

“spikes” of high seigniorage are indeed short-lived. The only episode that lasted more than one year was the Bolivian hyperinflation of 1982–84. The episodes are associated with developing countries; among OECD countries only Denmark indulged in a seigniorage spike. One might have thought that these bursts of seigniorage revenue would be associated with accelerations of inflation, but this hypothesis is, surprisingly, not confirmed by the data. Of the sixteen episodes (treating Bolivia, 1982–84, as a single episode), only nine showed rising inflation—roughly the same proportion as in the broader sample. There is no evidence for the supposition that inflation shows a lagged response, as the following year’s inflation also shows no tendency to accelerate. Some of the episodes of rising inflation are quite spectacular. Bolivia in 1982–84 and Peru in 1988 experienced classic hyperinflation in which real money demand fell but inflation soared to four digits. Large accelerations of inflation also took place in Argentina in 1975, Mexico in 1982, and Zaire in 1987.

A decomposition of the seigniorage spikes into components associated with the real change in the money base and the inflation tax helps explain the cases in which inflation did not accelerate (see appendix 1.3). Table 1.7 shows that the real change in the money base explains most or all of the above-average seigniorage in seven of the sixteen cases. In six of these cases, inflation declined. The lack of a close association between acceleration of inflation and bursts of seigniorage comes about because in nearly half the cases seigniorage was driven mainly by real money balances. An understanding of this phenomenon would require more careful examination of individual cases, but apparently there was scope for temporary increases in seigniorage revenues through actions such as raising reserve requirements or through exploitation of exogenous increases in demand for money. Price controls were used in Chile in 1971 to generate a “real” change in money demand, but inflation exploded in the following year.<sup>18</sup>

Of course, the classic inflationary method worked just as well as a method for generating bursts of seigniorage. One-time inflation taxes that were more than 8 percentage points of GDP above average were recorded in the hyperinflation in Bolivia and Peru, while less spectacular increases were registered in Argentina, Ghana, and Zaire. The money base fell in all these cases, limiting the potential for further inflation taxes.

The GDP growth rates during the seigniorage spikes were not so high as to make money creation a recommended method of raising revenue. In twelve of the sixteen episodes growth during the episode was below the average growth rate for that country, and eight cases actually registered negative growth of gross—not per capita—output. We must remain skeptical about whether growth was poor because of

the unusually high seigniorage or countries resorted to seigniorage because economic recession dried up other revenue sources. But it is interesting that the countries with spikes have a lower average growth than other countries in the sample, perhaps reflecting a tendency toward higher *average* seigniorage and inflation, as well.

In conclusion, seigniorage may be more important as a source of temporary increases in revenue than as a steady-state phenomenon. But the link between these temporary seigniorage surges and inflation is weak. A surprising number of episodes of high seigniorage are attributable to increases in real money balances instead of to accelerated inflation, illustrating the scope for achieving temporary revenue increases through various actions by the monetary authorities other than printing money. But the poor performance of countries that resort to such measures does nothing to further the case for using bursts of seigniorage as an instrument of public finance.

### *Fiscal Deficits, Seigniorage, and Inflation*

Average long-term (1965–89) monetary financing or seigniorage is 2.3 percent of GDP in the ten sample countries (table 1.8)—close to the average of 2.1 percent for all developing countries, but twice the level of 1.0 percent for the OECD countries (see table 1.6). Seigniorage and inflation show an association across the ten sample countries. The short-run relationship between money financing and inflation is typically blurred by factors such as indexation practices, slowly changing expectations, slow portfolio substitution, and inflationary exchange rate depreciations.

In the long run, however, the tradeoff between inflation and money creation becomes increasingly unfavorable, explaining why seigniorage is generally used only as a last resort. Table 1.8 reports the amount of additional inflation required to achieve another percentage point of GDP in long-run seigniorage revenue. The figures are derived from estimated Cagan-type, constant-inflation or interest-elastic, money demands for the case countries. The tradeoff is still favorable in countries with low inflation (in Thailand the additional inflation is just 5 percentage points), worsens in moderate-inflation countries (15 to 20 percentage points in Colombia and Ghana), and becomes untenable in countries with high inflation (97 percentage points in Argentina), where moneyholders replace most of their local currency holdings with foreign currency and interest-bearing assets.

These results are remarkably similar to the simulation results in table 1.9, which are based on more comprehensive portfolio substitution and deficit-financing models (and, in the case of three countries, general equilibrium macroeconomic frameworks). The long-term effects on price levels of transitory deficits financed by money cre-

**Table 1.8. Seigniorage, Inflation, and Marginal Inflation Revenue, 1965–89**

Country	Seigniorage (percentage of GDP) <sup>a</sup>	Inflation (percent) <sup>b</sup>	Percentage increase in inflation required to collect additional seigniorage of 1 percentage point of GDP
<i>Case study countries</i>			
Argentina	4.2	115.3	97
Chile	3.7	56.6	23
Colombia	2.1	17.7	15
Côte d'Ivoire	1.3	7.6	—
Ghana	3.1	31.6	20
Mexico	3.1	28.9	—
Morocco	1.7	6.1	8–26
Pakistan	2.0	8.0	—
Thailand	1.0	5.7	5
Zimbabwe	1.1	7.7	10
Average	2.3	28.5	n.a.
<i>Other countries</i>			
Average, 35 developing countries	2.1	—	n.a.
Average, 15 industrial countries	1.0	—	n.a.

— Not available.

n.a. Not applicable.

a. Seigniorage is defined as the nominal change in the money base each month divided by the consumer price index (CPI) for that month. The typical method of calculating the ratio of the nominal change in the money base over the entire year to the annual nominal GDP can seriously overstate seigniorage in high-inflation countries. Although interest paid on reserves should also be subtracted to get a true estimate of seigniorage, the data are generally lacking, and, in any case, few developing countries pay interest on reserves. Where interest is paid, it appears that it is quantitatively unimportant. An important exception is Argentina, where the combination of high inflation and interest paid on reserves makes this adjustment important. We use the Argentine seigniorage series used by Rodríguez in chapter 3 of this volume. Periods covered are generally 1965–89 but vary depending on the availability of data.

b. Average annual rates of change in the CPI between 1964 and 1988.

Source: For annual data, Statistical Appendix, table A.2. For average annual rate of change, IMF, *International Financial Statistics*, various years. For Argentina, Colombia, Ghana, and Morocco, data in the last column are from the country case studies listed in the references to this chapter; for Chile, Thailand, and Zimbabwe, these data are calculated from seigniorage and inflation rates in the first two columns and from long-run money demand inflation semielasticities in the country studies.

ation, taking into account feedback effects on inflation from asset substitution (and endogenous output response in the cases of Pakistan and Colombia), are similar to those obtained using the simple Cagan form. For the four reported countries, the additional infla-

**Table 1.9. Simulation Results for Long-Term Effects of Fiscal Deficits on Inflation and Real Interest Rates**  
(percent)

Country	Effect of a 1 percentage point increase in the deficit-to-GDP ratio	
	On the price level, with money financing	On the real interest rate, with domestic debt financing
Chile	14	0.1
Colombia	14	3.0
Morocco	—	0.2
Pakistan	18	1.1
Zimbabwe	10	2.7

— Not available.

*Note:* This table presents the long-term effects of a transitory (one-year) increase in the public deficit, financed by issuing either domestic non-interest-bearing monetary liabilities or domestic interest-paying debt. Both the short-term effects and the cross-effects (of money financing on the real interest rate and of debt financing on inflation) are of less interest and vary from country to country because of differences in model structures. The results for Chile and Zimbabwe are based on portfolio models combined with the public sector budget equation; those for Colombia, Morocco, and Pakistan are based on macroeconomic-portfolio general equilibrium specifications.

*Source:* Country case studies listed in the references to this chapter.

tion required to collect 1 additional percentage point of GDP through seigniorage ranges from 10 percent for Zimbabwe to 18 percent for Pakistan. Considering the unfavorable tradeoff in most cases and the widespread consensus on the undesirability of inflation, it is difficult to believe that revenue motivations alone explain chronic high inflation. (See Blejer and Liviatan 1987 and Kiguel and Liviatan 1988 for similar conclusions.)

