Government Default versus Financial Repression*

Olivier Jeanne**
Johns Hopkins University

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Abstract

We present a model of a government faced with a choice between financial repression and default. Financial repression extracts quasi-fiscal resources from the banking sector. We show that, although financial repression is costly, it is desirable to use it as a last resort to avoid default. This policy stabilizes the dynamics of government debt and buys the government time to implement a fiscal adjustment. In a calibrated model, optimal financial repression occurs much less frequently than default in the equilibrium without financial repression.

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**Olivier Jeanne, Johns Hopkins University, ojeanne@jhu.edu

1 Introduction

There are many historical examples of governments reducing their debt burdens through financial repression (Reinhart and Sbrancia, 2015; Acalin and Ball, 2023). In these episodes, banks are induced to make transfers to the government or compelled to accept returns on government debt that are below market rates. Since the global financial crisis, concerns have grown that the large increases in government debt could lead to a return of financial repression in advanced economies.

There is wide agreement that stabilizing government debt through fiscal adjustment is preferable to financial repression. However, the relevant policy alternatives also include default. If fiscal adjustment is infeasible or requires time to implement, cannot financial repression be preferable to a default? The purpose of this paper is to develop a framework for analyzing the scope of optimal financial repression when the alternatives are either delayed fiscal adjustment or an immediate default.

The theory rests on two main premises. First, raising government revenue through conventional taxation is less distortive than through financial repression. Second, desirable fiscal adjustments take time to implement because of political frictions, whereas financial repression can be deployed at short notice when needed to preserve financial stability. In other words, financial repression is more distortive but also more "nimble" (readily deployable, rapidly implementable) than fiscal policy.

We show that under these conditions, financial repression can be beneficial as a last resort to prevent default. The point is not that financial repression is less costly than default, but that it is used much less frequently in equilibrium. The key lies in the effect of the availability of financial repression on debt dynamics. In the equilibrium where financial repression is available as a last resort, the government can issue higher levels of debt, buying time to implement fiscal adjustments when needed. By contrast, if financial repression is ruled out, default becomes the only alternative to fiscal adjustment. The government faces a risk premium that destabilizes debt dynamics. As a result, the government defaults far more frequently in the equilibrium without financial repression than it resorts to repression in the equilibrium with optimal financial repression.

The basic assumptions of our framework are as follows. Fiscal policy switches between active and passive regimes a la Leeper (1991). Fiscal adjustment opportunities arrive with a Poisson process but the government is free to use them or not. Taxation, financial repression and default entail different costs. The cost of financial repression is that it increases the cost of liquidity supplied by banks to households.

We present two versions of our model, a tractable version that is more suitable to derive analytical results, and a more general version that is more suitable to

derive quantitative implications. The tractable version corresponds to the special case where a fiscal adjustment, if it occurs, permanently fixes the problem.

The tractable model can be solved in closed form and yields a number of results. We solve for the optimal financial repression policy that both prevents default and preserves the incentives to implement the fiscal adjustment. We show that it is optimal to use financial repression only as a last resort to avoid a default. Because financial repression is costly, the government is willing to implement a fiscal adjustment as soon as the opportunity comes.

By contrast, if financial repression is ruled out, the government buys time by diluting its creditors until default occurs. We show that if a simple condition is satisfied (the debt threshold for default is lower than the debt threshold for financial repression), welfare is higher if financial repression is allowed as a last resort than if it is ruled out.

In the more general model, a fiscal adjustment never permanently fixes the problem because the economy is hit by bad fiscal shocks. The model explains the long debt-increase and -decrease episodes that we observe in the data, and we use the low-frequency moments associated with these episodes in a sample of advanced economies to calibrate the model. The calibrated model implies that optimal financial repression significantly increases welfare. If financial repression is ruled out defaults occur every 20 years on average, whereas with optimal financial repression there is no default and financial repression is very rare—the economy spends less than 1% of the time financially repressed on average. The welfare gain from optimal financial repression is equivalent to about a one percent permanent increase in consumption.

One issue with financial repression is that it may weaken the incentives to do fiscal adjustments. The optimal financial repression policy is designed to preserve these incentives, and the high cost of financial repression is key to make that possible. It is precisely because financial repression is costly that the government is willing to adopt a fiscal adjustment in order to exit financial repression whenever possible. At the same time, financial repression should not be so costly as to make a default preferable.

We consider several extensions of the model. We show that the properties of the model dramatically change if $r < g$. Then government debt converges to a finite level even if there is no fiscal adjustment and a default-free equilibrium does not need to be backstopped by financial repression. This implies that government debt tends to be very high and makes the government vulnerable to a default if the sign of the interest-growth differential changes.

Literature. The building blocks of the model are familiar from the literature on the interaction between fiscal and monetary policies and the literature on government

debt default. We draw on the distinction between active and passive fiscal policy made by Leeper (1991). The government defaults to avoid the distortionary cost of domestic taxation as in Pouzo and Presno (2022).

Models in which fiscal policy can switch between active and passive and with interaction between fiscal and monetary policy. Models that have these features and also incorporate default. Uribe, 2006.

The paper belong to the literature on financial repression. There is a large literature on how unsustainable debt dynamics have been corrected in the past (Mauro et al., 2015) and some authors have specifically studied the role of financial repression—see Reinhart and Sbrancia (2015) and Acalin and Ball (2023). Chien, Cole and Lustig (2023) argue that government debt purchases by the Japanese central bank in the recent period can be interpreted as a form of financial repression.

The theoretical literature on financial repression is less developed. Chari, Dovis and Kehoe, 2020 present a model where the government is less likely to default on banks than on other creditors in order to avoid a banking crisis (Bocola, 2016). Forcing banks to purchase government may be costly, though, because it crowds out the financing profitable private investment projects.

By contrast, I define financial repression as the extraction of quasi-fiscal revenue from the banking sector by the government.[1] There are different ways that this revenue could be extracted. For example, the central bank could buy large amounts of government debt and force commercial banks to hold unremunerated reserves, or the banking sector could be induced to receive below-market interest rate on government debt. The cost of financial repression comes from the resulting increase in the opportunity cost of holding bank deposits.

The welfare cost of financial repression, thus, is the same as the welfare cost of inflation in the literature that studied the optimal rate of inflation in models where the inflation tax is one of several distortionary taxes (Schmitt-Grohé and Uribe, 2010; Lucas, 2000). That literature has generally found that the optimal rate of inflation is equal or close to zero, which is consistent with my result that financial repression should be used only as a last resort. The difference between my paper and that literature is that I assume that deposits yield a real interest rate that is determined by the banking sector's budget constraint. Financial repression, thus, is not accompanied by inflation unless the zero lower bound on the nominal interest rate is binding. More importantly, I assume that because of fiscal inertia, the government cannot choose between financial repression and less distortionary forms of taxation most of the time.

[1]See Jeanne (2025) for an extension of my model with endogenous government debt purchases by the banking sector.

My model is mostly real and inflation plays a relatively small role in the analysis. In particular, I assume that government debt is real, which precludes the channels at work in the fiscal theory of the price level (Cochrane, 2023).

This paper is also related to the literature on the central bank backstop of government debt motivated by the 2010 euro debt crisis. An important theme in that literature is that the central bank can play a role in removing self-fulfilling government debt crises.[2]

The analysis in this paper does not rely on the existence of multiple equilibria. Although financial repression can be viewed as a form of "taxation of last resort" in our model, it does not offer a free lunch and must sometimes be used in equilibrium. Thus, this paper does not support the view that central banks can costlessly remove the default risk on government debt with open market operations—what Reis (2013) calls the "mystique" surrounding the central bank balance sheet.[3] One issue with the self-fulfilling view is that in the real world we see countries where government debt seems to be on an unsustainable path even though its price does not involve a significant default risk premium. For this situation to be an equilibrium investors must believe that the government will either implement a fiscal adjustment or be rescued from default in some other way that produces new revenue for the government. This is the situation that our model attempts to capture.

2 Model

We consider a continuous-time economy with three sectors: households, banks and the government. The government issues debt held by banks and households. Banks issue deposits held by households. Both banks and households hold real assets on top of government debt.

In normal times the government revenue comes from a tax on households. When there is financial repression, the government collects quasi-fiscal revenue from the banking sector.

Households. The economy is populated by a mass 1 of identical infinitely-lived

[2]This argument has been developed in models with self-fullfilling rollover crises a la Cole and Kehoe (Aguiar et al., 2015), and in models a la Calvo (1988) where the crisis mechanism involves the interest rate. Corsetti and Dedola (2016) show that the central bank can select the good equilibrium by purchasing government debt in a two-period model a la Calvo. Lorenzoni and Werning (2019) study the existence of self-fulfilling government debt crises a la Calvo in a more dynamic and microfounded environment. Bacchetta, Perazzi and van Wincoop (2018) show how the central bank can remove self-fulfilling crises in a New Keynesian version of the Lorenzoni and Werning's model.

[3]Similar views were developed earlier by Jeanne (2012) and Zhang (2022).

households. The utility of the representative household is given by

$$U_0 = E_0 \left\{ \int_0^{+\infty} \left[c_t + u\left(m_t\right) \right] e^{-rt} dt \right\}, \tag{1}$$

where c_t is consumption at time t and $u\left(m_t\right)$ is the utility of real bank deposits. The quasilinear utility implies that the risk-free real interest rate is equal to r. The utility of deposits is a power function,

$$u\left(m\right) = \mu \frac{m^{1-\nu}}{1-\nu}, \tag{2}$$

with $\nu > 1$.

