3

The Determinants of the Interest-Rate–Growth Differential

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3.1 Introduction

The interest-rate–growth differential (IRGD) is a key determinant of the dynamics of the ratio of government debt to GDP (the debt ratio, for short). Essentially, the IRGD is the difference between the interest rate paid on government debt and the growth rate of GDP.[1] The IRGD drives the inertial or "snowball" dynamics of the debt ratio. For any given primary balance, higher interest rates result in larger rollover refinancing needs, while higher growth reduces the ratio of debt to GDP by increasing the latter.[2] Thus the IRGD represents the rate at which the debt ratio would increase (or decrease, when the IRGD is negative) if the primary budget was balanced. Also, from a different angle, the IRGD determines the primary balance necessary to keep the debt ratio constant (the debt-stabilizing primary), which is the IRGD times the debt ratio.

An economy with a high IRGD will require the allocation of large budgetary resources to debt service if the debt ratio is to be kept in check. Conversely, an economy with a negative IRGD can incur sustained primary deficits and still experience a stable, or even declining, debt ratio. This will occur when the growth-induced reduction in the debt ratio exceeds its increase owing to the interest bill plus the primary deficit which need to be financed with additional debt.

I explore in this chapter the cross-country and temporal patterns of the IRGD. In this analysis, I follow closely Escolano, Shabunina, and Woo (2011) (henceforth ESW). I first discuss and quantify the snowball effect on debt driven by the IRGD. This effect turns out to be large but generally of opposite sign in advanced and nonadvanced economies. In the latter, a large negative snowball effect—rooted in negative IRGDs—has allowed sustained significant primary fiscal deficits without exploding debt ratios. The next section shows that IRGDs are associated with GDP per capita, with persistently negative IRGDs in many nonadvanced economies. I suggest then the reasons for this anomalous behavior of IRGDs in nonadvanced economies and discuss whether such behavior is caused by the income catch-up process or

by financial repression. I conclude the chapter with some implications for the design of medium-term fiscal policies in nonadvanced economies.

3.2 How Large Is the Impact of the IRGD on Debt Dynamics?

The change in the government debt ratio during a given period can be split into two conceptually different components: on the one hand, the effect of on- and off-budget operations driven by policies, and, on the other hand, the snowball effect driven by the IRGD and the inherited debt ratio, which is arguably less subject to the direct control of fiscal policies. The first component can be gauged by the sum of the primary balance and the stock-flow residual. The primary balance summarizes the budget policy decisions on revenue and primary spending. The stock-flow residual is the difference between the change in debt and the overall budget balance (revenue less expenditure, including interest payments). It reflects financial operations (e.g., sales or acquisition of stocks, bank recapitalizations) that affect the debt stock.[3] The second component, the snowball effect, is determined by the size of the existing debt stock, the associated interest bill, and the growth of the economy. While these latter variables are influenced by the policy environment, they are not under the direct control of policy makers.

Formally, the increase in the debt ratio of a country during N years between two dates (t and $t + N$) is given by the following expression (Escolano, 2010).

$$d_{t+N} - d_t = \sum_{i=t+1}^{t+N} \lambda_i d_{i-1} + \left(\sum_{i=t+1}^{t+N} -p_i + \sum_{i=t+1}^{t+N} e_i \right), \tag{3.1}$$

where d_t represents the debt ratio to GDP at the end of year t; λ_t represents the IRGD, defined as $\lambda_t = (i_t - \gamma_t) / (1 + \gamma_t)$, where i_t is the (nominal) average effective interest rate paid on government debt and γ_t is the growth rate of (nominal) GDP, both in year t; p_t is the primary budget balance (revenue less expenditure before interest payments) as a ratio to GDP; and e_t is the stock-flow residual measured as a ratio to GDP.[4] **Equation (3.1)** decomposes the change in the debt ratio as the sum of the contribution from the snowball effect, and the contribution from budgetary resources (the primary balance ratio) plus the stock-flow residual. Each of these contributions is the aggregation over the N periods of the corresponding annual values.

For most countries, the size of the snowball effect on debt, driven by the IRGD, is of a first order of magnitude compared with the effect of budgetary and off-budget financial operations—often exceeding them. Table 3.1 shows the contribution to changes in the debt ratio for a sample of countries during 2000–2011 from the IRGD snowball effect versus the contribution from the fiscal and financial operations summarized by the primary balance and the stock-flow residual.

