

## Economics and Population Growth

In 2009, the United Nations estimated that the world population stood at 6.8 billion, and it's expected to grow by about 1.8 percent a year going forward, hitting 9 billion by 2040.

Even now, the world's population puts many stresses on the planet – hunger, environmental degradation, diminishing arable land, diminishing supplies of oil and other fuel stocks, poverty, and much more. Inevitably, those issues will keep challenging the human race as the global population continues to grow.

It begs the question – is there a maximum capacity?

Looking back at history, many have predicted the planet would hit a carrying capacity. In the late 1700s, British scholar Thomas Malthus theorized that the world would run out of food in the 19th century. It didn't happen. In the 1960s, scientist Paul Ehrlich predicted that the population would outstrip resources at some point between 1970 and 1985. It did not come to pass.

Unlike Malthus and Ehrlich, demographer Robert W. Fogel does not believe a “population bomb” threatens the long-term well being of the planet. Fogel, who won the Nobel Prize for Economics in 1993, contends that population growth will not constrain the world's ability to feed everyone and, in fact, argues that the quality of life for people worldwide will continue to improve over time.

Fogel, who heads the Center for Population Economics (CPE) at the University of Chicago, recently talked with OUTLOOK about global population trends and the relationship between population statistics and economics.

***OUTLOOK: You've been a major proponent of the idea that improvements in technology and human physiology go hand in hand, a process called “technophysio evolution.” Could you explain a little more?***

**Robert Fogel:** Life expectancy during the 20th century in rich countries increased from 47 years at birth to close to 80 years at birth. That's a larger increase in life expectancy in a single century than took place in the previous 200,000-year history of Homo sapiens. This remarkable advance in health and longevity has been promoted by major advances in technology, including improvements in the water supply and much higher levels of nutrition per capita. At the same time, we've seen improvements in the

ARTICLE: ECONOMICS AND POPULATION GROWTH..... 1-6

    COUNTRIES WITH THE LARGEST POPULATIONS ..... 4

    WORLD POPULATION GROWTH BY REGION, 1950-2050 ..... 5

INTEREST RATES AND ECONOMIC INDICATORS ..... 7

OUTLOOK ON INTEREST RATES ..... 8

ABOUT COBANK ..... 8

vital organ systems of people. The electrical transmission within the body is much stronger today than it used to be. The heart is stronger, the lungs are stronger. The average height of the Dutch has gone from a little over five feet to a little over six feet in 200 years.

***OUTLOOK: Are we physically stronger because of better technology, or vice versa? Which phenomenon is the driver?***

**RF:** It's both. There's a synergism. The improvement in technology improves physiology, and the improvement in physiology leads to a more rapid advance in technology. Technology (better food, better water, better health care) has helped to create a better environment for people, starting with the very first environment of all – the mother's uterus. The two forces work together and the results of the interaction are greater than the sum of the parts. The mortality rate (deaths per thousand people) has dropped from 25 to 6 since the beginning of the 20th century.

***OUTLOOK: What does that mean for future life expectancy?***

**RF:** In my cohort it's about 78 or 79. In my recent book, *The Escape from Hunger and Premature Death*, I predicted the median age of death in my grandchildren's cohort will be 100. When you look back at the history of life expectancy forecasts, the biggest surprise is how drastically the experts have underestimated. In the early 1930s, for example, the chief actuary of the Metropolitan Life Insurance Company said that the conceivable upper limit of life expectancy was about 60 years. Well, we're already way past that. One by one, these expert predictions have been shattered by the reality of human development. We're not talking about amateurs. We're talking about the best technicians in the field of forecasting. Every generation predicts that the human body can't possibly last more than the current average plus about five years.

This same phenomenon applies to technological advances, by the way. The commissioner of the Census in 1850 reviewed all of the developments that had taken place during the previous 40 years, which included the initial commercialization of railroads. He said the technological changes have been so great, they can not possibly continue for the next 10 years. That was in 1850. In 1900 the commissioner of the Census, looking back on the last previous 50 years, said the changes in technology had been so remarkable they couldn't possibly continue in the next half century. In the end, the limits aren't on the human body but on our imagination.

