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Spend Now, Pay Later? Tax Smoothing and Fiscal Sustainability in South Asia

Prepared by Paul Cashin, Nadeem Haque, and Nilss Olekalns[1]

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Abstract

This paper tests a version of Barro's tax-smoothing model, which assumes intertemporal optimization by a government seeking to minimize the distortionary costs of taxation, using Pakistan and Sri Lankan data for 1956-95 and 1964-97, respectively. The empirical results indicate that Pakistan's fiscal behavior is consistent with tax smoothing, but not Sri Lanka's. Moreover, fiscal behavior in both countries was dominated by a stagnation of revenues, large tax-tilting-induced deficits, and the consequent accumulation of excessive public liabilities. Analysis of the time-series characteristics of tax-tilting behavior indicates that for both countries the stock of public liabilities is unsustainable under unchanged fiscal policies.

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Authors' E-Mail Addresses: Pcashin@imf.org; Nhaque@imf.org;
Olekalns@ariel.ucs.unimelb.edu.au

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[1] Nilss Olekalns is Associate Professor of Economics at the University of Melbourne; this paper was initiated while he was a visiting scholar in the Research Department. The authors are grateful to Benedict Bingham, Jeremy Carter, Sena Eken, Przemyslaw Gajdecza, Ratna Sahay, Eric Sidgwick, and Peter Wickham for their comments and suggestions on earlier drafts, and to Ivan Guerra for excellent research assistance.

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I. INTRODUCTION

One rationale for the existence of fiscal imbalances is to minimize the distortionary effects of levying nonlump-sum taxes (for a given present value of tax collections), by spreading the burden of these taxes over time. For a given amount of public expenditure, if taxes are lump sum and the other conditions for Ricardian equivalence are present, there are no real effects from shifts between taxes and the issuance of public debt as modes of financing fiscal imbalances. However, if taxes are distorting then the timing of taxes will matter, and it will be desirable to smooth tax rates over time, financing any temporary difference between public revenue and public expenditure by creating public debt.[2] This concept of tax smoothing, first introduced by Barro (1979), is now well established in the literature on fiscal policy. Tax smoothing has the normative implication that budget imbalances can be optimal fiscal policy responses to anticipated future events. In particular, a government anticipating an increase in its own expenditure can minimize the distortionary effects of raising the finance for that expenditure if it brings forward some of the associated tax increase and runs a budget surplus (or a smaller deficit) in the current period. Similarly, a budget deficit (or a smaller surplus) is optimal if the government anticipates future falls in its expenditure.

Budget imbalances are pervasive in developing countries. Yet there are few studies asking whether this outcome is consistent with any notion of optimal fiscal policy. The only previous study of tax smoothing for developing countries found that the fiscal policy of India was consistent with tax-smoothing behavior, in the presence of large-scale financial repression (Cashin, Olekalns and Sahay (1998)). In this paper, we examine time series data for Pakistan and Sri Lanka, two other large-deficit countries of South Asia, to ascertain: (i) whether their recurrent budget imbalances are consistent with tax-smoothing fiscal policy; and (ii) whether any systematic bias towards deficit financing has led to the creation of unsustainable stocks of public debt. Like India, Pakistan and Sri Lanka incurred deficits because of: (i) the ready availability of resources garnered from financial repression as, until relatively recently, interest rates were kept artificially low; and (ii) an inability to raise revenues owing to domestic political and institutional constraints. However, as explained below, deficits caused for these reasons need not exclude the presence of tax-smoothing behavior when future changes to government expenditure are anticipated.

In this paper we test whether tax-smoothing behavior is consistent with the fiscal policies of Pakistan and Sri Lanka, using data from 1956-95 and 1964-97, respectively, and the vector autoregressive approach of Huang and Lin (1993) and Ghosh (1995). This

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[2] Optimizing governments will not alter tax rates contemporaneously with temporary fluctuations in expenditures, but, given that the marginal cost of taxation rises with the tax rate, then the total cost of revenue-raising will be minimized if the planned tax rate is constant (smoothed) over time. A smooth tax rate implies that temporary shocks to government spending and output yield fiscal imbalances, and provides a rationale for the issuance of public debt.

approach is an improvement on early (random walk) tests of tax-smoothing, due to its focus on the optimal path of the budget surplus, rather than on tax rates themselves. This is important as even if tax rates are deemed to follow a random walk, tax smoothing is only one among many potential explanations for the unpredictability of changes in tax rates. In contrast, the approach adopted here allows us to generate a time series for the optimal budget imbalances, assuming that the government tax smooths, and then compare that to the stationary component of actual budget imbalances. If smoothing is to hold, any differences between the two series should be quite small. In addition, by analyzing the persistence of the differential between the actual stock of public liabilities and the stock which would be consistent with tax-smoothing behavior (which is sustainable, by definition), we are also able to examine whether fiscal policies in both countries are on a sustainable path.

We find that the intertemporal tax-smoothing model explains the behavior of the fiscal deficits of Pakistan, since taxes remained fairly unresponsive to anticipated changes in expenditure, most likely because of the government's inability to raise revenue. In contrast, the volatility of taxes in Sri Lanka has been excessive relative to those which would be consistent with minimizing the utility losses arising from the levying of distortionary taxes, and so its government has not tax smoothed. Our results also confirm previous findings that financial repression (in the form of tax-tilting behavior which shifts taxes into the future) has traditionally made a significant contribution to South Asian net revenues (Haque and Montiel (1991, 1994), Cashin, Olekalns and Sahay (1998)). A likely explanation of the concurrence of both tax smoothing and financial repression is the inability of these governments to meet their fiscal objectives from conventional (tax and nontax) revenue sources. In this context, we find that Pakistan's financial-repression-induced overborrowing of the 1970s and 1980s (and Sri Lanka's overborrowing of the early 1980s) has yielded a stock of liabilities which deviates significantly from the stock of liabilities generated from the series of optimal (tax-smoothing) fiscal deficits. As of 1995, Pakistan's actual stock of public liabilities was about 56 percent of GDP higher than it would have been under optimal tax smoothing, implying that fiscal surpluses (or at least smaller deficits) will need to be run in the future to ensure intertemporal solvency. Similarly, as of 1997 Sri Lanka's actual stock of public liabilities was about 43 percent of GDP higher than it would have been under optimal tax smoothing. For both countries the differential between the actual and optimal (tax-smoothed) stocks of public liabilities is not mean reverting, and under unchanged fiscal policies would increase indefinitely. These results suggest that, while fiscal regimes in South Asia have become less deficit-biased in the 1990s when compared with those of earlier decades, there remains in both countries a need for further fiscal reform to ensure the sustainability of fiscal policy.

The paper is organized as follows. Section II summarizes the previous literature on tax smoothing and optimal fiscal policy, while Section III presents an overview of the main features of public finance in Pakistan and Sri Lanka. A formal model of optimal tax smoothing and test for fiscal sustainability is briefly outlined in Section IV, as is a description of the

econometric methodology. This is followed by a discussion of the data in Section V. The results from the analyses of tax smoothing and fiscal sustainability are presented in Section VI, followed by a short conclusion in Section VII.

II. Previous Literature on Tax Smoothing

There is a growing empirical literature that tests the implications of the tax-smoothing hypothesis. The first of these implications is that the tax rate, if optimally smoothed, will follow a random walk since an optimally set tax rate would only change upon the arrival of new information. Numerous studies have checked the time series properties of average tax rates, with the most common finding being that tax rates do follow a random walk.[3] However, this is quite a weak test of the tax-smoothing hypothesis, as the finding of a unit root in tax rates is consistent with a variety of explanations of tax determination.[4]

Tax smoothing also has implications for the debt to GNP ratio, and these can be easily checked. Barro's (1979) seminal paper found that U.S. government debt did increase during temporary surges in government spending (such as wars) and recessions. Later, Barro (1986, 1987) examined long-run U.S. and British data, and found that the debt to GNP ratios for both countries generally increased during wars, decreased during peacetime, and fluctuated over the business cycle. All of this is consistent with tax smoothing although, once again, the power of this test to reject the tax-smoothing hypothesis is likely to be quite low.

More recent research has focussed on the question of whether the budget surplus is informative about future changes in government spending. The information content of the budget surplus has been tested by Huang and Lin (1993) and by Ghosh (1995). Both studies examine the time series properties of North American data using vector autoregression techniques, and find that increases in the budget surplus signal future increases in government expenditure, which is evidence in favor of tax smoothing. In contrast, the two most recent studies of tax smoothing reject the hypothesis. Olekalns (1997) found for Australian post-World War II data that the budget surplus has been too volatile to be fully consistent with tax smoothing. Olekalns and Crosby (1998) examine long-run data, covering all of the

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[3]An example is the study by Barro (1981), who found that the average tax rate in the United States between 1884-1979 followed a random walk. Other studies include: Barro (1986), Sahasakul (1986), and Barro (1987) for the United Kingdom; and Huang and Lin (1993) for the United States.

[4]For example, taxes could follow a random walk if rates were determined by a random political process, or if the budget surplus was adjusted to help satisfy a country's external constraint.

twentieth and some of the nineteenth centuries, for Australia, the United Kingdom, and the United States. They find that tax smoothing is accepted only for the United States.

There has been little work examining the presence of tax smoothing in developing countries. Cashin, Olekalns and Sahay (1998) find that the intertemporal tax-smoothing model is useful in describing the fiscal behavior of the Indian central government, but that the Indian states do not tax smooth when there are temporary shocks to expenditure. Importantly, they find a concurrence of tax smoothing and significant financial repression. This situation is likely to be present in many developing countries, which have difficulty in meeting their fiscal objectives from conventional (tax and nontax) revenue sources, and is examined in this paper for two other important South Asian countries, Pakistan and Sri Lanka.

