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CORRIGENDUM

The attached title page of WP/97/48 (April 1997) is being reissued to include the footnote, which was inadvertently omitted.

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INTERNATIONAL MONETARY FUND

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Modeling the World Economic Outlook at the IMF: A Historical Review

Prepared by James M. Boughton*

April 1997

Abstract

The World Economic Outlook (WEO) exercise at the IMF evolved during the 1980s, partly in response to demands by policymakers in national finance ministries for objective and internationally comparable projections and policy scenarios. The exercise had begun as a staff initiative, encouraged by the Managing Director (Johannes Witteveen). Gradually, the Executive Board, the Interim Committee, the Group of Seven, and others came to view the discussion of the WEO documents as an important element in their efforts to keep abreast of world economic developments and prospects. Direct and indirect feedback from those discussions informed the staff as to how the exercise should be improved. Driven by this policy relevance, the WEO evolved from a decentralized project that was only haphazardly model-based into a more rigorous and coordinated exercise.

JEL Classification Numbers: B23, F47

Keywords: World Economic Outlook, forecasting, econometric models - history, IMF

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Table of Contents

Summary

The IMF's World Economic Outlook (WEO) exercise originated with an informal discussion by the Executive Board in 1969. Within a few years, it became a regular agenda item for both the Board and the Interim Committee, and much of its development was driven by the policy concerns of those governing bodies.

By the late 1970s, the WEO had become a major semiannual forecasting project, supplemented by analyses of trends and policy issues. Most important, it evolved to include conditional medium-term projections or "scenarios." By the mid-1980s, the role of the scenarios grew to the point where the primary focus of the WEO was no longer short-term forecasts where cyclical fluctuations dominated, but rather the policy requirements for sustainable, noninflationary growth and for consistency between countries. The economic analysis underpinning the scenarios also evolved during the 1980s, from one based primarily on Keynesian models of aggregate demand to one that emphasized neoclassical macroeconomics and incorporated a systematic role for structural policies.

The staff's ability to prepare scenarios representing viable policy options hinged on the development of increasingly sophisticated econometric models. That process also began in the late 1960s, with the specification of the Multilateral Exchange Rate Model (MERM). Both the MERM and the later World Trade Model, however, were static representations with only limited applicability to policy analysis. The real breakthrough came in 1986, with the emergence of MINIMOD, a scaled-down version of a dynamic multicountry model developed elsewhere. Not only was the Fund version smaller and more manageable; it also incorporated endogenous, forward-looking, model-consistent expectations. The credibility gained from that exercise paved the way for the development of MULTIMOD, the staff's first full-scale dynamic model. MULTIMOD, and a separate system of developing-country models, enabled the staff to develop more detailed policy scenarios within the short lead times required for the WEO.

Modeling the World Economic Outlook at the IMF: A Historical Review

The heads of state of the major industrial countries decided at the Versailles Summit in June 1982 to invite the Managing Director of the International Monetary Fund to participate in the regular multilateral meetings of their finance ministers and central bank governors. Accordingly, three months later, when the Fund's Governors gathered in Toronto for the Annual Meetings, the private (and then secret) G-5 meeting[1] began with a presentation by the Managing Director, Jacques de Larosière, on the Fund's view of the World Economic Outlook (WEO) and its implications for macroeconomic policies. From then on, de Larosière and later his successor, Michel Camdessus—built their presentations in these semi-annual meetings around the global outlook.

The G-5 meetings were a nearly invisible but highly important vehicle for disseminating the projections and analysis made by the Fund staff. Eight years earlier, the WEO had been given a more public and more global platform when the committee of Fund Governors known as the Committee of Twenty initiated a review of the implications of the sharp rise in world petroleum prices of 1973-74. The staff was already producing global economic forecasts for informal discussion by the Fund's Executive Board; at the initiative of the Managing Director (then H. Johannes Witteveen), those forecasts were presented to the Governors for their meeting in Rome in January 1974. From that moment on, the Committee of Twenty and its successor, the Interim Committee,[2] always included the WEO as a major agenda item.

The interest in the WEO shown by policymakers at this high level induced the Fund's management and staff to devote substantial resources over the years to refining the forecasting process. The goal of this paper is to describe how the WEO exercise evolved from a loosely structured set of ad hoc projections in the early 1970s to a more rigorous and far more detailed set of forecasts and "scenarios," based primarily on econometric models, by the late 1980s. The focus is on the 1980s, because of the major changes that took place then; one should keep in mind that WEO models and procedures have continued to evolve and mature throughout the 1990s. The evolution discussed here was driven by three interrelated developments: prodding from policymakers (via the Interim Committee and the Executive

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[1]From 1973 through 1986, meetings of the major-country finance ministers—held at least semi-annually—were restricted to the Group of Five, or G-5 (France, Germany, Japan, the United Kingdom, and the United States). Separately, from 1976 on, the Heads of State and Government of those countries plus Canada and Italy (the G-7) met annually in public summits. The 1986 Tokyo summit led to a decision to expand the ministerial meetings to the G-7.

[2]The membership of both committees comprised the Governors of the Fund from the countries represented on the Executive Board. Virtually all member countries are represented either directly or through constituencies.

Board) to deal with specific policy issues, shifting views in the economics profession, and the continuing development of econometric models at the Fund.

