CHAPTER II

GLOBAL IMBALANCES: A SAVING AND INVESTMENT PERSPECTIVE

Global saving and investment rates have fallen and current account imbalances have widened to unprecedented levels, yet real long-term interest rates remain low in most countries. How did the global economy arrive at this position? Some have argued that the catalyst is the substantial changes that have taken place in Asia, where saving has risen but investment has collapsed since the late 1990s. According to this view, the swing in the saving-investment gap—from deficit to large surplus—in emerging Asia has resulted in an excess global supply of saving (a global saving "glut") that has been channeled to the United States to finance its large current account imbalance (Bernanke, 2005). At the same time, this would explain the low level of long-term real interest rates, which is needed to equilibrate desired saving and planned investment on a global basis. Others have argued that the sharp drop in national saving in the United States—reflecting the deterioration in the fiscal position and the increase in housing wealth—and the recent rebound in investment are at the root of current account imbalances (see, for example, Roubini and Setser, 2005). Thus, according to these observers, current global imbalances are mainly the result of policy decisions—both fiscal and monetary—in the United States. By itself, however, this would not explain the low level of real interest rates, as a higher demand for net saving from the United States would lead (everything else equal) to higher, not lower, global interest rates.

This chapter examines the main factors that have driven the recent evolution of saving and investment across the globe, to shed light on both existing global imbalances and low real interest rates. The analysis covers 46 countries (21 industrial and 25 emerging market economies; 5 of which are oil producing) that account for over 90 percent of world GDP.[1] Specifically, the chapter addresses the following questions.

- What factors account for recent movements in saving and investment in industrial, emerging market, and oil-producing countries? Are these changes due to country-specific developments, or do they reflect broader global and regional trends?
- Looking forward, what policies can help change existing saving-investment gaps, and lead to a reduction in global imbalances?

An important theme running through the chapter is that the current constellation of current account imbalances and low real interest rates is the result of important changes in saving and investment patterns across the world. In particular, the chapter finds that unusually low investment rates across the globe are a contributing factor to low real long-term interest rates. In addition, the chapter also finds that the current pattern of external imbalances largely reflects a series of diverse and unrelated regional developments. As a result, the unwinding of these imbalances will require economic responses across a large number of countries.

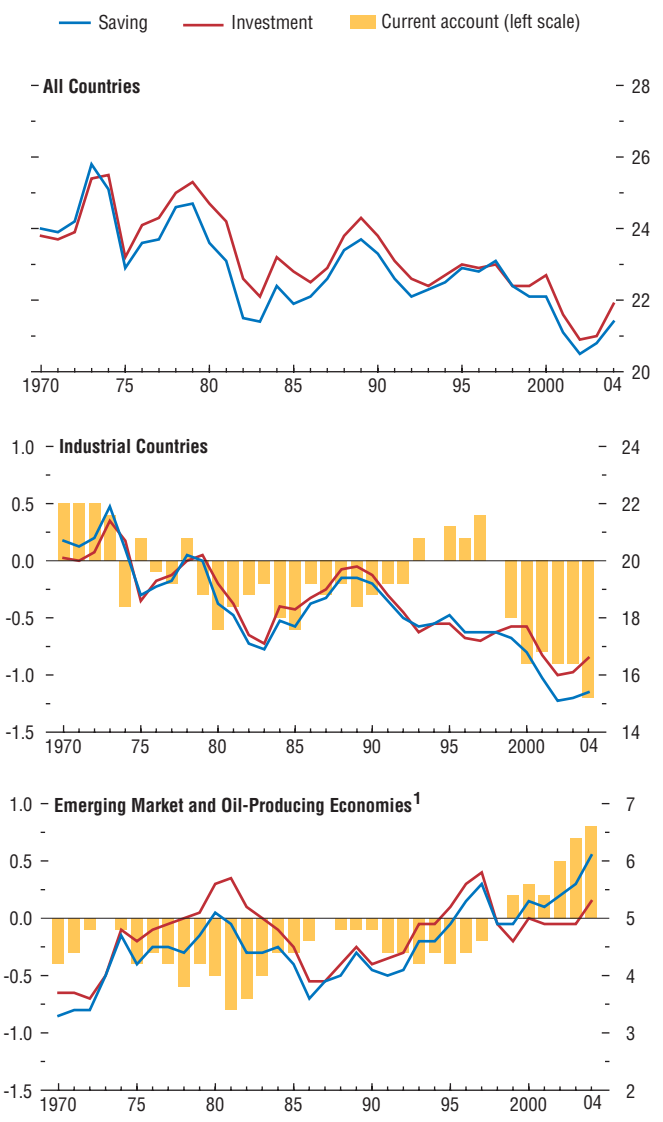
The main authors of this chapter are Marco Terrones and Roberto Cardarelli, with support from Enrique Mendoza and Chris Otrok. Stephanie Denis provided research assistance.

[1]An important preliminary consideration is that any analysis of saving and investment is affected by concerns about the quality of the data (Schmidt-Hebbel and Servén, 1999). Saving, for instance, is usually calculated as the difference between income and consumption. Reflecting this, the measures of saving normally do not adjust for changes in net worth due to asset price movements, including house prices. Similarly, there is growing consensus that the measures of investment should include expenditure on research and development and education, as well as households' spending on durable goods.

Figure 2.1. Global Saving, Investment, and Current Accounts

(Percent of world GDP)

Global saving and investment have been trending downward since the early 1970s. They reached historic lows in 2002, and have recovered modestly since then.



Sources: OECD Analytical Database; World Bank, *World Development Indicators;* and IMF staff calculations.

[1]Includes Norway.

Global Saving and Investment: The Current State of Play

The world economy is experiencing changes in both saving and investment behavior that are having implications for the configuration of current account imbalances and the level of real interest rates. Global saving and investment (as a percent of GDP) fell sharply in the decade following the first oil price shock in the early 1970s, but were then relatively stable until the late 1990s.[2] More recently, however, they again declined, hitting historic lows in 2002 before modestly recovering over the past two years (Figure 2.1). These global trends mainly reflect developments in the industrial countries, where both saving and investment have been trending downward since the 1970s. In contrast, saving in the emerging market and oil-producing economies has risen over this period, while investment, after increasing substantially up to the time of the Asian financial crisis, has since fallen and remains below the levels of the mid-1990s. As a result of these trends, the industrial country share of global saving and investment has dropped from about 85 percent in 1970 to 70 percent at present.

Focusing in more detail on developments since 1997—the period when substantial global current account imbalances have emerged—about two-thirds of the fall in saving rates in the industrial countries has been due to a reduction in private saving, with falling household saving only partly offset by higher corporate saving.[3]

[2]In this chapter, saving and investment ratios are calculated as U.S. dollar saving and investment divided by U.S. dollar GDP at current exchange rates. Global saving and investment should in principle be equal because of the requirement that current account balances sum to zero across the globe. In practice, however, this is not the case because of statistical problems that give rise to the so-called global current account discrepancy. In addition, in this study, the sample does not cover the whole world.

[3]A full offset between corporate and household saving could be expected as households are the ultimate owners of corporations. However, the extent to which households "pierce the corporate veil" has not been fully assessed. Poterba (1987) finds that changes in corporate saving are only partly offset (between 25 to 50 percent) by changes in household saving in the United States.

Indeed, corporate saving has now overtaken household saving as the main source of private sector saving in industrial countries.[4] In contrast, after dipping in the immediate aftermath of the Asian financial crisis, the saving rate in emerging market and oil-producing economies has resumed its secular increase, reaching a record-high level in 2004. A substantial part of this increase reflects higher public saving.

These aggregate developments, however, mask considerable variation between the countries and regions. The recent deterioration in saving rates in industrial countries has been particularly marked in the United States, Japan, and, to a lesser extent, the euro area countries (Figure 2.2). In Japan and the euro area, this has continued the decline in saving that began in the early 1990s, driven by a large drop in public saving in the former and lower private (household) saving in the latter (Figure 2.3). In the United States, saving has declined sharply since the late 1990s—accelerating the secular downward trend—driven initially by a drop in private saving and since 2000 by the swing in the budget from surplus to substantial deficit. Furthermore, in both Japan and the United States, corporate saving has risen substantially, offsetting lower household saving. In the other industrial countries, saving has been flat in recent years, after rebounding from the drop in the early 1990s.

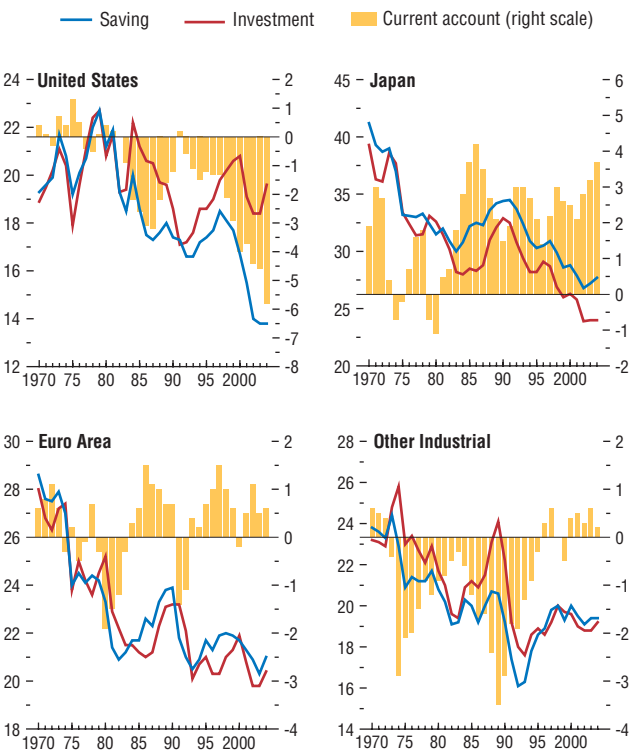
Saving rates in emerging market and oil-producing countries have caught up with and largely overtaken those of industrial countries (when measured against their own GDP; see Figure 2.4). Particularly remarkable has been the very sharp increase in saving in China, especially since 2000 (see Box 2.1). Elsewhere in Asia, saving rates remain high, although they have declined since the early 1990s. In other emerging market countries, saving has risen

[4]This trend has become more accentuated since 2000 as corporations in several industrial countries have sought to strengthen their balance sheets. In contrast with the past, however, the financial sector has contributed substantially to the recent increase in corporate saving (JPMorgan Chase & Co., 2005).

Figure 2.2. Saving and Investment in the Industrial Countries

(Percent of each subregion's GDP)

The recent sharp drop in saving in the United States and the decline in investment in Japan and the euro area countries have contributed to recent global current account imbalances.

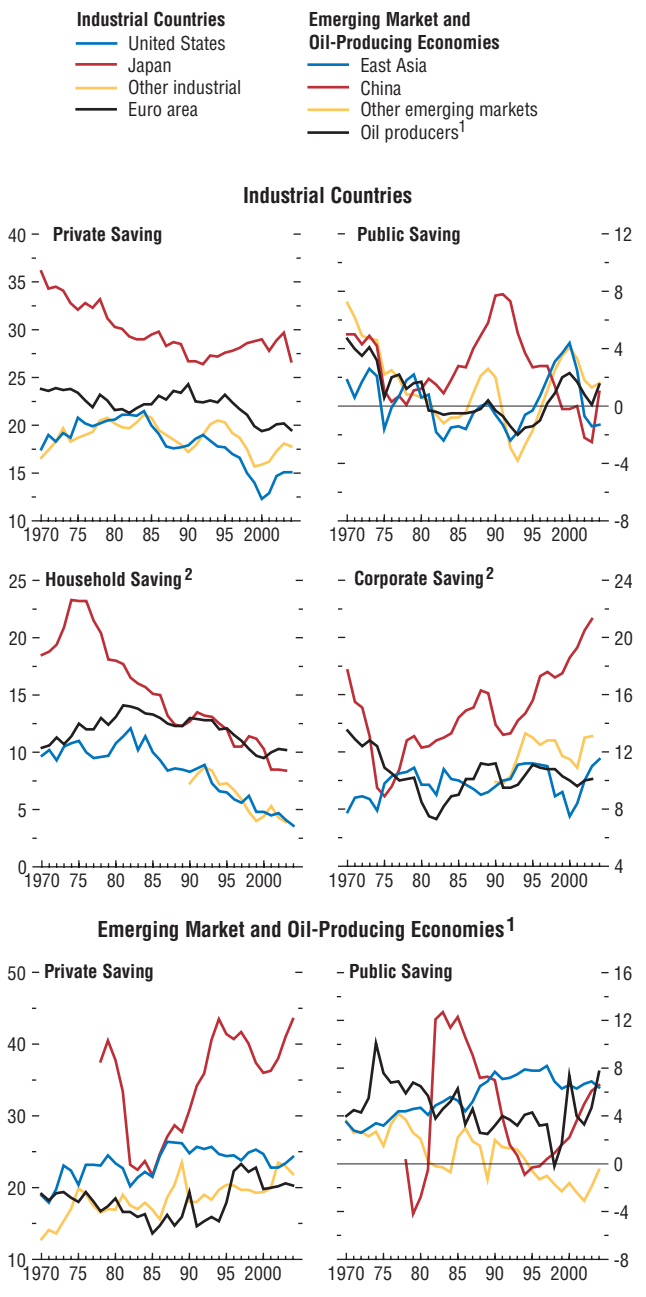


Sources: OECD Analytical Database; World Bank, *World Development Indicators;* and IMF staff calculations.

Figure 2.3. Saving Trends Across Regions

(Percent of each subregion's GDP)

Despite the increase in corporate saving, private saving in most industrial country regions has fallen over the past decade. Public saving in most industrial country regions has declined recently, but it has risen in China and oil-producing countries.