### *Fiscal Deficits and Interest Rates or Financial Repression*

There are two ways in which fiscal deficits can affect domestic real interest rates and financial markets. First, if interest rates are not controlled, a high fiscal deficit financed through domestic borrowing would be expected to result in high real interest rates. Second, if interest rates can be and are controlled, the implicit tax on financial assets could be a hidden source of revenue for the government.

By liberalizing interest rates, financial reform has shifted deficit financing from implicit financial repression revenue to explicit debt issuing in many developing countries. Argentina, Chile, Colombia, Morocco, Pakistan, and Thailand introduced financial reforms in the 1970s, and their real interest rates reached positive levels in the 1980s (table 1.10). Ghana, Mexico, and Zimbabwe, however, maintained varying degrees of domestic interest controls during most of the 1980s

**Table 1.10. Real Interest Rates under Financial Reform or Financial Repression in the 1980s**

Country	Real interest rates on deposits (percent) <sup>a</sup>		Tax revenue on deposits attributable to financial repression, 1980–88 (percentage of GDP) <sup>b</sup>
	1970–79	1980–88	
Argentina	–17.2	4.8	n.a.
Chile	–15.9	8.1	n.a.
Colombia	–6.3	0.7	n.a.
Ghana	–18.8	–18.3	0.5
Mexico	–4.6	–8.4	1.6
Morocco	–3.1	1.8	n.a.
Pakistan	–3.4	2.1	n.a.
Thailand	–0.5	6.5	n.a.
Zimbabwe	–3.7	–4.3	0.8 <sup>c</sup>

n.a. Not applicable.

a. Average annual real interest rates on time deposits at banking system, calculated using the consumer price index.

b. Average annual revenue calculated as the difference between domestic real interest rates and the average real interest rate in OECD countries (0.9 percent) multiplied by deposits outstanding as a percentage of GDP.

c. 1980–87.

Source: Country case studies listed in the references to this chapter; Statistical Appendix, tables A.4 and A.5.

(Mexico liberalized its rates in 1988), as reflected by negative average real interest rates.

The implicit tax from financial repression is normally computed as the product of the interest tax (typically, the difference between the foreign and domestic interest rates) and the outstanding stock of the relevant public liability or the time deposits in the financial system. In the latter case the financial repression revenue collected by the financial system is often transferred back to the public sector via compulsory placements of government debt in financial institutions or through unpaid reserves held at the central bank.

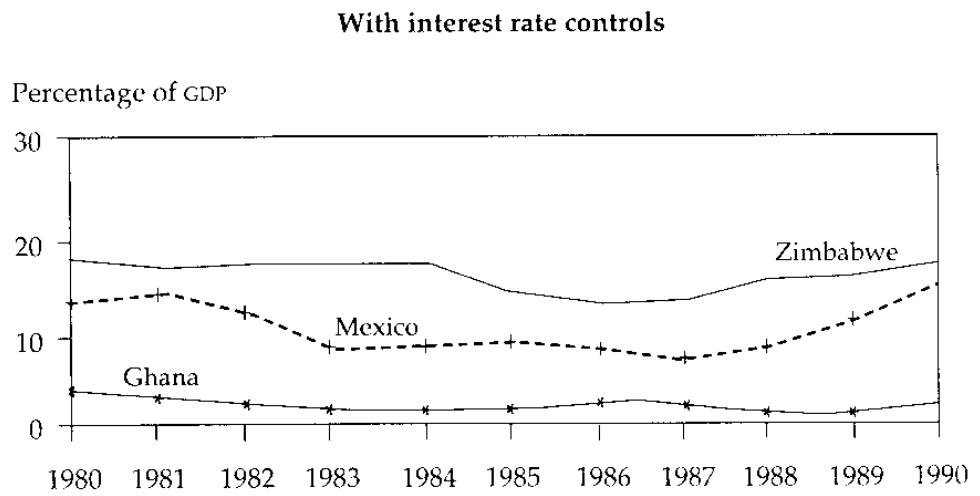
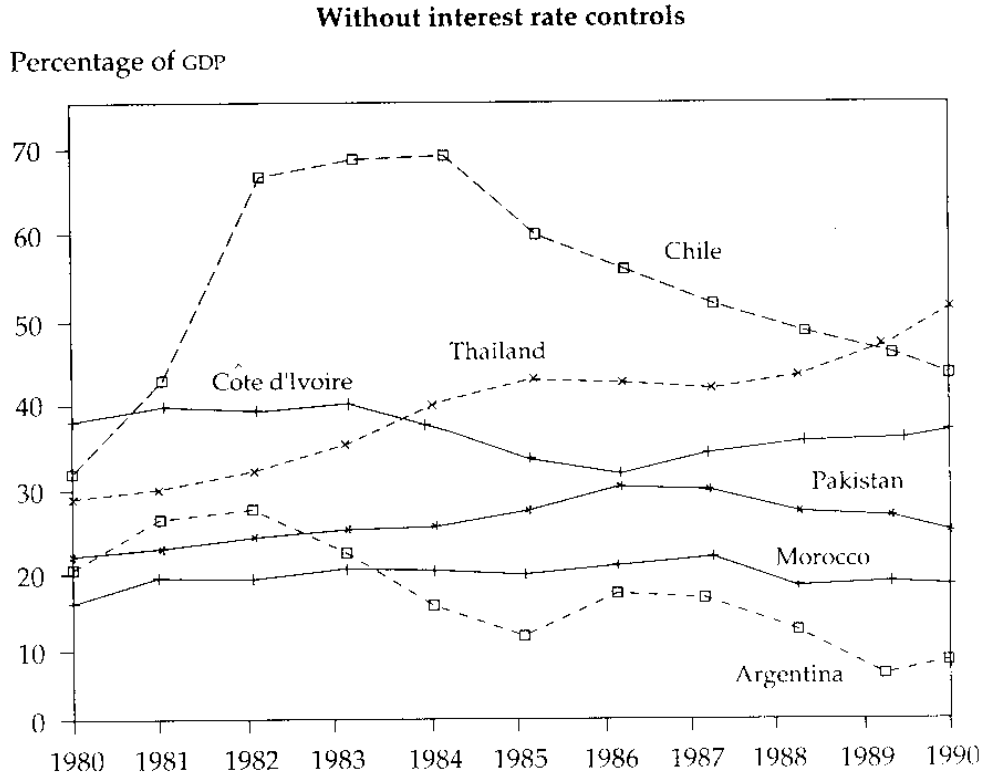
Average annual revenue for the three countries from financial repression of deposit interest rates during 1980–88 ranged from 0.5 percent of GDP for Ghana to 1.6 percent of GDP for Mexico (see table 1.10). Holding down nominal interest rates under high inflation was a quick and easy way of obtaining revenue to compensate for the loss of external financing after 1982. Table A.5 of the Statistical Appendix presents estimates from other studies of revenue from financial repression. Although calculations differ widely because of different methodologies, there is a consistent finding that Ghana, Mexico, and Zimbabwe reaped significant amounts of revenue from controls on domestic interest rates during the 1980s.<sup>19</sup>

Revenue from financial repression in these three countries is comparable to the 1.0 to 2.1 percent of GDP of average seigniorage collected in OECD and developing countries (see table 1.6). Although the implicit tax from financial repression is less visible than seigniorage and its inflation tax component, its deleterious effects on financial intermediation—and hence on the quantity and quality of private investment—is probably as strong as that of inflation. In fact, controlling interest rates was a costly strategy for private credit and investment, which remained depressed throughout the 1980s.<sup>20</sup> In reaction, partial decontrol of interest rates in Ghana and Zimbabwe and complete interest liberalization in Mexico since the mid-1980s have reduced or abolished taxes on financial intermediation.

Figure 1.6 shows the evolution of domestic private credit in the case studies. There are large differences in domestic private credit stocks between countries with deregulated financial markets—where private credit reaches an average 30 percent of GDP—and those with stringent financial controls, where the corresponding average ratio hovers around 10 percent. Mexico's experience well illustrates the effects of financial repression. Financial controls intensified after 1981 as inflation soared, and the ratio of private credit to GDP dropped below already low levels. Following financial liberalization in 1988, the ratio doubled within two years. In Ghana private credit was at a dismally low level, reflecting years of financial repression, including two episodes of outright expropriation of financial assets. By contrast, countries that abstained from repressive interest rate controls, such as Chile and Thailand, had very high levels of private credit, which may partly explain their superior investment and growth performance in the late 1980s.