1. Evolution of the outlook exercise

The WEO originated with a staff paper prepared as a background document for an informal discussion by the Fund's Executive Board in June 1969. The Organization for Economic Cooperation and Development (OECD) in Paris had been producing and publishing its *Economic Outlook* for industrial countries semiannually since 1967, but no official agency was doing an overall forecast of world economic conditions.[3] At the outset, the Fund staff merely reported the OECD secretariat's forecasts and offered its own interpretation of the policy implications for both industrial and developing countries. In January 1971, the Executive Board began holding regular "informal" discussions of the WEO, based on increasingly detailed papers that included the staff's own projections for aggregated groups of developing countries. It then quickly became apparent that, notwithstanding the good working relationship between the IMF and the OECD, the Fund would have to do its own projections for the industrial countries if it wanted to produce timely and consistent forecasts for the world economy that reflected its own analysis and was consistent with its own policy advice to member countries. By the late 1970s, the exercise developed into a major Fund-wide forecasting project, supplemented by analysis of key trends and policy developments. The exercise was conducted at least semiannually in the late winter and summer, and the conclusions of the informal Executive Board meetings were circulated as background papers for the ministerial-level Interim Committee meetings that followed soon afterwards. Beginning in 1980, the Board agreed that the papers should be published.

As early as the mid-1970s, it became clear to the staff that the WEO had the potential to become much more than a forecasting exercise. To play an important role in the Fund, it would have to focus as much on the policy options available to member governments as on the staff's views on how the world economy might evolve. That simple notion led to the idea of emphasizing "scenarios": conditional medium-term projections, the character of which evolved substantially during the 1980s. These scenarios were a key to the success of the WEO for focusing the discussions on major policy issues. Rather than emphasizing short-term forecasts—in which cyclical fluctuations necessarily dominate—the WEO gave greater emphasis to medium-term considerations, notably the policy requirements for generating

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[3]Other international organizations had long produced periodic papers on world economic conditions, dating back to the League of Nations' "World Economic Survey," published annually from 1932 to 1944. The United Nations began producing annual reports on global economic developments around 1948. In addition, the IMF Annual Report—which is a report of the Executive Board rather than the staff—has always included a review of world economic conditions, but its focus has been on the policy implications of current developments, rather than on the outlook. For a detailed description of the evolution of the WEO through 1978, see de Vries (1985), Chapter 40, pp. 785-797.

sustainable, noninflationary growth and for consistency between countries. As an unpublished 1984 paper summarized the point, the medium-term scenarios "should be viewed not so much as a forecast of what will happen, but as an indication of the policy challenges that will need to be faced if a satisfactory outcome is to be achieved."

Initially, the WEO scenarios were stylized presentations of how the pattern of current-account balances among industrial countries might evolve over a period of around three years under various assumptions. For two years starting in April 1978, the staff presented a "recommended" or "desirable" scenario based on the assumption that the major industrial countries would adopt the policies necessary to jointly achieve moderate, noninflationary growth. In that scenario, the large external imbalances observed in 1978 (notably a large current-account surplus in Japan and a large deficit in the United States) were projected to be substantially reduced over the medium term.[4] This desirable outcome, however, was judged by the staff to be unlikely in the absence of significant policy improvements in several countries.[5] But the alternative scenarios, rather than projecting the consequences of specific deviations in policy from the assumed path, merely showed the effects of different assumptions about economic growth. Notably, if the U.S. economy were to grow more rapidly, and Japan more slowly, then the desirable outcome would be less likely to be achieved.

The first true medium-term scenarios were produced in 1980, in the form of projections for a specific period (1985-86) rather than for an undated comparative-static equilibrium. The impetus for this step was that the United States, Japan, Germany, and the United Kingdom were all embarked on an anti-inflation strategy to combat the effects of the second oil shock and (in the United States and the United Kingdom) the cumulative excesses of the late 1970s. Much of the public and internal discussion of economic policy was focused on the question of whether this reaction was excessive. Both the United States and the United Kingdom had slipped into recession with sharply rising unemployment, while Japan and Germany had developed large external surpluses. The major oil-exporting countries also were registering large external surpluses, and the non-oil developing countries were facing danger-

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[4]The length of the "medium term" was not defined precisely in that comparative-statics exercise, but it was understood to be around three years. The methodology involved allowing lagged effects that either were already "in the pipeline" or were introduced by the assumed changes in growth rates to have their full effect on current-account balances. Thus the medium term was the period over which equilibrium would be achieved in the absence of new shocks. For an exposition, see Artus and Knight (1984), Chapter 4.

[5]That judgment was offered in February 1979. When the scenario was first presented a year earlier, the staff commented only that it "would represent a very significant shift in strategy," notably through a "more expansionary stance" of fiscal policy, without commenting on the likelihood of that shift taking place. The sharpening of the tone followed widespread criticism from Executive Directors and others that the staff was being too complacent.

ously large deficits. Was it therefore time for the major industrial countries to ease up on the restraint?

To tackle that question, the Fund staff presented a summary of how the world economy might evolve over the next five to six years, (a) with a continuation of existing policies in industrial countries, (b) with more expansionary policies until inflation resumed, followed by a policy correction, and (c) with expansionary policies maintained even after inflation resumed. The staff's judgment was that countries should continue with contractionary policies in order to restore a reasonable balance to the global pattern of current-account balances while continuing to rein in inflation. Allowing inflation to heat up again would lead to a deeper and more prolonged downturn than the one that was then in progress, and failing to tighten policies after inflation heated up would only aggravate the eventual downturn. Thus the first global scenarios, although in retrospect they look quite primitive and unquantified, served—for better or worse—to bolster confidence in the use of contractionary demand-management policies to combat inflationary pressures.

