ELSEVIER

Journal of Public Economics 65 (1997) 147-162

JOURNAL OF PUBLIC ECONOMICS

Fiscal crises and aggregate demand: can high public debt reverse the effects of fiscal policy?

Alan Sutherland*

Department of Economics and Related Studies, University of York, Heslington, York, YO1 5DD, UK

Received 1 February 1996; received in revised form 1 November 1996

Abstract

This paper shows how the power of fiscal policy to affect consumption can vary depending on the level of public debt. At moderate levels of debt fiscal policy has the traditional keynesian effects. Current generations of consumers discount future taxes because they may not be alive when taxes are raised (or there will be a larger population available to pay the taxes). But when debt reaches extreme values, current generations of consumers know there is a high probability that they will have to pay extra taxes. A fiscal deficit can have a contractionary effect in these situations. © 1997 Elsevier Science S.A.

Keywords: Fiscal policy; Public debt stabilisation; Aggregate demand

JEL classification: E21; E62; H69

1. Introduction

In 1993, after a number of years of large budget deficits and rapidly growing public debt, the UK government announced a programme of tax increases. The government claimed that stabilisation of public debt was a precondition for a sustained recovery from recession. A similar argument was advanced for the UK budget in 1981 which also introduced large tax increases in the middle of a recession. Other relevant examples of debt stabilisation programmes occurred in Denmark in 1982 and Ireland in 1982 and 1987.

*E-mail: ajs13@york.ac.uk

PII S0047-2727(97)00027-3

At a time of recession an increase in taxes and a reduction in the fiscal deficit is the opposite of the traditional keynesian policy prescription. A traditional keynesian would recommend a cut in taxes and an increase in the deficit as a means of stimulating aggregate demand. The actions of the UK, Danish and Irish governments are clearly based on an opposing view of the effects of fiscal policy. This view suggests that deficit financing discourages private sector spending because private agents fear the eventual consequences of accumulating public debt. Henceforth this will be referred to as the "anti-keynesian" view.

Giavazzi and Pagano (1990) conducted a detailed study of the Danish and Irish cases and came to the conclusion that there is good evidence to suggest that the Danish case is consistent with the anti-keynesian view. However, they found that the Irish case is more consistent with the traditional keynesian view. They attribute the latter conclusion to the importance of liquidity constraints on private agents in Ireland.[1]

Miller et al. (1990) have proposed a model which is capable of capturing some aspects of the anti-keynesian view. The main feature of their model is that there is a critical level of public debt above which the government imposes a tax on bond holders. As stochastic shocks take the debt towards the critical level the rate on government bonds rises to reflect the increased risk of the tax being imposed. The rise in interest rates crowds out private spending.

Bertola and Drazen (1993) proposed an alternative model which concentrates on the effect of government spending on consumers' expectations of future tax levels. Government spending follows a stochastic process with positive drift. In the absence of stabilisation measures the growth in government spending would be unsustainable. Consumers therefore expect a large cut in government spending when it reaches a critical level. Bertola and Drazen assume consumers are uncertain about the precise level of spending at which a stabilisation takes place. This gives rise to a variety of consumer responses to the evolution of government spending.

The main mechanism at work in the Bertola and Drazen model is the link between government spending, expected future taxes and consumer spending. It turns out that, as government spending approaches a critically high level, further increases in spending have a smaller and smaller effect on future taxes. This is because consumers know that a stabilisation is imminent. The model therefore has the feature that fiscal policy (represented by increases in government spending) has a smaller and smaller crowding out effect as a crisis point approaches. In an important respect therefore, the Bertola and Drazen model appears to contradict the anti-keynesian view.

[1] Barry and Devereux (1995) attempt to provide a fuller explanation of the behaviour of a number of variables in the Danish and Irish cases in the context of a two-period general equilibrium model with nominal rigidities. Alesina and Perotti (1995) and Giavazzi and Pagano (1995) consider cross sections of OECD economies and provide further evidence that the anti-keynesian view has some empirical support.

This paper retains some of the important features of the Bertola and Drazen approach but embeds them in a different underlying model. The fundamental mechanism at work in the model of this paper, as with the other models, is the link between current fiscal policy and future expected taxes.[2] The model in this paper, however, emphasises the dynamics of government debt (an issue not considered by Bertola and Drazen) and its linkage to the expected distribution of taxes between generations.