The alternative to financial repression is government borrowing at market interest rates. Table 1.9, above, reports simulation results (based on the portfolio and general equilibrium frameworks referred to earlier) for the long-term effects on the real interest rate of a transitory 1 percentage point increase in the deficit (in relation to GDP), financed by floating domestic debt, in five country cases. The effects vary widely in the five countries, reflecting differences in the willingness of asset holders to shift from alternative forms of saving. Flat demands for domestic debt imply that real interest rates increased by a modest 0.1 to 0.2 percentage point in Chile and Morocco. Low asset substitutability between domestic debt and alternative private sector asset holdings in Colombia, Pakistan, and (after interest decontrol) Zimbabwe—partly because of high domestic debt levels—explains increases in real interest rates that range from 1.1 to 2.7 percentage points. The implication for those three countries is that when domestic borrowing is high and costly—which could lead to a domestic debt spiral such as the one in Argentina described in box 1.4—there is no

**Figure 1.6. Private Credit under Financial Liberalization and Repression in Nine Countries, 1980–90**



Source: IMF, *International Financial Statistics*, various issues.

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**Box 1.4. Argentina's Unusual Financial Behavior**

The massive decline in Argentina's ratio of private credit to GDP, shown in figure 1.6, reflects an unusual kind of financial behavior. The government, far from controlling interest rates, oscillated between paying high interest rates and "melting down" domestic liabilities through surprise devaluations and other methods (including a forced conversion of time deposits into government bonds of questionable value in 1990). This tactic was necessary because the high interest rates themselves fueled the accumulation of more debt, in a classic example of a debt spiral, or Ponzi game. Borrowing was increased in order to pay the interest on the debt, which implied yet higher interest and borrowing in the next period, and so on. Although the government managed to keep persuading the public to buy domestic debt, increasingly high interest rates were required. The Argentina case study in this book chronicles the rise in nominal interest rates at the outset of successive economic plans, each of which opened with a devaluation.

<i>Stabilization plan and date</i>	<i>Initial devaluation (percent)</i>	<i>Nominal interest rate per month (percent)</i>
Austral (June 1985)	40	7
Primavera (August 1988)	24	10
Bunge-Born I (July 1989)	200	17
Bunge-Born II (December 1989)	54	60
Erman (January 1990)	220	100

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choice except to continue financial repression (as Zimbabwe has done up to now) or to pursue the more desirable course of fiscal adjustment (as in Morocco or Colombia throughout the 1980s and to the present).

These results for domestic debt financing and real interest rates (or financial repression) and those for seigniorage and inflation indicate strong correlations in both cases in developing countries. The increasingly unfavorable tradeoffs between these financing sources and the rates of return on government liabilities—leading in the extreme cases to hyperinflation, debt repudiation, or the virtual disappearance of domestic capital markets—imply that there is no alternative to fiscal adjustment for ensuring monetary and financial stability.

**Private Sector Response to Public Deficits**

The macroeconomic effects of deficits are determined to a large extent by the direct response of private spending—consumption and investment—to changes in the deficit and in its composition. The way

in which governments adjusted their fiscal imbalances during the 1980s (frequently by cutting public investment) was often costly for private sector investment. In the ten sample countries private investment declined sharply from an average of 13 percent of GDP in 1981 to 9 percent in 1986. Meanwhile, consumption, both public and private, was relatively insulated. Not even the sharp increases in public consumption of the 1970s—expansions that had much to do with the subsequent fiscal crises—were moderated during the adjustments of the 1980s.

To provide some insight into how the private sector responds to fiscal policies, we first identify the channels of transmission between fiscal policies and private spending and then assess their empirical relevance. The empirical inferences are derived from econometric estimations (based on annual time series for each country) for both private consumption and investment, consistent with optimizing behavior under liquidity constraints. Here we summarize only the qualitative response to variables related to fiscal policy; the chapters on individual countries provide the estimated coefficients of both fiscal and nonfiscal variables.

### *Private Consumption and Fiscal Policies*

Fiscal policies affect private consumption and saving through two major channels: disposable income and rate of return (real interest rate).

An increase in the deficit brought about by a cut in current taxes boosts private consumption by increasing disposable income, according to the standard Keynesian hypothesis that consumers increase spending when their current income rises. The permanent income hypothesis asserts that only a permanent tax cut significantly affects consumer spending; thus, if the tax cut is temporary, the consumption effect will be minimal.

Both hypotheses are denied by the Ricardian equivalence hypothesis, which claims that consumers react the same whether government spending is financed through debt or taxes because consumers foresee that a tax cut today, paid for by a deficit and borrowing, will lead to a tax increase in the future. In anticipation of that future tax increase, consumers save rather than spend the income from the tax cut. So a tax cut that simply substitutes debt finance for tax finance of unchanged government spending would leave consumer spending unchanged—and would lower it as a share of (now higher) disposable income. However, if government consumption is increased, private consumption should decline one-to-one with each dollar of higher permanent government spending. The argument, first skeptically postulated by Ricardo and affirmed in the recent literature by Barro

(1974), rests on—in addition to many secondary assumptions—two main and rather stringent assumptions (Seater 1993): that consumers are concerned with their own future welfare and that of their descendants, and that consumers can shift consumption over time by borrowing or lending whenever they wish.

There is another reason—unrelated to the Ricardian hypothesis—why a tax cut could cause private saving to rise or a government consumption increase could cause private consumption to fall. If there are strict government controls on domestic credit and external capital flows, with government having the first claim on credit, an increase in the deficit (a fall in government saving) reduces the credit available to the private sector, forcing private saving to rise or consumption to fall. This effect, which may be difficult to distinguish from the Ricardian hypothesis, may be termed the direct-crowding-out hypothesis.

The real interest rate determines how consumers schedule their consumption over time, assuming that they have access to credit. The effect of the interest rate on today's consumption levels is ambiguous because of the offsetting substitution, income, and wealth effects. An increase in interest rates causes consumers to substitute consumption tomorrow for consumption today, but it also induces consumers to feel richer and thus to spend more both today and tomorrow—unless this wealth stems significantly from future income streams discounted by the (higher) interest rate. Credit controls or borrowing constraints would block the effect of the real interest rate on consumption.

Table 1.11 summarizes the qualitative effects of the above-mentioned fiscal policy variables on private consumption.<sup>21</sup> (For brevity, the discussion excludes any reference to other consumption determinants included in the estimations, such as the terms of trade, foreign saving, or money.) For most of the countries, both current (or temporary) and long-run (or permanent) disposable income levels are found to be important determinants of private consumption—and often by magnitudes halfway between those implied by the Keynesian hypothesis and those implied by the permanent income hypothesis.

Does public saving (or the deficit) affect private consumption directly, as implied by the Ricardian hypothesis and the direct-crowding-out hypothesis? For most countries it does not: permanent public saving is not significant in Chile, Mexico, or Pakistan; current public saving or deficits do not affect consumption in Colombia, Côte d'Ivoire, Ghana, or Pakistan. In three cases, however, changes in public saving (or surplus) cause consumption to move in the same direction, which is consistent with either hypothesis. Private consumption rose with permanent public surpluses in Argentina and

**Table 1.11. Qualitative Effects of Fiscal-Policy-Related Variables on Private Consumption**

Country	Disposable income		Public saving		Public surplus		Real interest rate
	Current	Permanent	Current	Permanent	Current	Permanent	
Argentina, 1915-84, 1961-84	(+)	(+) <sup>a</sup>	-	-	-	(+) <sup>a</sup>	-
Chile, 1960-88	(+)	(+)	-	(0)	-	-	(0)
Colombia, 1971-86	(+)	(+)	(0)	-	-	-	(+)
Côte d'Ivoire, 1972-87	(+)	-	-	-	(0)	-	-
Ghana, 1969/70 to 1988	(+)	(+)	-	-	(0)	-	(0)
Mexico, 1981.1-89.4	(+)	(0)	-	(0)	-	-	(-)
Morocco, 1972-88	-	(+)	-	-	-	(+)	(0)
Pakistan, 1963-87	-	(+)	-	(0)	(0)	-	-
Thailand, 1971-87	(+)	-	-	-	-	-	(+)
Zimbabwe, 1965-88	(+)	(+)	-	(+)	-	-	(0)

-- Not available.

