

John Muth (1930-2005)

Remembering the Man Behind Rational Expectations

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FEW IDEAS HAVE HAD AS MUCH OF AN effect on the science of economics as the concept of rational expectations. The idea is deceptively simple: Buyers and sellers who need to guess future prices do not merely assume that they will be the same as previous prices. Instead, they use all available information to make an educated guess as to what prices will be—at least when it is worth their while to do so. What is more, the educated guess will, on average, be correct. People will not consistently make mistakes when it comes to prognosticating future prices.

This elementary notion, first formulated by the economist John Muth, ultimately upended four decades of economic research on macroeconomics and monetary policy, utterly discrediting the notion that governments can simply fiddle with the money supply and inflation rate to achieve the desired rate of unemployment. New Fed chairman Ben Bernanke's stated desire to target inflation to between one and two percent, a policy that seems quite sensible today, would have sounded foolish only 30 years ago.

Eventually, the bulk of what came to be considered as mainstream "Keynesian" economics, with its emphasis on the need for governments to play an active role in the economy, was jettisoned. Robert Lucas, the economist who popularized the idea

of rational expectations, received the Nobel Prize for his efforts.

Despite the impact of Muth's idea, the honor and glory ultimately accorded by the profession for this titanic idea skipped by him with nary a nod in his direction. John Muth passed away last October 25th at the age of 75, and if the lack of honor and glory bothered him, he never let on. Muth, a shy and socially awkward man, would have found the attention and fuss that goes with a Nobel Prize pure torture.

THE LIFE OF JOHN MUTH

Muth grew up in the Midwest, with his family eventually settling in St. Louis. He attended Washington University in St. Louis, where he studied industrial engineering, and in 1952 he went to Carnegie Tech in Pittsburgh to study mathematical economics. At the time, Carnegie Tech was the place to be for young academics studying quantitative economics. Future Nobel laureates Herb Simon, Merton Miller, and Franco Modigliani were on the faculty, and John Nash, the game theorist who won the prize in 1984 and whose life story was the subject of the movie *A Beautiful Mind*, had finished his undergraduate degree a couple years earlier. Future Nobel winners Ed Prescott and Robert Lucas arrived later in Muth's tenure there.

Muth excelled at Carnegie; Modigliani, his adviser, called him "a very original and talented man." Modigliani, with whom Muth did a good bit of his research, also commented upon Muth's eccentricity, remarking that "he seemed to take pains to appear

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as an oddball.” Muth quickly went from graduate student to professor before taking the Ph.D., and it was there that he conceived of and published his research on rational expectations.

The first paper he published in this area, entitled “Rational Expectations and the Theory of Price Movements,” appeared in *Econometrica* in 1961. The paper was little noted at the time of its release, and one of the referees fought against its publication, claiming it was of little consequence. A companion piece appeared in *The Journal of the American Statistical Association* around the same time

It was not until a decade after publication that other economists began to recognize the importance of Muth’s idea, after it was incorporated into a paper by Bob Lucas and Leonard Rapping. By that time, Muth had left Carnegie, first to Michigan State and then to Indiana University.

Much like Nash, who abandoned his work on game theory shortly after graduation after its lack of acclaim forced him to “settle” for a job at MIT, Muth soon abandoned work on rational expectations. He once confided that after his *Econometrica* article came out, he had assumed that he would be able to go anywhere he wanted, but no one paid it much attention. He could not persuade any journal to publish a third article on the subject and his colleagues at the time did not muster a lot of enthusiasm for the idea. Herb Simon proffered an alternative to Muth’s thesis that Simon called “bounded rationality,” which holds that people generally have to sort through too much information to make a “perfect” choice in the marketplace. Instead, they wait until they see a deal that they believe is good enough. Simon’s work won him the Nobel in 1978, just as rational expectations was beginning to catch on.

While Simon got the award, Muth got nothing. As Lucas commented in Arjo Klammer’s 1984 book *Conversations with Economists*, “It must be quite an experience to write papers that radical and have people just pat you on the head and say ‘That’s interesting’ and nothing happens.”

THE RATIONAL EXPECTATIONS REVOLUTION

Economics as a discipline experienced a crisis during the Great Depression, as few economists could come up with a

decent explanation for why the Depression occurred. Then in 1936 John Maynard Keynes, in *The General Theory of Income and Employment*, took a radical approach that eventually swept the profession. Keynes said that one key reason why the Depression lingered was that people are not smart enough to figure out price changes, and hence they make all kinds of irrational decisions. For instance, prices fell precipitously during the 1930s; Keynes hypothesized that because people did not recognize that prices fell, they were unwilling to take wage cuts that would have preserved their jobs and left them just as materially well off as they were before. As a result, wages would not fall and there would be unemployment.



