

## **CHAPTER 2. State of the Future Index Section**

Studies initiated and conducted by Theodore J. Gordon

### **2.2 National SOFIs**

#### Americas Selected Countries' National SOFIs

- 2006
- 2005
- 2004

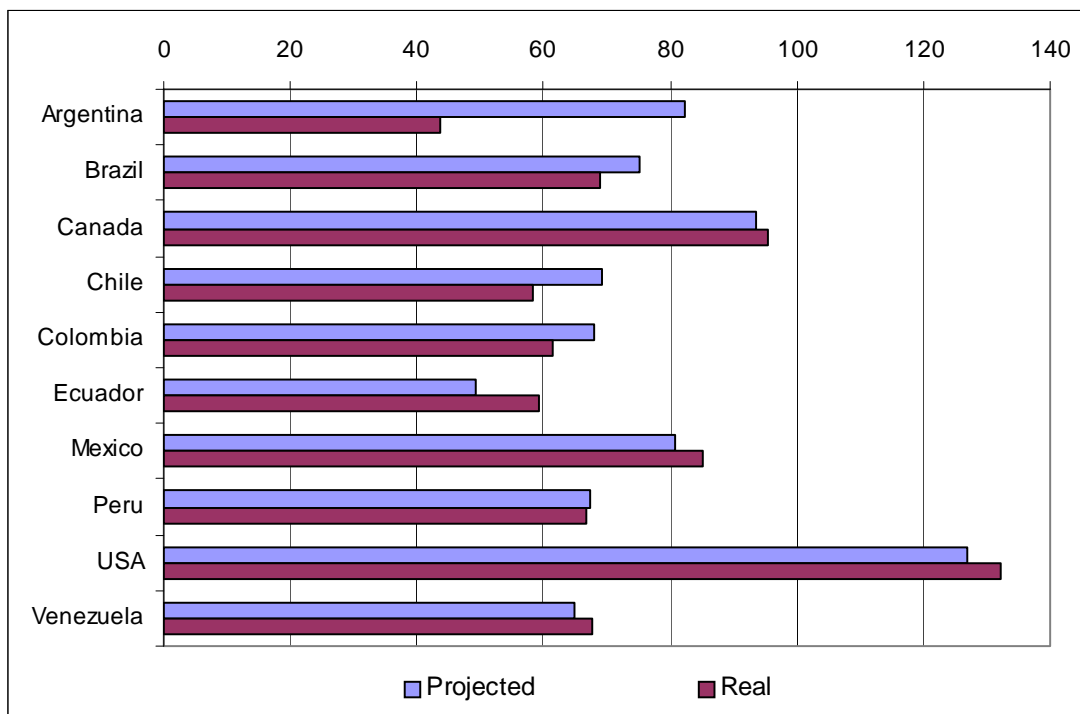
Development of National SOFIs--some characteristics, effects of changes in datasets and backtesting of results

## Americas Selected Countries' National SOFIs 2006

SOFI can be computed at the global, national, regional, or even sectoral level. National SOFIs could help establish priorities for policy and investment decisions intended to improve a country as a whole. This could encourage countries to ask themselves what it means to say a nation is better off or worse off in 10 years—and to answer that question in more objective, quantifiable terms.

In 2004, the Venezuela Node of the Millennium Project together with Deloitte & Touche C.A. computed SOFIs for selected countries in the Americas (Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, United States, and Venezuela). This exercise allowed assessment of data availability and comparability, as well as analysis of which factors in each country determined favorable or unfavorable changes. In 2005, the calculations and forecasts were reviewed based on new data available for each country, and the national SOFIs computed in 2004 (which used estimated data for 2002) were compared with national SOFIs using actual data for 2002. Figure 2.2.1 shows the national SOFIs as well as the comparison between the forecasted and actual data.

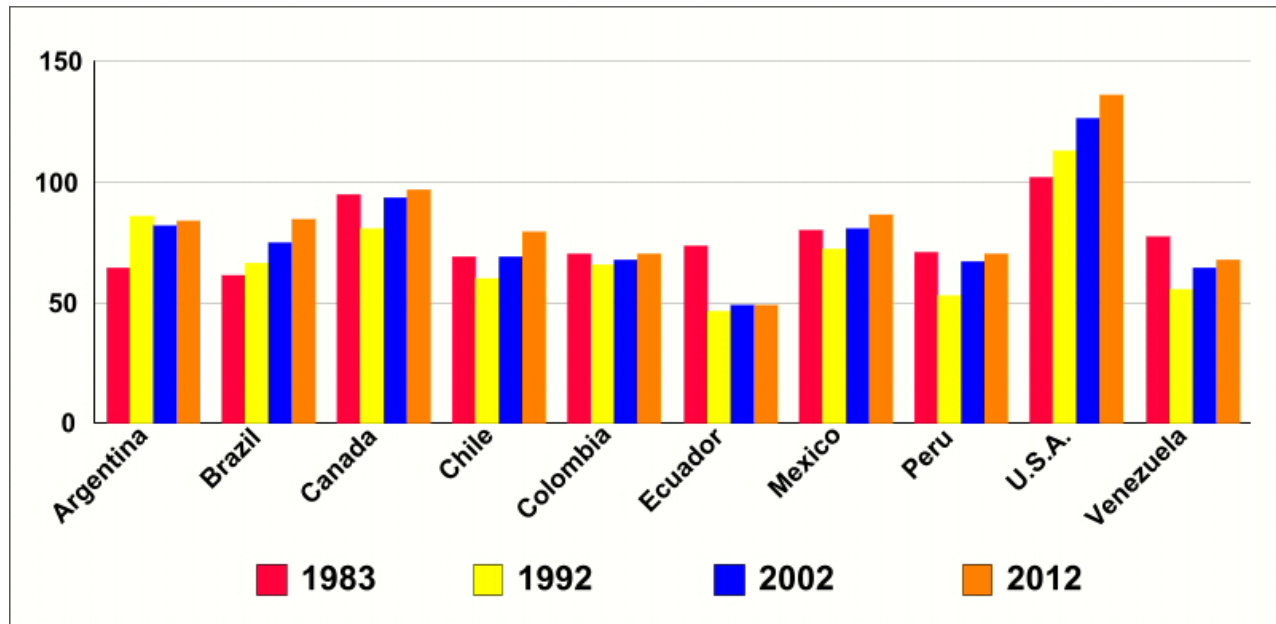
Figure 2.2.1 National SOFI Backtesting: Projected 2002 versus Real 2002 Values



Calculating national SOFIs also allows a comparison between the performance of different countries. National SOFIs also address a problem with the global SOFI: variations among

regions and nations. Figure 2.2.2 shows the comparison between the SOFI of the 10 American countries.

Figure 2.2.2 Countries' Non-adjusted SOFI Absolute Values



Interest in creating national SOFIs has spread; Canada, China, Egypt, Hungary, Kuwait, South Korea, and Turkey have all expressed interest in developing their own indexes using national data. Turkey finished its SOFI calculation just before this report went to print.

## Conclusions

It may be time to review the menu of variables included in the index and the judgments pertinent to the SOFI. We are not inclined to change the menu of variables capriciously, since an index is meant to track change over a significant period of time. Nevertheless, a new look may be appropriate.

There is more work to be done in reviewing the variables to include and in validating the data sources used to construct new global and national indexes. But the project has already been successful in several ways: it has raised methodological questions (not all of which have been answered); it has presented the dilemma “what is concretely meant by a desirable whole future,” not just the future of some area; it has asked about developments that can improve the outlook; and, finally, it has identified policies that may be directed toward improving the likelihood of favorable developments and diminishing the likelihood of unfavorable developments. It has raised awareness of the interconnected nature of the elements that forge the future.

## Americans National SOFIs—2005

--Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, USA and Venezuela--

### Development of National SOFIs some characteristics, effects of changes in datasets and backtesting of results

Study conducted by the Venezuela Node of the Millennium Project  
in collaboration with Venezuela Deloitte & Touche C.A.

The Millennium Project is producing the Global State of the Future Index (SOFI) since 2001. In 2004, the Venezuela Node of the Millennium Project (Jose Cordeiro and Edgar Cotte) together with Deloitte & Touche C.A. (the Venezuelan member of Deloitte), started to build such an index at national level. In 2004 they produced National SOFIs for selected countries in the Americas (Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, USA and Venezuela). In 2005, this effort was expanded to other major world countries and the work is still in progress. This chapter presents the results so far as well as an interesting exercise of backtesting of the previous SOFIs.

#### Executive Summary

#### Introduction

#### Results and Discussion

#### Conclusions and Recommendations

#### Appendix



## EXECUTIVE SUMMARY

Chapter 2.1 illustrated how changes in historical data influence the global SOFI. This chapter reinforces that analysis by showing changes at the national level. In 2004, the Venezuela Node of the Millennium Project together with Deloitte & Touche C.A. created indexes for selected countries in the Americas (Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, United States, and Venezuela). This year, the calculations and forecasts were reviewed based on new data available for each country. Changes occurred mainly due to adjustments or modifications in economic and societal data, which are subject to redefinition or to re-evaluation. Sometimes these redefinitions produced a discontinuity in a particular series or changed trends.

In addition, the national SOFIs reported in the *2004 State of the Future* (which used estimated data for 2002) were compared with national SOFIs computed this year using actual data for 2002.

While the methodology used in computing the global SOFI has evolved yearly, the original methodology was used both last year and this year for comparison purposes. Clearly, the improvements developed in the 2002, 2003, and 2004 editions should be included in future exercises of this sort. However, assessment of availability, comparability, quantity, and quality of national data is important for improving data collection, sophistication in computation, and ultimately decisionmaking—the final purpose of the SOFI at any level in which it would be used.

This chapter presents more details of the analysis presented in Chapter 3: National SOFIs, of the print section of the *2005 State of the Future*.

### Selection of Variables

The definitions of the variables and data sources used in constructing the 2005 country-specific SOFI are in general the same as those used in the 2004 exercise. The complete set of 20 variables used in global SOFI exercises (see Chapter 2.1) was taken as a starting point for the national SOFIs. Their stability since 2001 indicates that they represent a strong set and warrants their application to specific countries. The idea was to compare the national SOFIs with the global SOFI as far as possible; to do this, the variables ought to be comparable, and any modification, elimination, or addition of new variables was to be done only if necessary. Problems with data collection in 2004 for the 10 countries included in the research restricted the number of usable variables from 20 to 12:

- Infant mortality
- Food availability
- GDP per capita
- Mean monthly carbon dioxide in atmosphere
- Annual population addition

- Percent unemployed
- Literacy rate, adult total
- Annual AIDS deaths
- Life expectancy
- Debt-to-GDP ratio
- Share of population living in countries that are not free
- School enrollment

### **Available Information per Country**

Including a larger list of countries complicated national SOFI calculations because available data for the years of interest are considerably different for each country. The complete list of countries and the corresponding number of variables with 15–20 or 10–14 annual data points is given in the CD detailed version. Availability issues of different national data necessary for comparison of countries are also treated in Chapter 7 on the Sustainable Development Index.