Households hold government debt, bank deposits, and real assets. They maximize their utility subject to the budget constraint

$$c_t + \tau_t + q_t \left(\dot{b}_t + \alpha b_t \right) + \dot{m}_t + \dot{a}_{ht} = y_t + \left(r + \alpha\right) b_t + r_{mt} m_t + r a_{ht}, \tag{3}$$

where y_t is gross income, τ_t is a tax paid to the government, and r_{mt} is the real return on bank deposits. Government debt is composed of real bonds with an exponentially decaying coupon like in Hatchondo and Martinez (2009). The term $\left(r + \alpha\right) b_t$ on the right-hand side is the flow of payment on the outstanding bonds and the term $q_t \left(\dot{b}_t + \alpha b_t \right)$ on the left-hand side is the net issuance of debt taking into account that bonds "melt" at rate α. The equilibrium price of the debt q_t may be lower than 1 due to the risk of default.

Banking sector. The banking sector holds real assets $a_{bt} = m_t$. Banks maintain a zero level of equity, do not make profits and do not distribute dividends to households. Hence, the banking sector's income is equal to the return spread between its assets and liabilities times the size of its balance sheet. Its budget constraint is given by,

$$\kappa + \theta_t = (r - r_{mt}) m_t, \tag{4}$$

where κ is a fixed cost of operation and θ_t is the quasi-fiscal revenue from financial repression paid to the government. The nature of this transfer is discussed momentarily.

Fiscal policy. The government finances an exogenous and constant flow of expenditures g by raising taxes and issuing debt. The budget constraint of the government is,

$$g + \left(r + \alpha\right) b_t = \tau_t + \theta_t + q_t \left(\dot{b}_t + \alpha b_t \right). \tag{5}$$

Fiscal policy consists in setting τ_t. We assume that the government cannot change τ_t whenever it wants. Fiscal policy is difficult to change quickly for reasons (left outside of the model) that have been discussed in the political economy literature on inefficient delays in fiscal adjustment. Fiscal deadlock has been explained for example by wars of attrition between political parties (Alesina and Drazen, 1991).

Specifically, we assume that fiscal policy switches between a passive or active regime as defined by Leeper (1991). In the *passive* regime, the tax rate is set so as to ensure the convergence of government market debt towards a long-term level $\underline{b}$,

$$\dot{b}_t = -\sigma \left(b_t - \underline{b} \right), \tag{6}$$

where σ is an exogenous parameter. In the *active* regime, the tax rate is set at a constant level $\tau_t = \tau_a$ that is too low to keep government debt on a sustainable path.

A transition from the passive regime to the active regime is a *bad fiscal shock*. A transition from the active regime to the passive regime is a *fiscal adjustment*. Importantly, bad fiscal shocks are exogenous, whereas fiscal adjustments involve a choice by the government. The government receives fiscal adjustment opportunities that it is free to use or not. An important feature of the equilibrium, therefore, is whether the government has incentives to implement a fiscal adjustment when it has the opportunity. We assume that bad fiscal shocks and fiscal adjustment opportunities arrive with constant-flow probabilities, respectively, denoted by μ and ϕ.

Taxation distorts output (this is what generates the temptation to default). We capture this idea in reduced form by assuming that

$$y_t = \overline{y} - \gamma_\tau \tau_t. \tag{7}$$

where γ_τ is a positive coefficient. As shown in Appendix A, γ_τ can be endogenized by linearizing a production economy where the government taxes production or labor income.

Financial repression. Financial repression consists in setting the level of quasi-fiscal revenue θ_t. There are different policies by which the government can extract quasi-fiscal revenue from the banking sector. First, θ_t could be a special lump-sum levy on the banking sector. Second, it could come from bank regulation. For example, the central bank could increase its profits (and its dividend to the Treasury) by imposing a non-interest bearing reserve requirement on banks. Then θ_t would be equal to $(r - r_{\ell t})\ell_t$, where $r_{\ell t}$ is the lower interest rate paid to banks. One could think of other implementation mechanisms but for the purpose of our analysis, all that matters for allocations and welfare is the financial repression revenue θ_t.

The cost of financial repression is that it raises the opportunity cost of holding deposits. The first-order condition for holding deposits, $u'(m_t) = r - r_{mt}$, together with equations (**??**) and (4), imply

$$r_{mt} = r - \mu^{-1/(\nu-1)}(\kappa + \theta_t)^{1/(\nu-1)}, \tag{8}$$

$$u(m_t) = -\frac{\theta_t + \kappa}{\nu - 1}. \tag{9}$$

The return on bank deposits, r_{mt} is endogenous to θ_t. It decreases with θ_t, because financial repression reduces the resources available to renumerate bank depositors. The utility of deposits decreases linearly with the revenue from financial repression.

The welfare costs of taxation and financial repression can then be compared as follows. We assume that the total supply of real assets is constant, $a_{ht} + a_{bt} = a$. Consolidating the budget constraints (3), (4) and (5), and using (9) and (7) gives the following expression for the representative household's flow utility,

$$c_t + u(m_t) = \overline{c} - (\gamma_\tau \tau_t + \gamma_\theta \theta_t),$$

where $\overline{c} \equiv \bar{y} + ra - g - \kappa$ is potential consumption, i.e., the consumption level if output is undistorted by taxes, and $\gamma_\theta \equiv 1/(\nu - 1)$.

We assume that financial repression is more distortive than regular taxation,

$$\gamma_\theta > \gamma_\tau. \tag{10}$$

This condition is consistent with the literature on the optimal inflation tax, and is satisfied for plausible calibrations of the model. When given the choice, thus, a welfare-maximizing government always chooses to raise revenue through taxation rather than financial repression.[4]

Why use financial repression, then? Because it is not affected by the same inertia as fiscal policy. Financial repression involves policies that typically do not require explicit legislative approval. These policies are delegated to agencies, such as the central bank, that can act swiftly to address the financial instability that would result from a government default. In the model, we assume that the revenue from financial repression θ_t can be changed at any time.

We assume that the revenue from financial repression is non-negative, $\theta_t \geq 0$, i.e., that the government does not subsidize banks.

[4]Because of the linearity of the distortionary costs, our results are not driven by the second-best argument that all taxes should be used at the margin to equate their marginal costs.

Default. The government may default on its debt b_t at any time. The trade-off involved in a default is that it reduces the burden of taxation but involves an output cost γ_d.[5]

We assume that the debt of a defaulting government is reduced to $\underline{b}$. Creditors receive $\underline{b}/b$ unit of new debt per unit of old debt where b is the face value of debt at the time of default. We assume that a defaulting government implements a fiscal adjustment, but this assumption can easily be relaxed.

The government may default of its own volition, or it may be forced to default because creditors refuse to roll over its debt. We call the two types of default *opportunistic default* and *rollover default* respectively. We assume that the government can roll over its debt as long as the price is larger than a threshold,

$$q_t \geq \underline{q}, \tag{11}$$

and that a rollover default occurs when the price of debt falls to $\underline{q}$. Without this assumption the government would delay the default by diluting outstanding creditors until q_t falls to zero, which is unrealistic. Assumption (11) sets a limit on the government's ability to dilute creditors.

Equilibrium. We consider Markov equilibria in which exogenous and endogenous variables are functions of the state. Let us denote by $\omega_t = a, p$ the state of fiscal policy at time t (a for active and p for passive respectively). At any time t, the state of the economy is summarized by ω_t and b_t. We will proceed in two steps. First, we look for the equilibrium conditional on a financial repression policy

$$\theta = \Theta_\omega(b). \tag{12}$$

Then, we will look for financial repression policies that satisfy desirable properties (avoid default, maximize welfare).

Given $\Theta_\omega(\cdot)$, an equilibrium is composed of policy functions for the flow probability of a fiscal adjustment $\Phi(b)$ (equal to ϕ if the government implements the fiscal adjustment when given the opportunity in the active regime, and to zero if not), for default $D_\omega(b)$ (equal to 1 if the government defaults, and to 0 if not) as well as a function for the bond price $Q_\omega(b)$. We denote by $V_\omega(b)$ the value functions for household welfare. An equilibrium satisfies the following conditions:

1. The law of motion for the state variable b_t is (6) in the passive regime; in the active regime it is (5) with $\tau_t = \tau_a$, $\theta_t = \Theta_a(b_t)$ and $q_t = Q_a(b_t)$.

[5]Taking into account the default cost, the formula for output is $y_t = \overline{y} - \gamma_\tau \tau_t - \delta_t^T \gamma_d$ where δ_t^T is the Dirac delta function. The integral of the Dirac delta function in an infinitesimal interval around time T is equal to 1, that is, $\int_{T-\varepsilon}^{T+\varepsilon} \delta_t^T dt = 1$ when ε goes to zero.

2. The bond price function $Q_\omega(b)$ clears the market for government debt.

3. The policy functions for fiscal adjustment and default maximize household welfare, that is

$$\Phi(b) = \phi \quad \text{iff} \quad V_p(b) \geq V_a(b), \tag{13}$$
$$D_\omega(b) = 1 \quad \text{iff} \quad V_\omega(b) < V_d \text{ or } Q_\omega(b) = \underline{q}, \tag{14}$$

   where V_d is welfare under default.

4. The households' transversality condition

$$\lim_{t \to +\infty} E_0 \left\{ e^{-rt} b_t \right\} = 0. \tag{15}$$

Inflation. Government debt is real and cannot be inflated away. However, financial repression may have to be associated with inflation if there is a zero lower bound constraint on the nominal interest rate. The real interest rate on deposits is equal to the nominal interest rate minus the inflation rate, $r_{mt} = i_{mt} - \pi_t$. If i_{mt} cannot be negative, the rate of inflation π_t must be positive to make r_{mt} negative.

3 A tractable specification

This section focuses on a specification of the model in which analytical results can be derived: the case where fiscal policy is initially active and there are no bad fiscal shocks after a fiscal adjustment ($\omega_0 = a$ and $\mu = 0$). This special case is useful to guess the form of the equilibrium in the general case, and to develop intuition for the numerical results presented in the next section.

The analysis proceeds in two steps. First, we derive the equilibrium in the passive regime. Second, we derive the equilibrium in the active regime without financial repression. Finally, we characterize the financial repression policies that prevent default and maximize welfare.