Sources: OECD Analytical Database; World Bank, *World Development Indicators;* and IMF staff calculations.

[1]Includes Norway.

[2]Data unavailable in 2004 for all regions except the United States.

sharply in recent years, driven by higher public saving in Latin America. Lastly, saving in oil-producing countries has also increased considerably, owing to the impact of higher oil prices on public saving.

Investment rates have fallen across virtually all industrial country regions, although this has been most noticeable in Japan and the euro area countries, where they reached historic lows in 2002 (see Figure 2.2). Given that investment in these regions started out higher than elsewhere, this has underpinned a convergence of investment rates across industrial country regions to about 20 percent of GDP in 2004 (although not a convergence in growth rates). Investment rates in the United States are broadly unchanged from their levels in 1997, although they remain below the peak in 2000. Of course, the decline in the nominal investment ratios over time partly reflects the fact that capital goods have become relatively less expensive—mainly owing to the extensive process of information technology (IT) capital deepening and productivity growth in the capital good–producing sectors.[5] In volume terms, the fall in average investment rates in industrial countries has been more modest.

Investment rates differ substantially across emerging market economies (see Figure 2.4). Investment in China has surged since 2000, and stood at 45 percent of GDP in 2004. With the exception of China and a handful of other countries, however, investment rates have fallen in emerging market economies since the Asian financial crisis. Indeed, investment rates in east Asia have declined by more than 10 percentage points of GDP since their peak in the mid-1990s and have not rebounded

[5]The shift toward IT capital has also increased the average depreciation rate, an effect that works in the direction of increasing the amount of gross capital formation consistent with a constant, desired, level of net investment. Indeed, several authors, including Tevlin and Whelan (2003), attribute the U.S. investment boom in the late 1990s mainly to the rise in capital depreciation.

Table 2.1. Average Correlations of Saving and Investment Ratios

	1970–2004	1970–96	1997–2004
	Saving		
Across all regions	0.15	0.18	0.22
Between industrial regions	0.58	0.68	0.48
Between emerging market regions	0.03	0.04	0.27
Between industrial and emerging market regions	–0.16	–0.19	–0.08
	Investment		
Across all regions	0.27	0.22	0.36
Between industrial regions	0.68	0.69	0.53
Between emerging market regions	0.12	0.11	0.30
Between industrial and emerging market regions	. . .	–0.14	0.24

Source: IMF staff estimates.

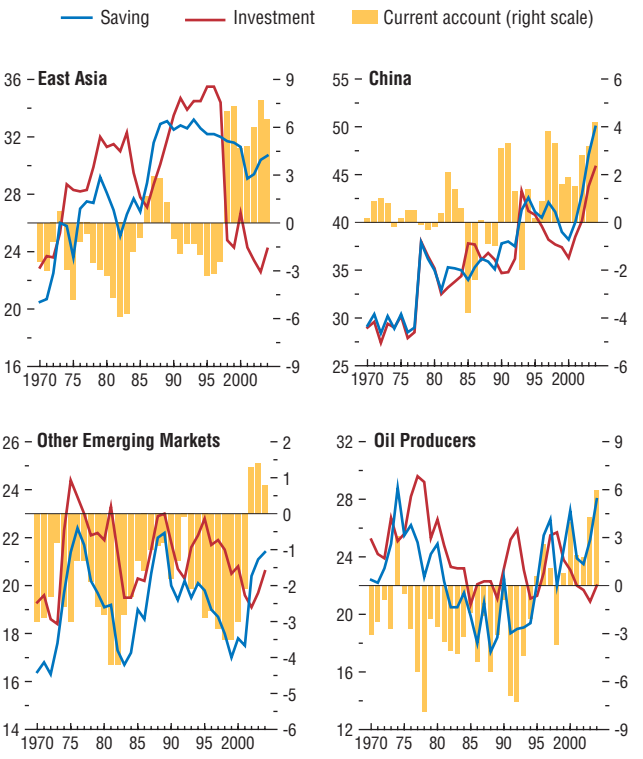
despite a sharp increase in public investment. Investment in oil-producing countries has also remained low despite the recent strength of oil prices.

As is evident from Figures 2.2–2.4, saving and investment in the large industrial countries have followed broadly similar trends in recent years. There appears to be much more divergence in behavior, however, among emerging market countries. The correlations reported in Table 2.1 confirm this. Saving and investment ratios are strongly correlated in industrial country regions, although this correlation has declined in recent years, while there is a lower—but rising—correlation across emerging market countries. There is little correlation between saving in industrial and emerging market countries, although the degree of co-movement of investment rates across all regions has increased over the past seven years, possibly reflecting the global nature of the IT-related productivity shock. The correlation between saving and investment rates within each region has been significantly positive on average over the period considered, although the strength of this association, originally documented by Feldstein and Horioka (1980), has fallen over time (from an average of 0.6 in 1970–96 to 0.4 during 1997–2004).

Figure 2.4. Saving and Investment in the Emerging Market and Oil-Producing Economies

(Percent of each subregion's GDP)

The sharp drop in investment in east Asia and increase in saving in the oil-producing countries are two other important developments behind the recent global current account imbalances.



Sources: OECD Analytical Database; World Bank, *World Development Indicators;* and IMF staff calculations.

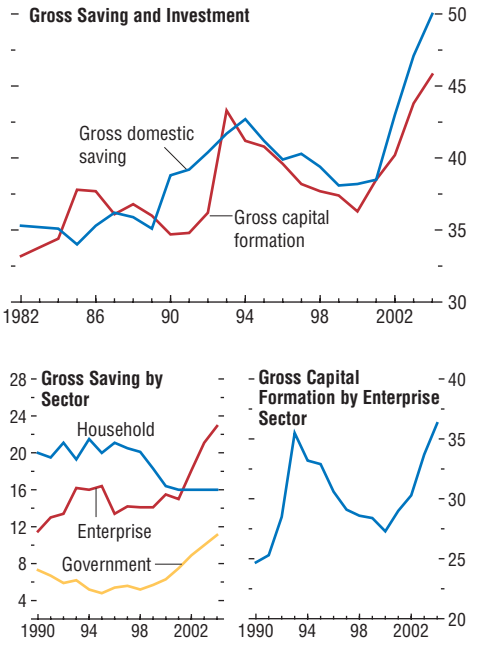
Box 2.1. Saving and Investment in China

After averaging some 40 percent of GDP during the 1990s, China's gross domestic saving rate has increased sharply to close to 50 percent of GDP over the past five years (see the figure). This has been accompanied by a smaller—but still substantial—rise in gross capital formation to about 45 percent of GDP, along with a widening external current account surplus. The present levels of saving and investment are very high, both in terms of China's own historical experience, and by comparison with experience in other advanced or developing countries.[1]

Analysis of both saving and investment in China is hampered by a variety of data limitations, and the sectoral breakdown presented in the figure should be taken only as being broadly indicative of underlying trends. With that caveat, several interesting points stand out.

- Corporate saving has risen sharply since 2000. Profitability has increased substantially in both the state-owned enterprise and—even more—the non-state-owned enterprise sectors, driven by a combination of strong economic growth; low interest rates; falling unit labor costs; reductions in employee benefits (see below); and—in resource sectors—rising commodity prices. More generally, the high level of corporate saving may also partly reflect the still-underdeveloped financial sector in China—including domestic bond and equity markets—as well as the limited access of non-state-owned enterprises to financial markets (forcing them to finance investment primarily through retained earnings).
- In contrast to recent experiences in many other countries—see the main text—the rise in corporate saving has been accompanied by a surge in investment, in both state- and non-state-owned firms.[2] Sectorally, this has been concentrated in infrastructure; in manufacturing, especially aluminum, steel, autos, and cement; and in real estate. While China has clear infrastructural needs, particularly in the underdeveloped western and central provinces, and demand growth in many of these sectors has been strong, this has raised concerns about potential overcapacity, and—if

China's Saving and Investment by Sector
(Percent of GDP)



Sources: Modigliani and Cao (2004); and IMF staff calculations.

Note: The main authors of this box are Marcos Chamon and Akito Matsumoto.

[1]Such comparisons need to be treated with caution given the possibility that GDP is underestimated in China (Barnett and Brooks, 2005).

[2]Including majority state-owned shareholding firms, state-controlled firms still accounted for almost 60 percent of urban fixed asset investment in 2004 (Barnett and Brooks, 2005).

investment is not efficient—a potential further buildup of nonperforming loans. Such concerns are underlined by recent research. Manufacturing investment in China is strongly correlated with corporate liquidity, suggesting that expansion considerations, not profitability, may be driving investment (Barnett and Brooks, 2005). Moreover, state-owned enterprise profits do not seem to be a factor in determining lending by state-owned banks (Podpiera, 2005), and interprovincial bank flows appear to favor provinces with a high share of state-owned enterprises in their output at the expense of high-growth provinces (Boyreau-Debray and Wei, 2005), although less than was previously the case (Aitken, 2005).

- Household saving has remained broadly constant in recent years—following some decline in the late 1990s—but, at close to 25 percent of disposable income, remains very high (despite low real interest rates on bank deposits, the dominant vehicle for household savings). This high level of household saving appears in part to reflect demographic developments, including the gradual aging of the population. Losses or uncertainty in the future provision of housing, health, education, and pension benefits—which were traditionally provided by state-owned enterprises—may also result in high levels of precautionary saving. Households' limited access to credit for the purchase of durable goods and housing likely further contributes to their saving motives.[3]
- Government saving has also increased markedly, driven by higher revenues. This increase has been used partly to strengthen the fiscal position, but mainly to finance a substantial increase in investment, particularly by local governments.

Looking forward, with the investment share very high, a key medium-term challenge is to increase the efficiency of investment, accompanied by a welfare-enhancing shift in the composition of domestic demand from investment toward consumption. To some extent, this will occur naturally. For example, strong corporate profits will—with some lag—feed through into wages; slowing growth in commodity prices will gradually lower profit rates in the resource sector; and—over the longer term—population aging will gradually reduce the household saving rate. But economic policies also have an important role to play.

- First, on the macroeconomic side, recent administrative measures to slow investment need to be accompanied by a tightening of monetary policy—both by reducing excess liquidity and by further raising lending rates—which would be facilitated by the scope for greater exchange rate flexibility afforded by recent reforms.
- Second, continued efforts to improve governance of state-owned enterprises and make their behavior more market oriented (and accountable to their owners) will be key. One immediate step could be to require profitable state-owned enterprises to pay dividends, which would reduce corporate incentives for excessive investment. It would also provide the government with resources to help fund existing pension and social liabilities, thereby reducing incentives for precautionary saving by households (see Box 3.5 in the September 2004 *World Economic Outlook*).
- Third, financial sector reforms—both to strengthen the banking sector and to further develop bond and equity markets—are critical to improve the intermediation of China's large pool of saving and to direct it to the most productive investments (Prasad and Rajan, 2005). This would provide alternative vehicles for saving and additional sources of financing for firms and households, and would have the added benefit of promoting banking reforms by exposing state banks to domestic competition.

[3]These effects are quantified in Chamon and Prasad (2005).

Consistent with the decline in the cross-country correlation between saving and investment, external current account imbalances (relative to domestic GDP) have, on average, increased, and the dispersion across industrial—and, to a lesser extent, emerging market—countries has widened (see Chapter III of the April 2005 *World Economic Outlook)*. In particular, external imbalances between some major economic areas—notably the United States, Asia, and oil producers—are at record levels. Interestingly, the current constellation of external imbalances is very different from that in the mid-1980s—the last period of large global imbalances. At that time, the external deficit of the United States peaked at slightly above 3 percent of GDP in 1987, and was largely matched by surpluses in a relatively small number of countries (particularly Japan and the euro area countries). In contrast, current account imbalances are now dispersed across a much wider group of countries and involve many emerging market and oil-producing economies. Between 1997 and 2004, about two-thirds of the increase in the U.S. current account deficit has been balanced by higher external surpluses in emerging market and oil-producing countries, with the rest matched by larger surpluses in industrial countries (mainly Japan).

The transformation of emerging markets from net importers to net exporters of capital in recent years is difficult to reconcile with the predictions of economic theory (Lucas, 1990), or with the historical pattern of international capital flows, particularly in the period before World War I when capital flowed from the core countries of western Europe to the new settlements. While some have argued that these developments are the result of policy decisions in emerging markets—mainly reflecting the desire to accumulate foreign exchange reserves that could be used as a buffer in the event of turbulence in financial markets (Bernanke, 2005)—they could also reflect the lack of profitable investment opportunities in emerging market economies vis-à-vis industrial countries (see Box 2.2).

What Drives Saving, Investment, and the Current Account?

What are the main factors that have been driving recent saving and investment behavior across the globe? This section uses two approaches—econometric analysis and a dynamic factor model—to investigate this issue.

Econometric Results

Building on a burgeoning literature on the determinants of saving and investment, separate dynamic panel models for saving and investment were estimated using data for 46 industrial, emerging market, and oil-producing countries (and separately for the industrial and emerging market subsamples) over 1972–2004.[6] The key results of this analysis—which are shown in Table 2.2 and described in more detail in Appendix 2.1—are described below.[7]

For saving, the estimated equations fit the data well and indicate the following.

- *Higher output growth boosts saving.* A sustained 1 percentage point increase in per capita output growth in industrial countries would over time lead to an almost 1 percent of GDP increase in the national saving rate.[8] For emerging market economies, the estimated impact is smaller, at ½ percent of GDP.

[6]See, for instance, Masson, Bayoumi, and Samiei (1995); Edwards (1995); Haque, Pesaran, and Sharma (1999); and Loayza, Schmidt-Hebbel, and Servén (2000), among others.

