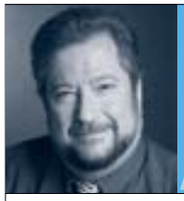

Aaron Brown

The Invisible Hand-Making Pins

On the myth of Adam Smith's fingerprints

I've recently finished two books by physicists about finance: James Owen Weatherall's *The Physics of Wall Street: A Brief History of Predicting the Unpredictable* and Mark Buchanan's *Forecast: What Physics, Meteorology and the Natural Sciences Can Teach Us About Economics*. Weatherall is a clear thinker, partly because he is a smart guy, but mostly because he is unencumbered by facts. He starts with a skeleton of knowledge acquired by skimming some popular books on finance (overall, a good general selection), then fills in the rest by making stuff up that seems reasonable to him. I call it the most arrogant book in the world. That isn't just due to making things up, an unfortunately common habit of smart people, but because his fictional universe is populated with idiot practitioners (except Jim Simons) failing to listen to brilliant physicists; and because his simplified vision of finance fails the most basic tests of common sense. He could not have shown his work to any knowledgeable person before publication.

The arrogance makes *The Physics of Wall Street* a useful book. Weatherall's extreme clarity makes it easy to point out exactly where common-sense assumptions go wrong, assumptions that more humble or less intelligent authors muddle. As philosopher Daniel Dennett famously said of rival Jerry Fodor:

> "*Most philosophers are like old beds. You jump on them and sink deep into qualifications, revisions, addenda. But Fodor is like a trampoline: you jump on him and he springs back, presenting claims twice as trenchant and outrageous. If some of us can see further, it's from jumping on Jerry.*"

Buchanan is also a smart guy, with far more experience in the world. He knows a lot more about finance and has a firm grasp on the key intellectual issues. Unfortunately, he is not clear. It's not a problem of qualifications, revisions, addenda; he just presents conflicting versions of his argument. Even when he gets on the right track, he does not push hard enough to complete his thinking. Much of the problem comes from overreliance on secondary sources, and perhaps some rushed editing of the manuscript. Or maybe he took Niels Bohr to heart: "*Never express yourself more clearly than you are able to think.*"

The central ideas of *Forecast* are positive feedback versus equilibrium. Near the beginning of the book we read:

> "….[C]*urrent thinking about markets rests on an arbitrary and misleading division of events into normal and abnormal, a division with no true basis. This way of thinking makes authorities look for special reasons for big events, while they should (at least in many cases) be looking to the ordinary workings of markets as they're currently set up. The Federal Reserve and other institutions currently charged with forming economic policies think like early man, seeing in storms and lightning the acts of angry gods. Embracing the reality of disequilibrium means coming to terms with the truth of how violent and unusual events nevertheless have perfectly ordinary origins.*"

The book traces this fallacious thinking back to Adam Smith's invisible hand. Unfortunately, relying on secondary sources reverses the meaning. Adam Smith, in fact, agrees with Buchanan. The invisible hand is mentioned once in passing in *The Wealth of Nations*. People have argued about what he meant ever since, but what's obvious is that he didn't think it was very important, and he didn't mean anything complicated or obscure, or he would have explained it.

What Smith does care about is positive feedback. The first three chapters of *The Wealth of Nations* examine the concept in great detail, much of it through an extended account of a pin factory. In equilibrium microeconomics, when demand for something goes up, the price goes up, increas-

ing supply and reducing demand, until an equilibrium price and production quantity are reached. What Smith pointed out is that increased demand could also lead to economies of scale (specifically, emphasizing division of labor), allowing prices to fall, causing demand to rise, leading to more economies of scale, reducing the cost of a pin by more than a thousand-fold. Of course, the process does not continue forever – we are not all up to our necks in pins – but today it is hard to conceive of anyone changing a decision due to the cost of the necessary pins. *The Wealth of Nations* is an extended treatise on positive feedback that mentions at one point that individual greed need not lead to antisocial results because individuals will be steered by an invisible hand. Smith does not claim that the hand is wise or good or leads to optimal results. He claims, in agreement with Buchanan, that the collective effect of many individual decisions can be unrelated to the intentions of the individuals.

