

Appendix 1: An Analytical Framework for Fiscal Policy and Public Debt

Balance sheet of public sector

Government assets can be thought of as being composed of two parts: the first is the current stock of assets (the conventional definition); the second is the present value of anticipated future revenues from tax and non-tax sources. Current assets include both domestic and foreign assets. The present value of future revenues is the expected stream of revenues discounted back to the present using a given discount rate. Thus, revenues expected in the future can be analysed in terms of current assets. The notion of present value is important, because it underscores a fundamental equivalence between the stock and the flow dimensions of fiscal policy: that is, it makes it clear that revenues expected in the future are as relevant in determining a government's ability to meet its liabilities as current revenues.

Similarly, corresponding to government assets, government liabilities can also be thought of as composed of two parts: (1) the current outstanding stock of debt and other current obligations (the conventional definition), and (2) the present value of future expenditures, including subsidies. This way of looking at government assets and liabilities is useful, because the determinants of both short-term and long-term fiscal performance are integrated into a single forward-looking balance sheet.

The difference between the government's assets and liabilities is its net worth. On the one hand, if assets exceeded liabilities, then net worth is positive and the government is regarded as being solvent – that is, it is able to meet both its current and future obligations. On the other hand, if net worth is negative, then the government is insolvent and, without an increase in its assets, it is not able to meet its current contractual debt obligations. Therefore, in the ensuing discussion, it is assumed that the flow of government revenues from taxes and other sources constitutes the main source of funds available to service public debt. The issue of public sector solvency is of particular importance when one is dealing with highly indebted countries, and it will be examined at length below.

The implications of the above framework can be seen clearly by using the following identity, which schematically presents a government's balance sheet in terms of domestic currency:

$$EA^* + R = G + S + B + EB^* + K$$

where G , S , and R denote the present values of (expected) government expenditures, subsidies, and (tax and non-tax) revenues; A^* denotes the stock of foreign exchange reserves; B and B^* denote domestic and external government debt, respectively. E denotes the exchange rate. By assumption, B is denominated in local currency while A^* and B^* are denominated in foreign currency. K denotes the government's net worth. Consequently, government assets appear on the left-hand side of its balance sheet while government liabilities appear on the right-hand side. Because the balance

sheet focuses only on those assets which are considered most likely to be used to service the public debt, K provides a measure of the government's net worth which is relevant in assessing the public sector's ability to service its liabilities. Therefore, it is important to stress that for the purposes of the discussion below, solvency is defined only with respect to this notion of government net worth.

Implications of the balance-sheet approach

The forward-looking balance sheet provides several interesting insights. First, for a given net worth to be maintained, any increase in debt has to be matched by one or both of the following: (1) an increase in government revenues or current assets; and (2) a decrease in expenditures. The changes in revenues and/or expenditures refer to their present values and, hence, comprise not only current fiscal adjustments but also any expectations of future improvements.

Second, domestic and external debt appear to enter the statement of public sector liabilities on an equal footing – that is, domestic and external debt have equal claims on government resources. Therefore, if an external debt-servicing problem exists, it is likely that a domestic debt-servicing problem also exists. This simple observation suggests that departures from the equivalence of claims should be based on a recognition that the characteristics of the two types of debt may be quite different and that, as a result, government policies for managing the two types of debt may also differ significantly.

From the above observations, it follows that domestic debt problems may occur where the ratio of domestic debt to GDP is low by international standards if, at the same time, either the ratio of external debt to GDP is high or the current or expected future fiscal position is weak.

Third, the present value of the anticipated future stream of government expenditure and subsidies is also a form of government debt to the extent that the stream is perceived as a permanent obligation. This equivalence appears to be particularly relevant for subsidies and transfers, because they may be thought of as representing promises to provide flows of payments in much the same way governments agree to make contractual interest payments. By the same token, the stream of future taxes can be regarded as a form of government asset. For this reason, solving the debt problem may involve, for example, a cut in subsidies or an increase in taxes. In this sense, a reduction in subsidies represents a reduction of government liabilities just as a reduction in debt would.

