Letters

Stock Prices and Stress

The Research News article "Heart attacks at 9:00 a.m." (25 July, p. 417) may have relevance to a problem in a field very different from medicine. In studies of stock price behavior, it has been found that investor returns on Monday are generally less than returns for other days of the week and, in fact, are usually negative. One explanation for this puzzling difference in day-of-the-week patterns involves higher Monday stress: feeling higher stress, investors will react by selling risky stocks and substituting low-risk bonds or Treasury securities, which results in downward movements in stock prices peculiar to Mondays. With the recent availability of intraday price data, however, it has been found that the negative return behavior is not evenly spaced throughout Monday, but instead takes place wholly within the first 45 minutes of trading (from 10:00 a.m. Eastern Standard Time), leading some to question whether stress is a likely explanation of price movement so early in the day. However, the finding that heart attacks and strokes cluster around 9:00 a.m. seems to salvage the "high stress" idea as an explanation of stock price behavior.

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Space Policy and Economic Analysis

John M. Logsdon's article "The space shuttle program: A policy failure?" (30 May, p. 1099) provides a description of the sometimes convoluted process by which important U.S. space policy decisions are made. As such, the article provides food for thought as many of these decisions are being reconsidered. In our view, however, the article introduces but does not clearly resolve several important points concerning the role and value of economic analysis in the formulation of space policy. Our comments on this issue are organized into two broad observations.

1) Costs are not irrelevant in the formulation of good policy, since national resources available for space and other activities are inherently limited. As Logsdon's narrative points out, excessively tight budget constraints may lead to undesirable consequences. However, excessively loose constraints also cause problems because they provide inadequate incentives for making hard choices wisely and for using scarce resources efficiently.

2) Yet, the goal of good policy should be not to minimize costs per se, but to maximize the net of benefits over costs. Achieving this requires not only cost consciousness but also a clear awareness of benefits, including what economists generally refer to as "nonmarket values"—benefits that do not fully or even partially register in the commercial marketplace (such as the amenity value of clean air and water) but are real nonetheless. Economics provides methods for assessing some of these benefits, but in other cases society must rely on the political process for their evaluation. The problems with the shuttle program since its inception appear to be less due to budget consciousness than to a general fragmentation and confusion in the political decision process as a consequence of multiple, poorly articulated objectives.

The conclusion that we draw—from both Logsdon's history and our own observations of the U.S. space program—is that economic analysis broadly construed, as opposed to narrowly preoccupied with costs, can play a valuable role in the policy process. This role consists of helping to clarify the societal choices that must be made for a successful space policy and educating decision-makers and the public about them. Virtues such as "presidential leadership" and "national commitment" may be necessary, but are not sufficient for a well-conceived program. This is not to suggest that economics alone is adequate, or that it cannot be mistaken (for example, by a neglect of nonmarket values) or misused. But many of the conflicts in ends that have arisen in the space program represent exactly the kinds of trade-offs that economic analysis can illuminate and, at least sometimes, help to resolve.

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Nuclear Strategy

R. Jeffrey Smith's 6 June article "A worrisome shift in nuclear strategy" (News & Comment, p. 1187) is ill-named.

There has been no shift in strategy. The growing pressure for "retaliation" or "launch-on-warning" is the inexorable consequence of the old, all-offense strategy of Mutual Assured Destruction. As Soviet long-range ballistic missiles become more and more capable of destroying our retalia-

tory force before it is launched, we are driven more and more away from the option of "riding out" an attack. And we are driven more and more toward Rube Goldberg deployment schemes such as MX Racetrack.

The answer to this dilemma is the deployment of Strategic Defense Initiative (SDI) systems, not Midgetman. No attack will be made against our retaliatory forces if any reasonable percentage of ballistic missiles can be prevented from striking their targets, and this can be done with current technology.

So long as we continue to permit Soviet missiles a free ride to their targets, we will move inexorably toward "launch-on-warning"—not through a "change in strategy," but because of a mule-headed insistence on clinging to the dangerous old strategy of MAD. Only SDI will change that strategy.

