



---

**The Journal of Robotics,  
Artificial Intelligence & Law**

---

Editor's Note: Biometrics

Steven A. Meyerowitz

Biometrics: Is It Always About You?

Paul B. Keller and Jenny Shum

**Price Fixing: "It Was the Machines, Sarah!"**

Dante A. Stella and Howard B. Iwrey

Automated Vehicles 3.0: Preparing for the Future of Transportation

Susan H. Lent, Greg W. Guice, and Ashley Edison Brown

Policymakers Focusing on Artificial Intelligence

Greg W. Guice, Diana E. Schaffner, Ed Pagano, and Hans Christopher Rickhoff

The SEC's State of Play on Cryptocurrency

Thomas K. Potter, III

Everything Is Not *Terminator*: Public-Facing Artificial Intelligence Policies—Part II

John Frank Weaver

- 71 Editor’s Note: Biometrics**  
Steven A. Meyerowitz
- 75 Biometrics: Is It Always About You?**  
Paul B. Keller and Jenny Shum
- 97 Price Fixing: “It Was the Machines, Sarah!”**  
Dante A. Stella and Howard B. Iwrey
- 109 Automated Vehicles 3.0: Preparing for the Future of Transportation**  
Susan H. Lent, Greg W. Guice, and Ashley Edison Brown
- 117 Policymakers Focusing on Artificial Intelligence**  
Greg W. Guice, Diana E. Schaffner, Ed Pagano, and Hans Christopher Rickhoff
- 123 The SEC’s State of Play on Cryptocurrency**  
Thomas K. Potter, III
- 141 Everything Is Not *Terminator*: Public-Facing Artificial Intelligence Policies—Part II**  
John Frank Weaver

**EDITOR-IN-CHIEF**

**Steven A. Meyerowitz**

*President, Meyerowitz Communications Inc.*

**EDITOR**

**Victoria Prussen Spears**

*Senior Vice President, Meyerowitz Communications Inc.*

**BOARD OF EDITORS**

**Miranda Cole**

*Partner, Covington & Burling LLP*

**Kathryn DeBord**

*Partner & Chief Innovation Officer, Bryan Cave LLP*

**Melody Drummond Hansen**

*Partner, O'Melveny & Myers LLP*

**Paul B. Keller**

*Partner, Norton Rose Fulbright US LLP*

**Garry G. Mathiason**

*Shareholder, Littler Mendelson P.C.*

**Elaine D. Solomon**

*Partner, Blank Rome LLP*

**Linda J. Thayer**

*Partner, Finnegan, Henderson, Farabow, Garrett & Dunner LLP*

**Mercedes K. Tunstall**

*Partner, Pillsbury Winthrop Shaw Pittman LLP*

**Edward J. Walters**

*Chief Executive Officer, Fastcase Inc.*

**John Frank Weaver**

*Attorney, McLane Middleton, Professional Association*

THE JOURNAL OF ROBOTICS, ARTIFICIAL INTELLIGENCE & LAW (ISSN 2575-5633 (print) /ISSN 2575-5617 (online) at \$495.00 annually is published six times per year by Full Court Press, a Fastcase, Inc., imprint. Copyright 2019 Fastcase, Inc. No part of this journal may be reproduced in any form—by microfilm, xerography, or otherwise—or incorporated into any information retrieval system without the written permission of the copyright owner. For customer support, please contact Fastcase, Inc., 711 D St. NW, Suite 200, Washington, D.C. 20004, 202.999.4777 (phone), 202.521.3462 (fax), or email customer service at [support@fastcase.com](mailto:support@fastcase.com).

Publishing Staff

Publisher: Morgan Morrisette Wright

Journal Designer: Sharon D. Ray

Cover Art Design: Juan Bustamante

Cite this publication as:

The Journal of Robotics, Artificial Intelligence & Law (Fastcase)

This publication is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If legal advice or other expert assistance is required, the services of a competent professional should be sought.

Copyright © 2019 Full Court Press, an imprint of Fastcase, Inc.

All Rights Reserved.