An illustration of the equivalence between debt and the discounted present value of government expenditures and subsidies is provided by remuneration paid on bank reserves – a government transfer quite often employed in developing countries. Paying interest on reserves held against bank deposits is an interesting example, because whether such payments are included in government expenditure or are considered to be interest on part of the domestic debt depends on the government's accounting practices. On the one hand, a straight transfer would take place if the central bank just paid remuneration on commercial banks' reserves without acknowledging the latter as part of its domestic debt. On the other hand, some countries (for example, Argentina until recently) consider part of these reserves to be government obligations. In this situation, the central bank's transfer would become an interest payment.

Finally, it follows from the forward-looking balance sheet that whether a

government is solvent or not depends on the amount of its expenditures (including subsidies), its total revenues, and its debt. On the one hand, a government is solvent if its net worth is not negative, or, to put it differently, a solvent government does not have a debt problem. On the other hand, if a government's net worth is negative, it will not be able to service fully its debt obligations.

What happens when a government is insolvent or nearly insolvent? Consider first the case where total contractual debt has reached the maximum level that can be serviced and therefore, the government's net worth is zero. If solvency is to be maintained, there cannot be any further increase in liabilities without a corresponding increase in assets. Thus, any increase in domestic debt not matched by an equivalent increase in assets should be met either by a decrease in the contractual value of external debt (for instance, by debt relief) or by a decrease in the present discounted value of expenditures and subsidies. Otherwise, the government will become insolvent.

A government's insolvency has two main implications. First, if the government has no other assets to draw on in order to cover a negative net worth, the market value of its contractual obligations will have to fall; the market value, then, reflects the government's perceived debt-servicing capacity. The market value can only fall if domestic and external debt trade at less than their contractual values – that is, if they trade at a discount. In fact, those discounts will be set by the market at levels where a government's net worth will not be negative. Recalling the forward-looking balance sheet, this implies that

$$EA^* + R = G + S + qB + Eq^*B^*$$

where the prices of domestic debt and foreign debt, which are denoted by q and q^* , respectively, are less than unity, so that the discounts are $1 - q$ and $1 - q^*$, respectively.

While the market value of total debt (i.e., $qB + Eq^*B^*$) has to decline when there is the perception of insolvency, the shares of the burden that fall on domestic and foreign debt can differ markedly if the characteristics of the two debts are different. For example, if domestic debt were perceived as having, in some sense, seniority over external debt, q might not fall; hence, the brunt of the adjustment would be borne by the market price of external debt, q^* .

The second implication of government insolvency concerns the issuance of new debt. If an insolvent government is able to issue new domestic debt without a corresponding improvement in its debt-servicing ability (e.g. by increasing assets or by strengthening its primary fiscal stance), then any new debt issues are likely to induce capital losses on previous creditors by depressing even more the market value of outstanding debt. The question then becomes, how can this debt be issued?

One possible explanation is that the domestic debt provides liquidity services to its holders. Such would be the case, for example, if banks were allowed to hold new debt as part of their legal reserves against bank deposits. New debt could then be taken up even if its market value were less than its contractual value. This is similar to the case in which the banking system is forced to hold debt at interest rates lower than market rates. The issuance of debt is feasible because it is likely to result in lower rates being paid on bank deposits, which continue to be held voluntarily by the public because of their superior liquidity relative to other financial assets.

Even if new debt did not provide liquidity services to the holder, it might still be issued if its yield were high enough to compensate bondholders for the anticipated capital loss owing to government insolvency. A third possibility is that the new domestic debt might be issued if it were perceived by the public as being 'senior' relative to external debt – in other words, if holders of domestic debt believed that whatever government resources were available would be used to service their debt first. Such a perception could reflect a belief that the costs associated with default are substantially higher when the holders of government paper are domestic residents. The public perception of the seniority of domestic debt compared with external debt, however, is likely to vanish rapidly if the government faces problems in servicing its domestic debt.

