Forecast Tables: Introduction and Glossary

Forecasts (or simulation results) from International Futures (IFs) are dynamic calculations of the full modelling system, not extrapolations of series, results of isolated multiple regressions, or representations of the forecasts of others. To understand more about IFs forecasts and the specific formulations for the variables shown in the following tables, see the text of this volume, especially Chapters 4 and 5, and the documentation of the model.

Forecasts for individual countries over a long period of time are very seldom done. There are good reasons for reluctance to provide such forecasts, including:

- Data in any series are seldom available for all countries, particularly for smaller ones or those that have undergone substantial sociopolitical transitions. IFs represents 182 countries and uses estimation procedures to fill data holes as necessary.
- Every country is very much unique. Formulating a large-scale dynamic model to behave reasonably in the face of such complexity is extremely challenging, and structures of the system will never be completely free of poor behavior for many countries, especially under extreme or new circumstances.
- Some variables, such as income distribution (Gini), have especially weak bases for forecasting.

Most longer-term global forecasting reduces the severity of these problems in several ways, including reliance on regional aggregations of countries and significantly limiting the forecast horizon. The tables included here obviously ignore such practical approaches and simply present the numbers the model produces. This volume has repeatedly emphasized that we should never treat any model results as predictions; we should instead use them for thinking about and exploring possible futures. That is the spirit behind these tables. With continuing development of the modeling system, results will change and presumably improve on average. The project will give regular attention, in particular, to results that are extreme relative to other countries or to expectations based on regional expertise or other forecasts.

These forecast tables are organized by geographical, substantive, and temporal attributes. Geographically, the first page of each of eighteen sets begins with global and four-continent totals (Africa, the Americas, Asia with Oceania, and Europe), followed by the UN subregional divisions within each of the continents—see Chapter 7 for definition and discussion of those subregions. The subsequent six pages of each set provide forecasts for each of the country members of the subregional divisions within the four continents.

The eighteen sets cover six substantive issue areas. The first simply provides total population and population density information. The remaining sets of forecasting variables are divided into five categories: poverty (with standard economic variables such as GDP and GDP per capita as well as some demographic ones), health, education, infrastructure, and governance. These five categories correspond to the topics the Patterns of Potential Human Progress series will cover, and forecasts in each category will therefore be developed across volumes.

Temporally, each forecast series contains values for 2005, 2030, and 2055, thereby providing a forecast horizon of fifty years. Additional columns show the cumulative percentage change forecast from 2005 through 2055 and the annualized rate of change over the period. The model is currently initialized in 2000, and it computes annual results recursively from 2000 through the simulation horizon. Thus results in years after 2001 are computations rather than actual values, even when data are available. The only exception is that IFs imposes the actual GDP data from 2001–2005 on the model calculations so as to obtain accurate

values for this key series. In the near future the model will be rebased to 2005 and run from that year. That rebasing will change (and improve) all results, although few are likely to change dramatically. We will post new forecast sets on line periodically.

To facilitate reading and interpretation of the hard-copy tables presented here and the electronic copies on the IFs web site (www.ifs. du.edu), we provide the following glossary of the variable names used in the tables, the variable name used in IFs, and some basic comments on the variables, such as the sources of initial conditions and/or the forecast approach.