The model is based on a stylised account of fiscal policy in a world where consumers have finite lives. In normal times the government conducts fiscal policy in a way which tends to allow public debt to accumulate at an unsustainable rate. In order to satisfy its intertemporal budget constraint the government introduces debt stabilisation policies when debt reaches extreme levels. These stabilisation programmes involve large tax rises. Debt evolves stochastically, so at every instant consumers are uncertain that debt will reach a sufficiently extreme level to trigger a stabilisation programme within their lifetimes.[3]

The model has the property that, at low levels of debt, fiscal policy has the usual "keynesian" effects (i.e. a fiscal deficit is expansionary). This is because the next debt stabilisation programme is very remote for current consumers. On the other hand, at high levels of debt fiscal policy conforms to the anti-keynesian view (i.e. a fiscal deficit is contractionary). This is because the next debt stabilisation programme is an imminent threat to current consumers. The solution to the model shows a smooth transition from the keynesian case to the anti-keynesian case as public debt rises.

The paper is organised as follows. Sections 2 and 3 describe the model and the solution procedure. Section 4 demonstrates the effects of fiscal policy in the special case where consumers are infinitely lived. Section 5 considers the finite lives case. Section 6 contains concluding comments.

2. The model

2.1. Fiscal policy and the evolution of public debt

The model is set in continuous time. The evolution of public debt during normal times (i.e. non-crisis times) is governed by the following expression

$$dB = rB\,dt + F. \tag{1}$$

[2]There is an earlier literature, starting with Sargent and Wallace (1981) and developed by Drazen and Helpman (1988) and Drazen and Helpman (1990) which considers the links between the unsustainability of current fiscal policy and expected future taxes. The primary focus of that literature is on the inflation rate rather than on consumption and aggregate demand.

[3]In his discussion of Giavazzi and Pagano (1990); Blanchard (1990) sketches a deterministic model with similar features to the model presented here.

where B is the per capita level of public debt, F is the primary deficit and r is the world interest rate. To keep things simple it is assumed that the primary deficit takes the form of a transfer payment to/from consumers. A deficit is a lump-sum transfer payment to consumers (equally shared across consumers) while a surplus is a lump-sum transfer from consumers to the government (again equally shared). The government does not purchase goods or services.

The primary deficit is assumed to be an independently and identically distributed series of random shocks. In continuous time this corresponds to making F proportional to the increment of a Wiener process, i.e.

$$F = \sigma \, dW. \tag{2}$$

where W is a standard Wiener process and σ is a scaling parameter. One explanation for the randomness in F is that the economy is being disturbed by shocks which the government is attempting to offset with fiscal policy. Fiscal policy therefore takes on the stochastic characteristics of the economy.

Without further structure, Eqs. (1) and (2) imply that the government's intertemporal budget constraint is not satisfied. The government ensures its solvency by implementing debt stabilisation programmes when the debt level reaches extreme values. There are thus upper and lower "crisis" levels of B, denoted U and L. At U a lump sum tax of (per capita) size T is imposed on consumers which reduces B to $U-T$. At L a negative lump sum tax is imposed which increases B to $L+T$. These stabilisations ensure that, overall, the government's intertemporal budget constraint is satisfied.[4,5]

At U there is a corresponding step reduction in consumers' stock of financial assets of size T, while at L there is a corresponding step increase. It is assumed that consumers can not escape the tax by emigrating or by holding foreign rather than domestic assets. It is assumed that the stabilisation taxes are evenly spread across all consumers alive at the time of implementation. All consumers therefore pay/receive T. (The implications of an uneven distribution of T across consumers are considered in Sutherland (1995).)

There are a number of special features of this structure which require some discussion. Firstly, the assumption of i.i.d. primary deficits is clearly unrealistic. A more general structure would allow for some degree of serial correlation in F. In general, however, introducing serial correlation in the primary deficit makes this model intractable. The structure used here is therefore partly adopted out of necessity. However, one simple and tractable way of modelling serially correlated

[4] The assumption that all taxes are lump sum is adopted to isolate the effects being emphasised in this paper from those that will arise from distortionary taxes. Different distortionary taxes will introduce different substitution effects which will operate in addition to the wealth effects of crisis taxes which are the subject of this paper.

[5] For simplicity the structure described here is symmetric about a zero debt level. Of course for most countries the region of positive debt is the most relevant region. It is also likely that many countries will exhibit exogenous trends in fiscal policy which will add to the asymmetry.

deficits is to relate the deficit to the level of debt so that, for instance, the government tends to run primary surpluses when debt is positive and primary deficits when debt is negative. Sutherland (1995) shows that the qualitative nature of the results derived later in this paper are unaffected by making such a modification.

A second special feature of this model is the assumption that fiscal policy takes the form of transfers rather than government spending. The important state variable in the Bertola and Drazen (1993) model is spending and the interaction between public spending and private consumption is the central mechanism in that model. For the sake of tractability, however, Bertola and Drazen abstract away from the dynamics of debt. The model of this paper can be an regarded as an alternative polar case which considers the role of debt in fiscal crises while maintaining tractability by abstracting away from the dynamics of government spending. In effect, by ruling out serial correlation in deficits and suppressing government spending, the model of this paper excludes the expectational effects that drive the Bertola and Drazen model and concentrates on a different set of expectational effects which are related to the dynamics of debt. In this sense the model presented here should be regarded as complementary to the Bertola and Drazen model, rather than as a substitute.