### **Comparison of 2004 and 2005 Datasets**

Examination of the two databases for the national SOFIs of the Americas in 2004 and 2005 indicates that data from the same sources can change in a significant way from year to year, including whole sets of historical data series. (See Chapter 2 for a similar analysis of the data used in calculating the global SOFI.) For 2004 and 2005, the data sets for CO<sub>2</sub>, annual AIDS deaths, and freedom were identical; the most significant differences for the data sets that changed were as follows:<sup>2</sup>

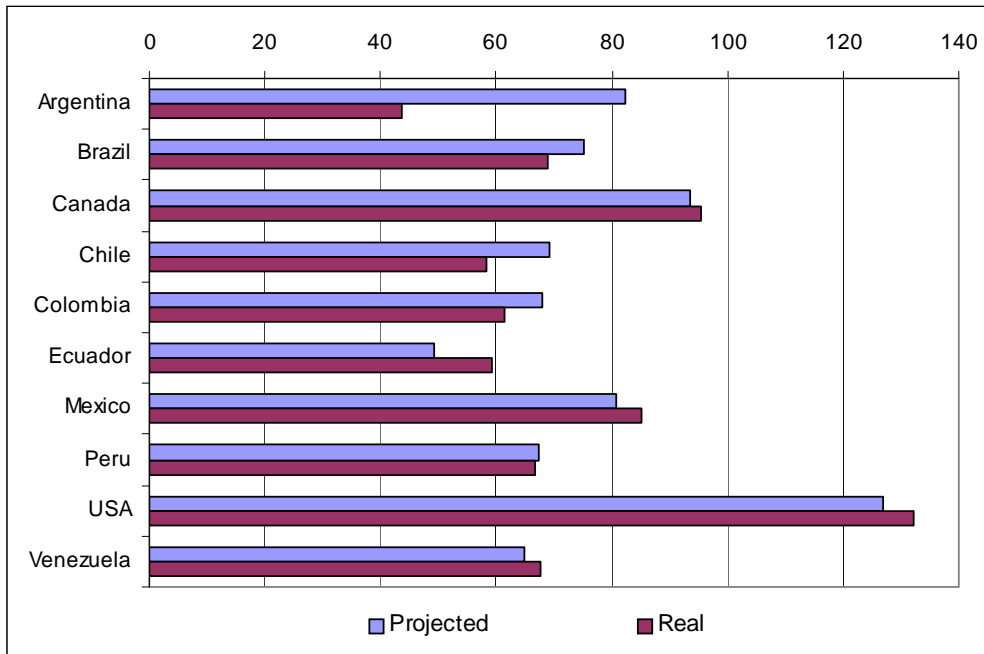
- Maximum negative variation:
  - Food availability (–4%) Argentina
  - GDP per capita (–24%) Brazil
  - Annual population addition (–31%) Argentina
  - Unemployment (–18%) Brazil
  - Debt-to-GDP ratio (–19%) Ecuador
- Maximum positive variation:
  - Food availability (+12%) Canada
  - GDP per capita (+51%) Venezuela
  - Annual population addition (+19%) Venezuela
  - Unemployment (+20%) Mexico
  - Debt-to-GDP ratio (+243%) Peru

These variations could be due to revisions of the data by the original sources caused by redefinition, recalculations based on country-specific variations in economic policies, or economic discontinuities due to devaluations, debt default, or similar causes.

To see how the changes of the variables influence the forecasts, the calculations made last year for 2002 were compared with the real values of the variables collected for 2002. The next section

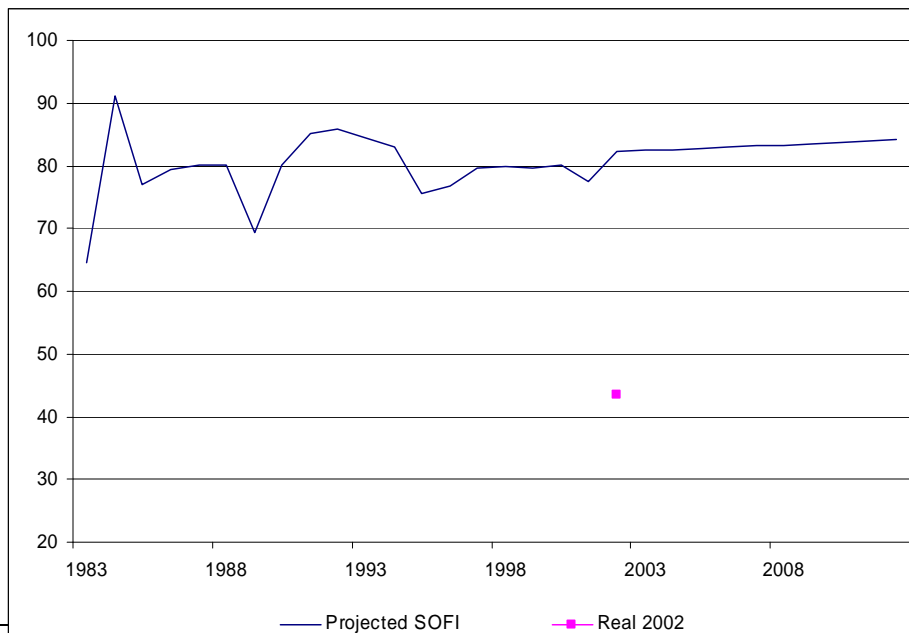
presents comparisons for all data series in all 10 countries analyzed. The figure below illustrates the changes in absolute values of the SOFI projected and the SOFI calculated using actual data for 2002. It also shows a comparison of the non-adjusted value of each country's 2002 SOFI point.

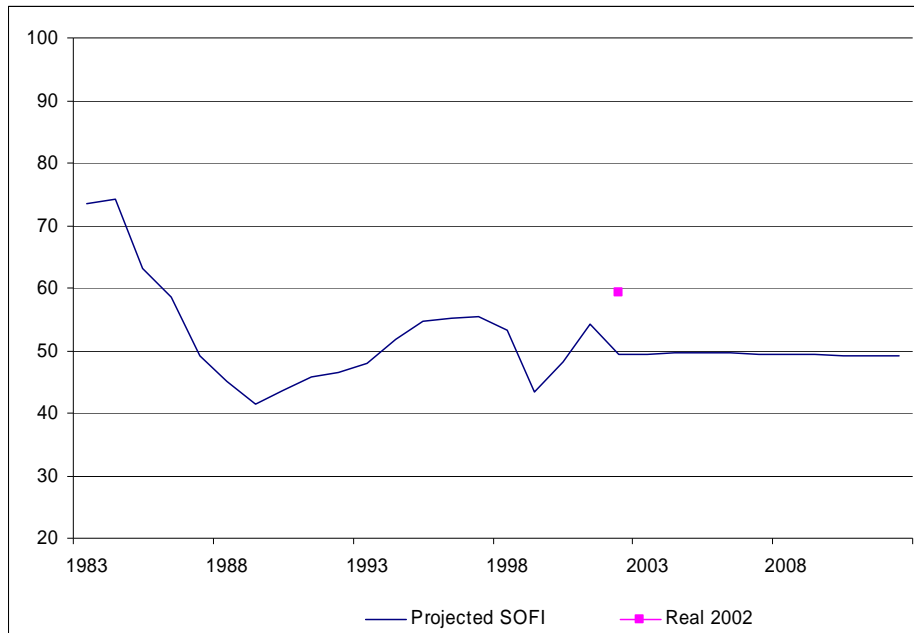
*National SOFI Backtesting: Projected 2002 versus Real 2002 Values*



The next two figures show the variations produced by changes in data sets of the SOFI for Argentina and Ecuador, the countries that had the most significant differences between the data projected and the real data. Argentina had a considerably lower real SOFI point for 2002 than the one projected, while Ecuador's real situation was better than projected.

*Argentina SOFI Using Projected Data, with Real Data Point for 2002*



*Ecuador SOFI Using Projected Data, with Real Data Point for 2002*

The real examples of Argentina and Ecuador are worth considering. In the first case, Argentina went through a massive devaluation of its currency when the currency board was abandoned, and the peso went abruptly from 1-to-1 to the US dollar to almost 3-to-1. This sudden change decreased significantly the GDP and increased the foreign debt ratio. Ecuador, on the other hand, actually experienced strong growth thanks to the monetary stability created by the complete dollarization of its economy, which made the GDP increase and the foreign debt ratio decrease.

The variables that had the most significant impact on the difference between the 2002 projected and real SOFI for each country are shown in Table 1.

*Table 1. Impact of Variables' Changes on National SOFIs*

Country	Variable that most changed	Variation in variable that most changed	Impact on SOFI
Argentina	debt/GDP	+252%	–
Brazil	debt/GDP	+65%	–
Canada	AIDS deaths	–92%	+
Chile	debt/GDP	+132%	–
Colombia	AIDS deaths	–77%	+
Ecuador	debt/GDP	–36%	+
Mexico	AIDS deaths	–52%	+
Peru	AIDS deaths	+1,321%	–
USA	AIDS deaths	–60%	+
Venezuela	school enrollment	+148%	+



It is important to identify the variables that contribute to an improvement or deterioration of the SOFI. These positive and negative impacts are a very useful guide to separate effects due to dataset variations and real changes that were not present in the historical data series, including unexpected events that change the extrapolations of the variables. These factors could be a useful guide to the application of other techniques like trend or cross-impact analyses or as elements in the construction of scenarios.

Previous work with the global SOFI indicates that there is a delicate balance between the variables that create positive and negative impacts. The sensitivity analysis done for the 12 variables used to calculate the SOFIs of the 10 American countries reported in 2004, although not conclusive, also indicated the very high sensitivity to one or several variables, but very low sensitivity to others. This leads to the suggestion that the variable weights be reviewed and adapted to the particularities of each analyzed country.

In 2005, the exploration of national SOFIs continues with the addition of 22 other countries: 10 more from the Americas (Bolivia, Costa Rica, Cuba, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, and Uruguay); 5 from Asia (China, India, Japan, Republic of Korea, and Russian Federation); 3 from Africa (Egypt, Nigeria, and South Africa); and 4 from Europe (Germany, Portugal, Spain, and the United Kingdom).

The national SOFIs exercise revealed that the most difficult factor in the construction of comparable national SOFIs is availability and compatibility of country-specific data sets. In addition, significant changes of data from the same sources from one year to another renders the calculations, extrapolations, and comparisons even more difficult. Hence, in our globalized world it is important to use international standards for definition and collection of statistical data at national levels.

Exchange rate volatility has proved to be a major factor in all the monetary and economic variables considered. The different experiences of Argentina and Ecuador clearly indicate the extreme cases of devaluation and dollarization. That is also why the World Bank uses the Alfa methodology for computing three-year averages for the GDP values; this averages the GDP values for three consecutive years (the year considered, plus one year before and one year after).

Nevertheless, the present exercise to develop a national SOFI methodology, although very crude, indicates that the study of national and regional SOFIs is a promising area of future research for decisionmaking and priority setting. Similarly, company SOFIs and even individual SOFIs could eventually be developed.

## INTRODUCTION

Since 2001 the Millennium Project has produced a State of the Future Index (SOFI) for the world as a whole, and 2005 is the second year in which it is experimenting with the construction of a National SOFI. The Venezuela Node of the Millennium Project (Jose Cordeiro and Edgar Cotte) together with Deloitte & Touche C.A. (the Venezuelan member of Deloitte), started to build such an index in 2004 for selected countries in the Americas (Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, USA and Venezuela).

In 2005, the computation of national SOFIs was extended to other major countries in the world, and to determine if problems diminish with more country data sets, but the availability and comparability of country specific data turned out to be the most difficult factor for the construction of the National SOFIs. It proved to be a far more difficult task than expected and the advance in the calculation of the SOFI for other countries has been slow. Not only the same problem of data availability was encountered with every other country considered, if the possibility of comparison with the global SOFI or the previous year National SOFI is maintained, but it was also found that data from the same sources can change in a significant way from one year to other. This was mainly observed for data of economic or social nature, which is subject to redefinitions or sudden changes due to national specific problems or variations in public policies. As sometimes these redefinitions not only produce a discontinuity in the particular trend, but are also extended to the whole set of historical data, it was decided to search its effect in the calculations of the previous year SOFI and its consequences in the extrapolation of the trend.

Additionally, we have tried to differentiate between the effects of these factors in the SOFI calculations and those due to the inability of an extrapolation to fit real data produced afterwards. In order to achieve this goal, the SOFI computed for 2002, based on the data of the 1982 – 2001 trend reported in the 2004 National SOFI, was compared with the value calculated using the 2002 real value of the different variables. This is normally referred to as backtesting. Differences, when not due to redefinition of the variable or any of its components, could be an indication of factors not present in the past that can so be identified and explored using other tools of the futurist toolbox, like, for example, trend or cross impact analysis. The results obtained, their consequences, and the availability, quantity and quality of variables for 32 countries, including representative countries in three other continents are included in this work.

