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For What It's Worth: Historical Financial Bubbles and the Boundaries of Economic Rationality

William Deringer

This essay is a historical and epistemological exploration of a traditionally crazy economic event: the financial bubble. Venturing into two different moments in the history of economic thinking, it investigates financial bubbles as epistemic frontiers, where rationality has reached its limits. The first half forays into late-twentieth-century economics. Since 1980, an interpretive battle over the ir/rationality of bubbles has made those peculiar events, long beyond the pale of the rational, contested terrain upon which the limits of rationality have been fought out. The essay's second half turns to one historical crisis, the South Sea Bubble. For contemporaries in 1720, the Bubble was a different kind of epistemic frontier. As they tried to reckon what South Sea Stock was worth, investors were confronted not with clearly rational or irrational choices, but a decidedly unruly collection of similarly plausible calculations. The story of 1720 suggests that studying historical confusion might be a profitable enterprise for scholars of the economic and epistemological past.

“Are financial bubbles rational?” Since 1980, this question has organized much inquiry into the financial past. It is a profoundly strange question. To begin, for most of the history of financial capitalism, it has been taken for granted that bubbles—those frenzied fits of financial boom and bust, when the price of some asset loses touch with reality before crashing back down—were, in a word, crazy. More fundamentally: bubbles are not people. They do not think. How could they be *rational*? How did they get minds of their own? This essay is a historical exploration of this odd question, in two very different historical settings. The first part examines how, in the middle of the twentieth century, a clash between rising confidence in market efficiency and traditional intuitions about the mindlessness of bubbles made our odd opening question—*are bubbles rational?*—a thinkable one. Market-efficiency advocates pondered whether seemingly *irrational* events might be explained as the outcome of entirely *rational* behaviors, while their critics looked for new “behavioral” justifications for the traditional view that bubbles indicated investors’ stubbornly irrational inclinations. Economists on both sides looked to the bubbles of history as natural experiments. Long beyond the pale of the “rational,” financial bubbles became a main epistemological frontier upon which rationality’s borderlines were fought out. The story of how bubbles became ir/rational things is an intriguing chapter in the tumultuous tale of rationality in the late twentieth century.¹

The second part of this essay ventures even more deeply into this epistemological borderland, by observing what financial reasoning meant to people trying to make sense of a financial bubble as it happened. I foray into one historical crisis—the 1720 “South Sea Bubble”—to reconstruct how, for contemporaries, moments of financial crisis were indeed a kind of epistemological frontier, but in a different sense. Faced with many different ways to calculate what one peculiar financial object—South Sea Company stock—was worth, contemporaries found themselves with no clear guide to distinguish where the reasonable ended and the unreasonable

¹ Compare: Philip Mirowski, *Machine Dreams: Economics Becomes a Cyborg Science* (Cambridge & New York: Cambridge University Press, 2002); S. M. Amadae, *Rationalizing Capitalist Democracy: The Cold War Origins of Rational Choice Liberalism* (Chicago and London: University of Chicago Press, 2003); Paul Erickson et al., *How Reason Almost Lost Its Mind: The Strange Career of Cold War Rationality* (Chicago: University of Chicago Press, 2013).

began. In studying financial valuation not as a matter of ir/rational deliberation, but as an unsolved problem with many possible answers, this essay renews Simon Schaffer's earlier call for a history of *plausibility*.² My goal is not to offer yet another historical critique of the conceptions of rationality propounded by some (and certainly not all) late-twentieth-century economists. Rather, what follows is an excursion in historical epistemology, an adventure into spaces where the concept of rationality has somehow met its limits.

As long as there have been financial bubbles, they have been seen as stark testaments to the limits of human reason. In the wake of Britain's first major mania, the 1720 South Sea Bubble, political critics John Trenchard and Thomas Gordon commented that the Bubble "shews the little power that reason and truth have over the passions of men."³ Dutch publishers memorialized that year in a remarkable compilation of cartoons, broadsides, and ballads entitled *Het Grootte Tafereel der Dwaasheid*—"the great mirror of folly."⁴ The idea was extended in Charles Mackey's *Memoirs of Extraordinary Popular Delusions and the Madness of Crowds* (1841), in which financial bubbles were cited as the first archetype of irrationality, before others like the alchemist's search for the philosopher's stone.⁵ The view that bubbles were baldly irrational prevailed into the second half of the twentieth century. John Kenneth Galbraith located the source of the "Great Crash" of 1929 in the "seminal lunacy which has always seized people who are seized in turn with the notion that they can become very rich."⁶ The apotheosis of this traditional view came in Charles Kindleberger's widely-read *Manias, Panics, and Crashes* (1978), which recalled how "the pages of history are strewn with language... that allows no other interpretation than occasional irrational markets." He assembled several choice examples: "*insane land speculation... blind passion... financial orgies...*"⁷

