Producing state of the future indexes using the international futures model ☆

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ABSTRACT

This paper reports on the introduction of the State of the Future Index (SOFI) into the University of Denver's International Futures (IFs) modeling system, a synthesis that will permit the calculation and comparison of the SOFI for all nations covered in the model. The SOFI is an index designed to show whether the future outlook is improving or not; it is also useful in policy analysis since it can be used to demonstrate whether contemplated policies appear to change the future, overall, for the better. It is one of the few indexes that are forecasted.

The capability to calculate SOFI has been added to the IFs model; this addition now permits the model to calculate SOFI for all of the countries in the model. With this capability national SOFIs can be computed by anyone and for any country, set of countries, region, or globally. The model, its database, and now the SOFI calculation are available online at no cost to the users. This opens the opportunity to produce an annual or biennial publication that tracks and ranks the State of the Future Index for countries, regions, and the world as a whole.

1. Introduction, background, and objectives

This paper reports on a new facility for computing national State of the Future Indexes: the International Futures (IFs) model which operates at the Frederick S. Pardee Center for International Futures, University of Denver. Over the past several months the model has been modified to extend its database to include the required historical data, where available, interpolations for missing data where possible, and the SOFI algorithm has been added to accomplish the computation of a SOFI for any country. These capabilities are on line and free to the users of the IFs model.[1]

In 2001, the Millennium Project began to explore the possibility of creating a quantitative index, that would depict the global state of the future, measuring, in effect, whether the future seemed to be improving or not. The SOFI is a single integrated measure that indicates whether the human condition in a given country or region has improved or diminished and seems likely to improve or diminish in the future [2,3]. Inevitably some of the variables included in a SOFI will show the potential for improvement while others show worsening, but the SOFI integrates such changes into a single measure so that the balance between pluses and minuses can be assessed. Existing indexes such as the Human Development Index present an historic and current integration of measures of poverty reduction, education, and health; but this index and others miss important dimensions of sustainable human development captured by SOFI such as improvement or degradation of the environment, levels of corruption, and personal freedom.

☆ The Frederick S. Pardee Center for International Futures is the home of long-term forecasting and global trend analysis at the Josef Korbel School of International Studies on the University of Denver campus. The core of the Center's forecasting efforts is the Patterns of Potential Human Progress (PPHP) series. This project produces annual volumes on human development topics, beginning with global poverty reduction, which can be purchased or downloaded for free. The second published volume, Advancing Global Education, can also be purchased or downloaded. Each volume includes tables with long-term country-level forecasts across the various issue areas of the IFs model. (From http://www.ifs.du.edu/pardee/index.aspx). Also see [1].

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Global SOFI

The Millennium Project

Example of SOFI (State of the Future Index) Variables:

Infant mortality
Food availability
GNP per capita
Access to fresh water
CO2 emissions
Literacy
Wars
AIDS deaths
Terrorist attacks
Debt ratio
Unemployment
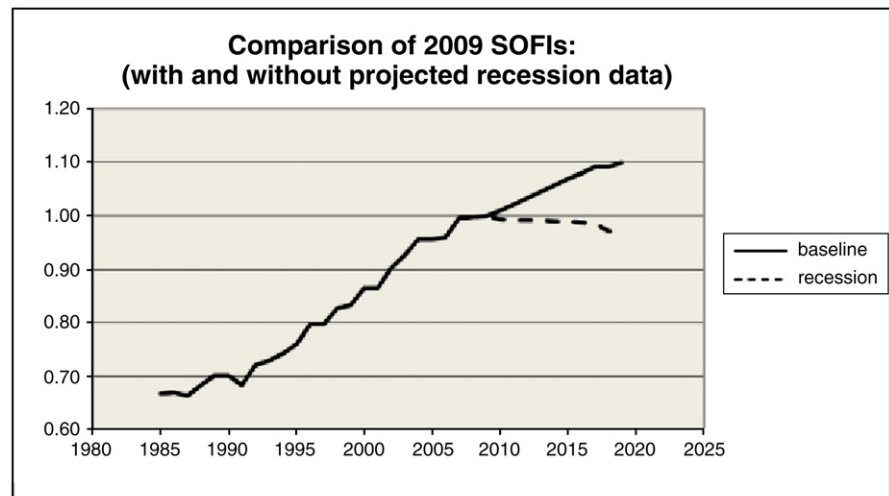Calories per capita
Health care
Forest lands
Rich poor gap
...

Comparison of 2009 SOFIs:
(with and without projected recession data)

baseline
recession

Fig. 1. Global State of the Future Index (illustrating effect of recession assumptions) [3].

What variables should be included in such an index (See [2] and [4] for a full discussion of what's involved in the creation of an index.))? What would make the global future appear to be improving or worsening? Working with a worldwide panel, the Project identified several dozen variables that could provide insight into the directions of change.

The State of the Future Index is constructed using a selected set of variables and forecasts that, in the aggregate, depict whether the future promises to be better or worse. The SOFI is intended to show the directions and intensity of change in the outlook and to identify the factors responsible. Some Millennium Project's experiments with the SOFI have illustrated how it might be used in policy analyses. In these tests, SOFI projections are first run without the contemplated policies. Then, in a second run, the proposed polices are included by estimating their consequences on forecasts of the SOFI variables. The recalculated SOFI is compared with the original run and in this way the effects of the policies are demonstrated. This process may show, for example, that a policy intended to improve one variable (say lowering of corruption) may produce a change in SOFI that is unexpectedly negative since other variables may have been affected adversely. The SOFI approach provides a mechanism for studying the relationships among the items in a system—how making a single change ripples throughout a system, creating some positive and intended consequence as well as unintended results.

To construct the index it is necessary to accomplish a number of steps. First historical data must be collected for the selected variables. Usually 20 years of historical data are collected if the forecast is to be 10 years into the future.[2] Missing data must be "imputed" using various techniques, the simplest of which is interpolation. Then the variables must be forecasted; usually using well known time series statistical techniques to make these forecasts. These forecasts are generally based on first or second order equations and therefore do not include perceptions about how future developments may influence their course. In many past SOFI calculations, perceptions about future developments obtained through international Delphi's and other sources have been included using Trend Impact Analysis.[3]

Next, the variables must be "non-dimensionalized." This process involves stating the value of the variables in terms of their percentage of the range defined by the "best" value and the "worst." These percentage values are then multiplied by their assigned weights and summed. This sum is known as the systemic SOFI. The SOFI is produced when the systemic SOFI is divided by the value of the systemic SOFI in a reference year.

Results of these computations for the most recent year in which global SOFI was produced by the Millennium Project are shown in Fig. 1.

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[2] The IFs model is set up to project through the year 2100. The rule of thumb used for SOFI is that the time span of historical data should be twice as long as the intended projection- usually 20 years of past data for 10 year projections. So that while the model is capable of numeric forecasts of 90 years, limitations in historical data should limit the time horizon to a decade.

[3] See Futures Research Methods, FRMv3, Millennium Project 2009 [2].

Table 1
List of IFs variables.