III. Public Finance in South Asia

As in many developing countries, governments in Pakistan and Sri Lanka have found it difficult to satisfy their intertemporal budget constraint with conventional revenue and public borrowings. In addition to market borrowing, both governments have also typically made recourse to the implicit taxation of financial intermediation, using quasi-fiscal activities such as seigniorage and financial repression as sources of fiscal revenue and reduced interest costs, respectively. As to financial repression, governments in South Asia have historically financed their fiscal deficits by forced levies on the financial system via a system of credit rationing and obligatory portfolio requirements (requiring banks to hold government paper at less than market rates of return). The financial sector has provided hidden revenue to the fiscal accounts, as the government captures a large share of bank deposits at artificially low rates of interest.

Financial repression in South Asia has traditionally involved: (i) domestic borrowing by government at below-market interest rates, intermediated by a network of publicly-controlled banks and financial institutions, which were required to hold public debt (due to high reserve and liquidity requirements) at interest rates below those that would be required to voluntarily acquire the debt; and (ii) financial intermediaries setting loan rates on private domestic credit which differed from the exchange-rate adjusted world interest rate (these typically involved nominal ceilings on institutional interest rates to limit competition

from the private sector for the pool of loanable funds).[5] Since 1991, Pakistan has also obtained a large share of its finance from foreign currency deposits, yet at the cost of large actual and contingent liabilities emanating from government-provided exchange rate guarantees. Governments in South Asia have also required their public financial institutions to undertake additional quasi-fiscal operations, involving activities such as: the promotion of subsidized credit to priority areas of the private sector (such as agriculture and small-scale manufacturing), the setting of credit ceilings and floors, exchange rate guarantees, loan rate ceilings, and loan guarantees. The following sub-sections will examine major developments in the public finances of Pakistan and Sri Lanka in recent decades.

A. Public Finance in Pakistan

The period between 1965-72 was marked by internal disturbances and international conflicts, which resulted in a rapid jump in defense expenditures. Pakistan lost control of its fiscal expenditures following the large-scale nationalization and public sector investment initiatives of the early 1970s. This largely permanent jump in development expenditure, initially financed by external borrowing, was not accompanied by higher revenues (Figure 1a). The public sector expanded rapidly from then on, and efforts to contain it through downsizing of the civil service and privatization have not, as yet, been successfully concluded. At the same time, successive regional conflicts have not allowed the containment of military expenditures. The lack of a political consensus on broadening the tax base has prevented any substantive growth in revenues as a percentage of GDP, and the deficit remains high because of the political and administrative inability to either raise revenues or reduce expenditure (Haque and Montiel (1994)). The absence of any substantive revenue-raising effort may also reflect strategic considerations such as the potential for shifting part of the existing public debt burden onto creditors, particularly external creditors. As a result, through much of the 1980s and 1990s policy has been preoccupied by the need to contain growing fiscal deficits and the accompanying increase in public indebtedness, and efforts to curb the cost of debt servicing (Figure 1b).

Through much of the country's history, financial markets have been repressed by policy, with direct controls on deposit and loan rates being maintained. The principal instrument for monetary control has been credit controls involving bank-by-bank credit ceilings and directed credit by way of subceilings on credit allocated to selected sectors.

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[5]Annual average revenue from financial repression in Pakistan has been estimated by Giovannini and de Melo (1993) at a sizeable 3.23 percent of GDP and over 20 percent of government revenue (excluding revenue from financial repression) for the period 1982-83. The results for Sri Lanka are similar, with repression at 3.40 percent of GDP and 19 percent of revenue for the period 1981-83.

Figure 1. Pakistan and Sri Lanka: Fiscal Outcomes, 1954-97
(In percent of GDP)

Figure 1a

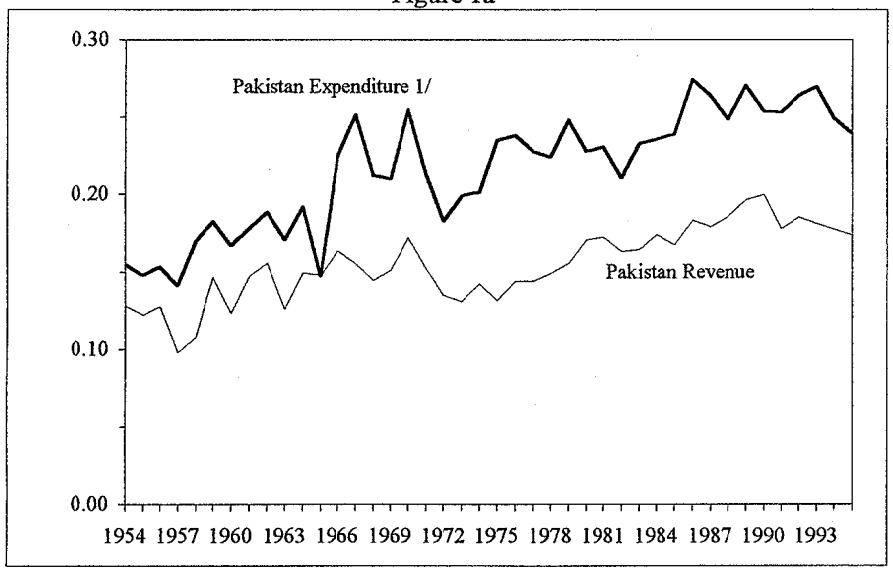


Figure 1b

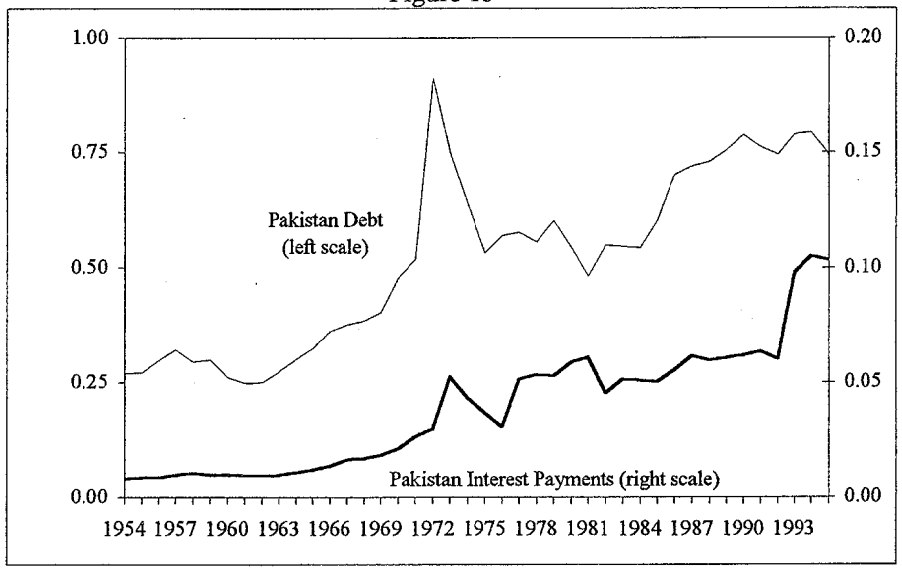


Figure 1c

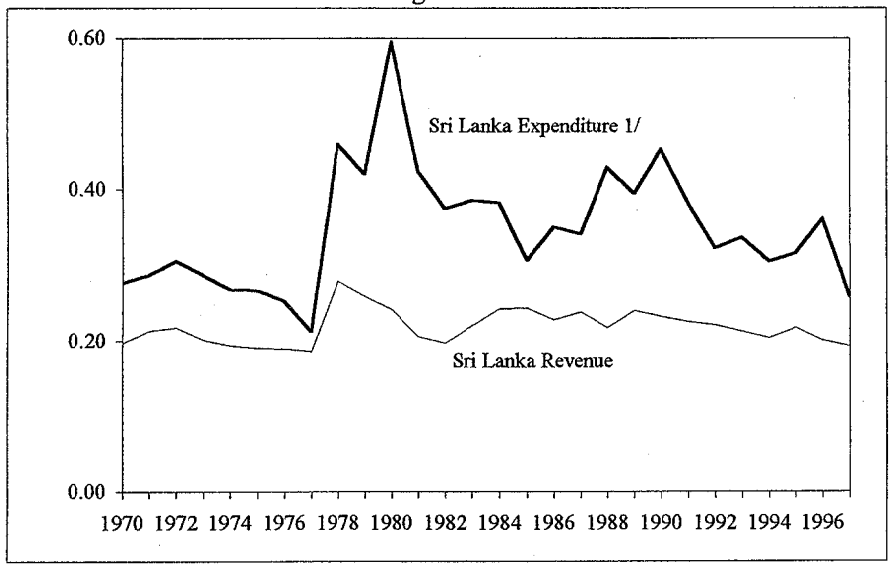
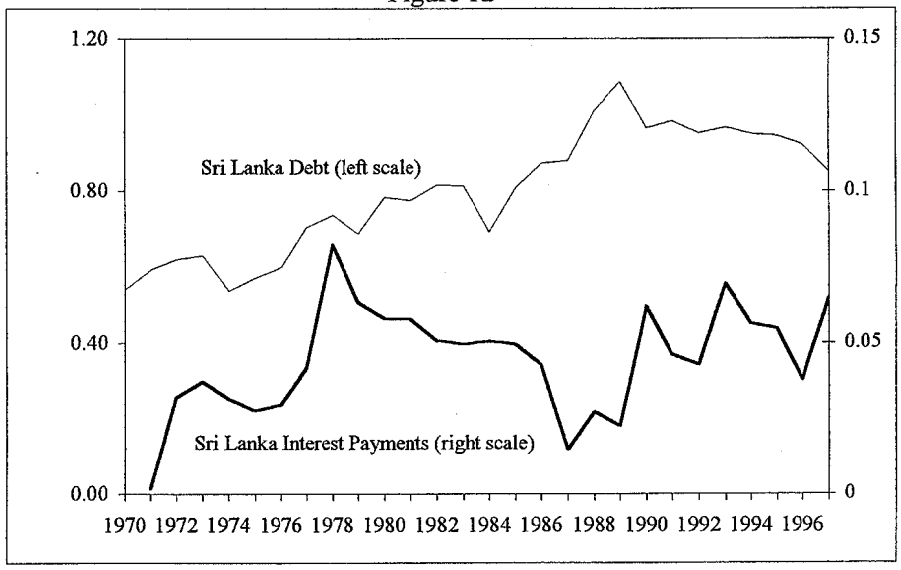


Figure 1d



Sources: IMF, IFS (various issues); IMF staff estimates; authors' calculations. See Section V for data sources and definitions.