Appendix II: Conditions for Debt Sustainability

This is a simplified framework of debt sustainability based on the work of Blanchard. It explains when a debt situation becomes explosive and fiscal deficits are unsustainable. A fiscal plan can be considered sustainable, if, together with a plausible set of assumptions about the key macro-economic variables, it results in a terminal value of debt-to-GDP ratio that is equal to the initial ratio. This initial ratio corresponds to a year when fiscal policy was sustainable, with an acceptable rate of inflation. The target variable is the debt-to-GDP ratio, a measure of the debt relative to the size of the economy. The following notations are used:

- B = Nominal stock of debt
- I = Nominal interest rate
- P = Price level
- p = Inflation rate (i.e. percentage change in P)
- r = Real interest rate (i.e. $I - p$)
- Y = Level of real output
- y = Growth rate of output
- z = Primary deficit
- b = Debt to income ratio (i.e. B/PY)
- S = Monetary base measured as currency plus non-interest bearing deposits

The budget identity of the central government can be written as follows:

$$(1) \quad Z + iB = dS + dB$$

where d stands for change over one period.

Equation (1) states that the sum total of primary deficit (z) and interest payments on existing debt (iB) should be financed by increase in monetary base (dS, which is seignorage) and increase in government borrowing (dB). Dividing both sides of equation (1) by the GDP (i.e. PY), the following can be derived:

$$(2) \quad z + ib = s + dB/PY$$

The lower case letters indicate the proportions of GDP. Since $b = B/PY$, we can derive for the change in B (i.e. dB), by using simple fraction rule of calculus, as follows:

$$(3) \quad dB = PYdb + bPY(dP/P + dY/Y)$$

or

$$(4) \quad dB = PYdb + bPY(p + y)$$

or

$$(5) \quad dB/PY = db + b(p + y)$$

Replacing (5) in (2) and rearranging the term, db can be derived as:

$$(6) \quad db = (z - s) + b(r - y), \text{ since } r - I - p$$

Equation (6) explains the change in debt-to-income ratio (db) through four components: primary deficit to GDP ratio (z), financing of deficits by base money (s), the growth rate of GDP (y) and the real interest rate (r). Setting $db = 0$, that is, no change in debt-GDP ratio in the limiting case, we can solve for b as follows:

$$(7) \quad b = (z - s) / (y - r)$$

Appendix III: Some Recent Contributions to the Academic Literature on Debt Management

There is increasing research interest in issues relating to domestic debt management. For example, Dornbusch and Draghi (1990) contains ten papers and discussion, on the management of public debt and its implications for financial stability. Contributions focus on the efficient design of public debt; indexation and maturity of government bonds; public confidence and debt management; confidence crises and public debt management; funding crises in the aftermath of World War I; the capital levy in theory and practice; episodes in the public debt history; the Italian national debt conversion of 1906; fear of deficit financing; and government domestic debt and the risk of default.

In addition, Dornbusch and Edwards (1991) have recently edited a volume of proceedings of a conference held in 1989 that deals with problems of domestic public debt management and their implications for financial stability under conditions of high public debt and deficits. The contributions by leading scholars in the field present theoretical, empirical, and historical studies of this important policy issue.

Dornbusch and Edwards (1991) emphasise the risk of confidence crises associated with the existence of large public debts. It is argued that as the public debt becomes bigger, creditors request shorter maturities (or index debt) because of the increased default risk. The ensuing shortening of maturities, however, brings a risk of a confidence crisis. While higher interest rates might compensate creditors for such risks and avoid a crisis, they might also increase the likelihood of a crisis because they lead to a higher rate of growth of the debt. Formal models of a confidence crisis are presented by Giavazzi and Pagano (1990) and Alesina, Prati and Tabellini (1990). It is shown how the optimal management of the debt maturity might help to avert one. In essence, the models suggest that the risk of a crisis is reduced if the maturities are not concentrated on a few dates so that a similar amount of debt matures in each period; this implies that long-term debt should be preferred to short-term debt.

The key issue of institutional co-ordination of public debt and monetary management is covered in depth in Sundararajan, Dattels and Blommestein (1997). The book contains an essay on co-ordination in transitional economies and eight case studies, all of them of advanced economies.