Variable	IFs Name	Source and Comments
Annual Carbon Emissions	CARANN	Releases to the atmosphere of carbon dioxide from any human activity (such as burning fossil fuels or deforestation).
Calories per Capita	CLPC	Calorie consumption per day from all sources. Initialized with data originally from the UN FAO.
Contraception Use	CONTRUSE	Percentage of women of reproductive age (usually measured as 15–49) using any form of contraception. Initialized from Population Reference Bureau assorted years.
Crop Yield	YL	Agricultural crop production of all kinds summed and divided by land area devoted to the production. Initialized with production and land data originally from UN FAO.
Crude Birth Rate	CBR	Annual births per thousand population. Although the measure shows progress of the demographic transition, total fertility rate (see TFR) is a better measure of fertility.
Crude Death Rate	CDR	Annual deaths per thousand population. Although the measure indicates progress of the demographic transition, life expectancy is a better measure of population health.
Economic Freedom	ECONFREE	Initialized from Fraser International, which defines economic freedom as "the extent to which one can pursue economic activity without interference from government" and builds its index on several measures assessed by experts. See http://www.freetheworld.com.
Economic Integration Index	ECONINTEG	Based on A.T. Kearney/Foreign Policy globalization subindex, tied to trade and foreign direct investment flows. See Hughes 2005, Part II, for IFs specification.
Education: Adults (15+) with Primary Education	EDPRIPER	Percentage of adults aged 15 years or older with a completed primary education. Initialized from the Barro-Lee data set (Barro and Lee 2000).
Education: Adults (15+) with Secondary Education	EDSECPER	Percentage of adults aged 15 years or older with a completed secondary education. Initialized from the Barro-Lee data set (Barro and Lee 2000).
Education: Adults (15+) with Tertiary Education	EDTERPER	Percentage of adults of 15 years or older with a completed tertiary education (any degree). Initialized from the Barro-Lee data set (Barro and Lee 2000). Tertiary education for most countries begins beyond grades 10–12.
Education: Adult (25+ Years of Education)	EDYRSAG25	Average number of years of education of adults 25 years of age or older. Initialized from the Barro-Lee data set (Barro and Lee 2000).

Variable	IFs Name	Source and Comments
Education: Net Primary Education Enrollment	EDPRIENR	The percentage of the relevant age group (based on the International Standard Classification of Education 1997) enrolled in primary education. Contrast this with gross enrollment, which includes those enrolled from other age groups, but maintains the base of the relevant age group and can therefore exceed 100%) . Initialized with UNESCO data.
Education: Primary Education Completion	EDPRICR	The percentage of the relevant age group that completes primary education. Initialized from UNESCO data. Primary education for many countries is the first 5 grades.
Education: Net Secondary Education Enrollment	EDSECENR	The percent of the relevant age group enrolled in secondary education. Initialized with UNESCO data. Secondary education for most countries is approximately grades 6–10. (See net primary enrollment for distinction between gross and net.)
Energy Demand Ratio to GDP	ENRGDP	Sometimes called energy intensity, the units of energy consumed per unit of GDP generally decrease as countries get richer. Initialized mostly using data from British Petroleum. A technology parameter heavily influences forecasts.
Freedom House Index (Inverted)	FREEDOM	Freedom or democracy levels. This variable is initialized from the well-known indicator from the Freedom House Freedom in the World series. Freedom House defines freedom as "the opportunity to act spontaneously in a variety of fields outside the control of government and other centers of potential domination." See www.freedomhouse.org. Coding of countries on separate civil and political liberty scales are done by experts. Inverted from Freedom House so that higher means more free (2–14).
Gini Index	GINI	The Gini index, originally from Corrado Gini, is computed from the Lorenz curve of income or other distribution and varies from 0 to 1 (highest means most unequal); sometimes values are multiplied by 100 and expressed as a percentage. See Figure 3.1 and discussion. Initialized from compiled World Bank sources and IFs data preprocessor to fill holes. Computed in IFs only across two categories of country subpopulation, so that forecasts of this variable are highly problematic.
Globalization Index	GLOBALIZ	Based on A.T. Kearney/Foreign Policy globalization index, built on four subindexes for economic integration, personal contact, technological connectivity, and political engagement. See Hughes 2005, Part II for specification in IFs.
GDP per Capita	GDPPC	GDP per person (of any age) in a population. Computed in IFs economic model.
GDP per Capita at PPP	GDPPCP	See GDPP and GDPPC. See GDPP for explanation of PPP.
Government Corruption Perception	GOVCORRUPT	Based on and initialized from Transparency International's Corruption Perceptions Index. CPI is a composite index that draws on multiple polls and surveys. See www.transparency.org.
Government Effectiveness	GOVEFFECT	Initialized from the World Bank's (Daniel Kaufman, Aart Kraay and others) Governance Matters index, defined as "the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies." Rescaled from the original to run from 0–5 (most effective).
Gross Domestic Product	GDP	Gross domestic product is defined as either the sum of value added across all sectors of an economy or as the sum of goods and services delivered to meet final demand of an economy. Initialized from WDI data using 2000$; forecasts use much other data including GTAP series.