The 1981 scenarios, which for the first time included projections of the debt-servicing burdens of developing countries through the mid-1980s, reflected the growing concerns among policymakers about the longer-run effects of the massive recycling of external surpluses from oil exporters to oil-importing developing countries. These scenarios are of particular interest because they foreshadow the problems that led, a year later, to a nearly global debt crisis. In the text as published in June 1981, the staff described the medium-term debt prospects of low- and middle-income oil importers as "worrisome" and "disturbing"; "in the absence of adjustment measures, [many of these countries] would soon find themselves unable to finance their deficits" (pp. 16-17)

It may be noted in passing that to a reader of the published papers, the staff's analysis in the WEO might seem unduly timid. The preliminary papers discussed by the Executive Board, however, often were more direct. In the case just described, the warning about the debt buildup was made more explicit in the version of the paper discussed by Executive Directors in April. That paper noted that the staff had prepared a scenario in which the non-oil developing countries did not carry out adjustment policies to reduce the buildup of external debt, but that such a scenario had not even been quantified because the implied financing requirements were completely infeasible. Because of the sensitivity of such conclusions, the published papers were always at least slightly bowdlerized.

The WEO scenarios were expanded slightly further in the fall of 1981: In addition to the baseline and more pessimistic scenarios, a "favorable" Scenario C was now presented in the internal papers. This seemingly innocuous extension was a response to the new-found optimism among many policymakers under the influence of the "new" supply-side

economists.[6] According to that school of thought, a combination of liberalization of markets and reduction of the size of governments would enable private-sector activity to expand rapidly to fill the vacuum left by contractionary demand-management policies. The "favorable" scenario therefore assumed that inflationary expectations would fall rapidly, and real growth rise rapidly, in response to a cut in government expenditure. But the staff argued that such a favorable development was "unlikely," and the paper cautioned that if governments relied on the rosy scenario, they could be led into relaxing policies prematurely and falling inadvertently into the "pessimistic" Scenario B.[7]

Not until 1985 did the Fund staff begin developing fully articulated medium-term scenarios for the world economy. That same year, both the Group of Ten (G-10) industrial countries and the Group of 24 (G-24) developing countries issued reports (reproduced in Crockett and Goldstein, 1987) calling on the Fund to strengthen its surveillance over the policies of the major industrial countries by more clearly explaining the consequences of pursuing unchanged policies and by specifying and evaluating options for policy adjustments. In response, the staff significantly expanded the scope of the scenarios in the spring 1986 exercise. For the first time, the staff made quantitative projections for each of the next four years, rather than just for a single medium-term period, for key macroeconomic variables for the United States, Japan, and Europe, as well as aggregate figures for industrial countries. These projections were produced under several different sets of assumptions, an exercise that earlier would have been impossibly complex to complete in the limited time available.

For the 1986 experiment, the Fund staff called on the staff of the U.S. Federal Reserve Board, the OECD, and the Philadelphia-based Project Link to provide econometric model simulations based on a common set of assumptions about economic policies and conditions. Those simulations were then combined, and extended to cover the implications for developing countries in more detail, using the newly developed MINIMOD system (see below). In essence, the exercise showed that an easing of fiscal or monetary policy could mitigate the short-term decline in output that was otherwise projected to occur, but at some risk of a rekindling of inflation.

As the staff's econometric modeling capabilities strengthened in the second half of the 1980s, the WEO scenarios became correspondingly more focused on specific policy options. For example, in August 1987, in an exercise that implicitly called into question the Louvre accord on key-currency exchange rates, the scenarios suggested that maintaining fixed rates might make reduction of the large external imbalances of the largest countries quite difficult. A few months later, after the October 1987 stock market crash, the staff for the first time since 1979 undertook to prepare a "mini-WEO": a special review of the outlook in the light of

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[6]The appellation "new" is from Feldstein (1986).

[7]For an updated version of the rosy scenario, see WEO (April 1982), pp. 19-24.

a major shock. That review again suggested that the major industrial countries should allow exchange rates to adjust to absorb the differential effects of the decline in equity prices.

Another development of the late 1980s was the advent of the "objective indicators" exercise. The idea, first proposed by the staff in 1985 as a means of strengthening Fund surveillance, was to introduce a set of normative benchmarks for the major industrial countries that would be comparable to the performance criteria used for monitoring progress under Fund-supported adjustment programs. Although the G-7 flirted with but never did agree to any normative indicators, the framework survived in the WEO in the form of medium-term projections for a standardized set of macroeconomic variables. The published tables doubtless looked to readers like the grin of the Cheshire cat, but they did serve to focus the semi-annual discussions of the WEO by Executive Directors by linking projected fiscal deficits to shifts in current-account balances via the national saving-investment identity.[8]

2. Absorbing Theories and Avoiding Fads

The 1980s brought dramatic changes in thinking about how macroeconomic policy works. The difficulty of explaining the stagflation of the late 1970s with classical or Keynesian or monetarist models left a vacuum that was filled in part by a series of short-lived fads such as the new supply-side (or "voodoo") economics, some extreme forms of monetarism, and the revival of "gold bugs." As those movements inevitably faded away, the vacuum was filled by a neoclassical revolution that brought a greater scientific discipline to policy analysis and shifted attention away from the business cycle toward longer-term growth and stability.[9] IMF surveillance encountered all these movements, and the staff's analysis of policy options both helped to shape the debate and evolved in important ways as a result.

At the risk of oversimplifying a complex theoretical debate, one could say that until the late 1970s, the WEO had a distinctly Keynesian tone. That tone reflected a general optimism about the ability of governments to regulate the degree of stimulus to the economy so as to maximize growth without unduly contributing to inflationary pressures. This view was expressed most clearly in the spring of 1978, when many industrial countries were struggling to find some means of restoring economic growth while simultaneously getting inflation back under control.[10] "There is now a need for greater emphasis on policies to stimulate economic

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[8]Internal WEO documents presented data for each G-7 country and for the aggregate group. Published documents included only the aggregates.