[7]These equations have been estimated using Generalized Method of Moments, which controls for the potential endogeneity of the explanatory variables (see, for instance, Arellano and Bond, 1991). Indeed, the Hansen tests for all reported regressions suggest that the lagged values of the variables are valid instruments.

[8]This can be calculated from Table 2.2, column 2, as the ratio of the coefficient on per capita output growth (0.28) over one minus the coefficient of lagged saving (0.7); that is, $0.28/(1 - 0.7) \approx 1$.

Table 2.2. Global Saving and Investment: Panel Regression[1]

	Saving (percent of GDP)			Investment (percent of GDP)		
	All	Industrial countries	Emerging market economies	All	Industrial countries	Emerging market economies
Lag-dependent variable						
Percent of GDP saving	**0.62**	**0.70**	**0.71**	. . .	. . .	. . .
Investment	. . .	. . .	. . .	**0.76**	**0.80**	**0.80**
Main determinants						
Real per capita GDP growth	**0.17**	**0.28**	**0.13**	**0.26**	**0.33**	**0.23**
Real interest rate[2]	0.01	*–0.07*	0.01	. . .	**–0.08**	. . .
Credit (percent of GDP)	**–3.47**	**–1.53**	*–2.51*	**–1.36**	**0.81**	**–1.64**
Change in credit (annual percent of GDP)	–2.17	–0.94	**–7.39**	**0.08**	**0.02**	**0.12**
Elderly dependency ratio	**–0.44**	**–0.43**	–0.66	–0.09	–0.04	*–0.19*
Public saving (percent of GDP)	**0.27**	**0.15**	**0.24**	. . .	. . .	. . .
Terms-of-trade growth	**0.08**	**0.06**	**0.08**	. . .	. . .	. . .

Source: IMF staff calculations.
Note: Bold-faced values are statistically significant at the 5 percent level. Values in italics are statistically significant at the 10 percent level.
[1]The estimated effects reported in the text are the long-term effects calculated as the ratio of the estimated coefficients over one minus the coefficient of the lagged-dependent variable.
[2]In the investment equation, this is the cost of capital.

- *Fiscal consolidation is associated with increased saving*, as higher public saving is only partially offset by adjustments in private saving behavior (i.e., Ricardian equivalence does not hold, consistent with the findings of other studies). A 1 percent of GDP increase in public saving in industrial countries would lead over time to a ½ percent of GDP increase in national saving.[9] In emerging markets, the impact is larger, raising national saving by 0.85 percent of GDP, reflecting in part the less developed financial markets in these countries that make it more difficult for households to smooth consumption over time.
- *Increases in private sector credit are associated with a reduction in saving*. This may reflect the fact that households face borrowing constraints that are normally relaxed by the process of deregulation and innovation in financial markets. Private credit is also likely capturing wealth effects associated with the sharp increase in asset prices, particularly house prices, which are believed to have driven the reduction in household saving in a number of industrial countries over the last decade, but especially in the United States (see Faulkner-MacDonagh and Mühleisen, 2004). The regression results suggest that a 10 percent of GDP increase in credit in industrial countries would lead over time to a reduction of ½ percent of GDP in the saving rate. The impact is again larger in emerging markets, at 0.9 percent of GDP, possibly because of the lower levels of financial intermediation and higher dependency on bank credit in these economies.
- *As populations age, this puts downward pressure on saving*. Given that people tend to dissave during their retirement years, an increase in the elderly dependency ratio—the ratio of those aged over 65 to the working age population—should reduce saving (see Box 2.3). This is confirmed by the regression results, which suggest that an increase in the elderly dependency ratio of 1 percentage point in the industrial countries would over time reduce saving by about 1½ percent of GDP. Because of the

[9]De Mello, Kongsrud, and Price (2004) find that the Ricardian offset for 21 OECD countries ranges from ⅓ to ½. Using a different approach, Gale and Orszag (2004) find a similar result for the United States.

Box 2.2. Return on Investment in Industrial and Developing Countries

In recent years, international capital has flowed from the developing world to a number of industrial countries, particularly the United States. This is hard to reconcile with standard economic theory, which holds that—given restrictions on mobility of labor—industrial countries with abundant capital should export capital to developing countries, where capital is scarce but labor plentiful, and the return on capital is expected to be higher. This puzzle was addressed specifically by Lucas (1990). This box provides some estimates of the realized return on capital in developing and industrial countries to see if they shed light on why capital is flowing the "wrong way."[1]

A first look at returns seems to deepen the puzzle. The table uses national accounts data to compare the realized return on aggregate capital over the past decade in emerging markets with that in the G-7 countries. The focus is on emerging markets as a subset of developing countries since these countries receive gross capital inflows and are thus integrated into international capital markets. The return on aggregate capital is defined as the value added paid to capital owners divided by the aggregate capital stock.[2] Across emerging markets this measure averages 13.3 percent over the past decade, compared with 7.8 percent in the G-7. If returns are higher, why would capital be flowing from emerging markets to industrial countries? Of course, higher risk may deter investors from investing in emerging markets. However, it may also be the case that true average returns to investors are much lower than what national accounts–based measures suggest. For one thing, they may reflect predominantly small and medium-sized firms that are difficult to invest in. Moreover, in emerging markets they may disproportionately reflect state-owned companies, for which claims on capital may not be traded. Finally, the quality of the underlying national accounts data may in some cases be poor.

An alternative measure of the return on capital is the internal rate of return on invested capital (calculated by Fama and French, 1999, for publicly traded, nonfinancial companies in the United States). The internal rate of return is the discount rate that sets the net present value of cash flows into and out of the corporate sector equal to zero. It captures the return to an investor who buys firms at market value, receives or covers their subsequent cash flow, and then sells them at market value.[3] Compared with simply looking at the performance of equity markets over a certain horizon, this measure is more comprehensive since it provides a return on all invested capital, including debt and equity. Compared with the return on aggregate capital, this measure has the advantage that it is based on publicly traded companies, so that domestic and foreign investors can buy and sell the shares of these companies.

To calculate the internal rate of return across countries, IMF staff used Worldscope, an international database that covers balance sheet and other information from annual reports of

Note: The main authors of this box are Robin Brooks and Kenichi Ueda.

[1]Klingen, Weder, and Zettelmeyer (2004) investigate a similar question for sovereign debt. They find that returns on sovereign debt in emerging markets barely exceed returns on U.S. treasury bonds.

[2]Profit income in the system of national accounts is the value added paid to capital owners. The capital stock for each country is estimated by cumulating fixed capital formation over time, using the perpetual inventory method with 1951 as the initial year. The initial capital stock is assumed, but recent estimates for the capital stock are robust to changes in initial stocks.

[3]The present value is calculated at the initial year, 1994. The actual cash flows are used for 1994 to 2003, and the value of future cash flows is approximated by the market capitalization in 2003. More formally, the internal rate of return is the discount rate, r, that solves the following equation for each country:

$$V_{1994} = \sum_{t=1(1994)}^{T(2003)} \frac{X_t - I_t}{(1+r)^t} + \sum_{t=1(1994)}^{T(2003)} \frac{FS_t - FB_t}{(1+r)^t} + \frac{V_{2003}}{(1+r)^T},$$

where V denotes the sum of the market value of firms; X, the sum of cash earnings; I, the sum of gross investment; FS, the sum of the market value of firms that exit from the sample; and FB, the sum of market value of firms that enter the sample.

Estimated Rates of Return on Invested Capital, 1994–2003
(Percent, unless otherwise indicated)

	Return on Capital	Coverage	Size[1]	Internal Rate of Return
Latin America[2]	12.9	56.0	37.7	–4.7
Emerging Asia[3]	14.7	79.6	97.2	–4.6
Other emerging markets[4]	11.3	70.2	42.5	–4.7
Average	*13.3*	*70.5*	*64.1*	*–4.7*
G-7, of which:	7.8	78.8	83.2	2.4
United Kingdom	7.7	79.0	149.1	2.6
United States	9.9	79.8	126.8	8.6

Source: IMF staff calculations.
[1]Percent of GDP.
[2]Argentina, Brazil, Chile, Colombia, Mexico, and Peru.
[3]China*, Hong Kong SAR, India, Indonesia*, Korea, Malaysia*, the Philippines, Singapore*, Taiwan Province of China*, and Thailand. Asterisk indicates countries where data on return of capital are not available.
[4]Czech Republic*, Hungary*, Israel, Morocco*, Pakistan*, Poland*, Russia*, and South Africa. Asterisk indicates countries for which data on return of capital are not available.

publicly traded firms. These data are subject to several caveats. As the table illustrates, coverage of publicly traded firms in emerging markets is not as good as in the G-7 countries. On average over the 1994–2003 period, Worldscope covers 71 percent of listed firms in emerging markets, according to the *S&P Global Stock Markets Factbook,* while it covers 79 percent in the G-7. In addition, the stock market is substantially smaller in relation to economic activity in emerging markets than in the G-7. On average over this period, market capitalization in percent of GDP is 64 percent in emerging markets, compared with 83 percent in the G-7. In other words, the proxy for the return on capital in emerging markets needs to be interpreted with caution, both because the stock market captures a smaller share of productive capital in these economies and because coverage is less comprehensive.

The table provides the internal rate of return for the nonfinancial corporate sector for the past decade, measured in local currency and deflated using the price index for investment goods. The internal rate of return is –4.7 percent across emerging markets over the period, while it is 2.4 percent on average in the G-7.[4] On this measure, the return on capital for publicly traded firms in the nonfinancial corporate sector was lower in emerging markets than in the G-7 during 1994–2003.

Of course, the short time horizon may bias the results against emerging markets, where returns on investment may only be realized over a longer horizon.[5] The short time horizon also carries the added risk that cyclical and crisis effects may dominate the results; indeed, returns have recovered strongly in emerging markets over the past few years. Nevertheless, the return on capital—as measured by the internal rate of return—for publicly traded firms in emerging markets has been below that in the G-7 for the 1994–2003 period. This is especially striking because the return on capital is measured in local currency. It therefore does not incorporate currency risk, which for many emerging markets is substantial. As a result, attainable rates of return for domestic and foreign investors may help explain the current direction of international capital flows. Still, further research is needed to understand why the return from investing in publicly traded firms in emerging market countries has been lower than in industrial countries, and whether this result holds over different time periods.

[4]This result is consistent with other measures of corporate performance, such as the return on assets or an alternate internal rate of return based on acquiring costs of assets calculated by Fama and French (1999).

[5]To put this in perspective, Fama and French (1999) calculate the internal rate of return in the United States for a period of 47 years.

Box 2.3. Impact of Demographic Change on Saving, Investment, and Current Account Balances

The world is in the midst of major demographic transitions in which declining fertility rates and increasing life expectancy are significantly altering the age structure of national populations. The timing and speed of demographic changes, however, are highly asymmetric across countries. Advanced economies began their transition several decades earlier than developing countries; hence the age composition of populations differs greatly between developed and developing countries (see the figure). Ongoing demographic changes will have significant albeit uncertain impacts on saving, investment, and current account balances in the years ahead (Bryant, 2004).

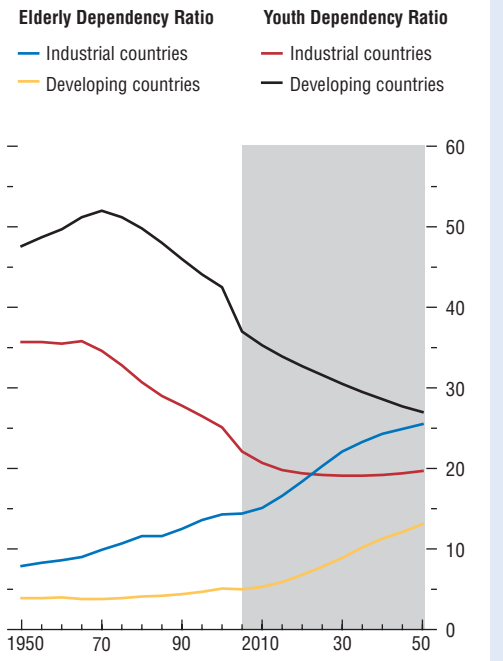
How do demographic changes affect saving, investment, and the current account?

Demographic impacts on saving stem from individuals smoothing consumption over their lifetimes while the age distribution of their income follows a hump-shaped profile. This "life-cycle" behavior entails dissaving when individuals are young, little saving early in adult life, high saving at the middle and end of the working life, and then low or negative saving after retirement. Changes in the age composition of the population therefore affect aggregate personal saving. In particular, a demographic transition initially increases household saving as it reduces the number of young dependents and increases the number of working adults, but eventually it reduces saving as a larger portion of the population retires and reaches old age.

There remain, however, some uncertainties about saving behavior in the later stages of the life cycle. Studies based on macroeconomic data generally support the predictions of life-cycle approaches (for example, an increase in the elderly dependency ratio—which shows the population aged 65 and older as a share of the working-age (age 15–64) population—reduces saving). Studies based on microeconomic data, however, have cast some doubt on the extent to which the elderly dissave (Poterba, 2004). This may be because simplified applications of the life-cycle approach do not adequately take into account the desire of the elderly to leave bequests, or their uncertainties about their lifespan after retirement and the financial support they will need. Some empirical studies based on household survey data do not adequately incorporate the public-pension portion of elderly incomes, and this is why they may appear at odds with life-cycle behavior (Miles, 1999).

With regard to investment, empirical studies generally find that investment is positively related to the share of the young in the population (Higgins, 1998). Countries with higher youth dependency rates—which show the population aged 0–14 as a share of the working-age

Population Structure, 1950–2050
(Percent of total population)



Source: United Nations, *World Population Prospects: The 2000 Revision.*

Note: The main authors of this box are Ralph C. Bryant and Marc de Fleurieu.

population—face a relatively higher demand for investment related to the development of human capital (schools) and to a growing labor force (infrastructure). As a population ages, however, the labor force grows more slowly and the level and composition of investment shift with the needs of a more elderly population (medical facilities).