A Full Court Press, Fastcase, Inc., Publication

Editorial Office

711 D St. NW, Suite 200, Washington, D.C. 20004

<https://www.fastcase.com/>

POSTMASTER: Send address changes to THE JOURNAL OF ROBOTICS, ARTIFICIAL INTELLIGENCE & LAW, 711 D St. NW, Suite 200, Washington, D.C. 20004.

## Articles and Submissions

Direct editorial inquires and send material for publication to:

Steven A. Meyerowitz, Editor-in-Chief, Meyerowitz Communications Inc.,  
26910 Grand Central Parkway, #18R, Floral Park, NY 11005, smeyerowitz@  
meyerowitzcommunications.com, 646.539.8300.

Material for publication is welcomed—articles, decisions, or other items of interest to attorneys and law firms, in-house counsel, corporate compliance officers, government agencies and their counsel, senior business executives, scientists, engineers, and anyone interested in the law governing artificial intelligence and robotics. This publication is designed to be accurate and authoritative, but neither the publisher nor the authors are rendering legal, accounting, or other professional services in this publication. If legal or other expert advice is desired, retain the services of an appropriate professional. The articles and columns reflect only the present considerations and views of the authors and do not necessarily reflect those of the firms or organizations with which they are affiliated, any of the former or present clients of the authors or their firms or organizations, or the editors or publisher.

### QUESTIONS ABOUT THIS PUBLICATION?

For questions about the Editorial Content appearing in these volumes or reprint permission, please call:

Morgan Morrisette Wright, Publisher, Full Court Press at mwright@fastcase.com  
or at 202.999.4878

For questions or Sales and Customer Service:

Customer Service  
Available 8am–8pm Eastern Time  
866.773.2782 (phone)  
support@fastcase.com (email)

Sales  
202.999.4777 (phone)  
sales@fastcase.com (email)  
ISSN 2575-5633 (print)  
ISSN 2575-5617 (online)

# Price Fixing: “It Was the Machines, Sarah!”

Dante A. Stella and Howard B. Iwrey\*

*This article explores the changing nature of e-commerce “markets,” the role of pricing software, and practical steps to minimize inquiries from the authorities.*

---

E-commerce, particularly in “marketplaces,” has brought about a fiercely competitive environment in which sellers frequently use price-setting software to achieve optimum pricing given various market conditions. This software uses algorithms of varying complexity to adjust prices on an almost real-time basis. For in-house counsel charged with antitrust compliance, this technology presents novel issues—due to the rapidity and reliability of the software, the relative ease with which the government or private parties can detect its use, and the ways that like Skynet in the *Terminator*, it can go rogue. In some instances, use of pricing software has already resulted in criminal antitrust prosecution, even for small companies. This article will explore the changing nature of e-commerce “markets,” the role of pricing software, and practical steps to minimize inquiries from the authorities.

## How Has the Market Been Changing?

---

In classical economics, the “market price” of a good or service is defined by the intersection of a demand curve (defined by the preferences of all buyers) and a supply curve (to which all sellers similarly contribute). Prior to the internet and the rise of e-commerce, customers did not have access to perfect information on pricing across sellers competing for their business. At best, a purchaser of goods or services would have to consult competing price lists, make written inquiries, or make phone calls. Even when commerce was first moving to the Web, it was still necessary to visit multiple websites to compare prices. Price shopping was burdensome, and in many cases, where impracticalities of long-distance buying (like shipping costs and lead time) inhibited arbitrage, negotiation of

prices was much more local and limited. For example, a customer may pay more for a cubic foot of Styrofoam packing fill locally because a less expensive product sold in another state might be too expensive to ship in. Likewise, a driver with a burned-out clutch may be more inclined to pay more for a new part available immediately from a dealership than wait a few days for an independent garage to obtain a cheaper part.