Variable	IFs Name	Source and Comments
Gross Domestic Product at PPP	GDPP	See GDP and Box 2.2 on purchasing power parity. In an OECD definition, "Purchasing Power Parities (PPPs) are currency conversion rates that both convert to a common currency and equalize the purchasing power of different currencies. In other words, they eliminate the differences in price levels between countries in the process of conversion." Initialized from WDI data using 2000$ at purchasing power parity; forecasts use much other data including GTAP series.
HIV Infection Rate	Not directly available in model; calculated as infection numbers over population	The percentage of adults (15–49) living with HIV infection at end of the year. Computed from HIVCASES and POP in IFs population model. Initial conditions from UNAIDS and recent downward revisions by that source are not fully reflected.
Human Development Index	HDI	This corresponds very closely to the UNDP's HDI (see http://hdr.undp.org), which is an average of three components: long and healthy life, knowledge (literacy and education), and standard of living (GDP per capita). Computed in IFs population model from nearly identical drivers within IFs (see Hughes 2004c for specifics).
Human Development Index: HDI with Higher Ceilings	HDI21STFIX	An IFs-specific measure. Computed in IFs population model from driver categories within IFs corresponding to the UNDP's HDI, but with maximum values raised to levels that constitute better upper limits for the twenty-first century, notably life expectancy of 120 and GDP per capita of $100,000. It would be good to substitute secondary education completion for literacy rate (see Hughes 2004c).
Infant Mortality	INFMOR	The death rate of infants in the first year of life per 1,000 births. Initialized from WDI.
Infrastructure: Electricity Use	INFRAELEC	Defined as kilowatt hours per capita. Initialized from WDI. Formulations for this and other infrastructure variables in IFs are very simple at this stage.
Infrastructure: Internet Use	Not directly available in model; calculated	The percentage of the population with Internet access. Calculated from the number of networked people (NUMNWP) divided by the population size.
Infrastructure: Road Density	INFRAROAD	Defined as meters of road per hectare. Initialized from WDI. Formulations for this and other infrastructure variables in IFs are very simple at this stage.
Infrastructure: Telephone Density	INFRATELE	Defined as telephone lines per 1,000 people. Initialized from WDI and indirectly from ITU. Formulations for this and other infrastructure variables in IFs are very simple at this stage.
Knowledge Society Index	KNOWSOC	Based on A.T. Kearney/Foreign Policy knowledge subindex. See Hughes 2005, Part II for specification tied to research and development spending and tertiary graduation rate.
Land Area	LANDAREA	Total national land area in 10,000 square kilometers, which equal 1 million hectares. Constant over time.
Life Expectancy at Birth	LIFEXP	The average number of years a newborn is expected to live.
Literacy	LIT	The basic definition is the ability of adults to read and write, but different countries use very different standards. Initialized from WDI data.