[9]Smithin (1990) provides a good overview of the fads in policy-making in the 1980s. For a critique of the neoclassical focus on longer-term issues, see Hahn and Solow (1995).

[10]Perhaps the most well-known statement of the prevailing official view of macroeconomic policy of that time is the OECD's McCracken Report. In November 1975, the Ministerial

(continued...)

growth," the staff concluded then. Moreover, "the risks of exacerbating inflation would be minimal if the policies of expansion were cautious and well designed." By the time the 1970s ended, however, caution and good policy design were clearly elusive goals, and the structural underpinning of the post-1973 stagnation was more well understood. The tone of subsequent WEO policy recommendations became decidedly less activist.

In the early 1980s, the goal of macroeconomic policy throughout the industrialized world was to restrain the conduct of fiscal and monetary policies to bring inflation down gradually without incurring excessive costs through lost growth in output and employment. Most governments were more successful during this period at slowing monetary growth than they were at reducing fiscal deficits. At the IMF, it was relatively easy for the staff and Executive Directors to agree that more aggressive fiscal restraint was required, but devising a recommended course for monetary policy was rather more difficult. What was the right balance between fiscal and monetary restraint in these circumstances? The prevailing view in the Executive Board at the time was that the preferred course was for countries to tighten fiscal policy while leaving monetary targets unchanged, a recommendation that confusedly was described as a shift in the "mix" (but not the overall stance) of macroeconomic policies.

This implied view of the world represented a significant departure from the mainstream economics of the 1960s and 1970s. In the conventional textbook model, a combination of fiscal tightening and monetary easing would leave aggregate demand initially unchanged but would stimulate growth over time by lowering real interest rates. The Fund's view of the WEO in the early 1980s differed in two ways. First, the stimulus to real growth from this shift in the mix would be thwarted by a resurgence of inflationary expectations, which were assumed to be determined by monetary growth and structural factors rather than by overall demand pressures. Second, the usual negative consequences of fiscal contraction on output would be offset by a supply-side stimulus arising from the anticipation of a more stable and sustainable macroeconomic environment. Therefore, the appropriate policy advice was to leave monetary targets unchanged while tightening control over ("consolidating") fiscal policy. Neither of these propositions had been verified empirically, and no doubt few would have claimed that they held universally. Rather, they were a reaction to the very high inflation

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[10](...continued)
Council of the OECD initiated a study by an international group of experts—chaired by a former Chairman of the U.S. President's Council of Economic Advisers, Paul McCracken—to recommend a strategy for achieving both full employment and price stability over the medium term. The report of the McCracken Committee, issued in April 1977, concluded that although the major countries faced a "narrow path" toward that objective, "a relatively *active* demand management policy may be needed, involving a succession of injections of purchasing power over a period of months or even years, while at the same time standing ready to begin withdrawing stimulus as soon as endogenous forces gather momentum." McCracken et al. (1977), p. 190; the italics and the mangled syntax are in the original.

and monetary growth of the late 1970s. Unfortunately, confusion lingered throughout the rest of the decade, long after inflation and monetary pressures had subsided.

Political views were mixed on the more general question of whether macroeconomic policies should be used for countercyclical stabilization or applied steadily toward longer-term goals. The staff view, as expressed in the WEO documents of the 1980s, was generally against countercyclical policy but also against extreme adherence to a single medium-term goal. In 1984, for example, when both Germany and Japan were experiencing sharply reduced inflation and sluggish real growth, the staff argued in the WEO—over objections from several Executive Directors—that both countries should persevere with policies of fiscal restraint. By the fall of 1987, however, when growth was still disappointing, both the staff and the Executive Board agreed that these two surplus countries should aim temporarily to stimulate aggregate demand above the underlying growth rate of potential output.

Perhaps the most important example of the staff's attempt to steer a moderate medium-term course was the WEO analysis of the effects of the Gramm-Rudman-Hollings (vernacularly, Gramm-Rudman) legislation in the United States. That legislation, enacted in December 1985, mandated a schedule for eliminating the U.S. fiscal deficit (then approximately 5 percent of GNP) by fiscal year 1991. The next WEO papers presented three scenarios on how the world economy might evolve through 1991. The baseline assumed partial implementation, with the deficit declining only to 2½ percent of GNP by the time the law decreed it should be reduced to zero. That scenario reflected a staff judgment that the Gramm-Rudman target was simply too ambitious: not just politically, as was obvious, but economically as well. In the alternative with full implementation, U.S. and global growth were both shown to be reduced significantly during the first four years (1986-89), so that the level of output would remain below the baseline until well into the 1990s. The staff also discussed a second alternative, with no deficit reduction at all; in that case, U.S. debt was shown to grow relentlessly relative to GNP, and the staff concluded that such a scenario would be disastrously unsustainable. Reduction of the fiscal deficit was therefore essential but would best be pursued moderately over a period of years. The Executive Board was split in its assessment of the staff's pessimism, as several Directors backed up the U.S. contention that aggressive deficit reduction would reap rapid rewards for growth. In the event, these competing views were never tested, because the U.S. fiscal deficit remained high throughout the 1986-91 period, and the Gramm-Rudman legislation was eventually abandoned.

Another policy issue with which the WEO authors wrestled around the beginning of the 1980s was whether the root cause of the inflation that was then rampant was primarily monetary or structural. A decade earlier, any sustained inflation would have been analyzed as a simple case of "too much money chasing too few goods"; in Milton Friedman's catchphrase, inflation was said to be "always and everywhere a monetary phenomenon." The inflation of the 1970s, however, seemed different, partly because it clearly had been aggravated by a major structural shift—the two large rounds of increases in world oil prices of 1973-74 and 1978-79—and partly because it persisted through a decade of sluggish aggregate demand.