Table 3.1
Decomposition of changes in the debt ratio, 2000 to 2011

	Change in the debt ratio (% GDP)	Of which:		IRGD (geometric annual average) (%)
		Due to primary and stock-flow residual (% GDP)	Due to IRGD (snowball effect) (% GDP)	
Advanced economies				
Australia	4.66	5.75	–1.09	–0.81
Austria	6.10	–2.74	8.84	1.22
Belgium	–9.97	–23.22	13.25	1.21
Canada	3.30	–12.34	15.64	1.86
Czech Republic	22.72	23.48	–0.76	–0.51
Denmark	–16.31	–24.67	8.36	1.52
Estonia	0.92	3.49	–2.57	–4.66
Finland	5.33	2.01	3.33	0.88
France	28.61	19.51	9.10	1.28
Germany	20.37	5.70	14.67	2.10
Greece	61.97	44.69	17.28	0.85
Iceland	58.17	53.75	4.41	–0.14
Ireland	68.97	61.69	7.28	0.44
Israel	–10.21	–37.89	27.67	2.75
Italy	11.63	–14.35	25.97	2.18
Japan	89.47	50.67	38.79	1.94
Korea	16.16	21.37	–5.21	–1.81
Netherlands	11.36	3.80	7.56	1.21
New Zealand	6.37	3.02	3.35	1.41
Norway	16.95	29.00	–12.05	–2.07
Portugal	59.46	43.60	15.86	2.01
Slovak Republic	–6.99	1.09	–8.08	–1.83
Slovenia	17.34	21.12	–3.79	–1.36
Spain	9.74	11.77	–2.03	–0.39
Sweden	–15.38	–15.25	–0.13	–0.03
Switzerland	–13.03	–9.14	–3.88	–0.52
United Kingdom	40.87	35.33	5.54	0.97
United States	48.10	44.41	3.68	0.52
Nonadvanced economies				
Argentina	–0.68	81.96	–82.65	–7.63
Brazil	–1.71	–0.62	–1.08	–0.13
Bulgaria	–59.83	–38.99	–20.85	–4.53
Chile	–2.00	–1.03	–0.97	–0.35

(*continued*)

Table 3.1
(*continued*)

	Change in the debt ratio (% GDP)	Of which:		IRGD (geometric annual average) (%)
		Due to primary and stock-flow residual (% GDP)	Due to IRGD (snowball effect) (% GDP)	
China	9.40	32.09	–22.69	–10.50
Colombia	–2.12	–1.88	–0.25	0.09
Egypt (2002–2011)	–13.99	41.62	–55.61	–7.15
Hungary	24.90	22.33	2.57	0.00
India	–5.73	35.58	–41.31	–4.92
Indonesia	–70.65	–22.34	–48.31	–9.03
Jordan	–30.08	30.40	–60.49	–7.01
Kenya	–4.26	21.01	–25.27	–4.59
Latvia	25.41	29.18	–3.77	–4.43
Lithuania	14.96	19.46	–4.50	–1.96
Malaysia	17.56	31.87	–14.31	–2.81
Mexico	1.26	1.69	–0.42	–0.16
Morocco	–19.33	–12.25	–7.07	–1.10
Nigeria	–66.95	–9.03	–57.92	–10.62
Pakistan	–22.82	25.05	–47.87	–6.79
Peru	–21.51	–8.05	–13.46	–3.55
Philippines	–16.87	–9.72	–7.16	–1.19
Poland	19.55	21.87	–2.32	–0.28
Romania	3.44	26.45	–23.01	–9.18
Russia	–47.90	–12.79	–35.11	–11.62
Saudi Arabia	–81.14	–55.92	–25.22	–5.40
South Africa	–4.47	0.00	–4.48	–1.14
Thailand	–14.76	5.61	–20.38	–3.86
Turkey (2001–2011)	–38.69	–28.12	–10.57	–1.30
Ukraine	–9.30	28.50	–37.80	–13.06

Source: World Economic Outlook Database

The magnitude of the snowball effect on debt dynamics is particularly large among nonadvanced economies, often dwarfing primary on-budget and off-budget operations. Among the sample of advanced economies in table 3.1,[5] the IRGD averaged about 0.4 percentage point and the snowball effect contributed on average about 7 percentage points of GDP to an average change in debt of 19 percentage points of GDP.[6] Among nonadvanced economies, the average contribution of the snowball effect to changes in the debt ratio was substantially larger than among advanced economies and of the opposite sign (i.e., debt-reducing). This contribution averaged –23 percentage points of GDP, toward an average change in the debt ratio of –14 percentage points of GDP. In other words, among nonadvanced economies, the large debt-reducing snowball effect more than offset the debt-increasing contribution of the combined net primary budgetary operations and net off-budget financial operations—which averaged 9 percentage points of GDP.

The cause of the large debt-reducing contribution from the snowball component in nonadvanced economies is the pervasive presence of negative IRGD values among these economies—as evidenced by the last column in table 3.1.[7] In contrast to the advanced economies, virtually all the nonadvanced economies in the sample had negative average IRGDs during the period—the exceptions (Colombia and Hungary) had IRGDs very close to zero.[8]

The important factual point is that the IRGD-driven snowball effect is generally negative (i.e., debt-stabilizing) and large among nonadvanced economies—exerting a powerful downward thrust on the dynamics of their debt ratios. This downward pull on debt ratios among economies with a negative IRGD has allowed them to maintain broadly stable and often strongly declining debt ratios, even in the presence of substantial primary deficits or large debt-augmenting off-budget operations. The reasons underpinning the pattern of variation of IRGDs across countries and whether they should be expected to persist form the topic of the following sections.