***OUTLOOK: Won't huge numbers of senior citizens place an ever larger burden on the health care system?***

**RF:** No. Longer life spans don't mean everybody will be lying in hospital beds suffering from chronic illness. The fact that we're living longer means that we're going to be healthier for a longer portion of our lives. The age of

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**About this article**

Robert W. Fogel is an American scientist and historian who won the Nobel Prize for Economics in 1993. Today, he heads the Center for Population Economics (CPE) at the University of Chicago.



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onset of chronic diseases is going to be delayed. At the beginning of the 20th century, the average age of onset of chronic diseases was around 50. Today it's over 65. As our physiologies improve, the age of onset of chronic disease will be delayed still further. In other words, while the total number of years contained in the average lifespan will increase, the years in which we are heavy users of health care, both drugs and procedures, will be much the same as it is now.

**OUTLOOK: *If what you are saying is true, why does the amount of money we as a country spend on health care keep rising?***

**RF:** The main factor affecting the consumption of health care services is not age, it is income. The richer we get, the larger the share of our income we want to spend on health care. If you go back to 1929, only 3 percent of GDP was spent on health care, but we were much sicker. Life expectancy was only 58 years. Today we spend about 16.5 percent of our GDP on health, even though we're much healthier. The reason is that we're rich enough to be able to afford the best levels of health care. We demand the most expensive diagnostic procedures, the most expensive pharmaceuticals and the most expensive surgeries. My estimate is that the share of GDP spent on health care will reach 29 percent in 2040, not because we're sicker, but because we're richer.

**OUTLOOK: *What you're describing doesn't sound like a health care crisis.***

**RF:** Quite the contrary. If this was any other industry we'd simply say it was booming. The United States is currently the single biggest purchaser, on a household basis, of automobiles. Suppose I told you that demand for automobiles was going to double and in the next decade we'd go from two per household to four. While there might be environmental and traffic issues to contend with, everybody would be cheering about more jobs for auto workers, more jobs for steel workers, more jobs for people who work in tire factories. But if you say we're going to consume twice as much health care, everybody says that's terrible.

**OUTLOOK: *What about the insurance crisis?***

**RF:** Let's put that into perspective. We currently spend \$4,000 per year per capita in health care. Single-payer countries such as England only spend a third of that. How could that be? How could it be that when the government

## COUNTRIES WITH THE LARGEST POPULATIONS

COUNTRY	POPULATION	% OF WORLD TOTAL
1. China	1,335,800,000	(19.62%)
2. India	1,129,040,000	(17.31%)
3. United States	309,016,000	(4.54%)
4. Indonesia	231,369,000	(3.40%)
5. Brazil	192,727,000	(2.83%)
6. Pakistan	169,172,000	(2.48%)
7. Bangladesh	162,221,000	(2.38%)
8. Nigeria	154,729,000	(2.27%)
9. Russia	141,927,000	(2.08%)
10. Japan	127,530,000	(1.87%)
11. Mexico	107,551,000	(1.58%)
12. Philippines	92,227,000	(1.35%)
13. Vietnam	85,790,000	(1.26%)
14. Germany	81,882,000	(1.20%)
15. Ethiopia	79,221,000	(1.16%)

Source: United Nations Population Division

is paying for it, you get less health care spending per capita than when health care is financed mainly through private insurance? It's very simple. In Europe, and in particularly England, health care is rationed by queuing. Everyone is entitled to health care under National Health Service. But if you have a hernia you're going to wait 28 months to get it repaired. If you told somebody in the United States they'd have to wait 28 months, they'd be out on the streets demonstrating. Our average length of time between diagnosing a hernia and receiving an operation to correct it is only about two months. If we try to be like Europe, there'll be a lot of queuing, a lot of older people will not get procedures they can get now, because their insurance covers it.

**OUTLOOK: What pressures will a rising world population place on our ability to feed everyone? Is there a point at which shrinking agricultural lands and more people lead to world hunger?**

**RF:** There used to be widespread acceptance of the idea, based on Malthus, that as the population grew more rapidly you wouldn't be able to feed them all. In actual fact, from 1960 to 2000 the per-capita consumption of calories increased by 15 percent even though population doubled.

