

How better financing could help create new cancer drugs

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The pharmaceuticals industry presents a quandary for potential investors: Major investments in drug development pay off handsomely in a relatively small number of cases, but many other projects deliver no returns at all. The evident difficulty of picking winners can deter investors from putting money into individual companies.

But a novel way of financing the industry could help bring infusions of money into the drug-development pipelines of many firms, as scholars from the MIT Sloan School of Management outline in a paper appearing this week in [Nature Biotechnology](#). The authors suggest that a large "megafund," consisting in large part of long-term bonds issued by drug companies, would help fund languishing projects while providing a safer investment option for large [institutional investors](#) and [money managers](#).

"This kind of financing vehicle could actually be a great mechanism to spur the industry to fill those pipelines," says co-author Andrew Lo, the Charles E. and Susan T. Harris Professor of Finance at MIT Sloan and director of the school's Laboratory for Financial Engineering.

Many biotech companies finance their research through venture capital funds when in the startup phase, or by going public and issuing stock as they get bigger. But a new financing arrangement incorporating bonds—also known colloquially as securitized debt—would help mitigate the hit-or-miss nature of drug development for both companies and wary investors, Lo believes. For [biotech firms](#), he says, "using [debt financing](#) on a relatively large scale" would bring in more funding, thus "enabling [firms] to support very risky kinds of research projects that currently [they] really can't afford to take on."

From the investment side of things, Lo adds, the paper shows that debt financing produces "relatively reasonable probabilities of default such that the debt can be rated and that you can make a credible case that you could market these instruments to institutional investors."

Beyond the valley of death

The MIT research uses cancer drug research and development between 1990 and 2011 as a model for the wider industry. After crunching numbers on biotech investments, revenues and production patterns for

oncology drugs, Lo and his co-authors found that a megafund between \$5 billion and \$15 billion in size could yield average annual returns from roughly 9 to 11 percent for the equity portion of the fund, and 5 to 8 percent for the debt portion of the fund.

"We basically tried to put together a simulation that an investor might want to see in order to gauge the risk and reward for investing in these drugs," Lo says.

The key to those returns, the paper emphasizes, is that a megafund would constitute a long-term investment in biotech, in contrast to stockholders who may expect increasing quarterly earnings. The funding vehicle would be aimed at riding out the ups and down of particular firms and drugs, and producing solid returns over many years.

On the industry side, the megafund concept helps address the problem people in many industrial sectors call the "valley of death"—that is, the challenge of taking promising lab research and developing it into viable products. In 2010, the authors note, the biotech industry spent about \$48 billion on basic research, and \$127 billion on clinical development, but only about \$6 billion to \$7 billion on so-called "translational" efforts to transform lab research into drugs that enter clinical trials.

"There's plenty of money for basic research, there's plenty of money for Phase III clinical trials," Lo says. "There's not a lot of money for the process in between, and that's what we're hoping to support."

In addition to Lo, the authors of the paper are Jose-Maria Fernandez, a researcher at MIT Sloan's Laboratory for Financial Engineering, and Roger Stein, a research affiliate at MIT Sloan and managing director for research and academic relations at Moody's Corp.

Evolving finance for an evolving industry

The impetus for the paper, Lo says, came in part from recent personal experience: His mother died of cancer last year, and Charles Harris, who funded his professorship, died of cancer two years ago. Working on new ways of financing is, in part, Lo's "way of coping" with the fact that "you feel helpless when your friends and family are stricken with cancer."

The megafund idea, as the authors note, faces several hurdles that would need to be addressed, from effective management of the funds to "proper controls" in the regulatory arena, especially surrounding the sale of prospective biotech securities. Still, the paper has received a positive reaction from executives in the biotech industry.

"I'm excited about it," says Monique Mansoura, director of policy and development on the Medical Countermeasures Global Program Team at Novartis Vaccines and Diagnostics in Cambridge, Mass., who has read the paper. New concepts such as this, she adds, are vital for "an industry and ecosystem that's been struggling."

In the paper, the researchers test their financing concept against both the "blockbuster" model of drug production in the industry—in which a small number of products succeed, generating giant returns—and a nonblockbuster version in which more drugs pay off, but are tailored to reach smaller populations of consumers.

Mansoura says she found the scenario in which the industry moves away from the blockbuster model to be more compelling. "The idea of a blockbuster [industry] is evolving," Mansoura says, adding that "the science is pointing toward more stratified, personalized medicine" in the future.

For his part, Lo says that input of that nature, from industry experts, is essential to help make the megafund concept viable.

"We're not experts in oncology or biomedical research," he acknowledges. "We're hoping this is going to be the beginning of a much longer and deeper conversation between financial experts and biomedical researchers."

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