Note: The positive and negative signs correspond to statistically significant coefficients; (0) denotes a coefficient not significantly different from zero. Specifications and estimation techniques vary by country. The dependent variable (private consumption) enters in levels for Argentina, Ghana, and Pakistan, in log levels for Morocco and Thailand, in both levels and log levels for Colombia, in the ratio to national income for Côte d'Ivoire, and in the ratio to private disposable income for Chile, Mexico, and Zimbabwe.

a. The specification does not permit a clear distinction between current and permanent forms.

Source: Country case studies listed in the references to this chapter.

Morocco and with permanent public saving in Zimbabwe. Although the coefficients were significant and positive, they were much lower than those for permanent disposable income, implying—contrary to the Ricardian hypothesis—that tax cuts would affect consumption. It also implies that public saving would still have a positive net effect on total saving.

These three cases could have supported the Ricardian explanation only if the countries had freely operating financial markets so that consumers could shift their consumption over time in anticipation of future tax increases. In fact, however, Argentina did not liberalize its financial markets until 1977 (late in the sample period), while Morocco and Zimbabwe had institutional arrangements that gave the public sector preferential access to domestic credit. These facts suggest that direct crowding-out of private consumption by public deficits is the more likely explanation. Similar results for a different sample of developing countries were found by Corbo and Schmidt-Hebbel (1991).

The ten case studies provide little evidence that real interest rates have a positive effect on private saving—a result consistent with similar findings for other developing country samples (Giovannini 1983, 1985; Corbo and Schmidt-Hebbel 1991; Schmidt-Hebbel, Webb, and Corsetti 1992). The real interest rate showed significant effects in three countries. Rising real interest rates depressed private consumption in Mexico (signaling the dominance of the intertemporal substitution effect) but increased consumption in Colombia and Thailand. The absence of significant results in five other cases suggests either that the substitution, income, and wealth effects tend to cancel each other out or that borrowing constraints prevent consumers from responding to interest rate swings by shifting consumption over time. Borrowing constraints are also behind Haque and Montiel's (1989) rejection of Ricardian equivalence for a set of developing countries.

### *Private Investment and Fiscal Policies*

Fiscal policies affect private investment through three major channels: public investment, public deficits, and the user cost of capital.

Public capital could be a close substitute for private capital, driving down the rate of return on private investment. Public investment in steel plants is an obvious example. However, governments also invest in activities that do not attract private investment but that raise the rate of return of other private projects, such as infrastructure projects. Thus the higher the complementarity of public and private capital, the more likely it is that public investment will have a net positive effect on private investment.

**Table 1.12. Qualitative Effects of Fiscal-Policy-Related Variables on Private Investment**

Country	Public capital		Public sector			Cost of capital	
	Stock	Flow	Deficit	Consumption	Revenue	User cost	Real interest rate
Argentina, 1915-84	-	(0)	-	(-)	(+)	-	-
Chile, 1961-88	-	(-)/(0)	-	-	-	(-)/(0)	-
Colombia, 1925-88	(-)	-	-	-	-	(0)	-
Côte d'Ivoire, 1972-87	-	-	(-)	-	-	-	-
Ghana, 1967-88	-	(-)	-	-	-	-	(0)
Mexico, 1970-89	-	(-)/(0)	-	-	-	(-)	-
Morocco, 1972-88	-	(+)	-	-	-	(-)	-
Pakistan, 1972/73 to 1987/88	(+)	-	-	-	-	(-)	-
Thailand, 1971-87	-	(+)	(-)	-	-	-	-
Zimbabwe, 1965-88	-	(+)	-	-	-	(-)	-

- Not available.

Note: The positive and negative signs correspond to statistically significant coefficients; (0) denotes a coefficient not significantly different from zero. Specifications and estimation techniques vary by country. The dependent variable is private investment for all countries except Côte d'Ivoire and Pakistan; it enters in levels for Argentina, in log levels for Thailand, in the ratio to GDP for Chile, Ghana, Mexico, and Zimbabwe, in the log ratio to GDP for Morocco, and in the level, log level, or ratio to GDP for Colombia. In the case of Pakistan the dependent variable is the ratio of private capital stock to GDP. Because of data limitations for Côte d'Ivoire, the dependent variable is the ratio of domestic investment to national income.

Source: Country case studies listed in the references to this chapter.

If there is repression of domestic interest rates and the public sector is given preferential access to domestic credit, the public deficit could crowd out private investment. When interest rates are not regulated, deficit financing through domestic borrowing tends to raise real interest rates, diminishing the profitability of investment by raising the user cost of capital. (The user cost of capital is determined by the real interest rate, the price of investment goods, and investment incentives.)

Table 1.12 summarizes the qualitative effects of fiscal policy variables on investment. (For brevity, the discussion excludes any reference to other investment determinants included in the estimations, such as the marginal product value of capital, foreign saving, firm profits, or banking credit to firms.) Consistent with the theoretical ambiguity of the relationship between public capital and private investment, the case studies found sharply different results. For Pakistan each percentage point increase in the ratio of public capital stock to output results in a 2.1 percentage point increase in the ratio of private capital stock to output. A similar relationship is found for Zimbabwe; a higher public capital stock also raises private investment, but the effect is smaller than in Pakistan. By contrast, an increase in public capital stock in Chile and Colombia tends to lower private investment.

Some of the country studies used public investment rather than public capital stock, again finding opposite effects in different countries. For Ghana and Mexico increasing public investment reduces private investment (although the effect was weak for Mexico), while for Thailand private investment rises with public investment. For Argentina no significant relation was found. The Morocco study found that public investment contributes to growth, from which it can plausibly be inferred that private investment rises with public capital formation.

Thus, only three countries provide direct evidence for the widespread presumption that public sector investment is good for private investment. These findings confirm previous studies for developing countries (Blejer and Khan 1984; Khan and Reinhart 1990), with ambiguous results regarding the effect of public on private investment. By way of comparison, Aschauer (1989) finds that higher public capital strongly increases private investment in the United States. It seems reasonable to infer, then, that for countries with a negative relationship (Chile, Colombia, Ghana, and Mexico) or no relationship at all (Argentina), public investment is concentrated in activities which substitute directly for private investment.

Public deficits have a negative effect on private investment in Côte d'Ivoire, where the effect is weak, and in Thailand, where it is strong. For Argentina the study decomposed the deficit into its three main

components and found that public investment does not affect private capital formation but that public consumption and public revenue do, in directions consistent with the crowding-out hypothesis. The inference, then, is that deficits tend to crowd out private investment through domestic financial markets in Argentina, Côte d'Ivoire, and Thailand.

Although many studies have found that private investment is insensitive to real interest rates, the results for the sample countries show a surprisingly strong negative effect in five of them, with only two (Colombia and Ghana) showing no relationship. The effect of interest rates on private investment is strongest in Morocco and Pakistan, moderately strong in Zimbabwe, and weakest in Chile and Mexico.

### **Public Deficits, Trade Deficits, and Real Exchange Rates**

For the 1980s real exchange rates are closely correlated with the behavior of fiscal deficits in many developing countries. The major fiscal adjustment in Côte d'Ivoire in 1982-85 was accompanied by real depreciation; subsequent fiscal backsliding occurred in 1985-88 together with real appreciation. The large reduction in the fiscal deficit in Colombia in 1983-88 was accompanied by real depreciation. In the same way Chile's real depreciation of 1984-88 was contemporaneous with a fall in the deficit. Ghana's reform program after 1982 included both a deficit reduction and a real depreciation of the official exchange rate (as well as a depreciation of the real black-market exchange rate). Morocco experienced both a deficit reduction and a real depreciation in 1982-85; in Thailand a deficit reduction and a real depreciation occurred together in 1985-88. These associations support the finding of Edwards (1989) that nominal devaluations last as real devaluations only if accompanied by fiscal adjustment.

In order to provide more systematic evidence on the linkages between the fiscal deficit, the trade deficit, and the real exchange rate, the project case studies tested behavioral relations for the two latter variables on the basis of Rodríguez's two-sector dependent-economy model with optimal capital accumulation (see chapter 2 in this volume). This framework permits the derivation of a two-step relationship between the fiscal deficit and the real exchange rate: the fiscal deficit (among other determinants of investment and saving behavior) affects the external deficit, which then determines the real exchange rate consistent with the clearing of the domestic goods market.