Kindleberger's *Manias* was a nostalgic synthesis of two-and-a-half centuries of bubble thinking. But the author warily acknowledged that such traditional intuitions were no longer unquestioned. A belief was mounting among economists that men are inherently rational, that markets consistently produce rational outcomes, and therefore, as Milton Friedman put it in 1953, "there can be no destabilizing speculation" of the sort depicted in traditional bubble accounts.⁸ Two particular trends challenged long-held thinking about bubbles. First, financial economists led by Eugene Fama marshaled statistical evidence of the "random walk" behavior of asset prices to argue that financial markets were "efficient." Because hyper-rational investors seized upon new information to make profitable trades through "arbitrage," they contended, market prices of assets

² Simon Schaffer, "A Social History of Plausibility: Country, City and Calculation in Augustan Britain," in Adrian Wilson, ed. *Rethinking Social History: English Society 1570-1920 and Its Interpretation* (Manchester and New York: Manchester University Press, 1993): 128-57.

³ John Trenchard and Thomas Gordon, *Cato's Letters: Or, Essays on Liberty, Civil and Religious*, ed. Ronald Hamowy, Vol. I (Indianapolis: Liberty Fund, 1995 [1720]), 55.

⁴ William N. Goetzmann et al., eds. *The Great Mirror of Folly: Finance, Culture, and the Crash of 1720* (New Haven: Yale University Press, 2013).

⁵ Charles Mackay, *Memoirs of Extraordinary Popular Delusions* (London: R. Bentley, 1841).

⁶ John Kenneth Galbraith, *The Great Crash 1929*, Third Edition (Boston: Houghton Mifflin, 1972 [1954]), 4.

⁷ Charles P. Kindleberger, *Mania, Panics, and Crashes: A History of Financial Crises* (New York: Basic Books, 1978), 3-4, 25-27.

⁸ Milton Friedman, "The Case for Flexible Exchange Rates," in *Essays in Positive Economics* (Chicago: University of Chicago Press, 1953), 176-77.

necessarily reflected real values.⁹ Second, new “rational expectations” models made strong assumptions of rationality a guiding premise of macroeconomic analysis.¹⁰ Neither of these rationalizing projects had much room for bubbles. For efficient-markets advocates in finance, history’s apparent bubbles threatened to contradict directly the notion that markets yielded rational prices. For macroeconomists building general-equilibrium models, sudden crises proved computationally intractable. (Kindleberger wryly recalled: “econometricians among my friends tell me that rare events... cannot be dealt with by the normal techniques of regression.”)¹¹

Beginning in the late 1970s, a flurry of revisionist articles queried whether seemingly bubbly moments might be explained through purely “rational” means. In a 1980 article, Robert Flood and Peter Garber developed an econometric model to test whether, during one supposed bubble event—the German “hyperinflation” of 1918-’23, a “negative” bubble—there was evidence that prices actually deviated from real values. They concluded “no”: even hyperinflation could be explained in terms of rational agents tracking market “fundamentals.” Effectively, they argued that bubbles did not exist. Without empirical evidence for bubbles, requiring macroeconomists to account for them “is analogous to requiring... a chemist to explain why there is no philosopher’s stone.”¹² Flood and Garber’s “first test” provoked various responses. Theorists like Maurice Obstfeld and Kenneth Rogoff complemented their empirical assay with abstract reasons “for ruling out explosive or implosive bubbles *a priori*.”¹³ Others, though, agreed with their rational-expectations approach but disputed their denial of bubbles. Oliver Blanchard and Mark Watson, by contrast, contended that the “rationality of both behavior and of expectations often does not imply that the price of an asset be equal to its fundamental value.”¹⁴ The authors examined a test case involving a dramatic, but rationally-explicable, spike in gold prices in 1979, and coined a term for what they found: a *rational bubble*. A series of studies followed, trying to adjudicate whether, under strong assumptions of rationality, market prices could ever depart from fundamentals. As empiricists tested and re-tested for bubbles in commodities, stocks, and foreign currencies, econometricians struggled with new questions about observation—it was hard to distinguish a bubble from “fundamental” effects the econometrician could not see.¹⁵

The debate between “fundamental”-ist bubble deniers and more moderate bubble “rationalists” was an internecine dispute, Kuhnian “puzzle-solving” at its clearest. All agreed the game at hand involved explaining the asset price movements *without* jettisoning any assumptions

⁹ Eugene Fama, “Efficient Capital Markets: A Review of Theory and Empirical Work,” *Journal of Finance* 25, no. 2 (May, 1970): 383-417; Donald Mackenzie, *An Engine, Not a Camera: How Financial Models Shape Markets* (Cambridge, MA and London: MIT Press, 2006), chaps. 2-3; Justin Fox, *The Myth of the Rational Market: A History of Risk, Reward, and Delusion on Wall Street* (New York et al.: Harper Business, 2009), chap. 6.