Variable	Model designator	Weight	Best	Worst
Calories per capita available (cal/person/day)	CalPCap	7.08	3800	1245
Freedom: Freedom House indicator (higher is more democratic	FreedomLevel	7.52	14	2
GDP per capita at PPP in 2000$ (using ITC 2007 update)	GDPPCP	7.50	75.98	.52
Energy demand ratio to GDP	GDPPUnitEnergy	8.00	1.938	.04
Infant mortality rate per 1,000 live births	SOFIInfMort	7.01	3.748	170.7
Number of networked persons	SOFIICTInternet%Pop	7.90	75.68	.005
Population (used in calculating per capita variables)	POP	na	na	na
Govmt corruption perceptions (based on TI, higher is less corrupt)	SOFICorruption	8.57	10	1.7
Life expectancy (years)	SOFILifExpect	7.14	83.88	27.9
Literacy % population 15 and older	SOFILiteracyAdultTotal%	7.45	100	19.05
Population growth rate (% year to year)	SOFIPopulationGrowthRate	7.27	1.012	5.292
Water source safe, % people with access to safe water	POPWNOSafWtr	8.33	87.75	.005
HIV infection rate, % adult population	SOFIHealthUNAIDSAdultHIV% MidEst	5.97	.0070	33.4
Education, secondary gross enrollment, % age group	EdSecEnrollGross%Total	8.09	140	5.687
Annual carbon emissions from non-fossil fuels	CarbonEmissionsPC	7.82	0	.039
Population with income less than $1 day	IncBelow1D%PovCalTotExt	7.84	0	61.24
Forest land area	SOFILandPcntForest	7.21	91.87	.034
Land area (used in calculating % forest land)	na	na	na	na
Energy, ratio, non-fossil except nuclear	ENPpct	0	8.05	1.299
Homicides	not used	6.92	0	.0015
R&D Expenditures as % GDP	SOFIR&D%GDPWDI	8.63	.028	0
Debt service, % GNI	SOFIDebtServ%GNI	6.79	−133.1	112.9
Number of Physicians (later expressed as % of population)	SOFIPhysicians	Data available but not yet included	na	na
Number of Women in Parliament, % parliament	SOFIWomParlWDI%	Data available but not yet included	na	na
Unemployment rate (% labor force)	SOFILaborUnemployment	Data available but not yet included	na	na

This figure shows the results of an analysis conducted in 2009 under differing assumptions about the global economic recession. The variables used were for the world as a whole, rather than for single countries. Whenever a global SOFI has been computed in the past, the general shape of the curve has been: appreciable growth in recent history, continuing into the future but at a slower rate.

Several other experiments have been run in which *national* SOFIs were manually constructed by South Korea, South Africa, Turkey, and for several Latin American countries. It soon became apparent that national SOFI's could be compared, nation to nation, but only if the variables and their weights were the same for all countries. In addition, since most countries have distinct interests, a second type of national SOFI (called a National Focus SOFI) was defined in which each country could select its own set of variables and perturbing developments. As an example of unique national interests, consider that what some nations consider a desirable direction of change others would deem undesirable. Case in point, population growth: while most countries would say slowing growth is a good thing, some countries (such as South Korea which is dropping in population) are concerned that further slowing population growth may result in negative economic and social consequences.

The work involved in constructing national SOFIs of either sort is considerable, therefore the possibility of using a facility such as the IFs model to make this computation across a set of nations over a wide time interval is very attractive.

The International Futures (IFs) model is a large-scale, long-term, structure-based and agent-class-driven global modeling system. It represents demographic, economic, energy, agricultural, socio-political, and environmental subsystems for 183 countries interacting in the global system. It can show how changing the value of a variable in a country affects other measures in that country, other countries, regions, and the world as a whole.

The central purpose of IFs is to facilitate exploration of global futures through alternative scenarios. IFs can be used to teach or study demographics, economics, food, energy, the environment, international politics and other substantive issue areas. It is especially suitable for analysis of sustainable human development and for examining the human dimensions of global change. The model is integrated with a large database containing values for its many foundational data series since 1960. Through its web site IFs is freely available to users both online and in downloadable form.[4] Most recently, the model has been used as the basis for a series of remarkable publications titled "Patterns of Potential Human Progress." Volume 1 of the series dealt with the outlook for poverty; Volume 2, with global education; Volume 3 with global health; Volumes 4 and 5 will address infrastructure and governance globally.[5]

The IFs model includes data for 183 countries and computes projections for the long-term future (to year 2100). The Millennium Project SOFI calculations extended ten years into the future. The original SOFI calculations were all spreadsheet-based, and as a result tedious and inefficient. Introducing SOFI into the IFs model, it was hoped, would lead to the capability to easily compute SOFIs for all countries for which data were available. If the capability to compute national SOFIs were added to the publicly available online model and the database were updated periodically, then SOFIs could be computed by anyone and for any country, set of countries, region, or globally. This opens the opportunity to produce an annual or biennial publication that tracks and ranks State of the Future Index for countries in a manner similar to the annual UNDP Human Development Index.

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[4] The model can be accessed at: http://www.ifs.du.edu/ifs/index.aspx.
[5] See: http://www.ifs.du.edu/documents/index.aspx for on-line access or Paradigm Publishers and Oxford University Press of India for print versions.
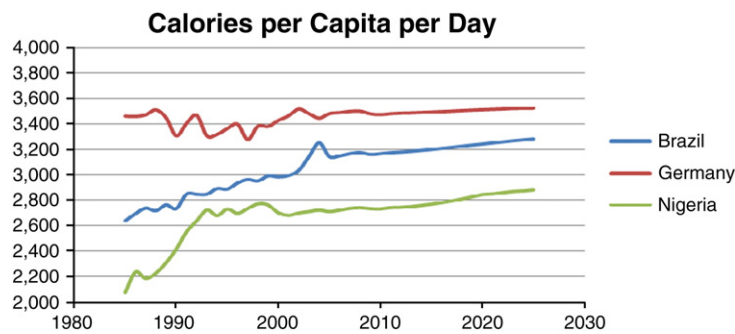
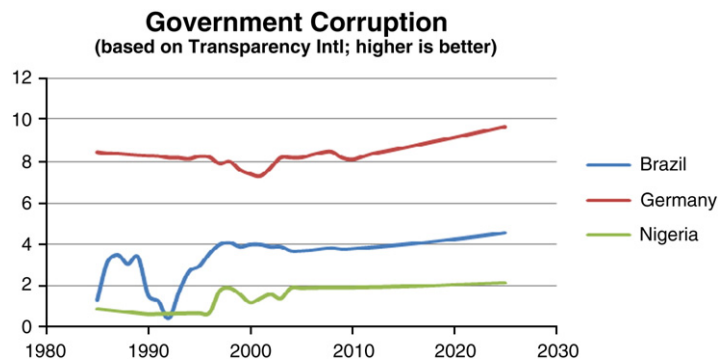**Fig. 2.** Calories per capita per day (3 countries, IFs).

Fig. 3. Government corruption (3 countries, IFs).

2. The variables

The IFs model uses a set of variables in its calculations almost identical to the original SOFI's. The few differences between the original set and the IFs set were due to changes in definition and data constraints.

Table 1 lists the variables, weights, and limits that are included in the IFs model for calculating SOFI.

Some examples of the history and forecasts of variables in the IFs SOFI set are shown in Figs. 2–4.

3. Calculation of State of the Future Indexes

In Table 2 we illustrate the calculation of the SOFI and systemic SOFI through an example. Suppose that only two variables were included for a given country: "Life Expectancy" and "GDP/capita." To perform the SOFI calculation not only are historical data required, but, the relative importance of each variable (weights), and a "best" and "worst" value for each is needed for scaling purposes (non-dimensionalizing).[6] Table 2 lists values for the calculation of SOFI used only for this illustration.