**OUTLOOK: How do you account for that?**

**RF:** The technological changes in agriculture have been fast enough that the cost of food has actually been going down. In the 19th century in the United States, about 80 percent of the population was involved in agriculture. Today, it's around 2 percent. The same trend has been true in Western Europe. And yet that 2 percent of the U.S. population is not only able to feed all of the United States but feed another 300 million people abroad. In other words, 2 percent of the people produce double the consumption of the people in the United States.

**OUTLOOK: Won't the rising middle classes in India and China put pressure on our ability to produce enough food to meet their demands, as they move to a more protein-rich, Westernized diet? What about water issues?**

**RF:** China has had its own remarkable rate of growth in agricultural technology and productivity. Despite the large increases in population over the last half century, China is feeding itself. We're not going to be feeding China and India. Most of our exports are going to be going to poorer countries whose agriculture has not kept up with their population growth.

In terms of water, there's more water than there is land. So, there's never going to be a shortage of water in the sense that you can't get enough. What's going to happen is that, if you have to get potable water by desalinating ocean water, it's going to make water more expensive. When we're talking about problems of potable water, we're talking about effective

sewage systems and cleaning up waters supplies. In countries that aren't landlocked, desalinization may become necessary.

**OUTLOOK: What's the population outlook for the United States?**

**RF:** For the population of a country to remain constant, the total fertility rate has to be 2.3 children per family. If it's below that, the population will eventually shrink. In the United States we're right about at the reproduction level. Population growth in the U.S. will continue to be driven by fertility and a declining mortality rate, assisted by immigration. Immigration will add a couple tenths of a percent to the growth rate, but most will come through fertility and the low mortality rate.

In much of Europe, the fertility rate is quite different. In Italy, France and Spain, the total fertility rate is down to about 1.2. If that continues for another generation or so, the population of Italy will fall by half. It's not just the Pope who's concerned about it. Every Italian politician is.

**OUTLOOK: Why is the European fertility rate lower than that of the U.S.?**

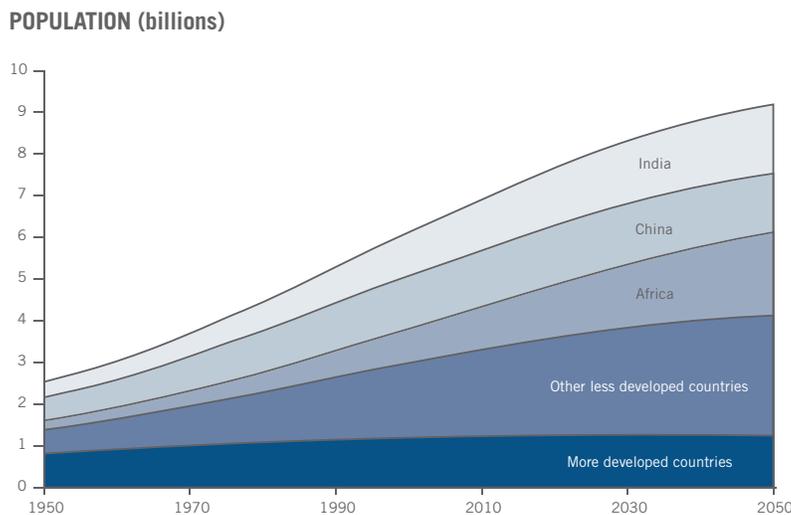
**RF:** It's cultural. What do you want out of life? The view that raising a family is a very important part of life is widespread in the United States, and less so in many of our European counterparts.

**OUTLOOK: What are the most important developments in the years to come with respect to China and India?**

**RF:** Those two countries together by the end of 2040 will represent more than half the global market for goods and services. Everybody in the developed world is going to want to service them. There will be an increase in business people in the West who speak Mandarin. But it's not a requirement, since English is widely taught in China and English has for centuries been the legal language of India.

Chinese growth right now is mainly being driven internally by improvements in technology and in the organization of production. Their biggest internal challenge is moving away from state-operated enterprises to more free-market competition within China. They've been growing at 8 to 10 percent each year since 1979, and they'll continue to grow at about that rate.

**WORLD POPULATION GROWTH BY REGION, 1950-2050**



Source: United Nations Population Division

I expect that in the not-too-distant future the recession we're going through right now will seem like another exceptional period that does little to disrupt our overall growth, which just keeps accelerating.