## RESULTS AND DISCUSSION

The Millennium Project has completed four global SOFI exercises, reported in the State of the Future 2001, 2002, 2003 and 2004 editions; and one National SOFI exercise, reported in the State of the Future 2004 edition. Based on the reasons stated in the first National SOFI exercise, the same original process is been followed repeating the assumptions of the 2001 exercise for the particular country-specific SOFIs. Clearly, the improvements developed in the 2002, 2003 and 2004 editions should be included in the following exercises. However, the problems encountered with the availability, comparability, quantity and quality of national data for the different

variables prompted the project to review not only the selection of the variables, but their effects in the selection of countries and the calculation of the SOFI. The results thus obtained and a discussion of some of its consequences follows.

**Selection of Variables.** The definitions of the variables and data sources used in constructing the 2005 country-specific SOFI are in general the same used in the previous 2004 exercise. By design, the complete set of 20 variables used in previous global SOFI exercises was taken as a starting point for the country-specific SOFIs. Their stability since 2001 indicates that they represent a strong set and warrants their application to specific countries. The idea was to take the possibility of comparison with the global SOFI as far as possible; and to consider any modification, elimination or addition of new variables only if necessary. Problems with data collection in 2004 restricted the number of usable variables from 20 to 12 for the 10 countries included in the research, and in 2005 to only 10 variables for the 32 countries included in the research. These 10 variables were:

1. Food availability
2. GDP per capita
3. Mean monthly carbon dioxide in atmosphere
4. Annual population addition
5. Literacy rate, adult total
6. Annual AIDS deaths
7. Share of population living in countries that are not free
8. Infant mortality
9. Unemployment
10. Debt to GDP ratio

Due to the lack of enough information available, we set a benchmark for the number of data needed in order to predict with certainty the behavior of the variables. This benchmark was set at 15 years of available data out of 20 historical years for most of the countries, or at least 10 years of available data for some of the variables in some countries (see below).

**Available information per country.** The evaluation of a larger country dataset compounded the problem because available data is in general different for each country, so that for a given set of countries it is not always possible to find the same quantity of variables with a similar quantity of data points, defined as the number of years with useful data out of the two decades before the study. The historical data series found for each variable and each of the 32 countries considered are given as Appendix and the situation was basically the same as that described previously for the year 2004 data. For the 20 variables originally defined for the SOFI, only 10 are usable with ten or more data points, but not for every country. The complete list of countries and the corresponding number of variables with 15 – 20 or 10 – 14 data points is given in Table 2. Comparable information as for the 2004 National SOFIs is lacking for most of the representative

countries in Asia, Africa and Europe. To keep the possibility of comparison with the global SOFI, a major effort should be undertaken to expand the present database for a more representative and comparable SOFI for all countries.

*Table 2. Availability of variables for selected countries in different continents*

<b>Continent</b>	<b>Country</b>	<b># variables with 15 – 20 data points</b>	<b># variables with 10 – 14 data points</b>
<b>America</b>	Argentina*	9	1
	Bolivia	8	1
	Brazil*	9	1
	Canada*	10	0
	Chile*	10	0
	Colombia*	10	0
	Costa Rica**	10	0
	Cuba	7	1
	Ecuador*	8	2
	El Salvador**	8	2
	Guatemala	8	1
	Honduras**	8	2
	Mexico*	9	1
	Nicaragua**	9	1
	Panama**	10	0
	Paraguay**	9	1
	Peru	9	1
	Uruguay**	9	1
	USA*	10	0
	Venezuela*	10	0
<b>Asia</b>	China**	8	2
	India	8	0
	Japan**	10	0
	Republic of Korea	5	0
	Russian Federation	6	1
<b>Africa</b>	Egypt	8	0
	Nigeria	8	1
	South Africa	7	1
<b>Europe</b>	Germany	8	1
	Portugal**	9	1
	Spain	8	0
	United Kingdom	9	0

\*: countries selected for the 2004 National SOFI

\*\* : countries that fulfill similar conditions as those selected for the 2004 study

**Comparison of 2004 and 2005 datasets.** Appendix B shows the database of historical data series for each variable used in the 2004 National SOFIs and the Appendix shows the corresponding database of historical data series for each variable used in the 2005 National SOFIs. Examination of these two data bases indicates that data from the same sources can change in a significant way from year to year, including the whole set of historical data series for the 10 countries originally studied. Due to this finding, we decided to take a closer look at these variations and their impact on the SOFI calculations. Table 3 summarizes the comparison of historical data series for some of the variables used in the 2004 and 2005 National SOFIs.

*Table 3: Comparison of historical data series for some of the variables used in the 2004 and 2005 National SOFI*

#	Variable	Maximum negative variation* %	Country	Max positive variation* %	Country
1	Food availability	-4	Argentina	+12	Canada
2	GDP per capita	-24	Brazil	+51	Venezuela
3	CO2 in atmosphere	0		0	
4	Annual population addition	-31	Argentina	+19	Venezuela
5	Annual AIDS deaths	0		0	
6	Freedom	0		0	
7	Unemployment	-18	Brazil	+20	Mexico
8	Debt to GPC ratio	-19	Ecuador	+243	Peru

\*:  $100 \times (2005 \text{ SOFI value} - 2004 \text{ SOFI value}) / (2004 \text{ SOFI value})$ , for every year with data in the range 1982 – 2002

Variation in food availability was in general below 1% except for Argentina, Canada and Peru. According to databases, the numbers for Peru and Canada showed diverging trends after 1999, up to -3% for Peru in 1999 and up to 12% for Canada in 2001. The values for Argentina were below 1% with the exception of -4% in 2001. Annual population addition presented a similar behavior: for Argentina it showed a decreasing trend from values close to 1% in 1982 – 1984, down to values of -31% in 2001; and for Venezuela, it showed a decreasing trend from values close to 19% in the period 1982 – 1985, down to -4% in 2000. Most of the other countries (Brazil, Canada, Mexico, Peru and the USA) showed no variation for this variable.

The GDP behavior was very different. The variation was relatively constant for every data point for the whole period of 20 years of historical data for every country; however, there were also large variations. For example, it was close to only 1% for Canada, but -24% for Brazil and +51% for Venezuela.

Finally, unemployment and Debt/GDP ratio did not showed any general trends, but very noticeable fluctuations in the ranges (-17 to +20) and (-20 to +243) respectively for almost every country. However, the Debt/GDP ratio was constant at 0% for Canada and USA for the whole period, while Latin American countries had very larger fluctuations.

The origin of these variations was not investigated here, but it is possible to hypothesize that they could be due to revisions of the data by the original sources, redefinition of economic variables,

recalculations based on country specific variations in economic policies, or economic discontinuities due to devaluations, debt default or similar causes. Nonetheless, if their impact is important in the SOFI calculations, as they appear to be (see below), it should be further investigated.

**Data Backtesting.** To continue with the evaluation of the variables, it was decided to test the SOFI 2002 forecasts for the 10 countries studied the previous year with data up to 2001. These results were compared with those of the same calculation using the real values of the variables found for year 2002.

Data from Argentina (Table 4) was a clear example of the overriding effect on the SOFI of one variable (Debt/GDP ratio) when no equivalent compensating effects appear in the other variables. A 252% increment in the Debt/GDP ratio produced a drop of 47% in the future perspectives for Argentina as measured by the SOFI. No other variable had a significant enough variation as to compensate for this deviation. Another interesting case was Colombia (Table 5), where the real change in the number of AIDS deaths has to be studied. In spite of being the most important variation (−77%) with a presumably significant positive impact on the SOFI, this indicator dropped almost 10%. In this case, the other significant variation was in school enrollment that increased by 29%, which was more important to the SOFI in spite of its relatively low value.

Data from Peru (Table 6) was also indicative of the SOFI low sensitivity to variations in AIDS value. The negative impact of an increase of 1324% in AIDS deaths was only reflected in a very small (−0.8%) decrease in the SOFI for Peru, without any other compensating effects of other variables. Perhaps, and this could be evaluated in the future, the weight of the AIDS indicator should be reevaluated in view of these results. The weight of school enrollment appears reasonable based also in the case of Venezuela (Table 7). An increase of 148% produced a positive impact of 4.6% in the future perspectives of Venezuela as measured by the SOFI, in spite of the negative impact of an increase of 121% in unemployment. No other major problems with the respective weights were evident from these considerations.

Table 4: Comparison of the Argentina SOFI for 2002 based on the historical data 1982 – 2001, with the value calculated using the 2002 real data for the different variables

Argentina	YEAR 2002		Absolute error	Relative error	Impact on SOFI
	SOFI Projection	Real data			
Infant Mortality	15.65	16.50	0.85	5.4%	–
Food Availability	3,181.55	2,992.10	(189.45)	–6.0%	–
GDP per Capita	8,085.95	6,635.86	(1,450.09)	–17.9%	–
Access to Safe Water					
CO2 Emissions	0.14	0.14	(0.00)	–2.9%	+
Added Population	0.45	0.32	(0.14)	–30.6%	–
Unemployment	13.29	20.00	6.71	50.5%	–
Literacy Rate	97.13	97.00	(0.13)	–0.1%	–
AIDS Deaths	1,448.33	1,380.00	(68.33)	–4.7%	+
Life Expectancy	74.24	74.00	(0.24)	–0.3%	–
Armed Conflict					
Debt / GDP	41.76	146.99	105.23	252.0%	–
Forest Land					
Poverty					
Terrorist Attacks					
Crime					
People Not Living Free	1.83	3.00	1.17	63.9%	–
School Enrollment	71.30	80.75	9.45	13.3%	+
Access to Health Care					
Nuclear Proliferation					
<b>SOFI</b>	<b>82.24</b>	<b>43.56</b>	<b>–38.68</b>	<b>–47.0%</b>	

Table 5: Comparison of the Colombia SOFI for 2002 based on the historical data 1982 – 2001, with the value calculated using the 2002 real data for the different variables

Colombia	YEAR 2002		Absolute error	Relative error	Impact on SOFI
	SOFI Projection	Real data			
Infant Mortality	17.99	18.50	0.51	2.8%	–
Food Availability	2,640.24	2,584.00	(56.24)	–2.1%	–
GDP per Capita	2,357.70	1,973.60	(384.10)	–16.3%	–
Access to Safe Water					
CO2 Emissions	0.06	0.06	(0.00)	–1.7%	+
Added Population	0.74	0.76	0.02	2.3%	+
Unemployment	14.68	15.00	0.32	2.2%	–
Literacy Rate	92.52	92.00	(0.52)	–0.6%	–
AIDS Deaths	310.82	72.00	(238.82)	–76.8%	+
Life Expectancy	71.70	72.00	0.30	0.4%	+
Armed Conflict					
Debt / GDP	37.75	41.32	3.57	9.5%	–
Forest Land					
Poverty					
Terrorist Attacks					
Crime					
People Not Living Free	4.00	4.00	–	0.0%	–
School Enrollment	73.71	53.50	(20.21)	–27.4%	–
Access to Health Care					
Nuclear Proliferation					
<b>SOFI</b>	<b>67.86</b>	<b>61.43</b>	<b>(6.43)</b>	<b>–9.5%</b>	



Table 6: Comparison of the Peru SOFI for 2002 based on the historical data 1982 – 2001, with the value calculated using the 2002 real data for the different variables

Peru	YEAR 2002		Absolute error	Relative error	Impact on SOFI
	SOFI Projection	Real data			
Infant Mortality	24.77	26.00	1.23	5.0%	–
Food Availability	2,540.42	2,570.90	30.48	1.2%	+
GDP per Capita	2,156.62	2,130.67	(25.95)	–1.2%	–
Access to Safe Water			–		
CO2 Emissions	0.03	0.03	0.00	4.5%	–
Added Population	0.43	0.40	(0.03)	–6.0%	–
Unemployment	9.27	9.00	(0.27)	–2.9%	+
Literacy Rate	91.10	85.00	(6.10)	–6.7%	–
AIDS Deaths	295.00	4,200.00	3,905.00	1323.7%	–
Life Expectancy	68.91	70.00	1.09	1.6%	+
Armed Conflict			–		
Debt / GDP	54.98	49.29	(5.69)	–10.4%	+
Forest Land			–		
Poverty			–		
Terrorist Attacks			–		
Crime			–		
People Not Living Free	2.00	2.00	–		–
School Enrollment	74.93	68.90	(6.03)	–8.1%	–
Access to Health Care					
Nuclear Proliferation					
<b>SOFI</b>	<b>67.20</b>	<b>66.69</b>	<b>(0.52)</b>	<b>–0.8%</b>	