The empirical evidence summarized in the following sections is based on econometric estimations (on annual time-series data for each country) for both the trade surplus and the real exchange rate.

Only the qualitative response to fiscal variables is reported here; the chapters on individual countries provide quantitative results on both fiscal and nonfiscal variables.

Table 1.13 summarizes the sensitivity of the trade surplus to three fiscal variables: the deficit, public consumption, and public investment. For eight countries—Argentina, Chile, Colombia, Côte d'Ivoire, Ghana, Mexico, Thailand, and Zimbabwe—there is significant evidence that rising external surpluses are correlated with higher public surpluses. A similar relationship—reducing the fiscal deficit by reducing public investment improves the trade balance—was found for Pakistan on the basis of a comprehensive macroeconomic model. That fiscal adjustment is a major determinant of external adjustment is also implied by the hypothesis that fiscal policy is an effective instrument for raising national saving, as the substantial evidence presented in the preceding section shows.

Table 1.14 summarizes the sensitivity of the aggregate real exchange

**Table 1.13. Qualitative Effects of Fiscal-Policy-Related Variables on the Trade Surplus**

Country	Public surplus			Public expenditure	
	Total	Primary	Operational	Consumption	Investment
Argentina, 1963–88	—	(+)	—	—	—
Chile, 1960–88	—	—	(+)	—	—
Colombia, 1970–88	—	(+)	—	—	—
Côte d'Ivoire, 1971–81	—	(0)	—	—	—
Côte d'Ivoire, 1979–89	—	(+)	—	—	—
Ghana, 1970–88	—	—	—	(–)	—
Mexico, 1970–89	—	—	(+)	—	—
Morocco, 1974–88	—	—	—	(–)	—
Pakistan, 1983/84 to 1987/88	—	—	—	—	(–)
Thailand, 1972–89	(+)	—	—	—	—
Zimbabwe, 1965–88	—	—	(+)	—	—

— Not available.

*Note:* The positive and negative signs correspond to statistically significant coefficients; (0) denotes a coefficient not significantly different from zero. Specifications and estimation techniques vary by country. The dependent variable (current account or trade balance) enters as a ratio to GDP for Argentina, Chile, Colombia, Côte d'Ivoire, Mexico, and Thailand; in levels for Ghana, Morocco, and Pakistan; and as a log ratio to GDP for Zimbabwe. The coefficient for Ghana is for aggregate private expenditure. The effects for Morocco and Pakistan are not the coefficients for one structural equation but represent the general equilibrium effect of a change in the exogenous variable on the current account surplus (in Morocco) or the trade surplus (in Pakistan). For Morocco the sign reflects the deterioration in the current account as a result of a foreign-financed increase in government consumption. For Pakistan the sign reflects the improvement in the trade surplus based on the impact of deficit reduction through lower public investment.

*Source:* Country case studies listed in the references to this chapter.

**Table 1.14. Qualitative Effects of the Trade Surplus and Fiscal-Policy-Related Variables on the Real Exchange Rate**

<i>Country</i>	<i>Trade surplus</i>	<i>Public expenditure</i>	<i>Public deficit</i>
Argentina, 1964–87	(–)	(+)	–
Chile, 1960–88	(–)	(–)	–
Colombia, 1967–87	(–)	(–)	–
Côte d'Ivoire, 1972–87	–	(+)	–
Côte d'Ivoire, 1972–89	(–)	(0)	–
Ghana, 1970–88	–	–	(+)
Mexico, 1970–89	(–)	(–)	–
Morocco, 1974–88	(–)	(+)	–
Pakistan, 1983/84 to 1987/88	(+)	–	–
Thailand, 1972–89	(–)	–	–
Zimbabwe, 1965–88	(–)	(+)	–

– Not available.

*Note:* The increase in the real exchange rate equals appreciation. The positive and negative signs correspond to statistically significant coefficients; (0) denotes a coefficient not significantly different from zero. Specifications and estimation techniques vary by country. The dependent variable (real exchange rate) enters as levels for Côte d'Ivoire, Ghana, and Thailand; as levels distinguished between the relative export price and the relative import price for Chile, Mexico, and Zimbabwe; as natural logarithms of the import price for Argentina; and as natural logarithms of the real exchange rate for Colombia. The effects for Morocco, Pakistan, and Thailand are not the coefficients for one structural equation but represent the general equilibrium effect of a change in the exogenous variable on the corresponding endogenous variable. For Morocco the reported effects combine the simulation results of a domestic-debt-financed increase in public expenditure and a foreign-financed increase in public expenditure. For Pakistan the effect of an appreciation of the real exchange rate is brought about by a 10 percent reduction of the public deficit through lower public investment, which causes domestic prices to rise with a fixed nominal exchange rate. For Thailand the reported effect summarizes the simulation results of domestically financed deficits, which cause a trade deficit and a real exchange rate depreciation.

*Source:* Country case studies listed in the references to this chapter.

rate to the trade surplus and to fiscal variables. For eight countries (Argentina, Chile, Colombia, Côte d'Ivoire, Mexico, Morocco, Thailand, and Zimbabwe) higher trade surpluses lead to depreciation of the real exchange rate. For Ghana a higher public deficit leads directly to appreciation of the real official exchange rate, taking into account the existence of a black market in foreign exchange. The only contrary result was for Pakistan, where deficit reduction through reduced public investment leads to appreciation of the real exchange rate because of the depressing effect of lower public investment on domestic output. These findings, together with those on the positive relation between trade deficits and fiscal deficits, strongly support the central hypothesis of this section: a lower fiscal deficit leads to a lower trade deficit, which in turn leads to a real exchange rate depreciation.

The studies also examined Rodríguez's hypothesis (see chapter 2 in this volume) that, for a given trade deficit, an increase in public spending affects the real exchange rate. This effect occurs because an increase in public spending for a given trade deficit implies a corresponding decline in private spending. If the public sector has a higher propensity than the private sector to spend on imports rather than on domestic goods, a shift toward more public and less private spending implies an increased demand for imports and a corresponding depreciation of the real exchange rate. Tests of this hypothesis show split results for the sample countries. Higher government spending leads to an appreciation of the real exchange rate for Argentina, Côte d'Ivoire, Morocco, and Zimbabwe and to a depreciation for Chile, Colombia, and Mexico.

These empirical results support the notion that the real exchange rate is sensitive to both policy and external variables, including, prominently, the fiscal deficit. The strong contribution of fiscal adjustment to external adjustment and to a corresponding depreciation of the real exchange rate, as found in the ten-country sample, is reflected in figure 1.7. The figure confirms that the dominant macroeconomic policy trend of the 1980s in these countries was fiscal and external adjustment. However, this average trend of steady improvement from 1982 to 1988 was not confined to the sample countries. Other developing countries showed similar, although less pronounced, reductions of the public deficit, and industrial countries also cut their deficits in half during the same period. A major consequence of fiscal adjustment was sharp reductions in current account deficits, supported by massive real exchange rate depreciations.

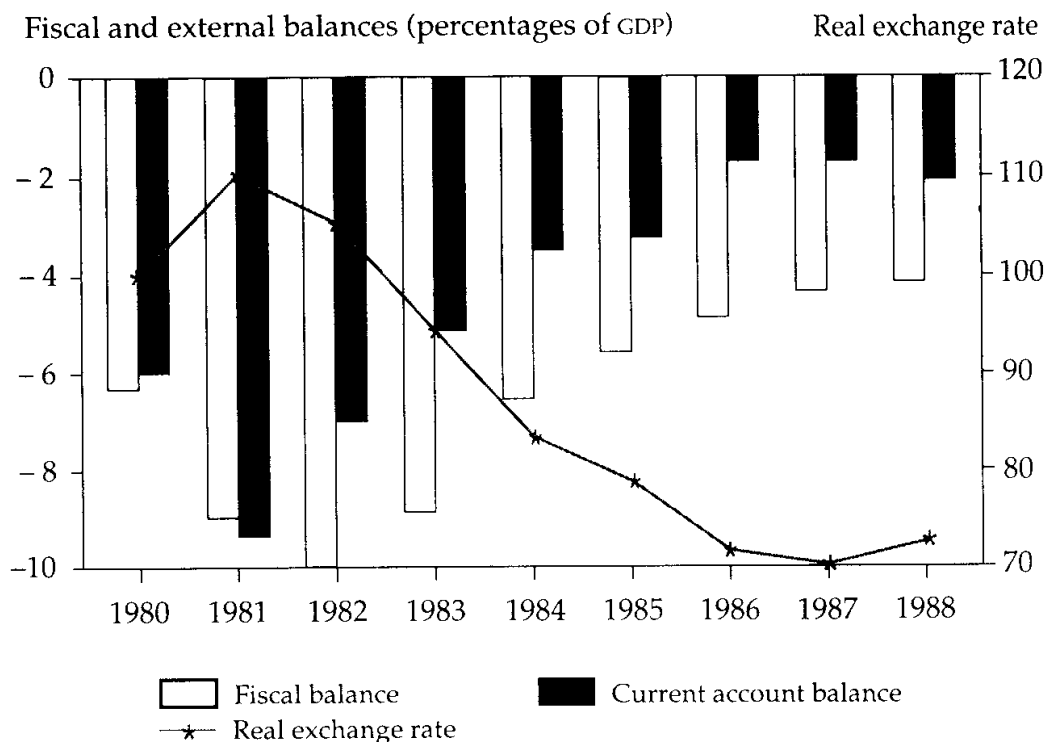
### **Conclusions and Policy Implications**