Smith also thought about early man's ideas of storms in this context, but in considerably more depth than Buchanan. In his *History of Astronomy*, written before but published after *The Wealth of Nations*, Smith writes:

> "*Hence the origin of Polytheism, and of that vulgar superstition which ascribes all the irregular events of nature to the favor or displeasure of intelligent though invisible beings – to gods, demons, witches, genii, fairies. For it may be observed, that in all polytheistic religions, among savages, as well as in the early ages of heathen antiquity, it is the irregular events of nature only that are ascribed to the agency and power of their gods. Fire burns, and water refreshes; heavy bodies descend, and lighter substances fly upwards, by the necessity of their own natures; nor was the invisible hand of Jupiter ever apprehended to be employed in these matters. But thunder and lightning, storms and sunshine, those more irregular events, were ascribed to his favor, or his anger. Man, the only designing power with which they were acquainted, never acts but either to stop or to alter the course which natural events would take, if left to themselves. Those other intelligent beings, whom they imagined, but knew not, were naturally supposed to act in the same manner; not to employ themselves in supporting the ordinary course of things which went on of its own accord, but to stop, to thwart, and to disturb it.*"

The invisible hand is an error invented to give (in Buchanan's phrase) "special reasons for big events" because people could not accept that "violent and unusual events nevertheless have perfectly ordinary origins." But Smith goes further by pointing out that there is no god of gravity, and that gods of wind, waves, thunder, and dreams are far more important than gods of air, tides, rain, and thinking. Thus, in addition to the error of thinking that big events have special reasons, people make the more serious error of thinking that regular events need no reason at all.

In fact, everyone, including economists and maybe even a few regulators, understands both positive and negative feedback

Forecast goes on to highlight the overemphasis on equilibrium in the history of economics. It does a fair job, but *Knowledge and the Wealth of Nations* by David Warsh is far better (to be fair, that book concentrates on economic history, whereas it is just one thread of *Forecast*). Many of the economists under discussion were well aware of the criticism, and some even did significant positive-feedback work. Kenneth Arrow, for example, is treated in the most detail because of his famous work on general equilibrium. But Arrow in conversation emphasized that equilibrium economics was like tracing the surface of the earth, while there were forces deep within the earth that were far more powerful but more difficult to observe.

In fact, everyone, including economists and maybe even a few regulators, understands both positive and negative feedback. Light a match, and the energy released by the flame ignites more material that releases more heat so the fire can expand. The bigger it gets, the faster it grows. But on another scale, the fire eventually runs out of fuel, so negative feedback wins. Everywhere you look, you see positive feedback generating effects, and negative feedback snuffing them out, with positive feedback on a larger scale ad infinitum (the one possible exception is advances in knowledge and technology, which may allow unlimited positive feedback). Some people need to believe that the universe has equilibrium at the highest level, even if they have to invent a cosmological constant or afterlife to balance the books. It's hard to find meaning if there is chaos on every scale. Other people (including me) are agnostic on the issue. We're content to define our own meaning locally and let the universe take care of itself.

Having clearly identified the important point, Buchanan then descends into some unworthy nonsense: "*Greedy bankers have taken a lot of blame for the recent financial and economic crisis, and I personally believe they deserve most of it.*" 'Greed' is not a useful concept in this context. It usually means someone acted in his interest instead of yours. I suspect Buchanan means something like: "*Some bankers made a lot of money, and things ended badly, and they didn't apologize.*" This is the know-nothing sense of greed, in which someone says an athlete who makes a lot of money but loses the game, or a movie star paid a fortune to make a bad movie, is greedy. If Buchanan is willing to name specific greedy actions of specific people, or even categories narrow enough to make the statement falsifiable, then he should do it. If not, he joins the long ignoble history of people calling for the heads of 'speculators,' 'hoarders,' 'Jews,' 'Chinese,' 'reactionaries,' or any other unpopular group used by the people in charge when things go wrong. Of course, he has a lot of company in this casual slander, but you expect more precision and fairness from a scientist.

When he does get more specific, it's worse. He tells us: "*Banks such as Goldman Sachs and J. P. Morgan were ignoring laws on a vast scale.*"

Leaving aside the question of how an abstract entity can ignore anything, why not tell us what those laws were? If the scale was so vast, they should be easy to see. He wants to throw individual people in jail, but he won't say who they are or what the charges are. He goes completely into la-la-land when he favorably quotes Matt Taibbi that Bernie Madoff went to jail only because his victims were rich people. It couldn't have had anything to do with the fact that he walked into the FBI and confessed? In fact, rich people lost far more from the financial crash than from Madoff, and lots of financial people did go to jail; and many more were tried or threatened with indictment but won in court.