Likewise, a seller in the pre- or proto-internet environment had a limited ability to divine the prices of its competition. Older readers will recall that in that “analog” era, a seller could only gain information about competitors’ pricing from publicly available printed catalogues or word of mouth. Catalogues were printed only at intervals, injecting a time lag, and even then they typically showed *manufacturers’ list* prices—which in many industries bore little or no resemblance to the price—as discounted at various percentages to wholesalers/retailers (including via back-end rebates) and then marked up to the end user (the “street” price). Customers, on the other hand, could be expected to provide inaccurate, difficult-to-verify, or outright fabricated information about competitive prices. For example, a customer could walk into Beta’s business and declare that “your price is higher than Acme’s.” For business reasons, if not also fear of an antitrust violation, Acme probably would not confirm its selling price to Beta.

The rise of e-commerce websites run by individual sellers, and later, massive “e-markets” like Amazon and eBay that present the products of multiple sellers simultaneously, has resulted in far more informed buyers and sellers. A buyer can now compare prices for a particular product on numerous websites in a matter of minutes using Google Shopping, flip over to eBay or Amazon to see competitive pricing in list format, or even use real estate tools like Zillow that attempt to show price trends and norms. With special rate deals on Priority Mail and SmartPost, freight forwarding like eBay’s Global Shipment Program, and Amazon’s newish vertically integrated delivery service, buyers can connect with, and buy from, even the smallest businesses on the other side of the country. Such developments break down the geographic barriers to buying from out-of-state sellers.

The information situation, however, works much better for buyers than sellers. On Amazon, for example, it does not behoove a seller to be more expensive than any other seller *unless* customer feedback or quicker delivery can support a higher price. In

practical terms, perfect information for buyers can lead to a nearly textbook perfectly competitive market—one in which sellers can either match the going price (becoming price takers) or in which they can choose to forego sales. This can lead to relentless price changes in e-marketplaces, as often as several times an hour for some products.

Because few businesses have the personnel and resources to continuously monitor price changes on e-commerce websites, many have turned to algorithmic pricing software, sometimes called "repricing software." An *algorithm*, put simply, is "a process or set of rules to be followed in calculations or other problem-solving operations."<sup>1</sup> The algorithms for pricing software can be as simple as a rule telling the program to match the lowest price, or as complex as a computation taking into account both measurable market conditions (like sales prices) and external factors (such as net prices or commodity prices). Many sellers will choose off-the-shelf software, but others may commission their own.

## How Does This Intersect With Antitrust Enforcement?

---

Civil damages for violations of the Sherman Act have their own simple algorithm: treble damages *unless* your company first obtained leniency on the criminal side.

Where the government—be it the Antitrust Division of the Department of Justice ("DOJ") or the Federal Trade Commission ("FTC")—investigates a group of sellers, the process often starts with a tip or some readily identifiable phenomenon. Following a further look, this would lead then to a grand jury subpoena. Even where there is no smoking gun in a party's documents, the government often collects the various sellers' transactional sales data separately, attempts with an economist to identify where and how prices moved, and then does its best to convince a grand jury to infer cause to prosecute a conspiracy. Due to resource and time limitations, much of this process relied on game theory: a seller would be highly incentivized to turn in a competitor, and even if a seller participated in a conspiracy, it could reduce its own civil liability *and* punish its competitor by reporting the conspiracy to the government. The competitors would stand to suffer harsher criminal penalties if convicted—and in any event have *three times*

*the potential liability* in any civil suit. The DOJ used this technique to devastating effect *In re Automotive Parts Antitrust Litigation* to extract almost \$3 billion in fines arising from guilty pleas made by Tier I and II suppliers (*i.e.*, direct and first-order indirect suppliers to vehicle manufacturers). This game theory also benefits settling defendants by curtailing what could otherwise be a large and expensive document production.

The rise of e-markets—sites where multiple sellers offer the same product simultaneously—makes investigations considerably easier for the authorities. The government is able to observe the pricing in a marketplace (as would any customer or competitor), and it can *instantly* see coinciding price movement. In fact, this movement—and the use of automated software to implement those moves—is detectable via machine learning.<sup>2</sup> This opens the door to almost continuous scanning of e-markets for suspicious activity in a way that was never possible before. This leads to three implications for enterprises.