A third special feature of the model is the assumption that a fiscal stabilisation results in a step change in debt and asset stocks. A more realistic assumption might be that a fiscal stabilisation aims merely to stabilise the level of debt (i.e. to reduce the deficit to zero) or at most to reduce debt over a period of years. The assumption adopted here, however, has a more general interpretation than appears at first sight. This is because all taxes can be thought of as imposing step changes in wealth. For instance, suppose that crisis taxes take the form of a flow tax designed to push the stock of debt to a lower level over some time horizon. Forward looking consumers will regard the capitalised value of a flow of taxes as a step change in total (financial plus human) wealth. It turns out to be analytically more convenient to assume that stabilisation taxes take the form of step changes in financial asset stocks. Hence the approach adopted here. In addition, however, the model presented here can be used to analyse the case where stabilisation does no more than reduce the deficit to zero. This can be achieved by considering the limit as T tends to zero.[6]

It is clear that no government which is maximising a plausible social welfare function would choose to set fiscal policy in the way assumed in this model. Underlying the structure adopted here, however, is the assumption that fiscal

[6] What is important for the generating the anti-keynsian results discussed later is that stabilisation taxes fall more heavily on generations alive at the time of the crisis. The degree to which stabilisation taxes do fall more heavily on generations alive during a crisis depends on T. In the limit as T tends to zero the stabilisation tax become "fair" in the sense that generations alive during the crisis are not baring a disproportionate burden. This point will be discussed again in Section 5.

policy is the result of some kind of conflict between parties in a democratic process. In this model the evolution of debt and the crisis points are fixed exogenously. In principle, however, it would be possible explicitly to incorporate within the model a game between rival political groups of the type analysed by Alesina and Drazen (1991). Alesina and Drazen show that a dispute between rival political groups about the distribution of taxes results in a period of unsustainable growth in debt which is terminated by a large stabilisation programme.

2.2. Consumer behaviour

The country is populated by a large number of finitely lived agents. The overlapping generations structure proposed by Blanchard (1985) is adopted where an individual agent faces a Poisson death rate θ.[7] An individual consumer maximises expected lifetime utility:

$$E_t \int_t^{\infty} u[c(\tau)]e^{-(r+\theta)(\tau-t)}\, d\tau, \tag{3}$$

where r is the consumer's rate of time preference and also the world rate of interest on bonds. E_t is the expectations operator conditional on time t information and c is consumption of a single homogeneous good which is freely traded on world markets at a fixed price.

In "normal" times (i.e. non-crisis times) the consumer's flow budget constraint is

$$dA = [y - c + (r + \theta)A]\, dt + F. \tag{4}$$

where y is income (which is assumed fixed), A is bond holdings and F is the (random) transfer payment from/to the government. The rate of return on bonds is $r+q$ where q is the "premium" received from the insurance company which receives the consumer's assets when she dies.[8] At a crisis point debt stabilisation taxes result in a step change in A of size T.

If $u(c)$ is quadratic (e.g. $u(c) = \alpha c - \beta c^2$) the consumer optimally chooses a level of consumption that she expects to be able to maintain constant through time. This implies the following consumption rule[9]

[7]The infinite horizon overlapping generations structure proposed by Weil (1989) could also be used. The Blanchard structure has the advantage for the present model that the population is stationary.

[8]The presence of insurance companies is assumed simply as a convenient analytical device for redistributing the assets of agents who die. It is assumed that it is not possible for agents to insure, either domestically or internationally, against the taxation risk created by fiscal crises.

[9]The consumer's optimisation problem is formally presented in Appendix A, where the form of the optimal consumption rule is confirmed. The assumption of quadratic utility has the obvious advantage that an explicit solution can be obtained for consumption. It has the drawback that it implies that the consumer has no desire to engage in precautionary savings.

$$c(t) = y + (r + \theta)\left[A(t) - E_t \int_t^{\infty} \delta(\tau) T e^{-(r+\theta)(\tau - t)}\, d\tau \right], \tag{5}$$

where $\delta(t)$ is a function which takes the value $+1/dt$ at dates when a crisis reduction in debt takes place, $-1/dt$ when a crisis increase in debt takes place and zero at all other times. In words, this consumption rule says that the consumer consumes her flow endowment plus the interest income on assets net of the present value of expected future taxes.[10] It is the behaviour of the last term which is going to be crucial for determining the effectiveness of fiscal policy. Notice that future taxes are discounted at the rate $r+q$ which reflects the consumer's finite life.[11]