Table 7: Comparison of the Venezuela SOFI for 2002 based on the historical data 1982 – 2001, with the value calculated using the 2002 real data for the different variables

Venezuela	YEAR 2002		Absolute error	Relative error	Impact on SOFI
	SOFI Projection	Real data			
Infant Mortality	18.32	18.50	0.18	1.0%	–
Food Availability	2,352.19	2,336.00	(16.19)	–0.7%	–
GDP per Capita	3,422.96	4,503.00	1,080.04	31.6%	+
Access to Safe Water					
CO2 Emissions	0.15	0.16	0.01	9.7%	–
Added Population	0.47	0.46	(0.01)	–1.8%	–
Unemployment	7.23	16.00	8.77	121.2%	–
Literacy Rate	93.58	93.00	(0.58)	–0.6%	–
AIDS Deaths	396.84	396.84	–	0.0%	–
Life Expectancy	74.01	74.00	(0.01)	0.0%	–
Armed Conflict					
Debt / GDP	30.51	35.62	5.11	16.8%	–
Forest Land					
Poverty					
Terrorist Attacks					
Crime					
People Not Living Free	3.00	3.00	–	0.0%	–
School Enrollment	24.08	59.62	35.54	147.6%	+
Access to Health Care					
Nuclear Proliferation					
<b>SOFI</b>	<b>64.78</b>	<b>67.77</b>	<b>2.99</b>	<b>4.6%</b>	

Main results from the 10 countries reported in the *2004 State of the Future* are summarized in Table 7 from the respective Appendix. The numbers here confirm the previous appreciations concerning the impact of the SOFI variations.

*Table 8: 2002 SOFI variation, and main responsible variable for the 10 countries studied in 2004 based on the historical data 1982 – 2001, when recalculated using the 2002 real data for the different variables*

Country	SOFI absolute variation	SOFI % relative variation	Variable that most changed	Variation in variable that most changed	Impact on SOFI
Argentina	-39	-47	Debt/GDP	+252%	-
Brazil	-6	-9	Debt/GDP	+65%	-
Canada	+2	2	AIDS deaths	-92%	+
Chile	-11	-16	Debt/GDP	+132%	-
Colombia	-6	-10	AIDS deaths	-77%	+
Ecuador	+10	+20	Debt/GDP	-36%	+
Mexico	+4	+5	AIDS deaths	-52%	+
Peru	-1	-1	AIDS deaths	+1321%	-
USA	+5	+4	AIDS deaths	-60%	+
Venezuela	+3	+5	School enrollment	+148%	+

## CONCLUSIONS AND RECOMMENDATIONS

The results from the first National SOFIs in 2004 and from the investigation of the quality of variables in 2005 indicate that in order to have a national and regional SOFI, much remains to be done. However, the Global SOFI Methodology is fully applicable to National SOFIs as stated in the 2004 State of the Future, and no country specific methodological requirements need to be taken into account at this stage of development. Availability and comparability of data continued to be a problem with other 22 countries, including 12 from three other continents (5 from Asia, 4 from Europe and 3 from Africa). The main problem in the application of the methodology is not just the availability of country specific historical data for some variables, but the quality and variations upon actualization. The necessity of a sensitivity study for certain variables should be considered in order to take into account the possible variations in the datasets. Such sensitivity analysis applies mainly to the economic and social variables, which are very prone to be restated due to various reasons, including political reasons. The effect of dataset variations could be very significant for the SOFI calculations, as seen previously, and it could be evaluated each year. Similarly, the weights of certain variables should also be reconsidered as exemplified by the low sensibility found for the AIDS variable of some National SOFIs.

The results obtained in the calculation of National SOFIs with real data, as compared to the predicted results from data series of previous years, warrant further research in this area. Variables whose improvements contribute to a better future outlook and variables which produce a worsening due to their deterioration can readily be identified. These positive and negative impacts are a very useful guide to separate effects due to dataset variations and real changes that were not present in the historical data series; including unexpected events that change the extrapolations of the variables. These factors could be a useful guide to the application of other techniques like trend or cross impact analyses, or as elements for the construction of scenarios.

The variety and variations of trends and specificities in historical data series are a rich source of elements for comparison and further developments.

Previous work with a global SOFI indicates that there is a delicate balance between the variables that create positive and negative impacts. The sensitivity analysis done for the 12 variables used to calculate the SOFIs of the 10 American countries reported in 2004, although not conclusive, also indicated the very high sensibility to one or several variables, but very low sensibility to others. Worth considering was the relatively low impact of AIDS deaths on the SOFI, and such results should be considered in the next SOFI exercises, including the global SOFI.

Conclusions from the present exercise within the scope of the national SOFI methodology development, although very crude, indicate that the study of national and regional SOFIs stands out as a very promising area of futures research. This should be considered since it could also synergistically interact with the global SOFI development.

## Appendix The Americas SOFI 2005

### 2005 National SOFI data sources and definition summary table

**green** -- variables with 15—20 years of historical data for all or most of the countries considered are indicated in

**blue** -- variables with less than 10 years of historical data are indicated in blue

**red** -- variables without significant or usable data.

	Variable	Definition	Source	Remarks
1	Infant Mortality Rate (deaths per 1,000 live births)	Infant mortality rate is the number of infants who die before reaching one year of age, per 1,000 live births in a given year; includes both male and female deaths. (World Bank, World Development Indicators)	World Bank, CD International Data Base.	
2	Food availability Cal/cp Low Income Countries	Estimates of per caput food supplies available for human consumption. Calorie supplies are reported in kilocalories. Nationals living abroad during the reference period are excluded, but foreigners living in the country are included. Per caput supply figures represent only the average supply available for the population as a whole and do not necessarily indicate what is actually consumed by individuals. (FAO).	Food and Agriculture Organization; On line at: <a href="http://faostat.fao.org/default.jsp?language=EN">http://faostat.fao.org/default.jsp?language=EN</a>	
3	GDP per capita, PPP (constant 1995 dollars)	GDP per capita based on purchasing power parity (PPP). GDP PPP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar in the United States. GDP measures the total output of goods. Gross domestic product at purchaser prices is the sum of gross value added by all resident producers in the economy plus any taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation. Data are in current international dollars	World Bank, CD International Data Base.	

	Variable	Definition	Source	Remarks
4	<b>Percentage of Households w/ Access to Safe Water (15 Most Populated Countries)</b>	Access to safe water is the share of the population with reasonable access to an adequate amount of safe water (including treated surface water and untreated but uncontaminated water, such as from springs, sanitary wells, and protected boreholes). In urban areas the source may be a public fountain or standpost located not more than 200 meters away. In rural areas the definition implies that members of the household do not have to spend a disproportionate part of the day fetching water. An adequate amount of water is that needed to satisfy metabolic, hygienic, and domestic requirements, usually about 20 liters of safe water a person per day. The definition of safe water has changed over time. The countries included are: Bangladesh, Brazil, China, Germany, India, Indonesia, Iran, Japan, Mexico, Nigeria, Pakistan, Philippines, Russia, United States, and Viet Nam.	World Bank, CD International Data Base.	Except for Canada and USA, data only for 1990 and 2000.
5	<b>Mean Monthly Carbon Dioxide in Atmosphere (ppm)</b>	Atmospheric carbon dioxide determined from the continuous monitoring programs of the four NOAA baseline observatories of the Climate Monitoring and Diagnostics Laboratory, US Department of Commerce.	World Bank, CD International Data Base.	
6	<b>Annual population additions millions</b>	Mid-year to mid-year differences in world population.	World Bank, CD International Data Base.	
7	<b>Percent unemployed</b>	The "unemployed" comprise all persons above a specified age who during the reference period were: "without work", "currently available for work", and "seeking work". The unemployment rates are calculated by relating the number of persons in the given group who are unemployed during the reference period (usually a particular day or a given week) to the total of employed and unemployed persons in the group at the same date. (ILO) The included only urban areas in China. Data include: Bangladesh, Brazil, China, Germany, Indonesia, India, Japan, Mexico, Philippines, Pakistan, and United States.	World Bank, CD International Data Base. ILO, WDI, ECLAC (Data for Cuba) <a href="http://www.eclac.cl/badestat/analisis/cuadros/E119P0T.X.xls">http://www.eclac.cl/badestat/analisis/cuadros/E119P0T.X.xls</a>	
8	<b>Literacy rate, adult total (% of people aged 15 and above in low and middle income countries)</b>	Adult literacy rate is the percentage of people aged 15 and above who can, with understanding, read and write a short, simple statement on their everyday life (UNESCO)	World Bank, CD International Data Base.	
9	<b>Annual AIDS deaths (millions)</b>	Annual number of deaths from AIDS related diseases	Pan American Health Organization. 2003 and Non Latin Countries: UN AIDS	

	<b>Variable</b>	<b>Definition</b>	<b>Source</b>	<b>Remarks</b>
10	Life Expectancy (World)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. (World Bank)	World Bank, CD International Data Base.	
11	Number of Armed Conflicts (at least 1000 deaths/yr)	A major armed conflict is defined as the use of armed force between two or more organized armed groups, resulting in the battle-related deaths of at least 1000 people in any single year and in which the incompatibility concerns control of government, territory or communal identity. (Stockholm International Peace Research Institute)	SIPRI <a href="http://first.sipri.org/index.php">http://first.sipri.org/index.php</a>	No data found for Latin American Countries
12	Debt to GNP Ratio: (%) Developing Countries	Total external debt stocks (EDT) consist of public and publicly guaranteed long-term debt, private nonguaranteed long-term debt, the use of IMF credit, and estimated short-term debt. Total debt service (TDS) shows the debt service payments on total long-term debt (public and publicly guaranteed and private nonguaranteed), use of IMF credit, and interest on short-term debt. (World Bank)	World Bank, CD International Data Base.	Except for Canada and USA, data from 1985 and afterwards.
13	Forest Lands (Million Hectares)	Global estimate of the land area in forest inventories. Includes "total forest," the sum of natural forest and plantations.	World Bank, CD International Data Base.	Data only for 1990 and 2000.
14	People living on less than \$2 per day (Billions, less China)	The poverty reference lines are set at \$1 and \$2 per day in 1993 Purchasing Power Parity (PPP) terms (where PPPs measure the relative purchasing power of currencies across countries). (World Bank).	World Bank, CD International Data Base.	Data very scarce
15	Terrorist Attacks, number of people killed or wounded	Premeditated, politically motivated violence perpetrated against noncombatant targets by subnational groups or clandestine agents. The term "international terrorism" means terrorism involving citizens or the territory of more than one country. (U.S. Department of State).		Not data found for Latin American Countries
16	Violent Crime Rate, 17 Countries (per 100,000 population)	Reported total crime rate (murder, Rape, Robbery, assault), 17 countries, comprising about 4 billion people; the countries included: Argentina, Australia, Bangladesh, Chile, China, France, Germany, India, Italy, Indonesia, Japan, Korea, Malaysia, Philippines, Poland, Russia and the United States.		Not found

	Variable	Definition	Source	Remarks
17	Percent of World Population Living in Countries that are Not Free	Based on a survey and analysis performed by Freedom House and segmenting countries into three categories: free, partly free and not free. Includes consideration of political rights and civil liberties. (Freedom House Survey of Freedom, A Century of Progress)	Freedom House Survey of Freedom, A Century of Progress" On line: <a href="http://www.freedomhouse.org/research/freeworld/2004/table2004.pdf">http://www.freedomhouse.org/research/freeworld/2004/table2004.pdf</a>	
18	Net school Enrollment, secondary (% school age)	Net enrollment ratio is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age. Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers. Based on the International Standard Classification of Education (ISCED)	World Bank, CD International Data Base.	
19	Percentage of population with access to local health care (15 most populated countries)	The countries included are: Bangladesh, Brazil, China, Germany, India, Indonesia, Iran, Japan, Mexico, Nigeria, Pakistan, Philippines, Russia, United States, and Viet Nam.	World Health Organization	Data 1995 – 2000
20	Number of agencies having, though to have, or seeking nuclear capacity	This variable includes countries and groups with or thought to be seeking nuclear weapons capacity.		Not applicable.