The systemic SOFI is calculated for each year of interest by scaling the current and projected values using the weights and the maximum and minimum values in the process, as follows:

Systemic SOFI 2010 = .80*(77−75 / 83−75) + .90*(8500−7000 / 10000−7000) = .65
Systemic SOFI 2020 = .80*(80−75 / 83−75) + .90*(9000−7000 / 10000−7000) = 1.10

And the SOFI itself is calculated by taking the ratio of the systemic SOFI's as follows:

SOFI 2005 = .65 / .65 = 1.00 (since 2005 is the reference year)
SOFI 2020 = 1.10 / .65 = 1.69

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[6] In the Millennium Project implementation, best and worst come from one of two sources: 1) direct estimates by experts as the best plausible and worst plausible values which they expect, or 2) the extreme maximum and minimum values of the variable during the time interval of interest. The better or the two best's, and the worst of the two worst's estimates are used in the SOFI calculation. Data for only one country and from the expert panel are required for this longitudinal approach In the IFs implementation, the best and worst values are chosen as the extreme values over the time interval from a sample of all countries; thus in this cross sectional approach, no expert judgments are required for best and worst estimates, but data from multiple countries are necessary. In this paper, the IFs approach has been used throughout. See a further discussion in Section 4.
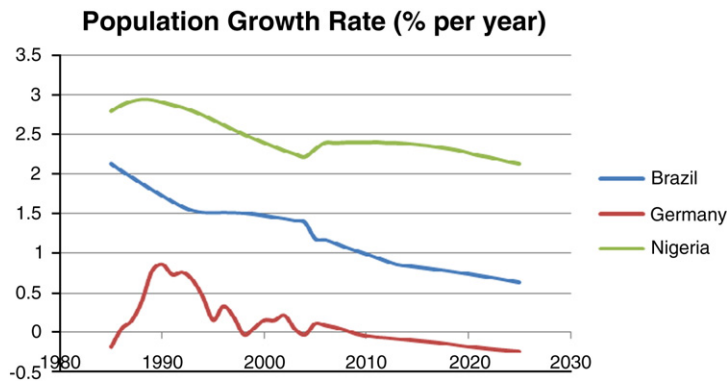
Population Growth Rate (% per year)

Fig. 4. Population growth rate (3 countries, IFs).

Table 2
Judgments for SOFI.

Variable	Best	Worst	2005 values	2020 projections	Weight
Life expectancy	83	75	77	80	.80
GDP/capita	10,000	7000	8500	9000	.90

Using the same computational technique, but including all of the variables, systemic SOFI and SOFI can be calculated for any country in the model, and for any grouping of countries, including the world as a whole. The complete algorithm is presented in Appendix A.

The systemic SOFI is defined as the weighted sum of the normalized values of the SOFI variables; the Index can be obtained from the systemic SOFI by dividing each yearly value by the value attained in the reference year. The higher the systemic SOFI, the higher the level of attainment toward an improved state of the future of a given country. To explain further, two countries might have the same SOFI (in fact they must in the reference year—their value will be 1.00) but might be quite different in their attainment levels.

In the material that follows, we have used the IFs model to produce the indexes for three countries: Brazil, Germany, and Nigeria. The choice of countries was arbitrary except in the case of Nigeria which was chosen because it had the highest projected SOFI. Figs. 5 and 6 show the systemic SOFI and SOFI projected for the three countries.

The changes for Nigeria are much more striking than for the other two countries; why should the ascent be so steep for Nigeria? Because GDP/capita is forecasted in IFs as almost doubling between 2005 and 2030. In addition, great improvements are expected in infant mortality, Internet usage, access to safe water, school enrolments, energy generated from non-fossil sources, and poverty reduction. (On the negative side is an expected large increase in expenditures for debt service.)

The model can of course compute SOFI and systemic SOFI for all 183 countries. Appendix B contains this detailed information; a sample is shown in Table 3.

Fig. 7 shows the relationship between systemic SOFI and SOFI for almost 100 countries. Plotting these values shows a clear correlation between SOFI and systemic SOFI: generally the higher the systemic SOFI the lower the SOFI. This relationship makes sense since the countries with low systemic SOFI are more distant from their goals and therefore SOFI has room to grow.

It is possible also to classify countries by their systemic SOFI and SOFI in a two dimensional space defined by these axes as
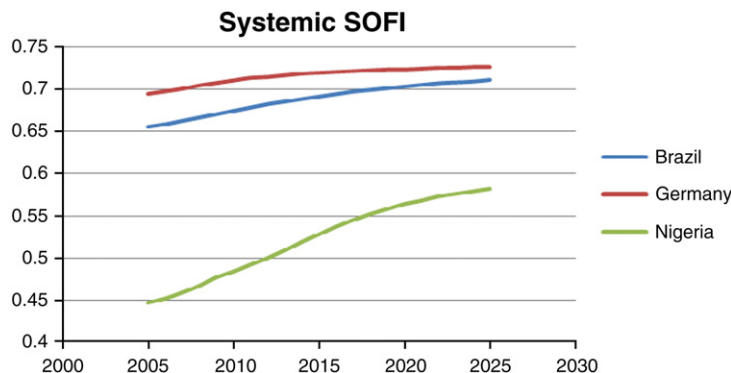
Systemic SOFI

Fig. 5. Systemic SOFI (3 countries, IFs).
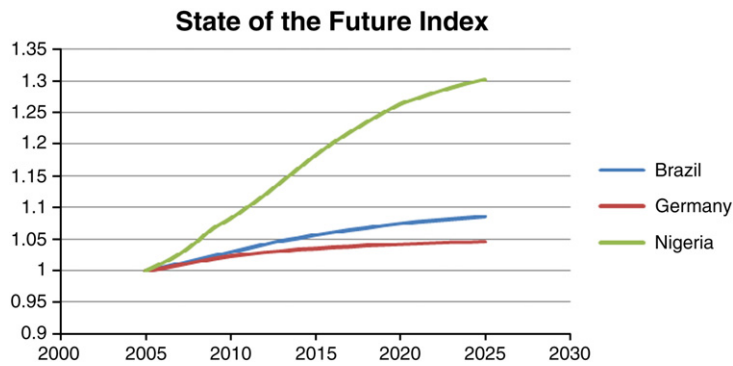
State of the Future Index

Fig. 6. SOFI (3 countries, IFs).

shown in Tables 4–7 for 80 or so countries. The thresholds for the dividing high and low are the averages of all the countries examined: the median SOFI in 2020 was 1.057; the median systemic SOFI in 2020 was 0.577.

These listings may be interpreted as follows: countries that have a higher than average systemic SOFI are anticipated to achieve values in the selected variables that are closer to aspired values; countries that have higher than average SOFIs are anticipated to grow toward those values at a faster rate.

4. Discussion of the reference values

In Section 3, an illustration was presented using two variables; the reference values for Life Expectancy were 83 years for the estimate of the "best" value and 75 years as the estimate for the "worst." Where do these values come from? There are two approaches: longitudinal and cross sectional. The prior Millennium Project work used a longitudinal approach. Experts were asked for their judgments about the "best" and "worst" expected values for each variable and country. These judgments were used to set the reference values in the equation, unless actual historic data or forecasted values provided more extreme limits, in which case they were used. Thus in the longitudinal approach, no data about other countries is required.