Eq. (5) defines the behaviour of consumption for an individual consumer. Aggregation across consumers yields a similar relationship between aggregate consumption and aggregate income, assets and expected taxes. The only difference between individual and aggregate quantities arises in the dynamics of aggregate A. The insurance premium θ that consumers receive on their assets is effectively a transfer payment from consumers who die to the consumers who remain. The evolution of aggregate (per capita) assets, denoted $\tilde{A}$, is therefore

$$d\tilde{A} = [y - c + r\tilde{A}]\, dt + F. \tag{6}$$

Eq. (5) combined with Eq. (4) implies that the expected path of individual consumption is a constant. Eq. (5) combined with Eq. (6) implies that the expected path of aggregate consumption is exponential convergence towards $c=y$. The important point for the purposes of this paper is, however, that fiscal shocks have exactly the same impact effect on individual and aggregate consumption.[12]

3. Solution procedure

The effects of fiscal policy on consumption depend on the term

$$S \equiv E_t \int_t^{\infty} \delta(\tau) T e^{-(r+\theta)(\tau - t)}\, d\tau, \tag{7}$$

so the main task is to determine the effects of B and F on this term. Intuitively it

[10]This is an open economy model so at times when c is greater than y there is a balance of trade deficit.

[11]In the Weil (1989) infinite life framework expected future taxes would be discounted, not because of the probability of death, but because of the expected future expansion of the population upon which taxes could be raised.

[12]A fiscal shock has the same impact effect on the asset stocks and expected future taxes of all consumers. All consumers therefore adjust consumption in the same way. The mean reverting tendency of aggregate consumption comes into effect as time elapses following the shock.

should be clear that the value of S depends on the expected time until the next stabilisation programme is implemented. It also depends on the expected sign of that stabilisation. The time until the next stabilisation is clearly stochastic because it depends on a stochastic process, B, hitting a critical level. It is possible to tell, however, that the expected time until this occurs depends on the distance between the current value of B and the trigger points. The closer B is to a trigger point the shorter is the expected hitting time. Likewise the sign of the next stabilisation is stochastic but the relative probability attached to hitting each trigger point depends on the relative distance between B and U and L. From the foregoing discussion it is possible to deduce that S is an increasing function of B, i.e. $S(B)$.

The rules of stochastic calculus can be used to obtain a differential equation in $S(B)$. First rewrite Eq. (7) in the following form

$$S \equiv E_t \int_t^{\Delta t} \delta(\tau) T \mathrm{e}^{-(r+\theta)(\tau-t)} \,\mathrm{d}\tau + \mathrm{e}^{-(r+\theta)\Delta t} E_t \int_{\Delta t}^{\infty} \delta(\tau) T e^{-(r+\theta)(\tau-t-\Delta t)} \,\mathrm{d}\tau, \tag{8}$$

where Δt is a small interval of time. Taking the limit of this expression as Δt tends to $\mathrm{d}t$, and assuming a stabilisation does not take place during that interval, yields the following expression

$$E_t(\mathrm{d}S) = (r+\theta) S \,\mathrm{d}t, \tag{9}$$

where $\mathrm{d}S$ indicates the change in S over the infinitesimal time interval $\mathrm{d}t$. Applying Ito's Lemma to the function $S(B)$ yields a separate expression for E(dS) as follows

$$E_t(\mathrm{d}S) = rBS'(B) \,\mathrm{d}t + \frac{\sigma^2}{2} S''(B) \,\mathrm{d}t. \tag{10}$$

Combining (8) and (9) yields

$$(r+\theta) S(B) = rBS'(B) + \frac{\sigma^2}{2} S''(B), \tag{11}$$

which is a linear second order differential equation in the function $S(B)$.

Two boundary conditions are needed to tie down a unique solution for $S(B)$. These are easily obtained from the economic structure of the problem. At the upper crisis point, U, it is known that a tax of size T is collected by the government. The present value of expected taxes must fall by T the instant the tax is paid. The value of B also falls by T at the same time so it must follow that

$$S(U-T) = S(U) - T. \tag{12}$$

This provides one boundary condition. A similar argument holds at the lower crisis point, L, where the present value of expected taxes must rise by T the instant the transfer is made. Hence

$$S(L+T)=S(L)+T. \tag{13}$$

An alternative way to derive these boundary conditions is to take the limit of Eq. (7) as Δt tends to dt while assuming a stabilisation takes place during the interval dt. The solution of the model simply requires the solution of Eq. (11) subject to conditions (12) and (13).

4. Infinitely lived consumers

Before considering the general case where $\theta > 0$ (i.e. finite lives) it is important and convenient to consider the case where $\theta = 0$ (i.e. infinite lives). In this case it is simple to check that the following solution satisfies Eq. (11) and the boundary conditions

$$S(B)=B, \tag{14}$$

i.e. the discounted value of expected future taxes is equal to the stock of public debt. This result is not surprising since, in the case where consumers are infinitely lived, Ricardian equivalence should hold, i.e. taxation and bond finance should be equivalent. Eq. (14) is nothing other than Ricardian equivalence.

