \text{Social Security liabilities} + \text{Medicare liabilities} \end{aligned}$$

Each year, a new fiscal imbalance (Ft^∞) can be calculated, based on what have happened to the publicly held debt during the past year and any new information about future expenditures and taxes. There is a simple law that governs the evolution of the fiscal imbalance over time. Under the conditions that the expenditures and taxes during the past year turned out to be exactly as projected a year earlier, that all the projections for future expenditures and taxes stay the same and that the discount rate remains the same, the new fiscal imbalance this year would simply be the fiscal imbalance last year times $(1+r)$. That is,

$$Ft^\infty_{\text{this year}} = (1+r) \cdot Ft^\infty_{\text{last year}}$$

This property regarding the evolution of the fiscal imbalance over time has an important implication. It is now well known that for developed economies the interest rate – which is the foundation for the discount rate – tends to be higher than the GDP growth rate, a phenomenon referred to as $r > g$. This means that the fiscal imbalance will grow faster than the GDP. Since the GDP represents the ultimate resources a government can tap into in order to shore up the government’s financing shortfall, the trend of the fiscal imbalance growing faster than the GDP unambiguously suggests a worsening government financing position over time, absent reforms that deal with the existing financing shortfall head on. Therefore, a fiscally responsible government should not postpone addressing a large scale financing shortfall.

Another measure often used to quantify a government’s financing shortfall is the fiscal gap, which looks at the financing shortfall relative to the economy’s scale. The fiscal gap is defined as the immediate and permanent increase in taxes (or decrease in expenditures), as a share of GDP, that is necessary to maintain the long-run government budget balance. Formally, the fiscal gap, denoted Δ , is determined by

$$D + \left(\sum_{t=0}^{\infty} \frac{E_t}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{T_t}{(1+r)^t} - \sum_{t=0}^{\infty} \frac{\Delta \cdot GDP_t}{(1+r)^t} \right) = 0,$$

or equivalently,

$$\Delta = \frac{FI^\infty}{\sum_{t=0}^{\infty} \frac{GDP_t}{(1+r)^t}}.$$

That is, the fiscal gap is the ratio of the fiscal imbalance to the present value of future GDP. Should new taxes of $\Delta \cdot GDP_t$ be raised in all future years the debt-GDP ratio would converge to its present level in the long-run.⁵

Conclusion

This short note identifies the relationship between various measures of the federal government's current and future fiscal position. The long-run fiscal imbalance can be decomposed in several ways that provide valuable insights into the generational burden of federal spending in general or of specific programs like Medicare and Social Security. Further, the individual programs' anticipated expenditures can be decomposed between those that have already accrued to current participants and those that are yet to accrue with the continuation of the programs in their current form. Each of the separate components give policy makers and analysts the necessary information to evaluate the effects on different generations of alternative reform proposals aimed at reducing the imbalance.

⁵ See Auerbach and Gale (2016) for several estimates of the fiscal gap under varying assumptions about the time horizon and ultimate debt to GDP ratio.

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