3.3 The IRGD and Income Levels

The evidence of widespread negative IRGDs among nonadvanced economies is an aspect of a broader stylized fact: IRGDs show a positive correlation with (relative) income per capita (figure 3.1).[9] Among advanced economies, the IRGD has averaged about 1 percentage point in recent decades (table 3.2). Blanchard et al. (1990) and ESW find values within this range for the OECD as a whole in the 1980s and for the advanced G20 economies in 1999 to 2008, respectively. The IRGD in some advanced economies, such as the United States, has been occasionally very low or even negative for long periods before the 1970s. However, Reinhart and Sbrancia (2011) provides evidence that these low IRGDs were caused by temporary episodes

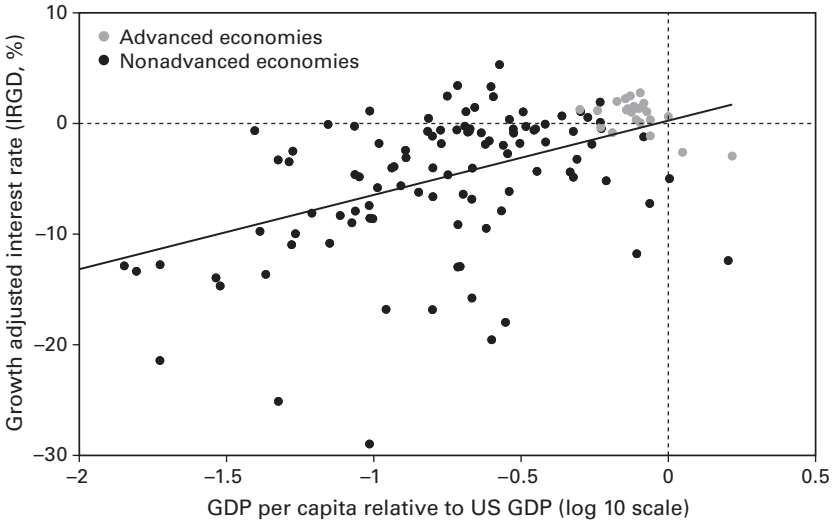

Figure 3.1
IRGD and income levels
Source: Escolano, Shabunina, and Woo (2011)

of financial repression (associated with the reduction of large public debt ratios after the Second World War and other exceptional debt surges).

In contrast, nonadvanced economies have generally low IRGDs, many of them substantially negative. The average IRGD annual observation during 1999 to 2008 was about –4 percentage points among emerging market economies, and below –7 percentage points for the whole ESW sample of nonadvanced economies. Nonadvanced, nonemerging economies, which correspond to the lower income level group, had an average IRGD of about –8.5 percentage points, and a substantial part of these observations were well below –10 percentage points. As shown in figure 3.2, these extremely low average values of the IRGD among nonadvanced economies are not driven by a few outliers.

3.4 Why Is the IRGD So Low in Nonadvanced Economies?

Economic growth theory suggests that the IRGD should be positive in economies that operate along a path of balanced growth (Blanchard and Fischer 1989)—that is, when over sufficiently long periods, the main macroeconomic aggregates (output, capital stock, consumption, wages, etc.) broadly grow at the same rate, and key ratios (growth, interest rate, savings rate, etc.) are approximately constant. This is the so-called "modified golden rule."[10] A balanced growth path is thought to de-

Table 3.2
Interest-rate–growth differential (IRGD), advanced economies (geometric average over the period, in percentage points)

	Nominal interest rate		Nominal growth	Interest-rate–growth differential[a]	
	Effective[b]	Long-term bond[c]		Effective[b]	Long-term bond[c]
Country					
Australia (1990–2011)	8.6	6.9	5.1	3.4	1.7
Austria (1991–2011)	5.3	5.2	3.9	1.4	1.2
Belgium (1991–2011)	5.9	5.4	3.8	2.0	1.5
Canada (1985–2011)	9.2	6.5	5.2	3.8	1.3
Denmark (1991–2011)	6.6	5.4	3.7	2.9	1.7
Finland (1991–2011)	6.1	5.8	3.7	2.3	2.0
France (1985–2011)	6.1	6.1	4.0	2.1	2.1
Germany (1992–2011)	5.4	4.8	3.5	2.7	2.1
Greece (1992–2011)	8.1	9.6	9.4	0.8	2.3
Ireland (1991–2011)	5.4	6.0	7.1	–1.6	–1.1
Italy (1985–2011)	8.0	7.9	5.4	2.5	2.4
Japan (1985–2011)	3.4	3.0	1.6	1.8	1.4
Luxembourg (1991–2011)	5.4	5.0	6.9	–1.4	–1.8
Netherlands (1991–2011)	6.0	5.1	4.4	1.5	0.6
Norway (1998–2011)	4.6	4.7	6.5	–1.8	–1.7
Portugal (1991–2011)	7.4	6.8	5.5	1.8	1.3
Spain (1995–2011)	5.4	5.2	5.8	–0.3	–0.5
Sweden (1995–2011)	4.8	4.9	4.4	0.3	0.5
Switzerland (1985–2011)	3.3	3.7	3.4	0.0	0.3
United Kingdom (1991–2011)	6.4	5.8	4.7	1.6	1.0
United States (1985–2011)	6.1	6.0	5.1	1.0	0.9
Average[d]	6.1	5.7	4.9	1.3	0.9

Sources: AMECO and World Economic Outlook Databases
a. IRGD, defined as $(a - b)/(1 + b)$; where a is the interest rate and b is the growth rate.
b. Interest payments in year t as a ratio to debt outstanding at the end of year $t - 1$.
c. Ten-year benchmark central government bond, when available; closest bond available otherwise.
d. Unweighted arithmetic average.