The implications for individual (and aggregate) consumption can be found by substituting $S(B)=B$ and $\theta=0$ into the consumption function (Eq. (5)) to yield

$$c(t)=y+r[A-B]. \tag{15}$$

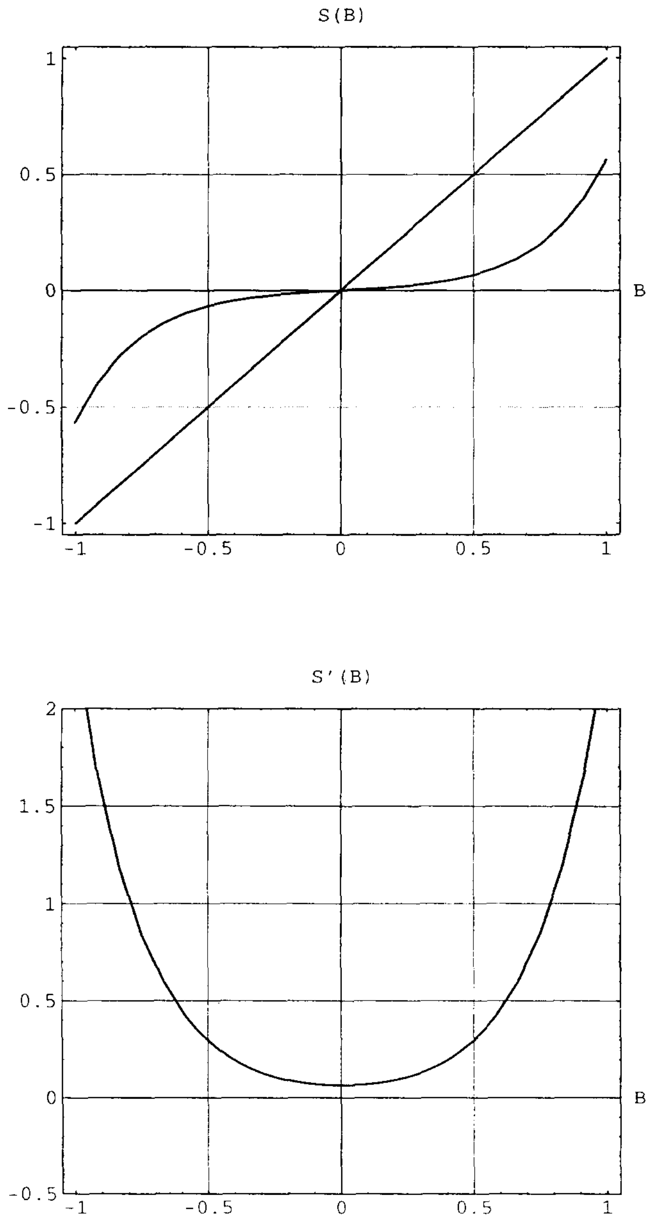
The implication of this equation is that consumers base their consumption decision on the interest income on their own assets net of the public debt. Any transfer payment between the government and consumers cannot affect $A-B$ so fiscal policy has no effect on consumption. This is precisely the result that is expected with Ricardian equivalence. This result holds regardless of the level of B, T and σ, i.e. no fiscal variable has any implication for consumption.

5. Finitely lived consumers

In the case where $\theta > 0$ (i.e. finitely lived consumers) the general solution to Eq. (11) is

$$S(B)=D_1BM\left[-\frac{\theta}{2r},\frac{3}{2},-\frac{rB^2}{\sigma^2}\right]+D_2M\left[-\frac{(r+\theta)}{2r},\frac{1}{2},-\frac{rB^2}{\sigma^2}\right], \tag{16}$$

where $M[.,.,.]$ is the Confluent Hypergeometric function and D_1 and D_2 are constants to be determined by the boundary conditions. To illustrate the properties of this solution the upper panel of Fig. 1 shows a plot of $S(B)$ for the following set



θ=0.4; r=0.02; σ=0.2; φ=0.0; L=-1.0; U=1.0; T=0.5;

Fig. 1. Debt and the present value of taxes.

of parameter values: $\theta=0.4$, $r=0.02$, $\sigma=0.2$, $L=-1$, $U=1$, $T=0.5$.[13] For comparison the infinite lives case ($\theta=0$) is also plotted. The finite lives case is the nonlinear plot while the infinite lives case is the 45° line.