The net effect on the saving-investment balance tends therefore to vary during the different stages of a demographic transition.[1] Countries with a relatively young population should experience current account deficits, as investment demand outstrips domestic saving. As children age, fertility rates decline, and life expectancy rises, the ratio of active workers to the total population increases, which in turn tends to cause saving to rise faster than investment. Hence, as economies go through the middle stages of a demographic transition, they should experience current account surpluses. Eventually, as the aging of the population continues, the net impact on the saving-investment balance becomes ambiguous, reflecting uncertainty about the relative effects of rising elderly ratios on saving and investment. Although higher elderly dependency is often associated with an excess of investment over saving, and hence a current-account deficit, this partial correlation has lower statistical reliability and may not be a robust guide to the effects of rising elderly dependency ratios on current account balances (Higgins, 1998; Bosworth and Keys, 2004).

Demographics and capital flows

According to UN projections, elderly dependency ratios in the advanced countries will nearly double by 2050. At the same time, working-age populations will rise significantly in many developing countries. How will these population trends affect capital flows in the future? For developing countries, an IMF study (see the September 2004 *World Economic Outlook*) found that demographic forces are likely to lead to improved current account positions over time as more of the population move through their higher saving years. In industrial countries, demographic trends will probably reduce current account surpluses in Japan and Europe during the course of the next 50 years. In the United States, the demographic transition is less steep and demographic forces by themselves may have smaller effects on the current account balance.

Understanding how demographic change will affect saving, investment, and net capital flows is far from complete. There are uncertainties not only about the demographic projections themselves, but also about the reactions of private saving and investment as the demographic transitions unfold. Households—in both advanced and developing countries—will probably respond according to the broad predictions of the life-cycle model; but aggregate saving, investment, and net capital flows will also be significantly influenced by other factors, including international differences in policies and business-cycle conditions.

What can the role of labor migrations be?

A remaining issue to consider is the possible role of labor mobility in the demographic adjustment process. Most macroeconomic models assume that labor does not move across countries. This omission could lead model predictions to overstate the role of capital flows in the adjustment process because movements of labor from regions with rising working-age populations to those with rising elderly dependency ratios are a possible alternative to capital flows.[2]

[1]Empirical work suggests that, on average, about half of the demographic effects on national saving are matched by changes in domestic investment, with the remainder altering the saving-investment balance (Higgins, 1998; and Helliwell, 2004).

[2]Also, the assumption of perfect capital mobility and perfect foresight ignores the presence of capital account restrictions and political risk in developing countries. As a result, model predictions of the magnitude of demographically induced capital flows to and from developing countries could be overstated.

Box 2.3 *(concluded)*

More research is needed to clarify the net benefits of migration for both recipient and sending countries. Permanent immigration tends to have a neutral effect on a recipient country's public saving—immigrants are as likely to claim pension and healthcare benefits as national citizens (Fehr, Jokisch, and Kotlikoff, 2004). The effects on private saving could be significant, though dampened by the extent to which migrants send remittances to their home country. For sending countries, permanent emigration is a net loss apart from remittances.

Government policies inhibit the flow of people across borders. In fact, immigration policies are a more significant determinant of migration than the willingness of individuals to migrate. Large movements of people across borders in the coming decades are thus unlikely—under current policies—to significantly mediate the macroeconomic effects of asymmetric demographic transitions.

different population characteristics in emerging countries, the elderly dependency ratio is not found to be a significant explanator of saving behavior in those countries.

- *Saving is positively related to improvements in the terms of trade*, which are normally expected to be transitory (the "Harberger-Metzler" effect). The results suggest that a 1 percentage point increase in terms-of-trade growth would imply an increase of ¼ percent of GDP in the saving rate.
- *Saving behavior does not appear to be affected by rate of return considerations.* While saving and real interest rates are generally expected to be positively related—with the strength of this relationship likely to depend on the size of households' net asset position (see Deaton, 1992)—the regression results did not show a statistically significant impact (at the 5 percent level). This finding is consistent with previous empirical work.

In turn, the estimated investment equation suggests the following.

- *Stronger output growth leads to higher investment rates.* This could reflect demand shocks, responses to changes in productivity, or the presence of financial market imperfections.[10] The results suggest that a sustained 1 percentage point increase in per capita output growth in the industrial countries would over time lead to a 1.6 percent of GDP increase in the investment rate. In emerging markets, the impact is smaller, at 1.1 percent of GDP.
- *Increased availability of credit is associated with higher investment,* given that firms, in part, depend on external finance. The regression results, however, suggest that the effects of an increase in credit on investment, although statistically significant, are modest.
- *An increase in the cost of capital is associated with lower investment.* Here, the cost of capital is measured as the product of the real interest rate and the relative price of capital (investment deflator over GDP deflator). In the industrial countries, a 1 percent increase in the cost of capital would, over time, lead to a 0.4 percent of GDP reduction in the investment rate.[11]

What do these equations tell us about the factors that could explain recent movements in saving and investment? At the outset, the ability of both regressions to capture recent developments varies considerably across countries, reflecting both the panel nature of the regressions and the heterogeneity in regional saving and investment behavior (as documented in the previous section). The results suggest that

[10]See Blanchard and Fischer (1989). Indeed, both past and future output growth and real interest rates are expected to influence investment (see, for example, Romer, 1996).

[11]See Pelgrin, Schich, and de Serres (2002) for a related result.

two factors are particularly important in explaining the decline in saving in industrial countries over 1997–2004 (Figure 2.5). First is the increase in credit to the private sector, which is likely approximating for wealth effects from the sharp increase in house prices in many countries (but not Japan). Second is the fall in public saving, which is particularly important in the United States—where according to the regression estimates it accounted for over one-third of the 4½ percentage point decline in national saving since 1997—and Japan. Another factor that has played an important role in Japan and the euro area—but not in industrial countries as a group—is the rise in the elderly dependency ratio.

Turning to emerging markets, the results also suggest that two factors have been key drivers of the recent increase in saving. First, there has been a sharp increase in public sector saving, particularly in China and the oil-producing countries (which has more than offset the weakening in public saving in east Asia). Second, stronger output growth has boosted saving in all emerging market regions (again, this appears particularly important in China, where it likely contributed to the sharp increase in corporate saving—see Box 2.1). In contrast, rising oil prices have had a modestly negative effect, with the boost to saving in oil-producing countries offset by the adverse effect elsewhere (particularly in parts of Asia).

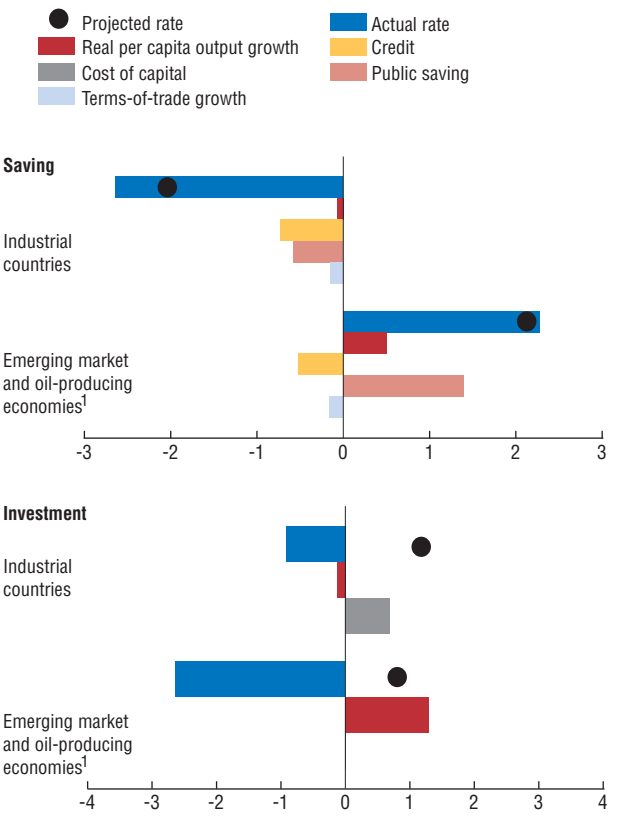
The investment equation is less successful than the saving equation in tracking recent developments. This result is similar to other recent studies, which have found that traditional econometric models of investment have difficulty explaining recent trends.[12] The equation overpredicts investment in both the industrial and emerging market regions, in some cases by

[12]According to Tevlin and Whelan (2003), there are three main reasons that account for this failure: (1) the falling price of computer equipment played a key role in the investment behavior of the 1990s; (2) capital depreciation rates rose significantly during the 1990s; and (3) depreciation is not homogenous across the diverse types of capital.

Figure 2.5. Explaining Saving and Investment Rate Movements Between 1997 and 2004

(Change in percent of GDP unless otherwise noted)

While the recent evolution of saving is largely explained by the economic fundamentals included in the regression analysis, the evolution of investment is not.



Source: IMF staff calculations.
[1]Includes Norway.

large margins. For instance, while the equation predicts that investment should have increased in industrial countries—largely as a result of the decline in the cost of capital—investment in several key industrial countries, including Japan and the Large Euro countries (see footnote 15), fell. Similarly, the equation fails to explain the drop in investment in emerging markets, particularly in the east Asian countries. The equation suggests that the investment accelerator—whereby investment rates and output growth move in the same direction—has not worked as strongly as expected in recent years in these countries, most likely because corporates have focused on reducing debt and strengthening balance sheets, rather than on investing in capital (see Box 2.4 for a discussion of investment in Asian emerging markets).[13] One conclusion of this analysis is that investment appears to be below the levels that would usually be associated with this stage of the economic cycle, and this may be an important factor in explaining both the current low level of real long-term interest rates and the shift of emerging market economies from net importers to net exporters of capital.

A Model of Saving, Investment, and the Current Account

The econometric analysis provides some important insights into what may be driving recent saving and investment behavior, but it also has drawbacks. Most important, each variable is considered separately in the analysis, rather than as part of an integrated economic system. As was highlighted in the previous subsection, saving and investment—and indeed many of their potential determinants, including output and interest rates—are highly correlated, particularly across industrial countries but also increasingly in emerging markets. This suggests that it is very important to be able to capture the interactions between variables and across countries within an integrated and consistent framework. One approach is to use a multiregion macroeconomic model—such as the IMF's Global Economic Model (GEM)—that explicitly captures such interactions (see Appendix 1.2). An alternative that is used here is to estimate a dynamic factor model to examine the extent to which "global" economic conditions have been driving saving, investment, and current account balances across regions.[14]

The dynamic factor model that was estimated considers five variables—real GDP growth, short-term real interest rates, saving rates, investment rates, and current account balances—and decomposes them into the following four estimated (unobserved) components (see Appendix 2.1 for more details on the model):[15]

- A world factor that captures the common shocks affecting all regions and all variables of the model. This will reflect major global

[13]There is also evidence that the current low corporate investment in the euro area reflects the high leverage levels of these corporations (Jaeger, 2003).

[14]Several important features of the model are worth stressing. First, while bivariate correlations capture the degree of contemporaneous co-movement of the saving and investment ratio for any pair of regions, the global factors estimated in the model capture all intertemporal (e.g., including leads and lags) cross-country correlations among the variables considered. Second, by estimating the global and country-/region-specific factors *simultaneously*, the model correctly identifies the relative importance of global and region-specific developments. Third, the global factors estimated in this model are independent of the choice of any particular weighting scheme, contrary to those obtained as cross-country averages of variables, as in Glick and Rogoff (1995) and Dees and others (2005).

[15]For this exercise, the countries in the sample were divided into 12 regions. These are the United States, Japan, Anglo-Saxon (Australia, Canada, New Zealand, and the United Kingdom), Large Euro (Italy, France, and Germany), Small Euro (Austria, Belgium, Finland, Greece, Ireland, the Netherlands, Portugal, and Spain), Other Industrial (Denmark, Sweden, and Switzerland), East Asia 1 (Indonesia, Korea, Malaysia, the Philippines, and Thailand), East Asia 2 (Hong Kong SAR, Singapore, and Taiwan Province of China), China, Latin America (Argentina, Brazil, Chile, Colombia, and Peru), Other Emerging Markets (Egypt, India, Israel, Morocco, Pakistan, South Africa, and Turkey), and Oil-Producing Countries (I.R. of Iran, Mexico, Norway, Saudi Arabia, and Venezuela). Before the model was estimated, all time series were linearly detrended to avoid the possibility of nonstationarity.

Box 2.4. Is Investment in Emerging Asia Too Low?

Investment in emerging Asia fell during the regional financial crises in the late 1990s, and has since remained at these lower levels (except in China). For Hong Kong SAR, Singapore, and Taiwan Province of China, the decline has taken investment rates to levels not seen in over three decades, while investment in Indonesia, Korea, Malaysia, and Thailand, after reaching historical peaks in the early to mid-1990s, has returned to levels comparable to those in the mid-1980s.