3.1 The passive regime

After the government has implemented a fiscal adjustment, fiscal policy is in the passive regime. Welfare is given by the present discounted value of potential consumption minus the distortionary cost of the taxation required to finance the government

expenditure and repay the debt,

$$V_p(b) = \frac{\overline{c} - \gamma_\tau g}{r} - \gamma_\tau b, \tag{16}$$

(see derivation in Appendix B).

If the government defaults, it must repay the post-default debt $\underline{b}$ as well as the default cost. Welfare under default is given by,

$$V_d = V_p(\underline{b}) - \gamma_d = \frac{\overline{c} - \gamma_\tau g}{r} - \gamma_\tau \underline{b} - \gamma_d. \tag{17}$$

The government does not default if and only if $V_p(b) \geq V_d$, which is true if government debt is lower than the threshold

$$b_p^d = \underline{b} + \gamma_d/\gamma_\tau. \tag{18}$$

3.2 Equilibrium without financial repression

In the equilibrium without financial repression, government debt increases until there is either a fiscal adjustment or a default. Default occurs when debt reaches a critical threshold.

An equilibrium without financial repression cannot be default-free. There is a non-zero probability that b exceeds the threshold b_p^d above which the government prefers default over fiscal adjustment. This implies a violation of the transversality condition (15).

When does the government default? In the active regime, the price of government bonds is governed by the valuation equation

$$(r + \alpha) q_t = r + \alpha + \Phi(b_t)(1 - q_t) + \dot{q}_t.$$

The return on government debt is equal to the flow of payment on debt plus the valuation gain if the price of debt jumps up to 1 because of a fiscal adjustment, which happens with flow probability $\Phi(b_t)$. This equation can be re-written

$$\dot{q}_t = -[r + \alpha + \Phi(b_t)](1 - q_t). \tag{19}$$

Hence, the price of debt decreases over time if $q_t < 1$. If there is no fiscal adjustment, q_t reaches $\underline{q}$ in finite time. There is no opportunistic default before q_t reaches $\underline{q}$.[6]

[6]There is no opportunistic default because $V_a(b_t)$ decreases over time and reaches V_d when $q_t = \underline{q}$. Hence, $V_a(b_t)$ is larger than V_d before the rollover crisis.

Default, therefore, results from a rollover crisis. By arbitrage in perfect foresight, the market value of debt cannot jump at the time of default, implying that default occurs when debt reaches the threshold

$$b_a^d \equiv \frac{\underline{b}}{\underline{q}}. \tag{20}$$

We assume that the fiscal-incentives threshold (18) is higher than the default threshold (20), that is

$$\underline{q} \geq \left(1 + \frac{\gamma_d}{\gamma_\tau \underline{b}}\right)^{-1}. \tag{21}$$

This ensures that the government implements the fiscal adjustment whenever given the opportunity before a default, that is, $\Phi(b) = \phi$ in equation (19).

To characterize the dynamics of debt, observe that equations (5) and (19) can be written as the 2-dimensional differential system

$$\dot{b}_t = \frac{g - \tau_a}{q_t} + \left[\frac{r + \alpha}{q_t} - \alpha\right] b_t, \tag{22}$$

$$\dot{q}_t = -\left(r + \alpha + \phi\right)\left(1 - q_t\right). \tag{23}$$

The phase diagram for this system is analyzed in Appendix B. As shown there, there is a unique path leading to the point of default. This path defines, for any level of debt b, the equilibrium price of debt $Q_a(b)$, the time to default $T_a(b)$, and the probability of fiscal adjustment $P_a(b) = 1 - e^{-\phi T_a(b)}$. The debt price, time to default and probability of fiscal adjustment are all decreasing in the level of debt. If the flow probability of a fiscal adjustment, ϕ, goes to infinity, the probability of fiscal adjustment $P_a(b)$ and the price of debt $Q_a(b)$ converge to 1. That is, if there is no fiscal inertia, the government immediately implements the fiscal adjustment and there is no default.

That government debt has a non-zero maturity also plays an important role in the analysis, as shown by the following proposition.

Proposition 1 *(Zero maturity debt) Assume $\tau_a = g$. If α goes to infinity, for any $b \in \left(\underline{b}, b_a^d\right)$, the time to default $T_a(b)$ and the probability of fiscal adjustment $P_a(b)$ converge to zero.*

Proof. See Appendix B. ■

The intuition behind the impact of debt maturity involves creditor dilution. The government is expected to default at a known future time (conditional on no fiscal

adjustment). In spite of this, it is able to roll over its debt by diluting outstanding creditors, i.e., by making them share their claims with new lenders conditional on a default. Lower debt maturity reduces the government's ability to dilute outstanding creditors and hastens the default. In the limit case of zero-maturity debt, dilution is impossible and the default occurs immediately.

3.3 Optimal financial repression

We now consider equilibria in which the government uses financial repression to avoid a default. We first show that default can be prevented only if government debt does not exceed a threshold. We then characterize the welfare-maximizing financial repression policy that prevents default, and determine the conditions under which financial repression is preferable to a default.

Let us assume that the government extracts a revenue path $(\theta_t)_{t\geq 0}$ until a fiscal adjustment becomes possible, and stops financial repression afterwards. As shown in Appendix B, at any time t before the fiscal adjustment welfare is given by

$$U_t = V_p(b_t) - (\gamma_\theta - \gamma_\tau) \int_t^{+\infty} \theta_s e^{-(r+\phi)(s-t)} ds. \tag{24}$$

This is equal to the welfare level if the fiscal adjustment were implemented immediately minus the present discounted value of the extra cost of financial repression expected in the future. The fact that $U_t \leq V_p(b_t)$ implies that the government implements the fiscal adjustment whenever it has the opportunity.

In addition, the government must be unwilling to default, i.e., $U_t \geq V_d$ for all t. As stated in the following result this requires that government debt be not too high.

Proposition 2 *(Default-preventing financial repression) There exists a default-preventing financial repression policy if and only if government debt b is below the threshold:*

$$b_a^f \equiv b_p^d - (\gamma_\theta - \gamma_\tau) \frac{r\gamma_d/\gamma_\tau + \delta}{r\gamma_\theta + \phi\gamma_\tau}, \tag{25}$$

where $\delta \equiv g + \underline{b} - \tau_a$.

Proof. See Appendix B. ■

If debt exceeds the threshold given by (25), its repayment implies a distortionary cost of taxation and financial repression that is larger than the cost of default, so that the government is better off defaulting. The threshold b_a^f is lower than the

threshold for fiscal adjustment b_p^d because financial repression is more costly than regular taxation.

Financial repression can prevent a default if it keeps government debt below b_a^f. Conditional on this, what is the financial repression policy that maximizes welfare? We now characterize the welfare-maximizing path $(\theta_t)_{t\geq 0}$, effectively solving the Ramsey problem for financial repression. We will then consider the conditions under which this path is time consistent.

Proposition 3 *(Welfare-maximizing financial repression) The welfare-maximizing financial repression policy is to have no financial repression until government debt reaches the threshold b_a^f and then use financial repression to stabilize debt at that level.*

Proof. See Appendix B. ■

It is optimal to use financial repression *as a last resort* when debt reaches the threshold b_a^f. Before that, the government is better off waiting for a fiscal adjustment opportunity rather than trying to slow down debt accumulation with financial repression.

Finally, is financial repression preferable to a default? We compare two equilibria: the equilibrium without financial repression characterized in section 3.2, and the equilibrium with optimal financial repression characterized in Proposition 3.

Proposition 4 *(Financial repression vs. default) For any level of debt b, the equilibrium with financial repression yields a higher level of welfare than the equilibrium with default if and only if the debt threshold for financial repression is higher than the debt threshold for default,*

$$b_a^f > b_a^d. \tag{26}$$

This condition also ensures that the optimal financial repression path is time consistent.

Proof. See Appendix B. ■

To understand this result, observe that since $\theta = 0$ under optimal financial repression, the utility flow before the debt threshold is reached is the same in both equilibria. Welfare is also the same when the debt threshold is reached, since the no-default condition is binding when financial repression is implemented. The welfare comparison, thus, is entirely determined by the time that it takes to reach the debt threshold.

If (26) is satisfied, starting from any $b \leq b_a^d$, it takes more time to reach the debt threshold triggering financial repression than the threshold triggering default. Hence, welfare is higher with financial repression than with default. The policymaker has no incentive to deviate from the optimal financial repression policy described in Proposition 3.

Conversely, if (26) is not satisfied, there is a range of debt levels below b_a^d where welfare is lower under financial repression than under default. When debt is in this range, the policymaker is better off not implementing financial repression and gambling for the chance that a fiscal adjustment opportunity will come before default. A promise to implement financial repression is not time consistent.

As shown in the proof of Proposition 4, equations (10) and (26) are equivalent to

$$1 < \frac{\gamma_\theta}{\gamma_\tau} < 1 + (r + \phi)\frac{b_p^d - b_a^d}{\delta + r(b_a^d - \underline{b})}. \tag{27}$$

In words, there is scope for transitory financial repression if γ_θ is in a "goldilocks" region where it is neither too low nor too high relative to the cost of taxation γ_τ. The cost of financial repression should be higher than the cost of regular taxation for financial repression to be used only in last resort, but it should also not be too high for financial repression to be preferable to a default.[7] This goldilocks condition is satisfied for plausible calibrations of the model, as we will see.

4 Calibration

Our baseline calibration is reported in Table 1. The values for the costs of taxation, financial repression, and default are discussed in Section 4.1. Section 4.2 presents the calibration of the fiscal process, while Section 4.3 covers the remaining parameters. Section 4.4 discusses the implications of the calibration for the tractable model introduced in the previous section.

4.1 Costs of taxation, financial repression and default

Taxation. The calibration of γ_τ is based on a production economy model (presented in Appendix A) in which fiscal revenue is raised through taxation of output or labor income. The value of γ_τ is obtained by linearizing the model assuming a conventional value for the Frisch elasticity of labor supply (0.2).