Now consider what these solutions imply for fiscal policy. The effect of fiscal policy (represented by F) on S is determined by the slope of the S function. In the infinite lives case S is linear and the slope is constant at unity. This gives rise to the result discussed in the previous section, namely that a fiscal transfer gives rise to a one-for-one change in expected future taxes. It can be seen from the shape of the S function in the finite lives case that this result no longer applies. It can be seen from the lower panel in Fig. 1 that the slope of the S function is close to zero when B is close to zero but rises to over 2 as B approaches U or L. This implies that a fiscal transfer that takes place when B is close to zero has a less than one-for-one effect on expected future taxes while a fiscal transfer that takes place when B is close to U or L has a more than one-for-one effect. The critical values of B, where the $S'(B)$ rises above unity, are approximately ±0.75.

The first main result of this paper is therefore established. A fiscal deficit (represented by a positive F) increases individual and aggregate consumption provided B is small (in absolute value). This is the traditional keynesian result. But a similar fiscal deficit when B is close to U or L causes consumption to fall. This is the anti-keynesian result.

These results can easily be explained in terms of consumers' finite lives. At low values of B there is a high probability that current consumers will die before the next stabilisation tax is imposed. These consumers therefore discount future taxes very heavily.[14] But at extreme values of B there is a strong chance that the current generation of consumers will be alive when the next stabilisation tacks place. Discounting is correspondingly lower. In addition, however, these consumers know that, when a debt stabilisation programme takes place, very large taxes will be imposed. These taxes will be much larger than the small fiscal transfers represented by F. The impact of a fiscal deficit on the expected future taxes of these consumers is therefore very strong.[15]

It should be apparent from the foregoing discussion that the underlying cause of these effects is the implicit unequal distribution of taxes across generations. It may

[13] These parameter values are chosen to provide a clear illustration of the features of the model. Values of 0.5 for T and 0.4 for θ are obviously too high to be empirically relevant. However, the general qualitative features of the model remain the same for more moderate values of these parameters.

[14] In the Weil (1989) model it is the fact that the population is expanding which makes current generations discount future taxes.

[15] It is important to emphasise that these effects are not arising from precautionary savings. As already pointed out, the assumption of quadratic utility rules out precautionary savings behaviour. However, given the nature of the stochastic process followed by taxes it is clear that a precautionary saving motive, if it were present, would reinforce the effects described here.

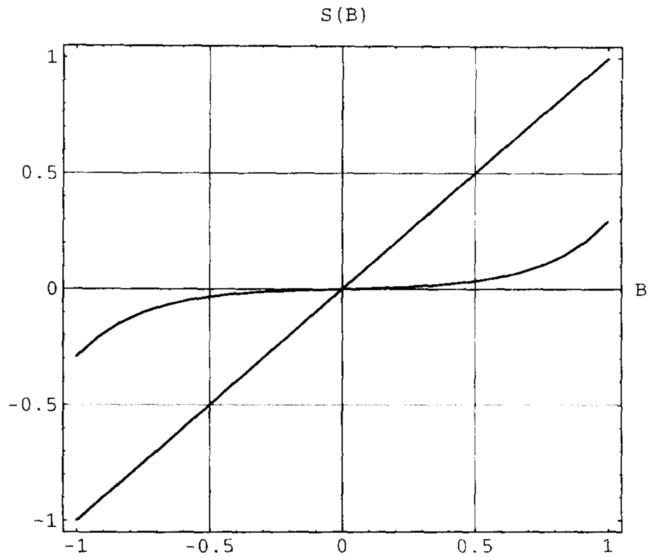
be supposed that a reduction in T should reduce the inequality of the tax distribution and should therefore reduce the region for which the anti-keynesian effects take place. This is confirmed in Fig. 2 where T is reduced to 0.1. In this case $S'(B)$ does not rise above unity until B is greater than ± 0.9.[16]

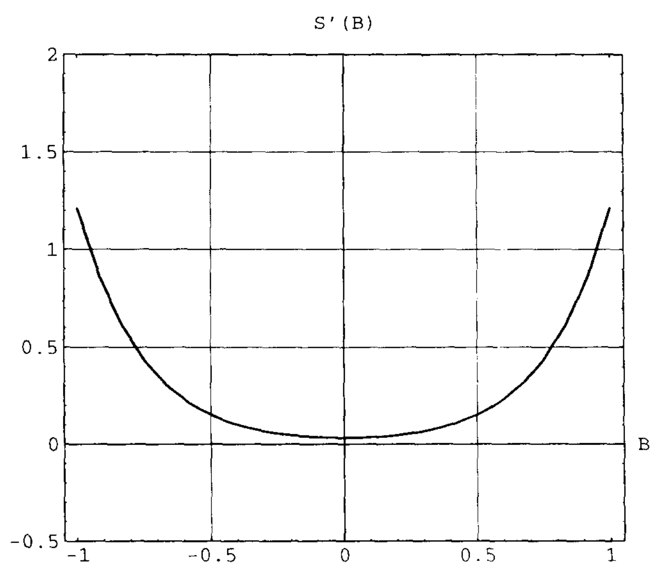
The limiting case where T is reduced to zero is an important case to consider. It can readily be established that in the limit as T tends to zero the boundary conditions (12) and (13) imply $S'(U)=S'(L)=1$. Thus the slope of $S(B)$ never rises above unity, even at the crisis points. This implies that fiscal policy has the usual keynesian effect at all points strictly within the region between L and U and only becomes powerless at the crisis points. The explanation for this is that in this case crisis taxes are doing no more than neutralising the current deficit. The generation alive at the time of a crisis is merely paying sufficient taxes to prevent a further expansion of debt. They are not being required to fund a reduction in the debt level. They are not therefore suffering an undue burden of taxation compared to other generations.