A number of models of domestic public debt management are proposed in the literature. Bertocchi (1993) proposes a model of public debt management where government bonds are placed through 'subscription issues' and the demand for bonds is not directly observed by the authority. The debt manager selects an optimal pricing policy which maximises profits subject to an intertemporal budget constraint. The ratios produced by the discrepancies between estimated and actual demand reveal valuable information about unobservable market conditions. By applying results from the theory of 'active learning' it can be shown how the price adjustment

process reaches a steady state. However, it may not converge to the full information price associated with complete learning. In the long run, ratios are zero on average.

In another innovative model, Kesselman (1992) has shown that by implementing new methods of debt management, the government of Canada could significantly reduce its largest outlay, domestic public debt service costs. The model is used to assess the advantages, operation, and economics of one such innovation, namely of issuing USdollar denominated treasury bills (USDTBs) for domestic debt. It is found that average annual savings from USDTBs could range from \$250 million to more than \$1 billion, depending upon how they were applied and economic circumstances. Any exchange rate losses would be more than offset by the interest savings. Exchange risks would be justified by the reduced risks associated with the total public deficit – the sum of debt service charges plus the fiscal operating deficit. Reducing debt service costs through USDTBs is shown to be more attractive than most other means of curbing the budget deficit.

Another possible model is the cost minimisation model. Boothe and Reid (1992) examine the consequences of using cost minimisation as the goal of public debt management in a small open economy. Authorities are assumed to minimise interest costs subject to constraints on their ability to refinance at different maturities, and the information conditioning expectations of future interest rates. A numerical simulation model and a highly disaggregated Canadian data set for the period 1967–87 are used in the analysis. It is found that, conditional on the small open economy assumption, savings do result from following a cost-minimising strategy. Savings decline as authorities are increasingly constrained in their refinancing choices. However, even the gains in moderately-constrained cases suggest that cost minimisation is worthy of serious consideration by authorities.

Another useful domestic public debt management model involves exploiting the relationship between debt maturities and financing strategies. Goudswaard (1990) studies financing strategies that underlie the maturity structure of the public debt. Three important objectives for domestic public debt management are distinguished: interest cost reduction, economic stabilisation, and economic neutrality. The strategies that can be associated with these objectives are incorporated in a simple debt management model, which has been tested empirically for the case of the Netherlands. Variations in debt maturities between 1960 and 1985 appear to be related to changes in capital market conditions, investment preferences, and expected real interest rates.

Further, in Calvo and Guidotti (1990), optimal management of the public debt is explored in a context where economic policy is continuously revised because, when the public debt is non-indexed, policy-makers are tempted to use inflation (seignorage and inflation tax) in order to reduce the real value of the public debt. The model's implications are explored following two approaches. First, the effects of various exogenous disturbances are examined by means of numerical simulations. Secondly, the analysis explores if the model's implications concerning the maturity structure of government debt are consistent with actual experience.

The literature also presents politically motivated models for manipulating domestic public debt. It is argued that governments facing elections may strategically manipulate policy instruments in order to increase their re-election chances. For example, Milesi and Gian (1995) study the incentives

for strategic manipulation in the context of a debt management model, in which two parties with different inflation aversion compete in elections. It is shown that the inflation-averse party may issue nominal debt in order to make its opponent 'look bad' to voters, thus getting closer to the median voter. Nominal debt artificially enlarges the ex-post inflation tax base, causing higher inflation. Conversely, an inflation-prone government may issue indexed debt in order to reduce inflation incentives.

Finally, but most importantly, special attention should be paid to the models used in the corporate finance literature for the valuation and pricing of bonds in the short-run and long-run (see, for example, Brealey and Myers, (1991) ch. 4). These models predict that as time tends to infinity (in the long run), the value of the bond (debt) tends to zero, as long as the debt has been continuously serviced. Researchers studying international debt have applied similar principles to determine the pricing and amortisation of debt, and in particular to explore the conditions for national solvency – see, in particular, Ghatak and Levine (1994). We believe that these same models for bond valuation could be applied to study government instruments issued for domestic public debt, in order to get a handle on the parameters for interest rate (return) determination, servicing, structuring, and retiring of existing debt as well as contracting new debt.