In the cross sectional approach used by the IFs model, reference values are set for each variable by observing the maximum and minimum values in the set of countries over the time interval of concern. Using this approach, a "best" life expectancy of say 85 years and a "worst" of say 75 years would mean that in the time period for which data and projections are available, the highest value for any country is 85 years and the lowest is 75 years. No judgments are required for "best" and "worst" reference value, although judgments are still needed for setting the weights.[7]

Since the two approaches yield internally consistent but different systemic SOFI's, it is not possible to make a direct comparison.

5. The data problem

One of the difficulties in creating a national SOFI is the absence of complete historical data. Some countries have more data than others, but given a set of two dozen or so variables to include in a national SOFI, it is likely that some data will be missing from the prior 20 years. If a system is to be devised that will produce national SOFI's for all countries, then methods must be available for "filling in the gaps" in the historic data since many of the forecasts of the variables could be based on the history.

The Millennium Project conducted an analysis in 2009 to determine the degree to which a reliable data source covered the map of historical data for a selected set of countries and variables and to develop techniques for filling in the missing data in a systematic and responsible manner.[8]

The World Banks' World Development Indicators (WDI) data base was used as a principle source in this exploration of methods for imputing values for missing data points. This source, which is now freely available on the Internet, contains data for 227 countries, 854 variables, and, for some variables and countries at least, data from 1960 to the present. The database was tapped for a group of 30 developed and developing countries, for 24 variables of the sort used in SOFI, over a time interval from 1985 to 2006.

The process which was used to impute the missing data for this test involved the follow ing steps[9]:

1. Interpolation of single or dual missing data points, which involved locating all absent single or dual data points that existed between two valid data points and to simply interpolating the given data.

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[7] Note that the cross sectional approach could also involve sampling across all countries in a given year rather than in the whole time interval.

[8] OECD has also addressed this issue in their excellent: OECD, Handbook on Constructing Composite Indicators: Methodology and User Guide, 2008. http://213.253.134.43/oecd/pdfs/browseit/3008251E.PDF [4].

[9] Details of the process and the specific variables and countries used can be found in Glenn, J., Gordon, T. and Flouresu, E., "2009 State of the Future", The Millennium Project, Washington, DC. 2009 [3].

Table 3
Sample of systemic SOFI and SOFI (7 countries).

	Systemic SOFI			SOFI		
	2005	2010	2020	2005	2010	2020
Uzbekistan	0.496	0.525	0.547	1.000	1.059	1.102
Vanuatu	0.525	0.543	0.564	1.000	1.034	1.073
Venezuela	0.571	0.590	0.612	1.000	1.032	1.072
Vietnam	0.533	0.545	0.566	1.000	1.022	1.061
Yemen	0.454	0.476	0.501	1.000	1.048	1.102
Zambia	0.409	0.432	0.472	1.000	1.054	1.153
Zimbabwe	0.391	0.410	0.428	1.000	1.051	1.096
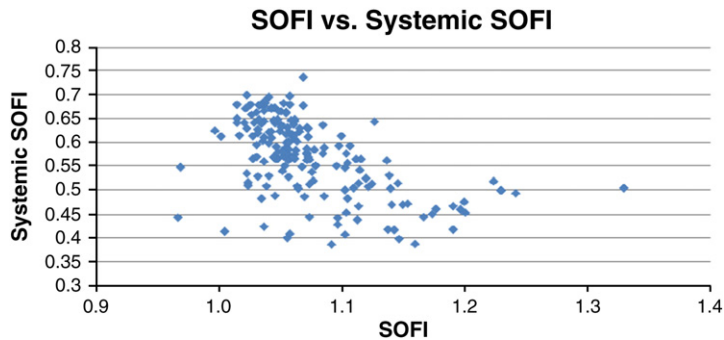
Fig. 7. SOFI vs. systemic SOFI.

2. Applying limits: inserting known limits. Some data series should have begun with zero value data points (such as early points for Internet users) and others (such as literacy) had to be limited to 100%. Where such data were missing, the blanks were given approprate values.
3. Country by country time series: filling in some of the remaining gaps by fitting time series equations to the existing data, included data furnished in the prior steps. This activity involved writing first, second, or third order time series equations for variables in countries that met several criteria: the series had to consist of generally monotonic data, the adjusted r square had to be relatively high, the resulting curve had to seem logical, and the data points available had to be spread sufficiently over time to make the fitting process meaningful.
4. Other series: the curve fitting process of step three involved only time as the independent variable. Next other complete series were used as the independent variable; for example, in many cases "School enrollment" was found to be a function of "Literacy."

Table 4
Above median systemic SOFI, below median SOFI.

Australia	Guyana	Puerto Rico
Austria	Hongkong	Russia
Bahamas	Hungary	Serbia
Bardados	Israel	Slovak Rep
Belgium	Italy	Slovenia
Belize	Japan	Spain
Bosnia	Korea South	Sri Lanka
Brunei	Lebanon	St. Lucia
Bulgaria	Macedonia	St. Vincent and the Grenadines
Canada	Malaysia	Sweden
Chile	Malta	Switzerland
Costa Rica	Mauritius	Taiwan
Croatia	Mexico	Thailand
Czech Republic	Micronesia, Fed. Sts.	Turkey
Denmark	Netherlands	UAE
Ecuador	New Zealand	Ukraine
Estonia	Norway	United Kingdom
Finland	Paraguay	Uruguay
France	Philippines	USA
Germany	Poland	
Grenada	Portugal	

Table 5
Above median systemic SOFI , above median SOFI.

Albania	Cyprus	Panama
Argentina	DominicanRep	Peru
Armenia	Georgia	Qatar
Bahrain	Greece	Romania
Belarus	Iceland	Samoa
Bolivia	Indonesia	Suriname
Brazil	Kuwait	Trinidad
Cape Verde	Latvia	Venezuela
China	Lithuania	
	Oman	

5. Country pairs: for the variables that still had missing data, the questions were asked: "For this variable with missing data, are there any other countries that have a complete series? Is the complete series similar enough to the partial series to serve as a pattern for the missing data?" Where such similarity existed, the the missing data were computed.
6. Regression analysis across all countries: the previous steps were all conducted country by country. Now the review searched for relationships among the variables, considering all of the countries and all of the years simultaneously. The incomplete variables served as dependent variables in a series of regression analyses that ranged across all years and countries. The independent variables were those in the set that were complete.

Table 8 shows the percenta of data available after each step and summarizes the contribution of each of these steps to the complete imputation of the missing data.

The methods used by the IFs model to estimate the missing historical data and to project the future values of the variables are varied. In some cases, as in the prior Millennium Project SOFI applications, missing historical data and forecasts are estimated by interpolation or regression; in others the IFs model uses more sophisticated means. Consider the projection of life expectancy: the

Table 6
Below median systemic SOFI , above median SOFI.

Afghanistan	Gambia	Niger
Algeria	Guinea	Nigeria
Angola	GuineaBiss	Pakistan
Bangladesh	India	Papua NG
Benin	Iran	Rwanda
Bhutan	Iraq	SierraLeo
Botswana	Kazakhstan	Solomon Islands
Burkina Faso	Kenya	Somalia
Burundi	Korea North	Sudan
Cambodia	Laos	Swaziland
Cameroon	Lesotho	Tanzania
Central AfR	Liberia	Tunisia
Chad	Libya	Turkmenistan
Congo, Democratic	Madagascar	Uganda
Republic of	Malawi	Uzbekistan
Congo, Republic of	Mali	Vanuatu
Cote Ivoire	Mongolia	Vietnam
Djibouti	Morocco	Yemen
Equa Guinea	Mozambique	Zambia
Ethiopia	Myanmar	Zimbabwe
Gabon	Namibia	

Table 7
Below median systemic SOFI , below median SOFI.