The discussion so far has concentrated on the effects of the anticipation of a debt stabilisation programme on expected taxes and consumption. Notice one further important property of the solutions pictured in Figs. 1 and 2. The effect of a debt stabilisation programme when one actually occurs is neutral on consumption. The change in expected future taxes is equal to the taxes imposed. In Sutherland (1995) an extension of the model is considered where stabilisation taxes are unequally distributed across the population alive at the time a stabilisation programme is implemented. It is shown there that, with such a modification, a stabilisation programme can have a non-neutral impact on consumption.

The differences between the effects of fiscal policy in the model of this paper and the effects described in Bertola and Drazen (1993) should be noted. Bertola and Drazen consider the effects of changes in government spending rather than debt. In the absence of fiscal crises their underlying model is one where a rise in government spending crowds out consumption one-for-one. The approach of a crisis produces a departure from this underlying classical structure so that fiscal policy becomes more keynesian. This is because consumers know that a stabilisation programme will produce a cut in government spending and therefore a cut in taxes. The presence of stabilisation programmes effectively implies that any increase in current spending and taxation is expected to be temporary. Optimal consumption smoothing therefore implies that crowding out is less than one-for-one. In contrast, in the model of this paper the underlying structure is keynesian in the sense that fiscal deficits are expansionary due to overlapping generations. The approach of a crisis produces a departure from this underlying keynesian structure.

[16]Notice that reducing the size of the stabilisation increases the amount of time B spends close to the extremes. The direction of drift in B is always towards the extremes so smaller stabilisations imply that B is less likely to return to moderate values.





θ=0.4; r=0.02; σ=0.2; ϕ=0.0; L=-1.0; U=1.0; T=0.1;

Fig. 2. The effects of reducing the size of crisis taxes.

In Bertola and Drazen it is the balance between public and private spending which is producing aggregate demand effects of fiscal policy. In this paper it is changes in the intertemporal distribution of taxation which is affecting private spending decisions.

6. Conclusion

The model presented in this paper shows how the power of fiscal policy to affect consumption can vary depending on the level of public debt. At moderate levels of debt fiscal policy has the traditional keynesian effects. Current generations of consumers discount future taxes because they may not be alive at the time of the next debt stabilisation programme (or equivalently there will be a larger population of consumers available to pay taxes when a stabilisation programme is implemented). But when debt reaches extreme values current generations of consumers know that there is a high probability that they will be alive when the next stabilisation programme is implemented. A fiscal deficit can have a contractionary effect on consumer spending in these situations.

As emphasised in the introduction, there is a close relationship between the model presented here and the model of Bertola and Drazen (1993). It is important to note, however, that the two models should be regarded as complements, rather than substitutes, in the sense that they each emphasise particular aspects of a more general (but intractable) structure. The Bertola and Drazen model emphasises the dynamics of government spending and its impact on private spending while the model presented here emphasises the dynamics of debt and its impact on the expected inter-generational distribution of taxes. Both spending and debt are likely to be important in determining the impact of fiscal crises but it is difficult to build a model which incorporates the dynamics of both variables.

Despite the difficulty in building a more general theoretical model, the Bertola and Drazen model and the model of this paper provide some clear predictions about the qualitative features of such a model. There are therefore some clear testable implications about the relationship between deficits, debt, government spending and consumer demand which can be used to construct a general empirical model. This can be used to judge the relative importance of the alternative theoretical approaches in particular historical episodes. This is likely to be an important direction for future research.

Acknowledgments

I am grateful for many useful comments on an earlier draft of this paper from seminar participants at York, Liverpool, Aberystwyth, Aberdeen, Cambridge, Warwick, Aarhus and Durham Universities and from an anonymous referee.

