

NATIONAL AFFAIRS

The Great Miscalculator

Arnold Kling

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In the minds of economists, market outcomes are deterministic. The price system is an efficient calculating machine, leading households and firms to make reliable decisions. To be sure, economists can identify "market failures," but these are isolated, predictable, and amenable to correction with taxes or regulation. This standard economic story takes the fundamental soundness of the market for granted.

But in the real world, the market cannot possibly make the sort of reliable calculations that economists expect from it. Market outcomes are highly contingent on strategies, beliefs, and past choices that are somewhat arbitrary. The market is not as well informed as we would like to believe, which in turn makes policymaking more problematic than we would like to think. Actual markets miscalculate an awful lot.

This distance between our expectations of markets and their actual abilities has numerous implications. It argues for humility about economic analysis and public policy, and for a sense of perspective about what the tools of economists offer us. The work of economists and policymakers is not entirely without such humility, of course. And the distance between economic theory and practice is hardly an unknown problem. But the most important implication of this view of the market as a great miscalculator is actually badly underappreciated. More fully accounting for the limits of markets as calculators would suggest that policy should focus, above all, on the fragility of the economy.

Our prosperity has come to rely on certain key companies, business practices, habits of thought, and assumptions about government finances. When there is a major shift in beliefs or conventions, these institutions can come under sharp, severe, and sudden stress. This will happen; there is no getting around it. But when it does, just how will these important firms, practices, and norms handle the problem? Whether they will degrade gracefully or fail catastrophically ought to be a foremost concern of policymakers.

THE SYSTEM OF EQUATIONS

Anyone who attempts to learn economics in college will encounter a curriculum that uses mathematics. The further one advances in the subject, the greater the reliance on mathematical models and equations.

Economists have come to have faith in mathematics because they see the market as a mechanism for solving one giant math problem, to be taken up in two key steps. In step one, they take certain conditions as given: the initial endowments of resources held by individuals, as well as their tastes; the engineering relationships that determine the feasible production outputs; and the rules, regulations, and tax policies set by government.

In step two, they find a set of prices that will balance supply and demand for every form of input and output. When prices have adjusted to the point where at those prices no consumer wishes to buy more and no firm wishes to supply more, the economy is said to have arrived at equilibrium.

This approach leaves no room for contingency. Historians are often keenly aware of idiosyncratic factors at work, as shown by such expressions as "alternative history" or "historical accident." But economic analysis is conducted outside of time and history. Nearly all models are written as if one could arrive here from Mars and be able to predict and explain economic outcomes looking just at conditions as they exist today, with no knowledge of the path that got us here.

In short, historians understand intuitively that they are describing processes that are too complex to be captured by scientific laws and mathematical models. Economists pretend otherwise. But economics is history. We observe circumstances that are peculiar to a particular time and place. Every firm and each household is following habits and norms that were developed in response to past experiences, many of which have long been forgotten.

On paper, one can find the equilibrium in which supply and demand are everywhere balanced by solving a set of equations; this is what economists do when they articulate their theories. In the real world, as Friedrich Hayek pointed out, the information needed to describe tastes and technologies is too dispersed for any one person to actually carry out the computation. The market itself collects the information and finds the solution. The mathematical economist is merely performing a (partial) simulation.

According to the neoclassical or mainstream economic paradigm, the market grinds out its solution by undertaking marginal analysis. For every input and output, the market calculates the value of the output that an additional unit of input could produce. This is called the marginal product. If the marginal product of, say, an apple picker exceeds that of an automobile assembler, then market prices will guide one or more workers out of automobile plants and into apple orchards.

Both market-friendly and interventionist economists share the assumption that individual productivity is well defined and can be calculated by the households and firms responsible for allocating resources. Economists go on to identify situations in which market calculations will yield suboptimal results, as when a factory owner does not bear the social costs of the pollution that the factory causes. Such situations are deemed "market failures." Interventionists suggest that government can correctly identify market failures and undertake policies to steer the market toward a better social outcome. Market-friendly economists focus instead on the flaws in the policy process and on the hope that private entrepreneurs will see opportunities to start businesses that reduce the waste that market failures otherwise would generate.

But even market-failure theory rests on a foundation of mathematically precise calculations of individual productivity. Although a market might be imperfect in the theoretical sense, it is still treated as generating predictable, deterministic outcomes. The case for government intervention is based on the presumption that taxes or regulation can shift the outcome from one that is suboptimal to one that is better in a predictable and deterministic way.