And who does he think is protecting these criminal bankers? Are prosecutors insufficiently aggressive? Hard to believe when a major Wall Street conviction, or even a front page picture leading a banker off in handcuffs with no charges ever filed, has been a major springboard to political success. It's also hard to square with the thousands of investigations. Are the laws too weak? Then, with nearly 5,000 pages of new regulations in the US alone, why is there none that clearly criminalizes the behavior that led up to the crisis?

Another example of silliness is comparing Eugene Fama's statement that he won't believe in bubbles until someone can predict one to someone asserting that he doesn't believe in earthquakes until someone can predict one. But Fama is not denying that prices go up or down, any more than anyone would deny that the earth moves. Fama is asking for evidence that the price movements that people label as "bubbles" are any different in kind from everyday price movements. In particular, labeling something as a bubble requires that the prices paid are foolish, which means it's knowable by non-foolish people at the time, not just in hindsight.

The proper comparison is arguing against someone who claims that earthquakes are sent by God to punish the wicked, and are entirely distinct from smaller earth movements that cause no damage. After every earthquake, this guy explains the sin that caused it. Fama would reserve belief until the guy could tell us before the earthquake where the sinners were.

On this issue, I disagree with Fama. I believe there are bubbles, and that they can be predicted. But Buchanan should be on Fama's side here. I'm the one claiming that there is a "special reason" for the "big event" of a bubble, Fama that "violent and unusual events nevertheless have perfectly ordinary causes." This kind of muddy argument diminishes the clarity of *Forecast*.

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Now that he's got that out of his system, we get to the more rational parts of the book. A central point is:

> *"Now we come to the rhetorical trick. The strong (and false) form of the efficient market idea says something amazing about markets – that they process information with ruthless efficiency and give wise valuations to the stocks of different enterprises, thereby acting as an invaluable social resource for steering our society. The markets really know best. In contrast, the ridiculously weak form says nothing about the wisdom of markets, merely asserting that markets are hard to predict. This could be true even if markets were driven up and down by monkeys bashing randomly on keyboards, and we obviously wouldn't use the word 'efficient' in that case. We have two forms of the hypothesis – one bold and interesting, but false, and another uninteresting and true – and the trick economists often use is to mix these two meanings, defending the interesting one by giving evidence for the uninteresting one."*

Buchanan claims that economists play the rhetorical trick, but it's a pot/kettle accusation. There are economists who believe that markets are wise, although not very many; it's more commonly asserted by sophomores taking their first economic course, and political partisans arguing against interference with markets. It has nothing to do with the efficient market hypothesis, which asserts only that prices behave as if they incorporate all information. The "ridiculously weak" form is closer to the truth, but leaves out a crucial part. Prices are hard to predict *and* they get to the right place in the end. When a bond matures, a stock liquidates, or a derivative contract expires, the market price equals the cash flow. If something ends up in the right place, and you cannot predict its movements beforehand, you have no information that is not in the price. Monkeys bashing randomly on keyboards are not efficient, although they are unpredictable, because their end result does not match any reality.

But Buchanan has grasped the important point; he just does not express it clearly. If you assume that there is a single possible economic equilibrium, then the two facts – that the market is unpredictable and that it gets to the right place – imply that market efficiency is a good thing; just like if you're driving to the right place an efficient car is a good thing. An efficient car might also be a good thing if you're driving to the wrong place; you're at the wrong place either way but you've spent less on gas. However, if an efficient car steers you to the wrong place, it's not a good thing.

For example, suppose Buchanan's monkeys bash out random prices until by chance a monkey price-matches the value of the security, at which time the security liquidates. We would still have unpredictable prices that lead to the right place, so securities would be priced as if they incorporated all

information, but the prices would, in fact, incorporate no information.

For a more realistic example, suppose there are two possible equilibria. In one, oil prices are high. People conserve and explore for more oil. Economic growth is slow. There is investment in known conservation technologies such as public transportation, smaller, lighter cars, and insulation. People move to warmer places and closer to work. The world gradually moves into a sustainable energy balance.