Keynes’s ideas were acclaimed not only as the answer to the cause of the Great Depression but also as a justification for government action to fix the economy. Soon, his ideas swept the profession and the bulk of research in macroeconomics hewed to his framework. However, the Keynesian model was fraught with problems: First, there is the minor flaw that wages were not that rigid downward. In fact, wages fell by nearly a third in the early 1930s. (Facts were never Keynes’ strong suit.)

Second, and ultimately more important, Keynes’s ideas represented a significant break with the past by essentially throwing out the central tenet of economic rationality. The notion that individuals might consistently make mistakes in the marketplace goes against one of the main principles of the modern neoclassical model. It was his theories that essentially cleaved the discipline into microeconomics and macroeconomics.

But the most important problem with the Keynesian model is that it eventually ceased to explain the economic world. For instance, the high inflation and high unemployment that characterized much of the 1970s simply could not exist concomitantly in Keynes’s framework. Keynesian economists believed that increases in inflation had to be accompanied by decreases in unemployment, an idea enshrined in the Phillips Curve.

Muth, in his seminal articles, questioned the assumptions behind the Keynesian model well before it stopped working. In his papers, he argued that people did not consistently make

economic mistakes in the market, and that they used all information available to understand the economic situation at hand. In other words, he defended the idea of rationality when it needed a defender.

The context in which he explained his idea was the hog market: For years, people thought the hog market was rife with wild fluctuations in price and quantity as people reacted poorly to price changes. For instance, if hog prices were low in a given year, people would react by not raising as many hogs the next year, pushing prices higher. Then, seeing the higher prices, farmers would raise a lot of hogs, pushing prices lower the following year. The idea was that farmers would never catch on to such a cycle because they were too busy looking only at the current prices.

Rational expectations said this was nonsense; farmers cannot consistently make such mistakes or they would be out of business. If hog prices are low this year, farmers will not automatically cut back on production today; they will look at the factors that led to low hog prices today and determine whether it is likely to happen next season as well. No farmer in his right mind will assume that if hog prices are low today, they will be low tomorrow as well. Using data on hog markets, Muth found no evidence of prices oscillating from year to year. Rational expectations explained this market quite well.

SLOW ACCEPTANCE Donald McCloskey, in his path-breaking book *The Rhetoric of Economics*, argues that Muth's idea did not become popular earlier because his paper was inaccessible. The first problem was simply that the paper was poorly written, McCloskey contends. To demonstrate this fact, McCloskey "translates" paragraphs of Muth's verbiage into a more sensible prose. There is no denying that the paper is a difficult read; the writing is very dense in places and, combined with its unorthodox ideas, only a dedicated reader can hope to get the thrust of the argument.

The other point made by McCloskey and others is that the technical aspects of the paper were simply too far ahead of the rest of the profession. A non-economist picking up an academic journal of economics today is invariably struck by the sophisticated math contained within. Back in 1960, however, Muth was one of the few economists comfortable with such a technical approach. In fact, it can be suggested that the paper contributed to the science not only with its ideas but also with its mathematical sophistication.

But perhaps the main reason for the paper not catching on was merely because of bad timing. When the idea came out, Muth was thinking about microeconomic markets, like the infamous hog market. The idea of rational expectations really took off when the Keynesian model failed and a vacuum arose in macroeconomics. Muth probably would never have come up with applying rational expectations to macroeconomics; he never considered himself a true economist and scarcely thought about macroeconomic problems. In fact, when Robert Lucas first suggested the idea to him, Muth confessed that he was skeptical and told Lucas as much, although he did work with him on the idea. When Muth did his research in rational expectations, no one was questioning the

Keynesian model that seemed to be working so well.

GLORY AND POLITICS

One argument for giving the Nobel Prize for the development of rational expectations to Robert Lucas rather than John Muth is that while Muth came up with the idea, Lucas was the one who popularized it and brought it to the forefront of economic research. Notre Dame economist Chris Waller echoes the sentiments of many macroeconomists by insisting that because Lucas made it popular, he deserves the award. In other words, quoting Principal Skinner from *The Simpsons*, a good scientist is half B.F. Skinner and half P.T. Barnum.