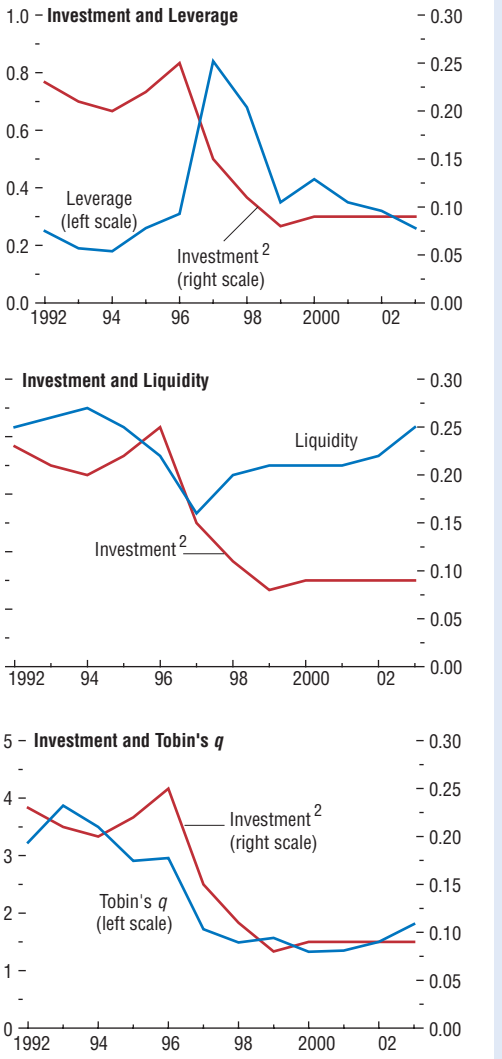
Corporate investment in emerging Asia has fallen particularly sharply—the investment to capital ratio fell by one-half between 1993–96 and 1997–2003—although an increase in public investment has offset part of this decline. The drop in corporate investment in the region reflects a sharp decline in the Tobin's *q*—as the market value of the corporations fell sharply relative to the replacement cost of capital—and the efforts of corporations to strengthen their balance sheets and streamline their operations as the financial and economic environment deteriorated. In particular, leverage and liquidity have improved significantly since 1997, as shown in the first figure, even if they have not yet reached their pre-1997 levels.[1]

These developments raise two related questions: Is investment in emerging Asia now too low? What are the prospects for a rebound in investment?

While these are clearly difficult questions to answer, one way of addressing the first is to compare the investment and capital-output ratios in each country with estimates of their long-run equilibrium (steady-state) levels. To the extent that these countries are still in a transition period (that is, their capital-output ratio is below its long-run level), investment rates should be above their long-run level. Such calculations are shown in the second figure. In making these calculations, a depreciation rate of 5 percent is used in estimating the capital stock (the average depreciation rate for

Emerging Asia: Investment, Leverage, Liquidity, and Tobin's *q*[1]

(Regional averages of country medians)



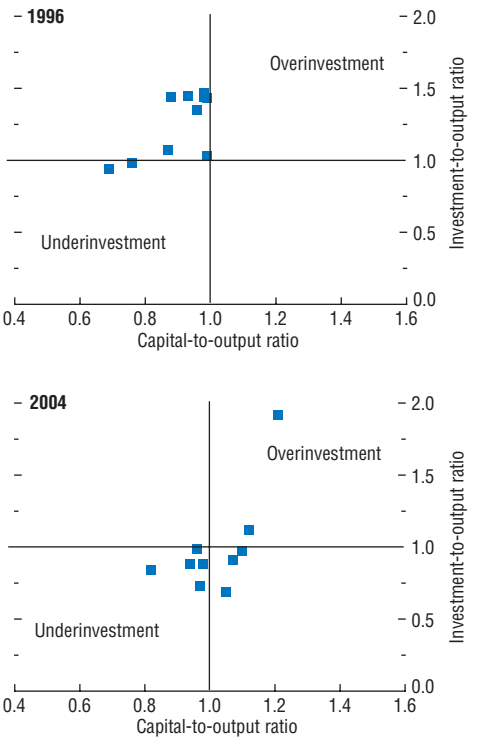
Source: IMF staff calculations.
[1]Excludes China.
[2]Investment-to-capital ratio.

Note: The main authors of this box are Roberto Cardarelli and Marco Terrones.

[1]A description of the database is provided in Appendix 2.1.

Box 2.4 *(concluded)*

Emerging Asia: Capital/Output and Investment/Output Relative to Steady-State Level



Source: IMF staff estimates.

emerging markets in 2004 was about 5 percent,[2] although in the future this may be too low an estimate given that depreciation rates have been increasing over the past decade owing to the compositional shift in the aggregate capital stock toward short-lived assets such as computers and software).[3] A further critical issue is the choice of the steady-state levels of the capital stock and investment. Here, they are estimated from a standard neoclassical growth model, using conservative estimates of capital ratios and potential output growth, although alternatives were also tried and yielded broadly similar results.[4]

In 1996—the year prior to the regional financial crisis—almost all countries were investing relatively more than in the steady state as they increased their capital stock toward its long-run level. This does not preclude the possibility that these countries could have been overinvesting during this period as they moved too quickly toward the long-run level (Sachs and Radelet, 1998). Indeed, for some countries, such as Malaysia, the investment rate in 1996 appears to be consistent with an excessive speed of convergence, as reflected in a capital ratio that in 2004 is higher than its estimated long-term level. For these countries, the fall in investment is a response to the excess capacity built over the past decade. In 2004, however, some countries were investing relatively less than in the steady state despite the fact that their capital stock was below its long-run level (and, therefore, were in the "underinvestment" quadrant). This appears to be the case, in particular, for Indonesia, the Philippines, and Thailand. On the other hand, there is some evidence of overinvestment in China.

Of course such evidence is tentative, and even if investment rates are too low in some countries at present it is difficult to know when they may rebound. On a positive note, Tobin's *q* appears to be starting to recover, which, given the close relationship with investment in the region and the improved balance sheet position of corporations, suggests that the investment outlook may be turning more positive.

[2]Based on consumption of fixed capital from the National Accounts, deflated by the investment deflator.

[3]A depreciation rate of 7 percent yielded a broadly similar outcome to that shown in the second figure (see Appendix 2.1).

[4]For example, broadly similar results were achieved when steady-state values of capital and investment ratios were set as the averages for industrial countries over an eight-year period (for example, for 2004, the average of ratios in industrial countries over 1996–2004). For a description of the methodology, see Appendix 2.1.

However, the low level of investment may also reflect structural changes in these economies, such as the shift toward less capital and more skill- and knowledge-intensive type of exports, particularly information technology–related products and services (Lee, McKibbin, and Park, 2004) and the start of a demographic transition toward an older population structure (see Box 2.3). Both factors suggest that emerging Asian countries could face a slower pace of capital accumulation in the future than they have in the past.[5]

[5]Anecdotal evidence suggests that another potential "structural" explanation for the lower investment rate in many emerging Asian countries involves the relocation of production facilities from these countries to China. Unfortunately, lack of data on bilateral foreign direct investment flows that distinguish between greenfield investment and mergers and acquisitions prevents any quantitative estimate of the phenomenon.

economic events, such as oil price increases or global technological progress.

- A factor common to each of the five variables in the model. For instance, the saving factor captures the common shocks affecting saving rates across all regions (reflecting, for example, the ongoing process of financial innovation) but not other variables.
- A region-specific factor that reflects common shocks affecting the five variables within each region. For instance, the process of European integration may affect all economic variables in the European countries, but not in other regions.
- An idiosyncratic term capturing region-specific shocks to each individual variable in each region.

The results from the dynamic factor model indicate that a high proportion of the variations in saving and investment rates in industrial countries are explained by global factors (defined as the sum of the world factor and the variable-specific factors—see Table 2.3). Indeed, much of the recent cyclical evolution in saving and investment in these countries—with the important exception of Japan—can be explained by the global factor, suggesting that industrial countries have been subject to

Table 2.3. Variance Decomposition

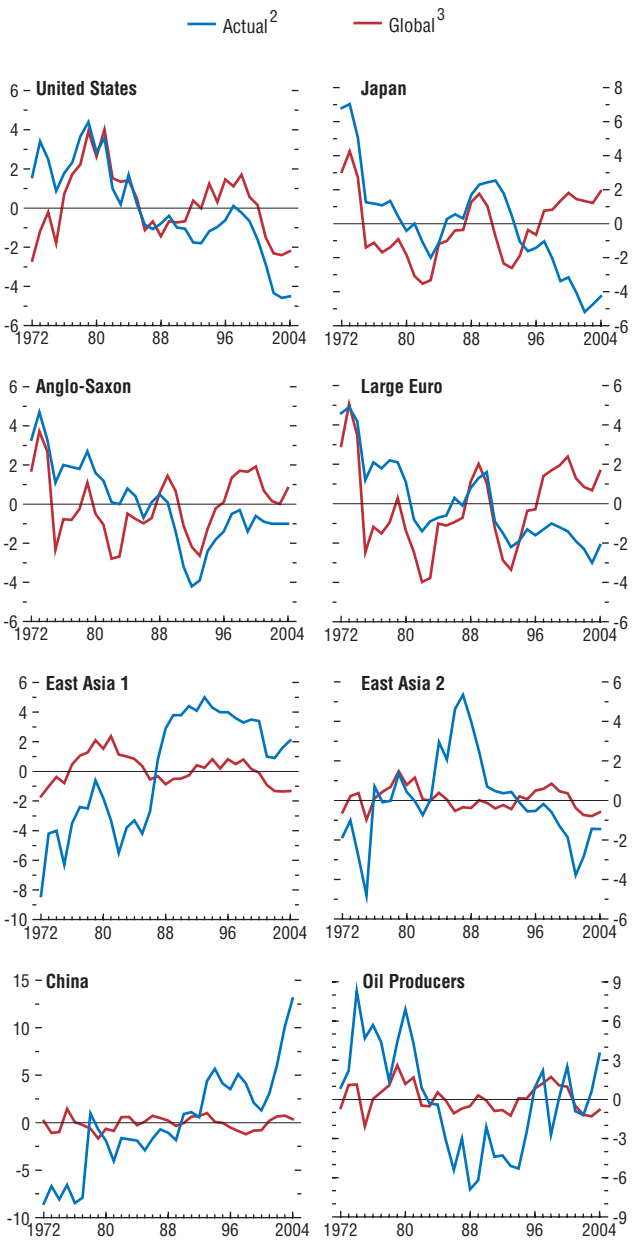
	Output (y)	Short-Term Interest Rate (r)	Current Account (CA)	Saving Rate (S)	Investment Rate (I)
Average for all countries					
Global	37	51	36	39	34
World	18	8	7	24	21
Aggregate	19	43	28	15	14
Region plus idiosyncratic	63	48	63	60	65
Average for industrial countries					
Global	57	80	32	71	59
World	27	10	7	45	35
Aggregate	30	70	25	26	23
Region plus idiosyncratic	43	20	43	28	41
Average for emerging market and oil-producing countries					
Global	17	23	39	7	10
World	8	7	8	3	6
Aggregate	9	16	32	4	4
Region plus idiosyncratic	83	77	83	92	89

Source: IMF staff calculations.

Figure 2.6. Saving: Global Factor[1]

(Percent of GDP)

The global factor plays an important role in explaining fluctuations of saving rates in industrial countries, but fails to account for the recent decline in saving in Japan and large euro area countries. Saving rates in emerging markets have been largely unexplained by the global factor.



Source: IMF staff calculations.
[1]See footnote 15 in main text for definition of country groupings.
[2]Actual time series have been rescaled by subtracting the average of the period.
[3]The global factor is the sum of the world and saving factors. For each region, the world and saving factors are multiplied by their factor loadings in the saving equation.

similar shocks in the variables affecting saving and investment (Figures 2.6 and 2.7).[16] Subsequent causality tests suggest that it is the high degree of co-movement in productivity and asset prices across industrial countries that is driving this observed co-movement of saving and investment.[17] These results are similar to those from the econometric analysis, suggesting that common developments in credit/asset prices and output growth/productivity are the most important factors driving the evolution in saving and investment across most industrial countries.

In emerging market countries, on the other hand, the global factor has been much less important in explaining movements in saving and investment. Rather, these regions have been more likely to experience region-specific saving and investment cycles, a reflection of the large differences in economic structures, institutions, and policies between the two groups of countries.[18] For example, the rapid acceleration of saving in China and oil-producing countries in recent years is described by the model as a

[16]Figures 2.6, 2.7, and 2.8 plot the global factors together with actual (not detrended) time series. However, it is worth stressing that, because the model is estimated based on detrended data, the common factors are not able to explain trend developments in the observable variables and, in particular, the trend decline of saving and investment ratios in Japan and Large Euro countries, as well as the trend increase in these ratios in China.

[17]This is done through a series of bivariate Granger causality tests. In particular, movements in the global saving factor appear to be related to changes in real house prices in the United States, while the global investment factor appears to be related to total factor productivity growth in industrial countries. These results are consistent with the existence of a strong co-movement in housing prices across industrial countries, as discussed in "The Global House Boom," in Chapter 2 of the September 2004 *World Economic Outlook*, and with other studies showing the relevance of productivity dynamics in explaining the co-movement of investment across G-7 countries (Gregory and Head, 1999; and Kose, Otrok, and Whiteman, 2004).

[18]This result is in line with that of Kose, Otrok, and Whiteman (2003), who find that output and investment dynamics are much more idiosyncratic in developing countries than in developed ones.

highly idiosyncratic event. The same is true for the sharp drop in investment in east Asia after the 1997 regional financial crisis, a finding that is consistent with the results from the panel regression.

The results from the dynamic factor model reveal a high degree of synchronization between the current account balances in industrial and emerging market economies (as would be expected given that the movements of regional saving-investment gaps are subject to the global constraint that saving should be equal to investment).[19] On average, the global current account factor explains about one-third of the variation in current account balances for both industrial and emerging market economies. This result, however, is largely driven by relatively high shares for a small group of regions (the United States, Japan, the Large Euro area, and the East Asia 2 countries).