Colombia	Jamaica	Sao Tome and Principe
Comoros	Jordan	Senegal
Cuba	Kyrgyz	South Africa
Egypt	Maldives	Syria
El Salvador	Mauritania	Tajikistan
Eritrea	Moldova	Timor-Leste
Fiji	Montenegro	Togo
Ghana	Nepal	Tonga
Guatemala	Nicaragua	
Honduras	Palestine	

Table 8
Summary of missing data.

	Raw data	Single point fill	Known limits	Time series	Other parameters	Country pairs	Regression
Perecntage of data points available, considering all variables, summing all countries in the analysis	57.13	59.34	64.40	79.37	87.61	90.60	100.0

IFs model uses structural models that forecast mortality in accordance with the WHO Global Burden of Disease models, modified for other factors and assumptions such as smoking behavior, traffic accidents, HIV/AIDS, and health spending.[10]

6. Comparison with human development index

The HDI was introduced in 1990 by the UNDP; it is an index designed to measure social and economic development by combining several variables related to literacy (adult literacy rate and gross primary, secondary, and tertiary enrolment ratios), health (life expectancy), and wealth (GDP/capita). As in SOFI, the variables are scaled by comparing current values to maximum and minimum values called "goalposts." For HDI, these scaling values are chosen by the UNDP analysts. Scores for the three components are computed and then averaged. The current values for the HDI are compared and published in periodic reports issued by UNDP.[11] Since the IFs model contains forecasts of the HDI variables, it is capable of producing HDI forecasts.

The SOFI differs from HDI in several ways. First, SOFI's are usually constructed using 20 or more variables chosen and weighted by experts. The variables are always forecasted, and when the variable forecasts are modified to include possible future developments using Trend Impact Analysis (TIA), the forecasts of the variables and SOFI are probabilistic.[12] SOFI, where possible, relies on judgments of global panels.

Table 9 summarizes the differences between HDI and SOFI.

The IFs forecast of HDI for the three countries selected earlier appears in Fig. 8.

For all three countries, for both HDI and SOFI, improvements in the human condition are forecasted. Does SOFI add to the understanding of the potential future of the human condition? The HDI curves were produced by the IFs model using three variables: GDP/capita, literacy, and life expectancy. The SOFI used these variables and 17 other variables in addition. Table 10 lists these variables and shows for the three countries how much the variables changed from 2005 to 2030. Some of the changes were greater than 50%; both favorable and unfavorable changes were projected.

How does the SOFI add to the understanding of the human condition presented by the HDI? It includes variables that extend the HDI domains of health, wealth, and literacy (e/g. infant mortality). It also adds dimensions of environmental and resource sustainability, national financial stability, personal security, and freedom.

7. Using IFs for SOFI

In order to use this new facility, go to the IFs web site: http://www.ifs.du.edu/ifs/index.aspx. Make sure you have version 6.32. Select the "Display" tab and click "Flex Packaged Display" under it. This will take you to a new page with several columns. From the Categories column, select Indices—SOFI. In the lower left hand box select "Working File Based on IFSBASE RUN. Under"3rd Dimension" select "Total" if it appears. Under the "Grouping Options" tab select either "Using Countries/Regions" or "Using Groups." Under the "Display Format" tab, if the user checks "Use Estimation to Complete Data" gaps in the historic data will be filled in. Then select the group of interest or the country under study in the "Dimensions "column. Then select the analysis type from the upper left hand column. Those options labeled SOFI20 use a 20 year time horizon to find the reference values for the SOFI calculations, otherwise the entire time horizon (to 2100) is used in determining the reference limits. At the bottom of the page select the whether you want to see the output in the form of a table or graph. On the output page you can save the table to a file you create or to the clipboard under the tab "Save" and then "Save Normal View."

There are several series listed. SOFI uses the entire IFs horizon (all the way to 2100), while SOFI20 only uses the first 20 years of forecast (until 2025).

The user can manually enter new historic data, change the weights, and change the reference limits manually. From the main menu in IFs, go to Display/Self-Managed Displays, a new form opens.

1. Select the menu option: Variable Selection Options/Show Variable and Display Lists. (If you want to work with the History plus forecast version, you'll need to select Variable Selection Options/History plus Forecast before this step).
2. Select one of the SOFI indices, for example SOFI_Forecast Index. You use any country.
3. Select the menu option Variable Selection Options/Edit Index. This will load the index creation form.

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[10] Barry B. Hughes, Randall Kuhn, Cecilia Mosca Peterson, Dale S. Rothman, and José Roberto Solórzano 2011.

[11] See: http://hdr.undp.org/en/statistics/indices/hdi/.

[12] In Trend Impact Analysis, experts are asked to suggest future developments which if they occurred could deflect the projections of the values of the variables. For each development, probabilities of occurrence over time are specified and the level of impact on each variable is specified. The probability and impact judgments are used in a Monte Carlo analysis to produce a new, probabilistic, forecast for each variable. See: the CD ROM "Futures Research Methods, v3, The Millennium Project, 2009.

Table 9
Comparison of HDI and SOFI.

	HDI	SOFI
Number of variables	3	20
Weighting	Equal	Chosen by global expert panels
Maximum and minimum scaling values (goalposts)	Max and min chosen by analysts	MP: Max and min are extremes selected from global expert panel suggestions or best and worst history and forecast data for each country. IFs: Selected as best and worst from history and forecast data from a sample of all countries
Computation	Scores for health, wealth, and literacy are averaged	Scores for all variables are weighted, summed, and normalized to a reference year.
Publication	Periodic	Ad hoc
Forecasts	UNDP: no; IFs: Yes	Yes
Probabilistic	No	Yes if TIA is used

4. In order to change the scaling options, go to the Scaling menu option and select from the different options: Find Min for Selected Variable, Find Max for Selected Variable, Manually change, Time horizon for Scaling. Remember you'll need to click on one of the variables to select it before continuing with this step.

    4.1 Manually change allows you to set your own Min and Max for each variable.

    4.2 Time horizon for scaling allows you to set the number of years to be used to automatically find Min and Max, for example using 20 years will search Min and Max from 2005 (base year) to 2025.

5. In order to change the weights double click the desired weight to change from the Weights grid (3rd grid of the form).

6. Finally to save your changes, you'll need to:

    6.1 Click on one of the options on the menu Save Options: Save and Continue, Save, Rename and Continue, Rename. This step will only save the changes in the current session.

    6.2 Once you're back in Self-Managed Display you'll want to save the new formula for the SOFI in the same Variable List you loaded in step 3. In order to do that:

        6.2.1 Choose the menu option: Variable Selection Options/Edit Variable Lists, then select the list originally chosen in step 3, and delete the old formula (which is still saved there), by double clicking it.

        6.2.2 Go back to Self-Managed where the new formula should still be there loaded, and click the menu option: Variable Selection Options/Create Variable List from Selection Status box, it'll ask you for a name, and you should use the original name, for example: SOFI_Forecast Index. Don't forget to keep using the same Category (2nd to last box) in order to filter in Flex Packaged Displays, Indices—SOFI.