### Appendix B II.2.2: Historical data series for each variable used in the 2004 National SOFIs

See the Excel file “Data National SOFI 2004.xls”

### Appendix B II.2.3: Historical data series for each variable used in the 2005 National SOFIs

See the Excel file “Data National SOFI 2005.xls”

### Appendix B II.2.4: Comparison of Historical data series for each variable used in the 2004 and 2005 National SOFIs

See the Excel file “Comparison National SOFI 2004\_2005.xls”

### Appendix B II.2.5: Backtesting of National SOFIs

See the Excel file “Backtesting National SOFI 2005.xls”



## Americans National SOFIs—2004

The Millennium Project is producing the Global State of the Future Index (SOFI) since 2001. In 2004, the Venezuela Node of the Millennium Project (Jose Cordeiro and Edgar Cotte) together with Deloitte & Touche C.A. (the Venezuelan member of Deloitte), started to build such an index at national level. In 2004 they produced National SOFIs for selected countries in the Americas (Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, USA and Venezuela).

### Introduction

### Design

### The Procedure

### The Results

### Conclusions and Recommendations

### Appendix



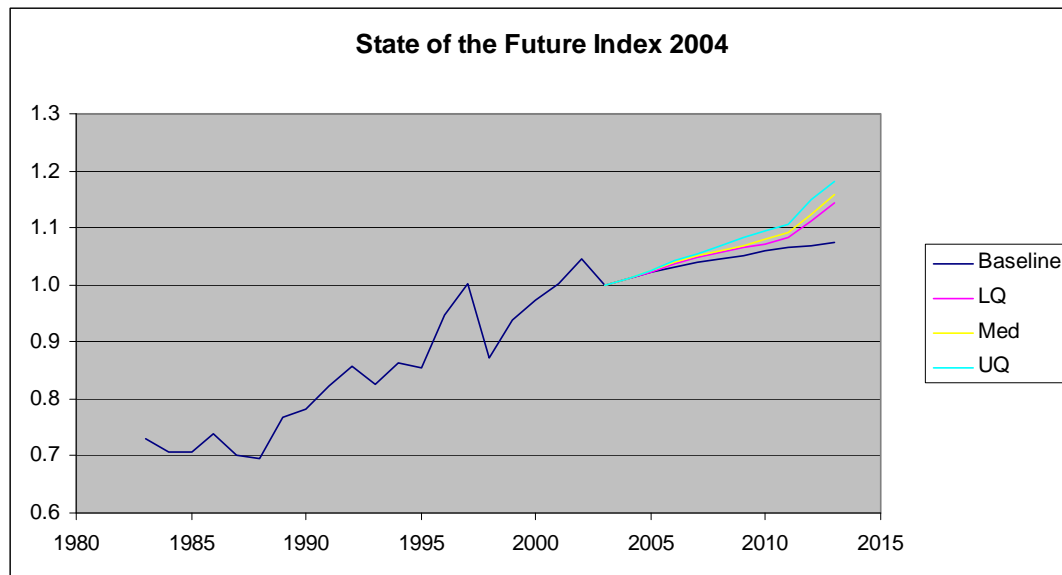
## INTRODUCTION

Since 2001 the Millennium Project has produced a State Of the Future Index (SOFI) for the world as a whole. At several Planning Committee meetings the possibility of constructing similar indices for regions or nations was discussed. The Venezuela Node of the Millennium Project (Jose Cordeiro and Edgar Cotte) together with Deloitte & Touche C.A. (Venezuelan member of Deloitte) have built such an index this year for selected countries in the American continent (Argentina, Brazil, Canada, Chile, Colombia, Ecuador, Mexico, Peru, USA, and Venezuela).

In the sense that the first year's work, published in 2001, was designed to explore the concept and applications of such an Index, we explored its application to somewhat smaller geographical scales.

The current year's work for the global SOFI is based on 20 variables (see Box 1 ext page) using two decades of historical data. This work, as reported in section "2.1.2 State of the Future Index–2004" of this chapter yielded the graph shown in Figure 1.

*Figure 1: State of the Future Index 2004 (2003=1)*



This is a moderate view of the global SOFI. Basically, the SOFI is increasing because of improvements in factors such as life expectancy, education, health and economy; but other factors have been deteriorating such as carbon emissions, poverty, AIDS, and developing country debt. Also, there are factors that could lead to a plausible and significant drop in the future SOFI, like the lack of control on AIDS and the possibility of use of weapons of mass destructions by individuals, which can produce significant changes from the curve shown in Figure 1 and are reported in Section "B State of the Future Index" of this chapter.

These factors suggest an agenda for global attention. One important point on this agenda will be further improvements of the SOFI methodology and extension to regions, nations and groups. An

index of global conditions can mask variations, for better or worse, among regions and nations, and the referred extension will be necessary for a comprehensive interpretation of the aforementioned results.

Promising areas for further development of SOFI are its application to individual countries or groups, and its use to compare their future outlook to each other as well as to the world as a whole.

This step implies country rather than global data be used, and the use of weights that are appropriate to the country or region. There are at least several major possibilities.

- If the parameters selected for the national or regional future index are the same as those used for a global measure, then direct comparisons could be made. For example, are things improving for our region as much as for the world as a whole? What set of improvements would change our outlook to be more in line with global prospects?
- However, it is quite conceivable that the countries or groups will use different variables; or that two political groups in a single country, working with the same data set, could produce quite different SOFIs by weighting the variables according to their views of the importance of the variables and by their views of the best and worst outlook for each one. Political differences can be quantified in this way.

These are examples of important challenges the definition of a national SOFI must address. Taking into account these and other aspects, a first approximation to a national SOFI was designed to explore the concept and applications of such an Index. The target of this work was to identify the new possibilities and problems that can arise in the construction of such a national or regional SOFI and to explore the methodology to perform the analysis using a representative set of countries in the American Continent, as a first step to compare SOFIs and to ascertain differences from a global SOFI.

**Box 1. VARIABLES INCLUDED IN THE 2004 SOFI**

1. Infant mortality rate (deaths per 1,000 live births)
2. Food availability (calories per capita in low-income countries)
3. GDP per capita, PPP (constant 1995 dollars)
4. Share of households with access to safe water (15 most populated countries)
5. Mean monthly carbon dioxide in atmosphere (ppm)
6. Annual population addition (million)
7. Percent unemployed (world)
8. Literacy rate, adult total (in low- and middle-income countries)
9. Annual AIDS deaths (million)
10. Life expectancy (world)
11. Number of armed conflicts (those with at least 1,000 deaths per year)
12. Developing-country debt
13. Forestlands (million hectares)
14. People living on less than \$2 per day (billion, without China)
15. Terrorist attacks (number of people killed or wounded)
16. Violent crime (per 100,000 population, in 17 countries)
17. Share of population living in countries that are not free
18. Secondary school enrollment (% of school age)
19. Share of population with access to local health care (in 15 most populated countries)
20. Number of countries having or thought to have nuclear capacity

## DESIGN

The original State of the Future Index research introduced five questions and in our current work we interpreted these in light of specific countries in North and South America. The questions are:

*1. What variables should be included in a State of the Future Index?*

In the prior research, the SOFI indicators (shown in Box 1) were selected through a series of international questionnaires and refined through a review of index studies. Except for the addition of a twentieth variable in 2003, those included in the 2001 SOFI did not change during the following years. In the aggregate the variables selected have to represent the key elements of the question the Index is designed to address: does the future seem to be getting better or worse? For the nations, the question might be identical, but, as stated before, the variables selected could be different, nation-to-nation. However, the stability of the variables used for the global SOFI indicates that they represent a strong set and we feel are applicable to specific countries. Furthermore, if the parameters selected for the national or regional future index are the same as those used for a global measure, then direct comparisons could be made. So, based on these premises it was decided as far as possible to use the same set of variables as in the global SOFI to keep a comparative approach.

*2. How can very different variables be combined?*

It is necessary to make all the measures included in the SOFI commensurate—that is, expressed in terms that are comparable. In the Millennium Project approach the best possible value for the variable equals 100 and the worst, zero. The value of the variable is then expressed as a percentage of this range. This process has been called scaling and the same procedure was used for the calculations of the national SOFI. The Global Lookout Panel was also asked to provide judgments about what the best (norm) and worst (dystopic) status was for each nominated indicator previously for 2011 and again this year for 2013. We think there could be significant differences with national values, which are, in fact, scenario-like assumptions about how the future may evolve. But lacking useful scenarios for this purpose in the target countries, as a first approximation the same best and worst values were used to combine the variables of the national SOFI.

*3. How can the variables be forecasted?*

Measurement is not enough; since we are dealing with the future, the elements of the SOFI must be forecast. How can this be done? In the first uses of SOFI, the variables were forecasted using simple curve fitting techniques; in later applications, trend impact analysis and scenarios were used. In the present instance, given the exploratory nature of the work and the focus on a first approach for the methodology, the simple curve fitting technique was used.

*4. How can the variables be weighted?*

The Global Lookout Panel not only provided judgments about the anticipated best (norm) and worst (dystopic) value of each variable, but also rated the importance of reaching the norm and dystopic state in 2011. The criteria for assigning a high weight to a variable were: the number of people affected; the significance of the effect; whether some groups seem to be affected differentially; the time over which the effect will be felt; and whether the effect is reversible. The

SOFI uses the concept of nonlinear weighting in order to balance the significance of the measures that are included. To accommodate this nonlinearity, an S-shaped function was developed that allows the weight of a variable to vary with the value of the variable. But weighting leads to other problems: different people may see one or the other of the measures as being more or less important, or even of different polarity—that is, some may see an increase in a variable as good while others see it as bad. Since the SOFI is designed to be a globally aggregated measure, it can mask differences among groups or nations: the SOFI could look very positive and yet for some groups or nations, the situation could be worsening. Therefore it is important to recognize that in disaggregated SOFI analyses it will be essential to allow groups or nations to determine their own data weights. Although in a closer look than the one in which we are interested here the weighting of the variables may change, country-to-country, for a beginning, we kept the same weights as in the prior global SOFI.

#### 5. *How can double accounting be avoided?*

This has to be considered or else one area could be over-represented. There is no formula for removing redundancies; it requires careful thought and examination of the definitions of similar or overlapping variables. This is particularly difficult if two variables are similar in most respects but differ only in nuance. Nevertheless, this step is essential and ultimately relies on judgments of the analysts to choose variables that best capture the essence of the problem being addressed. For example, should SOFI include both a measure of carbon dioxide concentration and global temperature? They measure different things but are important to consider for the SOFI for the same reason. We considered that for this first approximation to the calculation of national SOFIs, further elaboration was not warranted and the same set of variables used for the global SOFI was maintained.

As a conclusion, we can say that by design, the SOFI here reported for some American Continent countries has the closest correspondence with the global SOFI first developed in 2001.

## THE PROCEDURE

The Millennium Project has completed four SOFI exercises, reported in the *State of the Future* 2001, 2002, 2003 and 2004. Based on reasons stated before, the same process was followed repeating the assumptions of the 2001 exercise for this particular country-specific SOFI. Clearly, in the next exercises the improvements developed in 2002, 2003 and 2004 should be included.

**Task 1. SOFI Selection of Variables:** By design, the whole set of 20 variables used in previous SOFI exercises (listed in Box 1) was taken as a starting point for this country specific SOFI. The idea was to take the possibility of comparison with the global SOFI as far as possible; and to consider the modification, elimination or addition of new variables only if necessary.