Chinese manufacturing has improved by leaps and bounds, obviously. A couple of years ago I was driving around in a Shanghai-made Buick. It felt like a Mercedes. I said to myself, wait till the Chinese start exporting Chinese Buicks to Detroit. The United States and EU countries are investing very heavily in China. At the same time, China is investing all over the world. The global economy is growing and China's share of the global economy will increase.

But they still have a long way to go to catch up with American technology. China sends many thousands of young people to study engineering in the U.S, We do not send our young people to study engineering in China. We're way ahead and it will take at least a generation for China to catch up. You have to distinguish how big they are in the global market versus how close they are to the technological frontier. We're the country that's still moving the technological frontiers out in almost every area – chemistry, pharmaceuticals, Internet technology. They fly Boeing aircraft in their fleets. We're the technological leaders; we haven't lost that. China is growing by adapting Western technology to its conditions, not by creating new technologies.

***OUTLOOK: Given your underlying optimism about the human race and its ability to overcome challenges, why do so many people sound as though everything is going downhill?***

**RF:** Pessimism is the normal state of opinion for the human race. People always seem to live with a sense of crisis, a sense that things are falling apart. A good example is that right after World War II, most economists and politicians predicted that the Great Depression, which ended with the war, was going to return now that the war was over. None of them envisioned that we would go through one of our most rapid periods of economic growth, lasting from 1945 to the mid 1970s. Looking back on it now, the Great Depression seems like the exception rather than the rule. I expect that in the not-too-distant future the recession we're going through right now will seem like another exceptional period that does little to disrupt our overall growth, which just keeps accelerating. ■

# Interest Rates and Economic Indicators

The interest rate and economic data on this page were updated as of 3/31/10. They are intended to provide rate or cost indications only and are for notional amounts in excess of \$5 million except for forward fixed rates.

## KEY ECONOMIC INDICATORS

Gross Domestic Product (GDP) measures the change in total output of the U.S. economy. The Consumer Price Index (CPI) is a measure of consumer inflation. The federal funds rate is the rate charged by banks to one another on overnight funds. The target federal funds rate is set by the Federal Reserve as one of the tools of monetary policy. The interest rate on the 10-year U.S. Treasury Note is considered a reflection of the market's view of longer-term macroeconomic performance; the 2-year projection provides a view of more near-term economic performance.

## ECONOMIC AND INTEREST RATE PROJECTIONS

Source: Insight Economics, LLC & Blue Chip Economic Indicators US Treasury Securities

2009	GDP	CPI	Fed Funds	2-year	10-year
Q3	2.20%	3.60%	0.16%	1.00%	3.50%
Q4	5.90%	2.60%	0.12%	0.90%	3.50%
2010	GDP	CPI	Funds	2-year	10-year
Q1	2.80%	2.00%	0.12%	0.90%	3.70%
Q2	2.90%	1.50%	0.14%	0.90%	3.80%
Q3	2.70%	1.90%	0.19%	1.00%	3.80%
Q4	3.00%	1.80%	0.19%	1.10%	3.90%

## PROJECTIONS OF FUTURE INTEREST RATES

The table below reflects current market expectations about interest rates at given points in the future. Implied forward rates are the most commonly used measure of the outlook for interest rates. The forward rates listed are derived from the current interest rate curve using a mathematical formula to project future interest rate levels.

## IMPLIED FORWARD RATES

Years Forward	3-month LIBOR	1-year Swap	3-year Swap	5-year Swap	7-year Swap	10-year Swap
Today	0.29%	0.92%	1.80%	2.71%	3.30%	3.80%
0.25	0.58%	1.15%	2.05%	2.92%	3.46%	3.92%
0.50	1.12%	1.36%	2.33%	3.13%	3.63%	4.06%
0.75	1.64%	1.45%	2.56%	3.32%	3.78%	4.17%
1.00	1.27%	1.45%	2.78%	3.49%	3.91%	4.27%
1.50	1.50%	2.14%	3.27%	3.87%	4.20%	4.50%
2.00	2.52%	3.00%	3.79%	4.23%	4.48%	4.73%
2.50	3.12%	3.48%	4.12%	4.48%	4.68%	4.88%
3.00	3.49%	3.89%	4.41%	4.68%	4.84%	5.01%
4.00	4.15%	4.49%	4.81%	4.96%	5.07%	5.20%
5.00	4.57%	4.86%	5.04%	5.15%	5.24%	5.32%

## HEDGING THE COST OF FUTURE LOANS

A forward fixed rate is a fixed loan rate on a specified balance that can be drawn on or before a predetermined future date. The table below lists the additional cost incurred today to fix a loan at a future date.