1/ Expenditure includes nominal interest payments

For example, concessionary credit amounted to nearly 35 percent of all credit in 1992-93 (Haque and Kardar (1995)). Interest rates on deposits have remained largely negative in real terms, while government paper has been relatively more attractive because of a higher rate of return as well as tax concessions. While the 1985 move to Islamization and profit and loss banking had ostensibly allowed banks to determine their own interest rates, in practice moral and other forms of suasion continue to keep interest rates on deposits at effectively uncompetitive levels. Deposit rates have remained below international rates as implied by uncovered interest parity for much of the period—the difference was as much as 14 percent in 1992-93—and was sharply reduced only as international rates of interest started to come down (see Haque and Kardar (1995)).

Unremunerated reserve requirements have traditionally been set at about 5 percent of deposits, but statutory liquidity ratios have been used at very high levels (as much as 65 percent of deposits in 1992). To meet these requirements banks have to hold government paper.[6] Importantly, commercial banks were nationalized in 1973 and no private banks were allowed to operate until 1992. Even now the banking system is dominated by these large nationalized banks. The repressed financial environment, a system of allocated credit, and government ownership are all factors that have resulted in poor banking practices and the buildup of nonperforming loans in banks' portfolios.

As its fiscal difficulties increased in the 1990s, the government began to offer attractive rates of return to holders of foreign currency. The effective ceiling on interest rates on domestic deposits and the attractive rates on foreign currency deposits further encouraged dollarization of the economy and the buildup of large potential quasi-fiscal losses. Under pressure from the growth of the potential liabilities, in 1998 the government had to terminate this arrangement by a suspension of withdrawals in foreign currency, while withdrawals in rupees at the official exchange rate (lower than the market exchange rate) have been voluntary. Dollar-denominated bonds were also offered to holders of foreign currency deposits as an alternative to withdrawals in local currency.[7]

Previous work examining the sustainability of Pakistan's path of fiscal imbalances found that a combination of concessionary external finance, imperfect private capital mobility and relatively rapid economic growth had allowed the government to borrow, both

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[6] As at mid-1998, unremunerated reserve requirements were 3.5 percent of deposit liabilities, and the statutory liquidity ratio had been reduced to 15 percent of deposit liabilities.

[7] Pakistan has been liberalizing its financial sector since 1989. Importantly, interest rates on government paper had become positive in real terms over the mid- to late-1990s, and exchange controls had been eased. However, the 1998 suspension of withdrawals of foreign currency deposits coincided with the reimposition of exchange controls and a significant reversal of reform efforts, while interest rates remained positive in real terms.

domestically and externally, at rates below the marginal cost of funds in international private capital markets.[8] However, the increasing recourse to domestic nonbank borrowing in the 1980s to finance ongoing deficits rapidly raised the stock of domestic public debt and the magnitude of associated debt servicing (Haque and Montiel (1994)).

B. Public Finance in Sri Lanka

Massive public sector investment initiatives in the 1978-82 period resulted in a permanent jump in development expenditure, which was not accompanied by significantly higher revenues, but was accompanied by a drastic deterioration in Sri Lanka's export duties and terms of trade as tea prices fell (Figure 1c).[9] In addition, during the 1980s current expenditures rose steadily (largely accounted for by rising defense spending, welfare and entitlement expenditures, subsidies to public enterprises and interest expenditures), while the relatively high revenue-to-GDP ratio remained unchanged at about 20 percent. The higher expenditure was initially financed by large capital flows from abroad on concessional terms, but over the course of the 1980s the substantial local funds required to implement the investment projects necessitated the government borrowing domestically and from foreign commercial creditors, so that by 1989 public debt exceeded 100 percent of GDP, split almost equally between domestic and external debt (Figure 1d).

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[8] Much of Pakistan's external debt during the 1980s was acquired on a bilateral basis on concessional terms (see Haque and Montiel (1991)).

[9] The major part of the public investment expenditure concerned the Accelerated Mahaweli Development Program (AMDP), a housing and irrigation project designed to settle 140,000 families and construct five major dams in a six-year period—total expenditure on the AMDP alone was 6 percent of GDP in 1982 and 1983 (Dunham and Kelegama (1997)). For an analysis of fiscal developments in Sri Lanka in the 1970s and 1980s, see Dheerasinghe (1992), Athukorala and Jayasuriya (1994) and Dunham and Kelegama (1997).

The relatively easy availability of concessional external financing, in tandem with domestic financial repression policies, made it possible (as with other South Asian countries) for Sri Lanka to finance fiscal deficits without the associated buildup of inflation.[10] [11] [12] Financially repressive policies have been similar to those followed in the region as well as in the rest of the world. Real interest rates (particularly deposit rates) were substantially negative until the mid-1980s, and direct interest rate controls were used until a serious financial liberalization effort was adopted in 1989—since then more indirect methods of keeping rates at reasonably financeable levels have been pursued (Athukorala and Jayasuriya (1994)). However, the financial sector remains repressed in other ways. For example, unremunerated statutory reserve requirements on rupee deposit liabilities of commercial banks remained in the range 13-15 percent until 1998, when they were reduced to about 10 percent. The banking system continues to be dominated by two large government-owned banks, which are obliged to direct credit to commercially nonviable sectors of the economy; as in other South Asian countries, pension funds are not allowed to invest in instruments other than treasury bills. As a result, up to two-thirds of total government debt is sold to public banks, insurance companies and government-sponsored pension funds at below-market interest rates.

In the wake of its balance of payments crisis of 1989, the Sri Lankan government has made a serious effort to rationalize fiscal policy and pursue domestic structural reform, in the context of a stabilization and adjustment program. As a result, nonmilitary spending (particularly subsidies and transfers) has been contained and tax measures put in place to allow

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[10] There were some exceptions to this general environment of low inflation. During some episodes, particularly in the late 1970s following the initiation of liberalization, and in the second half of the 1980s when military expenditures began to rise as a result of internal conflict, domestic inflation accelerated rather sharply. This was due, at least in part, not only to the incomplete sterilization of foreign capital inflows but also to the fact that not all of the monetization of the fiscal deficit was absorbed through increasing money demand and high statutory reserve requirements.

[11] Sri Lanka obtains a much larger share of its foreign financing at concessional terms than does Pakistan, with almost all of its foreign debt taking the form of concessional loans provided by international development and financial institutions on a bilateral basis. However, in spite of the concessional nature of foreign public debt, interest payments are a large component of public expenditure, accounting for about one-third of taxation revenue (more than 6 percent of GDP—see Figure 1d).

[12] In the early 1980s, the availability of concessional official external financing helped contain domestic inflationary pressures even though the fiscal deficit had grown to over 8 percent of GDP. Financially repressive policies, growing receipts from workers' remittances and an expanding domestic economy also helped in this regard. See Haque and Montiel (1994) for an analysis of the ability of South Asian countries to finance large fiscal deficits in a noninflationary manner.

the deficit to be reduced considerably. In the 1990s, concessional (domestic and foreign) financing and a relatively high rate of economic growth have been key factors helping to stabilize Sri Lanka's debt-to-GDP ratio. However, previous sustainability analyses have argued that, given the size of its debt stock and debt servicing burden, it is likely that further increases in net revenues will be required to ensure fiscal sustainability (Stern (1997)).

IV. The Tax-Smoothing Model and Empirical Methodology

The discussion above highlights how both Pakistan and Sri Lanka have used repressive financial measures to compensate for a shortfall in revenues from more conventional sources. In this section, we consider all sources of revenue and ask whether the raising of these revenues, with respect to both their magnitude and their timing, has been optimal. This analysis is carried out using the tax-smoothing model as our optimality benchmark. We also examine whether the accumulation of public liabilities, which involves both the tax-smoothing and tax-tilting components of fiscal deficits, is on a sustainable path.

A. The Tax-Smoothing Model

The basis for the tax-smoothing model of optimal fiscal policy is found in Campbell's (1987) model of consumption smoothing ("the saving for a rainy day hypothesis"). In Campbell's model risk averse economic agents use their savings to smooth the path of consumption expenditures in the presence of predictable changes in their future income. In the tax-smoothing model it is the government, acting on behalf of its risk-averse agents, that undertakes the required smoothing through its borrowing (dissaving) and lending (saving) behavior in the presence of predictable changes in its future expenditure.

In the absence of a first-best system of lump-sum taxes, the government must seek to minimize the welfare losses arising from its choice of tax rate. These losses are assumed to be an increasing, convex and time invariant function of the average tax rate. Following the presentation of Barro (1979) and Ghosh (1995), the government's objective function is to maximize

$$V = -(1/2)\sum_{i=0}^{\infty} \beta^i E\left[\tau_{t+i}^2 | I_t\right] \qquad 0<\beta<1, \tag{1}$$

where $\beta = 1/(1+\delta)$ is the government's subjective discount rate that reflects preference for current taxation over future taxation; δ is the government's rate of time preference; E is the expectations operator; I_t is the information set available to the government at time t; τ_t is the average rate of tax at time t; and distortionary costs are assumed to be proportional to the

square of the average tax rate.[13] The convexity of the tax rate means that agents favor a constant (smooth) tax rate over a variable rate yielding the same revenue.

In seeking to minimize any tax-induced distortions, the government's actions are conditioned by its adherence to the intertemporal budget constraint, which requires that the present value of tax receipts be sufficient to cover all current and future government spending, and its initial level of debt. In satisfying this budget constraint, taxes cannot remain invariant to changes in either current or future expenditure, but welfare losses will be minimized if, in responding to new (unforseen) information about the path of future government expenditure, the government smooths the implied change in tax rates over time. Accordingly, the optimal tax rate will follow a random walk (and so will not be forecastable), changing only in the face of new information about the government's plans for future expenditure. Moreover, an increase in the size of the budget deficit, if optimal, implies that government expenditure is expected to decline in the future, with the increased deficit allowing the tax reduction to be smoothed over time.