In the other equilibrium, oil prices are low. People consume a lot and there is no money for exploration. Economic growth is rapid. Capital is deployed to all kinds of speculative research. There is a shock when dwindling oil production cannot match demand, but there are leapfrog solutions available. Electric cars are practical because there is the expertise and knowledge to build a global grid of charging stations quickly. Home nuclear fusion generators appear on the market. After some years of chaos, we are in a totally new place.

It's probably impossible to know which of these equilibria is better; in fact, it's undoubtedly true that each has advantages and disadvantages, and different people would rank them differently. The current price of oil will reflect the market's assessment of the probabilities of the two states, but this is a positive feedback situation. If the price of oil moves up or down enough, perhaps for a trivial or even random reason, it could change the entire course of the future. It would be an act of pure faith to assert that the market has wisdom to get us to the right place.

In addition to that theoretical problem, there is an important practical one. Recall that the two tenets of the efficient market hypothesis are that price changes are unpredictable and that prices match actual cash flows in the end. If "the end" is a long time away, even a tiny amount of predictability destroys the economic force of the argument. Consider a stock with a dividend payout ratio of 2 percent (about average for large US stocks). It takes 35 years to recover in present value half the purchase price. There is enough predictability in price changes to make the connection between current prices and eventual value over that period of time weak; weak to the point of insignificance. On one hand, the situation is not that bad because stocks get taken over or otherwise liquidated, which reduces the time to cash flow payout, and other securities like bonds and derivatives mature sooner. On the other hand, the situation is worse because some of the most economically significant securities pay no dividends at all.

No one knows whether there is one, a few, or an infinite number of equilibria; and if there are more than one, what causes us to get to one versus another. There are plenty of shallow thinkers who assume that there is one, and another large, equally shallow group that assumes that wherever the market takes us randomly (or through the nefarious actions of greedy bankers) becomes an equilibrium.

Buchanan evidences deeper thought by assuming something in between. He thinks there are negative feedback forces that push markets to local equilibria, as well as positive feedback dynamics that send it spinning off in other directions, not random, but hard to predict. He compares it to the weather and earthquakes in this regard. He illustrates this view with insight and detail, but never offers convincing evidence that it is correct. I'm not sure if it's just that he would like the world to be like this, which is pretty much the reason that other people opt for a single equilibrium or a zero-information market, or if the example of weather and earthquakes and other things convinces him that dynamic equilibrium is a universal explanation.

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Forecast would be improved by more consideration of historical context. The efficient market hypothesis was not invented to replace the almost-efficient market hypothesis. At the time it was proposed, in both the US and the UK, the legal standard for investment management was the 'reasonable man' test. If a manager bought a stock and it went down in price, he was generally liable for the loss. He was not allowed to argue that his stock investments as a whole made money, any more than a guy who causes an automobile accident is allowed to argue that he successfully avoided other accidents. Investments were not gambles to be evaluated on an average basis; each security was either a good decision or a mistake. As a result, institutional investors did not buy stocks or risky bonds, even though statistical evidence clearly showed that these did better, on average, in the long run.

Similarly, investment professionals successfully avoided being compared to random portfolios or index funds, just as doctors and teachers fight publication of their success rates. In all three cases it was (is) argued that each decision was unique; averaging over them or comparing to other decisions was not relevant. There were financial products and government regulations that made sense only if you assumed a degree of market inefficiency far in excess of any possible statistical reality.

The efficient market hypothesis is the victim of its own success. It triumphed so clearly, despite being championed only by a few obscure academics against numerous opponents with institutional credibility and enormous funding and political connections, that most people have forgotten that there was opposition. It's as if people made fun of Johannes Kepler for thinking that planetary orbits were ovals, when everyone knows that there are deviations from geometric perfection. No prominent researcher today believes in perfect market efficiency; no intelligent person disputes that markets are extremely efficient. The precise degree and kind of efficiency is the only real debate.

Forecast is an interesting book that could have been much better. The author has enough distance from finance to grasp important truths that many academics and practitioners miss. Unfortunately, his distance separated him from the primary sources, historical context, and subtleties he needed to express himself clearly. I'm not sure if he and James Weatherall could produce a great book in collaboration, accurate and clear, or if (as George Bernard Shaw may have said to Isadora Duncan), "*It might have my body and her brains*."