[7] The cost of default is captured by b_p^d in expression (27). Raising the cost of default γ_d increases b_p^d and so expands the interval of γ_θ for which financial repression should be used.

The welfare cost of raising a given amount of tax revenue is higher with labor income taxation than with production taxation. In our baseline calibration, we obtain $\gamma_\tau = 0.07$ for a production tax and $\gamma_\tau = 0.21$ for a labor income tax. For an economy that relies on a mix of the two instruments, γ_τ should lie between these values, which motivates our baseline choice of $\gamma_\tau = 0.15$. We consider an interval of variation $(0.07, 0.3)$ for γ_τ.[8]

Financial repression. The parameter for the welfare cost of financial repression is given by $\gamma_\theta \equiv 1/(\nu - 1)$. To measure ν, we observe that if utility from holding money is given by (2), the demand for money follows a log-log specification $\log(m) = cst - e_m \log(r - r_m)$, where $e_m = 1/\nu$. It follows that

$$\gamma_\theta = \frac{1}{\frac{1}{e_m} - 1}, \tag{28}$$

where e_m is the elasticity of money demand with respect to the opportunity cost of holding money in a log-log model of money demand. In our model, m should include bank deposits as well as the money-like liabilities of non-bank institutions if they are subject to financial repression. Accordingly, m should be interpreted as a broad monetary aggregate, such as M2.

There is a literature estimating the welfare cost of inflation in micro-founded models with log-log money demand. Lucas (2000) argues that models based on the Allais-Baumol-Tobin inventory approach or the shopping-time approach imply an elasticity of 0.5, which he finds consistent with the behavior of M1 in the United States between 1900 and 1994. Subsequent work has generally found smaller elasticities.[9]

Based on this literature, we adopt a baseline value of $e_m = 0.2$, which implies $\gamma_\theta = 0.25$. We consider an interval of variation $(0.15, 0.40)$ for γ_θ.

Parameter μ_m must be calibrated to determine the level of inflation required by financial repression. We use the first-order condition $u'(m) = r - r_m$ together with the observation that, over 2000–2005, M2 amounted to approximately 50% of GDP in

[8] An alternative approach to calibrating γ_τ relies on the literature estimating the long-run impact of taxation on output (Blanchard and Perotti, 2002; Romer and Romer, 2010). Matching these estimates implies $\gamma_\tau \approx 1/3$, which corresponds to the upper bound of our calibration interval (see Appendix A).

[9] Teles and Zhou (2005) estimate $e_m = 0.32$ for M1 and $e_m = 0.2$ for MZM in the post-1980 United States. Haug and Tam (2007) estimate $e_m = 0.40$ for M1 over 1900–1999 and $e_m = 0.29$ for M2 over 1869–1999. Using quarterly data for 1980–2006, Ireland (2009) finds an elasticity slightly below 0.1 for M1. Benati et al. (2021) estimate e_m for M1 in 38 countries and find values ranging from 0.1 to 0.4; for the United States, they report an elasticity of 0.2 for a monetary aggregate that includes M1 and money market deposit accounts.

the United States, while the opportunity cost of holding M2 was about 2% (Judson, Schlusche and Wong, 2014).[10] This implies $\mu_m = 1/1600$.

Default. The literature assumes a wide range of output costs associated with sovereign default. Defaults may entail large cumulative output losses if they depress output below trend for extended periods, as suggested by Cerra and Saxena (2008). In their model of long-term sovereign debt, Hatchondo and Martinez (2009) consider default costs ranging from 10% to 50% of output. In contrast, models that seek to match the cyclical properties of default-related variables under short-term debt typically assume smaller and procyclical default costs (Arellano, 2008; Aguiar and Gopinath, 2006; Pouzo and Presno, 2022).

Our objective is to match the low-frequency dynamics of government debt, which in the data are characterized by long debt-accumulation episodes that can push debt to high levels without triggering default or financial repression. For instance, the Japanese government has not resorted to financial repression (as defined in this paper) despite public debt exceeding 250% of GDP. Using (25) together with the remaining parameter values, we find that b_a^f exceeds 250% only if $\gamma_d > 0.33$, that is, if the default cost exceeds 33% of GDP. We adopt $\gamma_d = 0.4$ in the baseline calibration. Given the considerable uncertainty surrounding this parameter, we consider an interval $(0.3, 0.5)$ in our robustness analysis.

4.2 Fiscal process

The fiscal policy process is calibrated to match empirical moments related to the long swings in the debt-to-GDP ratio observed in the data. We identify debt-increase and debt-decrease episodes in the same way as Zhang (2022). A debt-increase episode starts in a year where the government debt to GDP ratio increases by more than 1%, and ends when the debt to GDP ratio either declines by more 1% for three consecutive years, or falls by more than 4% in one year. A debt-decrease episode starts when the debt-to-GDP ratio falls and ends when the ratio increases for two years in a row or by more than 6% in one year. The episodes must last for 10 years or more to be included. This procedure identifies 50 debt episodes in 23 advanced economies over the period 1951-2022.[11] Figure 1 illustrates the results of this identification method

[10] An opportunity cost of 2% is also implied by the model when the banking system's operating cost κ is set to 1%, as assumed in the baseline calibration.

[11] We use the IMF Public Finances in Modern History Database (Mauro et al., 2015). The country sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Greece, Iceland, Ireland, Italy, Japan, Korea, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, and the United States.

Table 1: Baseline calibration

Parameter	Value	Source
$\bar{y}$	1.051	Normalization $y = 1$
r	2% $(0.5\%, 3\%)$	Barrett (2018)
α	0.15	Average maturity of debt 6 years
g	0.33	Share of US general government spending in GDP (2019)
$\underline{b}$	0.6	Maastricht Treaty benchmark
$\underline{q}$	0.5	Haircut in 2011 Greek default
κ	0.01	US Banks' Overhead Costs in % of GDP (2000-2020)
γ_τ	0.15 $(0.07, 0.3)$	Linearized production economy with Frisch elasticity = 0.2 (see Appendix A)
γ_θ	0.25 $(0.15, 0.4)$	Equation (28) with interest rate elasticity of money demand $e_m = 0.2$
γ_d	0.4 $(0.3, 0.5)$	No financial repression for $b \leq 250\%$ implies $\gamma_d > 0.33$
μ_m	1/1600	M2/GDP = 0.5 for $r - r_m = 2\%$ (Judson, Schlusche and Wong, 2014)
σ	0.10	Average $-\Delta b/(b - \underline{b})$ for $b > 80\%$ for advanced economies (1951-2022)
δ	0.036	Average primary deficit/GDP $+r\underline{b}$ for advanced economies (1951-2022)
ϕ	0.13	Average length of debt increase episode= 15.6 years
μ	0.20	Average length of debt decrease episode= 14.8 years



Figure 1: Debt-to-GDP ratios in selected advanced economies. Debt increase episodes are highligted in red and debt decrease episodes are highlighted in green (Source: IMF Public Finances in Modern History Database and author's computations.

for selected economies.

Parameter δ is equal to $g - \tau_a + r\underline{b}$, that is, the primary deficit in the active fiscal regime plus the interest payment on $\underline{b}$. In our sample of advanced economies, the average primary deficit when it is positive is 2.4% of GDP. With $r\overline{b} = 1.2\%$, this implies $\delta = 3.6\%$.

Parameter σ governs the speed at which the government debt to GDP ratio decreases in the passive regime. In the model,

$$\sigma \approx \frac{b_t - b_{t+1}}{b_t - \overline{b}},$$

where b_t and b_{t+1} denote government debt in consecutive years during the passive regime. In the data, we estimate σ by averaging $(b_t - b_{t+1})/(b_t - \overline{b})$ across all observations such that $b_t > b_{t+1} > 80\%$. This gives $\sigma = 0.10$.

Finally, we calibrate the transition probabilities ϕ and μ using the observed duration of debt episodes. For the parameter values reported in Table 1, the model with financial repression reproduces the average lengths of debt-increase and debt-decrease episodes observed in the data (15.6 and 14.8 years, respectively).

4.3 Other parameters

We normalize output y to unity, so that all other macroeconomic variables can be interpreted as shares of output. Output is assumed to equal one when government debt is equal to $\underline{b}$, that is,

$$y = \overline{y} - \gamma_\tau \left(g + r\underline{b}\right) = 1.$$

For the baseline calibration, this implies $\overline{y} = 1.051$, as reported in Table 1.

The real interest rate r is set to 2% in the baseline calibration. While the model abstracts from trend growth, in a more general setting r should be interpreted as the interest-growth differential. There is ongoing debate regarding the sign and magnitude of this differential (see Blanchard, 2019). Barrett (2018) points out that confidence intervals for estimates of the long-run interest-growth differential are wide, and that values of 1% or 2% cannot be ruled out at conventional significance levels even in countries where the point estimate is negative.

The debt repayment parameter α is set to 0.15, implying a government debt duration of approximately six years, close to the average maturity of government debt in OECD countries. Parameter g is set to 33% to match the share of general

government spending in GDP in the United States.[12] The target level of debt under the active fiscal rule is set to 60%, in reference to the Maastricht Treaty. The value $\underline{q} = 50\%$ is motivated by the 50% haircut born by private holders of Greek government debt during the 2011 Greek default.

Parameter κ represents the operating cost of banks as a share of GDP. In the US, banks' overhead costs net of taxes averaged 1.2% of GDP over the period 2010–2020. We round this value down to 1%, reflecting the fact that part of these costs was incurred in managing liabilities that are not included in M2.

4.4 Quantitative implications in the tractable model

Table 2 summarizes the quantitative implications of the tractable model under the baseline calibration.