¹⁰ Esther-Mirjam Sent, *The Evolving Rationality of Rational Expectations: An Assessment of Thomas Sargent's Achievements* (Cambridge: Cambridge University Press, 1998), 1-12.

¹¹ Kindleberger, *Manias*, 8.

¹² Robert P. Flood and Peter M. Garber, “Market Fundamentals versus Price-Level Bubbles: The First Tests,” *Journal of Political Economy* 88, no. 4 (Aug., 1980): 745-770, on 760-62.

¹³ Maurice Obstfeld and Kenneth Rogoff, “Ruling Out Divergent Speculative Bubbles,” *Journal of Monetary Economics* 17, no. 3 (May, 1986): 349-62, on 349.

¹⁴ Olivier Jean Blanchard and Mark W. Watson, “Bubbles, Rational Expectations and Financial Markets,” *National Bureau of Economic Research Working Paper* 945 (Jul., 1982), on 1; Blanchard, “Speculative Bubbles, Crashes and Rational Expectations,” *Economics Letters* 3, no. 4 (1979): 387-89.

¹⁵ For example: Richard A. Meese, “Testing for Bubbles in Exchange Markets: A Case of Sparkling Rates?” *The Journal of Political Economy* 94, no. 2 (Apr., 1986): 345-73; Behzad T. Diba and Herschel I. Grossman: “Explosive Rational Bubbles in Stock Prices?” *American Economic Review* 78, no. 3 (Jun., 1988): 520-30; Kenneth D. West, “A Specification Test for Speculative Bubbles,” *The Quarterly Journal of Economics* 102, no. 3 (Aug., 1987): 553-80.

about agents' rationality. At the same time, new "behavioral economics" researchers led by Robert Shiller and Richard Thaler began to mount a more direct challenge to this strong rationalism.¹⁶ In 1984, Shiller lamented how recent interest in speculative bubbles has been "pursued within rational expectations models with unchanging tastes."¹⁷ While Shiller looked to social psychology for corrections to the strong rationality of efficient markets, Thaler looked to cognitive psychology, particularly Daniel Kahneman and Amos Tversky's research on humans' persistent deviations from normative standards of rationality. Such efforts animated new attempts to understand financial bubbles. One influential behavioral model emphasized the role of market "noise"—various misleading input like hunches, rumors, and chart patterns. Noise theorists argued that a model of financial markets based on the interplay between irrational "noise traders" and rational arbitrageurs "accords with a variety of literary evidence on... bubbles" and "may be a plausible alternative to the rational bubbles theory."¹⁸

By the late 1980s, a veritable bubble battle had developed, fueled by the precipitous collapse of U.S. stock prices in October 1987, the first such crash in decades. The Spring 1990 issue of *The Journal of Economic Perspectives* published a "Symposium on Bubbles," featuring articles by Garber, Shiller, and leading "noise" theorists Andrei Shleifer and Lawrence Summers.¹⁹ These battles, while still unresolved, significantly reoriented economic discourse about extreme financial events around the rational-irrational axis. This ir/rationality fixation was promulgated through popular literature on financial crises, notably Shiller's *Irrational Exuberance* (2000).²⁰ Even Kindleberger's ever-popular *Manias, Panics, and Crashes* was updated to accommodate the ir/rationality obsession. A revised first chapter warned readers about "a strong and persistent voice preaching that there are no manias or bubbles," while a new appendix expounded on "irrationality in economics."²¹ Though not uncontested, the taxonomy of rational versus irrational bubbles remains a prominent interpretive framework well into the twenty-first century.²²

The rise of the binary ir/rationality framework was as much the work of critics of market rationality as its supporters. In arguing for the influence of specific deviations from rationality in moments of economic rupture, behavioral researchers effectively assented to the view of rationality assumed by their rationalist counterparts: to invest rationally was to invest in accordance with economists' models of fundamental value, based on discounted future income streams. The noise theorists, for example, did not offer a new conception of investor rationality, nor acknowledge that all investors' rationality was limited in some way—only that it was limited for *some* people. As Lawrence Summers reportedly once wrote to Fisher Black: "THERE ARE IDIOTS. Look around."²³ This was typical of the new behavioral economics that emerged in the 1980s, which intentionally shied away from the wholesale redefinition of rationality advocated two decades earlier

¹⁶ Esther-Mirjam Sent, "Behavioral Economics: How Psychology Made Its (Limited) Way Back into Economics," *History of Political Economy* 36, no. 4 (Winter 2004): 735-60; Fox, *Myth of the Rational Market*, chaps. 10-14.