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Appendix IV: Papers Presented at the Three Regional Workshops on Effective Domestic Debt Management Held in St. Kitts & Nevis, Sri Lanka and Kenya

Background papers

Commonwealth Secretariat: Fiscal Policy and Domestic Debt Management, Commonwealth Finance Ministers Meeting, Bermuda, 24–26 September 1996.

Economic and Legal Advisory Services Division, Commonwealth Secretariat (1996): Domestic Public Debt Management – An Overview

Economic and Legal Advisory Services Division, Commonwealth Secretariat (1996): Fiscal Developments and the Evolution of Domestic Public Debt

Economic and Legal Advisory Services Division, Commonwealth Secretariat (1996): Techniques of Domestic Debt Management

Economic and Legal Advisory Services Division, Commonwealth Secretariat (1996): Measurement of Domestic Debt and Sustainability

Economic and Legal Advisory Services Division, Commonwealth Secretariat (1996): An Analytical Framework for Assessment of Domestic Public Debt

Economic and Legal Advisory Services Division, Commonwealth Secretariat (1996): Implications of Domestic Public Debt for Monetary and Financial Market Development

Gray, Simon (1996): *The Management of Government Debt*, Centre for Central Banking Studies, Bank of England

Gray, Simon (1997): *Government Securities: Primary Issuance*, Centre for Central Banking Studies, Bank of England

Guidotti, Pablo E. and Manmohan S. Kumar (1991): *Domestic Public Debt of Externally Indebted Countries*, IMF, Washington DC

Her Majesty's Treasury and Bank of England: *Report of the Debt Management Review*, July 1995

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Kalderen, L. (1996): *Institutional Arrangements for Public Debt Management Functions*

Kalderen, L. (1996): *Organisation of Information Flows Between Debt*

Managers and Market Participants – the Swedish Experience

Kock, A. D.(1996): *The Role of the South African Reserve Bank in the Development of the Secondary Market for Government Bonds in South Africa*

McConnachie, Robin (1996): *Primary Dealers in Government Securities Markets*, Centre for Central Banking Studies, Bank of England

Sundararajan, V., Peter Dattels, Ian S. McCarthy, Marta Castello-Branco and Hans J. Blommestein; (1994): *The Co-ordination of Domestic Public Debt and Monetary Management in Economies in Transition Issues and Lessons from Experience*, IMF Working Paper

Ter-Minassian Teresa (1996): *Borrowing by Subnational Governments: Issues and Selected International Experience*, IMF

Truco, Manuel (1996): *Domestic Government Debt of ESAIDARM Countries*, World Bank

Regional Workshop, St. Kitts & Nevis, 17–21 June 1996

Papers presented by resource persons

Jayamaha, Rane (1996): *The Role of the Central Bank in the Development of Debt Securities Markets*, Commonwealth Secretariat

Venner, John (1996): *Fiscal Performance and Domestic Public Debt in the ECCB Area*

Country papers presented by participants

Arana, Francis: *Recent Trends in Government of Belize's Domestic Debt*

Brown, Jonathan: *Domestic Debt Management Operations in Jamaica*

Basdeo, Dax: *Domestic Debt Management Operations in the Cayman Islands*

Mauricette, Brenda: *Domestic Debt Management Operations in St Lucia*

Bonadie, Nicole: *Domestic Debt Management Operations in St Vincent & the Grenadines*

Bruno, E. Nicholas: *Domestic Debt Management Operations in Dominica*

Cornwall, Dennis: *Domestic Debt Management Operations in Grenada*

Derrick, Sandra: *Innovative Domestic Debt Management, ECCB*

Eastern Caribbean Central Bank: *The Impact of Fiscal Expansion on Money, Inflation and the Balance of Payments*

Lettsome, Lucia: *Debt Management, The British Virgin Islands Experience*

Seymour, Josephine: Domestic Public Debt Management Operations in The Bahamas

Thomas-Walters, Lenoa E. and Howard Richardson: Domestic Debt Management in St Kitts/Nevis