**Task 2. SOFI Data Collection** involves the collection of time series data for the variables that are to be included in the calculation of the index. Ideally, 20 years of annual historical data will be required. Definitions of the variables and data sources used in constructing the American country- specific SOFI are given in the respective Appendix. The main problem was encountered

in this task: data collection at country level was found to be by far more difficult than for global variables. Of the 20 variables used in the global SOFI, it was not possible to find a usable data set for 8 variables. Due to the lack of enough information available, we set a benchmark for the number of data needed in order to predict with certainty the behavior of the variables. This benchmark was set at 15 years of available data out of 20 for a complete set. The following 8 variables (see Box 1) do not meet these criteria:

- Share of households with access to safe water
- Number of armed conflicts
- Forestlands
- People living on less than \$2 per day
- Terrorist attacks
- Violent crime
- Share of population with access to local health care
- Countries having or thought to have nuclear capacity

For these variables, either we did not find any data at all (armed conflicts, terrorist attacks, violent crime rate and nuclear capacity) or we found less than 15 years of annual historical data from the 20 years under search. The Appendix B contains the data from the 20 American Continent countries under consideration.

From the 12 data series that met the established benchmark criteria in 8 countries, 7 variables were found with the complete set of 20 years of historical data. These are:

- Food availability
- GDP per capita
- Mean monthly carbon dioxide in atmosphere
- Annual population addition
- Literacy rate, adult total
- Annual AIDS deaths
- Share of population living in countries that are not free

For the remaining 5 variables for which the data series were not continuous, linear interpolations were made to complete the required 20 years historical data series based on available time data series from the literature (Sections 1 and 2 in the respective Appendix B), as indicated in Figure 2.

Figure 2: Variables, countries and years for which data was estimated to calculate the national SOFIs.

	Infant Mortality	Unemployment	AIDS Deaths	Life Expectancy	Debt/gdp	School Enrollment
Argentina	1983, 1984, 1986, 1988, 1989, 1991, 1994			1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	1989, 1990, 1992, 1993, 1994, 1995
Brasil	1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1993, 1996		1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	
Canada	1999			1983, 1984, 1986, 1993, 1994, 1996, 1998, 1999		1986, 1987, 1988, 1989
Chile				1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	
Colombia	1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999			1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	1990
Ecuador	1983, 1984, 1986, 1988, 1989, 1990, 1993, 1994, 1996, 1998, 1999	1988, 1990, 1995	2001	1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	
Mexico	1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1989, 1990		1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	
Peru	1983, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1999	1988, 1990, 1995		1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	
Venezuela	1983, 1984, 1986, 1988, 1989, 1991, 1993, 1999			1983, 1984, 1986, 1988, 1989, 1991, 1993, 1994, 1996, 1998, 1999	1986, 1987	

Together with the index for the USA, for which the whole set of time data series was available, the nine countries indicated in Figure 2 were selected as the set of 10 countries with enough data for the SOFI calculations.

**Task 3. Forecasting the Data** will result in 10-year forecasts of each variable. The simplest time series method approach was used; and the following equations were used in the fitting process<sup>1</sup>:

1. Linear  $v = m \cdot t + b$
2. Exponential  $\ln(v) = m \cdot t + b$
3. Power function  $\ln(v) = m \cdot \ln(t) + b$
4. Logarithmic  $v = m \cdot \ln(t) + b$
5. Inverse v  $1/v = m \cdot t + b$

where 'v' is the value of the variable, 'm' is the slope of the fitted curve, and 'b' is the intercept at t=0.

<sup>1</sup> The statistical package used in the analyses was the SPSS statistics software.



After obtaining two decades of historical data for each of the 12 variables as indicated before, the first step in computing the SOFI was to forecast each variable. The historical data series for each of the variables were fitted to this set of curves in order to extrapolate to the year 2012, and the best-fit curve was taken as the basis for extrapolation. The curve selected for each variable was based on the statistical “goodness of fit”  $R^2$  criterion. The table in Section 2 of the respective Appendix B summarizes the fit information for the set and the number of initial data points.

**Task 4. Analysis** involves the computation of the index and the study of its behavior. The computation, as in the global work, involved:

- Use of judgments of the Global Lookout Panel in 2002 about what the best (norm) and worst (dystopic) status was for each indicator in 2012 and the importance of reaching the norm and dystopic state (“Encuestas 2002” for each of the countries in Section 2 of the respective Appendix B).
- Scaling the data by assigning the value of 100 for the most desirable (normative state in 10 years) and 0 for the least desirable values (dystopic state in 10 years) (“Scaling” for each of the countries in Section 2 of the respective Appendix B).
- Weighting the data using an S-shaped function that allows the weight of a variable to vary with the value of the variable (“Weighting” for each of the countries in Section 2 of the respective Appendix B).
- Calculating the SOFI. Two values are obtained for each country. The non adjusted value for each year obtained as the sum of the product of the scaled value times its weight for the whole set of variables; and the adjusted value to the year 2002, obtained dividing the non-adjusted value for each year by the non-adjusted value for year 2002, which is then the reference year with a SOFI value of 1.

Section 2 of the respective Appendix B contains the graphics for each country. The calculation methodology is described in Section 3 of the respective Appendix B.

## THE RESULTS

Figures 3—12 show results obtained for the 10 countries under consideration. Historical data series are in general very irregular, been the most uniform the curve from the USA and the most irregular the curve from Venezuela. In spite of severe variations during several historical periods of time, all countries show a general tendency toward a better future outlook, but the rate of increase of their SOFI trends is notably higher for Brazil, Chile, Mexico and the USA as compared to Argentina, Canada, Colombia, Ecuador, Peru and Venezuela.

The SOFI calculation results for USA and Venezuela (Figures 11 and 12) are representative of two extreme behaviors. USA-SOFI presents the most stable trend coupled to a relatively large positive rate of change. By contrast, the Venezuela-SOFI presents, not only a very unstable trend in its historical behavior coupled to one of the lowest positive rates of change, but shows four

discernible types of behavior in different periods of time. In the 80's it presented a very sharp decrease in its future indicators; then reverted to a positive tendency during the 90's; but this positive tendency decayed to a stagnant period for the first years of the 21<sup>st</sup> century. Finally, future outlook for this country is of a weak tendency during the next 10 years, being positive mainly due to the extrapolation of the well-defined positive tendencies it followed during the 90's. According to these results, careful evaluation of the factors that produced the stagnation of this country during the first three years or so of the 21<sup>st</sup> Century is in order to avoid further compromising its future outlook.

Noteworthy is also a significant drop in the 80's, with a clear negative slope, in the historical data series for most countries except Brazil and the USA. Negative slopes for extended periods of time are not seen in the global SOFI, and are worth of investigating due to their effect on the selection of the functional forms used to extrapolate the data for the future outlook. Also, Chile (Figure 5) and Brazil (Figure 7) show the highest rate of increase in their future outlook, but it is to be noted that their non-adjusted SOFI absolute values are significantly below the USA values (Figure 3) for the whole time span 1983 – 2012 (Figure 13). This is an indication that both parameters, the one adjusted to a reference year and the one not adjusted, deserve consideration in any analysis.