Table 2: Tractable model under baseline calibration

Default threshold in passive regime, b_p^d	327%
Default threshold in active regime without financial repression, b_a^d	120%
Fiscal incentive condition (21)	$\underline{q} > 0.18$
Threshold for financial repression, b_a^f	294%
Goldilocks condition (27)	$1 < \frac{\gamma_\theta}{\gamma_\tau} < 8.3$

In the absence of financial repression, a debt rollover crisis is triggered when the face value of debt reaches $b_a^d = \underline{b}/\underline{q} = 120\%$ of GDP. This is much lower than the debt threshold under which the government is willing to implement the fiscal adjustment in the passive regime, which is $b_p^d = 327\%$ by equation (18).

The incentive condition (21) ensures that the government implements the fiscal adjustment when given the opportunity. Under the baseline calibration, the right-hand side of this inequality equals 18%, implying that the incentive condition is satisfied as long as the debt price triggering a rollover crisis is above 18 cents on the dollar. Since we assume $\underline{q} = 50\%$, condition (21) is satisfied .

Financial repression is optimally implemented when government debt reaches $b_a^f = 294\%$ of GDP. This threshold exceeds the default threshold in the absence of financial repression, b_a^d, implying, by Proposition 4, that financial repression dominates default in welfare terms.

[12] The share of general government spending in GDP is higher in most other advanced economies—about 43% on average for the G7 in 2019. It is lower for central government spending (approximately 30% for the G7). The level of g does not materially affect our results except through its influence on γ_τ, the marginal welfare cost of taxation.

The final row of Table 2 reports the "Goldilocks" condition (27). This condition is satisfied under the baseline calibration, since $\gamma_\theta/\gamma_\tau = 1.66$.

5 Quantitative Results

This section presents the quantitative properties of the general model, in which fiscal policy can switch between active and passive regimes. Section 5.1 discusses the quantitative implications of the model under the baseline calibration, while Section 5.2 provides sensitivity analysis.

5.1 Baseline calibration

Figure 2 plots welfare as a function of government debt, with and without financial repression, as well as under the constrained first-best allocation, defined as the allocation if the economy always remains in the passive regime. In all cases welfare declines with the level of debt, as higher debt entails either larger tax distortions or a higher probability of default.

Welfare is much closer to the first-best level under optimal financial repression than in the absence of financial repression. The welfare gap between the constrained first best and financial repression reflects the fact that financial repression is more distortive than conventional taxation. This gap, however, is virtually indistinguishable as long as debt remains below 200% of GDP. By contrast, welfare is substantially lower at all debt levels in the absence of financial repression. The welfare gap of about 2 implies that default generates a welfare loss equivalent to roughly 200% of GDP relative to financial repression, which is considerable.

To build intuition for these results, we simulate the economy over a long horizon both with and without financial repression, and record the frequency of default and financial repression episodes. Figure 3 illustrates one such simulation, reporting the path of the face value of government debt over 100 years, starting from identical initial conditions. The left-hand panel shows the economy with financial repression, while the right-hand panel shows the economy without financial repression.

Optimal financial repression is triggered only when debt reaches 277% of GDP, which occurs infrequently in equilibrium (on average once every 110 years). Prior to that point, the government can roll over its debt at the safe interest rate, stabilizing debt dynamics. In most cases, the government has the opportunity to implement fiscal adjustment before debt reaches the threshold for financial repression. For example, no financial repression episode occurs in the simulated debt path shown in Figure 3.

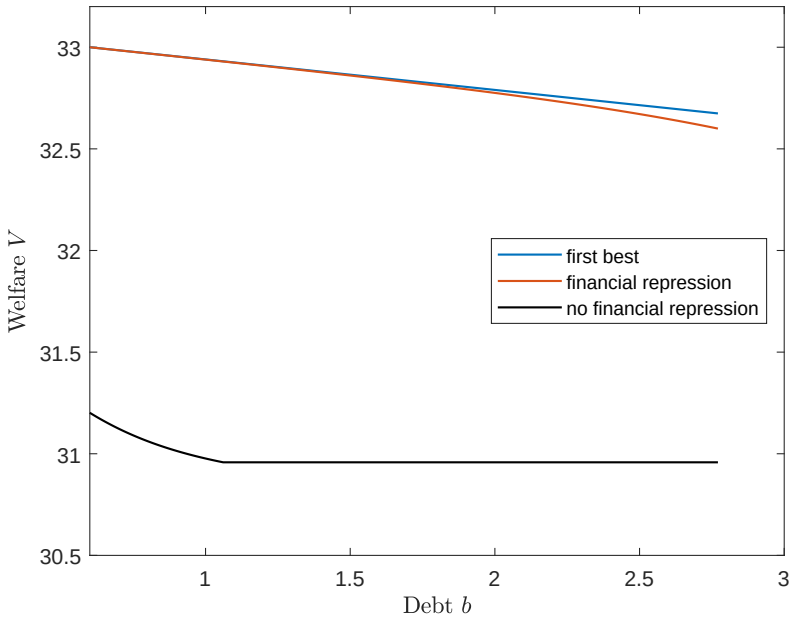


Figure 2: Variation of welfare with debt (Source: author's computations.

By contrast, in the absence of financial repression, debt dynamics are destabilized by the default premium embedded in the interest rate on government debt. Default occurs when debt reaches 106% of GDP. This threshold is lower than the corresponding value in the tractable model (120%) because, following a default, the market value of debt is reduced by the risk of another default, implying that the debt price reaches $\underline{q}$ at a lower level of debt. Once fiscal policy switches to the active regime, the combination of a primary deficit and an elevated interest rate causes debt to grow rapidly. As a result, defaults occur frequently—on average every 11 years—as illustrated by the right-hand panel of Figure 3, which features multiple defaults over a 100-year horizon. This is extremely costly in welfare terms, since each default entails an output loss of 40% of GDP.

How large is the inflation rate associated with financial repression? Financial repression must generate quasi-fiscal revenue equal to $\theta = \delta + r\left(b_a^f - \underline{b}\right) = 7.9\%$ of GDP. Using equations (8) and (2), the inflation rate is given by

$$\pi = \mu_m^{-1/(\nu-1)}(\theta + \kappa)^{\nu/(\nu-1)} - r.$$

The implied annual inflation rate is 28.9%. While this rate is high, it remains well below hyperinflation levels. The model can generate substantial quasi-fiscal rev-

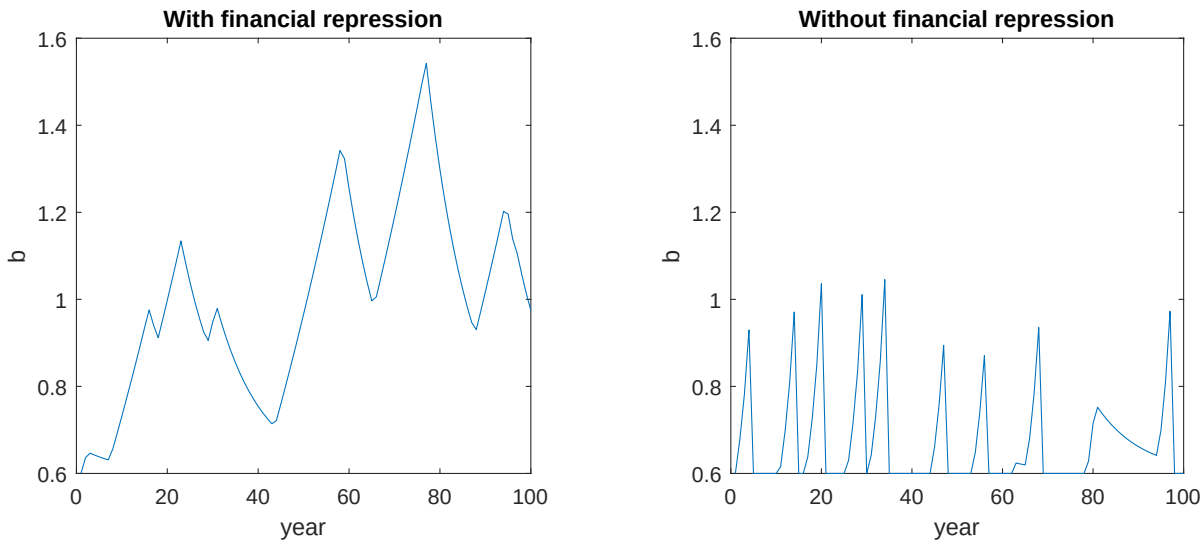


Figure 3: Debt dynamics simulations, with financial repression (l.h.s.) and without financial repression (r.h.s.)

enue without resorting to extreme inflation because seigniorage is levied on a broad monetary aggregate rather than on base money alone.

5.2 Sensitivity

Parameters α and $\underline{q}$ influence the debt dynamics in the absence of financial repression. Lowering α (i.e. lengthening the maturity of government debt) has an a priori ambiguous effect on the speed of accumulation of debt. It lowers the flow of debt that needs to be rolled over at any given point in time but increases the default premium since a larger fraction of the debt will be defaulted upon. Starting from our benchmark calibration, lengthening the maturity of debt slightly lowers the frequency of default. For example, lowering α from 0.15 to 0.08 (which corresponds to an increase in debt duration from 5.9 to 10 years) lowers the frequency of default, from once every 11.4 years to once every 10.9 years. This has a small welfare impact.

Similarly, lowering the debt price threshold $\underline{q}$ reduces the frequency of default. For example, reducing $\underline{q}$ from 50% to 30% significantly increases the debt default threshold, to 181% of GDP. Defaults occur less frequently, once every 15.5 years on

average. Decreasing $\overline{q}$ reduces the welfare gains from financial repression, but those gains remain substantial. In the active regime for $b = \underline{b}$, these gains still amount to 125% of GDP if $\underline{q} = 30\%$, against 180% of GDP under the benchmark calibration.

Changing the costs γ_θ and γ_d affects b_a^f, the debt threshold triggering financial repression. The no-default constraint is binding at this threshold, implying that the threshold is increasing with γ_d, the cost of default. The debt threshold varies between 216% and 338% of GDP when γ_d varies between 30% and 50% of GDP. Raising γ_d increases the welfare gains from financial repression because it makes defaults more costly in the equilibrium without financial repression, and repression less frequent in the equilibrium with optimal financial repression.