This structural stagflation had fostered many attempts to develop a more comprehensive model of inflation, but not with much success at producing a new consensus.[11]

In the late 1970s and early 1980s, the Fund's Executive Directors generally treated inflation in the major industrial countries as a structural as well as a monetary problem, while the staff treated it more as the result of lax monetary policy. For example, the spring 1979 WEO paper included an analysis of overall monetary growth in the large industrial countries, which showed that a broadly defined aggregate money stock for the G-10 countries had grown by around 10 percent per annum since 1975; the paper concluded that the primary method available for cutting inflation was to reduce that growth rate. That approach was criticized by some Executive Directors, who argued that cost-push pressures and institutional factors were also important and that aggregating money growth across countries was a dubious technique when exchange rates were floating.

If inflation was partly structural in its origins, then a case could be made for structural or incomes policies to control it. Overall, the staff was skeptical of incomes policy, having only recently decided that it had not been beneficial in the preceding decade. With some prodding by Executive Directors and the Managing Director, however, the WEO documents gradually reflected an eclectic stance. That process began in January 1980, when the staff paper for the WEO discussion noted that the recent tightening of monetary policies in several industrial countries was driving up interest rates and slowing output growth, and invited Executive Directors to discuss options for alleviating those pressures. The Board, with the full agreement of the Managing Director, responded that incomes policies could help. A few months later, in the next WEO survey, the staff gave its first qualified—and doubtless grudging—endorsement: "Incomes policies can sometimes help in solving the inflation problem while cushioning the impact of restrictive monetary policy on real activity" (WEO, May 1980, p. 7).

This soul-searching was far from academic. In 1981, five of the G-7 countries were actively implementing incomes policies, and many policymakers in those countries had concluded that the strong ideological opposition of the governments in the other two—the United States under President Reagan and the United Kingdom under Prime Minister Thatcher—was forcing an unnecessary reliance on monetary restraint and thus unduly driving up world interest rates. The undercurrent of the discussion was an attempt to bring the influence of the Fund to bear on the two holdouts. The staff paper for the spring 1981 discussion contributed to the debate by including a favorable analysis of several successful cases. The paper supported the idea of the "more flexible forms of incomes policies . . . in which efforts are made to relate the growth of real wages to the average economy-wide gain in productivity adjusted for changes in the terms of trade" (WEO, June 1981, pp. 9-10). Much

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[11]See, for example, the papers in Monti (1976) and Hall (1982); and Bruno and Sachs (1985). Friedman's 1963 Bombay lecture, which stresses the "always and everywhere" argument, is reprinted in Friedman (1968), pp. 21-39.

of the Executive Board endorsed that view, and Directors expressed particular admiration for the Japanese structural approach to inflation control.

The attention given briefly to incomes policies in the early 1980s was just one small sample of the attention paid to structural issues in the WEO. Especially from around 1986 on, analyses of structural problems became increasingly more systematic. Protectionist trade policies, labor market efficiency, the measurement of the natural rate of unemployment and potential output growth, and the economic effects of demographic changes were a few prominent issues.[12] To a large extent, the staff's choices on such matters were driven by the concerns of policymakers, as conveyed through the Executive Board. Demographic change, for example, became an issue in the WEO in the late 1980s, primarily in response to concerns about the projection of a relatively rapid rise in the average age of the Japanese population and its possible implications for the magnitude and distribution of world savings. At the same time, the models that underpinned the WEO forecasts were evolving toward a longer-run and more structural design, which gave the staff an ability to analyze issues that could not have been supported by earlier, more demand-driven, models.

3. The Forecasting Process

A key feature of the WEO exercise is the generation of forecasts that are conditional on standard assumptions. That is, the WEO forecasts are not necessarily the staff's best judgment of what will happen; they are the best judgment of what would happen, subject to certain assumptions. The standard "technical" assumptions for the short-term forecasts (i.e., forecasts for the remainder of the current year plus the following one) are that exchange rates among industrial countries will remain fixed in nominal terms, that oil prices will remain fixed in terms of U.S. dollars, and that current economic policies will continue. The definition of current policies allows for announced changes, regardless of whether they have yet been implemented. (See, for example, WEO, October 1985, p. 1.) Overall, the short-term forecasts incorporate enough flexibility that they can be interpreted as if they were unconditional. Similar assumptions underpin the medium-term scenarios, except that exchange rates and key prices are fixed in real rather than nominal terms beyond the end of the short-term forecast horizon, and the possibility of cyclical disturbances is excluded after the end of the short-term horizon. In this context, the constraints are more fundamental.

The specification of policy assumptions for the medium-term scenarios becomes especially difficult when current policies are thought to be unrealistic and unsustainable. The

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[12]No brief survey could do justice to the range of issues covered in the research papers prepared as background for the WEO. For the flavor, see Corden (1987) on protectionism; Chapters 1 and 2 in *Staff Studies* (July 1986) and Bartolini and Symansky (1993) on labor markets; Adams, Fenton, and Larsen (1987) on potential output; Heller et al. (1986) and Masson and Tryon (1990) on demographic effects; and Chapters 1-4 in *Staff Studies* (August 1989) on a broad range of structural policy issues.

projections will often become less and less believable as the forecast horizon lengthens, and the staff is forced either to hedge the forecasts or to derive complex explanations. This overdetermination problem first became acute in 1984, when the strength of the U.S. dollar was clearly unsustainable. It cropped up again around 1987, when the prevailing policy stance in the United States implied a growth in the stock of U.S. debt that was inconsistent with the maintenance of unchanged real exchange rates.