The other argument on behalf of Lucas receiving the award is that it was he who thought to apply the idea to macroeconomics, where it is currently all the rage. As the Nobel committee stated when they made the award to Lucas,

John Muth (1961) was the first to formulate the rational expectations hypothesis in a precise way. He used it in a study of the classic cobweb phenomenon. Muth's analysis was restricted to a single market in partial equilibrium. The importance of the rational expectations hypothesis became apparent when Lucas extended the hypothesis to macroeconomic models and to the analysis of economic policy.

The problem with this explanation is that despite its popularity in macroeconomics, the rational expectations model performs rather poorly when used to explain the overall economy. Most of the macroeconomic models used by top economists and forecasting firms are still based on a Keynesian perspective of the economy. Wall Street, too, is to some degree still under the Keynesian sway; the mere fact that the latest Fed increase in interest rates was perceived by the markets as a threat to economic growth is symptomatic of a Keynesian mindset. Markets are not wedded to philosophies; they merely stick with what is reliable. Thus far, we are still not sure why changes in the money supply matter in a world where everyone in the market fully anticipates every action by the Federal Reserve.

While it is not as revolutionary in the context of microeconomics, the concept of rational expectations reigns supreme when trying to understand individual markets like financial or commodities markets, which is where Muth originally applied the notion.

Being ahead of the curve has been the defining characteristic of Muth's career. For instance, he did seminal work in the field of operations management and spent much of the 1970s pondering artificial intelligence, another topic he abandoned before it became a "hot" area of research. Muth's work on non-convex cost curves at the end of his career generated some attention from economists as well. His goal with this research, he once confided to a friend, was to undermine microeconomic theory just as thoroughly as rational expectations undermined macroeconomic theory.

HOOSIER COUNTRY

Muth taught at Indiana University's Kelley School of Business while I was earning a Ph.D. in economics across campus at

the College of Arts and Sciences. When I arrived at Indiana in the late 1980s, the idea of rational expectations was in full bloom, and my year studying macroeconomics was virtually a paean to him and his radical idea. We spent weeks digesting his papers and asking ourselves “WWMT?”—“What would Muth think?” about this idea or that. Despite the primacy of his work, not a single student in the class knew that Muth was on our campus until the semester was over. By that time, he had drifted away from his flirtation with economic theory and taught operations management.

After that first year, my roommate, Mike Gorman (now a professor at the University of Dayton and an occasional contributor to these pages) decided to take a class from Muth, in part because he had an interest in Muth’s research area and in part because he wanted to meet this mythic figure. Muth did not disappoint; his lectures touched on a wide variety of topics, and for each one he was able to hold forth on an astounding amount of the literature and recent work. The seemingly chaotic, research-oriented approach of his class infuriated his MBA students—who once delivered a petition demanding his removal from the classroom—but captivated his doctoral students, who were uncommonly loyal to him. Muth was not the guy who had tons of contacts and could help his students on the job market, but he would read anyone’s research and give copious feedback.

Shortly after Muth’s former student (and subsequent colleague) Ed Prescott was awarded the Nobel Prize in 2004, I chatted with him after a talk Prescott gave in Washington, D.C. I asked him about Muth and he reminisced about his first year at Carnegie, when he took a two-semester sequence in dynamic analysis—the first semester taught by a newly arrived Lucas, the second semester taught by Muth. Prescott recalled that Lucas wasn’t quite comfortable with the subject material and that he was able to catch Lucas on a couple of errors. When the second semester began and Muth showed up, he told me he realized from day one that neither he nor anyone else on the planet was in a position to correct anything Muth did on the subject.

Muth seemed content at Bloomington, ensconced in a small but sophisticated, urbane community with ample diversions that afforded him his privacy. He was a familiar face at the local watering holes (his choice of haunt determined by the various weekly specials of his favorite bars) and was happy to talk shop with any of his students who encountered him on his barstool. If being at a “second-tier” school rather than at an Ivy League institution bothered him, he never let on. The mere fact that he helped begin more than one vitally important research area but moved on before the field came to fruition speaks volumes about the man; he was intellectually curious and was more interested in staving off boredom than in professional or academic glory.

Muth’s colleagues generally liked him, although the administration, always keen to please the MBA students, sometimes slighted him. One year a friend of mine, a hotshot assistant professor, received a larger raise than Muth, who was told that the new kid’s work seemed more relevant than what Muth had been doing of late. Muth went to the Social Science Citation

Index and returned to the dean, handing him a list showing that Muth’s work was cited more times than any other economist for the most recent year available, numbering in the thousands. (My friend looked himself up in the same index: he had been cited all of 12 times, and a majority of those were times that he was citing his own work.)