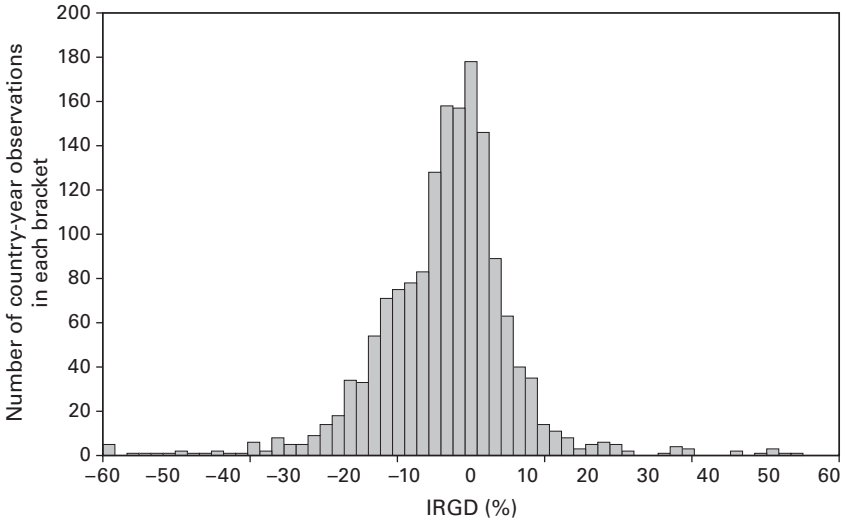

Figure 3.2
Interest-rate–growth differential: Nonadvanced economies, 1999 to 2010
Source: Escolano, Shabunina, and Woo (2011)

scribe well the main medium-term macroeconomic growth features of advanced economies—and indeed the IRGD is generally positive among advanced economies, as discussed above. Standard economic growth theory, however, is by and large silent about the values of the IRGD that should be expected in economies that are not at, or near, the balanced growth path (King and Rebelo 1993)—other than predicting that over the long term these economies will converge toward this path, and that as a consequence the IRGD will then eventually be positive.

Thus, in practice, it is often implicitly assumed by public finance analysts and practitioners that IRGDs well below those prevailing in advanced economies are a feature of the income catch-up process of emerging and low income economies. Under this benign view, high growth due to rapid accumulation of human and physical capital drives down the IRGD and erodes debt ratios, allowing these economies to sustain substantial primary fiscal deficits without adverse consequences. If very low—in many cases, strongly negative—IRGDs are an intrinsic feature of the income catch-up process, one can expect them to stay for many years to come. And by the time these IRGDs start trending up and the debt dynamics becomes a problem because the income catch-up is close to completion, the affected economies will have the capability and resources to rebalance their fiscal stance.

Unfortunately, under scrutiny, this view turns out to be strongly counterfactual. The gap in IRGD between advanced and nonadvanced economies is predominantly

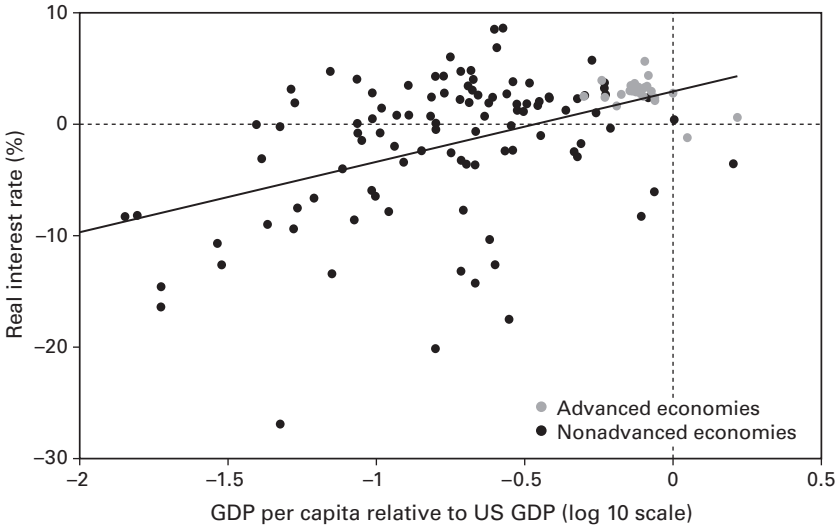

Figure 3.3
Real interest rates and income levels: Country averages, 1999 to 2008
Source: Escolano, Shabunina, and Woo (2011)

due to lower interest rates—not mainly to higher growth—in the latter economies than in the former. For example, during 1990 to 2010, the average IRGD gap between nonadvanced and G7 economies was 8 percentage points (the IRGD was –5.7 among nonadvanced economies and 2.4 in the G7). Of this gap, about two-thirds was due to lower real interest rates (by 5.3 percentage points) in nonadvanced economies, and about one-third was due to higher growth (by 2.8 percentage points). Like the IRGD, real interest rates are correlated with (relative) per capita income levels (figure 3.3) and their predominant role in explaining the IRGD gap is a widespread feature across time and regions (figure 3.4).