¹⁷ Robert Shiller, "Stock Prices and Social Dynamics," *Brookings Papers on Economic Activity* 1984, no. 2 (1984): 457-498, on 458.

¹⁸ Fischer Black, "Noise," *The Journal of Finance* 41, no. 3 (Jul., 1986): 529-43; J. Bradford De Long et al., "Positive Feedback Investment Strategies and Destabilizing Rational Speculation," *The Journal of Finance* 45, no. 2 (Jun., 1990): 379-95.

¹⁹ *Journal of Economic Perspectives* 4, no. 2 (Spring, 1990).

²⁰ Shiller, *Irrational Exuberance* (Princeton: Princeton University Press, 2000).

²¹ Kindleberger, *Manias, Panics, and Crashes*, Fourth Edition (New York et al.: John Wiley & Sons, 2000), 4, 217-21.

²² For an intriguing recent example: Sophie Moinas and Sebastien Pouget, "The Bubble Game: An Experimental Study of Speculation," *Econometrica* 81, no. 4 (Jul., 2013): 1507-39.

²³ As quoted in Fox, *Myth of the Rational Market*, 199.

by Herbert Simon. As Esther-Mirjam Sent has shown, behaviorists preferred “to strengthen mainstream economics by taking rationality as the yardstick as opposed to... develop[ing] an alternative based squarely on bounded rationality.”²⁴ In the end, the bubble battle was about the *explanatory* bounds of rationality within economic methodology, not about the empirical limits of human reasoning.

All this attention to the rationality of bubbles fundamentally energized research into financial *history*, but did so around a narrow set of problems. Economic historians revisited historical bubbles in order to assay their rationality.²⁵ In the early-'90s, researchers squared off in the *Journal of Economic History* over whether the famed crash of 1929 was a collapsing “bubble.” Leading behaviorists J. Bradford De Long and Andrei Shleifer used evidence from closed-end mutual funds to quantify *how much* irrationality existed in the roaring '20s market. They estimated “about a fifth of the runup in stock prices from 1927 to 1929 and about half of the fall in stock prices from 1929 to 1931 were the results of shifts in irrational investor sentiment.”²⁶ Arguably no historical crisis has received more attention in this regard, though, than the South Sea Bubble. Since the closing months of 1720, histories of that Bubble had invariably explained it in terms of a combination of mass gullibility and massive deception.²⁷ Recently, however, some researchers have attempted to “rationalize” the events of 1720.²⁸ In response, others have renewed efforts to prove the irrational behavior of South Sea investors or, drawing on “noise” models, have sought to explain the Bubble through the interactions between the impulsive masses and sophisticated investors who tried to “ride the bubble.”²⁹ The ir/rationalist showdown over 1720 peaked in dueling articles in 2005 and 2007: “Financial Markets Can Go Mad: Evidence of Irrational Behavior During the South Sea Bubble” by Richard Dale and collaborators, versus Gary Shea’s response, “Financial Market Analysis Can Go Mad (in the Search for Irrational Behavior during the South Sea Bubble).”³⁰ The ir/rational bubble debate has largely been a boon for economic-historical inquiry, uncovering many overlooked features of the financial past. Yet in promoting rational *or* irrational readings of crisis, recent historical work has left the oppositional paradigm itself essentially unquestioned. Such is the task of the remainder of this essay.

We have seen how our peculiar opening question—“are financial bubbles rational?”—took on new meaning in modern economic and historical inquiry. Yet such rationality testing has depended on an overly optimistic and ahistorical epistemology of financial value. Rationalists and

²⁴ Sent, “Behavioral Economics,” 747.

²⁵ On the fundamental-ist side, see Garber, *Famous First Bubbles: The Fundamentals of Early Manias* (Cambridge, MA: MIT Press, 2000).

²⁶ J. Bradford De Long and Andrei Shleifer, “The Stock Market Bubble of 1929: Evidence from Closed-end Mutual Funds,” *The Journal of Economic History* 51, no. 3 (Sep., 1991): 675-700, on 678.

²⁷ John Carswell, *The South Sea Bubble*, 2nd Edition (Dover, NH: Sutton, 1993 [1960]).

²⁸ Larry Neal, *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason* (Cambridge, UK et al.: Cambridge University Press, 1991), 80-8; Helen J. Paul, *The South Sea Bubble: An Economic History of its Origins and Consequences* (London and New York: Routledge, 2011), esp. 5.