The staff solved the problem beginning with the fall 1986 WEO—and even made a virtue of it—by emphasizing the "tensions" in the unrealistic scenarios. "Circumstances may arise, of course, in which current policies appear to be either unsustainable or inconsistent with the underlying exchange rate assumption. In such cases, the analysis focuses on the alternative ways in which incompatibilities might manifest themselves, or be reconciled" (WEO, April 1987, p. 11). This approach acknowledged explicitly that the projections are overidentified: policies would have to be adjusted if the authorities hoped to keep exchange rates stable. By focusing on the "tensions" in the overly constrained scenarios, the staff could discuss the requirements for a responsible policy stance without having to predict either policy changes or exchange rates.

The "indicators" tables in the spring 1987 WEO paper for the Executive Board suggested that from 1986 to 1991, the U.S. general government deficit would be reduced by 1.8 percent of GNP under the assumption of partial implementation of Gramm-Rudman. The counterparts of that deficit reduction were shown as a rise in gross private investment of 1.4 percent of GNP and a fall in the current-account deficit by 0.4 percent of GNP (with no change in the private saving rate).[13] The text pointed out that this scenario involved tensions, in that a strengthening of investment by that size seemed unlikely—whether on the basis of economic theory, econometric evidence, or historical perspective—while a larger reduction in the external deficit would seem to require a real depreciation in the dollar (which was inconsistent with the technical assumptions underlying the scenario).

The process by which these forecasts were produced was, for much of the 1980s, a cumbersome and unwieldy routine that imposed severe strains on the staff's limited resources. The Research Department, which had overall responsibility for the exercise, would initiate the forecasting round by circulating questionnaires to the area departments. Those questionnaires specified the main assumptions that were to underpin the forecasts (oil and other primary commodity prices, key-currency exchange rates, etc.) and asked the desk economists to provide initial projections for their countries on that basis. (Only the larger countries were included in this exercise; small countries were assumed to follow the patterns of their larger neighbors or trading partners.) These first-round forecasts were produced by whatever economic theories, methodology, models, and data that the desks believed to be relevant and appropriate for the country concerned. Some forecasts were derived primarily from official national projections, some were derived in part from models estimated and maintained by the

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[13]The 1991 projections were not included in the published WEO.

area departments, and some were largely judgmental. The Research Department staff would then feed the results into the central WEO data base for processing by (mainframe) computer and would carefully analyze the global and regional outcome for consistency and credibility. The results would then be returned to the area departments for further review and revision. Normally, several iterations would be required to produce a consistent forecast for the world economy, and over time this iterative interaction between the country desks and the WEO staff became a year-round disciplinary influence on the Fund's forecasts and analysis.

The forecasting process gradually became more streamlined and efficient toward the end of the decade, partly because of the increased availability of computer technology and the successful development of multinational econometric models in the Research Department. The latter development is examined in the next section.

4. Modeling the world economy

The debate over whether judgmental forecasting should be replaced by econometric models has always been highly controversial and contentious. Even in the heyday of the large models of national economies in the 1960s, most successful forecasters used the models more for evaluating internal consistency than for making baseline projections.[14] During the 1970s, the preeminence of large-scale econometric models for macroeconomic forecasting was challenged by several developments, including a return to simpler, smaller, and more transparent models and the development of more sophisticated time-series techniques. In response to the Lucas critique (Lucas, 1976), the use of models for forecasting fell for a while into almost total disrepute. Not until the mid-1980s would econometric techniques advance to the point where forecasters could conclude comfortably that they had taken adequate account of the critique (at least in the absence of a major regime change), principally by allowing expectations to be determined by and consistent with the structure of the model.

Multilateral Exchange Rate Model

The first model to play a significant role in the WEO exercise was the Multilateral Exchange Rate Model (MERM).[15] The idea for the MERM, which was developed by Paul

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[14]Clive Granger (1980) summarized model-based forecasting experience as follows: "... the forecasts produced by the model are not necessarily the forecasts issued by the model's constructors. If a forecast ... seems strange or out of line with ... the econometrician's own judgment, then it will probably be altered to look more reasonable. This application of 'tender loving care' has been shown to result in improved forecasts ..." (p. 119). For history and evaluation of policy analysis with econometric models, see Bodkin et al. (1990) and (specifically in a multi-country setting) Bryant et al. (1988).

[15]Earlier partial-equilibrium empirical models were developed by Jacques Polak and others in

(continued...)

Armington in the late 1960s (Armington, 1969), was to derive equilibrium relationships between exchange rates and trade balances by reference to highly disaggregated production functions. The model proved its worth in the policy discussions after the August 1971 suspension of dollar convertibility into gold, which led to the December 1971 ministerial meeting of the G-10 (the Smithsonian meeting) at which a new set of fixed exchange rates for the major industrial countries was to be negotiated. The staff's estimates of the pattern of rates that would equilibrate current-account balances were a major input into the negotiations, and the exchange rates that emerged from the political negotiations were quite close to the MERM solutions (see de Vries (1976), Chapter 26, and James (1995), pp. 222-223). Although the agreed rates quickly turned out to be unsustainable (the whole fixed-rate system collapsed just 15 months later), the problem was less with the initial pattern than it was with the subsequent lack of stabilization and coordination of macroeconomic policies.