A tax-smoothing government, given that its discount rate equals the effective real interest rate, will have an optimal budget surplus which is equal to the discounted sum of all future expected changes in government expenditure

$$sur_t^* = \sum_{i=1}^{\infty} R^i E(\Delta g_{t+i} | I_t), \tag{2}$$

where $R \equiv (1+n)/(1+r)$ is the real interest cost of servicing the government's debt; r is the real interest rate; n is the real rate of output growth; Δ is the first-difference operator; and g is (exogenously given) government spending (net of interest payments) normalized by the level of output. A test of whether the government is smoothing taxes optimally can be carried out by comparing equation (2) to the actual budget surplus

$$sur_t = \tau_t - g_t - (r-n)d_t, \tag{3}$$

where d_t is the stock of government debt normalized by the level of output.

There are two broad considerations motivating a government to run a budget deficit: tax tilting and tax smoothing. The analysis, up to this point, has assumed that only considerations of future changes to government expenditure (that is, tax smoothing) motivate the government to run either a budget deficit or a budget surplus. However, other intertemporal incentives for running unbalanced budgets exist. Even if we assume that government spending as a share of output will remain constant into the future (in which case

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[13] In this section we provide only a brief sketch of the theoretical model; the derivation and additional details can be found in Barro (1979) and Ghosh (1995).

there would be no need for tax smoothing), if the government's discount rate, β, differs from the effective interest rate, R, then the government may engage in tax tilting. Tax tilting results in a bias towards either budget deficits or budget surpluses, which are created in a manner consistent with intertemporal solvency.[14] For example, if $\beta < R$, the government's incentive is to shift taxes into the future, run fiscal deficits, increase its current level of liabilities and then gradually raise taxes over time. Such a government would choose to have a low tax rate in the present period, but would raise taxes over time to service its accumulating stock of debt—it has a preference to have deficits falling through time. Apart from a high government rate of time preference (which lowers the government discount rate (β)), two other important causes of deficit-inducing tax tilting are high economic growth rates and low real interest rates, both of which raise the effective interest rate on public borrowings (R).

Since tax tilting has implications for the budget surplus that are entirely distinct from tax smoothing, it is important to ensure that the optimal surplus derived from equation (2) is compared to only that component of the budget surplus that relates to tax smoothing, and not to the actual budget surplus (which potentially includes both tax smoothing and tax tilting components). This requires that tax tilting be filtered from the surplus according to

$$sur_t^{sm} = \gamma^{-1}\tau_t - g_t - (r-n)d_t, \tag{3}$$

where $\gamma \equiv [(1-(R/\beta)R)/(1-R)]$ is the tilting parameter. The coefficient γ accounts for the fact that the optimal tax rate incorporates incentives for the government to defer taxes or enlarge surpluses, depending on the relationship between the government's discount rate, β, and the real interest cost of servicing the government's debt, R.[15]

Equation (3) measures the tax-smoothing component of the actual budget surplus; when $\beta < R$ (and so $\gamma < 1$), the tax-smoothing surplus sur_t^{sm} will be larger than the measured budget surplus (sur_t), since the incentive is for the government to defer tax collections into the future and so run a budget deficit in the present on tax-tilting grounds. Assuming that sur_t^{sm} is stationary, then γ^{-1} is the cointegrating parameter from a regression of $(g_t+(r-n)d_t)$ on τ_t. Our focus in this paper is on the tax-smoothing component of budget surpluses, because without an explicit model of intergenerational welfare it is not possible to decide whether deferring/bringing forward tax collections (that is, tax tilting) is desirable. However, as long

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[14]Tax tilting could occur, for example, if the current government is unsure of its reelection prospects and therefore favors higher current debt levels than are implied by tax smoothing, in order to exert an influence of the future spending activities of rival political parties who assume office (Alesina and Perotti (1995) and Olekalns (1997)). See Ghosh (1995) for a discussion of tax tilting.

[15] When calculating the surplus, r and n are set equal to their respective period-average values.

as the government's objective function is of a form like equation (1), there will be avoidable deadweight costs from a failure to tax smooth (Ghosh (1995)).[16]

The derivation of the optimal budget surplus (equation (2)) requires a measure of anticipated future changes to government expenditure. One approach is to use current and lagged changes in government spending to predict future changes in government spending. In addition, and following Campbell and Shiller (1987), an obvious way of deriving such a measure is to exploit the fact that under the null hypothesis that tax smoothing is valid, the budget surplus contains all the known information about future changes to the government's spending plans. Accordingly, the budget surplus should Granger-cause (help predict) future changes in government expenditure. Because the smoothed budget surplus (sur_t^{sm}) responds to expected future changes in government spending, it is a relevant information variable to forecast future changes in government expenditure. This means that forecasts of future changes to government spending can be recovered from a bivariate autoregressive model of the Δg_t and sur_t^{sm}.

As a result, we estimate a first-order unrestricted bivariate vector autoregression (VAR) of the form $W_t = A\ W_{t-1} + \epsilon_t$, where $W_t = (\Delta g_t \ \ \hat{sur}_t^{sm})'$, ϵ_t is a 2×1 vector of disturbance terms, and A is a 2×2 matrix of coefficients. With the estimate of A from the VAR and using the fact that $E_t[W_{t+j}] = A^j\ W_t$, an estimate of the optimal tax-smoothing component of the budget surplus can be computed as

$$\hat{sur}_t^{*sm} = [1\ \ 0]R\hat{A}\,[I_2 - R\hat{A}]^{-1} W_t \equiv \hat{\Lambda} W_t \qquad (4)$$

where I_2 is the 2×2 identity matrix and Λ is a 1×2 matrix of coefficients.[17] Expression (4) is valid as long as both the infinite sum in equation (2) converges, and the variables appearing in the W matrix of the VAR system are stationary. Assuming that g_t is I(1), Δg_t will be I(0). Since under the null the actual (tax-smoothing) budget surplus (sur_t^{sm}) is equal to sur_t^*, which from equation (2) is a discounted sum of Δg_t, then sur_t^{sm} will also be I(0). The validity of the tax-smoothing hypothesis can be tested by comparing the estimate of the optimal (tax-smoothing) budget surplus derived from equation (4) with the estimated actual (tax-smoothing) budget surplus derived from equation (3).

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[16] While in the absence of a model of intergenerational welfare it is not possible to gauge the optimality of tax-tilting behavior, it is possible to use the optimality benchmark provided by tax-smoothing behavior (which is sustainable by definition) to examine the sustainability of the very large tax-tilting components of the fiscal deficits of Pakistan and Sri Lanka. This analysis is described in Section IV.B, and the results are presented in Section VI.

[17] The assumption of a constant real interest rate (r) assists in the derivation of equation (4), by allowing for the summation of a matrix geometric series. It also implies that the tax-tilting parameter is constant, which allows for stochastic detrending of the actual budget surplus data to focus on the stationary tax-smoothing component of the budget surplus.

In carrying out this test, we can examine whether the VAR parameters in equation (4) conform to the nonlinear restriction

$$\Lambda = [1\ 0]RA[I_2 - RA]^{-1} = [0\ 1]. \tag{5}$$

This restriction implies that movements of the actual (tax-smoothing) budget surplus reflect those of the optimal (tax-smoothing) budget surplus; failure of this restriction implies that the government is not optimally smoothing its taxation path. Examination of whether the optimal and actual (smoothed) budget surpluses are similar, which would be a finding supportive of the tax-smoothing hypothesis, can be done by inspection of a plot of the respective series or, more formally, by estimation of the equation

$$s\hat{u}r_t^{*sm} \equiv \Lambda W_t = \lambda_1 \Delta g_t + \lambda_2 s\hat{u}r_t^{sm}. \tag{6}$$

Optimal tax smoothing implies the joint parameter restriction $\lambda_1=0$ and $\lambda_2=1$, and nonrejection of these joint restrictions implies that movements in $s\hat{u}r_t^{*sm}$ fully reflect movements in $s\hat{u}r_t^{sm}$.

B. Sustainability of Public Liabilities

The final part of our analysis concerns whether fiscal policy (in particular the accumulation of public liabilities) is on a sustainable path. A fiscal policy is sustainable if it can be maintained into the indefinite future without leading the government into insolvency (Gerson and Nellor (1997)). Accordingly, sustainability focuses on whether fiscal policy *could* be continued indefinitely under unchanged policies, in contrast to the tax-smoothing analysis above which focuses on the optimality of fiscal policy (whether it *should* be continued). That is, an analysis of the optimality of the tax-smoothing component of fiscal deficits differs from an analysis of the sustainability of a given fiscal policy, as the latter concerns the sustainability of *both* the tax-smoothing and tax-tilting components of fiscal deficits.

A useful test of intertemporal solvency is to examine the relationship between government spending and revenue. Given that both g_t' (government spending *inclusive* of interest payments on public debt) and τ_t are both I(1) variables, then as demonstrated by Hakkio and Rush (1991), cointegration between g_t' and τ_t is a necessary and sufficient condition for a government to be solvent (satisfying its intertemporal budget constraint). That is, if the two variables are cointegrated, then over the long run taxation revenue cannot deviate too far from government expenditure.