While higher growth in nonadvanced economies than in advanced economies is an intrinsic feature of the income catch-up process, lower real interest rates are not. On the contrary, the income per capita catch-up process can be expected to result in higher, not lower, interest rates among nonadvanced economies. It is higher marginal productivity of capital—implying higher rates of return—that drives capital accumulation and causes faster GDP per capita growth in nonadvanced economies.[11] External borrowing could, in principle, circumvent high closed-economy interest rates, lowering the average effective interest rate on sovereign (and private) debt. But the interest rate should still be higher than that of advanced economies by the liquidity, risk, and other premia. For example, the spread between emerging market sovereign debt and US treasury bills (as measured by the EMBI Global spreads) averaged 451

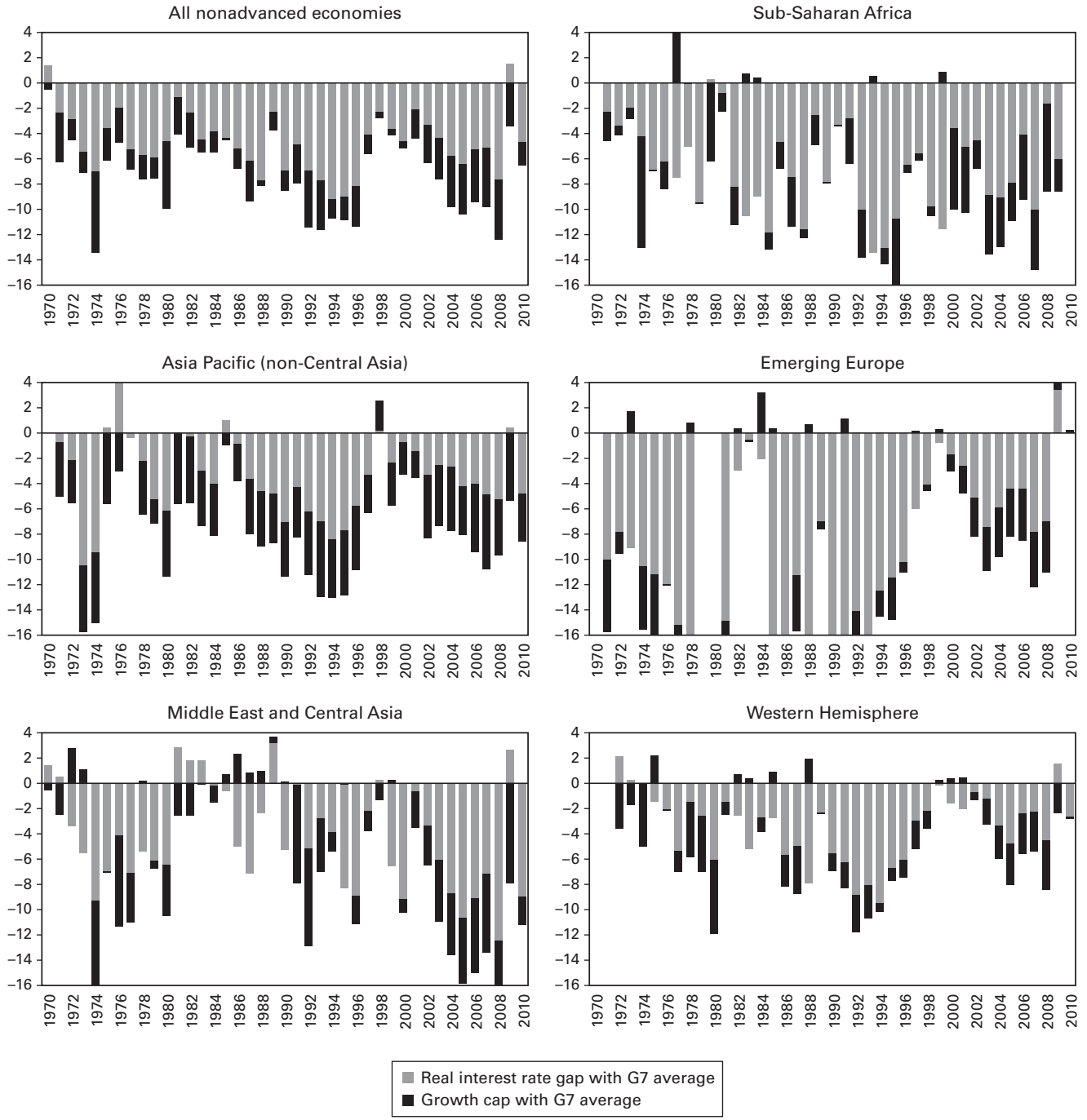

Figure 3.4
IRGD gap between nonadvanced economies and G7, with decomposition by *r* and *g*. The real interest rate is corrected by exchange rate effects. The sample size varies with time, depending on data availability. Database updated to 2010.
Source: Escolano, Shabunina, and Woo (2011)

basis points over 2000 to 2011—reflecting this market-determined overall premium. Moreover, in practice, the typical nonadvanced economy pays a lower average effective interest rate on its domestic debt than on its external borrowing (after adjusting for exchange rate gains and losses). Thus the capacity of some sovereigns to tap international capital markets does not explain the lower interest rates paid by nonadvanced economies.