The benefits of financial repression are obviously decreasing in the cost of financial repression, γ_θ. This is not only because repression is more costly when it occurs, but also because repression occurs more often in equilibrium. The threshold for financial repression, b_a^f, is decreasing with γ_θ.[13] If γ_θ increases from 0.25 (its value in the benchmark calibration) to 0.4, the threshold b_a^f decreases from 277% to 217% of GDP, and the frequency of financial repression increases from once every 110 years to once every 64 years on average.[14]

Our results are also sensitive to the parameters governing the fiscal process, σ, δ, ϕ and μ. To see how, we write the long-run expected change in the debt ratio conditional on the debt level as

$$\begin{aligned} \lim_{t\to+\infty} E\left(\dot{b}_t | b_t\right) &= -\frac{\phi}{\phi+\mu}\sigma\left(b_t - \underline{b}\right) + \frac{\mu}{\phi+\mu}\left[r\left(b_t - \underline{b}\right) + \delta\right], \\ &= \frac{\mu r - \phi\sigma}{\phi+\mu}\left(b_t - \underline{b}\right) + \frac{\mu\delta}{\phi+\mu}. \end{aligned} \tag{29}$$

The first line uses the fact that the unconditional probabilities of the passive and active regimes are given by $\phi/(\phi+\mu)$ and $\mu/(\phi+\mu)$ respectively, and that the rate of debt increase is given by (6) in the passive regime and by $\dot{b}_t = r\left(b_t - \underline{b}\right) + \delta$ in the active regime.

Equation (29) implies that if $\mu r > \phi\sigma$, there is an upward drift in debt in the sense that debt is expected to increase for any level of debt b_t. In contrast, if $\mu r < \phi\sigma$,

[13] This is an implication of equation (25) in the tractable case.

[14] Raising the cost of conventional taxation γ_τ makes default more tempting and lowers the threshold for financial repression. If one doubles γ_τ from 0.15 to 0.3 at the same time as γ_θ increases to 0.4, b_a^f is lowered to 173% of GDP and financial repression occurs once every 43 years on average.

whether debt is expected to increase depends on how it compares with the threshold

$$b^* = \underline{b} + \frac{\mu\delta}{\phi\sigma - \mu r}. \tag{30}$$

Debt is expected to increase (decrease) if it is below(above) b^*. Debt fluctuates around b^* in the long run.

Under the benchmark calibration, we have $\mu r < \phi\sigma$ and $b^* = 140\%$ of GDP. This is a relatively high level of debt, but it is consistent with the upward drift in the debt levels observed since 2000 in the data. Even so, the important point is that b^* is significantly below b_a^f, which explains why financial repression is not triggered very often. Decreasing the probability of fiscal adjustment ϕ, or increasing the probability of bad fiscal shock μ would imply that debt is closer to b_a^f on average, leading to a higher frequency of financial repression.

6 Extensions

We discuss two extensions of the model, the case where debt is nominal and the case where the banking sector's government debt purchase is endogenous.

6.1 Nominal debt

Our model assumed that government debt is real (i.e., CPI-indexed) but in the real world, most government debt is nominal. The fact that debt is nominal plays a central role in the fiscal theory of the price level.

Inflation reduces the real level of outstanding debt if it is nominal and has a non-zero maturity. However, expected inflation raises the nominal interest rate, which makes debt increase faster. We can show that in equilibrium the two effects balance each other, in the sense that a policy of state-contingent inflation does not change welfare relative to a commitment to zero inflation. We now proceed to explain the logic behind this neutrality result.

We now assume that government debt has predetermined nominal payoffs. One unit of debt issued at time t has a nominal payoff of $P_t(r+\alpha)e^{-\alpha s}$ at time $t+s$ where P_t is the nominal price of the consumption good at time t. The nominal payoff is indexed to the nominal price level at the time of debt issuance, P_t, rather than the price level at the time of payment, P_s. As shown in Appendix B, the government budget constraint (5) is replaced by

$$g + (r+\alpha)b_t = \tau_t + \theta_t + q_t\left[\dot{b}_t + (\alpha + \pi_t)b_t\right]. \tag{31}$$

The only difference with (5) is that on the right-hand side, the rate at which real debt "melts" includes a term for inflation.

Similarly, the valuation equation for the price of debt becomes[15]

$$(r + \alpha + \pi_t)q_t = r + \alpha + \dot{q}_t. \tag{32}$$

On the left-hand side, the equilibrium real return includes a term that compensates investors for inflation. The model with real debt is the special case where there is zero inflation.

Simple manipulations of (31) and (32) imply that the market value of debt

$$d_t \equiv q_t b_t, \tag{33}$$

satisfies the valuation equation

$$rd_t = \tau_t + \theta_t - g + \dot{d}_t. \tag{34}$$

The return on debt is equal to the primary surplus plus the valuation gain.

Equation (34) is the same as budget constraint (5) if there is no default risk and $q_t = 1$. Thus, the problem of determining the optimal default-preventing financial repression *cum* inflation policies is isomorphous to the problem that we have already solved when the policymaker could use only financial repression. The same results can be derived, replacing b_t by d_t and welfare is unchanged by inflation.

This does not mean that inflation cannot affect welfare, but it can do so only when there is an unexpected change in the policy regime. If, starting from an equilibrium with a commitment to zero inflation, a positive inflation policy $\pi_t = \Pi_{\omega_t}(b_t)$ is unexpectedly announced, the decrease in the market value of debt occurring at the time of the announcement raises welfare (by reducing the tax distortions involved in the repayment of the debt). However, conditional on the initial market value of debt, making inflation contingent on the level of debt or the fiscal regime does not affect welfare. This is true even though the inflation rule may make inflation sometimes jump stochastically, provided that these jumps are part of a rational expectations equilibrium.

This neutrality result should be qualified in different ways. First, in the baseline model, inflation has a zero welfare cost. The model does not include the Keynesian distortions that result from nominal stickiness. Inflation is costly only if households are not compensated for inflation with a higher nominal return on deposits, that is,

[15]Observe that the notation $\dot{q}_t$ encompasses possible jumps between regimes: for example, in the active regime, $\dot{q}_t = \dot{q}_{at} + \phi(q_{pt} - q_{at})$.

the cost of inflation is that of financial repression. If inflation had an intrinsic cost, the government should commit to a zero-inflation policy.[16]

Second, assuming rational expectations might seem a little extreme. If inflation and financial repression are used only once a century or so, agents might conceivably be taken by surprise when this happens. This could make inflationary surprises a component of the optimal policy mix.

6.2 Bank lending to government

In the baseline model, we assumed that the banking sector did not purchase government debt. However, in the real world, they do, and some authors have interpreted such policies as a form of financial repression. We now assume that the banking sector can lend ℓ_t to the government and write the government's total debt as

$$d_t = \ell_t + b_t, \tag{35}$$

where, like before, b_t is the government debt held by the non-bank sector. Now, ℓ_t is a new policy instrument that is set by the government.

A standard assumption is that the government does not default on bank-held debt. The government does not gain anything from defaulting on the central bank. In fact, if one consolidates the central bank into the government, the central bank liabilities (reserves and currency) should be viewed as a form of non-defaultable government debt—a point emphasized by MMTs. Furthermore, it is very costly to default on commercial banks due to the large macroeconomic costs of banking crises (Chari, Dovis and Kehoe, 2020).[17]

Effectively, this makes one component of government debt, ℓ_t, non-defaultable. This gives the government a commitment technology that removes the default risk. If issuing ℓ_t entailed no other cost than the distortionary cost of repaying the debt, the government could avid default by issuing ℓ_t until the adjustment opportunity arrives.

However, increasing ℓ_t may entail costs. First, there is the cost of crowding out bank lending to the real sector. If this cost is avoided by raising the size of the banking sector's balance sheet, there is the cost of an excessively large balance sheet. We call ℓ_t balance-sheet financial repression and θ_t quasi-fiscal repression.

[16] A commitment would be necessary because of the time inconsistency associated with the inflation policy (the government is tempted to engineer higher-than-announced inflation once nominal debt has been issued).

[17] As observed by [Ventura and co-authors], selective default requires market segmentation at the time of default if debt is traded in a secondary market.

Jeanne (2025) solves for the optimal policy ℓ_t and θ_t in a tractable version of the model. The solution takes a simple and intuitive form. There is a pecking order in the use of the two forms (balance-sheet and quasi-fiscal) financial repression. The social planner starts by increasing ℓ_t, i.e., balance sheet financial repression. When the cost of that form of repression becomes too large, the social planner switches to quasi-fiscal repression θ_t. Like in this paper, quasi-fiscal repression is used as a last resort.

Difference with the analysis in this paper.

7 Conclusions

We presented a model where the government makes endogenous policy choices over fiscal policy, financial repression and default. A calibration of the model implies that financial repression is more costly than regular taxation but less costly than a default. It follows that financial repression should be used to contain the increase in government debt and avoid a default when fiscal policy is in a deadlock. Because the expectation of financial repression stabilizes the debt dynamics the government is likely to implement a fiscal adjustment before debt reaches the threshold so that financial repression is rarely implemented in equilibrium. However completely ruling out financial repression leads to chronic default premia and frequent defaults in equilibrium.

This has implications for the optimal governance of monetary and financial policy. Our analysis does not invalidate the reasons to insulate monetary policy from short-run political influences and entrust it to an independent central bank. It suggests however the optimality of an escape clause: the objective of avoiding a government default should sometimes override the objectives of monetary policy in normal times. This escape clause should be used very rarely. We have have not discussed at length the governance of the escape clause itself because the assumption of a benevolent government ensures that monetary financing is used appropriately. This question becomes more interesting if a political agency problem makes the government's objective function differ from true social welfare.