First, unintended consequences within an e-market can make the use of software very obvious. Competing algorithms can react in positive feedback loops to each other. For example, Seller A might intend to fill its order by buying from another seller on the same marketplace. If Seller A sets his price to 125 percent of Seller B's price, and Seller B has a rule that prices two percent below Seller A's price, both prices could ratchet up stratospheric levels, simply playing off each other. Such a circumstance led to a book about insects to reach a price of \$24 million in a run-up between April 8 and April 18, 2011.<sup>3</sup> There was no actual (or even imaginable) market condition that would have supported this price, and the price drifted back down to a mere \$106.23 the next day. This price movement is very visible and draws media attention.

Second, the aggregation of data on these e-markets makes it easier for a government authority to look at everything at once. An e-market is involved in the advertising, sale, payment, and in many cases, fulfillment of its sellers' wares. That means that the e-market has a record of every advertised price and every single sale by every seller. Just as your own Amazon purchasing history is available to you, everyone's purchase (or sale) history would be available to the government. Every item sold with the same Universal Product Code ("UPC") number or Amazon Standard Identification Number ("ASIN") can be cross-referenced. This levels the playing field in terms of efficiency; before e-markets, the government would

have to pick and choose investigative targets or subjects based on industry and the sizes of the players. With subpoenas for aggregated sales data, the government can investigate numerous products and sellers using the same extracted data.

Finally, the centrality of e-markets decreases seller leverage in investigations. If the DOJ or FTC drops a subpoena on an e-market, the relevant agency can pull *all* third-party sellers’ transactional data simultaneously—and without individual sellers’ knowledge or consent. This means that by the time an individual *seller* receives a subpoena in an investigation, the government may already have a lot of valuable data—and has considerably less incentive to negotiate the scope of transactional or other data productions. When it has this information up front, the government may even be more likely to kick off an investigation with a raid—or several.

## Section 1 of the Sherman Act and the Electronic Seller

---

The Sherman Act is the primary vehicle of antitrust enforcement, and it prohibits “[e]very contract, combination the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States. . . .”<sup>4</sup> Many people understand that this would prohibit two human beings from contacting each other to coordinate on prices or on other actions that could impact prices (such as limiting supply). The legality (or, just as importantly sometimes) or perceived legality of actions boils down to what the behavior is. Are competitors pricing based on what they see their rivals doing (or expect them to do)? Or are competitors actively coordinating ahead of time? The former is legal “conscious parallelism”; the latter is a criminal Sherman Act violation.

A Sherman Act violation can be proven two ways. First, the government or a plaintiff can prove directly that market participants agreed to conduct their business in a coordinated fashion, the act of contracting provides both *mens rea* and *actus reus*. If, for example, a plaintiff or the government gets ahold of an email string in which two competitors agree to fix prices or allocate bids, then there is a big problem.

Alternatively, the government or plaintiff can provide circumstantial evidence that there was effective coordination, typically demonstrated by prices or sales practices that are similar and yet

lack any identifiable rational basis, or as the U.S. Supreme Court has put it, “tend[] to exclude the possibility” of independent action.<sup>5</sup> Price movement, alone, does not make out an inferential case,<sup>6</sup> nor does conduct that is consistent with permissible competition.<sup>7</sup>

To the extent that pricing software creates tacit collusion, *i.e.*, a convention by which competitors follow each other’s prices up or down, it is not actionable under the Sherman Act.

## Automating Conspiracies?

---

Human cartels are notoriously ineffective over the long run, and this is a key assumption of traditional economic theory. In a cartel, all participants agree to take an action that maintains a price (which could be raising prices, limiting supply, bid-rigging, or even retarding the lowering of prices). Economic theory assumes that a cartel has a limited half-life because its very nature creates incentives to break the cartel. For example, if John, Jane, and Sue are the only three sellers of apples on the block, and they agree to sell apples for \$10 apiece, the market price might rise to \$10, but Jane might figure out that she could sell more apples if she dropped out of the cartel and sold them for a mere \$9. Alternatively, Sue might forget to tell her little brother (and sales assistant) that apples should be sold at \$10, but he may forget and end up selling her apples for \$8. In the real world, the Organisation of the Petroleum Exporting Countries—an extraterritorial cartel that controls 40 percent of the world’s oil supply and is immune from prosecution in the United States—would organize price-maintaining actions and then would lose them to breakaway members.<sup>8</sup> Impatience, greed, and even negligence ultimately limit the ability of humans to sustain conspiracies.