While the evidence militates against the hypothesis that low IRGDs are rooted in the income catch-up process, it points instead to severe distortions and financial repression. The relevant financial market distortions include captive savings markets, high barriers to cross-border financial flows (particularly of retail savings operations), government-directed lending and administrative allocation of savings (often directly through public ownership of major financial institutions and pension funds), interest rate controls, and bans or severe restrictions on hedging means (e.g., inflation-indexed or foreign currency-denominated financial instruments). As documented in Reinhart and Sbrancia (2011), financial repression, particularly when combined with persistent (although not necessarily very high) inflation, has proved to be an effective means of reducing IRGDs and of eroding public debt ratios—via real interest rates well below their notional competitive market equilibrium and often negative for long periods of time.

Stylized facts as well as formal econometric testing suggest that financial repression is at the basis of the abnormally low real interest rates in nonadvanced economies. Sustained low real interest rates are associated with indicators of financial repression (figure 3.5) and with steady but persistent inflation (figure 3.6). Financial liberalization reforms in the 1980s and 1990s spurred growth in some emerging economies, but they also ended the previous period of negative real interest rates (figures 3.7 and 3.8), as these rates rose pari passu with indicators of financial development.

ESW formally explores this hypothesis through a panel regression model. Their model seeks to determine the significance and size of the influence that financial repression exerts on real interest rates. After controlling for standard determinants of interest rates,[12] they find that a variety of financial repression indicators are statistically significant and of a size that can explain the large deviations of real interest rates with respect to their notional market-determined levels in many nonadvanced economies. Among the most significant indicators are commercial bank assets as a ratio to commercial and central bank assets, private credit, financial liberalization index, external capital account openness, and inflation. Given that financial repression can take a variety of forms, they also extract the two first principal components (explaining 70 percent of the variance) from their set of indicators. The first principal component turns out to capture the presence of financial distortions, while the second principal component closely reflects the presence of inflation. All these

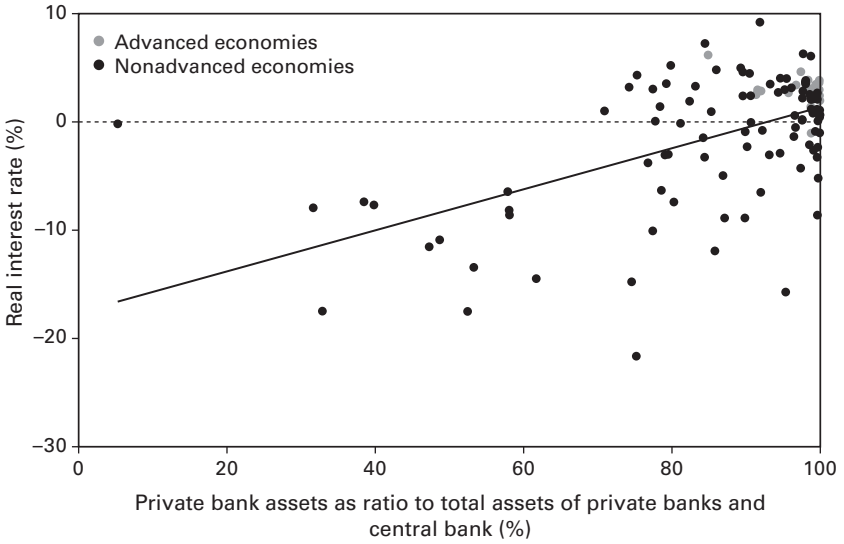

Figure 3.5
Financial repression and real interest rates
Source: Escolano, Shabunina, and Woo (2011)

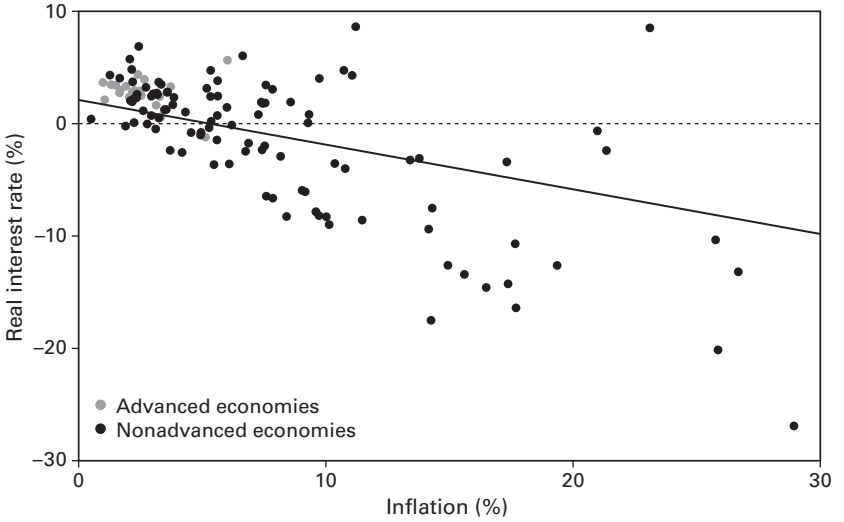

Figure 3.6
Inflation and real interest rates
Source: Escolano, Shabunina, and Woo (2011)