The analysis could be extended in several other directions. The micro-foundations behind the cost of financial repression and the cost of default could be further developed. Financial repression could have costs that have not been included in the analysis. Mandating the banking sector to lend to the government could come at the cost of not financing profitable investments in the private sector. The cost of government default could also be more severe when banks hold larger amounts of government debt. Finally, our analysis was based on exogenous active and passive

fiscal policy rules. It would be interesting to better endogenize the policy rules.

Another path for further research is the implications of the current framework for monetary unions. If the law of one price applies the member countries must have the same inflation rate. If there is perfect capital mobility financial repression must be imposed at the level of the union. This implies that a country that needs financial repression can externalize its costs to the rest of the union. This changes the incentives to fiscally adjust in ways that would be interesting to analyze in future research.

APPENDIX A. MODEL WITH ENDOGENOUS OUTPUT

This appendix presents an extension of the baseline model in which output is produced with labor. This allows us to calibrate the parameters for the cost of fiscal revenue, γ_τ. We present two versions of the model, one with a production tax and one with a tax on labor income.

Assumptions. Assume individuals maximize

$$U_0 = E_0 \left\{ \int_0^{+\infty} \left[c_t + u\left(m_t\right) - v\left(\ell_t\right) \right] e^{-rt} dt \right\}, \tag{36}$$

where ℓ is labor and the disutility of labor $v\left(\ell\right)$ is increasing and convex.

Output is produced with labor, $y = f\left(\ell\right)$, where the production function is given by

$$f\left(\ell\right) = A\ell^{\eta}.$$

Fiscal revenue is financed by a tax on production τ_y so that

$$\tau = \tau_y f(\ell). \tag{37}$$

We linearize the model around the point where fiscal revenue covers government expenditures, $\tau = g$.

Calibrating γ_τ. We calibrate γ_τ by linearizing welfare

$$\frac{d}{d\tau}\left[f\left(\ell\right) - v\left(\ell\right) \right] = -\gamma_\tau, \tag{38}$$

where the link between ℓ and τ is implicitly defined by equation (37) and

$$\left(1 - \tau_y\right) f'\left(\ell\right) = v'\left(\ell\right). \tag{39}$$

Equation (39) is the firms' first-order condition for the maximization of their profits given that the real wage w is equal to $f'(\ell)$.

Equation (38), (39), and $f'\left(\ell\right)\ell = \eta f(\ell)$ imply

$$\gamma_\tau = -\left[f'\left(\ell\right) - v'\left(\ell\right) \right] \frac{d\ell}{d\tau} = -\tau_y f'\left(\ell\right) \frac{d\ell}{d\tau} = -\eta \frac{\tau}{\ell} \frac{d\ell}{d\tau}. \tag{40}$$

Log differentiating (39) gives

$$\frac{d\tau_y}{1-\tau_y} = -\left(1-\eta+\psi\right)\frac{d\ell}{\ell}, \tag{41}$$

where $\psi = v"\left(\ell\right)\ell/v'\left(\ell\right)$is the inverse of the Frisch elasticity of labor supply. Log differentiating (37) gives

$$\begin{aligned}
\frac{d\tau}{\tau} &= \frac{d\tau_y}{\tau_y} + \eta\frac{d\ell}{\ell}, \\
&= -\frac{1-\tau_y}{\tau_y}\left(1-\eta+\psi\right)\frac{d\ell}{\ell} + \eta\frac{d\ell}{\ell}, \\
&= -\left[\left(\frac{y}{g}-1\right)\left(1-\eta+\psi\right)-\eta\right]\frac{d\ell}{\ell},
\end{aligned} \tag{42}$$

where the second line is derived using (41) and the last line uses $g = \tau_y y$ to substitute out τ_y. Using (42) to substitute out $\frac{\tau}{\ell}\frac{d\ell}{d\tau}$ in (40) finally gives

$$\gamma_\tau = \left[\left(\frac{y}{g}-1\right)\frac{1-\eta+\psi}{\eta}-1\right]^{-1}. \tag{43}$$

A conventional value for the Frisch elasticity in the real business cycle literature is 0.2, which implies $\psi = 5$. Assuming $\eta = 2/3$ and $y/g = 3$, equation (43) gives $\gamma_\tau = 0.07$.

Output impact of taxation. Using (40) and $\tau = g$ the impact of taxation on output is given by

$$\frac{dy}{d\tau} = f'(\ell)\frac{d\ell}{d\tau} = \frac{f'(\ell)\ell}{\tau}\frac{\tau}{\ell}\frac{d\ell}{d\tau} = \eta\frac{y}{g}\frac{\tau}{\ell}\frac{d\ell}{d\tau} = -\frac{y}{g}\gamma_\tau. \tag{44}$$

For the baseline calibration reported in Table 1, $\gamma_\tau = 0.15$ and $y/g = 3$ imply $\frac{dy}{d\tau} = -0.45$. This is lower in absolute value than some estimates from the empirical literature, which are closer to -1 (Romer and Romer, 2010). Given $y/g = 3$, setting $\frac{dy}{d\tau} = -1$ requires $\gamma_\tau = 1/3$. This is consistent with (40) if $\psi = 1$, i.e., if the Frisch elasticity of labor supply is equal to 1.

Tax on labor income. We now assume that fiscal revenue is financed by a tax on labor income τ_ℓ so that

$$\tau = \tau_\ell w\ell, \tag{45}$$

where $w = f'(\ell)$ is the real wage. Equation (38) still applies, and equations (37) and (39) are replaced by

$$\tau = \eta \tau_\ell f(\ell), \tag{46}$$

$$(1 - \tau_\ell) f'(\ell) = v'(\ell). \tag{47}$$

Equation (46) substitutes out w in (45) using the firms' demand for labor, $f'(\ell) = w$, and $f'(\ell)\ell = \eta\ell$. Equation (47) is the labor supply equation.

Going through the same steps as before we obtain

$$\gamma_\tau = -\frac{\tau}{\ell}\frac{d\ell}{d\tau}, \tag{48}$$

and

$$\frac{d\tau}{\tau} = -\left[\left(\eta\frac{y}{g} - 1\right)(1 - \eta + \psi) - \eta\right]\frac{d\ell}{\ell}. \tag{49}$$

It follows that γ_τ is given by,

$$\gamma_\tau = \left[\left(\eta\frac{y}{g} - 1\right)(1 - \eta + \psi) - \eta\right]^{-1}. \tag{50}$$

Comparing (43) and (50) shows that the welfare impact of increasing tax revenue by a given amount is larger with a tax on labor income than with a tax on production. The difference is quantitatively significant. For the baseline calibration with $\psi = 5$ equation (50) gives $\gamma_\tau = 0.21$, more than three times the value obtained with a tax on production.

The output impact of taxation. Another source of information to calibrate γ_τ is the literature that estimates the impact of taxation on output (Blanchard and Perotti, 2002; Romer and Romer, 2010). Using a narrative approach, Romer and Romer (2010) found that raising tax revenue by 1 % of GDP lowers GDP by at least 1 % (Blanchard and Perotti find lower estimates using a VAR analysis).

Parameter γ_τ is the derivative of welfare, i.e., output *minus the disutility of labor*, with respect to tax revenue. This is smaller than the derivative of output with respect to tax revenue because labor decreases with taxation. In the model with a production tax, the output impact of taxation is given by

$$\frac{dy}{d\tau} = f'(\ell)\frac{d\ell}{d\tau} = \frac{f'(\ell)\ell}{\tau}\frac{\tau}{\ell}\frac{d\ell}{d\tau} = \eta\frac{y}{g}\frac{\tau}{\ell}\frac{d\ell}{d\tau} = -\eta\frac{y}{g}\gamma_\tau,$$

where γ_τ is given by (50). If $y/g = 3$, the impact of taxation on output is three times its impact on welfare. For our baseline calibration $\gamma_\tau = 0.15$, raising fiscal

revenue by 1% of GDP lowers GDP by 0.45%, about one half of the effect estimated by Romer and Romer (2010). In order to match their estimate, one would need to assume $\gamma_\tau = 1/3$. This explains the interval of variation $(0.07, 0.3)$ that we assume for γ_τ.

APPENDIX B. PROOFS

Derivation of equation (16). Tbc

Phase diagram for (22)-(23). The phase diagram is reported in Figure 4, together with the unique path that goes through the point $\left(\underline{q}, b_a^d\right)$ corresponding to default (point D). For any initial debt level b_0 the path to default determines one unique debt price $Q_a(b_0)$ (point A).

One can see from the figure that a higher debt level is associated with a lower debt price, a shorter time to default and a lower probability of fiscal adjustment.

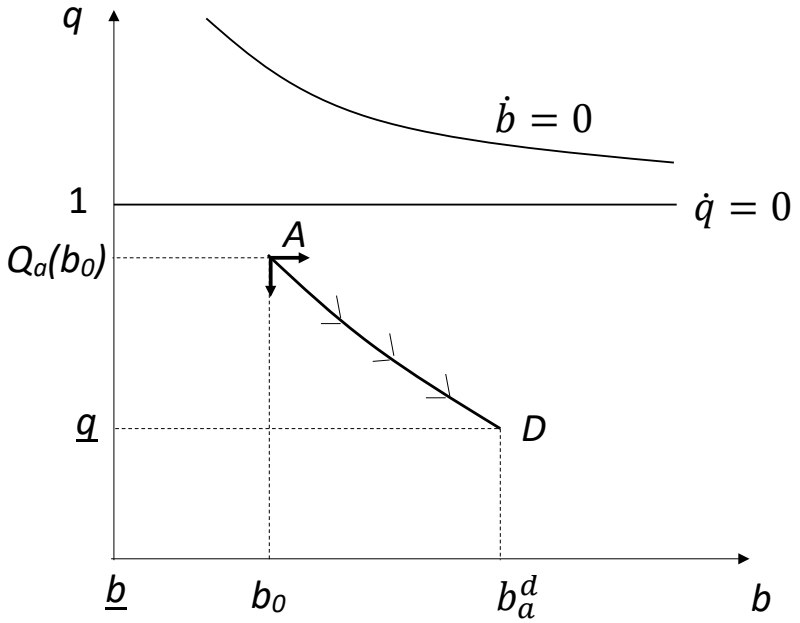


Figure 4: Dynamics of b and q (equations (22) and (23))

Dividing (23) by (22), the slope of path AD is

$$\frac{dq}{db} = -\frac{(r+\alpha+\phi)(1-q)}{\frac{g-\tau_a}{q} + \left(\frac{r+\alpha}{q} - \alpha\right) b}. \tag{51}$$

Increasing ϕ steepens this slope, implying that $Q_a(b)$ increases for all b. It then follows by equation (22) that b_t grows more slowly and takes more time to reach b_a^d. This increases $T_a(b)$ and $P_a(b)$.