In reality, market outcomes are not nearly this predictable and deterministic. They are contingent. A given set of pre-conditions, including government policies, does not entail a

predictable economic outcome. Many alternative outcomes can arise, depending on individuals' strategies and beliefs. This is a straightforward fact, and it would not be easy for economists to deny it in particular situations. And yet the practical premise of much of contemporary economics is rooted in denying it.

OVERHEAD LABOR

Marginal-productivity theory is at the center of mainstream economics. It asserts that economic decisions are based on the measurement of the incremental output produced by an additional hour of work. In theory, everyone's work can be converted into the equivalent of the number of bushels of apples picked or the number of cars assembled in an hour.

But think of yourself and your associates. Do any of you produce measurable output? It is more likely that you are engaged in intellectual or managerial work that does not directly yield output.

In 2018, there were 150 million Americans employed in the non-farm business sector. Of these, only 9 million were production and non-supervisory workers in manufacturing. That is, just 6% of the non-farm labor force consisted of workers directly producing goods. In 1948, these blue-collar workers were 28% of the labor force.

Over 90% of employed Americans are not blue-collar production workers. What are they doing? Some service-sector workers, such as manicurists or lawn mowers, produce output that can be readily counted. But the majority of us are providing indirect support to the provision of goods and services. Project teams at firms, for example, often are not creating measurable outputs; they are building capabilities that the firms hope to use to generate revenue. From the security guard to the graphic designer to the tax accountant, we are overhead labor.

For a traditional manufacturing firm, the number of production workers is closely tied to unit sales. Production labor can be incrementally increased or decreased as needed. But overhead labor is not adjusted strictly according to sales volume.

Some overhead is necessary regardless of the level of output; you cannot get rid of tax accountants just because sales are down 10%. Other overhead is discretionary. Suppose that your company is undertaking an initiative to develop a new product or service. If sales of existing offerings are down and your financial position is less robust than you expected, you may choose to cancel the initiative in order to conserve cash. But you also have the option of continuing with the initiative and retaining the overhead workers who are undertaking the task.

Important segments of the economy are dominated by overhead costs. For example, pharmaceutical companies spend relatively little actually manufacturing pills. Research, testing, and marketing are all more important cost components. For an airline, the cost of flying an additional passenger is trivial compared to the cost of equipment, fuel, personnel, maintenance facilities, the reservation system, and so on. For a telecommunications-service provider, the cost of transmitting an additional gigabyte of data is trivial compared to the cost of building and maintaining the firm's infrastructure. For a hospital, the cost of undertaking an additional diagnostic test or procedure is small relative to the cost of managing, equipping, and maintaining the facility.

Businesses in these industries cannot present their customers with prices that reflect the marginal costs of production. If every consumer paid the marginal cost of manufacturing a pill or flying on an airplane, the revenue would not be sufficient to cover overhead costs.

The significance of overhead costs relative to incremental production costs has greatly increased in the internet era. News and entertainment used to require such media as paper or vinyl discs, which were costly to produce and ship. Now, the cost of distribution to an additional customer over the internet is essentially zero, so the challenge is to recover the cost of creating the content. Writers, editors, artists, and producers must obtain revenue through digital subscriptions, advertising, donations, or other means.

When a firm's costs are dominated by overhead, price discrimination becomes an attractive strategy, even a necessity. The airline will try to attract price-sensitive customers with a low price while charging a higher price to those customers who are more committed to flying at a particular time rather than searching for a bargain. The hospital bill will include superficially outrageous charges for products like orange juice or aspirin, because the hospital is arbitrarily allocating its overhead costs to these items. If it were forced to charge only for the cost of certain items or procedures, it would have to raise the fees for other billable goods or services.

There is a sense in which the dominant role of overhead costs creates market failures. That is, the market is not allocating resources by making marginal calculations. The quantity of overhead labor is adjusted by management discretion, rather than being shifted up and down directly in response to incremental demand fluctuations. Consumers face prices that are marked up to cover overhead costs, and these prices can far exceed the incremental cost of supplying more of the good or service.

But unlike textbook market failures, the problem of heavy overhead costs cannot be corrected by a policymaker who understands the source of the failure. Each firm must try to develop management priorities that make effective use of overhead labor. Each firm must come up with pricing strategies that exploit those most willing to pay, in order to recover overhead costs. There is no tax or regulation that can solve those problems more easily.