²⁹ Richard Dale, *The First Crash: Lessons from the South Sea Bubble* (Princeton: Princeton University Press, 2004); Peter Temin & Hans-Joachim Voth, “Riding the South Sea Bubble,” *The American Economic Review* 94, no. 5 (Dec., 2004): 1654-68.

³⁰ Richard S. Dale, Johnnie E. V. Johnson, and Leilei Tang, “Financial Markets Can Go Mad: Evidence of Irrational Behavior During the South Sea Bubble,” *Economic History Review* 58, no. 2 (May, 2005): 233-71; Gary S. Shea, “Financial Market Analysis Can Go Mad (in the Search for Irrational Behavior during the South Sea Bubble),” *Economic History Review* 60, no. 4 (Nov., 2007): 742-65.

irrationalists dispute whether we can assume all investors to act rationally, and whether market prices ultimately derived from rational or irrational actions. But neither side seriously disputes the notion that there were discernibly rational ways for investors in 1720 to have thought and acted toward South Sea Stock, which the smartest people would have known. Consequently, economists have lost sight of an essential feature of financial thinking in the past—that it was not just a space for rationality but for *knowledge*, where people had to confront not just uncertainties by *unknowns*.

This is not to say that economic historians have wholly overlooked financial thought. Indeed the ir/rational bubble debate has brought new attention to the history of financial analysis. Paul Harrison has argued that surviving calculations show early-eighteenth-century investors “used modern valuation techniques based on fundamentals,” and therefore corroborate a rational interpretation of the crisis.³¹ On the other hand, Richard Dale and others have cited some of the very same calculations, notably by calculator and MP Archibald Hutcheson, as evidence that sophisticated observers at the time knew what was going on—meaning the bubble must have resulted from others’ irrationality. Such previous scholars have analyzed past financial thinking almost entirely against the benchmark of modern rational valuation. But those historical calculations emerged in a very different epistemological environment, a highly unsettled and lawless space where little was known or agreed upon about the value of stocks. The remainder of this essay ventures into that unruly world. What did it mean *in 1720* to ask “what is South Sea Stock worth?” Was it a question with a rational answer?

The scheme that spurred London’s first bubble was the culmination of years of political back-and-forth about how to unburden Britain from its massive National Debt, which by the late 1710s amounted to over £40 million.³² Most frustrating were a collection of long-term, “irredeemable” bonds, which not only carried high interest rates, but which the government could not voluntarily repay for decades. The enterprising leaders of the South Sea Company, guided by John Blunt, offered the most promising solution. The Company had been established in 1711 as part of the reigning Tory government’s efforts to deal with the National Debt. At its founding, the South Sea Company had agreed to buy up £11 million of outstanding government debts, by giving government creditors stock in the new Company in exchange for their bonds. This financial operation was supposed to provide the initial capital to finance a massive trading operation with Spanish America—especially in African slaves, a special right granted by the *Assiento* (“Contract”) negotiated between the British and the Spanish Crown.³³ By mid-1719, diplomatic tensions had largely stymied the Company’s trading activities, yet key Company Directors began exploring a project to buy up even more government debt—potentially over three-quarters of the total National Debt. Under this new “engraftment” scheme, the Company would exchange newly-issued shares of Stock for outstanding bonds, including the pesky irredeemables, at to-be-determined prices. The Company even agreed to pay a substantial fee to the government for the right (eventually £7.5 million). After considerable Parliamentary debate, and a competing proposal by the Bank of England, the plan received royal approval in early April 1720.

³¹ Paul Harrison, “Rational Equity Valuation at the Time of the South Sea Bubble,” *History of Political Economy* 33, no. 2 (Summer, 2001): 269-281, on 270.

³² P. G. M. Dickson, *The Financial Revolution in England: A Study in the Development of Public Credit* (London et al.: Macmillan, 1967), 90-93.

³³ Carl Wennerlind, *Casualties of Credit: The English Financial Revolution, 1620-1720* (Cambridge, MA: Harvard University Press, 2011), chap. 6; Paul, *South Sea Bubble*, chap. 6.