This chapter has summarized empirical evidence on various controversial issues that occupy the center stage in the discussion of the macroeconomics of fiscal adjustment or deterioration. The evidence is drawn mostly from a sample of ten case studies that are highly representative of the structural diversity of developing countries. This feature strengthens the conclusions reached and shows them to be relevant for the developing world at large.

The use of adequate measures of actual and sustainable public deficits was addressed first. Wide public sector coverage (including public enterprises and the central bank) and exclusion of economically irrelevant categories such as the inflation component of domestic interest payments permit the derivation of more meaningful deficit measures. These measures can be compared with estimates for sustainable deficit levels to evaluate the need for fiscal adjustment.

Public budgets are very sensitive to foreign and domestic macroeconomic shocks in the short run. But the empirical findings show

**Figure 1.7. Fiscal and External Balances and Real Exchange Rate: 1980–88 Averages for Ten Developing Countries**



*Note:* An appreciation of the real exchange rate is shown as an increase.

*Sources:* Chapters 4, 5, 7, 8, 9, and 10 and Statistical Appendix in this volume; IMF, *International Financial Statistics*, various issues.

that shocks explain only a minor part of the medium-term variation of public deficits. The major factor explaining change is fiscal policy. Policymakers are to be blamed for fiscal crises and praised for fiscal improvements—luck is a very minor determinant of fiscal stance.

The first set of issues concerning the macroeconomic consequences of deficits that this chapter addresses relates to the linkages between public deficits, inflation, and real interest rates. Although cross-country correlations between deficits and inflation and between deficits and real interest rates were found to be weak at best, the sample countries offer strong evidence that, in the medium term, money financing leads to higher inflation and debt financing leads to higher real interest rates or increased financial repression. As deficit financing mounts, the terms become increasingly unfavorable to the extraction of these unconventional taxes from the private sector.

The evidence soundly refutes the Barro-Ricardian proposition that consumers react the same to conventional taxes, unconventional taxes (inflation or financial repression), and debt financing. The

notion that private saving can be mobilized through higher real interest rates (brought about by increased debt financing or financial liberalization) was also rejected. Both findings are in line with the recent empirical evidence on private saving behavior in developing countries.

Higher interest rates, however, have a negative effect on private investment. This finding is consistent with investment theory, but it contradicts some of the empirical evidence showing that investment is insensitive to interest rates in developing countries. Public investment was found to crowd out private investment in some countries and, in others, to crowd it in. This result confirms previous studies showing that the net effect of public investment on private investment depends on the composition of the former—on whether it is a complement to or a substitute for private investment.

Finally, strong and systematic evidence was also found to support the hypothesis that fiscal deficits spill over into current account deficits, leading, in turn, to a real exchange rate appreciation.

The main policy implications derived from these findings can be summarized as follows.

- *Fiscal adjustment.* Estimations for six countries suggest that sustainable primary surpluses vary between 2 and -2 percent of GDP (equivalent to nominal deficits of between 2 and 6 percent of GDP). These figures, which depend on the combination of macroeconomic conditions and outstanding public liabilities, are a far cry from actual deficits in countries such as Côte d'Ivoire and Pakistan.

Successful fiscal adjustment can be seen as proceeding in two stages. First, deficits are reduced to sustainable levels, consistent with stable debt-output ratios and normalized financial markets, as, for instance, in Morocco. A second phase of deeper fiscal adjustment supporting a strong private sector response—as in Chile or Morocco— involves reaching nominal public surpluses or only slight deficits, thus allowing the public sector to reduce its indebtedness in relation to the domestic private or external sectors.

The ten-country sample suggests that sustainable adjustment typically requires action on four fronts: reducing an overblown government bureaucracy; cutting transfers and subsidies (other than efficient, targeted social programs); enacting tax legislation for increased, broadly based direct and indirect taxation; and reforming or privatizing public enterprises and commodity marketing boards.

- *Fiscal deficits and inflation.* To the extent that deficits are financed by money creation, the relationship between fiscal deficits and inflation is indisputable. However, the tradeoff between additional inflation and revenue is increasingly unfavorable to the latter, as documented by the Laffer-curve behavior of money demands.

Governments desperately lacking other income sources and with short planning horizons often start bursts of accelerated money printing and inflation that yield, for a brief period, abnormally high inflation tax revenue. This revenue falls as soon as people reduce their money holdings in response to higher inflation; that reaction leads to growing macroeconomic instability and relative price variability. Since the inflation tax (as well as financial repression, discussed below) is a tax, there is no reason to expect conventional fiscal adjustment to be any more contractionary than adjustment through inflation (or financial repression).

- *Fiscal deficits, real interest rates, and financial repression.* If domestic financial markets are not repressed but external financing is not easily available, higher deficits financed by domestic debt raise domestic real interest rates. When domestic financial markets are integrated with world capital markets, higher domestic public borrowing leads to external capital flows and higher foreign debt, without much affecting domestic real interest rates. The story is different when the government represses financial markets through controls on domestic interest rates, compulsory public debt placements, and controls on external capital flows. If the nominal interest rate is fixed, higher fiscal deficits lead to repressed (even negative) real interest rates, implying high taxes on financial intermediation. But the poor economic performance that follows from strong financial repression—depressed private credit and the attendant collapse of private investment—hardly recommends this unconventional form of taxation.

- *Budget deficits and private consumption.* Rejection of the notion that consumers are indifferent between taxes or debt finance carries the policy implication that increasing public saving—or reducing public deficits—is the most effective contribution fiscal policy can make to raising national saving. However, increasing real interest rates through domestic debt financing or financial liberalization will not raise private saving.

- *Budget structure, deficits, and private investment.* Real interest rates and private sector credit do significantly affect private investment. So whether there is financial repression or not, increasing public deficits reduces private investment. The composition of public spending matters as well, since more public investment depresses private investment in some cases—typically, when large public enterprises compete with private firms and enjoy preferential access to domestic financial resources. The implication is that the prospects for higher private investment and growth are improved by three policy measures: restructuring and privatizing public firms and marketing boards; concentrating public investment on public and social infrastructure; and deregulating domestic financial markets—including removal of

credit ceilings, compulsory credit allocation, preferential access of the government to credit, and interest controls.

- *Fiscal deficits, trade deficits, and real exchange rates.* The evidence of the strong relationship between public and external deficits complements the policy implication derived from the finding that private saving does not offset changes in public saving: fiscal adjustment is very effective in boosting national saving and therefore in increasing the trade surplus as well. Exchange rates are driven by fundamentals and not the other way around. This should serve as an antidote to the mistaken notion of many policymakers that nominal devaluation alone can restore macroeconomic balance. As Khan and Lizondo (1987) have hypothesized, real exchange rates are also affected by whether the government spends more on tradables than on nontradables. Policymakers should pay attention to the composition of government spending when deciding on an accommodating exchange rate policy.