Appendix A

The consumer's optimisation problem

The consumer's optimisation problem is

$$\underset{c}{\operatorname{Max}}\ E_t \int_t^{\infty} u[c(\tau)]\mathrm{e}^{-(r+\theta)(\tau-t)}\,\mathrm{d}\tau, \tag{A1}$$

where $u(c)=\alpha c-\beta c^2$ subject to

$$\mathrm{d}A=[y-c+(r+\theta)A]\,\mathrm{d}t+\sigma\,\mathrm{d}W, \tag{A2}$$

$$\mathrm{d}B=rB\,\mathrm{d}t+\sigma\,\mathrm{d}W, \tag{A3}$$

$$\lim_{t\to\infty} E_0[A(t)\mathrm{e}^{-(r+\theta)t}]=0, \tag{A4}$$

where A and B are subject to step changes of size $-T$ and T at crises points U and L respectively. The consumer's value function, $V(A, B)$, satisfies the following stochastic Bellman equation

$$(r+\theta)V(A,B)=\operatorname{Max}\Big[\alpha c-\beta c^2+(y-c+(r+\theta)A)V_A+rBV_B+\frac{\sigma^2}{2}V_{AA} + \frac{\sigma^2}{2}V_{BB}+\sigma^2V_{AB}\Big], \tag{A5}$$

where the subscripts indicate the partial derivative of $V(.,.)$ with respect to the appropriate argument.There is one first order condition with respect to c

$$\alpha-2\beta c-V_A=0, \tag{A6}$$

and a value matching condition at each of the crisis points

$$\left.\begin{aligned} V(A-T,U-T)&=V(A,U)\\ V(A+T,L+T)&=V(A,L)\end{aligned}\right\}\ \text{for all A.} \tag{A7}$$

It was asserted in the text that the optimal consumption rule is

$$c=y+(r+\theta)[A-S(B)], \tag{A8}$$

where $S(B)$ is giving by Eq. (16). It is possible to show that the following value function is consistent with this consumption rule and the Bellman equation

$$V(A,B)=(\alpha-2\beta y)A-\beta(r+\theta)A^2+2\beta(r+\theta)S(B)A+f(B), \tag{A9}$$

where $f(B)$ satisfies the following ordinary differential equation

$$\frac{\sigma^2}{2} f''(B) + rBf'(B) - (r+\theta)f(B) - (r+\theta)\beta\sigma^2 + \alpha y - \beta y^2$$
$$+ (r+\theta)2\beta\sigma^2 S'(B) + \beta rBS'(B)[rBS'(B) + \sigma^2 S''(B)] + \beta\left[\frac{\sigma^2}{2} S''(B)\right]^2 = 0. \tag{A10}$$

An appropriate choice of values for $f(0)$ and $f'(0)$ ensures that the value matching conditions are satisfied.

References

Alesina, A., Perotti, R., 1995. Fiscal Adjustment: Fiscal Expansions and Adjustments in OECD Countries. Economic Policy 21, 1–42.

Alesina, A., Drazen, A., 1991. Why Are Stabilisations Delayed?. American Economic Review 81, 1170–1188.

Barry, F., Devereux, M.B., 1995. The 'Expansionary Fiscal Contraction' Hypothesis: A Neo-Keynesian Analysis. Oxford Economic Papers 47, 248–264.

Bertola, G., Drazen, A., 1993. Trigger Points and Budget Cuts: Explaining the Effects of Fiscal Austerity. American Economic Review 83, 11–26.

Blanchard, O.J., 1985. Debt, Deficits and Finite Horizons. Journal of Political Economy 93, 223–247.

Blanchard, O.J., 1990. Comment on Giavazzi, Pagano. In: Blanchard, O., Fischer, S. (Eds.) NBER Macroeconomics Annual 1990. MIT Press, Cambridge, MA.

Drazen, A., Helpman, E., 1988. The Effects of Policy Anticipations on Stabilisation Programs. European Economic Review 32, 680–686.

Drazen, A., Helpman, E., 1990. Inflationary Consequences of Anticipated Macroeconomic Policies. Review of Economic Studies 57, 147–166.

Giavazzi, F., Pagano M., 1990. Can Severe Fiscal Contractions be Expansionary? Tales of Two Small European Countries. In: Blanchard, O., Fischer, S. (Eds.), NBER Macroeconomics Annual 1990. MIT Press, Cambridge, MA.

Giavazzi, F., Pagano, M., 1995. Non-Keynesian Effects of Fiscal Policy Changes: International Evidence and the Swedish Experience. Mimeo, IGIER.

Miller, M., Skidelsky, R., Weller, P., 1990. Fear of Deficit Financing: Is it Rational? In: Dornbusch, R., Draghi, M. (Eds.), Public Debt Management: Theory and History. CUP Cambridge.

Sargent, T.J., Wallace, N., 1981. Some Unpleasant Monetarist Arithmetic. Federal Reserve Bank of Minneapolis Quarterly Review 5, 1–17.

Sutherland, A.J., 1995. Fiscal Crises and Aggregate Demand: Can High Public Debt Reverse the Effects of Fiscal Policy. Centre for Economic Policy Research Discussion Paper No 1246.

Weil, P., 1989. Overlapping Families of Infinitely Lived Agents. Journal of Public Economics 38, 183–198.