        6.2.3 When leaving the Self-Managed form you'll get a second message to confirm to save the file where all changes are already stored, ifsVar.mdb.

8. Remaining issues and opportunities

8.1. Introduce trend impact analysis

The IFs model produces times series for the systemic SOFI and SOFI. These single value forecasts are quite useful for making country to country comparisons but do not include perceptions about how future events could change the projected trends. As noted earlier, in the Millennium Project work, lists of important future events were prepared and evaluated in terms of their probabilities over time and their impacts on each of the SOFI variables. These judgments were used in Trend Impact Analysis and led to probabilistic forecasts of the variables and SOFI. This step, if used in conjunction with the IFs model, has to be performed outside of the model. In the future, this process might be simplified by including load sheets that would collect probability
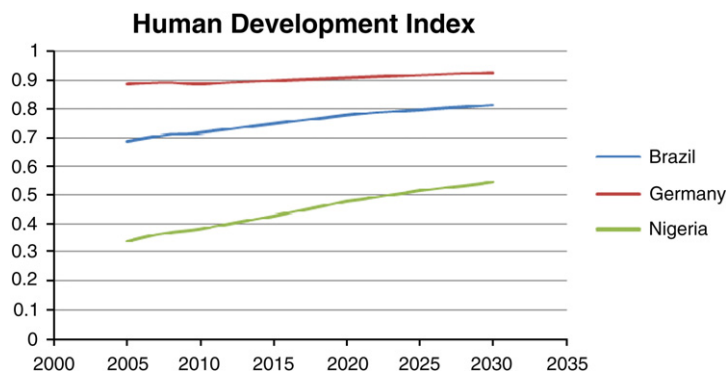

Fig. 8. Projections of human development index (3 countries, IFs).

Table 10
Variables, HDI and SOFI.

	Variable	Used in	Percent difference in the value of the variable 2005–2030 ([a])		
			Brazil	Germany	Nigeria
1	GDP/cap	HDI and SOFI	76.510	34.284	111.944
2	Literacy	HDI and SOFI	12.841	0.000	23.629
3	Life expectancy	HDI and SOFI	8.343	4.022	31.276
4	Calories per capita per day	SOFI	5.404	1.234	5.785
5	Freedom index	SOFI	12.727	0.000	20.988
6	GDP per unit energy consumption	SOFI	34.406	38.542	58.537
7	Infant mortality	SOFI	−72.851	−49.513	−60.632
8	Internet usage	SOFI	1,188.625	133.897	33.414
9	Corruption	SOFI	32.973	21.951	16.842
10	Population growth rate	SOFI	−57.591	−394.340	−13.762
11	(Un)safe water availability (% unsafe)	SOFI	−40.750	na	−56.462
12	HIV infection rate	SOFI	−29.659	−29.508	−29.774
13	Enrolment in secondary education	SOFI	6.730	1.796	66.975
14	CO2 emissions	SOFI	80.000	−3.846	33.333
15	Percent non-fossil energy	SOFI	−26.893	182.857	93.333
16	Homicide rate	SOFI	0.000	100.000	0.000
17	R&D expenditures	SOFI	−7.895	1.887	−12.500
18	Forest lands (% total land)	SOFI	−3.400	2.456	−34.758
19	Poverty: percent earning less than $1/day	SOFI	−72.405	na	−93.824
20	Total debt service	SOFI	72.087	−107.910	742.810

[a] The options offered by the IFs model software included "Use estimation to complete data" and "Use all available data." All data were obtained using the first selection. However to extend the data presented here, the later choice was changed for variables 15, 16, 17, and 20.

judgments about impacting developments and their consequences for the variables. This could lead to an online data base of developments and probabilities, available to all researchers using the model, and to the identification of developments that had the ability to efficiently improve the human condition, as measured by changes in the variables or SOFI.

8.2. Enrich the historical database

If use is made of the model to compare the SOFI's of many countries, and the analysts add or improve the historical data pertinent to the countries under study in the form of a cumulative wiki, the historical data contained in the model could be extended over time and the data added by one group could be made available to others who use the model. Such a data wiki could be a unique source of authenticated primary data, consistent in form and definition across all countries.

8.3. Country data sharing

Such a database need not be confined to historical data; the forecasts of the variables and SOFI calculations could be entered and made available to multiple users also.

8.4. Typically, SOFI has employed 20–30 variables identified as being important to the future outlook of a country or region

In 2007, some promising experiments were run by the Millennium Project in which the variables were grouped into sub-indexes. The advantage of this level of disaggregation is that areas of improvement or degradation may be more easily identified. The sub-indexes were: Security, Health, Wealth, Intellect, Infrastructure, and Moral/Ethical. In the future it may be useful to expand this effort and present the SOFI as the sum of such sub-indexes.

8.5. Create an annual national SOFI report

Imagine a once-a-year publication which displays the future outlook for all or most of the countries of the world. The countries could be compared not only in terms of their future outlook but also on the basis of year to year changes of their SOFIs. The publication would discuss the outlook, what's changed since last year, what seems to be improving or worsening and why, and the future events that could make a difference. It could also identify which of these critical future events might be affected by policies designed to change their probabilities and the cost benefit of such actions.

Such a publication could help create a sense of importance about the future, help create and track the human condition, national priorities, fuel rational political discourse within a country, and give quantitative substance to political arguments.

Having an efficient way to produce SOFI's for all countries will allow planners and policy makers to analyze whether their future seems to be improving or not, and what may have caused changes for better or worse in the outlook.

Appendix A. Computational algorithm for systemic SOFI

Using the forecasts to 2025:

$$(7.08^*(X03-1245) / (3800-1245) + 7.52^*(X05-2) / (14-2) + 7.5^*(X06-0.52) / (75.98-0.52)$$

$$+ 8^*((1 / X07A)-0.04) / (1.938-0.04) + 7.01^*(X09-170.7) / (3.478-170.7) + 7.9^*((X10A / X10B^*100)- 0.005)$$

$$/ (75.68-0.005) + 8.57^*(X11-10) / (1.7-10) + 7.14^*(X12-27.9) / (83.88-27.9) + 7.45^*(X13-19.05) / (100-19.05)$$

$$+ 7.27^*(X14--1.012) / (5.292--1.012) + 8.33^*(X15-87.75) / (0.005-87.75) + 5.97^*(X17-33.4) / (0.007-33.4)$$

$$+ 8.09^*(X19-5.687) / (140-5.687) + 7.82^*((X21A / X21B)-0.039) / (0-0.039)$$

$$+ 8.05^*(((X22A + X22B) / X22C) / 1.299) + 6.92^*((X23A / X23B)-0.0015)/(0-0.0015) + 8.63^*((X25A / X25B) / 0.028)$$

$$+ 7.21^*((X26A / X26B^*100)-0.034) / (91.87-0.034) + 7.84^*((X27A / X27B^*100)-61.24) / (0-61.24)$$

$$+ 6.79^*((X28A^*10 / X28B)-112.9) / (-133.1-112.9))$$

Where:

X03	CLPC[0] (Calories per capita per day)
X05	FREEDOM[0] (Freedom measure)
X06	GDPPCP[0] (GDP per capita)
X07	GDPperUnitEnergy
X09	INFMOR[0] (Infant mortality)
X10	InternetUsers
X11	GOVCORRUPT[0] (Government corruption measure)
X12	LIFEXP[0] (Life expectancy)
X13	LIT[0] (Literacy rate)
X14	POPR[0] (Population growth rate)
X15	WATSAFE[0] (Percent of population with safe water)
X17	HIVRATE[0] (HIV infection rate)
X19	EDSECENRG[0] (School enrollment)
X21	CO2Emissions
X22	ENPpct
X23	Homicides
X25	R&DExpPct (R&D expenditures as % of GNI)
X26	Forest Land
X27	Poverty Pct (Percent of population earning less than $1.day)
X28	Total Debt Service (Percent of GDP devoted to debt service)

Appendix B. Country by country SOFI projections

The following table shows the results from the IFs model for systemic SOFI and SOFI

	SYSTEMIC SOFI			SOFI		
	2005	2010	2020	2005	2010	2020
Afghanistan	0.347	0.359	0.398	1.000	1.033	1.146
Albania	0.583	0.590	0.617	1.000	1.012	1.058
Algeria	0.514	0.531	0.549	1.000	1.033	1.067
Angola	0.407	0.449	0.500	1.000	1.105	1.229
Argentina	0.608	0.623	0.645	1.000	1.025	1.061
Armenia	0.541	0.556	0.579	1.000	1.027	1.071
Australia	0.645	0.654	0.664	1.000	1.014	1.030
Austria	0.653	0.665	0.677	1.000	1.019	1.036
Azerbaijan	0.523	0.542	0.577	1.000	1.036	1.103
Bahamas	0.670	0.678	0.680	1.000	1.011	1.014
Bahrain	0.590	0.615	0.632	1.000	1.042	1.071
Bangladesh	0.466	0.485	0.531	1.000	1.041	1.138

Appendix B (*continued*)

	SYSTEMIC SOFI			SOFI		
	2005	2010	2020	2005	2010	2020
Barbados	0.625	0.633	0.642	1.000	1.014	1.028
Belarus	0.550	0.563	0.584	1.000	1.024	1.062
Belgium	0.623	0.633	0.645	1.000	1.015	1.036
Belize	0.619	0.626	0.640	1.000	1.011	1.034
Benin	0.456	0.465	0.487	1.000	1.021	1.069
Bhutan	0.458	0.477	0.514	1.000	1.042	1.124
Bolivia	0.536	0.554	0.593	1.000	1.034	1.106
Bosnia	0.558	0.566	0.589	1.000	1.013	1.054
Botswana	0.504	0.521	0.557	1.000	1.033	1.104
Brazil	0.611	0.626	0.649	1.000	1.024	1.061
Brunei	0.627	0.629	0.625	1.000	1.003	0.996
Bulgaria	0.586	0.597	0.610	1.000	1.019	1.042
Burkina Faso	0.404	0.410	0.442	1.000	1.014	1.096
Burundi	0.367	0.392	0.418	1.000	1.067	1.137
Cambodia	0.413	0.427	0.470	1.000	1.034	1.140
Cameroon	0.438	0.449	0.483	1.000	1.027	1.104
Canada	0.663	0.671	0.680	1.000	1.012	1.025
Cape Verde	0.581	0.595	0.616	1.000	1.024	1.059
Central AfR	0.354	0.366	0.386	1.000	1.033	1.091
Chad	0.351	0.383	0.418	1.000	1.093	1.190
Chile	0.598	0.609	0.622	1.000	1.018	1.040
China	0.541	0.563	0.593	1.000	1.042	1.097
Colombia	0.545	0.560	0.574	1.000	1.027	1.053
Comoros	0.459	0.455	0.443	1.000	0.991	0.966
Congo, Democratic Republic of	0.370	0.385	0.407	1.000	1.042	1.102
Congo, Republic of	0.470	0.504	0.525	1.000	1.072	1.119
Costa Rica	0.631	0.647	0.665	1.000	1.025	1.054
Cote Ivoire	0.450	0.458	0.488	1.000	1.020	1.085
Croatia	0.599	0.612	0.632	1.000	1.021	1.055
Cuba	0.542	0.551	0.572	1.000	1.016	1.056
Cyprus	0.612	0.632	0.647	1.000	1.034	1.058
Czech Republic	0.620	0.635	0.649	1.000	1.024	1.047
Denmark	0.646	0.655	0.673	1.000	1.014	1.042
Djibouti	0.411	0.427	0.453	1.000	1.038	1.103
DominicanRep	0.571	0.581	0.607	1.000	1.017	1.061
Ecuador	0.555	0.570	0.586	1.000	1.028	1.056
Egypt	0.541	0.552	0.566	1.000	1.020	1.047
El Salvador	0.513	0.524	0.540	1.000	1.021	1.051
Equa Guinea	0.486	0.492	0.542	1.000	1.013	1.114
Eritrea	0.379	0.381	0.400	1.000	1.005	1.055
Estonia	0.609	0.617	0.628	1.000	1.013	1.031
Ethiopia	0.384	0.408	0.450	1.000	1.063	1.173
Fiji	0.543	0.551	0.568	1.000	1.014	1.046
Finland	0.659	0.668	0.683	1.000	1.013	1.037
France	0.644	0.659	0.673	1.000	1.023	1.045
Gabon	0.537	0.554	0.575	1.000	1.032	1.071
Gambia	0.455	0.472	0.505	1.000	1.038	1.109
Georgia	0.543	0.557	0.585	1.000	1.025	1.077
Germany	0.644	0.657	0.672	1.000	1.020	1.044
Ghana	0.467	0.470	0.483	1.000	1.006	1.034
Greece	0.635	0.658	0.678	1.000	1.037	1.068
Grenada	0.616	0.621	0.630	1.000	1.008	1.022
Guatemala	0.523	0.533	0.551	1.000	1.018	1.053
Guinea	0.392	0.409	0.461	1.000	1.043	1.176
GuineaBiss	0.409	0.433	0.470	1.000	1.058	1.149
Guyana	0.582	0.592	0.603	1.000	1.016	1.035
Haiti	0.387	0.394	0.409	1.000	1.017	1.057
Honduras	0.544	0.555	0.573	1.000	1.022	1.054
Hong Kong	0.633	0.632	0.642	1.000	0.997	1.014
Hungary	0.595	0.607	0.624	1.000	1.020	1.049
Iceland	0.691	0.705	0.738	1.000	1.019	1.068
India	0.495	0.516	0.562	1.000	1.044	1.136
Indonesia	0.548	0.565	0.587	1.000	1.031	1.071
Iran	0.542	0.559	0.575	1.000	1.033	1.061
Iraq	0.500	0.512	0.538	1.000	1.024	1.075
Ireland	0.644	0.661	0.680	1.000	1.028	1.057
Israel	0.643	0.650	0.667	1.000	1.011	1.036
Italy	0.658	0.669	0.680	1.000	1.016	1.033

Appendix B (*continued*)

