
## Grandmasters and Global Growth

**07.01.2010 Professor Kenneth Rogoff is a strong chess grandmaster, who also happens to be one of the world's leading economists. In a *Project Syndicate* article that appeared this week Ken sees the new decade as one in which "artificial intelligence hits escape velocity," with an economic impact on par with the emergence of India and China. He uses computer chess to illustrated the point.**

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### Grandmasters and Global Growth

**By Kenneth Rogoff**

As the global economy limps out of the last decade and enters a new one in 2010, what will be the next big driver of global growth? Here's betting that the "teens" is a decade in which artificial intelligence hits escape velocity, and starts to have an economic impact on par with the emergence of India and China.

Admittedly, my perspective is heavily colored by events in the world of chess, a game I once played at a professional level and still follow from a distance. Though special, computer chess nevertheless offers both a window into silicon evolution and a barometer of how people might adapt to it.

A little bit of history might help. In 1996 and 1997, World Chess Champion Gary Kasparov played a pair of matches against an IBM computer named "Deep Blue." At the time, Kasparov dominated world chess, in the same way that Tiger Woods – at least until recently – has dominated golf. In the 1996 match, Deep Blue stunned the champion by beating him in the first game. But Kasparov quickly adjusted to exploit the computer's weakness in long-term strategic planning, where his judgment and intuition seemed to trump the computer's mechanical counting.

Unfortunately, the supremely confident Kasparov did not take Deep Blue seriously enough in the 1997 rematch. Deep Blue shocked the champion, winning the match 3.5 to 2.5. Many commentators have labeled Deep Blue's triumph one of the most important events of the twentieth century.

Perhaps Kasparov would have won the rematch had it continued to a full 24 games (then the standard length of world championship matches). But, over the next few years, even as humans learned from computers, computers improved at a far faster pace.

With ever more powerful processors, silicon chess players developed the ability to calculate so far ahead that the distinction between short-term tactical calculations and long-term strategic planning became blurred. At the same time, computer programs began to exploit huge databases of games between grandmaster (the highest title in chess), using results from the human games to extrapolate what moves have the highest chances of success. Soon, it became clear that even the best human chess players would have little chance to do better than an occasional draw.

Today, chess programs have become so good that even grandmasters sometimes struggle to understand the logic behind some of their moves. In chess magazines, one often sees comments from top players such as "My silicon friend says I should have moved my King instead of my Queen, but I still think I played the best 'human' move."

It gets worse. Many commercially available computer programs can be set to mimic the styles of top grandmasters to an extent that is almost uncanny. Indeed, chess programs now come very close to passing the late British mathematician Alan Turing's ultimate test of artificial intelligence: can a human conversing with the machine tell it is not human?

I sure can't. Ironically, as computer-aided cheating increasingly pervades chess tournaments (with accusations reaching the highest levels), the main detection device requires using another computer. Only a machine can consistently tell what another computer would do in a given position. Perhaps if Turing were alive today, he would define artificial intelligence as the inability of a computer to tell whether another machine is human!

So has all this put chess players out of work? Encouragingly, the answer is “not yet.” In fact, in some ways, chess is as popular and successful today as at any point in the last few decades. Chess lends itself very well to Internet play, and fans can follow top-level tournaments in real time, often with commentary. Technology has helped thoroughly globalize chess, with the Indian Vishy Anand now the first Asian world champion, and the handsome young Norwegian Magnus Carlsen having reached rock-star status. Man and machine have learned to co-exist, for now.

Of course, this is a microcosm of the larger changes that we can expect. The horrible computerized telephone-answering systems that we all now suffer with might actually improve. Imagine, someday you might actually prefer digital to human operators.

In 50 years, computers might be doing everything from driving taxis to performing routine surgery. Sooner than that, artificial intelligence will transform higher learning, potentially making a world-class university education broadly affordable even in poor developing countries. And, of course, there are more mundane but crucial uses of artificial intelligence everywhere, from managing the electronics and lighting in our homes to populating “smart grids” for water and electricity, helping monitor these and other systems to reduce waste.

In short, I do not share the view of many that, after the Internet and the personal computer, it will be a long wait until the next paradigm-shifting innovation. Artificial intelligence will provide the boost that keeps the teens rolling. So, despite a rough start from the financial crisis (which will still slow global growth this year and next), there is no reason why the new decade has to be an economic flop.

Barring another round of deep financial crises, it won’t be – as long as politicians do not stand in the way of the new paradigm of trade, technology, and artificial intelligence.

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- All of Ken Rogoff's articles at Project Syndicate
- Kenneth Rogoff on the World Economic Crisis (ChessBase)
- Chess Grandmasters at the Davos conference (ChessBase)

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### Kenneth Rogoff

Kenneth Rogoff is Thomas D. Cabot Professor of Public Policy and Professor of Economics at Harvard University. From 2001-2003, he served as Chief Economist and Director of Research at the International Monetary Fund. He is also a former Director of the Center for International Development at Harvard. Rogoff’s research covers global economic issues, including exchange rates, international capital flows and monetary policy. His treatise Foundations of International Macroeconomics (joint with Maurice Obstfeld) is the standard graduate text in the field worldwide, and his monthly syndicated column on global economic issues is published in 13 languages in over 50 countries. Rogoff is on the Economic Advisory Panel of the Federal Reserve Bank of New York and the Central Bank of Sweden. He is currently writing a book (with Carmen Reinhart) on the history of international financial crises over nine

centuries.

Rogoff is an elected member of the American Academy of Arts and Sciences, as well as a member of the Council on Foreign Relations, the Trilateral Commission and the Group of Thirty. He is also a fellow of the Econometric Society and the World Economic Forum, and has been invited to give numerous named campus-wide lectures at universities around the world. He holds the life title of international grandmaster of chess, and at his peak was ranked number 40 in the world.

More detailed biographical information including full cv and editorial writings can be found **here**. A webpage on his widely known new book on the history of financial crises with Professor Carmen M Reinhart's can be found **here**.

**PBS Newshour report with Rogoff and Reinhart**

- ***Browse in the Reinhart/Rogoff book: This Time is Different***