An alternative treatment of the sustainability issue follows the approach of Cashin and McDermott (1998), who considered the sustainability of net foreign liabilities in the context of the intertemporal approach to the current account. The test developed is based on a

multi-period application of the single-period budget constraint, and examines the time-series properties of the stock of public liabilities in order to characterize the data-generating process and make inferences about the sustainability of fiscal policy. By iterating the government's budget constraint forward we have

$$D_t = E_t\left[\rho^T D_T - \sum_{i=0}^{T-1} \rho^i DEF_{t+i}\right] \tag{7}$$

where $\rho = 1/(1+r)$; $DEF_t = (g_t - \tau_t)Y_t$; Y_t is nominal output and D_t is the government's stock of debt (liabilities). If the tax-smoothing model is valid (that is, the 'no-Ponzi-game' requirement holds), then we also have

$$D_t^* = E_t\left[-\lim_{T\to\infty} \sum_{i=0}^{T-1} \rho^i DEF_{t+i}^*\right] \tag{8}$$

where $DEF_t^* = (g_t - \tau_t^*)Y_t$; and τ_t^* is the optimal rate of tax. Equation (8) says that the present discounted value of future fiscal deficits (or surpluses) must be matched by initial assets (or liabilities). Abstracting from tax-tilting causes of any change in the stock of public liabilities, since the stock of public liabilities consistent with the (tax smoothing) model-generated path of fiscal deficits (D_t^*) is sustainable by construction, the difference between the actual stock of public liabilities (D_t) and the stock consistent with the tax-smoothing model, ($D_t - D_t^*$), must be stationary (and have zero mean) if fiscal policy is to be sustainable. That is, the present setting of fiscal policy can be sustained indefinitely without the need for reform if the series calculated as the difference in the two stocks of public liabilities ($D_t - D_t^*$) is stationary (that is, mean reverting). If not (($D_t - D_t^*$) is found to be nonstationary), then the government will eventually be unable to service its liabilities and the actual stock of public liabilities is accordingly not sustainable on unchanged fiscal settings, which necessitates a change in fiscal policy to ensure sustainability.[18] We carry out these solvency tests in Sections VI.A and VI.B below.

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[18] As with many developing countries, in the cases of Pakistan and Sri Lanka there are two main reasons why the stock of public debt may not be willingly held by market agents. First, part of the external debt was obtained on concessional terms from official bilateral and multilateral sources, and second, part of domestic debt is held by financial institutions (at below-market rates of return) to satisfy liquidity requirements. Haque and Montiel (1994) found that these effects were approximately offsetting in their influence on the differential between the actual and equilibrium deficits in Pakistan: they would tend to result in the overestimation of both the extent of financing private agents would have been willing to provide and the size of the actual deficit that required financing.

V. DATA

The data are taken from official sources—several data series are presented in Figure 1. The period covered ranges between 1954 and 1995 (Pakistan) and between 1964 and 1997 (Sri Lanka).[19] The data are largely taken from the International Monetary Fund's *International Financial Statistics* (IFS) and *Government Finance Statistics* (GFS) databases, for consolidated central government. Expenditure (GEXP) is measured by: aggregate disbursements (current expenditure, capital outlays and loans and advances) net of the recovery of government loans and advances (EXP), less real interest payments (RINT).[20] Revenue (GREV) is measured by: aggregate receipts (total revenue plus grants). The debt stock is measured by the outstanding (domestic and foreign) debt of consolidated central government (LIAB). [21]

A measure of the real interest rate and real growth rate is required to derive the optimal smoothed budget surplus. We experimented with two different nominal interest rates—the first (NOM) divides the central government's interest payments (INT) by its liabilities (LIAB) and the second is the government bond yield (GOV).[22] The change in

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[19] Pakistan includes data on East Pakistan (later Bangladesh) prior to 1974. Data for Pakistan are for fiscal years ending in June; data for Sri Lanka are for calendar years.

[20] RINT is formed as: (GOV*LIAB) less the change in ln(CPI) for Pakistan, and (NOM*LIAB) less the change in ln(CPI) for Sri Lanka; see below for variable definitions.

[21] Pakistan debt data for 1994 and 1995 were constructed using Fund estimates of outstanding domestic and external debt. Revenue data for Sri Lanka prior to 1970 is for total revenue (exclusive of grants). As noted in Section III, the measured path of the debt stock of Pakistan is likely to be an underestimate for a number of reasons: (i) it does not include the contingent liabilities accumulated under the foreign currency deposit scheme; (ii) the accrued interest on Defense Certificates (effectively a long-term zero coupon bond), which are a significant portion of the government's borrowings, are excluded; and (iii) the conduct of quasi-fiscal operations in the public enterprise sector (particularly in water and power distribution) are likely to have led to an increase in the government's (explicit and implicit) contingent liabilities.

[22] For Pakistan, there is no GFS data on interest payments prior to 1974, necessitating use of the government bond yield (GOV) to measure interest payments in the empirical estimation of the 1954-95 period. The results proved to be insensitive to our choice of nominal interest rate when using the post-1974 data. For Sri Lanka, data on interest payments between 1964-69 is taken from Jayamaha (1976), and in the absence of data on the government bond yield prior to 1984, (NOM) is used as the measure of interest payments.

the consumer price index (CPI) is used to convert these nominal rates to real rates. Nominal gross domestic product at market prices (NGDP) is used to normalize the variables where appropriate, and real gross domestic product (RGDP) is used to calculate the real growth rate for the economy. Finally, the tax-smoothing component of the budget surplus is derived according to equation (4).[23]

VI. Empirical Results

A. Tax Smoothing Results for Pakistan (1954-95)

The first step in the empirical analysis is to estimate the value of the tilting parameter $\hat{\gamma}^{-1}$, in order to construct the stationary, tax-smoothing component of the fiscal balance by removing from the data the nonstationary component of the fiscal balance that is associated with tax tilting. As noted previously, as long as τ_t and $(g_t + (r\text{-}n)d_t)$ are both I(1) variables, equation (3) can be interpreted as a cointegrating regression and $\hat{\gamma}^{-1}$ can be estimated using the Phillips-Hansen fully modified method, which yields an asymptotically correct variance-covariance estimator in the presence of serial correlation and endogeneity.[24] We therefore need to establish the time series characteristics of these variables and test for cointegration.

Augmented Dickey-Fuller (ADF) tests yielded test statistics of -2.145 (for τ_t) and -3.154 (for $(g_t + (r\text{-}n)d_t)$). These indicate that both τ_t and $(g_t + (r\text{-}n)d_t)$ are I(1), as the test statistic (using the critical values reported in Davidson and McKinnon (1993)) rejects a unit root at the 5 percent level of significance. As unit root tests are known to perform poorly when a structural change has occurred in the underlying data generating process, we also implemented the procedure due to Zivot and Andrews (1992) to determine whether the variables were I(1). This is a sequential unit root test allowing for the possibility of a

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[23] Data are taken from: GREV (line A.I, GFS); EXP (C.I); LIAB (F.I); INT (C.2); and NGDP (line 99b, IFS); RGDP (line 99b.p), CPI (line 64) and GOV (line 61) for the period 1954-95 (Pakistan) and (all variables except GOV) for the period 1964-97 (Sri Lanka).

[24] A correction for serial correlation and endogeneity is needed because while sur_t^{sm} is I(0) it is not iid, as sur_t will be endogenous to g_t and will most likely be correlated with sur_{t-1}.

structural change at an unknown break-point. Even after allowing for the possibility of significant structural change, both variables appear to be I(1), and this means that cointegration is a possibility.[25]

Given that τ_t and $(g_t + (r\text{-}n)d_t)$ are both I(1) variables, we proceeded to estimate the tilting parameter on the assumption that equation (3) is a cointegrating regression (and we check this assumption shortly). The Phillips-Hansen (1990) fully modified OLS estimator yielded a value for $\hat{\gamma}^{-1}$ in equation (3) of 1.228, with an associated standard error of 0.067. The cointegrating relation defined by this parameter appears to be stable; Hansen's (1992) *Lc, MeanF and SupF* statistics were, respectively, 0.120, 0.686 and 1.924, well below the critical values that would indicate that the cointegrating relation was unstable. Since the value for $\hat{\gamma}^{-1}$ is well above one (and significantly so), it shows that tax tilting has been very important for the Pakistan government and is symptomatic of a deficit bias that has existed in Pakistan's public finance over the sample period.[26] The source for this deficit bias lies in an extremely low real interest rate for Pakistan over the sample period, meaning that the Pakistan government has had a relatively high rate of time preference, causing it to have a preference for deferring taxes into the future, running high deficits initially and then having deficits fall through time. The value of $\hat{\gamma}^{-1}$ for Pakistan far exceeds the value of this parameter in previous empirical work for developed countries of Australia (Olekalns (1997), $\hat{\gamma}^{-1}$=0.96), Canada (Ghosh (1995), 0.93), and the United States (Ghosh (1995), 0.94), yet is close to that found for India (Cashin, Olekalns and Sahay (1998), 1.40). A value for $\hat{\gamma}^{-1}$ of 1.228 suggests that the component of the actual Pakistan fiscal deficit attributable to tax tilting is equivalent to forgoing 23 percent of tax revenue in the near term, and subsequently raising taxes over time to clear the stock of accumulated liabilities.

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[25] For Pakistan, the test statistics were -3.105 (for τ_t) and -4.088 for $(g_t + (r\text{-}n)d_t)$) and these should be compared, at the 5 percent level of significance, to a critical value of -5.08 (see Zivot and Andrews (1992) for more details about the construction of these statistics and the calculation of the critical values).

[26] A likely important source of this incentive to tilt deficits toward the current period has been the extensive quasi-fiscal activities of Pakistan's public financial institutions, chiefly the large-scale taxation of financial intermediation through seigniorage and financial repression (as outlined in Section III). These quasi-fiscal activities resulted in Pakistan's real rate of interest (r) being low (and often negative) for much of the sample period (averaging -1.00 percent), yielding low values for the effective interest rate faced by government ($R^{-1} \equiv (1+r)/(1+n)$), indicating that the government had a relatively low discount rate ($\beta < R$) and γ^{-1} is much greater than one. The sample average annual growth of real output was 5.85 percent.

Finally, the actual (tax-smoothing) component of the fiscal balance, sur_t^{sm}, is defined by the residuals of the cointegrated regression of equation (3), and to confirm the regression is indeed cointegrated, the Phillips-Ouliaris (1990) residual-based cointegration test was employed. This produced a test statistic of 26.861, which is greater than the 5 percent critical value (of 25.9) and therefore we can reject the null hypothesis of no cointegration. As a further check, we also used the Gregory and Hansen (1996) test for cointegration, which is robust in the face of a possible structural change. As with the Zivot and Andrews (1992) unit root test, the Gregory-Hansen procedure is a sequential technique which is suitable when the date of any structural change is unknown. Three possible structural changes are allowed for: a level shift (model *C*), a level shift with trend (model *C/T*) and a regime change (model *C/S*). The sequential augmented Dickey-Fuller test statistics were -5.062 (*C*), -5.118 (*C/T*) and -5.054 (*C/S*) which, when compared to the critical values reported in Gregory and Hansen (1996), are unable to reject equation (3) being a cointegrating relation.