By comparison, machine pricing is rapid, ruthless, and devoid of the need for (if not effectively immune to) human intervention. As a result, it can help enhance the permanence of cartels, which in turn has a better chance of actually distorting the market price, doing so over a longer period, and giving rise to even larger treble damages in a civil suit. There is some concern presently, that machine pricing agents will learn to communicate with (or adapt to) each other, which will increase the effectiveness and durability of cartels even more.

In avoiding criminal prosecution, or successful prosecution, the question is ultimately one of foreseeability—or at least plausible deniability. One unsettled point of the law is how much foreseeability (or lack of plausible deniability) is required to avoid successful prosecution. One could only predict from prior case law that the more foreseeable it is that a particular use of machine pricing will do a particular thing, the more likely a jury will conclude there is scienter when that thing comes to pass.

At a minimum, in civil cases, pricing formulas certainly appear to raise the odds of having a class certified.<sup>9</sup>

## Use and Misuse Cases

---

It may not always be completely clear how machine pricing may or may not interact with Section 1 of the Sherman Act, but its use and misuse can be broken down into four categories.

### 1. Independent Action With No Conscious Regard For Competitors

Buying repricing software without reference to what other sellers are doing and setting the parameters yourself, such as having the software match the lowest price, presents the least risky situation from the standpoint of a conviction. The pricing itself is classic conscious parallelism. But the pricing behavior of the software may still trigger an investigation, a grand jury indictment, or civil suit because it may not look rational to the person examining it. But even though this conscious parallelism is the least risky situation from a criminal perspective, it may not be completely effective in forestalling an investigation, a grand jury indictment, or civil litigation, all of which are highly unpleasant exercises in themselves. If an investigator or trier of fact (even a preliminary trier like a grand jury) is presented with evidence that makes irrational behavior such as supra-competitive pricing that is inexplicable as a business decision,<sup>10</sup> then there could be serious complications. One example that could arouse criminal or civil attention is a circumstance in which several participants are matching a competitor's lower price, but all making the change at the same interval, for example, seven days after the lowest price is established. Another is price leadership, where for a period (or on an ongoing basis), one firm is the

“leader,” setting supra-competitive prices that other participants follow.

## 2. Using the Same Software as Others For Your Marketplace or Industry

If there is only a limited range of available pricing software for an industry, it is hard to fault a company for choosing one. But the circumstances of how that software was chosen and how its parameters were set could still be the focus of investigative activity or litigation.

## 3. Agreeing With Others to Use the Same Software or Setting It the Same Way

This is an explicit agreement, and it could lead to prosecution, like it did for Art.com, which entered agreements with competitors to use the same pricing software, set the same way. The legal framework for evaluating this third scenario likely will follow prior case law on price fixing via formula.<sup>11</sup> In general, U.S. courts have not held the use of a formula by a single player to be unlawful. But agreements to use formulas have long been actionable. And the threshold for what is sufficient to support a claim under Rule 12(b) is relatively low where a formula—or even part of a formula—is agreed between industry players. The U.S. Supreme Court held—almost 80 years ago—that agreeing on one component of a formula can be construed as price fixing.<sup>12</sup> The U.S. Court of Appeals for the Second Circuit reaffirmed this in 2016 when addressing claims against banks that both set LIBOR and sold securities based on that index.<sup>13</sup>

## 4. Enforcing in Resale Price Maintenance By Monitoring Resellers' Prices

In the United States, resale price maintenance (“RPM”) was initially declared illegal by the Supreme Court more than 100 years ago—as a *per se* violation of Section 1.<sup>14</sup> But for a little more than a decade, RPM has been evaluated under the Rule of Reason.<sup>15</sup> The legality of using machines to monitor and enforce RPM,

consistent with the Rule of Reason in general, requires a court to weigh legitimate concerns with potential anticompetitive effects. Companies that do business within Europe, however, should note that no such balancing test exists, that RPM is illegal,<sup>16</sup> and that antitrust authorities have based fines *synergistic* horizontal effects. Asus, Denon/Marantz, Philips, and Pioneer collectively paid €111.2 million (*after* cooperation reductions) when the European Commission determined that their use of automated software for detecting and enforcing RPM arrangements, coupled with resellers' use of automated pricing software, had a much broader and deleterious effect.