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Response: Although Graham says that only SDI can overcome the Soviet missile threat, Midgetman is intended to serve at least a portion of the SDI function: it will supposedly ensure the survival of land-based missiles. Graham is not alone in viewing it as a threatening alternative to a treasured goal.—R. JEFFREY SMITH

Nuclear Terrorism

The excellent News & Comment article by Eliot Marshall on the *Report of the International Task Force on Prevention of Nuclear Terrorism* (11 July, p. 148) is correct in reporting that U.S. naval nuclear weapons are not equipped with coded locks known as PAL's. The article also states, "Many of the 4800 nuclear weapons stored in the NATO stockpile in Europe also lack PAL's."

To the knowledge of the Task Force, all U.S. nuclear weapons deployed or stored in Europe are PALed, even though the PAL devices on many of these weapons are only primitive mechanical combination locks. The Task Force does note that "a number of tactical weapons stored in the U.S. do not have PAL's." It recommends that all tactical nuclear weapons should be fitted with the most advanced electronic PAL's. As stated in the report (p. 6), "The most advanced PAL and command-disable systems should be used to provide the fullest possible protection against terrorists detonating a stolen weapon or dismantling it to obtain nuclear material."

On another point, the article reports that the main objective of the Nuclear Control Institute (NCI), reflecting my concerns, "has been to prevent the spread of nuclear technology." My concern and that of NCI has been to prevent the spread of *sensitive* nuclear technologies that produce or utilize weapon-usable forms of plutonium and uranium that can enhance the capabilities of nations or terrorist groups to make nuclear weapons.

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Human Genome Sequencing

As noted in Roger Lewin's article of 27 June (Research News, p. 1598), there has been considerable discussion in the past year of the prospects of obtaining a complete nucleotide sequence of the human genome. Much of that discussion has focused on the estimate of the costs of carrying out such a project with the technology that is available today. It has been estimated that it would require 30,000 person-years with the use of current technology, or perhaps as much as $3 billion. This estimate has caused a great deal of consternation among many within the biomedical community—as well it should if that were the best we could do.

What seems to be overlooked by many is that the discussions regarding sequencing soon focus on prospects for improving the efficiency of the sequencing process and on the scientific strategies that might be employed to reach the long-term goal of complete molecular characterization (including the base sequence) of the human genome. At the Department of Energy–sponsored workshop in Santa Fe, which was mentioned in Lewin's article, it was estimated that sequencing technology might in a few years be as much as two orders of magnitude more efficient. That of course would mean 300 person-years and maybe $30 million—a much more palatable figure than $3 billion. Thus, one task for the next few years is to drastically improve the efficiency of sequencing technology.

The preferred scientific strategies for approaching the sequencing question involve the preparation of linearly ordered chromosomal specific molecular maps. Large pieces of DNA arranged in linear order over the length of a chromosome would present not only the ideal starting point for sequencing but would be invaluable for a large variety of applications in basic research and clinical medicine as well as the biotechnology industry.

In short, we should devote our attention to doing what is necessary to develop efficient technologies and not be blinded by cost estimates based on technology that will rapidly be superseded.

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As a participant in the "Informational Forum on the Human Genome" (Research News, 8 Aug., p. 620), I did not sense that the outcome of the meeting was as negative toward the concept of sequencing the human genome as Roger Lewin reports. However, accepting Lewin's reportage, I believe such a conclusion represents a failure of vision, an unwarranted fear of (not very) "big" science.

The sequencing of the human genome *will* be done. There is currently a facile assumption that only 1 or 2 or 5 percent of the genome is "of interest." I am not convinced we know that. Surely, in an evolutionary sense, much more will be of interest. Knowledge of the variability among the genomes of individuals will surely shed light on variations in physiology and susceptibility to disease, as well as on questions of human origin.

Having developed an institutional process to sequence the human genome will enable biologists readily to sequence other genomes: the chimpanzee, the mouse, the fruit fly, the nematode, maize, yeast, and so forth. The science of biology, the quest for the understanding of the processes of evolution and development, will be lifted to a new plane of endeavor.

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Japanese Automation

There is more to the issue of Japanese industrial competitiveness than education and management style (Science in Japan Issue, 18 July). Often overlooked is the role demographics played in Japan's industry of today.

In 1971, demographers warned the Japanese government that because of its low birth rates, the country faced a major domestic labor shortage in the 1980's and 1990's. The government tried to encourage