Some indication of the magnitude of tax tilting can be obtained from Figure 2a, which plots the actual budget deficit and the budget deficit after the tilting component has been removed (we refer to this as the smoothed budget deficit). Tax tilting has meant that in all but two years, Pakistan has run an actual budget deficit. However, the smoothed component has traditionally been in surplus, the significant exceptions being the mid-1960s, mid-1970s and early-1990s.

The above results also confirm that two of the predictions made by the tax-smoothing model can be confirmed using Pakistan data. The first prediction is that the average tax rate follows a random walk, since the rate would only be changed on the arrival of previously unforeseen information about future expenditure changes. Since the ADF and Zivot-Andrews (1992) tests were unable to reject that τ is an I(1) variable, then this prediction of the theory is not refuted by the data. Secondly, the tax-smoothing hypothesis predicts that the smoothed budget surplus will be stationary (I(0)), as it reflects expected future *changes* in government expenditure.[27] Since (as found above) the smoothed budget surplus is the (stationary) residual from a cointegrating regression (equation (3)), then this prediction is also not rejected by the data.

A further implication of the tax-smoothing hypothesis, analogous to Campbell's (1987) consumption-smoothing hypothesis, is that the budget surplus should Granger-cause (help predict) future changes in government spending. This will be true whenever the government has better information about the future path of its expenditure (through news of political or

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[27] Assuming that g_t is I(1), then Δg_t will be I(0); since under the null hypothesis the actual (tax-smoothed) budget surplus is the discounted sum of Δg_t (see equation (2)), then the smoothed budget surplus should also be I(0). The Zivot-Andrews (1992) test statistic for g was -3.356 and for Δg_t the test statistic was -8.495, indicating that g_t is I(1) and Δg_t is I(0).

Figure 2. Pakistan and Sri Lanka: Tax Smoothing and Public Debt, 1954-97

Figure 2a

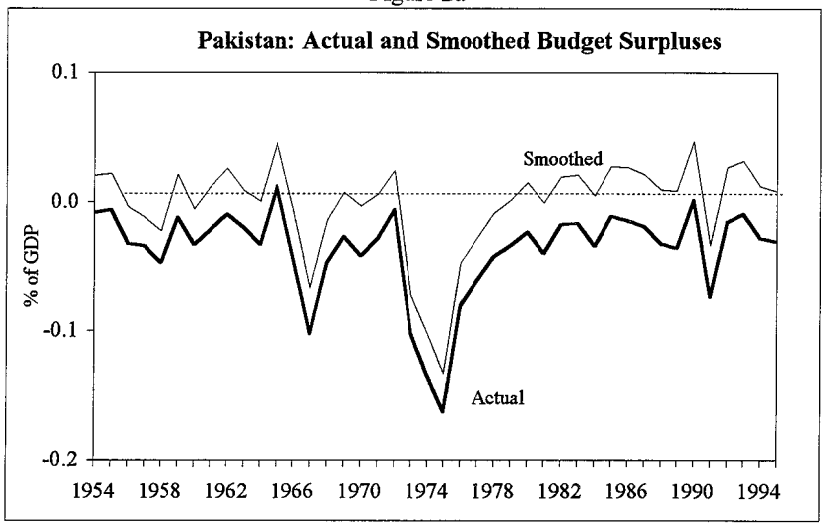


Figure 2b

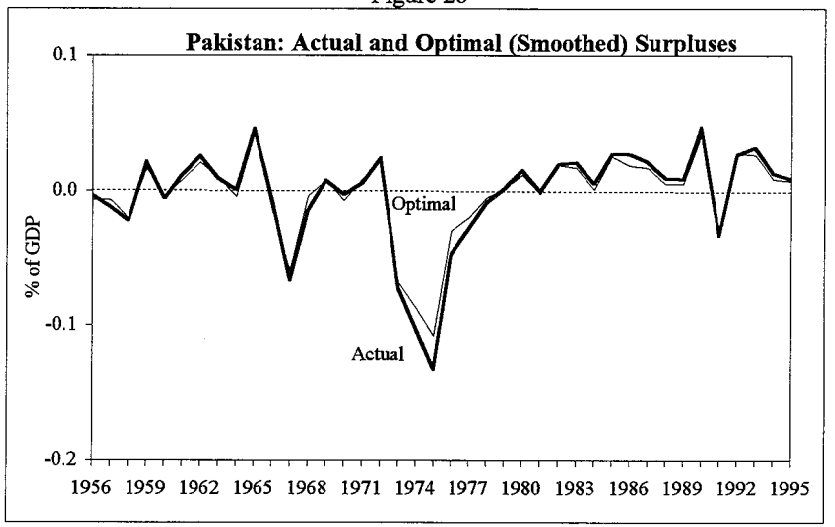


Figure 2c

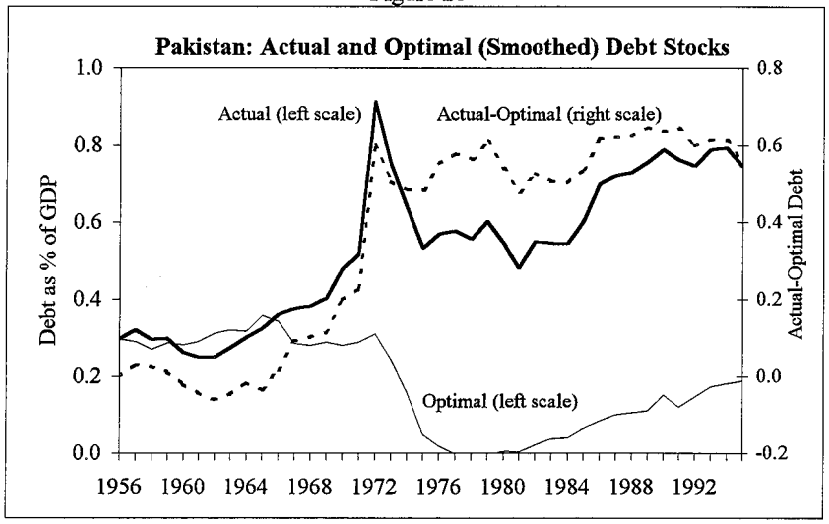
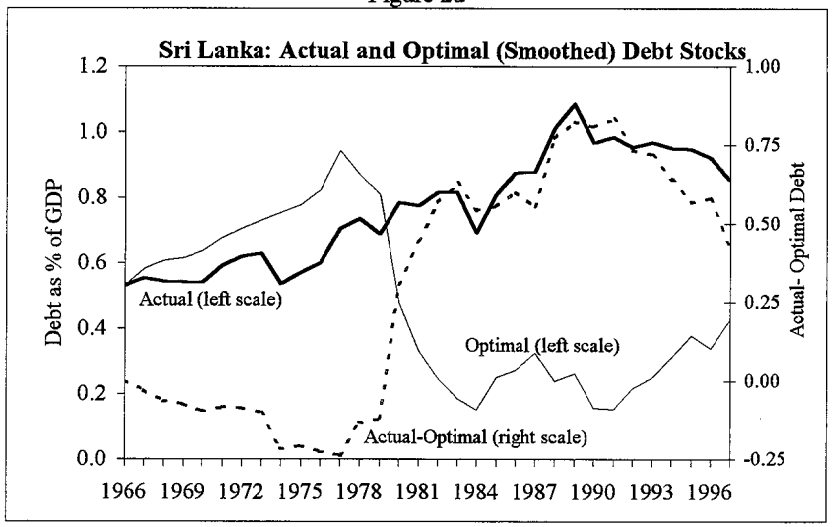


Figure 2d



Source: Authors' calculations.

other events) than is contained in past values of the expenditure series (Ghosh (1995)). Under the null hypothesis that equation (2) holds, and so the budget surplus equals the discounted value of future changes in government expenditure (given the government's information set), then the surplus should take into account this additional information and so Granger-cause changes in government spending. The F-statistic for the hypothesis that lagged values of the smoothed budget surplus have no predictive power for current changes in government expenditure is 6.845, which is significant at the 5 percent level. Therefore, the budget surplus has some information with regard to future changes in government expenditure, as predicted by the tax-smoothing hypothesis.

The actual (tax-smoothed) budget surplus derived from equation (3), and the optimal (tax-smoothed) budget surplus derived from equation (4), are shown in Figure 2b. The graph shows that with the exception of the mid-1970s, there has been a close correspondence between the optimal and actual smoothed surpluses. However, a Wald test of the parameter restrictions on the VAR implied by the tax-smoothing hypothesis (equation (6)), which examines whether there is a close association between movements in the actual (tax-smoothed) budget surplus and the optimal (tax-smoothed) budget surplus, formally rejects the tax-smoothing hypothesis at the 5 percent level of significance (Table 1). The test shows that the parameter restrictions are rejected by the data, indicating that the differences between the actual (tax-smoothed) and optimal (tax-smoothed) surpluses observed in Figure 2b represent more than just random sampling error.