The Scheme was, for its time, an intricate piece of financial engineering. The benefits for the government were plain: they could dispense with the irredeemables, reduce interest rates on the National Debt, and earn £7.5 million. The benefits to the Company were more opaque. One obvious benefit came from becoming the government's main creditors: the Company would earn 5 per cent on all the debt they absorbed, up to £31 million. But that hardly explained the incredible enthusiasm for the Scheme. What made it so appealing for the Company and investors—and so hard to evaluate—was how the planned refinancing maneuvers unlocked the Company's ability to raise additional capital. If the Company could convince holders of government debt to accept Stock at less than one-to-one (for prices over “par” of £100 per-share) the Company could generate a surplus of extra Stock, which could be distributed as dividends or, most enticingly, sold to new investors for cash. This unprecedented influx of capital would allow the Company to venture into new businesses and dominate global trade.³⁴

And at first, such optimism appeared more than justified. Investors could not get enough of the South Sea Stock. The Company began exchanging stock for government debts, and selling new stock for cash, in April 1720. By May, the mania was on. South Sea Stock sold in the London markets at almost £350 at the end of April, nearly £600 by the end of May, and £950 by the end of June. In mid-June, the Company made a new offering of Company stock to the public priced at £1,000 per share; eager investors subscribed to buy more than twice the stock that was available. The crash that followed the mania was dramatic and not soon to be forgotten. The Stock's price sagged into the £800s in July and August, but to barely over £300 by the end of September. It would fall more than £100 more by year's end.

What did observers in 1720 think was going on? How did they reckon what South Sea Stock was *worth*? The problem of how to calculate the Stock's value was an open question in 1720, which permitted a wide range of plausible answers. Financial analysis—and particularly the valuation of stocks—was an inchoate field of knowledge in 1720. Britons increasingly agreed that stocks were not purely fictitious forms of “paper wealth,” and instead carried some *intrinsic(k) value*—an ancient ethical concept popularized and reconfigured in seventeenth-century political economic debates about coinage.³⁵ In 1710, for example, an economic propagandist named Simon Clement argued that investors should look to calculate the intrinsic value of stocks rather than following the caprice of the marketplace: “People ought never to value [stocks] by the Rates they may go at in Exchange-Alley, but to inform themselves truly of the certain Sum that has been paid into the Stock, and of the Dividend that is constantly made, together with the probable Success of the Management, and then they may make a rational Judgment.”³⁶ The problem was that Britons shared little consensus on how to actually calculate intrinsic value. By 1720, relatively coherent theories of valuation had been established for some financial objects, in particular real estate and fixed-income securities like annuities, but not for stocks.³⁷ The instability of financial knowledge did not stop financial

³⁴ Compare: Simon Schaffer, “The Show That Never Ends: Perpetual Motion in the Early Eighteenth Century,” *The British Journal for the History of Science* 28, no. 2 (Jun., 1995): 157-189.

³⁵ On intrinsic value, see William Deringer, “Calculated Values: The Politics and Epistemology of Financial Numbers in Briatin, 1688-1738,” unpublished Ph.D. Dissertation (Princeton University, 2012), 296-306.

³⁶ [Simon Clement], *A Vindication of the Faults on Both Sides... With a Dissertation on the Nature and Use of Money...* (London: Printed and Sold by the Booksellers of London and Westminster, 1710), 16; Wennerlind, *Casualties*, 169-89.

³⁷ Alex Preda, “The Rise of the Popular Investor: Financial Knowledge and Investing in England and France, 1840-1880,” *The Sociological Quarterly* 42:2 (Spring, 2001): 205-232; Janette Rutterford, “From Dividend Yield to Discounted Cash Flow: A History of US and UK Equity Valuation Techniques,” *Accounting, Business & Financial History* 14, no. 2 (Jul., 2004): 115-49; Paul, *South Sea Bubble*, 55; William C. Baer, “The Institution of Residential Investment in

invention, though. Britain's wily financial "projectors" pitched new financial objects faster than the community as a whole could understand them. Stocks—shares in "joint-stock companies"—were themselves peculiar and perplexing objects. Though joint-stock companies had been around since 1553, the mechanics of such companies were still not well-defined in many ways.³⁸

The new joint-stock projects that sprouted up around 1700 often boasted novel corporate structures that made those stocks hard to evaluate—none more so than the South Sea. The Company was always a corporate monstrosity, half overseas trading company and half financier. In 1712, one of the Company's chief propagandists, Daniel Defoe, testified to how perplexing this was: "There has not been in our Memory an Undertaking of such Consequence... nor has there been an Undertaking, about which the People, even those who are to be concern'd, have been so uneasie [and] their Opinions of it so confused."³⁹ Such quandaries were no less evident eight years later, when the Company undertook its larger and more complicated refinancing Scheme. In particular, two analytical dilemmas frustrated potential investors in 1720. The first was the problem of combining the potential benefits from the Company's two very different businesses—government finance and overseas trading—into a single number. Whereas the Company's financial activities brought predictable, if less spectacular, income from the interest to be earned on government debt balances, its trading activities derived their conceivable value from unrealized and uncertain future profits. A second key problem came in making sense of what might be termed the Company's "capital structure." The 1720 "ingraftment" involved a series of transactions—in particular, exchanging Stock for various government debts and selling new Stock for cash—that were not scheduled in advance of the project's execution. Each maneuver changed essential facts about how the Company's capital was organized, and how each change would affect different shareholders or the Stock's total value was unclear. Behind this ambiguity was a more fundamental confusion about how to think about, and mathematically account for, a corporate entity that existed *over time*. The didactic commercial literature offered little instruction beyond "the rule of fellowship," an arithmetic rule for dividing profits in a small trading partnership.⁴⁰