Weekes, Julia A.: Domestic Debt Management Operations in Barbados

Williams, Debra: Domestic Debt Management in Antigua and Barbuda

Regional Workshop, Sri Lanka, 9–13 December 1996

Papers presented by resource persons

Jayamaha, Rane (1996): The Role of the Central Bank in the Development of Debt Securities Markets

Kumar, Raj (1996): Objectives of Debt Management in Context of Fiscal and Monetary Policy, Commonwealth Secretariat

Country papers presented by participants

Ahmed, Faruquddin: Country Paper of Bangladesh

Arshad, Harliza bin and Norazman bin Ismail: Malaysia – Developing and Managing the Economy to Success

Aslam, K. Sumaira: Country Paper of Pakistan

Busai, Michael: Country Paper of Vanuatu

Enazi, Atalina: Country Paper of Western Samoa

Hamou, Aloysius: Country Paper of Papua New Guinea

Lal, M.M.: Public Debt in India

Manchanda, R.K.: India Domestic Public Debt Management

Naseer, Ahmed and A. Zaheera: Country Paper of Republic of Maldives

Saha, K: Effective Domestic Debt Management in Bangladesh

Salini, P. Christian: Country Paper of Solomon Islands

Weerasinghe, R.: Country Paper of Sri Lanka

Regional Workshop, Kenya, 9–13 March 1998

Papers presented by resource persons

Jayamaha, Rane (1998): The Role of the Central Bank in the Development of Debt Securities Markets, Commonwealth Secretariat

Kitili, Andrew (1998): Fiscal Development and Evolution of Domestic Debt in Commonwealth Africa, Commonwealth Secretariat

Kumar, Raj (1998): Objectives and Key Issues of Domestic Public Debt Management, Commonwealth Secretariat

Kumar, Raj (1998): Indicators and Measurements of Domestic Debt Sustainability, Commonwealth Secretariat

Place, Joanna (1998): Techniques and Intervention Instruments for Domestic Debt Management, Bank of England

Place, Joanna (1998): Institutional Arrangements for Domestic Debt Management, Bank of England

Place, Joanna (1998): Role of Central Banks in Domestic Public Debt Management, Bank of England

Country papers presented by participants

Ansah, Kwame: Country Paper of Ghana

Chojoo, Raschida: Mauritius Effective Domestic Debt Management

Domingue, Joel: Country Paper of Seychelles

Iboklene, Bruno: Country Paper of Cameroon

Kajiyanike, Meg Debra: Country Paper of Malawi Domestic Debt Management

Marenga, Sam Riruako : Country Paper of Namibia

Mlangeni, Thabisile: Domestic Debt Management in Swaziland

Mvarecha, Joseph: Country Paper of Zimbabwe Effective Domestic Debt Management

Mwilwa-Malulu, Nancy Chanda: Effective Domestic Debt Management – The Case of Zambia

Onduri, Machulu Fred: Public Domestic Debt Management – The Case of Uganda

Sosse, Ngenarr: Country Paper of The Gambia

Tsolele, Makampong: Country Paper of Lesotho

Kimani, S. N.: Country Paper of Kenya

Komu, Esta: Country Paper of Tanzania Domestic Debt Management Operations

Appendix V: Participants in Regional Workshops on Effective Domestic Debt Management

Basseterre, St Kitts & Nevis, 17–21 June 1996

Antigua

Miss Debra Williams
Budget Analyst
Ministry of Finance

The Bahamas

Ms Josephine Seymour
Research Officer
Central Bank of Bahamas

Barbados

Mr Andrew Cox
Deputy Permanent Secretary
Ministry of Finance & Economic Affairs

Miss Julia Weekes
Investments Analyst
Central Bank of Barbados

Belize

Mr Francis Arana
Economist
Central Bank of Belize

British Virgin Islands

Mrs Lucia Lettsome
Budget Analyst
Ministry of Finance

Mr Allen Wheatley
Deputy Financial Secretary
Government of the Virgin Islands

Cayman Islands

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