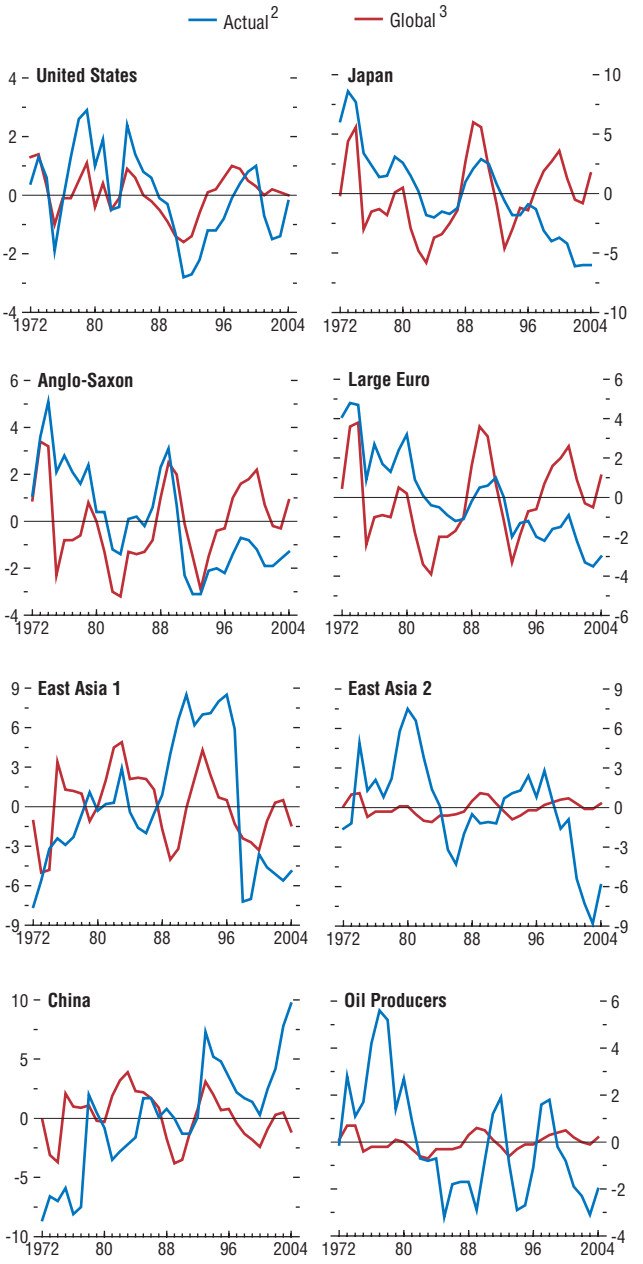
Interestingly, the global current account factor captures the global imbalances episode in the mid-1980s better than it does the current one (Figure 2.8). This is likely because—as noted in the previous section—the imbalances in the mid-1980s were largely concentrated in a relatively small number of countries (in particular, the United States, Japan, the Large Euro area, and the East Asia 2 countries). In contrast, the imbalances are now distributed across a larger number of countries, and appear to be more a result of region-specific (idiosyncratic) events rather than any single global event (although clearly the recent increase in oil prices has added to the size of the imbalances over the past two years). This clearly has important implications for how existing imbalances can be resolved, with actions needed across a broad group of countries.

[19]As the regions considered in this study account for a large share of world GDP, their current account balances cannot all move independently of each other. The dynamic factor model accommodates this constraint, as the sign of the impact of the global factors on the current account balances differs across regions (it is positive for three regions and negative for the other nine).

Figure 2.7. Investment: Global Factor[1]

(Percent of GDP)

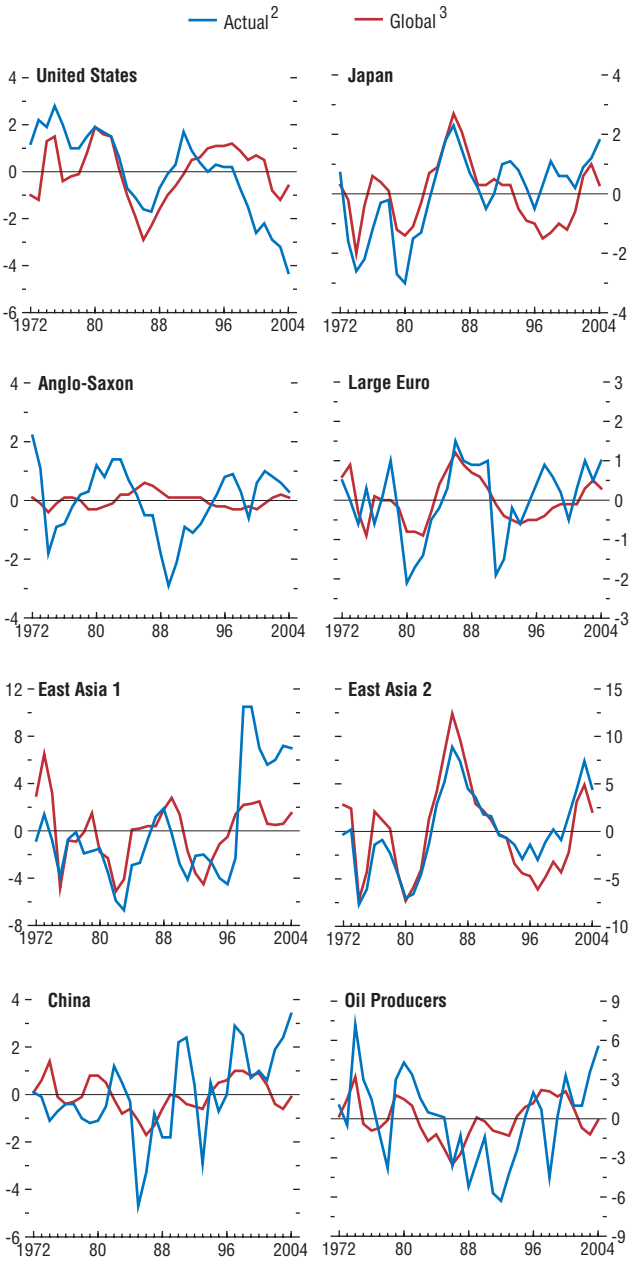
While the fluctuations of investment rates in industrial countries are relatively synchronized, in the emerging market economies they are more the result of idiosyncratic shocks.



Source: IMF staff calculations.
[1]See footnote 15 in main text for definition of country groupings.
[2]Actual time series have been rescaled by subtracting the average of the period.
[3]The global factor is the sum of the world and investment factors. For each region, the world and investment factors are multiplied by their factor loadings in the investment equation.

Figure 2.8. Current Account: Global Factor[1]
(Percent of GDP)

The global current account factor captures well the current account imbalances in the mid-1980s. More recently, it fails to account for the recent developments in the United States, East Asia 1 countries, China, and oil-producing countries.



Source: IMF staff calculations.
[1]See footnote 15 in main text for definition of country groupings.
[2]Actual time series have been rescaled by subtracting the average of the period.
[3]The global factor is the sum of the world and current account factors. For each region, the world and current account factors are multiplied by their factor loadings in the current account equation.

How Can Existing Global Current Account Imbalances Be Reduced?

The results from the previous section indicate that saving, investment, and current account balances have been affected both by factors that are common across many countries, such as rising asset prices/credit—which appear particularly important in industrial countries—and by factors that are specific to particular regions and countries.

What do these findings suggest about how existing global current account imbalances could be resolved? To address this question, a factor-augmented vector autoregressive (FAVAR) model was estimated that combines the estimated factors from the dynamic factor model with other variables of interest in selected countries (see, for instance, Bernanke, Boivin, and Eliasz, 2005). This approach has the advantage of yielding a parsimonious model that is able to capture global linkages and spillovers.

The particular simulations considered are an increase in U.S. national savings; an increase in investment in Asia and oil-producing countries; stronger real output growth in Japan and the Large Euro countries; and an increase in real interest rates in the United States. The results of the analysis are as follows.[20]

- *An increase in U.S. national saving rates would have a significant positive effect on the U.S. current account deficit* (Figure 2.9). A permanent (over the three-year horizon considered by the forecasts) 1 percent of GDP increase in the U.S. gross national saving rate would reduce the U.S. current account deficit by about

[20]The FAVAR model used to forecast the current account imbalances comprises the world factor, the global current account factor, the regional current account balance, and the variable of interest (e.g., the U.S. saving rate). The results are presented as differences between the forecast of the current account balance obtained imposing a specific time path on the variable of interest (conditional forecasts) and the forecast obtained from the unrestricted VAR (unconditional forecasts).

½ percent of GDP after three years.[21] Higher saving in the United States—and the associated reduction in domestic demand—would also reduce the current account surpluses in the Large Euro countries and Japan, by ¼ and ¾ percentage point of GDP by 2007, respectively. In the East Asia 2 countries, the projected decline in the current account surplus would be much larger—close to 3 percentage points of GDP by 2007—owing to the much higher exposure of these countries to trade with the United States (see Table 2.4).

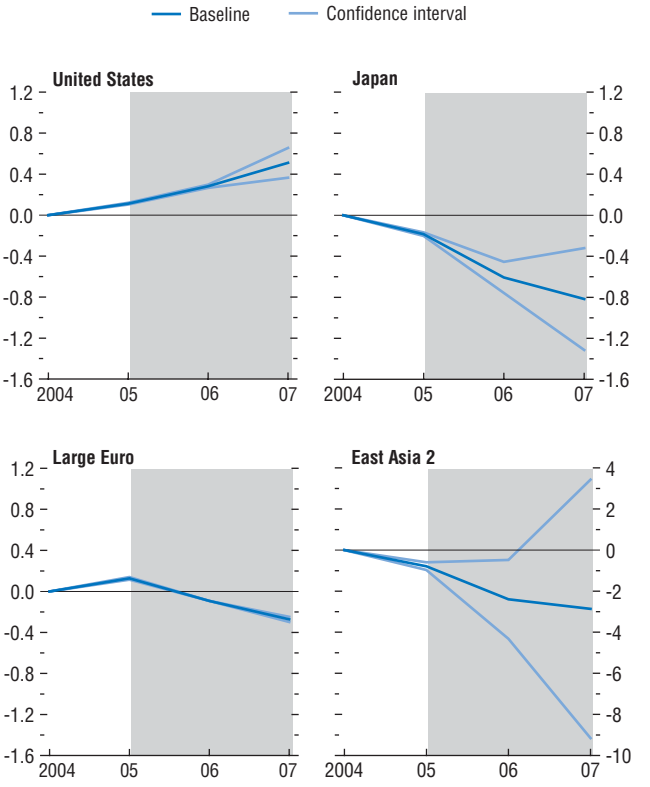
- *An investment recovery in Asia (excluding China) and oil-producing countries would offer a significant contribution to the resolution of current account imbalances.* An increase in the investment ratio in the East Asian 1 countries (Indonesia, Korea, Malaysia, the Philippines, Thailand)—as firms in this region complete their process of deleveraging and begin to increase their capital stock—would have an important impact on current account imbalances.[22] For example, a 5 percent of GDP permanently higher investment rate in these countries—which would reverse about one-half of the decline that has occurred since the peak in 1996—would reduce the U.S.

[21]Model-based analyses of the effect of U.S. fiscal policy on the current account deficit yield similar results. For example, Kumhof, Laxton, and Muir (2005) find that a permanent 1 percentage point of GDP increase in the U.S. government saving ratio—increasing the U.S. national saving rate by ¾ percentage point—improves the U.S. current account by almost ½ percent of GDP on average during the first five years. Moreover, current account changes as a ratio to GDP are similar across other regions of the world. If the duration of the fiscal consolidation effort is restricted to five years, the current account improvement is smaller—about ¼ percentage point of GDP—similar to that reported in Erceg, Guerrieri, and Gust (2005).

[22]It should be noted that these results are based on a model estimated over the past three decades, a period during most of which several emerging markets, particularly the fast-growing economies of southeast Asia and China, were much smaller and less important for world trade. Hence, an analysis based on past data likely underestimates the role played by adjustments in this group of countries today.

Figure 2.9. How Would the Current Account React to an Increase in the U.S. Saving Ratio?[1]
(Percent of GDP)

A 1-percent-of-GDP increase in the U.S. national saving rate would have a significant positive effect on the U.S. current account deficit, while negatively affecting the current account balances of Japan and the Large Euro and East Asia 2 countries.



Source: IMF staff estimates.
[1]See footnote 15 in main text for definition of country groupings.

Table 2.4. Average Trade by Region, 1970–2004
(Percent of regional GDP)

	United States	Japan	Anglo-Saxon	Other Industrial	Large Euro	Small Euro
United States	. . .	2.0	4.0	0.3	1.5	0.7
Japan	4.8	. . .	1.9	0.3	1.2	0.6
Anglo-Saxon	14.3	2.5	. . .	1.8	6.1	4.2
Other Industrial	3.9	1.6	5.5	. . .	17.4	7.4
Large Euro	3.0	1.0	3.3	2.8	. . .	7.0
Small Euro	3.3	1.1	5.4	2.9	18.3	. . .
East Asia 1	11.2	12.9	3.9	0.8	3.6	2.0
East Asia 2	36.7	27.9	15.9	4.1	14.2	5.8
China	3.3	4.5	1.3	0.3	1.9	0.8
Other Emerging Markets	2.7	1.0	1.8	0.8	4.0	1.7
Latin America	4.3	1.2	1.0	0.5	2.7	1.4
Oil Producers	13.9	3.4	3.5	2.2	5.4	2.9

	East Asia 1	East Asia 2	China	Other Emerging Markets	Latin America	Oil Producers
United States	1.0	0.5	0.5	0.5	0.5	1.8
Japan	2.7	0.9	1.1	0.5	0.4	1.5
Anglo-Saxon	1.2	0.9	0.6	1.1	0.4	1.6
Other Industrial	0.7	0.7	0.4	1.1	0.7	3.3
Large Euro	0.6	0.4	0.5	1.3	0.6	1.5
Small Euro	0.8	0.4	0.4	1.1	0.7	1.9
East Asia 1	. . .	5.6	2.1	1.1	0.5	2.0
East Asia 2	30.7	. . .	39.1	4.8	1.2	6.4
China	2.1	4.9	. . .	0.4	0.4	0.4
Other Emerging Markets	0.7	0.5	0.3	. . .	0.3	1.0
Latin America	0.4	0.2	0.4	0.4	. . .	1.4
Oil Producers	1.3	0.6	0.4	1.0	1.1	. . .