Investors in 1720 confronted many sources of uncertainty that made distinguishing a correct financial calculation challenging: asymmetries in information, ambiguities about fundamental financial concepts, unfamiliar financial operations, difficulty in assessing financial expertise. These dimensions of plausibility created an environment in which, during 1720, a wide range of computational claims could be made about South Sea Stock. This can be seen by looking at a collection of more-or-less simultaneous calculations. In February and March 1720, while the South Sea Scheme was under public debate but before it was put into operation, analysts offered page upon page of dense printed figures, elaborating the Scheme's fiscal efficacy and merits as an investment. Critically, pre-Bubble computations built upon the same, limited base of public information: primarily, the value of the Company's pre-existing capital stock (£11 million), the volume of redeemable (£16 million) and irredeemable (£15 million) debts to be exchanged, and the promised Company fee (£7.5 million). Yet calculators combined these same inputs into a startling

Seventeenth-Century London," *The Business History Review* 76, no. 3 (Autumn, 2002): 515-551, esp. 539-544; Geoffrey Poynter, *The Early History of Financial Economics, 1478-1776: From Commercial Arithmetic to Life Annuities and Joint Stock* (Cheltenham, UK & Northampton, MA: Edward Elgar, 2000), chaps. 5-6.

³⁸ W. R. Scott, *The Constitution and Finance of English, Scottish and Irish Joint-Stock Companies to 1720*, Vol. 1, Reprint ed. (Gloucester, MA: P. Smith, 1968 [1910]), esp. 15, 59-62.

³⁹ [Daniel Defoe], *An Essay on the South-Sea Trade...* (London: Printed for J. Baker, 1712), 5.

⁴⁰ Edward Cocker, *Cocker's Arithmetic: Being a Plain and Familiar Method...* Twentieth Edition Corrected (London: J. R. for Eben Tracey, 1700), 141-45.

variety of models. Analysts had to make numerous interpretive decisions without guidance from past experience. Was the Company's Stock price an output of the model, or an input? How to quantify the multi-stage transactions needed to effect the Scheme? What was the best way to commensurate the different financial instruments involved?

None of these questions had obvious answers. Three different calculations from that early period offer a sense of this plausible divergence.⁴¹ The first was a pessimistic model that reckoned a fair a price at just over £118, from the anonymous pamphlet *An Examination and Explanation of the South-Sea Company's Scheme*. The author pursued what might be termed an "asset-backing" or "book value" approach: he calculated what the Company's total financial assets would be after the Scheme's completion, and then divided those resources among the total base of stockholders they projected would result from the various transactions. The conclusion was that if the Stock's price were set at £150 for exchanging government debts, the Stock would really be worth only £118¾, a nearly 21 per cent loss to new investors.⁴² A second model, created by MP Archibald Hutcheson and published in a detailed pamphlet dated March 31, was the most intricate. It used a complex mathematical technique, "discounting" future incomes, to argue that the Stock's value was inflated at prices above approximately £150.⁴³ While he agreed with other skeptics that the Company's assets did not justify high stock prices for investors, he felt the question of the Stock's value did not end there. Hutcheson's calculated what profits the Company's overseas trade would need to generate in order to compensate new subscribers for those projected losses, using the logic of exponential discounting based on compound interest. Hutcheson actually considered sixteen hypothetical scenarios, considering eight initial prices for the Stock and two possible outcomes regarding the absorption of the "irredeemable" debts.

Not all South Sea models produced pessimistic conclusions. A third model, in the awkwardly-titled *Argument To Shew the Disadvantage That Would Accrue to the Publick, from Obliging the South-Sea Company to Fix What Capital Stock They Will Give for the Annuities*, conceived of the Scheme's quantitative mechanics in a much different way, and came to a much more positive conclusion.⁴⁴ That *Argument* claimed the stock was worth at least £175 but potentially much more, up to £200-300. Much like the *Examination and Explanation*, the *Argument* tried to assess the value of South Sea Stock primarily by analyzing the value of the "assets" the Company held. But it did so in rather creative—and, to modern eyes, somewhat peculiar—way. The calculation captured the relationships between the Company's Stock and different kinds of public debt involved in the scheme using a traditional valuation practice borrowed from land transactions known as "years' purchase." Further, unlike the *Examination and Explanation*, the *Argument* did not consider the Company's assets as temporally fixed. Rather, it argued that the refinancing operations that the Company was involved in would have a feedback effect that would fuel the growth of the Stock's value *over time*.