Determining whether there is an agreement underlying the use of a formula may hinge on direct evidence, or it may be premised on circumstantial evidence of "collective methods, such as boycotts, employee discharges, retaliatory price-cutting."<sup>17</sup> Authorities have also drawn inferences based on rigid identities of prices in the face of falling demand.<sup>18</sup> This should be of more concern to e-commerce sellers, since large marketplaces' transactional data would reflect, in a very granular manner and in a single data source, the relationship between units sold and price. Even when there is no concerted action behind "sticky" prices, data that a market participant cannot access could impel investigations that are expensive to defend.

## Single Players: Section 2 of the Sherman Act

---

Section 2 of the Sherman Act, 15 U.S.C. § 2, presents another possibility for enforcement. This type of claim relates to the intentional concentration of market (and therefore pricing) power by people or businesses. It does not require the participation of more than one player—in fact, it can be predicated on obtaining, or attempting to obtain, "the ability to control prices and exclude competition in a given market."<sup>19</sup> Courts have never been clear where that starts in terms of market share—or even whether that is a reliable trigger. That said, mere attempts are punishable, and actions that cannot be rationalized except for the purpose of harming competition can give rise to liability.

A key difficulty in understanding the impact of Section 2 is understanding what might be considered a "market," and an unresolved issue is what happens when a dominant platform moves prices up and down. The implication depends in part on how a

platform works. One variation is where the platform provides suggested pricing information to its participants. On eBay, a seller pricing tool suggests listing prices based on past sales. Airbnb claims to use a multivariate analysis, but the end result is a pricing suggestion or “tip.”<sup>20</sup>

The situation is different where a company is directly selling or reselling. Uber, for example, has complete control over fares and uses algorithms to decide what is a “surge” fare. An online travel agency (“OTA”) such as Expedia, Orbitz, or Travelocity resells services and has control over prices, which can also be obscured by bundling them into flight/hotel packages. Popular lore is that merely looking at a fare (or having looked at fares—or even clicking through to commit) will cause it to rise, which if true could blur the line between permissible “yield management” and actionable behavior. OTAs call this “dynamic” pricing—a practice that has even spread to baseball tickets in St. Louis!<sup>21</sup>

The DOJ considers Section 2 to be primarily civil in nature<sup>22</sup> and thus rarely uses it for prosecution. But this will not stop people from suing you when they learn you are using algorithms and jacking prices up. And to the extent that the power to unilaterally set prices in a concentrated market may provoke a public outcry, there may be increased prosecution activity.

The government’s interest in Section 2 enforcement may increase if the perception (or reality) becomes that algorithmic pricing is capable of executing on predatory pricing schemes: undercut the competition to a point, put it out of business, and then raise prices. The detection of Section 2 abuses may also be facilitated by examining how two sellers price goods obtained from the same supplier at the same price—the government can see where a seller is uniquely selling below cost.

## Tips for In-House Counsel

---

Robust compliance is extremely important for any pricing activity. Compliance programs are helpful in demonstrating a lack of wrongful intent and are essential to DOJ leniency programs.

- Make sure that employees understand that communications with competitors about pricing—even ones that reveal how prices are set—must be avoided.

- Understand generational differences like co-opetition and excessive sharing and "transparency." Employees should understand that prisons are also extremely transparent places.
- If your sales department employs algorithmic software, collect as much information as possible about how the parameters are set and why. Examine whether there is a rational basis for them and, equally importantly, whether the rules implicate other principles of antitrust law (such as setting price floors to reflect minimum advertised prices).
- Take steps to make sure that the system is adequately safeguarded against positive feedback loops. Even if your customers laugh at your \$24 million paperback book, and your competitor's \$23.9 million copy, other sellers' algorithms may cause them to have much more modest price increases that still lead to sales, in turn causing market effects.
- Consider whether employees could sabotage the system and subject your company to an investigation or prosecution.
- Examine how your software might be used or misused in non-U.S. jurisdictions.
- Talk to your insurance broker about options for covering malfunctions of, or alleged misuse of, pricing software.