- *Fiscal deficits and growth.* High deficits are strongly correlated with low growth. Inflation raises uncertainty and distorts relative prices, hurting private investment and resource allocation. The conventional notion that public investment is good for private investment and growth received mixed support. Countries that were forced to shift from external to internal financing of deficits—often because of a debt crisis induced by fiscal mismanagement—showed particularly poor investment and growth performance in the 1980s. Growth itself makes deficits less harmful: countries such as Pakistan and Thailand could sustain larger deficits because of strong growth, while economic collapse worsened the macroeconomic effects of deficits in Argentina, Côte d'Ivoire, and Mexico. The virtuous circle between growth and good fiscal management is one of the strongest arguments for a policy of low and stable fiscal deficits.

### **Appendix 1.1. Measurement of Deficits and Evaluation of Public Sector Solvency**

Alternative measures for public sector composition stretch from the central government to the consolidated nonfinancial public sector (which consolidates the central government with local government, social security, and nonfinancial public enterprises) and to the consolidated total public sector (adding to the first consolidation the central bank and, possibly, the public commercial banks). Although deficit measures based on the widest public sector coverage are the most accurate measure of fiscal stance and public sector resource transfers, they are often not readily available and are not free of controversy. (See the references in the text on the problems of measuring quasi-fiscal deficits.)

An alternative to cash-based deficits is measurement of deficits on an accruals (or payment-order) basis, which reflects income and spending actions measured at the time they take place, even if they do not immediately involve cash flows. Accumulation of arrears on interest, wage, or goods expenditure would cause accruals-basis deficits to be larger than cash-basis deficits. Box 1.2, above, illustrates the differences between alternative deficit measures for Morocco.

A popular alternative to the nominal cash deficit is the operational deficit, obtained by deducting from the nominal cash deficit the part of nominal interest payments on public debt attributable to inflation, which merely compensates the debt holder for the erosion of the real value of public debt caused by inflation and which, under asset-equilibrium conditions, is reinvested by the debt holder. This correction is particularly important in high-inflation, high-domestic-debt countries. The primary deficit deducts net interest payments from the nominal cash deficit.

Use of accruals-based deficits permits a move away from conventional deficits or intratemporal budget constraints and toward deficit measures consistent with public sector net worth or public intertemporal budget constraints. While the latter would constitute the economically most meaningful measures of fiscal stance and public sector solvency, they are, unfortunately, not observable. Three approaches have been adopted in dealing with this issue. The first is the accounting approach to public sector solvency developed by Buitter (1983, 1985, 1990) and van Wijnbergen (1989), which derives estimates of sustainable deficit levels as those that can be financed without raising debt levels (in relation to GDP) under feasible rates of growth, real interest, and inflation. This methodology has been applied to many countries (for instance, by van Wijnbergen and others 1992 to Turkey and by de Melo 1990 to Morocco), and it is used in deriving the sustainable deficit measures in the sample countries, as reported in the section on sustainable public deficits.

A less stringent requirement than the constancy of debt-output ratios imposed by the accounting approach is to test for the no-Ponzi-game condition on public debt followed by the neoclassical solvency approach. This methodology, developed by Hamilton and Flavin (1988), Grilli (1989), Wilcox (1989), and Buitter and Patel (1990), checks for public sector solvency by comparing the rate of growth of the public debt (in relation to GDP) with the real interest rate. If the debt ratio systematically grows faster than the real interest rate, the public sector is considered insolvent. Among the applications of the methodology are the recent studies by Buitter and Patel (1990) for India and by Werner (1991) for Mexico. The third method diverges from the first two methods by focusing on prices instead of quantities, testing for discounts on public debt paper.

## Appendix 1.2. Sustainable Deficits

This appendix derives the equation for the sustainable primary deficit calculations reported in the first section of this chapter. It is based on the accounting approach to public sector solvency developed by Buiter (1983, 1985, 1990) and van Wijnbergen (1989).

We start with the budget constraint of the consolidated total public sector, which consists of the nonfinancial and financial subsectors, the latter including the central bank. The budget constraint equates the above-the-line total nominal deficit (the sum of the primary deficit and total net interest payments) to below-the-line financing sources (the change in monetary and nonmonetary public debt holdings).

$$(1.1) \quad \frac{PD}{Py} + i \frac{D}{Py} + i^* \frac{ED^*}{Py} = \frac{\dot{M}}{Py} + \frac{\dot{D}}{Py} + \frac{E\dot{D}^*}{Py}$$

where  $PD$  is the consolidated total public sector primary deficit,  $P$  is the GDP deflator,  $y$  is real GDP,  $i$  is the domestic nominal interest rate,  $D$  is the stock of domestic public debt,  $E$  is the nominal exchange rate (domestic currency units per unit of foreign currency),  $i^*$  is the foreign nominal interest rate,  $D^*$  is the foreign public debt stock (in current-price foreign currency units), and  $M$  is the base money stock. All variables are in current-price domestic currency units unless otherwise noted.

Simple manipulation of equation 1.1 permits derivation of the ratio of the primary deficit to GDP as:

$$(1.2) \quad pd = \dot{m} + (\pi + n)m + \dot{d} + (n - r)d + \dot{d}^* + (n - r^* - \epsilon)d^*$$

where the lower-case variables  $pd$ ,  $d$ ,  $d^*$ , and  $m$  are defined as the ratios of  $PD$ ,  $D$ ,  $E$ ,  $D^*$ , and  $M$ , respectively, to GDP at current prices;  $\pi$  is the domestic rate of inflation;  $n$  is real GDP growth;  $r$  is the domestic real interest rate,  $r^*$  is the foreign real interest rate; and  $\epsilon$  is the rate of real exchange rate depreciation.

Equation 1.2 shows that the primary deficit of the consolidated public sector, as a share of GDP, is constrained to not exceed the sum of six financing sources: revenue from the sum of the inflation tax on the monetary base and growth-induced increase in money demand; the excess of domestic growth over the relevant real interest cost of domestic and foreign debt; and increasing demands for monetary and nonmonetary debt. Primary deficits are sustainable if they do not entail ever-increasing shares of debt and money to income. In the absence of explicit demands for public liabilities, the accounting approach to public solvency defines sustainability in the more restrictive sense of constant ratios of debt to output and of money to output, consistent with steady-state (constant) inflation and interest rates.

Therefore the country applications summarized in the first section of the chapter calculate sustainable primary deficits as determined by

equation 1.2, after imposing the steady-state condition of constant liability-to-income ratios. In most cases the calculations assume that 1988–90 liability-to-output ratios are the relevant steady-state values. Country applications differ in public sector coverage (central, general, nonfinancial, or total public sector), and equation 1.2 is modified accordingly.

### Appendix 1.3. Decomposition of Seigniorage

The decomposition is based on the following equation for seigniorage,  $T$ :

$$(1.3) \quad T_t = \frac{P_t M_t - P_{t-1} M_{t-1}}{P_t} = \left( \frac{\pi_t}{1 + \pi_t} \right) M_{t-1} + M_t - M_{t-1}$$

where  $P_t$  is the price level at time  $t$ ,  $M_t$  is the real money supply at time  $t$ , and  $\pi_t$  is the inflation rate at time  $t$ . The steady-state value of seigniorage is given by:

$$(1.4) \quad \bar{T} = \frac{\bar{\pi}}{1 + \bar{\pi}} \frac{\bar{M}}{1 + \bar{g}} + \frac{\bar{g}}{1 + \bar{g}} \bar{M}$$

where a bar denotes an average level of a variable and it is assumed that real money grows in proportion to output, with output growth given as  $\bar{g}$  and the trend value of real money as  $\bar{M}$ . The first term gives the inflation tax component of seigniorage, while the second gives the seigniorage that accrues from an increase in real money balances.

The deviation of seigniorage from the average can then be given as follows:

$$(1.5) \quad T_t - \bar{T} = \left( \frac{\pi_t}{1 + \pi_t} - \frac{\bar{\pi}}{1 + \bar{\pi}} \right) \frac{\bar{M}}{1 + \bar{g}} + \left( \frac{\bar{\pi}}{1 + \bar{\pi}} \right) \left( M_{t-1} - \frac{\bar{M}}{1 + \bar{g}} \right) \\ + \left( M_t - M_{t-1} - \frac{\bar{g}}{1 + \bar{g}} \bar{M} \right) \\ + \left( \frac{\pi_t}{1 + \pi_t} - \frac{\bar{\pi}}{1 + \bar{\pi}} \right) \left( M_{t-1} - \frac{\bar{M}}{1 + \bar{g}} \right).$$

The first term is the above-average seigniorage attributable to the above-average inflation tax rate. The second term gives the above-average revenue attributable to the above-average real money base. The third term gives the real change in the money base minus the amount that would take place as money grows with output. The last term is the covariance of inflation and money.