Figure 3: Argentina—SOFI

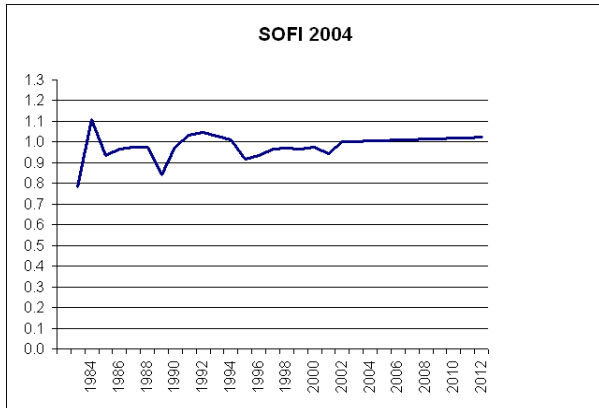


Figure 4: Brazil—SOFI

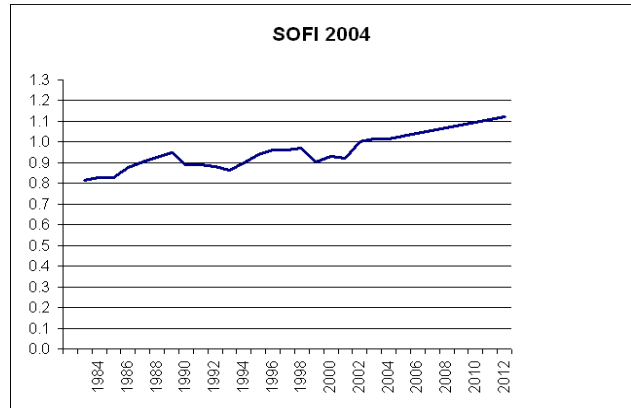


Figure 5: Canada—SIFI

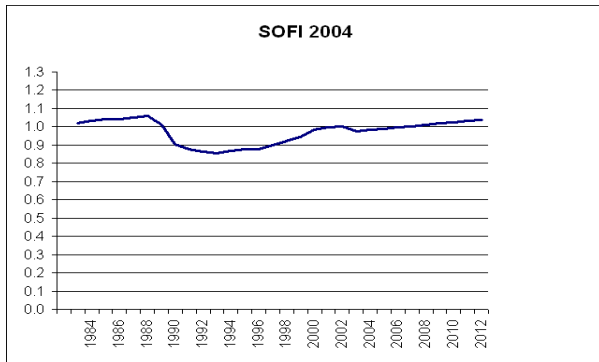


Figure 6: Chile—SOFI

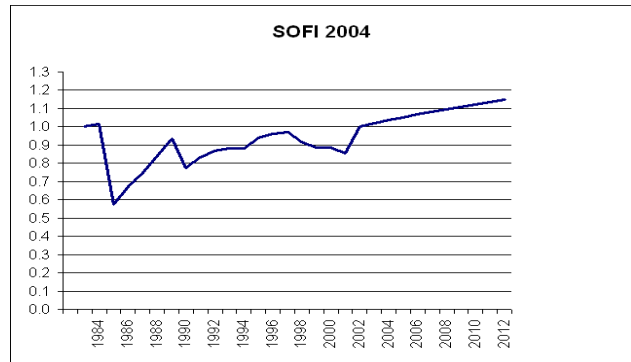


Figure 7: Colombia—SOFI

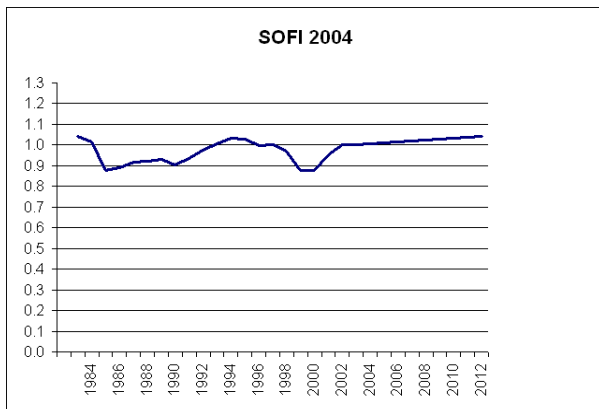


Figure 8: Ecuador—SOFI

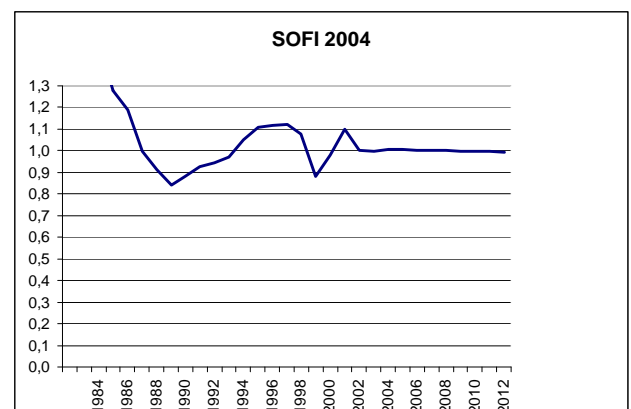


Figure 9: Mexico-SOFI

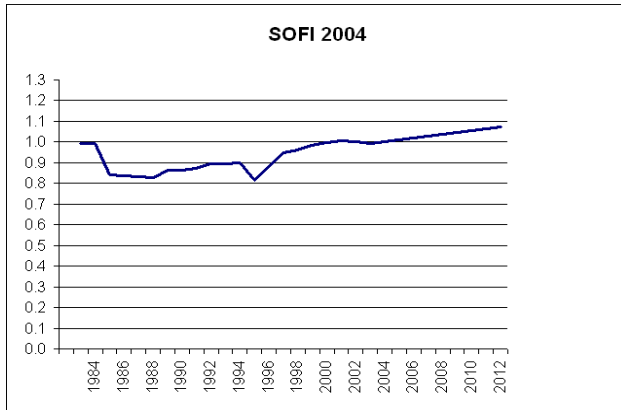


Figure 10: Peru—SOFI

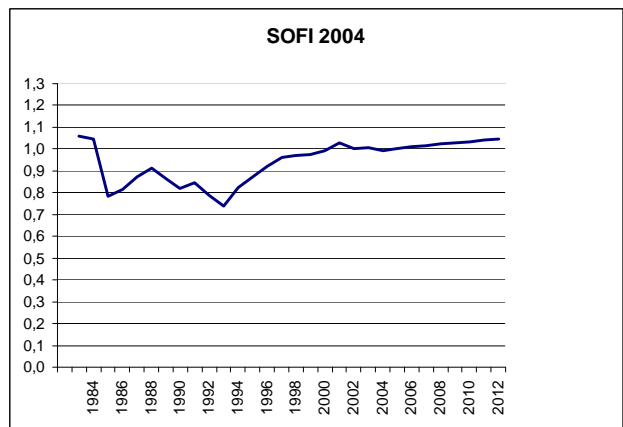


Figure 11: USA-SOFI

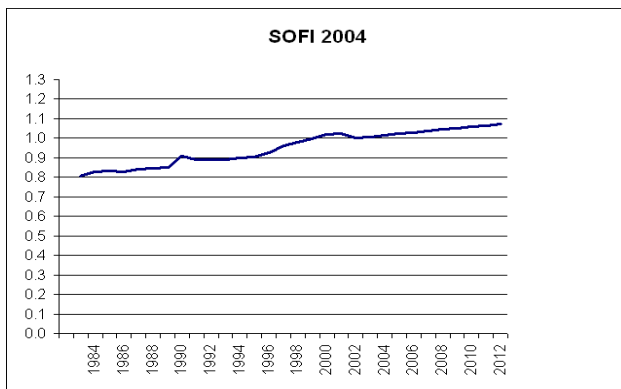


Figure 12: Venezuela-SOFI

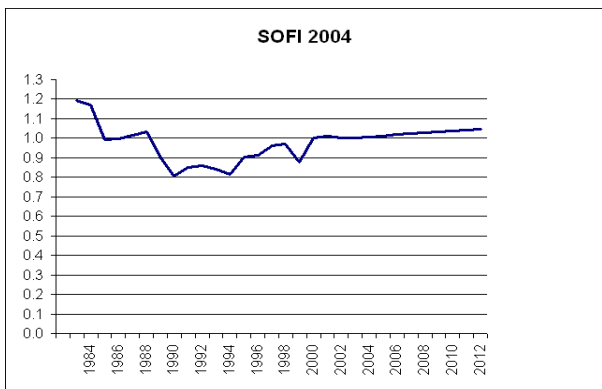
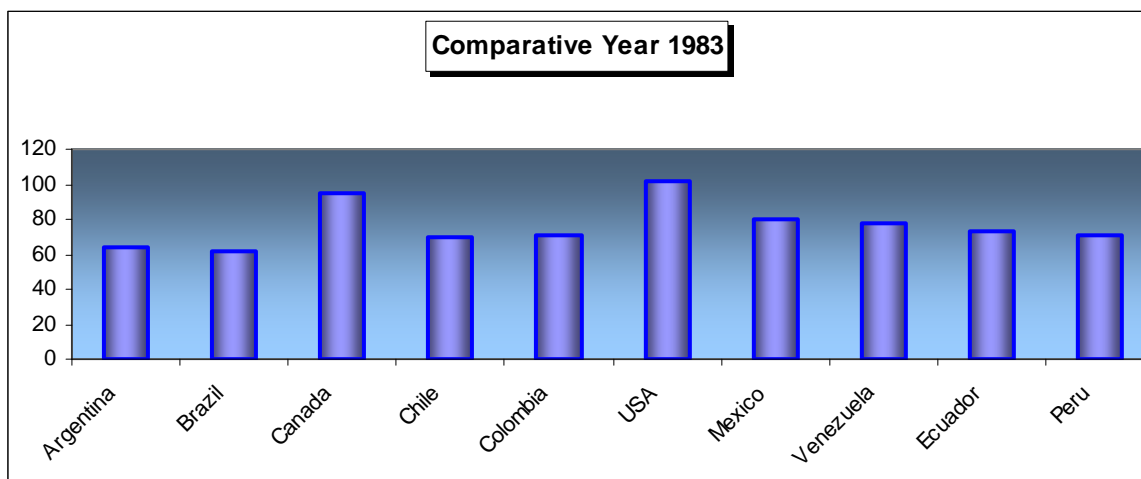
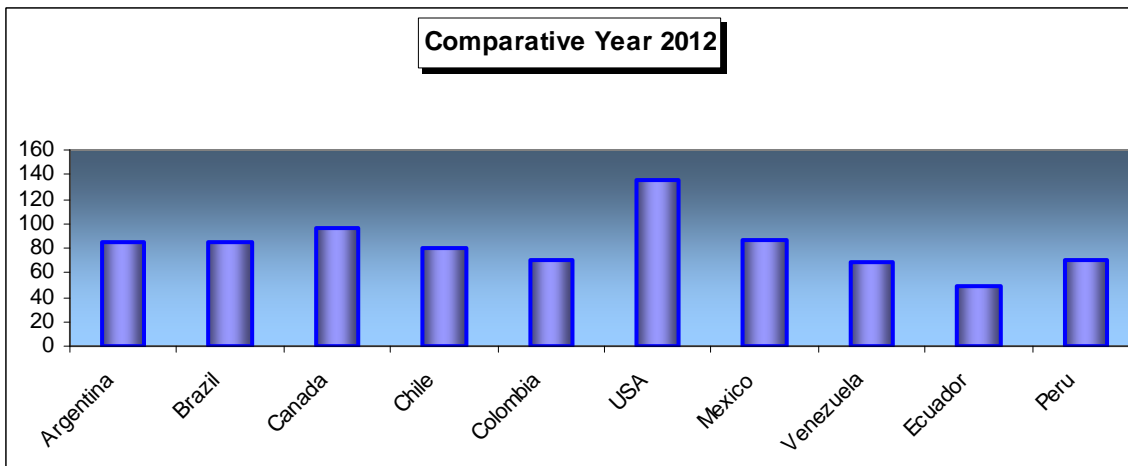
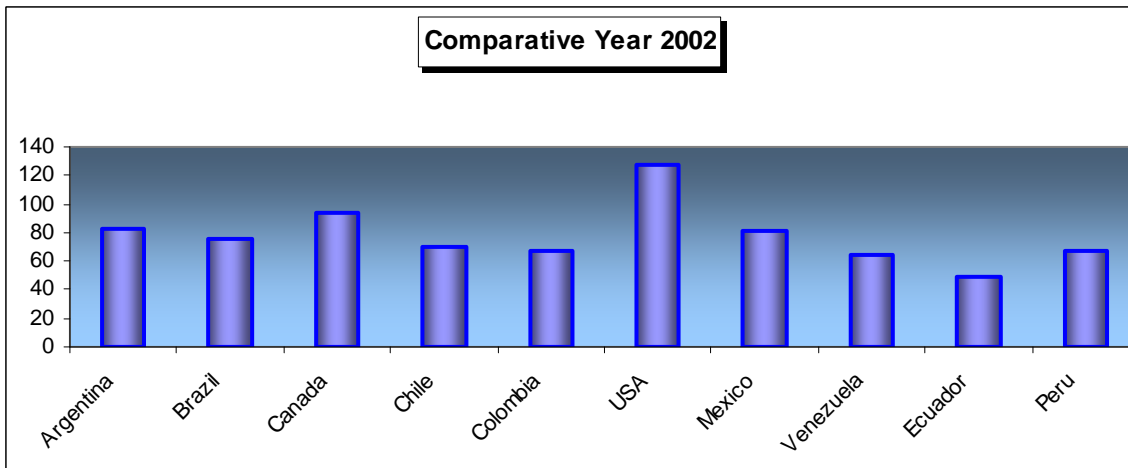
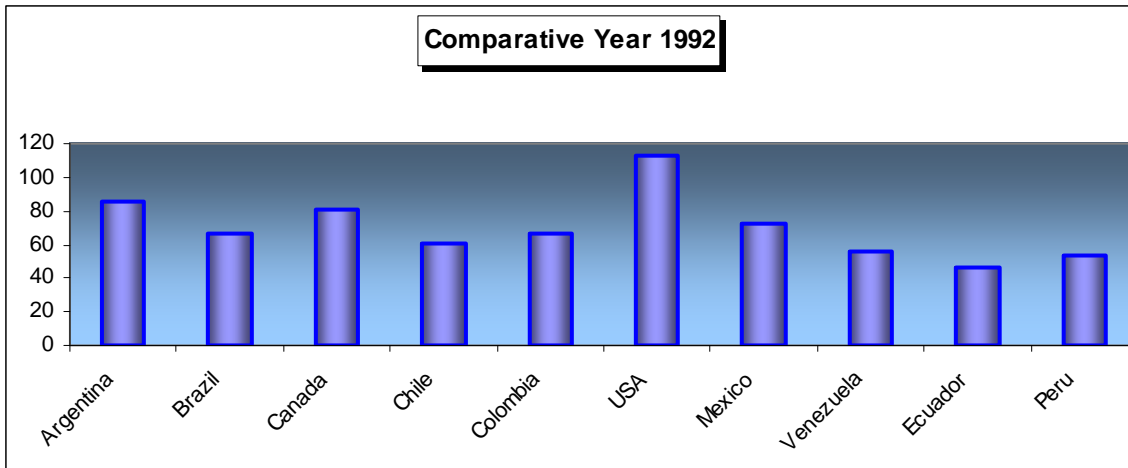