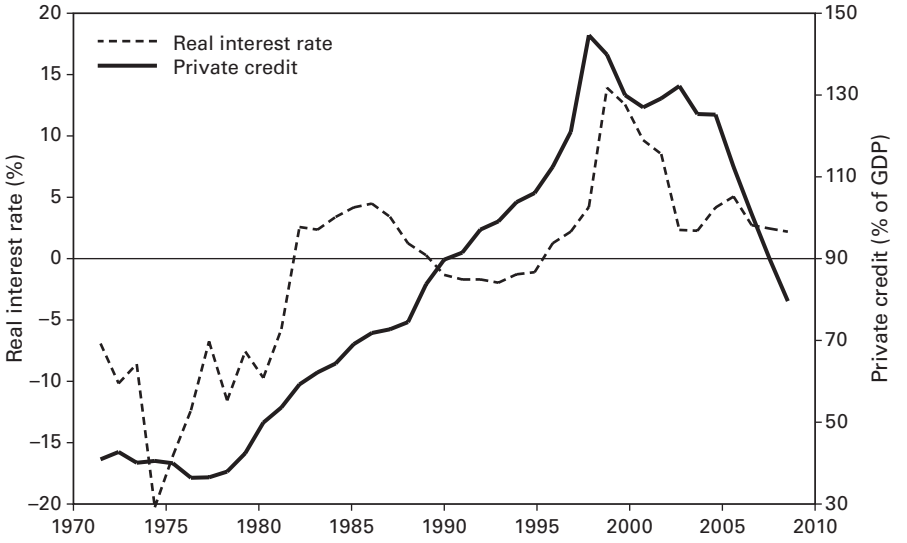

Figure 3.7
Korea: Real interest rates and private credit
Source: Escolano, Shabunina, and Woo (2011)

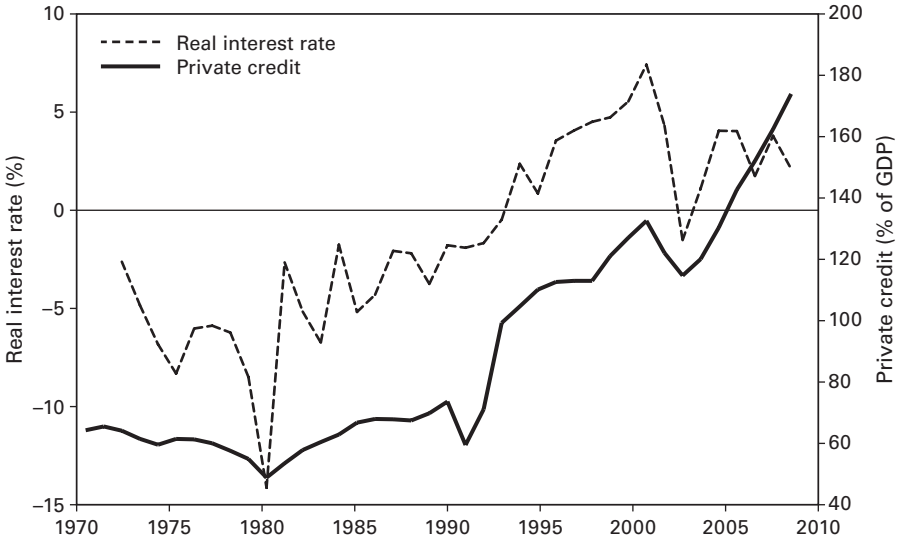

Figure 3.8
South Africa: Real interest rates and private credit
Source: Escolano, Shabunina, and Woo (2011)

indicators are found to be statistically significant and of a size that makes them economically meaningful.

3.5 Conclusions

Persistent negative values of the IRGD, often well below –10 percentage points, are a pervasive feature of the public debt dynamics of many nonadvanced economies. These negative IRGDs exert a sizable downward pressure on government debt ratios, allowing stable or even declining debt ratios in the presence of sustained primary fiscal deficits. But these negative IRGDs are unlikely to be a serendipitous side effect of the income catch-up process of these economies. The evidence strongly suggests that they are, by and large, the result of equally pervasive distortions and repression of financial activity, which keep average effective real interest rates paid on public debt well below their market-determined equilibrium levels. In association with persistent inflation, real interest rates are negative for extended periods in many cases.

In these conditions the favorable fiscal policy environment is likely to dissipate well before these countries complete their income catch-up process—perhaps in a few years—as a consequence of financial development and increasing financial globalization. During the 2000s, emerging Europe and some leading performers in Latin American and Asia have already experienced a significant erosion of the financial barriers that kept IRGDs and real interest rates artificially low in the past. Countries that envisage an increasing integration into the world economy will need to consider their medium-term fiscal stance in light of a likely increase of the IRGD toward market equilibrium levels.