Table 1. Wald Test Results: Pakistan

$$sur_t^{*sm} \equiv \Delta W_t = \lambda_1 \Delta g_t + \lambda_2 \, sur_t^{sm}$$

	γ^{-1}	F	$\hat{\lambda}_1$	$\hat{\lambda}_2$	χ^2_2
Pakistan	1.228	6.845	-0.117	0.796	6.321
(1954-95)	(0.067)	(0.010)	(0.052)	(0.123)	(0.042)

Notes: γ^{-1} is the Phillips-Hanson (1990) fully-modified estimate of the tax-tilting parameter, while the number in parentheses is the estimated standard error. F is the F-test for the null hypothesis that sur_t^{sm} does not Granger cause (help predict) Δg_t; the lag length (one lag) was selected by minimizing the Schwarz Criterion, and the significance level at which the null hypothesis can be rejected (p-value) is given in parentheses. The coefficients $\hat{\lambda}_1$ and $\hat{\lambda}_2$ are the estimated parameters from equation (4), and the numbers in parentheses are the estimated standard errors. The Wald test statistic (distributed as a χ^2_2) is to determine whether the estimated VAR coefficients satisfy a restriction of the tax-smoothing model, in particular the null hypothesis that $\hat{\lambda}_1 = 0$ and $\hat{\lambda}_2 = 1$. The significance level at which the null hypothesis can be rejected (p-value) is given in parentheses.

Despite the formal rejection of tax smoothing by the Wald test, the correspondence between the optimal and actual smoothed surpluses in Figure 2b is quite close, and therefore it would be far too strong to conclude that the data are completely inconsistent with the predictions of the tax-smoothing hypothesis. Accordingly, there is some evidence that Pakistan has engaged in tax-smoothing behavior over the period analyzed, in that it responded to expected future changes in government spending by running budget imbalances, rather than altering contemporaneous government revenue. In this connection, it is likely that the traditional inability of Pakistan's government to satisfy its intertemporal budget constraint from conventional (tax and nontax) revenue sources raised the likelihood of public borrowing being its preferred response to future shocks to government spending—behavior consistent with the tax-smoothing hypothesis.[28]

These results point to the broad consistency of Pakistan's fiscal data with the predictions made by the tax-smoothing hypothesis, and are similar to those found previously for India (Cashin, Olekalns and Sahay (1998)). It is important, however, to remember when interpreting these results that they relate *only to the smoothed component* of Pakistan's fiscal balance. The magnitude of the tax tilting that has occurred in Pakistan is sufficiently large that there can still be concerns about the sustainability of Pakistan's fiscal policy even if the stationary component of the budget surplus adheres to the tax-smoothing hypothesis. To gain some insight into this, we follow the technique used by Cashin and McDermott (1998) to investigate the sustainability of the actual stock of public liabilities. This involves calculating the stock of liabilities consistent with the optimal path of fiscal deficits generated by the tax smoothing model, (D_t^*), and seeing whether this evolves in tandem with the actual stock of

[28]This inability to garner sufficient revenue stems largely from the narrowness of the tax base, widespread tax evasion and exemptions, weak tax administration, the poor economic performance of revenue-earning public enterprises, and the fact that a large part of economic activity is undertaken in the underground economy (see Haque and Montiel (1994) and Haque and Kardar (1995)).

public liabilities, (D_t). A formal test of this is to check whether the difference in the two liability stocks ($D_t - D_t^*$), the implied excess accumulation of public liabilities, is stationary (mean reverting).[29] [30]

Plots of the actual and optimal (tax smoothed) stocks of liabilities, as well as the difference between the two stocks, are in Figure 2c. They show a sizeable divergence, as would be expected given the magnitude of the tax tilting that has occurred. A Zivot-Andrews (1992) unit root test for the difference between the two series returns a test statistic of -3.034, which is above the critical value at the 5 percent level of significance, clearly indicating that the difference between the actual and tax-smoothing-based stocks of liabilities contains a unit root. This implies that the two series deviate, and have no tendency to follow one another. That is, under unchanged fiscal policies, the differential between Pakistan's actual and optimal (tax smoothed) stocks of public liabilities would increase indefinitely, and accordingly Pakistan's fiscal policy is not on a sustainable path.

This result can also be seen in Figure 2c. Over the period 1956-95 (D_t-D_t^*) has been trending upward, indicating that public borrowing is in excess of what expected future fiscal surpluses can service. This shows there has been excess accumulation of public liabilities over the period, vis-à-vis the base year of 1956. While the excess accumulation was relatively small until the late 1960s (the stock of actual liabilities was less than 10 percent of GDP greater than

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[29] The tax-smoothing model generates conditions under which the stock of public liabilities can be repaid, as fiscal deficits derived under the model are sustainable, by definition. Accordingly, if the actual stock of public liabilities is rising more rapidly than the stock of liabilities implied by the tax-smoothing model, then the current path of fiscal deficits under unchanged policies is unsustainable. Note that the implied stock of liabilities that is consistent with the optimal budget surplus is calculated on the assumption that the 1956 actual stock of liabilities is equal to the optimal stock of liabilities.

[30] As noted in Section IV, a test of fiscal sustainability is to examine whether government revenue (τ_t) and government spending (inclusive of interest payments on public debt, g_t') are cointegrated variables. We find that both variables are I(1), and so the possibility of cointegration exists. The Zivot-Andrews (1992) test statistic for g_t' was -4.137, which should be compared, at the 5 percent level of significance, to a critical value of -5.08. Accordingly, the null hypothesis of a unit root cannot be rejected in favor of stationarity. The τ_t series has already been shown to be I(1). However, the null hypothesis of no cointegration between g_t' and τ_t (allowing for a structural break) is not rejected using the Gregory-Hansen (1996) test, as the sequential augmented Dickey-Fuller test statistics were: -4.747 (model *C*), -4.983 (model *C/T*) and -4.777 (model *C/S*). Using the critical values reported by Gregory and Hansen (1996), these test statistics reject cointegration at the five percent level under both the C/T and C/S specifications, and so intertemporal solvency under unchanged policies is rejected.

its optimal level), the difference between the two stocks of liabilities grew rapidly during the early 1970s, then grew more slowly in subsequent decades, peaking in the late-1980s at about 64 percent of GDP. As of 1995, the actual stock of public liabilities was about 56 percent of GDP higher than the level consistent with the optimal path of fiscal deficits generated by the tax-smoothing model.[31]

The actual stock of public liabilities reflects both tax smoothing and tax tilting considerations. For many developing country governments, the political and institutional difficulties of raising revenue, as well as the political advantages of raising expenditure, can lead to the adoption of unsustainable fiscal policies. In such situations tax-smoothing behavior could be observed in the context of the overall unsustainability of fiscal policies, with the government's excessive public borrowing being attributable to the excessively large tax-tilting component of its fiscal deficits.

Given that the Pakistan government was found to tax smooth (see Table 1 and Figure 2b), then the bulk of its excessive public borrowing can be attributed to tax tilting, with the government levying low taxes in the present and (implicitly) higher taxes in the future so that intertemporal solvency can be satisfied. In the Pakistan context, this requires that at some future point in time taxes will need to be raised and fiscal surpluses (or smaller fiscal deficits) will need to be run to service the government's stock of liabilities. These results suggest that, while Pakistan's fiscal regime has become less deficit-biased in the 1990s than those responsible for the tax-tilting-induced accumulation of public liabilities which occurred in the 1970s and 1980s, there is a need for further fiscal reform to ensure the sustainability of Pakistan's fiscal policy.

B. Tax Smoothing Results for Sri Lanka (1964-97)

A similar econometric analysis was then carried out for Sri Lanka. In establishing the time series characteristics of the fiscal variables, ADF tests yielded test statistics of -3.256 (for τ_t) and -3.176 (for $(g_t + (r\text{-}n)d_t)$). These indicate that both τ_t and $(g_t + (r\text{-}n)d_t)$ are I(1), as the test statistic (using the critical values reported in Davidson and McKinnon (1993)) rejects a unit root at the 5 percent level of significance. We also implemented the procedure due to Zivot and Andrews (1992) to determine whether the variables were I(1). Even after allowing

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[31] Interestingly, those periods when the differential between the actual and optimal stocks of liabilities fell typically coincided with IMF programs, particularly those: in the late-1970s to early-1980s, between December 1988-December 1991, and from February 1994 onwards. In addition, the tighter fiscal policies (fall in g and rise in τ) which typically accompanied these programs acted to dampen tax smoothing, through counter-cyclical fiscal (taxation) policies introduced to correct for undersaving-induced external crises.

for the possibility of significant structural change, both variables appear to be I(1), and this means that cointegration is a possibility.[32]

Given that τ_t and $(g_t + (r\text{-}n)d_t)$ are both I(1) variables, we proceeded to estimate the tilting parameter $\hat{\gamma}^{-1}$ on the assumption that equation (3) is a cointegrating regression (we check this assumption shortly). The Phillips-Hansen (1990) fully modified OLS estimator yielded a value for $\hat{\gamma}^{-1}$ in equation (3) of 1.245, with an associated standard error of 0.063. The cointegrating relation defined by this parameter appears to be stable; Hansen's (1992) *Lc, MeanF and SupF* statistics were, respectively, 0.192, 1.245 and 3.774, well below the critical values that would indicate that the cointegrating relation was unstable. Since the value for $\hat{\gamma}^{-1}$ is well above one (and significantly so), it shows that, as with Pakistan, tax tilting has been very important for the Sri Lankan government and is symptomatic of a deficit bias that has existed in Sri Lankan public finance over the sample period.[33] As with Pakistan, the source for this deficit bias lies in a extremely low real interest rate for Sri Lanka (averaging -5.00 percent over the sample period, meaning that the government has had a relatively high rate of time preference, causing it to have a preference for deferring taxes into the future, running high deficits initially and then having deficits fall through time. The value of $\hat{\gamma}^{-1}$ for Sri Lanka far exceeds the value of this parameter in previous empirical work for developed countries, yet is close to that found for other South Asian countries: India (Cashin, Olekalns and Sahay (1998), 1.40) and Pakistan (1.228). A value for $\hat{\gamma}^{-1}$ of 1.245 suggests that the component of the actual Sri Lankan fiscal deficit attributable to tax tilting is equivalent to forgoing 25 percent of tax revenue in the near term, and subsequently raising taxes over time to clear the stock of accumulated liabilities.