To be fair, the administrator who awarded the low raise was the same one who received the aforementioned petition from MBA students demanding Muth’s removal from the classroom, which he vigorously ripped up in front of them. “All of you should be giving him your signing bonus for your first job for what he’s done for this school’s reputation,” he admonished them. A friend of mine who happened to be part of the petition delegation asked me what the dean was referring to. After I had explained to him Muth’s contributions, my friend asked plaintively, “Why on earth don’t they let us know about this?” A good question indeed.

It is understandable how Muth could have gotten under the skin of a dean—he did not play politics. He once told me about showing up for a ceremony for the opening of a new building on campus. Asked to say a few words, he merely remarked that having a nice campus is undoubtedly socially unproductive, as it encourages students to spend more time in school rather than working. He laughed at his remembrance of the administrator in charge turning beet red from his remarks.

MY DATE WITH JACK

Five years after I finished my Ph.D., I returned to Indiana on a sabbatical and found myself teaching a summer finance course to make a few dollars. The capstone of the class was a complex case study that was amazingly elegant and instructive, and its author was none other than John Muth, who had by that time retired to Key West, but spent summers in Bloomington to avoid the worst of the Florida weather. He did the case studies as a favor to a close friend and former student, Jim Patterson, who was in charge of the department. As the semester progressed and I got to see snippets of his handiwork, I asked the department chair to arrange for me to meet Muth, ostensibly to talk about the case study. Muth readily agreed and we met for lunch at a nearby bar.

By the time I arrived at the restaurant, Muth had taken a table and was working on his second beer. He was friendly but plainly unused to talking about himself or revisiting his past jobs. He was a shy, self-conscious man, short, balding, and heavysset with a bit of a hunchback, and he rarely made eye contact. After a few minutes of awkwardness, I retreated into prodding him to talk about the idea that captivated him at the time, nonconvex cost curves. The notion is, like rational expectations, deceptively simple: Standard economic theory holds that, in the short run, firms cannot add plant and equipment, i.e., capital, to expand output, and thus must hire more workers to produce more. Muth argued that firms can actually do very little of this; most production lines, he reasoned, required a certain number of workers to be present before the lines could produce anything, and that any workers added above the minimum number contributed very little in terms of extra output. In other words, decreasing mar-

ginal cost curves, a staple of micro theory, do not apply to most industries.

After a few minutes our lunch arrived, and Muth's responses to my questions began to seem a bit bizarre. I was not sure if he was drunk, or just irritated with me, or not in a good mood. He had barely touched his barbeque sandwich, so I relented and kept quiet for a couple of minutes while Muth stared silently at his food. Embarrassed by the silence, I asked him a question about rational expectations, to which he looked straight at me, opened his mouth, and passed out face-first into his barbeque sandwich.

I reached across the table and pulled up his head and yelled for the bartender to call an ambulance. His breath was shallow and rapid, and the color had left his face. In short order, a nurse who happened to be dining in the restaurant came over and managed to revive him. As soon as he could process what had happened, he became very embarrassed at having become a spectacle in the restaurant. I walked along the stretcher as they carried him to the ambulance, and he apologized to me for the incident and promised to buy me lunch when he got out of the hospital.

Muth was discharged the next day, his fainting spell attributed to a change in blood pressure medication, and he soon made good on his promise. We met at my office and walked to Nick's, a legendary bar in Bloomington. As we walked in the door, a chorus of "Jack" (his preferred moniker) came from the

regulars at the bar—it was his favorite haunt and he was not above holding office hours there in his teaching days. As soon as we sat down, a waitress plopped down a Budweiser—in a can—in front of him, to which he merely replied, "Don't let me get empty, Carol."

After we had a few beers, he began to warm up a bit, and we talked about his career. He dismissed my suggestion that he still had a chance to win the Nobel, and applauded Bob Lucas's award. He said he did not regret giving up on the topic of rational expectations—he had other fish to fry, he said. He was uncommonly modest for an academic, dismissing the rumor circulating among graduate students in the business school that he had a host of unpublished papers in his files, and he told some stories about his days at Carnegie Tech. Muth may have been a socially awkward person but he enjoyed life—in his younger days, he liked to ski and sail, and played the cello as well.

After an hour or so, a couple of graduate students from the computer science department came by to introduce themselves and buy him a beer, telling him they found his work in whatever was their arcane field to be brilliant. Muth blushed with pride and invited them to join our table. The four of us shared a pitcher of beer while the three of them talked about new programming languages, to which I could only listen dumbfounded. For the only time in our acquaintance, I saw John Muth at ease in the world. R



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