This also complicates the problem of treating ordinary market failures. For example, suppose that the government wishes to use a tax on airline fuel as a tool to get passengers to internalize the pollution cost of flying. If the airline allocates this additional cost to price-insensitive passengers and leaves its discounts for price-sensitive passengers in place, then the total air miles flown may remain approximately unchanged in response to the tax.

Because most labor is overhead labor, the market's calculations must be viewed as more approximate than conventional economics assumes. That in turn means that policies that try to correct textbook market failures risk achieving fewer intended consequences, and having more unintended consequences, than would be the case if markets operated as the textbooks claim.

UNDERSTATING CONTINGENCY

For neoclassical economists, when consumer tastes are given, material conditions determine what output is produced and what inputs are used to produce it. There can be only one equilibrium outcome. But in reality, strategies and beliefs exert powerful effects. Outcomes are highly contingent.

I am old enough to remember when service-station attendants pumped gas into your car. Then, in the 1970s, when oil prices shot up, stations adopted the self-serve model wherever it was legal to do so. This change in strategy was not reversed when oil prices plummeted in the 1980s. It seems that the timing of the sudden conversion to self-serve was accidental rather than determined by material conditions.

Restaurants, to take another example, are one of the most competitive industries in the United States. Yet we do not observe prices determined by marginal cost. Instead, these businesses typically use the strategy of trying to recover much of their overhead cost by charging higher markups on beverages than on food.

The evolution of business practices and industry structure can seem inevitable in hindsight. But this is misleading. The personal-computer industry is famous for the role of start-ups, including Apple, Microsoft, and Dell. But with slightly different business decisions, it could instead have been the province of Xerox and IBM.

Until the mid-1990s, consumer online access was dominated by proprietary services, such as CompuServe and America Online, each with its own separate content. But eventually these gave way to the inter-operable networks known as the internet. Yet in today's social networking, we see no such inter-operability. Instead, we see separate platforms, notably Twitter, LinkedIn, and Facebook.

It is not obvious why some business strategies succeed and others fail. Google has attempted to extend its reach from web search to email, web browsing, computer-operating systems, mapping, video, and social networking. Its success in each realm has varied. With different approaches to strategy and execution, it might have dominated social networking and flopped in email, rather than the other way around. None of this was inevitable, or even readily predictable.

Google's approach has usually been to offer software and content at no charge to consumers, with revenue coming from advertising. Indeed, under industry leaders Google and Facebook, much of the content on the internet is supported by advertising. But in theory there are other plausible business models, including micropayments, bundled subscriptions, and patronage. We could have arrived at an outcome where one of these alternative business models prevailed. That in turn might have led to a very different industry structure.

Contingency plays a particularly large role in finance. Financial markets can arrive at many different outcomes, depending on the pattern of self-fulfilling beliefs. The financial crisis of 2008 reflected a sharp swing in investor sentiment regarding mortgage-related securities and other debt instruments backed by bank loans. Prior to the crisis, there was overconfidence in these instruments. At the height of the crisis, in the fall of 2008, there was probably an excess of pessimism about what many securities were worth.

Investor beliefs also affect the performance of businesses. Amazon would never have gained such a prominent role in retail without the confidence of investors who kept pouring capital into the company, patiently enduring years in which earnings were low or non-existent.

In macroeconomics, most economists posit a tight relationship between the money supply and the overall price level. But money's role in inflation is also mediated by beliefs. Households and firms have many choices regarding the means of payment. Credit cards and electronic funds transfers are increasingly important means for carrying out transactions. Young people in the

United States rarely conduct business in cash. Even for purchases under \$10, they prefer to employ credit cards. They are starting to use smartphone apps to make payments, and in fact some other countries may be ahead of the U.S. in their adoption of mobile-payment technologies.

The widespread use of paperless payment mechanisms has broken the direct link between the supply of money and the ability of people to undertake transactions. As a result, there is no tight mechanical relationship between the quantity of money as controlled by the Federal Reserve and the overall behavior of prices.