Again noting that the actual (tax-smoothing) component of the fiscal balance, sur_t^{sm}, is defined by the residuals of the cointegrated regression of equation (3), the Phillips-Ouliaris (1990) residual-based cointegration test was employed to determine if equation (3) represents a cointegrating relation. This produced a test statistic of 21.086, which is less than the 5 percent critical value (of 25.9), and therefore we cannot reject the null hypothesis of no cointegration. As a final check, we also used the Gregory-Hansen (1996) test for cointegration, which is robust in the face of a possible structural change. As with the case of Pakistan, three possible structural changes are allowed for: a level shift (model *C*), a level shift with trend (model *C/T*) and a regime change (model *C/S*). The sequential augmented Dickey-Fuller test statistics were -3.917 (*C*), -4.838 (*C/T*) and -3.865 (*C/S*) which, when compared to the critical values reported in Gregory and Hansen (1996), reject equation (3) as being a cointegrating relation.

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[32] For Sri Lanka the Zivot-Andrews test statistics were -4.66 (for τ_t) and -4.80 $(g_t + (r\text{-}n)d_t)$), and these should be compared, at the 5 percent level of significance, to a critical value of -5.08.

[33] The sample average annual growth of real output was 4.6 percent.

The above results also confirm that only one of the two predictions made by the tax-smoothing model can be confirmed using Sri Lankan data. The first prediction, that the average tax rate follows a random walk, cannot be rejected by the data, as the ADF and Zivot and Andrews (1992) tests were unable to reject that τ is an I(1) variable. However, the second prediction, that the smoothed budget surplus will be stationary (I(0)), is rejected by the data, because the smoothed budget surplus (the residual from the cointegrating regression (equation (3)), was found to be nonstationary.

The failure to find a cointegrating relation for Sri Lanka represents a rejection of the tax-smoothing hypothesis. In order to meet the requirement that the smoothed budget surplus is the discounted sum of expected future changes to government expenditure, the budget surplus defined by the residual of equation (3) must be stationary[34]. But since equation (3) does not appear to be a cointegrating relation, then this prediction of the theory is rejected by the data. Hence, even though the evidence indicates that the average tax rate in Sri Lanka has followed a random walk, Sri Lanka has not practiced tax smoothing over the 1964-97 sample period.

The failure of the stationary component of Sri Lanka's budget surplus to adhere to the tax-smoothing hypothesis may have important implications for the sustainability of its public liabilities, given that tax smoothing generates conditions under which the stock of public liabilities can be repaid (that is, the smoothing component of fiscal deficits are sustainable, by definition). Moreover, the magnitude of the tax tilting that has occurred in Sri Lanka is sufficiently large that there may be additional concerns about the sustainability of Sri Lanka's fiscal policy.[35]

Plots of the actual (D_t) and tax-smoothing-based (D_t^*) stocks of liabilities, as well as the difference between the two stocks (D_t-D_t^*), are set out in Figure 2d. They show a sizeable change in the relation between the actual and optimal stocks of liabilities around 1977, when the optimal policy was to run down the stock of liabilities whereas the actual stock of liabilities continued to grow. The possibility of a structural break, shown by the level shift in

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[34] As noted above, this assumes that Δg_t is I(0). An ADF test of Δg_t yielded a test statistic of -8.062, consistent with stationarity. The Zivot-Andrews (1992) test statistic for Δg_t was -8.390, again below the critical value of -5.08, indicating that Δg_t is I(0).

[35] If the actual stock of public liabilities is rising more rapidly than the stock of liabilities implied by the tax-smoothing model, then the current path of fiscal deficits under unchanged policies is unsustainable. Note that the implied liability stock that is consistent with the optimal budget surplus is calculated on the assumption that Sri Lanka's 1966 actual stock of liabilities is equal to the optimal liability stock.

the difference between the two liabilities series at about 1979, indicates that the Zivot-Andrews (1992) unit root test should be implemented to check whether the difference between the stocks has a unit root. The Zivot-Andrews test statistic is -4.71, which is greater than the 5 percent critical value, and therefore does not allow us to reject the hypothesis that the difference between the actual and tax-smoothing-based stocks of liabilities contains a unit root. This implies that the two series deviate, and have no tendency to follow one another. Under unchanged fiscal policies, the differential between Sri Lanka's actual and optimal (tax smoothed) stocks of public liabilities would increase indefinitely, and accordingly its fiscal policy is not on a sustainable path.[36] [37]

This formal result can also be seen in Figure 2d. Particularly between 1979-83, $(D_t-D_t^*)$ accelerated rapidly and then subsequently plateaued, indicating (as for Pakistan) that public borrowing is in excess of what expected future fiscal surpluses can service. While the excess accumulation was negative (excessive fiscal surpluses) until 1980, the difference between the two stocks of liabilities grew rapidly during the early 1980s, then grew more slowly in subsequent decades, peaking in the early-1990s at about 83 percent of GDP.[38]

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[36] While for Sri Lanka both the tax-smoothing component (given the rejection of the tax-smoothing hypothesis) *and* the tax-tilting component of its fiscal deficits were found to be unsustainable under unchanged fiscal policies, for Pakistan the tax-smoothing component of its fiscal deficits was found to be sustainable, yet the excessively large tax-tilting component of its deficits resulted in its overall fiscal deficits being on an unsustainable path. For both Pakistan and Sri Lanka, in the absence of further fiscal reform the differential between the actual and optimal stock of public liabilities would increase indefinitely.

[37] As with Pakistan, using a test of fiscal sustainability which examines whether government revenue (τ_t) and spending (inclusive of interest payments on public debt, g_t') are cointegrated variables, we find that both variables are I(1), and so the possibility of cointegration exists. The Zivot-Andrews (1992) test statistic for g_t' was -4.70, which is greater than the 5 percent critical value of -5.08, and so the unit root hypothesis cannot be rejected. The τ_t series has already been shown to be I(1). However, the null hypothesis of no cointegration between g_t' and τ_t (allowing for a structural break) is not rejected using the Gregory-Hansen (1996) test, as the sequential augmented Dickey-Fuller test statistics were: -4.265 (model *C*), -5.501 (model *C/T*) and -4.739 (model *C/S*). Using the critical values reported by Gregory and Hansen (1996), these test statistics reject cointegration (at the five percent significance level) under both the C/T and C/S specifications, and so intertemporal solvency under unchanged policies is rejected.

[38] Similar to Pakistan, those periods when the Sri Lankan differential between the actual and optimal stocks of liabilities fell typically coincided with IMF programs, particularly those: between August 1983-July 1984, between March 1988-September 1991, and between September 1991-September 1994.

Notwithstanding the rapid decline in the difference between the two stocks of liabilities in the 1990s, as of 1997 the actual stock of public liabilities was about 43 percent of GDP higher than the level consistent with the optimal path of fiscal deficits generated by the tax-smoothing model. These results suggest that, while Sri Lanka's fiscal regime has become less deficit-biased in the 1990s when compared with those responsible for the tax-tilting-induced accumulation of public liabilities which occurred in earlier decades, there is a need for further fiscal reform to ensure the sustainability of its fiscal policy. Accordingly, this requires that at some future point in time taxes will need to be raised and fiscal surpluses (or smaller fiscal deficits) will need to be run to service the government's stock of excessive liabilities.[39]

VII. CONCLUSION

In this paper we examined the evidence for tax-smoothing behavior in Pakistan and Sri Lanka, and the extent to which each country's tax-smoothing and tax-tilting behavior has resulted in a stock of public liabilities which deviates from a sustainable path. In response to a temporary increase in government spending, tax-smoothing predicts that the tax burden of funding this expenditure will be spread over time (and so the government will run a fiscal deficit); conversely, a permanent increase in spending should be financed by raising contemporaneous taxes (resulting in no fiscal deficit). The intertemporal tax-smoothing model explains the behavior of the fiscal deficits of Pakistan over the 1956-95 period, indicating that the government did keep its tax rates relatively constant (smooth) in the presence of temporary, anticipated shocks to expenditure. However, the volatility of taxes in Sri Lanka has been excessive relative to those which would be consistent with minimizing the excess burden arising from distortionary taxation, and so Sri Lanka has not tax smoothed over the 1964-97 period.

We argue that the inability of many developing country governments to satisfy their intertemporal budget constraint from conventional (tax and nontax) revenue sources raises the likelihood of public borrowing being such a government's preferred response to shocks to government spending. This behavior is consistent with the tax-smoothing hypothesis, but

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[39] The results for Pakistan and Sri Lanka can be compared with those obtained by Cashin, Olekalns and Sahay (1998) for India. In all three South Asian countries, the stock of excess public liabilities peaked in the late-1980s, although at levels (in percent of GDP) much larger for Sri Lanka (83 percent) and Pakistan (64 percent) than for India (25 percent). While fiscal consolidation during the 1990s has reduced the margin between actual and optimal liabilities in all three countries, outstanding stocks (in percent of GDP) of excess public liabilities remain large (India, 18 percent as of mid-1997; Pakistan, 56 percent as of end-1995; Sri Lanka, 43 percent as of end-1997).

probably reflects 'tax hysterisis', involving political and institutional constraints to revenue-raising. Moreover, this same inability to garner sufficient receipts from conventional revenue sources results in tax-tilting behavior by the government, with quasi-fiscal activities such as seignorage and financial repression being important sources of net revenue, through the implicit taxation of financial intermediation.

As to the sustainability of government borrowing in Pakistan and Sri Lanka, quantitative analysis based on long-term trends indicates that for both countries, under unchanged policies, their stocks of public liabilities are not on a sustainable path. Pakistan's tax-tilting-induced overborrowing (particularly in the 1970s) has yielded a stock of liabilities which deviates significantly from the stock of liabilities generated from the series of optimal (tax-smoothing) fiscal deficits. Similarly, a sharp jump in Sri Lankan public borrowing in the early 1980s has resulted in a differential between actual and optimal liabilities which is only slowly being reduced. As of 1995 (1997), Pakistan's (Sri Lanka's) actual stock of public liabilities was about 56 (43) percent of GDP higher than it would have been under tax smoothing, implying that fiscal surpluses, or at least smaller fiscal deficits, will need to be run in the future to ensure intertemporal solvency. Both of these results emphasize the importance of enhancing the process of fiscal consolidation in South Asia.

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