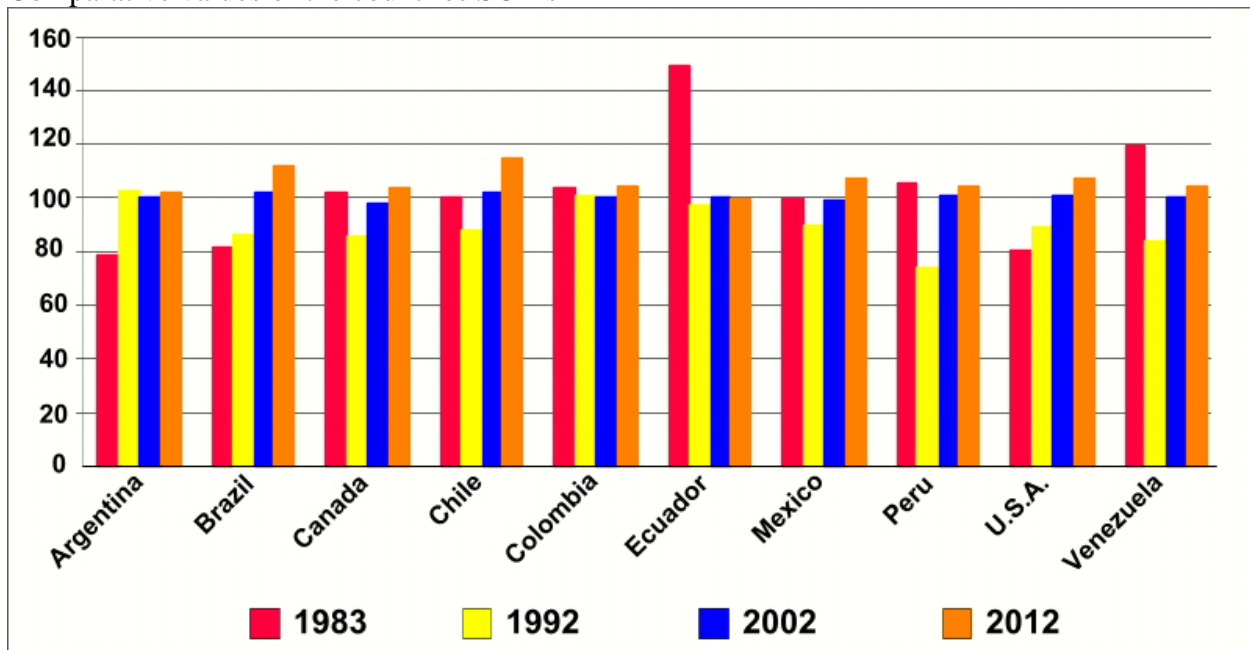
Figure 13: Comparative values of the country SOFIs in absolute values every 10 years (from 1983 to 2012)



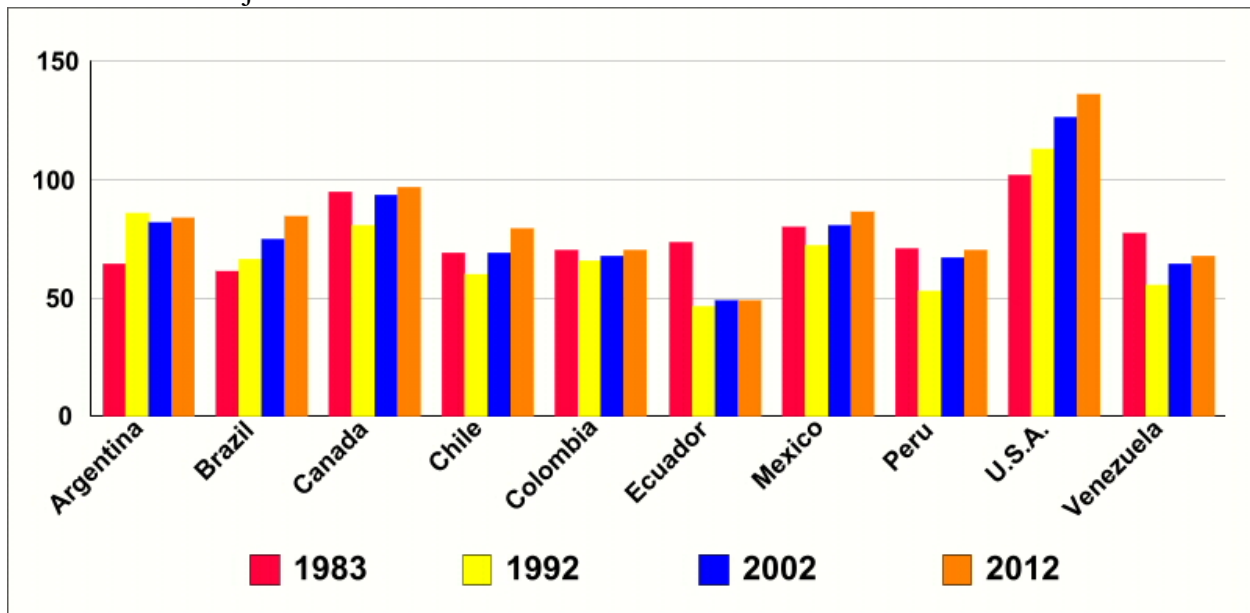


The Following two graphs show more explicitly the differences between countries' comparative values of SOFIs and the non-adjusted SOFI absolute values.

Comparative values of the countries SOFIs



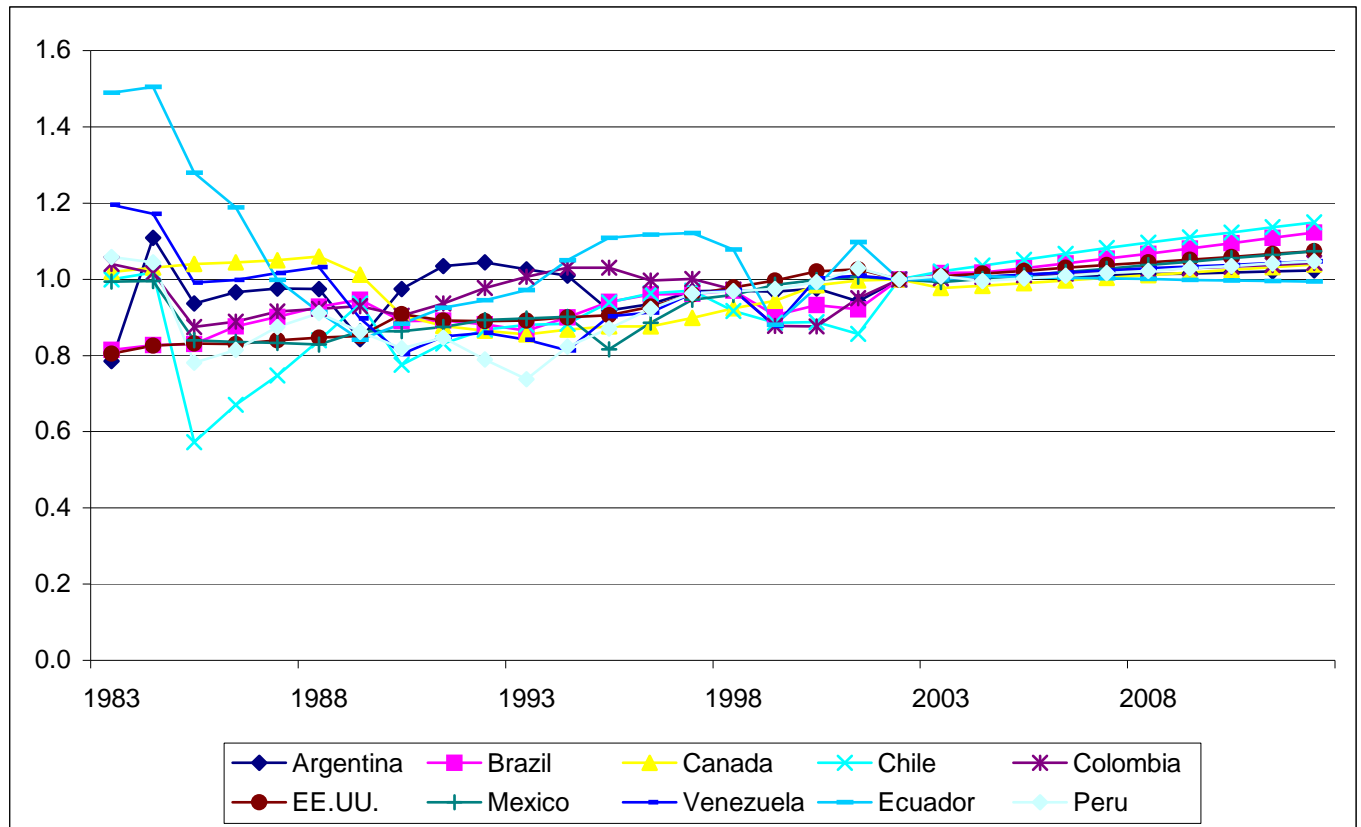
Countries' non-adjusted SOFI absolute values



Calculated SOFI's for the American Continent countries previously discussed are neither intended to be combined into a regional Ameri-SOFI, nor to be compared to the pre-existent Global-SOFI. We believe only 10 countries are not representative of the whole American Continent; and although direct comparison of the national SOFIs based on 12 variables with the global SOFI based in 20 variables is not warranted, preliminary conclusions based on significant differences, to be confirmed later, can be obtained. Figure 12 is a combination of the whole set of 10 SOFI curves obtained.

A SOFI for the American Continent may have a significant higher variability in its historical data series than the global SOFI. With the countries tested, this factor was of particular importance during the 80's. Given that negative trends are not seen in the global SOFI and that the 90's brought a stabilization and the outlook for the future is getting better in the 10 (from much better in Chile and Brazil to slightly better in Argentina, Ecuador and Venezuela) countries analyzed due to a general trend of improvements during the past 10 years, its effect on a mathematical fitting process to a curve that is going to be extrapolated ten years later should be investigated.

Figure 12: Combination of curves representing the SOFI results for 10 countries in the Americas.



## CONCLUSIONS AND RECOMMENDATIONS

In order to have a national and regional SOFI, much remains to be done. However, the Global-SOFI Methodology is fully applicable to National-SOFI's; there was not found any country-specific methodological requirement that needs to be taken into account at this stage of development. The main problem in the application of the methodology is the availability of country specific historical data for some variables, not their applicability. A lot of effort and time will be needed to collect a full country-specific data base and/or to find equivalent variables. New sources of data should be identified and data requested from international and/or national sources. Sometimes country-specific data used to calculate global trends are not published, but are available upon request from the authors.

Results obtained in the calculation of national SOFI's warrant further research in this area. The variety of trends and specificities in historical data series are a rich source of elements for comparison and further developments. Work on a specific project for an Ameri-SOFI might be undertaken. However, some of the data are weak and new data sources should be explored to improve the coverage and accuracy. Carrying out specific inquiries, perhaps using the Millennium Project's panels to again collect judgments about the most important national variables, their forecasted normative and dystopic values, their weights, and perturbing future developments could produce alternate variables with similar impact in the per country SOFI calculation. Also, these panels could open new venues of research based on particularities of countries and regions.

Application of the 2002 and 2003 developments is the next logical step after data collection. None of the global SOFIs between 2001 and 2003 show indications of a negative trend; however, when seen at the national level, clear differences, including negative trends, are detected during specific periods or time. Comparison between countries and regions need to be done. Present data should be extended to cover the American countries as a region (an Ameri-SOFI) and other regional SOFIs (Euro-SOFI and others). Developing an Ameri-SOFI and performing the analysis for the complete set of countries for different regions to compare SOFIs and explain differences will identify specific problems of impact that need to be addressed, not only in the specific country or region, but for the general well being for the whole Mankind.

There are many factors that could cause the projected SOFI to be different from the projections produced by the method outlined above. Unexpected events may occur that will change the extrapolations of the variables. The national effect of the kind of specific events that produced a bifurcation of the global SOFI could be devastating for a country, where the magnitude of the effect is not diluted by the global factors. Including such developments in the forecasts of the variables is the focus of other forecasting techniques, but is mentioned here because their use would enrich a SOFI analysis. The Millennium Project 2002 and 2003 work with SOFI utilized trend impact analysis and that needs to be introduced in the national SOFIs, given that new future possible events could cause great differences. In the present example, the variables were considered to be independent, but in the real world when one variable changes, others may be affected. A full consideration of the SOFI would include such complexities.



Previous work with a global SOFI indicates that there is a delicate balance between the forces that move the curve up and those that depress it. The signs are positive overall, although relatively small changes in some variables can swing the curve. A sensitivity analysis was not done for the 12 variables taken to calculate the SOFIs of the 8 American Continent countries here reported, but even with the data presently available it should be possible to proceed with this analysis. Variables whose improvements contribute to a better future outlook or which produce a worsening due to their deterioration should be identified and compared to the conclusions obtained with the global SOFI.

Conclusions from the present national SOFIs, although very crude, indicate that development and study of national and regional SOFIs stands out as a very promising area of futures research that should be addressed. With such a measure, decision makers and others can evaluate the consequences of proposed actions in terms of their impacts on the future outlook, and questions about whether things are improving overall, or worsening, can be answered quantitatively.