The MERM was formalized first by Artus and Rhomberg (1973) and later by Artus and McGuirk (1981). It was a purely static but highly disaggregated system of relationships that explicitly recognized the multilateral dimension of the external adjustment process: a country's "effective" exchange rate could be derived as a weighted average of bilateral weights, not by the traditional arithmetic based on the value of bilateral trade with each country, but by estimating the elasticity of trade in specific categories of goods to changes in exchange rates and by taking into account indirect competition between countries.[16] The MERM could be solved either for the pattern of exchange rates that would bring about a desired set of current-account balances (as for the 1971 Smithsonian discussions) or for the current-account balances that would result from an assumed set of exchange rates. It was in this latter mode that the MERM played a key role in quantifying the WEO forecasts in the 1970s and early 1980s (de Vries (1976), pp. 125-126, 790, and 810). Shortly afterwards, however, the comparative-static nature of the model had rendered it obsolete for most WEO purposes, and it was gradually phased out.

World Trade Model

The second general empirical model developed at the Fund was the World Trade Model (WTM), which was introduced in the late 1970s as a complement to the MERM (see

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(...continued)
the Research Department as early as the late 1940s; see notably Polak (1953), as well as the review in Frenkel, Goldstein, and Khan (1991). In addition, throughout the late 1970s and 1980s, the WEO forecasting process made use of a basic computer model (known as the "WEO facility") to derive the global implications and to test the consistency of the forecasts generated by the country desks in area departments.

[16]If two countries both sell the same good, or competing goods, to a third country, a change in either country's exchange rate vis-á-vis the third will affect the competitiveness of the other. That effect was captured by the MERM but not by models based on bilateral trade.

Deppler and Ripley, 1978). The WTM was a global, partial-equilibrium, model designed to estimate the effects on international trade from changes in domestic economic activity. Like the MERM, it focused primarily on the larger industrial countries, but it did include more dynamic adjustment.[17] The model was used by the Research Department to check the area departments' forecasts for consistency and to start the iterative process by which a global economic forecast was to be produced. However, these initial trade forecasts were never accorded much credibility by the area departments and therefore had little real influence. The WTM was updated and expanded (see Spencer, 1984), but its basic limitations—the absence of expectations, limited dynamic adjustment, and minimal feedback from international trade to domestic activity—remained. It played less and less of a role in the WEO process over time and—like the MERM—was phased out completely by the end of the 1980s.

MINIMOD

The real breakthrough in the evolution of modeling at the Fund came in 1986. The year before, in a first effort to tackle the Lucas critique head-on, the internal WEO papers had included a report on the results of a simulation study comparing policy effects with and without Muth-rational (i.e., model-consistent) formation of expectations about the economy.[18] That study showed that while fiscal multipliers were smaller when agents displayed perfect foresight about policy effects, most of the qualitative conclusions of the more conventional models still applied. To carry this type of analysis forward, the staff derived a scaled-down version of the Federal Reserve's Multi-Country Model. The Fund version, dubbed MINIMOD, not only had far fewer equations to be solved and thus was more manageable; it also incorporated endogenous, forward-looking, model-consistent, expectations and thus was relatively immune from the Lucas critique.[19] Relationships such as saving and investment functions depended in part on agents' expectations of future changes in interest rates, inflation, and exchange rates; and those expectations were formulated to be consistent with the long-run solution of the model (i.e., agents, on average, were assumed to forecast the eventual outcome of any policy or other exogenous action correctly).

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[17]The model comprised blocks of equations for 14 individual industrial countries, plus four blocks for groups of countries: developed countries producing primarily primary commodities, major oil-exporting countries, other developing countries, and centrally planned economies (including non-member countries).

[18]The study, Masson and Blundell-Wignall (1985), made use of a simplified version of the OECD's INTERLINK model, called "Minilink."

[19]See Haas and Masson (1986) and Masson (1987). The model could be solved either with or without endogenous expectations, but once the staff became convinced that the fully consistent solution gave the more realistic and credible forecasts, the partial version was largely abandoned.

MULTIMOD

The final step, a direct outgrowth of the MINIMOD project, was the development of MULTIMOD. Once the principle of generating alternative scenarios by running simulations with a global model was established and accepted, the Research Department staff set about estimating its own model. By the time of the spring 1988 WEO, MULTIMOD was ready for its debut. The new model (Masson et al., 1988) differed from its predecessor in several respects. It was much larger (a total of 308 equations covering seven countries or groups of countries, compared with a total of 67 equations for the United States and the "rest of the world" as a single bloc in MINIMOD);[20] the parameters were estimated by the staff using the Fund's own WEO data base, rather than being borrowed from other models; and the role of endogenous and model-consistent expectations was more extensive. Like MINIMOD, it was used by the staff to generate the *alternative* scenarios: the baseline projections were still based on the judgment of the country desks, and the model generated the deviations from the baseline in response to specified policy changes or other shocks.

When the Executive Board met to discuss the WEO in March 1988, the MULTIMOD projections immediately became the star of the show. The medium-term paper now included, besides the baseline, 11 alternative scenarios predicated on specific shifts in policies or other conditions. Three scenarios detailed how the "tensions" in the baseline might be manifested if the major countries did not change their policies in time. There might be another stock-market crash like that of October 1987, there might be severe deflation, or there might be a run on the U.S. dollar. The next five scenarios explained the types of policy changes that could avoid these dire consequences: improved structural policies in Europe, more fiscal consolidation in the United States, increased domestic investment and import penetration in Japan, or combinations of the above. The remaining exercises examined other possible actions such as increased financing for the heavily indebted developing countries and increased protectionist measures in industrial countries. These simulations—presented in detailed tables covering projections for each year 1988 through 1992, with accompanying analysis—provided a much more concrete foundation for the Board discussion than had ever before been possible. This type of exercise became the standard for years to come.[21]

Developing-country models

The Fund staff constructed several partial- and general-equilibrium models of developing countries in the 1970s and 1980s. Two circumstances combined to spur this

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[20]MULTIMOD was later extended to include a larger number of individual countries and greater disaggregation of the groups; the non-industrial world, however, remained highly aggregated. See Masson, Symansky, and Meredith (1990).