## Notes

---

\* Dante A. Stella and Howard B. Iwrey are members of Dykema Gossett, PLLC, and senior litigators in the Antitrust and Trade Regulation Group. Mr. Iwrey is the leader of the group. Messrs. Stella and Iwrey represent clients across numerous economic sectors, in a wide variety of civil, criminal, pre-merger, and compliance matters. The authors may be reached at [dstella@dykema.com](mailto:dstella@dykema.com) and [hiwrey@dykema.com](mailto:hiwrey@dykema.com), respectively.

1. An algorithm, whose etymology dates to the name of a ninth-century Persian mathematician, Muhammad ibn Musa al-Khwarizmi (Latinized as "Algoritmi"), via Old French and Middle English, is alternatively defined as "a procedure for solving a mathematical problem . . . in a finite number of steps that frequently requires repetition of an operation." *Webster's Ninth Collegiate Dictionary* (Merriam-Webster, 1985).

2. Chen, Le, et al., "An Empirical Analysis of Algorithmic Pricing on Amazon Marketplace." Proceedings of the 25th International Conference on World Wide Web, Montreal, Canada, at 1339-1349 (April 11-15, 2016).

3. “Amazon Seller lists book at \$23,698,655.93—plus shipping.” <http://www.cnn.com/2011/TECH/web/04/25/amazon.price.algorithm/>, retrieved September 24, 2018.
4. 15 U.S.C. § 1.
5. *Monsanto Co. v. Spray-Rite Service Corp.*, 465 U.S. 752, 764 (1984).
6. *United States v. United States Gypsum*, 438 U.S. 422, 436 (1978).
7. *Matsushita Electric Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 597 n.21 (1986).
8. See, e.g., <https://www.eia.gov/finance/markets/crudeoil/supply-opecc.php> (retrieved September 23, 2018).
9. See, e.g., *In re Wholesale Grocery Prods. Antitrust Litig.*, No. 09-2090, (D. Minn. Sept. 9, 2016) (finding class-wide impact where customers bought products on a regional formula).
10. *Boise Cascade Corp. v. FTC*, 637 F.2d 573, 581 (9th Cir. 1980).
11. See, e.g., *DPWN Holdings (USA) v. United Air Lines, Inc.*, 747 F.3d 145 (2d Cir. 2014) (allegations of common calibration of a fuel surcharge formula).
12. *United States v. Socony-Vacuum Oil Co.*, 310 U.S. 150, 222 (1940) (prices “are fixed . . . if by various formulae they are related to the market price.”).
13. *Gelboim v. Bank of America Corp.*, 823 F.3d 759, 771 (2d Cir. 2016).
14. *Dr. Miles Medical Co. v. John D. Park and Sons*, 220 U.S. 373 (1911).
15. *Leegin Creative Leather Products, Inc. v. PSKS, Inc.*, 551 U.S. 877 (2007).
16. Treaty on Functioning of the European Union, Art. 101(1)(a) (Official Journal 115, 09/05/2008 P. 0088-0089).
17. *FTC v. Cement Institute*, 333 U.S. 683, 699, 68 S.Ct. 793, 802, 92 L.Ed. 1010 (1948).
18. *Boise Cascade*, *supra* note 10 at 575.
19. See, e.g., *United States v. Grinnell Corp.*, 384 U.S. 563, 571 (1966).
20. Hill, Dan. “The Secret of Airbnb’s Pricing Algorithm,” *IEEE Spectrum* (August 20, 2015), <https://spectrum.ieee.org/computing/software/the-secret-of-airbnbs-pricing-algorithm>, retrieved September 26, 2018.
21. <https://www.mlb.com/cardinals/tickets/dynamic-pricing>, retrieved September 24, 2018.
22. <https://www.justice.gov/atr/antitrust-primer-federal-law-enforcement-personnel-revised-april-2005>, retrieved September 26, 2018.