Even if a country were able to keep pervasive restrictions on its domestic financial intermediation system, this would probably not be a desirable policy. Exploring the channels through which financial development is an intrinsic component of income growth is beyond the scope of this chapter.[13] However, most of the literature (as well as practitioners' experience) suggests that efficient mobilization and allocation of domestic savings becomes at some point incompatible with channeling a large part of these savings toward public debt yielding severely distorted returns. At that point many countries may in fact risk that farsighted growth-enhancing policies be discarded in favor of the short-term expedience of maintaining the financial distortions to ensure the financing of public debt at an artificially low cost.

Notes

1. More precisely, the IRGD is the difference between the interest rate and the GDP growth rate (adjusted if necessary for valuation gains or losses on foreign-currency or indexed debt),

divided by one plus the GDP growth rate. For a detailed discussion, see chapter 2 on debt dynamics in this book.

2. Output growth can also reduce the debt ratio indirectly by increasing the primary budget balance: higher growth typically raises tax revenue (as a percentage of GDP), and it can reduce expenditure by lowering the cost of safety net programs (e.g., unemployment). This endogenous impact of growth on the budget can be altered by discretionary policies. The discussion here takes the primary balances as given, and it does not deal with these indirect effects of growth. For a discussion of the determinants of the primary balance, see chapter 4 in this book.

3. This stock-flow residual may arise because accounting adjustments or because debt-changing financial operations. The latter could be sales of financial assets used to reduce debt, or acquisition of financial assets, such as financial sector support operations, financed by debt issuance. Unfortunately, the stock-flow residual also arises because debt-financed fiscal operations are often transferred off-budget in an attempt to reduce the reported headline budget deficit or to avoid budget disclosure of the details of these operations (see Irwin 2012; Weber 2012).

4. The (nominal) average effective interest rate is typically calculated as budgetary interest paid in year t divided by the stock of debt at the end of year $t - 1$. ESW also corrects the effective interest rate for exchange rate related valuation changes in the debt stock (see chapter 2 on debt dynamics in this book)—as I do whenever possible throughout this chapter. This is appropriate from an economic perspective, since these valuation changes are part of the cost of servicing the foreign currency-denominated debt. However, under standard fiscal accounting, these valuation changes are reflected in the value of the debt stock, but (unlike those arising on inflation-indexed debt) they are not part of the budgetary interest bill. Instead, they are implicitly part of the stock-flow residual. If the effective interest rate is adjusted to include valuation changes, these valuation changes should be subtracted, for consistency, from the stock-flow residual term.

5. Unless otherwise noted, the classification of economies as advanced, emerging, and so forth, follows the statistical appendix of the IMF *Fiscal Monitor* (http://www.imf.org/external/ns/cs.aspx?id=262). However, when the database of ESW is quoted, some countries that are currently classified advanced economies are counted as emerging economies if they were classified as such during most of the sample period (1999–2008). This reclassification includes Korea and new EMU members.

6. All cross-country averages are simple averages.

7. A large snowball effect could also be, in principle, the result of a large debt stock, even with an IRGD of small absolute value. However, the average initial debt ratio was similar for advanced and nonadvanced economies, at about 56 percent of GDP.

8. Many of the advanced economies with negative IRGDs are Central and Eastern European economies that were not classified as advanced for a significant part of the sample period.

9. Whenever it is not otherwise stated, the data used here are from the database of Escolano, Shabunina, and Woo (2011). This database is an unbalanced annual panel of 128 advanced and nonadvanced economies covering 1999 to 2008, after eliminating those with concessional debt exceeding 50 percent of their external public or publicly guaranteed debt (about

one-third of the original sample). For nonadvanced economies, the interest rate is adjusted for currency depreciation effects on foreign currency-denominated debt. The database has been updated through 2010.

10. The modified golden rule follows from the basic features of a competitive equilibrium. If the IRGD were negative, the return on investment (the interest rate) would be lower than the rate of increase of the capital stock (which equals the GDP growth rate along the balanced growth path). Thus each and every year, economic agents would be investing more than what they obtain from their investments. However, no individual economic agent would choose such an intertemporal investment–consumption pattern, since investment would reduce her consumption now without increasing it at any time in the future.

11. King and Rebelo (1993) find that in standard growth models that are realistically parameterized, the transition toward the balance growth path from low initial levels of capital (the income catch-up process) will result in very high real interest rates. In their simulations, both model-based real interest rates and IRGDs during the catch-up process were well in excess of their values when the transition is completed.

12. The controls include public debt ratios, fiscal deficits, output growth, population aging, domestic private saving ratios, and world interest rates. Some of these controls could have been caused or facilitated by financial repression (high debt and deficits, inefficiently high savings rates, low growth). In those cases, this would bias downward the size and significance estimates of the impact of financial repression indicators on real interest rates.

13. See Levine (1997, 2005) and Khan and Senhadji (2000).

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