[21]For an independent (World Bank staff) evaluation of the analytical and forecasting properties of MULTIMOD, see Jamshidi (1989).

activity: operational work at the Fund shifted more heavily toward the developing world, and the quantity and quality of data improved by enough to support the estimation of at least rudimentary empirical models. Several early studies, such as Khan (1974) on Venezuela and Otani and Park (1976) on Korea, focused on the linkages between monetary policy and economic activity and inflation. By the 1980s, more comprehensive macroeconomic models were appearing, such as Khan and Knight (1981). Simultaneously with the empirical studies, Fund staff were conducting basic theoretical research on the structure of developing economies and the differences between modeling industrial and developing countries. That work culminated in a series of papers in the early 1990s, collected in Khan, Montiel, and Haque (1991).

For the WEO scenarios, the Research Department developed two independent models of the developing world in the late 1980s. One, the developing-country module of MULTIMOD, was used to project the implications of the industrial-country scenarios for developing countries taken together. The other, LDCMOD, was used to produce disaggregated projections that could be re-aggregated and studied for any geographic or analytical group of countries.[22] LDCMOD comprised some two dozen behavioral equations plus around 60 identities for close to 100 individual countries. Because of data limitations and the sheer size of the project, the structure and econometric sophistication of LDCMOD were far more rudimentary than those of MULTIMOD. The LDCMOD simulations took the industrial-country output from MULTIMOD as exogenous inputs; in principle, the LDCMOD simulations could have been fed back into MULTIMOD and so on through an iterative interaction to produce a globally consistent set of projections. The MULTIMOD team, however, preferred to iterate with their own highly aggregated developing-country blocs (which, like the rest of the model, incorporated forward-looking, model-consistent, expectations) in order to produce an *internally* consistent outcome. This procedure was obviously inelegant, but it had a certain practicality that enabled it to endure well into the 1990s.

5. Evaluating the Outlook

How useful were the WEO forecasts, and were they improved by the development of sophisticated models and the interaction with the policy interests of the Executive Board in the 1980s? Answering those questions is far more complicated than just comparing the forecasts with actual outcomes, because of the constraints in the forecast process. If countries' policies changed (as they inevitably did) in the interim, then the outcome would differ from the forecast even if the forecast was perfect on its own terms. Over a long enough period, however, such apparent errors should even out, and the forecasts should be unbiased. The two key questions, then, are whether a persistent bias has been evident—either in the observed forecast errors or in the qualitative approach taken by the staff—and whether the forecasts have been statistically efficient: that is, whether they have added significantly to the

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[22]Analytical categories included countries grouped by level of per-capita income, type of principal exports, or degree of external indebtedness. For an exposition, see Adams and Adams (1989) and Kumar, Samiei, and Bassett (1993); the name LDCMOD was introduced in the latter paper.

information that one could get simply by looking systematically at the historical time-series data without reference to an economic model.

In the policy discussions at the Fund, the question of bias arose primarily for the medium-term scenarios. The staff acknowledged that the medium-term reference scenarios contained an inherent optimism in that they ruled out both recessions and exchange-rate changes. That optimism was tempered by the construction of alternative scenarios that illustrated how the tensions in the baseline might be resolved, but the staff still ran into frequent criticism that it was viewing the world with rose-colored glasses. Even the alternative scenarios necessarily assumed that countries borrowing from the Fund would successfully carry out the economic programs on which stand-by arrangements were conditional; since in practice many Fund-supported adjustment programs were not successfully completed, the potential for serious imbalances and crises was inherently greater than recognized in the scenarios. Executive Directors often complained that the staff was failing to recognize the dire consequences that lay ahead like economic land mines.

Occasionally, the question of bias arose in the discussion of the short-term forecasts as well. In February 1979, Executive Directors complained that the staff seemed to be overestimating likely growth in the industrial countries while underestimating the inflation problem. At the time, the OECD's *Economic Outlook* was projecting 3 percent growth in 1979-80 for the industrial countries as a whole, whereas the WEO was projecting 3.7 percent. Executive Directors, on the whole, concluded that the OECD forecast was more realistic. (The outturn, incidentally, was 3.5 percent.) That type of dispute, however, was uncommon.

Two intensive assessments of the basic track record have drawn mixed conclusions. Artis (1988) concluded that the forecasts of economic growth had been biased toward optimism in the 1970s but not in the 1980s, that in general the forecasts were statistically efficient, and that overall the Fund had done no better or worse than national or other international forecasters during the 1970s and 1980s (pp. 1-3). Four years later, Barrionuevo (1992) concluded that although the WEO forecasts were not biased in the 1980s, they were less accurate than forecasts made with simple time-series methods.[23] In assessing that conclusion, however, one must keep in mind that time-series forecasting methods provide insufficient information for policy analysis and thus are not a viable option for a project such as the WEO.

No matter how one interprets the statistics, if one considers the size and complexity of the task it is clear that the World Economic Outlook has been a major success story for the IMF. Driven in part by constant feedback from the world's economic policymakers, by the beginning of the 1990s the WEO had become arguably the world's leading review of global economic trends and prospects. Without question, it was the polestar of the Fund's analytical work and of its communication with member countries and the public at large.

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[23]For an informal but independent analysis, see Worswick (1983). Artis (1996) updated and extended his earlier study and drew similar conclusions.

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