Sources: IMF, *Direction of Trade Statistics;* and IMF staff calculations.

current account deficit by about ¾ percent of GDP after three years (Figure 2.10). An equivalent increase in the investment rate in oil-producing countries, as they devote a larger share of their oil revenues to the accumulation of capital, has a broadly similar impact on the U.S. current account deficit.

- *An increase in real GDP growth in Japan and the Large Euro countries would help reduce the U.S. current account deficit.* A ½ percent a year increase in real GDP growth in Japan would reduce the U.S current account deficit by about 0.2 percent of GDP after three years, while worsening the current account in Japan by 0.3 percent of GDP and having almost no effect on the current account of Large Euro countries (Figure 2.11). A ½ percent a year increase in real GDP growth in Large Euro countries would have a broadly similar impact on the U.S. current account deficit.
- *An increase in real short-term interest rates in the United States would have a limited impact on the current account.* A cumulative 2 percentage point increase over the next three years would have a very modest impact on current account balances in the United States or other countries (about 0.1 percent of GDP by 2007) (Figure 2.12). This is consistent with the high co-movement of interest rates, saving, and investment across industrial countries, meaning that as interest rates rise in the United States they are also likely to increase elsewhere. Correspondingly, saving and investment in other industrial countries will be affected, with little impact on global imbalances. Of course, if higher interest rates have more of an effect in countries that have been experiencing house price booms, the impact on saving and current account balances could be larger.

Overall, these results suggest that an increase in U.S saving, achieved most directly through fiscal consolidation, is likely to have a significant impact on the current account deficit in the

United States and would reduce surpluses in Japan, the Large Euro countries, and Asia. Stronger growth in Japan and Europe and a pickup in investment in emerging market economies would also play a role in addressing current imbalances. On the other hand, an increase in real interest rates in the United States would have a limited impact on its external deficit, given the spillovers on saving and investments ratios in other regions. These results emphasize the importance of adequately addressing cross-country linkages in any analysis of policies to reduce global imbalances.

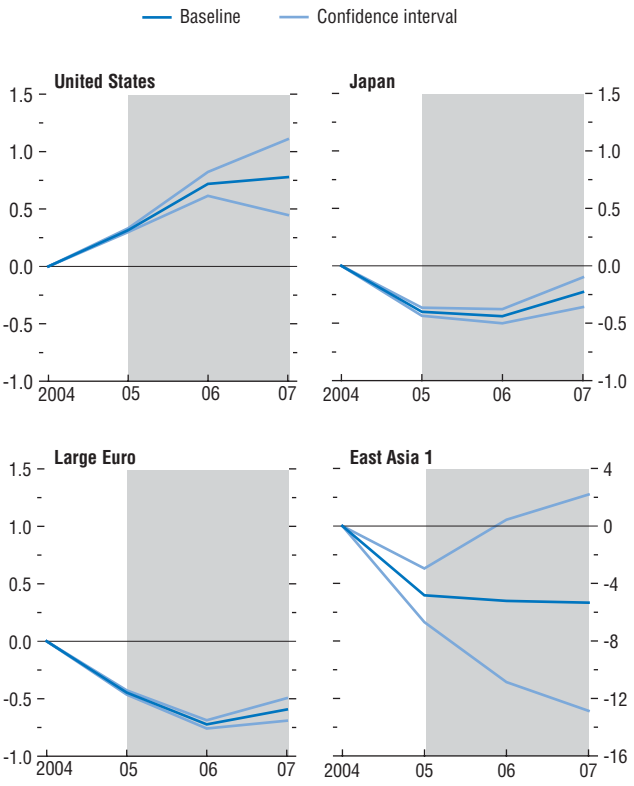
Conclusions

Global saving and investment are near historic lows, having fallen markedly since the late 1990s. These trends largely reflect developments in industrial countries; in emerging markets, saving has continued to rise, although investment has not recovered since its fall in the aftermath of the Asian financial crisis. The decline in global saving and investment has been due both to factors that have commonly affected a large number of countries—such as increases in credit and asset prices—and to country-/region-specific developments. Most important among these are the decline in public saving in the United States, demographic changes in Japan and Europe, and the slump in investment in Asian economies (excluding China) in the aftermath of the regional financial crisis.

The recent paths of saving and investment have had significant implications for the distribution of current account imbalances across the world. In particular, the U.S. current account deficit has reached unprecedented levels, and large surpluses have emerged in other regions. Contrary to the situation in the mid-1980s—the last period of significant global imbalances—when the imbalances were concentrated among a relatively small group of countries, the current situation involves a much wider set of players, including many emerging market countries. Consequently, the policy response will need to involve many more countries, and coordinating

Figure 2.10. How Would Current Account Imbalances React to Changes in the Investment Rate in Asia?[1]
(Percent of GDP)

A 5-percent-of-GDP increase in the investment rate in East Asia 1 countries would have a relatively significant effect on the U.S. current account deficit.

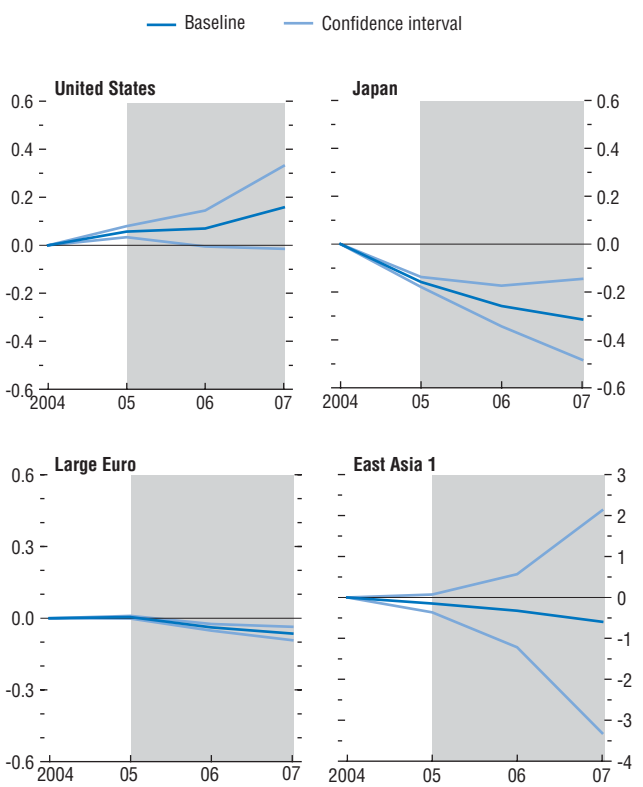


Source: IMF staff estimates.
[1]See footnote 15 in main text for definition of country groupings.

Figure 2.11. How Would the Current Account React to Changes in Japan's GDP Growth?[1]

(Percent of GDP)

A 1/2 percent acceleration in real GDP growth in Japan would help reduce the U.S. current account deficit.



Source: IMF staff estimates.
[1]See footnote 15 in main text for definition of country groupings.

this response will require considerable efforts from international policymakers.

As the current constellation of external imbalances reflects a series of diverse and unrelated regional shocks, a number of economic and policy developments will be required to unwind them. In particular, the results in this chapter indicate that steps to raise saving in the United States, boost growth in Japan and Europe, and increase investment in Asia—including completing ongoing financial and corporate restructuring—and in oil-exporting countries would all move global current account imbalances in the right direction.

Finally, the analysis suggests that unusually low investment rates for this stage of the economic cycle have resulted in an excess supply of saving that may be contributing to the low level of real long-term interest rates. This low investment is largely a result of the still-ongoing efforts by corporates in many countries to strengthen their balance sheets by paying down debt. Consequently, despite strong corporate profit growth, investment has generally remained weak. The evolution of investment is therefore likely to be a critical factor determining long-term interest rates going forward. A return of investment to a more normal cyclical relationship with growth would likely put upward pressure on interest rates.

Appendix 2.1. Sample Composition, Data Sources, Methods, and Results

The main authors of this appendix are Marco Terrones and Roberto Cardarelli. Stephanie Denis provided research assistance.

This appendix provides details on the data sources, samples, and econometric methods and results of the study discussed in the main text.

Sample and Data Sources

- The sample used in this chapter comprises the following 46 industrial and emerging market countries. Industrial countries: Australia,

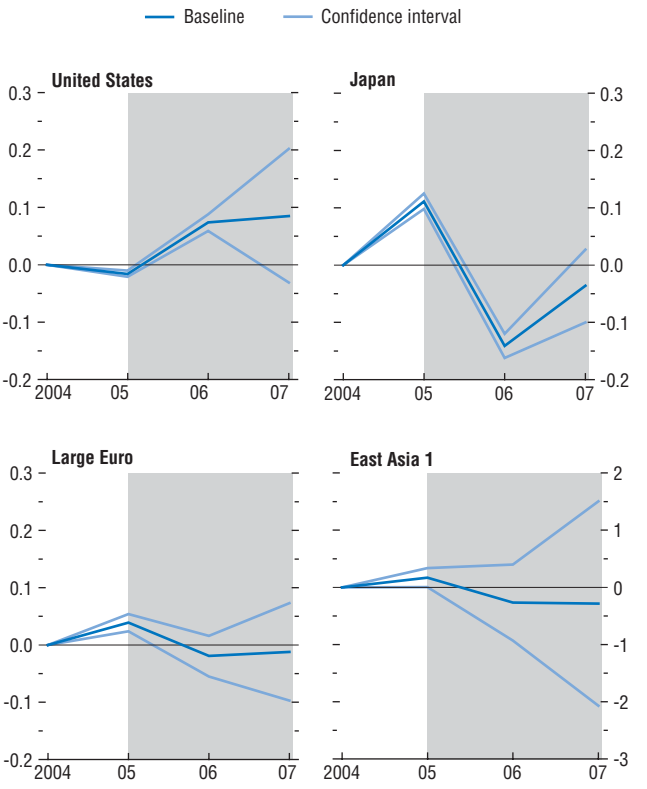
Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United States, and the United Kingdom. Emerging markets: Argentina, Brazil, Chile, China, Colombia, Egypt, Hong Kong SAR, India, Indonesia, I.R. of Iran, Israel, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, the Philippines, Saudi Arabia, Singapore, South Africa, Thailand, Taiwan Province of China, Turkey, and Venezuela.[23] The oil-exporting countries subgroup is defined as comprising I.R. of Iran, Mexico, Norway, Saudi Arabia, and Venezuela. The data are annual and cover 1970–2004.

- Data were taken from a variety of sources, including the Organization for Economic Cooperation and Development's (OECD) Analytical Database, the Global Financial Database, the IMF's *International Financial Statistics* and the *World Economic Outlook,* national authorities, the World Development Indicators from the World Bank, and Worldscope.
- The main series used in the chapter are as follows.
  - *Saving and investment rates.* These series were constructed using data from the OECD Analytical Database, World Development Indicators, and the *World Economic Outlook.*
  - *Interest rates.* The short-term interest rate series were mainly obtained from the Global Financial Database and the IMF's *International Financial Statistics.*
  - *Investment deflator.* This deflator was calculated using the OECD Analytical Database and the *World Economic Outlook.*
  - *Private credit (by deposit money banks and other financial institutions) to GDP ratio.* Obtained from the World Bank's Financial Structure Development Database.

[23]I.R. of Iran and Saudi Arabia are not usually included among the emerging market economies.

Figure 2.12. How Would the Current Account React to Changes in the U.S. Real Interest Rate?[1]
(Percent of GDP)

A 200 basis point increase in real interest rates in the United States would have a minor effect on global current account imbalances.



Source: IMF staff estimates.
[1]See footnote 15 in main text for definition of country groupings.

- *Elderly and youth dependence ratios.* These series were obtained from the World Bank's World Development Indicators.

- Corporate data series used in Box 2.3. The corporate data set used in Box 2.3 is based on information from nonfinancial publicly traded firms and reported in the Worldscope database. The data set includes information for nine emerging Asian economies—namely, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan Province of China, and Thailand.[24] The data were then used to construct ratios of investment (investment expenditures over book value of plant, machinery, and equipment), leverage (short-term debt over market value of equity), liquidity (cash flow over book value of machinery, capital, and equipment), and Tobin's q (market value of equity plus book value of long-term debt over book value of machinery, capital, and equipment) by country, using median values.

Dynamic Panel Model of Saving and Investment

Building on existing literature on saving and investment, IMF staff estimated a dynamic panel model for these two variables using data for the 46 countries over the 1972–2004 period.

The model postulates that saving, in any given country (i) and year (t), is explained by the following factors:

$$S_{it} = \gamma S_{i(t-1)} + X_{it}\beta + \nu_i + \eta_t + u_{it}, \quad (i = 1, \ldots, N;\ t = 2, \ldots, T) \tag{1}$$

where S_{it} is the saving rate for country i in period t; X_{it} is a matrix comprising information on the explanatory variables for country i in period t; ν_i is a country-specific effect; and η_t is a time-specific effect (which would capture the rest of the world trends). The right-hand-side variables included in the saving regression are of two types.