	SYSTEMIC SOFI			SOFI		
	2005	2010	2020	2005	2010	2020
Jamaica	0.540	0.548	0.565	1.000	1.014	1.046
Japan	0.670	0.682	0.696	1.000	1.018	1.040
Jordan	0.533	0.544	0.563	1.000	1.021	1.056
Kazakhstan	0.504	0.520	0.551	1.000	1.033	1.095
Kenya	0.478	0.493	0.513	1.000	1.032	1.073
Korea North	0.479	0.489	0.509	1.000	1.021	1.063
Korea South	0.685	0.687	0.700	1.000	1.003	1.022
Kuwait	0.587	0.613	0.637	1.000	1.045	1.084
Kyrgyz	0.552	0.558	0.566	1.000	1.011	1.027
Laos	0.463	0.476	0.515	1.000	1.028	1.113
Latvia	0.602	0.615	0.638	1.000	1.022	1.060
Lebanon	0.553	0.562	0.579	1.000	1.015	1.047
Lesotho	0.420	0.433	0.467	1.000	1.031	1.113
Liberia	0.398	0.429	0.494	1.000	1.079	1.241
Libya	0.525	0.540	0.563	1.000	1.028	1.071
Lithuania	0.583	0.595	0.618	1.000	1.020	1.059
Luxembourg	0.660	0.680	0.698	1.000	1.030	1.057
Macedonia	0.578	0.585	0.595	1.000	1.013	1.030
Madagascar	0.414	0.420	0.444	1.000	1.015	1.073
Malawi	0.442	0.468	0.504	1.000	1.058	1.139
Malaysia	0.590	0.600	0.611	1.000	1.016	1.036
Maldives	0.543	0.557	0.571	1.000	1.026	1.052
Mali	0.393	0.415	0.467	1.000	1.058	1.190
Malta	0.607	0.621	0.638	1.000	1.023	1.050
Mauritania	0.409	0.423	0.424	1.000	1.034	1.036
Mauritius	0.597	0.605	0.623	1.000	1.012	1.042
Mexico	0.613	0.625	0.641	1.000	1.019	1.045
Micronesia, Fed. Sts.	0.598	0.610	0.614	1.000	1.020	1.027
Moldova	0.540	0.547	0.560	1.000	1.013	1.036
Mongolia	0.509	0.538	0.565	1.000	1.057	1.111
Montenegro	0.554	0.560	0.570	1.000	1.012	1.030
Morocco	0.512	0.525	0.552	1.000	1.026	1.078
Mozambique	0.406	0.435	0.500	1.000	1.070	1.229
Myanmar	0.450	0.473	0.515	1.000	1.050	1.145
Namibia	0.483	0.495	0.520	1.000	1.023	1.076
Nepal	0.490	0.494	0.509	1.000	1.008	1.038
Netherlands	0.642	0.650	0.659	1.000	1.012	1.026
New Zealand	0.658	0.671	0.672	1.000	1.019	1.021
Nicaragua	0.505	0.511	0.517	1.000	1.011	1.023
Niger	0.365	0.379	0.417	1.000	1.037	1.142
Nigeria	0.380	0.424	0.505	1.000	1.116	1.329
Norway	0.643	0.656	0.671	1.000	1.020	1.042
Oman	0.543	0.563	0.589	1.000	1.038	1.085
Pakistan	0.473	0.484	0.504	1.000	1.023	1.064
Palestine	0.545	0.542	0.569	1.000	0.996	1.044
Panama	0.588	0.604	0.630	1.000	1.028	1.072
Papua NG	0.453	0.479	0.508	1.000	1.058	1.121
Paraguay	0.612	0.614	0.613	1.000	1.003	1.001
Peru	0.585	0.603	0.623	1.000	1.030	1.065
Philippines	0.565	0.579	0.591	1.000	1.025	1.046
Poland	0.619	0.632	0.647	1.000	1.021	1.044
Portugal	0.630	0.630	0.642	1.000	1.001	1.020
Puerto Rico	0.629	0.637	0.649	1.000	1.014	1.032
Qatar	0.572	0.597	0.644	1.000	1.043	1.126
Romania	0.566	0.582	0.602	1.000	1.028	1.063
Russia	0.569	0.583	0.600	1.000	1.025	1.054
Rwanda	0.378	0.396	0.453	1.000	1.049	1.200
Samoa	0.581	0.594	0.616	1.000	1.022	1.061
Sao Tome and Principe	0.498	0.512	0.510	1.000	1.028	1.023
Saudi Arabia	0.532	0.554	0.577	1.000	1.041	1.084
Senegal	0.468	0.475	0.489	1.000	1.016	1.045
Serbia	0.575	0.586	0.598	1.000	1.019	1.040
SierraLeo	0.381	0.402	0.444	1.000	1.055	1.166
Singapore	0.587	0.598	0.620	1.000	1.019	1.057
Slovak Rep	0.603	0.617	0.633	1.000	1.024	1.050
Slovenia	0.628	0.645	0.662	1.000	1.027	1.054
Solomon Islands	0.511	0.531	0.551	1.000	1.040	1.078
Somalia	0.334	0.353	0.387	1.000	1.057	1.159

Appendix B (*continued*)

	SYSTEMIC SOFI			SOFI		
	2005	2010	2020	2005	2010	2020
South Africa	0.499	0.507	0.528	1.000	1.015	1.056
Spain	0.634	0.654	0.666	1.000	1.031	1.050
Sri Lanka	0.548	0.559	0.578	1.000	1.020	1.055
St. Lucia	0.606	0.609	0.615	1.000	1.006	1.016
St. Vincent and the Grenadines	0.571	0.580	0.603	1.000	1.017	1.056
Sudan	0.397	0.423	0.476	1.000	1.063	1.199
Suriname	0.592	0.602	0.630	1.000	1.018	1.065
Swaziland	0.394	0.405	0.438	1.000	1.029	1.112
Sweden	0.658	0.665	0.679	1.000	1.011	1.032
Switzerland	0.649	0.660	0.683	1.000	1.016	1.052
Syria	0.513	0.526	0.529	1.000	1.025	1.031
Taiwan	0.642	0.646	0.651	1.000	1.007	1.014
Tajikistan	0.510	0.516	0.530	1.000	1.012	1.040
Tanzania	0.424	0.455	0.519	1.000	1.072	1.223
Thailand	0.555	0.566	0.583	1.000	1.021	1.051
Timor-Leste	0.523	0.526	0.535	1.000	1.005	1.022
Togo	0.412	0.426	0.414	1.000	1.034	1.004
Tonga	0.566	0.559	0.548	1.000	0.988	0.968
Trinidad	0.559	0.584	0.614	1.000	1.045	1.099
Tunisia	0.531	0.546	0.569	1.000	1.029	1.072
Turkey	0.568	0.579	0.599	1.000	1.021	1.056
Turkmenistan	0.506	0.525	0.565	1.000	1.036	1.115
UAE	0.586	0.602	0.618	1.000	1.028	1.054
Uganda	0.385	0.408	0.460	1.000	1.059	1.196
Ukraine	0.551	0.565	0.580	1.000	1.024	1.052
United Kingdom	0.635	0.648	0.666	1.000	1.021	1.048
Uruguay	0.602	0.607	0.620	1.000	1.009	1.031
USA	0.664	0.674	0.689	1.000	1.014	1.037
Uzbekistan	0.496	0.525	0.547	1.000	1.059	1.102
Vanuatu	0.525	0.543	0.564	1.000	1.034	1.073
Venezuela	0.571	0.590	0.612	1.000	1.032	1.072
Vietnam	0.533	0.545	0.566	1.000	1.022	1.061
Yemen	0.454	0.476	0.501	1.000	1.048	1.102
Zambia	0.409	0.432	0.472	1.000	1.054	1.153
Zimbabwe	0.391	0.410	0.428	1.000	1.051	1.096

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