### Notes

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Birdsall, Mario Blejer, Vittorio Corbo, Giancarlo Corsetti, Shantayanan Devarajan, Ricardo Ffrench-Davis, Nicolás Eyzaguirre, Stanley Fischer, Michael Gavin, Ravi Kanbur, Johannes Linn, Carlos Rodríguez, Vito Tanzi, and Martin Werner, as well as the participants at the World Bank Conference on the Macroeconomics of Public Sector Deficits (Washington, D.C.), the Tenth Latin American Meeting of the Econometric Society (Punta del Este), and seminars at Columbia University, the Ministry of Finance of China (Beijing), the Ministry of Finance of Costa Rica (San José), CEMA-Universidad de San Andrés (Buenos Aires), and the Central Bank of Chile (Santiago). They are also grateful for the comments and assistance of Paolo Mauro, for research assistance by Maria Cristina Almero-Siochi, Piyabha Kongsamut, and Raimundo Soto, and for interaction with the other chapter authors.

1. The chapter presents in more detail the project's findings and implications discussed in Easterly and Schmidt-Hebbel (1993a, 1993b).

2. The most complete study to date on the measurement of fiscal deficits is Blejer and Cheasty (1991). Other references on alternative deficit measures include Tanzi (1985); Eisner (1986); Blejer and Chu (1988); Kotlikoff (1988); Fischer and Easterly (1990); and Buitier (1990). IMF (1986) and United Nations (1968) discuss cash and accrual deficits in more detail. Robinson and Stella (1988) and Teijeiro (1989) survey issues concerning quasi-fiscal deficits.

3. The next section presents measures of sustainable primary deficits for sector coverages that range—because of varying degrees of data availability—from the central government to the total consolidated public sector. The questions addressed in subsequent sections require the use of cash-based operational (or nominal) deficit measures for the widest available public sector coverage. The discussion of correlations of deficits with other economic variables presents separate 1978–89 data for nominal consolidated nonfinancial and central bank quasi-fiscal deficits, while the fifty-nine-country correlations rely on nominal consolidated public sector or general government balances (depending on data availability), as reported in table A.1 of the Statistical Appendix in this volume. The section on causes and remedies is based on measures of the consolidated nonfinancial public sector deficit, and the subsequent section is based on consolidated total (nonfinancial plus quasi-fiscal) public sector deficits—the nominal or operational measures are indifferent here. Finally, the last two sections use operational consolidated nonfinancial public deficits because of the lack of long time-series for quasi-fiscal deficits.

4. In two cases (Chile and Zimbabwe) upper and lower bounds, consistent with possible deviations of the relevant macroeconomic variables from base-case levels, are added to the midpoint estimates. Here, as well as in the other four cases, the relevant macroeconomic variables used are those that determine the primary deficit: the rates of output growth, inflation, domestic and foreign real interest, and real exchange rate devaluation; see equation 1.2 in appendix 1.2.

5. An interesting short-run counterpart to this result is the suggestion of Giavazzi and Pagano (1990) and Blanchard (1990) that fiscal austerity can be expansionary.

6. See, for example, Balassa (1988); Reisen and van Trotsenburg (1988); Bartoli (1989); Sachs (1989); and Rodríguez (chapter 2 in this volume). Note,

however, that the link breaks down if the Ricardian hypothesis of offsetting private saving holds (Frenkel and Razin 1987; Leiderman and Blejer 1988).

7. In broad terms, countries face four types of foreign shocks: changes in the price and interest conditions of their foreign trade and their credit flows, and changes in quantity constraints affecting their foreign trade and their credit flows. While quantity constraints are rather uncommon in foreign trade (abstracting from countries affected by global embargoes or partial trade restrictions on certain goods), massive changes in borrowing constraints are a stylized fact in credit markets. The aftermath of the 1982 debt crisis implied, in fact, a massive change in regime in the form of foreign resource constraints suddenly faced by most developing debtor economies. Although borrowing constraints constitute a strong foreign shock affecting below-the-line financing sources, we focus only on changes in foreign terms of trade and interest rates, which impinge directly on above-the-line deficits.

8. The channels mentioned here add bracket creep and transfer effects to the five-item list of Dornbusch, Sturzenegger, and Wolf (1990).

9. This is also called the Keynes-Olivera-Tanzi effect; see Olivera (1967) and Tanzi (1977). Sometimes the Keynes-Olivera-Tanzi effect is used more restrictively to denote the tax erosion effect mentioned below.

10. The calculation is based on a reduced-form equation estimated for the CNFPS deficit in Thailand and on 1988 data for the deficit, inflation, and GDP.

11. The average relative contribution of each group of deficit determinants is calculated on the basis of the equation presented in the note to table 1.2; hence the equation is now used separately for external, domestic macroeconomic, and fiscal policy variables. However, in order to present the relative contribution of each group of variables,  $d_i$  is defined here as the explained change in the deficit, not the actual change as in table 1.2. Hence the average relative contribution of external variables to actual deficits in the second column of table 1.2 differs from the average relative contribution of external variables to explained deficits in figure 1.2. The average absolute deviations between actual and explained deficit changes in percentage points of GDP are 0.9 for Chile (1974–88), 2.0 for Ghana (1972/73–1988), and 1.4 for Zimbabwe (1981/82–1988/89).

12. Seigniorage is defined here as the ratio to GDP of the change in high-powered money during the year, averaged over 1970–89. The number of observations is forty-nine countries, including Argentina; the quadratic term is significant whether or not Argentina is included. See tables A.3 and A.4 of the Statistical Appendix for time-series data on seigniorage and inflation rates for forty-nine OECD members and developing countries.

13. Barro (1990) also suggests that the maximum of the Laffer curve is at inflation rates around 100 percent. Edwards and Tabellini (1990) present suggestive evidence for seigniorage Laffer curves in a number of developing countries.

14. Dornbusch, Sturzenegger, and Wolf (1990) describe the progressive substitution of interest-bearing assets for money in high-inflation episodes.

15. Similar magnitudes were found in the study by Fischer (1982).

16. The coefficient of variation is calculated over 1970–89 for a reduced sample of twenty-six countries with data over that period (to standardize the number of observations, which affects the variance). The coefficient of variation is the standard deviation divided by the mean.

17. There were actually twenty-one such observations, but three were found to involve changes in measurement of the money base and were discarded.

18. This is not a general pattern, however; of the nine cases in which seigniorage is explained largely by the change in the real money base, four had rising inflation the following year, two had essentially unchanged inflation, and three had falling inflation the next year. Dornbusch, Sturzenegger, and Wolf (1990) note the rise in real money balances in the early stages of hyperinflation. Our story is a different one: exogenous or policy-induced rises in real money balances allow large temporary seigniorage without hyperinflation.

19. Estimates by Giovannini and de Melo (1993) find much higher revenue from financial repression for Mexico, Morocco, Pakistan, and Zimbabwe than do the other studies because they calculate the tax rate as the ex-post difference between domestic and foreign interest rates, including devaluation. These countries were experiencing steady real devaluations in the early 1980s, which tends to raise the estimate of the tax rate when this method is used.

20. Chamley and Honohan (1990), Easterly (1989), and Giovannini and de Melo (1993) estimate financial repression revenue and discuss the costs of financial repression. Chapter 5 presents evidence from cross-section regressions that financial repression has a negative effect on long-run growth. Dornbusch and Reynoso (1989), however, argue that financial repression is costly only under very high inflation.

21. The consumption specification of the case studies and table 1.11 include (a) disposable income (gross income, including domestic debt interest payments, less tax revenue) and (b) public saving (tax and nontax revenue less current government expenditure, including domestic debt interest payments) or the public surplus (total government revenue less total government expenditure), as consumption determinants. This follows Corbo and Schmidt-Hebbel (1991) in distinguishing between the Keynesian and permanent-income hypotheses (according to which only disposable income matters) and the Ricardian and direct-crowding-out hypotheses (according to which only gross income net of government consumption matters, so that disposable income and public saving should have a high and positive common coefficient in the above-mentioned specification).

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