- Past saving rate, $S_{i(t-1)}$. This term captures the extent to which saving rates are persistent—that is, the extent current saving rates are correlated with past rates.
- Economic determinants of saving, X_{it}. The following determinants were considered, with the expected sign of the relationship between saving and each determinant in parentheses: per capita output growth (+); real interest rate (+); credit to the private sector (–); terms-of-trade growth (+); public sector saving (+); and the elderly and youth dependency ratios (–). For a discussion, see, for instance, Edwards (1995); Higgins (1998); Haque, Pesaran, and Sharma (1999); Loayza, Schmidt-Hebbel, and Servén (2000); and the May 1995 *World Economic Outlook*.

Similarly, the model postulates that investment, in any given country (i) and year (t), is explained by the following factors:

$$I_{it} = \gamma I_{i(t-1)} + X_{it}\beta + \nu_i + \eta_t + u_{it}, \quad (i = 1, \ldots, N;\ t = 2, \ldots, T) \tag{2}$$

where I_{it} is the investment rate for country i in period t, X_{it} is a matrix comprising information on the explanatory variables for country i in period t, ν_i is a country-specific effect, and η_t is a time-specific effect (which would capture the rest of the world trends). The right-hand-side variables included in the investment regression are of two types.

- Past investment rate, $I_{i(t-1)}$. This term captures the extent to which investment rates are persistent. If investment is a highly persistent process, higher investment rates today would be associated with higher investment rates tomorrow.
- Economic determinants of investment, X_{it}. The following determinants were considered, with the expected sign of the relationship between investment and each determinant in parentheses: per capita output growth (+); credit to the private sector (+); the cost of cap-

[24]Because investment in China has behaved differently from that in other countries in the region, China was excluded from the analysis.

ital (–)—measured as the ratio of real interest to the relative price of capital;[25] and the elderly and youth dependency ratios (undetermined). For a discussion, see, for instance, Romer (1996); Higgins (1998); Auerbach (2002); and Pelgrin, Schich, and de Serres (2002).

These regression equations were estimated using the Generalized Method of Moments estimator with robust errors (to correct for heterogeneity in the error term).

A Dynamic Factor Model

Dynamic factor models have become increasing popular among economists,[26] as they describe the covariance or co-movement between a group of (observable) time series as the result of the relationship between these variables and a small number of unobservable variables, known as factors. These unobserved factors can be regarded as indexes of common activity—across the entire data set (e.g., global activity) or across subsets of the data (e.g., for a particular region).

To estimate the factors, the dynamic factor model decomposes each observable variable—for example, the saving rate for the United States—into components that are common across all observable variables or common across a subset of variables. In particular, for each of the 12 regions considered in the chapter, the analysis uses five observable variables: real output growth (g), real short-term interest rates (r), ratio of the current account balance to GDP (CA), saving rate (S), and investment rate (I).[27] In the model, there are three types of factors: the common factor (f^W), 5 factors specific to each observed variable (f^i, one per variable) and 12 region-specific factors (f^j, one per region). So there are 60 (5×12) "regression" equations to be estimated, and 60 time series to be explained by 18 (1 + 5 + 12) factors. For example, for the United States the regressions estimated are:

$$
\begin{aligned}
y_t^{US} &= a_{y,US} + b_{y,US}^{W} f_t^{W} + b_{US}^{y} f_t^{y} + b_{y}^{US} f_t^{US} + \varepsilon_{t,US}^{y} \\
r_t^{US} &= a_{r,US} + b_{r,US}^{W} f_t^{W} + b_{US}^{r} f_t^{r} + b_{r}^{US} f_t^{US} + \varepsilon_{t,US}^{r} \\
CA_t^{US} &= a_{CA,US} + b_{CA,US}^{W} f_t^{W} + b_{US}^{CA} f_t^{US} + b_{CA}^{US} f_t^{US} + \varepsilon_{t,US}^{CA} \\
S_t^{US} &= a_{S,US} + b_{S,US}^{W} f_t^{W} + b_{US}^{S} f_t^{S} + b_{S}^{US} f_t^{US} + \varepsilon_{t,US}^{S} \\
I_t^{US} &= a_{I,US} + b_{I,US}^{W} f_t^{W} + b_{US}^{I} f_t^{I} + b_{I}^{US} f_t^{US} + \varepsilon_{t,US}^{I}.
\end{aligned}
$$

In this system, f^W is the world factor, the component common to all variables in all countries—that is, every variable depends on this common factor and that dependence varies across each variable i and country j through the parameter $b_{i,j}^{W}$, which is called the factor loading; f^i is the global factor for variable i, capturing co-movement across the world in this variable that is not explained by the world factor; and f^{US} is a U.S.-specific factor, which captures co-movement across all five variables within the United States that is not captured by either type of global factor. Finally, ε is the "unexplained" idiosyncratic error.

The model captures dynamic co-movement by allowing the factors (fs) and idiosyncratic terms (ε) to be (independent) autoregressive processes. That is, each factor depends on lags of itself and an i.i.d. innovation to the variable:

$$f_t = \phi(L) f_t + u_t,$$

where $\phi(L)$ is a lag polynomial and u_t is normally distributed. All the factor loadings (bs), and lag polynomials are independent of each other. Because the factors are unobservable, special methods must be employed to estimate them; in the chapter, the model is estimated using Bayesian techniques as described in Kose, Otrok, and Whiteman (2003).

To measure the contribution of each factor to the variation in the observable variables, the volatility in each aggregate variable has been decomposed into components due to each

[25]Because of lack of information on taxes, the measure of cost of capital used in this chapter takes into account neither differences in taxes across countries nor tax changes in a given country.

[26]See, for example, Stock and Watson (2002) and Forni, Lippi, and Reichlin (2004).

[27]Before estimating the dynamic factor model, the observables were detrended.

Table 2.5. Variance Decomposition for Country Regions

(Percent)

Region	Factor	Output (y)	Short-Term Real Interest Rate (r)	Current Account (CA)	Saving Rate (s)	Investment Rate (i)
United States	Global	82.2	53.3	53.8	83.9	44.5
	World	7.0	0.2	3.9	11.1	22.7
	Aggregate	75.2	53.1	49.9	72.8	21.8
	Region and idiosyncratic	17.5	46.5	45.9	11.2	54.8
Japan	Global	25.2	69.9	60.4	29.3	52.6
	World	6.0	24.8	2.9	13.9	21.4
	Aggregate	19.1	45.1	57.6	15.3	31.2
	Region and idiosyncratic	74.7	30.3	39.8	69.9	47.7
Anglo-Saxon	Global	74.8	93.8	4.0	55.3	53.4
	World	20.1	0.5	0.2	54.8	45.5
	Aggregate	54.7	93.3	3.9	0.5	7.9
	Region and idiosyncratic	25.3	5.8	95.9	44.2	45.8
Other Industrial	Global	57.5	85.4	18.5	91.3	69.0
	World	42.6	21.2	18.3	60.3	38.8
	Aggregate	14.9	64.3	0.1	30.9	30.2
	Region and idiosyncratic	42.5	14.6	81.2	8.4	30.5
Large Euro	Global	29.4	90.5	42.5	81.6	63.2
	World	23.2	4.4	9.9	68.5	40.8
	Aggregate	6.2	86.1	32.5	13.0	22.3
	Region and idiosyncratic	70.1	9.0	57.2	18.1	37.0
Small Euro	Global	71.3	86.4	11.5	85.0	69.2
	World	62.5	7.8	8.2	63.7	46.0
	Aggregate	8.7	78.6	3.3	21.4	23.2
	Region and idiosyncratic	28.4	13.4	87.7	14.4	30.9
East Asia 1	Global	2.5	49.1	37.6	9.4	21.2
	World	0.3	16.5	34.0	0.6	17.1
	Aggregate	2.2	32.6	3.6	8.8	4.0
	Region and idiosyncratic	97.4	50.4	62.2	90.4	78.3
East Asia 2	Global	35.7	19.2	97.2	6.5	1.5
	World	0.1	16.0	0.3	2.5	0.9
	Aggregate	35.6	3.3	96.9	4.0	0.6
	Region and idiosyncratic	64.2	80.6	2.5	92.8	97.8
China	Global	29.6	3.4	13.3	3.7	14.3
	World	19.4	0.4	3.7	2.5	6.7
	Aggregate	10.3	2.9	9.6	1.2	7.6
	Region and idiosyncratic	70.4	96.4	86.7	96.1	85.3
Other Emerging Markets	Global	2.3	9.1	36.2	7.2	21.4
	World	2.2	3.5	1.5	6.5	8.9
	Aggregate	0.1	5.6	34.7	0.7	12.5
	Region and idiosyncratic	97.6	90.7	63.5	91.9	78.4
Latin America	Global	7.5	33.3	33.8	3.2	1.3
	World	4.1	4.7	0.3	0.4	0.3
	Aggregate	3.4	28.6	33.4	2.7	1.1
	Region and idiosyncratic	92.3	65.8	66.0	96.6	98.5
Oil Producers	Global	23.6	23.1	18.4	14.2	1.7
	World	23.5	1.8	5.8	7.9	1.2
	Aggregate	0.2	21.3	12.5	6.3	0.5
	Region and idiosyncratic	76.1	76.7	81.8	85.5	97.7
Average	Global	36.8	51.4	35.6	39.2	34.4
	World	17.6	8.5	7.4	24.4	20.9
	Aggregate	19.2	42.9	28.2	14.8	13.6
	Region and idiosyncratic	63.0	48.4	64.2	60.0	65.2

Source: IMF staff calculations.

Table 2.6. Investment and Capital Ratios for Emerging Asia

	Steady State			1996		2004	
	Capital-output ratio	Potential real growth rate	Investment ratio	Investment ratio	Capital ratio	Investment ratio	Capital ratio
			Depreciation rate at 5 percent				
China	2.5	5.0	23.8	34.4	2.2	45.6	3.0
Hong Kong SAR	2.7	4.0	23.1	31.3	2.6	22.4	2.9
India	2.5	5.0	23.8	25.4	2.2	23.5	2.4
Indonesia	2.5	5.0	23.8	23.3	1.9	21.0	2.4
Korea	2.8	4.7	25.5	37.5	2.7	28.6	3.1
Malaysia	3.1	5.0	29.5	42.5	3.0	20.5	3.3
Philippines	2.7	4.0	23.3	24.0	2.7	17.0	2.6
Singapore	2.9	4.5	26.3	38.0	2.7	24.0	3.1
Taiwan Province of China	2.5	5.0	23.8	22.5	1.7	20.1	2.0
Thailand	3.0	5.0	28.7	41.1	3.0	25.3	3.0
			Depreciation rate at 7 percent				
China	2.1	5.0	24.3	34.4	2.0	45.6	2.7
Hong Kong SAR	2.3	4.0	24.2	31.3	2.2	22.4	2.5
India	2.0	5.0	22.9	25.4	1.8	23.5	2.0
Indonesia	2.0	5.0	22.9	23.3	1.7	21.0	2.0
Korea	2.4	4.7	27.1	37.5	2.4	28.6	2.6
Malaysia	2.7	5.0	30.9	42.5	2.7	20.5	2.8
Philippines	2.2	4.0	23.4	24.0	2.2	17.0	2.1
Singapore	2.5	4.5	27.7	38.0	2.4	24.0	2.6
Taiwan Province of China	2.0	5.0	22.9	22.5	1.5	20.1	1.7
Thailand	2.6	5.0	29.7	41.1	2.6	25.3	2.4

Source: IMF staff estimates.

factor. Table 2.5 reports the median of the posterior distribution of the variance decompositions for each region. For example, the variance of the saving rate for the United States is

$$var(S_t^{US}) = (b_{US}^W)^2\ var(f_t^W) + (b_{US}^S)^2\ var(f_t^S) + (b_{US}^S)^2\ var(f_t^{US}) + var(\varepsilon_{t,US}^S),$$

and, therefore, the variance in U.S. saving rates attributable to the world factor is

$$\frac{(b_{US}^W)^2\ var(f_t^W)}{var(S_t^{US})}.$$

Steady-State Level of Investment and Capital Output Ratio for Emerging Asia

Steady-state levels of investment rates are estimated based on standard neoclassical growth models, and thus as a function of the steady-state capital-output ratio, the depreciation rate, and the trend growth rate of output:

$$i^* = \frac{k^*\ (g + d)}{(1 + g)},$$

where i^* is the (steady-state) ratio of real gross fixed investment to real output, k^* is the (steady-state) capital-output ratio, g is potential output growth, and d is the depreciation rate. Thus, i^* is a positive function of k^*, g, and d. Capital stock is estimated based on a standard perpetual inventory method

$$K_t = K_{t-1}(1 - d) + I_t.$$

Two depreciation rates are used: 5 percent and 7 percent. With data on gross fixed real investment starting from 1950 (obtained using the Penn World Table Version 6.0), the initial estimate of capital stock is obtained assuming that the country is at steady-state capital-output ratio in 1950. To obtain this ratio, the averages of k, g, and d over 1950–60 are used. However, different periods and parameter values are used to test the sensitivity of the capital stock to the choice of its initial value, and the results show that the guess at the initial capital stock becomes relatively unimportant decades later (Easterly and Levine, 2001; and

Klenow and Rodriguez-Clare, 2001, adopt a similar methodology).

For a given depreciation rate, the steady state capital stock ratio, k^*, for each country is found as the maximum value of the capital-output ratio on average over long (15- and 20-year) subperiods between 1950 and 2004. However, when such capital-output ratio is lower than 2.5 (2) if calculated with a 5 (7) percent depreciation rate, it is set to this level to minimize the dispersion of capital ratios across countries and reduce possible measurement errors. Indeed, the steady-state capital-output ratios are in the range of 2 to 3.5 (see Table 2.6), a reasonable estimate for this group of countries (the average for industrial countries over the 1970–2004 period is slightly below 3). Potential growth rates are obtained from the World Economic Outlook database, but are capped at 5 percent a year when above this value.

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