Proof of Proposition 1. If $\tau_a = g$ equations (22) and (23) imply

$$\frac{\dot{b}_t}{b_t} = r + (r+\alpha)\frac{1-q_t}{q_t} = r - \frac{r+\alpha}{r+\alpha+\phi}\frac{\dot{q}_t}{q_t}.$$

Integrating (23) and the equation above gives

$$1 - q_t = (1-q_0)\, e^{(r+\alpha+\phi)t}, \tag{52}$$

$$b_t = b_0 e^{rt}\left(\frac{q_t}{q_0}\right)^{-(r+\alpha)/(r+\alpha+\phi)}. \tag{53}$$

Equations (52) and (53) can be used to derive implicit equations for the policy functions $Q_a(b)$ and $T_a(b)$. Let $b = b_0$ be the initial level of debt, so that $Q_a(b) = q_0$, and $T = T_a(b)$ be the time of default, which satisfies $q_T = \underline{q}$ and $b_T = b_a^d$. Equations (52) and (53) then imply

$$\begin{aligned} 1 - \underline{q} &= [1 - Q_a(b)]\, e^{(r+\alpha+\phi)T_a(b)}, \\ b_a^d &= b e^{rT_a(b)}\left[\frac{\underline{q}}{Q_a(b)}\right]^{-(r+\alpha)/(r+\alpha+\phi)}. \end{aligned}$$

Simple manipulations give two equations that involve $Q_a(b)$ and $T_a(b)$ separately,

$$\left(\frac{1-Q_a(b)}{1-\underline{q}}\right)^r \left(\frac{\underline{q}}{Q_a(b)}\right)^{r+\alpha} = \left(\frac{b}{b_a^d}\right)^{r+\alpha+\phi}, \tag{54}$$

$$\left(1-\underline{q}\right) e^{-(r+\alpha+\phi)T_a(b)} + \underline{q}\left(\frac{b_a^d}{b} e^{-rT_a(b)}\right)^{1+\phi/(r+\alpha)} = 1. \tag{55}$$

Consider the impact of a change in α. The time to default $T_a(b)$ must converge to 0 when α goes to infinity. Otherwise, taking the limit of equation (55) would imply $\underline{q} = 1$. Hence, the probability of fiscal adjustment $P_a(b) = 1 - e^{-\phi T_a(b)}$ converges to 0 as α goes to infinity.

Derivation of equation (24). Before the fiscal adjustment welfare satisfies

$$rU_t = \overline{c} - \gamma_\tau \tau_a - \gamma_\theta \theta_t + \phi\left[V_p(b_t) - U_t\right] + \dot{U}_t.$$

Denoting $V_p(b_t) = V_{pt}$, integrating this equation gives

$$\begin{aligned}
U_t &= \int_t^{+\infty} \left[\overline{c} - \gamma_\tau \tau_a - \gamma_\theta \theta_s + \phi V_{ps}\right] e^{-(r+\phi)(s-t)} ds, \\
&= \int_t^{+\infty} \left[\overline{c} - \gamma_\tau (\tau_a + \theta_s) + \phi V_{ps}\right] e^{-(r+\phi)(s-t)} ds - (\gamma_\theta - \gamma_\tau) \int_t^{+\infty} \theta_s e^{-(r+\phi)(s-t)} ds, \\
&= \int_t^{+\infty} \left[(r+\phi) V_{ps} - \dot{V}_{ps}\right] e^{-(r+\phi)(s-t)} ds - (\gamma_\theta - \gamma_\tau) \int_t^{+\infty} \theta_s e^{-(r+\phi)(s-t)} ds, \\
&= V_{pt} - (\gamma_\theta - \gamma_\tau) \int_t^{+\infty} \theta_s e^{-(r+\phi)(s-t)} ds.
\end{aligned}$$

The third line is obtained by using the budget constraint $\tau_a + \theta_s = g + r b_s - \dot{b}_s$, equation (16) and $\dot{V}_{ps} = -\gamma_\tau \dot{b}_s$. The fourth line is obtained by integrating by part the first integral on the r.h.s. of the third line. The fourth line is equation (24).

Proof of Proposition 2. If financial repression can prevent default for initial debt b_0, this is also true for any $b_0{}' \leq b_0$. Implementing the same default-preventing financial repression policy $(\theta_t)_{t \geq 0}$ yields a lower debt path $b_t' \leq b_t$ and, by equation (24), a utility path $U_t' \geq U_t \geq V_d$. Hence, the set of b_0 for which there is an equilibrium without default is an interval.

Let us denote by b_a^f the upper bound of this interval. For $b_0 = b_a^f$ it must be that the highest possible value of U_0 is equal to V_d. (Otherwise it would be possible to find a higher initial debt level b_0 for which default can be prevented.) Using (24), one can see that the highest value of U_0 is obtained when (θ_t) is minimized by setting it to the level that keeps b_t just equal to b_a^f. This implies,

$$\begin{aligned}
r V_d &= \overline{c} - \gamma_\tau \tau_a - \gamma_\theta \theta_a^f + \phi \left[V_p\left(b_a^f\right) - V_d\right], \\
g + r b_a^f &= \tau_a + \theta_a^f.
\end{aligned}$$

Using these equations and (16), one can solve for b_a^f, which gives (25).

Proof of Proposition 3. Using equation (24) and the previous proposition, the optimal financial repression policy starting from a debt level b_0 maximizes $-\int_0^{+\infty} \theta_t e^{-(r+\phi)t} dt$ subject to the government's budget constraint, $\dot{b}_t + \tau_a + \theta_t = g + r b_t$; the no-default constraint, $b_t \leq b_a^f$; and the non-negativity constraint on financial repression revenue, $\theta_t \geq 0$.

Leaving aside unimportant constants, the Lagrangian of the problem is

$$\mathcal{L}_0 = \int_0^{+\infty} \left\{-\theta_t + \lambda_t \left(\dot{b}_t + \theta_t - r b_t\right) - \mu_t b_t + \nu_t \theta_t\right\} e^{-(r+\phi)t} dt,$$

where λ_t, μ_t and ν_t are the costate variables for, respectively, the government's budget constraint, the no-default constraint and the non-negativity constraint on financial repression revenue.

The first-order conditions for θ_t and b_t are

$$\begin{aligned} \lambda_t + \nu_t &= 1, \\ \dot{\lambda}_t &= \phi\lambda_t - \mu_t. \end{aligned}$$

The first equation implies $\lambda_t \leq 1$. The constraint $b_t \leq b_a^f$ is initially not binding ($\mu_t = 0$). As long as this is the case λ_t is strictly increasing with time and strictly below 1, so that $\nu_t > 0$, i.e., the constraint $\theta_t \geq 0$ is binding. When λ_t reaches 1 two things happen. First, $\nu_t = 0$ so that θ_t is no longer equal to zero. Second, $\mu_t = \phi$, i.e., the constraint $b_t \leq b_a^f$ becomes binding. In words, the government starts using financial repression when debt reaches b_a^f.

Proof of Proposition 4. First, we show that condition $b_a^d \leq b_a^f$ is necessary for the optimal financial repression policy to be time consistent and to dominate default for all b. Assume that the condition is violated, $b_a^d > b_a^f$. Then for values of b close to b_a^f welfare is close to V_d in the equilibrium with financial repression while it is strictly higher in the equilibrium without financial repression since welfare is equal to V_d for $b = b_a^d$. The optimal financial repression policy is not time consistent. When the time comes to trigger financial repression according to the announced policy, the government is better off deviating and defaulting later.

Second, assume $b_a^d < b_a^f$. Starting from an initial debt level b_0, denote by $(b_t)_{0\leq t\leq T}$ and $(b'_t)_{0\leq t\leq T'}$ the debt paths associated with no financial repression and with optimal financial repression respectively. We have $b'_t \leq b_t$ for $t \in (0, T)$ since debt accumulates more slowly under financial repression. If $b_a^d < b_a^f$, this implies that financial repression occurs later than default, $T' > T$. We can then apply Lemma **??**, which implies that welfare is higher in the equilibrium with financial repression than in the equilibrium with default. The optimal financial repression policy is time consistent because the government has no incentives to deviate from the announced policy.

Nominal debt. One unit of debt issued at t pays off $P_t(r+\alpha)e^{-\alpha s}$ at time $t+s$. Hence, the total nominal debt service flow at time t is $(r+)B_t$, where aggregate nominal debt B_t is defined by

$$B_t \equiv \int_{-\infty}^{t} f_s P_s e^{-\alpha(t-s)} ds, \tag{56}$$

where f_s is the issuance of debt at time s.

Denoting by $q_t = Q_t/P_t$ the real price of debt, the nominal flow proceeds of debt issuance at time t is

$$Q_t f_t = q_t P_t f_t = q_t(\dot{B}_t + \alpha B_t). \tag{57}$$

Hence, the government's budget constraint can be written in nominal terms

$$P_t g + (r + \alpha)B_t = P_t(\tau_t + \theta_t) + q_t(\dot{B}_t + \alpha B_t), \tag{58}$$

which, dividing by P_t, gives (31)

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