Instead, prices are determined in large part by habit. People accept payment in dollars and sign contracts for future payments based on what they assume they will be able to buy with those dollars in the future. They know that the general trend in some industries, such as health insurance and college education, is for prices to rise. They know that in other industries, such as computers and communication, quality-adjusted prices are decreasing. They know that the prices of commodity-based goods, such as gasoline, can experience more short-term fluctuations than other prices. But in general, people assume that the purchasing power of a dollar will be about the same next month as it is today. These expectations become self-fulfilling, as many businesses keep their prices unchanged for long periods.

The U.S. government could, by running a substantial budget deficit financed by money creation, eventually dislodge these habitual expectations for prices and generate high and variable inflation. But short of that, most wages and prices are likely to continue to move within a narrow range.

This degree of contingency — and the importance of preferences, habits, and expectations — suggests that the social order studied by economists is not nearly as stable and predictable as mainstream theories assume. And it should move policymakers to ask whether our economy is prepared for that stability to be shaken or lost.

THE QUESTION OF FRAGILITY

The neoclassical economist sees the economy in a deterministic equilibrium and asks how that equilibrium can be improved. If instead we looked at economic outcomes as contingent, we would ask how catastrophic failure can best be prevented. Instead of assuming that the economy is robust, we would look for sources of fragility. Instead of hunting for market failures to avert, we would look for fragilities to mitigate.

The infrastructure for delivering electrical power offers a helpful analogy. If we assume that the grid is robust, we might look for ways to squeeze more efficiency out of it. If instead we see it as fragile, we would look for ways to introduce redundancy and to isolate points of potential failure.

In the economy, we might identify three sources of potential catastrophic failure: the government budget; the financial sector; and large firms in the technology sector.

At the moment, investors treat government debt as a safe asset. Everyone who owns government bonds expects to be paid in good funds on time. This belief is self-fulfilling, in that it allows government to "roll over" its debt, meaning that it can pay off debts as they come due by undertaking new borrowing. A sovereign debt crisis occurs when enough investors doubt that a government will always be able to roll over its debt. No one wants to be holding government

debt just before it goes into default. Fear of default will make investors reluctant to hold government debt. Thus, the fear causes the event that is feared to take place.

At present, the U.S. government budget is on an unsustainable path, as the Congressional Budget Office repeatedly indicates. Barring a change in the outlook for taxes and spending, deficits will get larger and larger until eventually there will not be enough tax revenue available even to cover interest on the debt.

For now, investors take the view that a crisis is a long way off. They assume that, for the near future, they can expect government debt to be repaid. But if that expectation were to change, it would trigger a self-fulfilling crisis. This would send the interest rate on debt soaring, forcing the government to immediately correct its fiscal path by some combination of renegeing on spending obligations, sharply raising taxes, partially defaulting on the debt, and engaging in inflationary finance.

The social and political consequences of a sovereign debt crisis are severe. Germany's social fabric did not recover from the hyperinflation of the 1920s, which wiped out the savings of many middle-class households. Greece was torn apart by its sovereign debt crisis, even though it was given substantial support from the European Union. Of course, the United States is much larger than Greece, but this cuts both ways: It means our economy is more robust, but also that there is no entity that could bail out this country in a crisis.

The best way to address the fragility of the budget would be to put government finances on a sustainable path. The most important step would be to rein in future entitlement spending. Other options include reducing non-entitlement spending and raising taxes. Needless to say, our political system is no mood to do any of that. But leaders looking to mitigate the risks of fragility would make it a priority.

The financial sector contends with another form of fragility. As we have seen, the failure of significant financial entities can cause a general freeze-up, as the creditors of that firm and the creditors of similar firms try to clarify their balance sheets and reduce exposure. It can take a long time to resolve the bankruptcy of a large, complex financial institution, and until things are sorted out, the creditors of that firm cannot know how much they will be paid.

It is far from clear what can be done to mitigate this risk. Throughout our country's history, regulators have attempted many approaches to this problem, and none of them has eliminated fragility. As Charles Calomiris and Stephen Haber point out in their 2014 book, Fragile by Design, until the 1980s banking policy was dominated by the public's fear of large national banks. The result was a fragmented financial system, with banks unable to cross state lines. While the small size of individual banks limited the consequences of any single bank failure, American banks were not robust, and the system as a whole was not well diversified. In the 1930s, many banks failed at once. In the 1980s, many savings and loan associations failed at once.