In only these three quantitative models from February-March 1720, it is evident just how many interpretive choices contemporary analysts had to make in interpreting the South Sea Scheme, and just how broad the space of plausible computations would therefore have been. Such quandaries became even more perplexing as the price investors were willing to offer for South Sea Stock began

⁴¹ Deringer, "Calculated Values," 248-77.

⁴² [Anon.], *An Examination and Explanation of the South-Sea Company's Scheme...* (London: Printed for J. Roberts, 1720), 5-7.

⁴³ [Archibald Hutcheson], *Some Calculations Relating to the Proposals Made by the South-Sea Company, and the Bank of England...* (London: Printed, and Sold by J. Morphew, 1720).

⁴⁴ [Anon.], *Argument to Shew the Disadvantage...* (London: Printed for J. Roberts, 1720).

to rise to unprecedented heights. Calculations became even more divergent over the course of the year. One calculation, for example, published in the *Flying-Post* newspaper in early April, when the Stock yet to hit £300, suggested that it might be worth as much as £880. It argued, rather ingenuously, that the Stock's value derived from its operation as a pyramid scheme.⁴⁵ Another calculation, published in June when the stock's price was soaring past £600, suggested it was really only worth £100.⁴⁶ What was rational? Who was to say...

Just as the “smart money” investor might reap the handsomest profits in moments of financial chaos, so might scholars profit by venturing more deeply into moments of economic confusion—profits both for our understanding of economic history and historical epistemology. For one, the disorderly story of the South Sea Bubble suggests that greater attention ought to be paid to how epistemic instability contributes to financial crisis. Instead of asking whether bubbles are rational, we might ask whether financial crises are also *epistemic crises*, moments in which the complexity of financial invention radically outstrips the capacity of the financial community to understand what is going on. Humanistic analysis of economic disagreement might have much to add to an alternative line of economic research that, though first conceived in the 1970s, has emerged primarily in the last fifteen years as an alternative to the ir/rationalist paradigm. Some economists have come to argue that a prime determinant of bubbles is the amount of disagreement, or “dispersion of opinion,” among investors about an asset's value.⁴⁷ Economists have explored various factors that might permit such significant disagreements, notably including investors' overconfidence and limited attention.⁴⁸ A few economists have even begun to think about investor disagreement in terms of differences in *knowledge*, and to borrow theoretical insights from the history and philosophy of science.⁴⁹ Looking to *disagreement*, it seems, may allow for new (and agreeable) collaborations between humanistic and social-scientific interpretations of economic life. But even more broadly, *confusion* itself merits much greater attention as an object of historical and humanist inquiry. How can we tell when individuals or groups are genuinely *confused* about something? How can we identify what was *plausible*—but could not be clearly affirmable nor deniable—in the past? These are promising questions for the field of historical epistemology. To understand where the possibilities of rationality—or knowledge, or understanding—begin and end, we must attend to its messy and contested borders in the past. Herbert Simon might approve.

⁴⁵ *Flying-Post*, or, *Post-master*, no. 4428 (7-9 April 1720).

⁴⁶ [Hutcheson], *An Estimate of the Intrinsic Value of South-Sea Stock* ([London]: s.n., [1720]).

⁴⁷ Harrison Hong and Jeremy C. Stein, “Disagreement and the Stock Market,” *The Journal of Economic Perspectives* 21, no. 2 (Spring, 2007): 109-128; Edward Miller, “Risk, Uncertainty, and Divergence of Opinion,” *Journal of Finance* 32, no. 4 (Sep., 1977): 1151-68; J. Michael Harrison and David M. Kreps, “Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations,” *Quarterly Journal of Economics* 92 (May, 1978): 323-36.

⁴⁸ David Hirshleifer and Siew Hong Teoh, “Limited Attention, Information Disclosure and Financial Reporting,” *Journal of Accounting and Economics* 36, nos. 1-3 (Dec., 2003): 337-86, esp. 341-44; Jose A. Scheinkman and Wei Xiong, “Overconfidence and Speculative Bubbles,” *Journal of Political Economy* 111, no. 6 (Dec., 2003): 1183-1220.

⁴⁹ Harrison Hong, Jeremy C. Stein, and Jialin Yu, “Simple Forecasts and Paradigm Shifts,” *The Journal of Finance* 62, no. 3 (Jun., 2007): 1207-42.