Variable	IFs Name	Source and Comments
Malnourished Children	MALNCHP	As defined by the World Bank, "The percentage of children under five whose weight for age is more than two standard deviations below the median reference standard for their age as established by the World Health Organization" and other bodies. Individual countries may look at children at ages 3, 4, or 5. Initialized from WDI data using weight-based malnutrition measure.
Malnourished Population	MALNPOPP	As defined by the World Bank, "Population below minimum level of dietary energy consumption (also referred to as prevalence of undernourishment)" on a continuous basis. Initialized from WDI data.
Polity Democracy Index	DEMOCPOLITY	Democracy level, with attention to autocracy level. Based on and initialized from Polity project data (see http://www.cidcm.umd.edu/polity). Historical values are coded by experts. Computed in IFs as the Polity measure of democracy (1–10 with highest meaning most democratic) minus Polity autocracy (1–10 with highest meaning most authoritarian) plus 10. This combined index measure is fairly widely used. See also FREEDOM.
Pop per Area	No variable name in model; calculated from others	Population per land area
Population	POP	Total number of people within a country. Total initialized from WDI data, with cohort data on age-sex distribution, fertility, and mortality from UN Population Division.
Population Growth Rate	POPR	Annual percentage change. See population.
Population Above 65 Years	POPGT65	The total number of people in this age category, which is generally considered a period of nonparticipation in the labor force.
Population Below 15 Years	POPLE15	The total number of people in this age category, which is generally considered a period of economic dependence on others.
Poverty (below $1 cross-section)	INCOMELT1CS	Population living below $1.08 per day at 1993 international prices (purchasing power parity). Initialized from the World Bank's PovCalNet. See Chapter 4 for details of forecasting formulation, which is based on a cross-sectional (CS) analysis of the relationship of GDP per capita and poverty rates, also responsive to the Gini index of distribution. See Poverty below $1 lognormal for a note on our inability to translate 1993 dollars to more contemporary values.
Poverty (below $1 lognormal)	INCOMELT1LN	Population living below $1.08 per day at 1993 international prices (purchasing power parity). Initialized from the World Bank's PovCalNet. See Chapter 4 for details of forecasting formulation, which is based on an assumption that income in a country is subject to lognormal (LN) distribution, also responsive to the Gini index of distribution. See Chapter 2 for a discussion of the problems with converting values from 1993 dollars to contemporary currency levels; although changes in the global consumer price index suggest that $1.08 in 1993 dollars would be $1.98 in 2000 dollars and $2.82 in 2005 dollars, the problems with converting different countries with different market baskets and inflation patterns preclude such simple translation.
Poverty (below $2 cross-section)	INCOMELT2CS	Population living below $2.15 per day at 1993 international prices (purchasing power parity). See poverty at $1 for information.

Variable	IFs Name	Source and Comments
Poverty (below $2 lognormal)	INCOMELT2LN	Population living below $2.15 per day at 1993 international prices (purchasing power parity). Initialized from the World Bank's PovCalNet. See poverty at $1 for information.
Poverty (below $5 lognormal)	No variable name in model; calculated from others	Population living below $5.40 per day at 1993 international prices (purchasing power parity). See poverty at $1 for interpretation. The forecasts of values at income poverty levels above $2 per day do not use survey data for initial conditions, but rather use the lognormal formulation and survey data for $2 per day to estimate initial conditions.
Poverty (below $10 lognormal)	No variable name in model; calculated from others	Population living below $10.80 per day at 1993 international prices (purchasing power parity). See poverty at $1 for general interpretation and poverty below $5 for a note on initialization.
Poverty (below $20 lognormal)	No variable name in model; calculated from others	Population living below $21.60 per day at 1993 international prices (purchasing power parity). See poverty at $1 for general interpretation and poverty below $5 for a note on initialization.
Research and Development Expenditures	RANDDEXP	The OECD defines research and development to cover basic research, applied research, and experimental development; expenditures can be private or public. Initialized from OECD and WDI data.
Total Fertility Rate	TFR	The average number of children a woman is expected to bear throughout her life. Initialized from WDI data; forecasts initialized with cohort data on fertility from UN Population Division.
Water Use per Capita	WATUSEPC	Annual water withdrawals (all uses) divided by population. Initialized with data from FAO via WRI EarthTrends. Formulation in IFs is very basic and does not include feedback from water supply constraints.
Youth Bulge	YTHBULGE	Although the youth bulge is always an indicator of the portion of a population that is young, specific definitions vary. In IFs the definition is population 15–29 as a percentage of all adults (15 and up). A bulge exists when this ratio is above a specified level, such as 50 percent.

Data Source Organization Abbreviations

FAO: Food and Agriculture Organization of the United Nations

ITU: International Telecommunications Union

OECD: Organization for Economic Cooperation and Development

UNAIDS: The United Nations Program on AIDS

UNDP: UN Development Program

UNESCO: UN Educational, Scientific, and Cultural Organization

WDI: World Development Indicators of the World Bank

WRI: World Resource Institute