By 2008, the United States had a much more concentrated financial system, including large national banks as well as other major financial institutions — from Bear Stearns, Lehman Brothers, and Freddie Mac to Fannie Mae and AIG. These firms had obligations to other firms that were so voluminous and so complex that doubts about their ability to meet those obligations threatened many other financial institutions, both here and abroad.

The Dodd-Frank legislation that was enacted in the wake of the financial crisis of 2008 envisions two approaches to the problem of large, complex financial entities. One approach is tighter regulation of firms designated as systemically important. The other approach has such firms develop "living wills" that would specify how they would be reorganized should they fail. The hope was that implementing such reorganizations would obviate the need for bailouts.

There are good reasons to be skeptical of both of these approaches. It is unlikely that mere human beings at government agencies can develop sufficient expertise, insight, and proficiency to render any firm too regulated to fail. As for the "living wills," it is hardly straightforward to break up and reorganize a major bank when everything is going well, let alone during a crisis.

Many economists believe that the capital structure of banks, and perhaps of non-financial institutions as well, is too heavily weighted toward debt and away from equity. These economists cite the relatively minor economic impact of the stock-market crash of 2000-2001 in comparison to the financial crisis of 2008. A decline in stock prices is a more graceful form of failure than a debt crisis.

But it is not easy to force a more robust financial structure on banks. A bank with a low ratio of debt to equity can still be highly leveraged. For example, a bank with low debt but a large exposure to financial derivatives would be susceptible to failure that throws counterparties into confusion, with consequences quite similar to those of the failures of financial institutions in 2008. It might be better to aim for a system in which financial firms can fail gracefully. Some scholars have proposed adding a new chapter in the bankruptcy code, which would allow for the rapid transfer of ownership of a failed bank to a single class of debt-holders, leaving other creditors of the bank unaffected.

For the system as a whole, it might be better to reduce the size of the largest institutions. In less than 50 years, we have gone from a system that was too fragmented to one that is probably too concentrated. Even though the Canadian banking system is highly concentrated, the largest U.S. banks now have much larger balance sheets than those of their counterparts in Canada. The U.S. could discourage the growth of the largest banks by, for example, limiting the total amount of insured deposits permitted for any one banking entity.

Next, consider large firms in a different sector: technology. The traditional anti-trust approach is to ask how industry concentration affects consumers. But consumer welfare is difficult to assess in industries with high fixed costs and low marginal costs. In the case of advertising-supported content, for example, the consumer may be paying nothing directly. But do Google or Facebook exploit monopoly power with advertisers, and if so, how can we tell how this affects social welfare?

It may be impossible to answer such questions. And perhaps they are not the right questions to be asking in the first place. Instead, we might wish to ask the same questions of large tech companies that we ask of large financial firms: Could they fail gracefully, or would the failure of such a firm create an economy-wide crisis?

From this perspective, it seems that we need not fear Facebook or Twitter. The rest of the economy does not seem to be intimately tied to those firms. But for Google, Amazon, and Apple, it may be a different story. Each of those firms is embedded in large business ecosystems. Could each ecosystem largely survive the failure of the core firm? If the answer is "no," then

policymakers should look for ways to try to promote greater redundancy and resiliency in those ecosystems. Steps might include making it easier for other firms to compete in businesses that are at the center of those ecosystems. We might want to try to avoid a situation in which the economy depends heavily on a single provider of cloud computing or streaming video.

FAILING GRACEFULLY

These observations point toward a fundamentally novel conception of the role of economic policy, and especially economic regulation. The idea that policymakers and regulators should seek to help markets that are highly effective calculators avert predictable failures is based on a conception of the economy that could not withstand scrutiny, and that perhaps no one really believes.

A more plausible conception of what markets are good at would suggest not more interventionist regulation but an approach that seeks to shore up the economy where it is most fragile and weak. Knowing that markets aren't infallible calculators at all, and that contingent judgments have immense implications, policymakers should be on the lookout for weak points, and should hunt and eradicate sources of especially concentrated and dangerous fragility.

Economists and policymakers tell themselves that they are dealing with a robust, predictable system with easily recognized points of failure and that they have reliable regulatory tools for steering it toward more optimal results. In reality, they are dealing with a fragile, complex system. It is less appropriate to seek to optimize this system, and more appropriate to worry about keeping it from failing catastrophically.

Arnold Kling is an adjunct scholar with the Cato Institute and a member of the Financial Markets Working Group at the Mercatus Center at George Mason University.