## FORWARD FIXED RATES

### Cost of Forward Funds

Forward Period (Days)	Average Life of Loan			
	2-yr	3-yr	5-yr	10-yr
30	11	12	11	7
90	29	30	28	19
180	53	56	53	34
365	101	101	95	63

Costs are stated in basis points per year.

## SHORT-TERM INTEREST RATES

This graph depicts the recent history of the cost to fund floating rate loans. Three-month LIBOR is the most commonly used index for short-term financing.

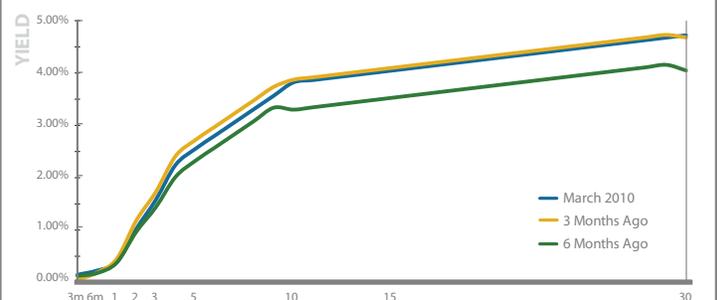
## 3-MONTH LIBOR



## RELATION OF INTEREST RATE TO MATURITY

The yield curve is the relation between the cost of borrowing and the time to maturity of debt for a given borrower in a given currency. Typically, interest rates on long-term securities are higher than rates on short-term securities. Long-term securities generally require a risk premium for inflation uncertainty, for liquidity, and for potential default risk.

## TREASURY YIELD CURVE





### About CoBank

CoBank is a \$58 billion cooperative bank serving vital industries across rural America. The bank provides loans, leases, export financing and other financial services to agribusinesses and rural power, water and communications providers in all 50 states.

CoBank is a member of the Farm Credit System, a nationwide network of banks and retail lending associations chartered to support the borrowing needs of U.S. agriculture and the nation's rural economy. In addition to serving its direct borrowers, the bank also provides wholesale loans and other financial services to affiliated Farm Credit associations and other partners across the country.

Headquartered outside Denver, Colorado, CoBank serves customers from regional banking centers across the U.S. and also maintains an international representative office in Singapore. For more information about CoBank, visit the bank's web site at [www.cobank.com](http://www.cobank.com).

*Commentary in Outlook is for general information only and does not necessarily reflect the opinion of CoBank. The information was obtained from sources that CoBank believes to be reliable but is not intended to provide specific advice.*

## Outlook on Interest Rates

Over the past several quarters, the Federal Reserve has kept interest rates at extraordinarily low levels to stimulate the nation's struggling economy. Today, the central bank's benchmark federal funds rate stands at a record low range between zero and 0.25 percent.

Though Fed Chairman Ben Bernanke made it clear this month that the Fed does not expect to raise interest rates in the very near term due to the continued fragility of the economic recovery – unemployment remains at almost 10 percent – the Fed has sent signals that it could change course when and if the economy starts to heat up. Many experts and analysts agree that interest rates will begin to rise later this year, albeit slowly and incrementally, as the economy becomes more stable.

For CoBank customers, interest rates bear careful attention in coming months, says Chief Banking Officer Phil DiPofi. "For projects or purchases that will require term-debt or a term loan, now is a good time to consider fixing the interest rate on all or a portion of the associated debt costs," DiPofi said. "By locking in rates now, CoBank customers can take advantage of low-cost, long-term financing instruments."

If you are interested in finding out more information about interest rates and financial tools to manage interest rates, contact your CoBank Relationship Manager or call us at (800) 542-8072 or visit [www.cobank.com](http://www.cobank.com). ■